

APPENDIX A: HOWARD COUNTY COUNCIL BILL #56-2018

Introduced	7/2/18
Public Hearing	7/16 & 23/18
Council Action	7/27/18
Executive Action	7/27/18
Effective Date	7/27/18

County Council of Howard County, Maryland

2018 Legislative Session

Legislative Day No. 10

Bill No. 56-2018

Introduced by: Jon Weinstein

Co-sponsored by: Calvin Ball, Jennifer Terrasa, Greg Fox, and Mary Kay Sigaty

AN ACT temporarily prohibiting issuance of certain permits and certain approvals of development plans and zoning changes for property that drains in whole or in part to the Tiber Branch Watershed or the Plumtree Branch Watershed in Howard County to study flooding events that threaten public health, safety, and welfare; requesting the Department of Planning and Zoning, the Department of Public Works, and other County agencies to study past, present, and future land uses, drainage infrastructure, storm water management, and flood mitigation, and all other factors related to flooding in the Tiber Branch Watershed or the Plumtree Branch Watershed, and report and make recommendations on changes to land uses, drainage infrastructure, stormwater management, and flood mitigation; defining certain terms; providing certain exemptions from the Act; providing that this Act shall be abrogated and of no further force and effect after a certain period; and generally relating to land use, storm water management, drainage and flood mitigation; and declaring this to be an emergency Act.

Introduced and read first time July 2, 2018. Ordered posted and hearing scheduled.

By order Jessica Feldmark
Jessica Feldmark, Administrator

Having been posted and notice of time & place of hearing & title of Bill having been published according to Charter, the Bill was read for a second time at a public hearing on July 16 & 23, 2018.

By order Jessica Feldmark
Jessica Feldmark, Administrator

This Bill was read the third time on July 27, 2018 and Passed ☐, Passed with amendments ☒, Failed ☐.

By order Jessica Feldmark
Jessica Feldmark, Administrator

Sealed with the County Seal and presented to the County Executive for approval this 27th day of July, 2018 at 2 a.m./p.m.

By order Jessica Feldmark
Jessica Feldmark, Administrator

Approved/Vetoed by the County Executive July 27, 2018

Allan H. Kittleman
Allan H. Kittleman, County Executive

NOTE: [[text in brackets]] indicates deletions from existing law; Text in small capitals indicates additions to existing law; Strike-out indicates material deleted by amendment; Underlining indicates material added by amendment.

1 **WHEREAS** the Tiber Branch and its tributaries constitute the natural drainage for the Tiber
2 Branch Watershed to the Patapsco River; and

3
4 **WHEREAS** the Tiber Branch Watershed contains various land uses including older and newer
5 commercial and residential development, public facilities and public schools, State and County
6 road networks, unimproved property, and Historic Ellicott City, which is located at a low-point
7 in the Tiber Branch Watershed and along the Patapsco River; and

8
9 **WHEREAS** the Tiber Branch and its tributaries drain through Historic Ellicott City, are
10 confined by steep topography surrounding Historic Ellicott City's Main Street, and are lined
11 along their banks by historic buildings that are unique and pose challenges for meeting modern
12 construction practices; and

13
14 **WHEREAS** Historic Ellicott City is a national and local designated historic district and contains
15 architectural, historic, and cultural resources that cannot be replaced and which have been
16 severely damaged by repeated flooding; and

17
18 **WHEREAS**, on May 27, 2018, Historic Ellicott City and other areas of the County were
19 subjected to devastating flooding for the second time in twenty-two months, resulting in the loss
20 of human life, the catastrophic destruction of private and public property, and the interruption of
21 public road networks and public, commercial, and personal activities and necessitating the
22 County Executive to exercise Emergency Powers through Executive Order 2018-07, which
23 declared a State of Emergency that was subsequently extended through July 3, 2018, by the
24 County Council with the passage of Council Resolution No. 84-2018 on June 1, 2018, and is
25 subject to further extension to address the devastating effects of flooding in Historic Ellicott City
26 and other areas of the County; and

27
28 **WHEREAS**, extreme weather events have recently become more frequent and severe as
29 documented by the National Oceanic and Atmospheric Administration in the 2016 U.S. Climate
30 Extremes Index and by the United States Environmental Protection Agency, which noted in its
31 2016 report of Climate Change Indicators in the United States that:

1 “In recent years, a larger percentage of precipitation has come in the form of intense
2 single-day events. Nine of the top 10 years for extreme one-day precipitation events have
3 occurred since 1990” ([https://www.epa.gov/climate-indicators/climate-change-indicators-](https://www.epa.gov/climate-indicators/climate-change-indicators-heavy-precipitation)
4 heavy-precipitation); and
5

6 **WHEREAS**, after the catastrophic flooding in the Tiber Branch Watershed in July 2016, the
7 Howard County Department of Public Works (DPW) conducted a Hydraulic and Hydrologic
8 (H&H) analysis of the area in and around Historic Ellicott City, along with other analyses of the
9 July 2016 flood event in Historic Ellicott City and other areas of the County; and
10

11 **WHEREAS**, the H&H study, entitled, “2016 Ellicott City Hydrology/Hydraulic Study and
12 Concept Mitigation Analysis,” concluded the following:

13 “The results of this study demonstrate that construction of stormwater storage facilities
14 throughout the watershed, combined with stormwater conveyance infrastructure
15 improvements, can make an appreciable difference in the severity of flooding from a 100-
16 year or other similar storm event. However, the nature and scope of such improvements is
17 significant in scope, impact and cost. It will require a long-term planning and
18 implementation effort, supplemental to the Master Plan process, to prioritize, design and
19 construct improvements based on the concepts represented in this report.”; and
20

21 **WHEREAS**, in the current State of Emergency, where much of Main Street in Historic Ellicott
22 City is temporarily closed to the public to assess and repair flood damage, the Howard County
23 community made up of residents, property owners, business owners, government workers, non-
24 profit groups, and volunteers has again galvanized to begin the task of clean-up, repair, and
25 restoration of Historic Ellicott City; and
26

27 **WHEREAS**, the cost to County taxpayers for the repair of public facilities damaged by the 2018
28 flood is currently estimated at over \$20 million and the cost from the 2016 flood was \$10
29 million; and
30

31 **WHEREAS**, the Plumtree Branch and its tributaries constitute the natural drainage for the

Plumtree Branch Watershed to the Little Patuxent River; and

WHEREAS, the Plumtree Branch Watershed is home to many neighborhoods, including but not limited to Valley Mede, Chatham, Nob Hill, and Dunloggin, and contains various land uses including older and newer commercial and residential developments, public facilities, State and County road networks, and unimproved property; and

WHEREAS, the Plumtree Branch and its tributaries are, in some areas, in close proximity to roads, private properties, and homes in the floodplain that have been severely damaged by repeated flooding; and

WHEREAS, after the catastrophic flooding in the Plumtree Branch Watershed in July 2016, the Maryland State Highway Administration (SHA) in coordination with the Howard County Department of Public Works (DPW) conducted a Hydraulic and Hydrologic (H&H) analysis of the Plumtree Branch area, along with other analyses of the July 2016 flood event in Ellicott City, entitled, “Valley Mede Hydrology/Hydraulic Study and Concept Mitigation Analysis for Plumtree Branch and Little Plumtree Branch,” which evaluated stormwater management options (storage via ponds) and conveyance improvements (culvert upsizing and replacement, additional storm drain) that could provide a significant reduction in discharges and water surface elevations for the 100-year and more frequent storm events; and

WHEREAS, the increased severity and frequency of flooding in the Plumtree Watershed has led to homes flooding, roads flooding, damage to culverts and storm drain infrastructure, and public safety concerns warranting the need for the County to study, make recommendations, and consider implementation of best practices in the watershed; and

WHEREAS, due to the potential that zoning changes may be necessary in the Tiber Branch Watershed or the Plumtree Branch Watershed in response to the studies, reports, and recommendations requested by this Bill and because the County Council is prohibited from taking any zoning action until January 2019, it is imperative that the County have sufficient time to consider, share with the public, and act on any recommendation concerning zoning changes in

1 the Tiber Branch Watershed or the Plumtree Branch Watershed.

2
3 **NOW THEREFORE,**

4
5 **Section 1. Be It Enacted** by the County Council of Howard County, Maryland, that the
6 Department of Inspections, Licenses and Permits shall not issue Permits for property that drains,
7 in whole or in part, to the Tiber Branch Watershed or the Plumtree Branch Watershed, as
8 highlighted in green on the ~~map~~ maps attached to this Bill as Exhibit A and Exhibit B,
9 respectively, during the Effective Period.

10
11 **Section 2. And Be It Further Enacted** by the County Council of Howard County, Maryland,
12 that, subject to the exception for emergency legislation as provided in the County Charter, the
13 County Council shall not pass any zoning regulation text amendment for property that drains, in
14 whole or in part, to the Tiber Branch Watershed or the Plumtree Branch Watershed during the
15 Effective Period.

16
17 **Section 3. And Be It Further Enacted** by the County Council of Howard County, Maryland that
18 the Zoning Board shall not take final action on any petition for approval of a development plan
19 or for piecemeal map amendment for property that drains, in whole or in part, to the Tiber
20 Branch Watershed or the Plumtree Branch Watershed during the Effective Period.

21
22 **Section 4. And Be It Further Enacted** by the County Council of Howard County, Maryland that
23 the Hearing Authority shall not hear or take final action on any application or petition related to
24 the zoning or development of a property that drains, in whole or in part, to the Tiber Branch
25 Watershed or the Plumtree Branch Watershed during the Effective Period. This prohibition
26 shall not apply to any appeal of an administrative decision which is not related to zoning or
27 development nor shall it apply to any enforcement action.

28
29 **Section-4. 5. And Be It Further Enacted** by the County Council of Howard County, Maryland
30 that the Department of Planning and Zoning and the Department of Public Works, along with
31 other appropriate units of County Government, are requested to study, as expeditiously as

1 practicable without compromising quality, the extent to which existing, planned, and future land
2 use, storm water management, drainage infrastructure, and flood mitigation for property that
3 drains in whole or in part to the Tiber Branch Watershed or the Plumtree Branch Watershed,
4 and any other relevant factor, may contribute to flooding in the each Watershed, share findings
5 as they become available with the public, and on or before May 31, 2019, submit to the County
6 Council a report of such study or studies and any recommendations about changes in law and
7 procedures that may help protect the Watershed from the effects of future flood events. Areas of
8 inquiry are to include, but not be limited to the following:

- 9
- 10 (1) An analysis of the May 27, 2018, flood based on the models and findings of the 2016
11 Ellicott City Hydrology/Hydraulic Study and Concept Mitigation Analysis and Valley
12 Mede Hydrology/Hydraulic Study and Concept Mitigation Analysis for Plumtree
13 Branch and Little Plumtree Branch; and
- 14 (2) Designs or plans for construction of stormwater storage facilities combined with
15 stormwater conveyance infrastructure improvements, and drainage infrastructure and
16 flood mitigation for property that drains in whole or in part to the Tiber Branch
17 Watershed or the Plumtree Branch Watershed; and
- 18 (3) An analysis of how any existing or proposed development or redevelopment of property
19 that drains in whole or in part to the Tiber Branch Watershed or the Plumtree Branch
20 Watershed may impact flooding in the Watershed Watersheds; and
- 21 (4) Proposed changes to the County's Stormwater Management regulations as they apply to
22 property that drains in whole or in part to the Tiber Branch Watershed or the Plumtree
23 Branch Watershed; and
- 24 (5) An analysis of public and private options for retrofitting existing public and private
25 property that drains in whole or in part to the Tiber Branch Watershed or the Plumtree
26 Branch Watershed that was developed with no or superseded stormwater management
27 requirements; and
- 28 (6) An analysis of potential general plan and density and open space zoning regulations
29 changes with respect to future development and redevelopment of property that drains
30 in whole or in part to the Tiber Branch Watershed or the Plumtree Branch Watershed;
31 and

1 (7) ~~An analysis of creating a special benefits district for the Tiber Branch Watershed~~ An
2 analysis of creating a special benefits district for the Tiber Branch Watershed and for
3 the Plumtree Branch Watershed, respectively, or other funding mechanisms to finance
4 stormwater and drainage infrastructure, and flood mitigation, and retrofitting
5 improvements for property that drains in whole or in part to the ~~Watershed~~ Watersheds;
6 and

7 (8) Any other matter that may assist the County in identifying and clarifying the various
8 complex factors contributing to flooding in the Tiber Branch Watershed or the Plumtree
9 Branch Watershed and in establishing a comprehensive plan for managing and
10 controlling such factors to the maximum extent practicable to protect public safety,
11 health, and welfare in the ~~Watershed~~ Watersheds.

12
13 ***Section 5- 6. And Be It Further Enacted*** by the County Council of Howard County, Maryland
14 *that:*

15 A. Short Title. *This Act shall be known as the “Tiber Branch Watershed and*
16 *Plumtree Branch Watershed Safety Act.*”

17
18 B. Purpose. *The purpose of this Act is to protect the public health, safety, and*
19 *welfare in the Tiber Branch Watershed and the Plumtree Branch Watershed.* *Based on the 2016*
20 *Ellicott City Hydrology/Hydraulic Study and Concept Mitigation Analysis, development in the*
21 *Tiber Branch Watershed or the Plumtree Branch Watershed may have contributed to flooding*
22 *events in the Watershed, especially in Historic Ellicott City. Also, based on the 2016 Valley*
23 *Mede Hydrology/Hydraulic Study and Concept Mitigation Analysis, development in the Plumtree*
24 *Branch Watershed may have contributed to flooding events in the Watershed.* *Planned and*
25 *future development of property that drains in whole or in part to the Tiber Branch Watershed or*
26 *the Plumtree Branch Watershed may pose a threat to public health, safety, and welfare in the*
27 *Watershed*~~*respective Watersheds, including to Historic Ellicott City, Valley Mede, and*~~
28 *Dunloggin.* *To combat this threat, this Act is necessary:*

29 1. *To provide the Department of Planning and Zoning and the Department of Public*
30 *Works, with help from other appropriate units of County government, time to*
31 *study the extent to which existing, planned and future development or*

1 redevelopment of property that drains in whole or in part to the Tiber Branch
2 Watershed or the Plumtree Branch Watershed and any other relevant factor may
3 contribute to future flooding in the ~~Watershed~~ respective Watersheds, identify
4 potential public policy and private solutions, and make recommendations for
5 changes in law and procedures to the County Council to protect public health,
6 safety, and welfare in the ~~Watershed~~ respective Watersheds, including in Historic
7 Ellicott City, Valley Mede, and Dunloggin; and

8 2. To provide the County Council time to study and act on any recommendations.

9 C. Definitions. For the purposes of this Act:

- 10 1. "Permit" means a building or grading permit issued by the Department of
11 Inspections, Licenses and Permits for property that drains in whole or in part to
12 the Tiber Branch Watershed or the Plumtree Branch Watershed.
13 2. "Development Review Process" means the process of review and decision on an
14 application submitted to the Department of Planning and Zoning or any other
15 applicable authorized County agency for a proposed subdivision or development
16 or redevelopment plan for property that drains in whole or in part to the Tiber
17 Branch Watershed or the Plumtree Branch Watershed.

18 D. Exemptions. The restrictions in this Act shall not apply to the following:

- 19 1. Any proposed construction on real property that drains in whole or in part to the
20 Tiber-Hudson Watershed or the Plumtree Branch Watershed involving the
21 reconstruction or repair of improvements on real property damaged by fire, flood,
22 or other natural disaster which results in no change of the square footage of
23 impervious surfaces that existed on the property prior to the natural disaster; or
24
25 2. Any proposed construction on real property that drains in whole or in part to the
26 Tiber Branch Watershed or the Plumtree Branch Watershed that does not change
27 the square footage of the impervious surfaces on the property over the square
28 footage of impervious surfaces that existed on the property prior to the Effective
29 Date of this Act; or
30

1 3. Any proposed construction that is exclusively devoted to improving storm water
2 management on existing developed property that drains in whole or in part to the
3 Tiber Branch Watershed or the Plumtree Branch Watershed.
4

5 E. Development Review Process. The development review process specified in Title 16
6 of the Howard County Code may continue notwithstanding this Act becoming
7 effective. Applications made to the Department of Planning and Zoning under the
8 development review process, filed before, on, or after the Effective Date of this Act
9 may proceed but shall not be considered for plan approval by the Department of
10 Planning and Zoning until the expiration of this Act. ~~The Department of Planning and~~
11 ~~Zoning shall notify any current or future applicant in the development review process~~
12 ~~of this Act and of the potential for changes to County law that might become~~
13 ~~applicable to the plans under the development review process before a Permit is~~
14 ~~issued.~~ During the Effective Period, the Department of Planning and Zoning shall
15 grant an applicant's written request for an extension of a development review process
16 deadline for development or redevelopment of property that drains in whole or in
17 part to the Tiber Branch Watershed or the Plumtree Branch Watershed. No fees shall
18 be charged for requesting, processing, or granting such an extension.

19 F. Notice. During the Effective Period, the Department of Planning and Zoning shall
20 notify any current or future applicant in the development review process, any current
21 or future petitioner to the Zoning Board, or any current or future applicant to the
22 Hearing Authority of this Act and of the potential for changes to County law that
23 might become applicable to the plans under the development review process before a
24 Permit is issued.

25 ~~F. Permitting deadlines~~ G. Deadlines suspended. During the Effective Period, any
26 applicable ~~review~~ deadline or timeframe for a Permit, application, or petition that is
27 subject to this Act shall be suspended until this Act is no longer in effect.

28 GH. Severability. Should any part of this Act be declared unconstitutional or invalid
29 by a court of competent jurisdiction, such decision shall not affect the validity of the
30 remaining parts of this Act.
31

1 *HI. Conflict with Existing Law. In case of a conflict between this Act and other applicable*
2 *law, this Act shall prevail.*

3
4 *IJ. Effective Date & Effective Period. This Act is adopted as an interim measure and*
5 *shall be in effect for twelve months (the Effective Period) from its Effective Date, and,*
6 *at the end of the day on the final day of the Effective Period, with no further action*
7 *required by the County Council, this Act shall be abrogated and of no further force*
8 *and effect unless this Act is modified, extended, replaced or terminated through a*
9 *subsequent legislative act of the Council.*

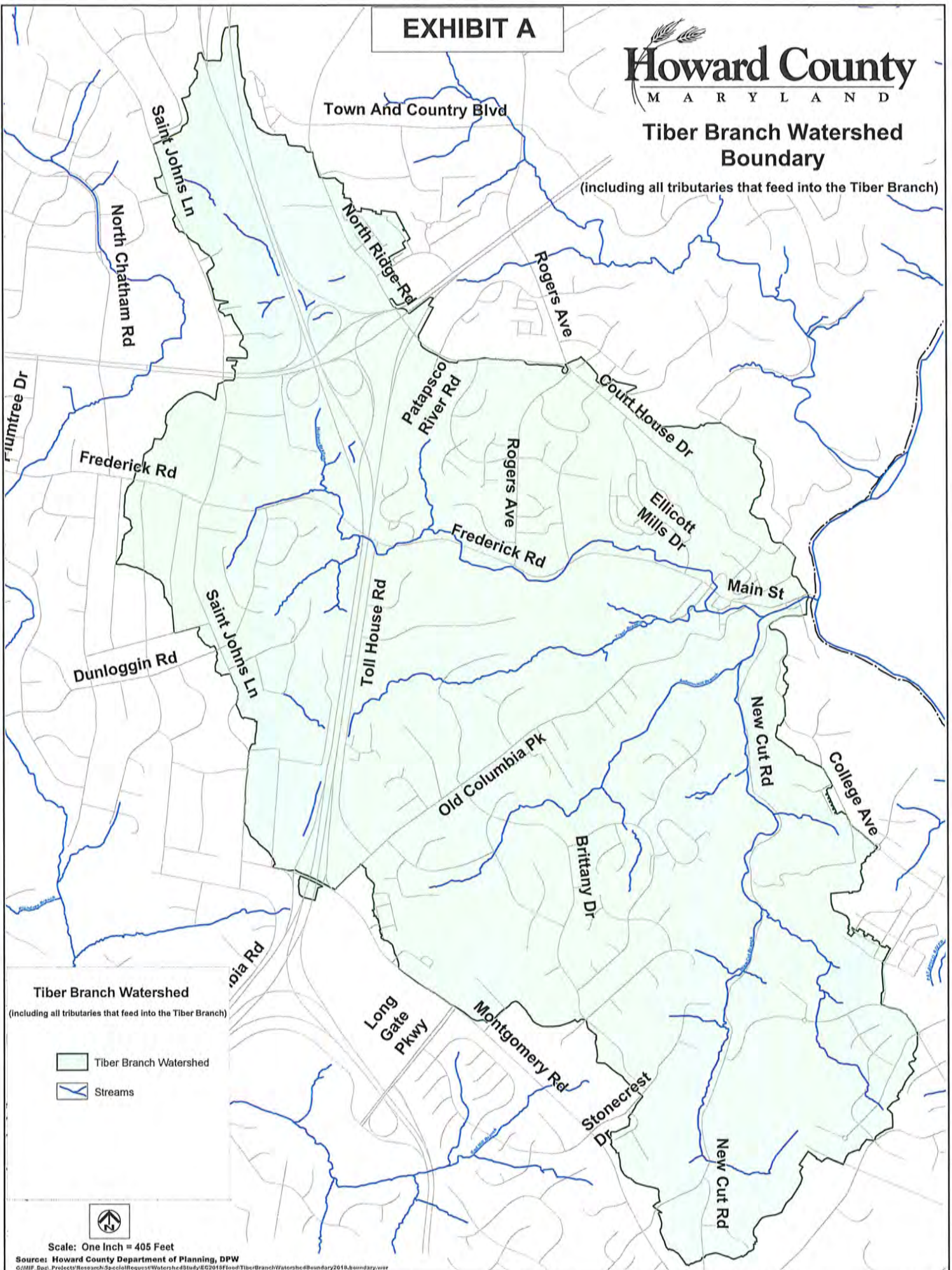
10
11 ***Section-6. 7. And Be It Further Enacted*** *by the County Council of Howard County, Maryland*
12 *that that this Act is hereby declared an emergency bill and necessary to meet a public emergency*
13 *affecting life, health or property and is effective upon enactment.*

EXHIBIT A



Tiber Branch Watershed Boundary

(including all tributaries that feed into the Tiber Branch)



Tiber Branch Watershed

(including all tributaries that feed into the Tiber Branch)

-  Tiber Branch Watershed
-  Streams



Scale: One Inch = 405 Feet

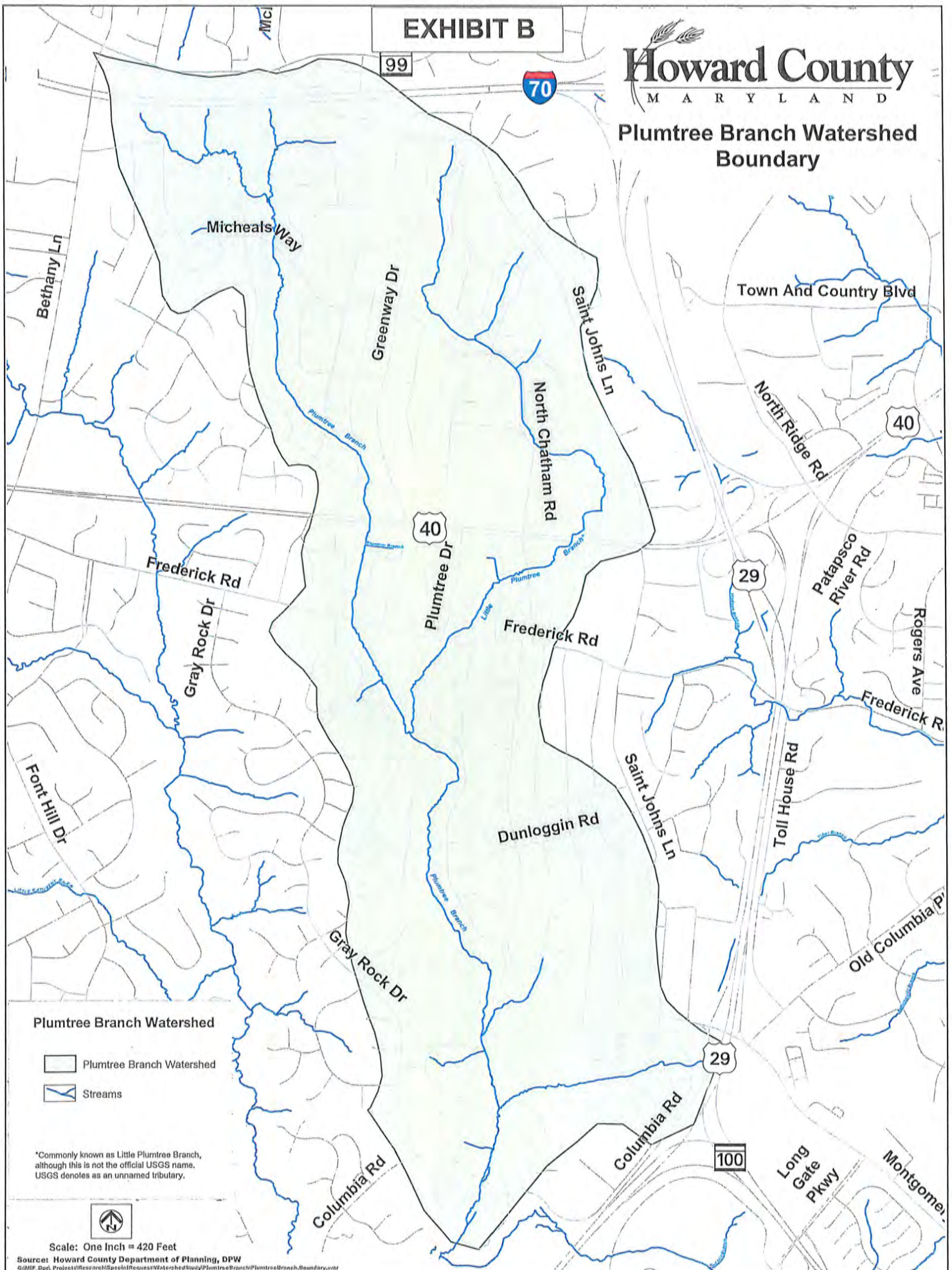
Source: Howard County Department of Planning, DPW

G:\MPF_Doc_Projects\Research\SpecialRequests\WatershedStudy\EG2018\FloodTiberBranchWatershedBoundary2018\boundary.vor

EXHIBIT B

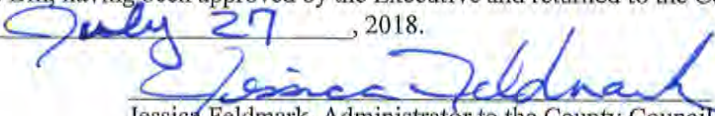
Howard County MARYLAND

Plumtree Branch Watershed Boundary



BY THE COUNCIL

This Bill, having been approved by the Executive and returned to the Council, stands enacted on July 27, 2018.



Jessica Feldmark, Administrator to the County Council

BY THE COUNCIL

This Bill, having been passed by the yeas and nays of two-thirds of the members of the Council notwithstanding the objections of the Executive, stands enacted on _____, 2018.

Jessica Feldmark, Administrator to the County Council

BY THE COUNCIL

This Bill, having received neither the approval nor the disapproval of the Executive within ten days of its presentation, stands enacted on _____, 2018.

Jessica Feldmark, Administrator to the County Council

BY THE COUNCIL

This Bill, not having been considered on final reading within the time required by Charter, stands failed for want of consideration on _____, 2018.

Jessica Feldmark, Administrator to the County Council

BY THE COUNCIL

This Bill, having been disapproved by the Executive and having failed on passage upon consideration by the Council stands failed on _____, 2018.

Jessica Feldmark, Administrator to the County Council

BY THE COUNCIL

This Bill, the withdrawal of which received a vote of two-thirds (2/3) of the members of the Council, is withdrawn from further consideration on _____, 2018.

Jessica Feldmark, Administrator to the County Council

APPENDIX B: HYDROLOGY DOCUMENTATION



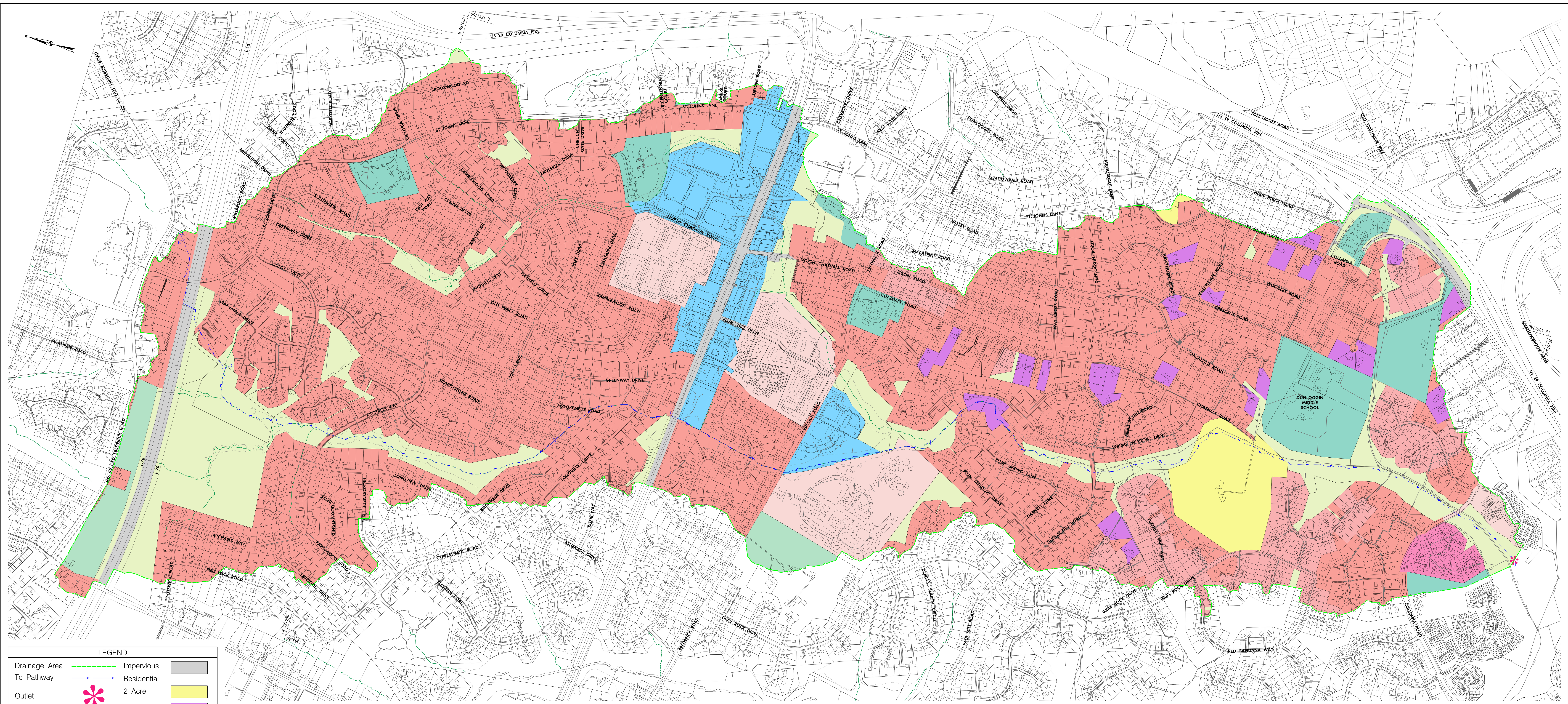
LEGEND

- Drainage Area
- Tc Pathway
- Stormdrain
- Existing FEMA
- Outlet

Plumtree Branch
Drainage Area Map

300' 0 300' 600'

SCALE: 1" = 300'



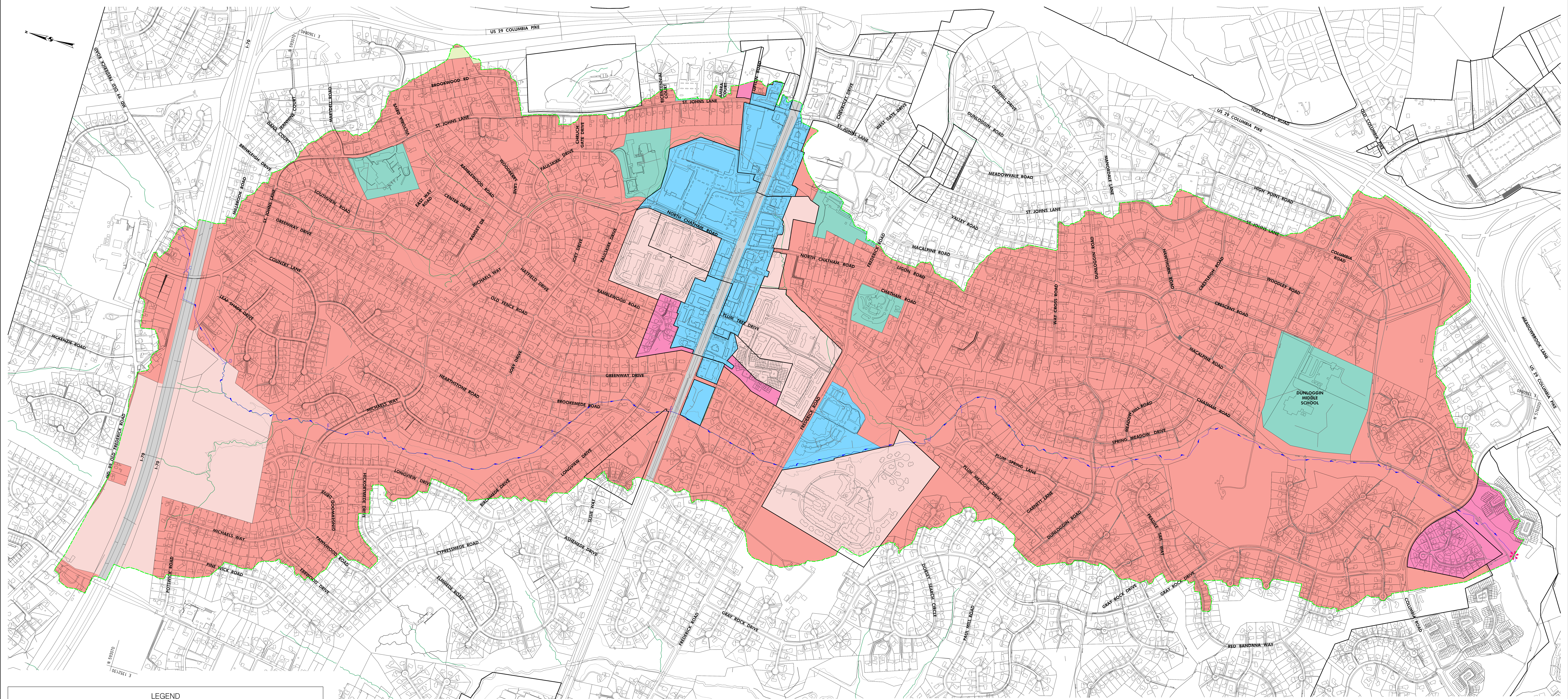
LEGEND

Drainage Area	-----	Impervious	-----
To Pathway	-----	Residential:	-----
Outlet	-----	2 Acre	-----
	-----	1 Acre	-----
Commercial	-----	12 Acre	-----
Open Space	-----	13 Acre	-----
Agricultural	-----	14 Acre	-----
Institutional	-----	18 Acre	-----

Plumtree Branch
Existing Land Use Map

300' 0 300' 600'

SCALE: 1" = 300'



LEGEND

Drainage Area
To Pathway

Outlet

Open Space

12 Acre

14 Acre

18 Acre

Commercial

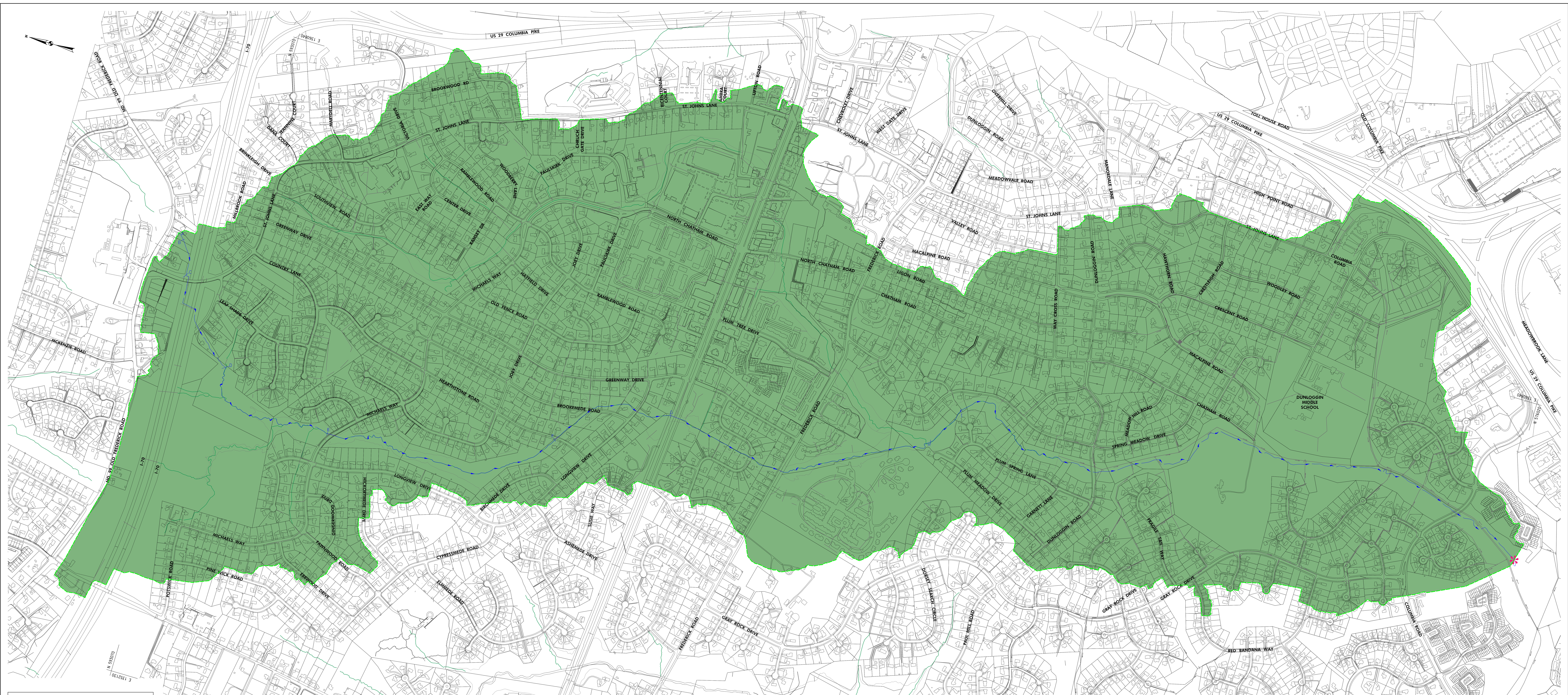
Institutional

Impervious

Plumtree Branch
Ultimate Land Use Map

300' 0 300' 600'

SCALE: 1" = 300'



LEGEND

Drainage Area

To Pathway

Outlet

Woods

Plumtree Branch

Woods in Good Condition Map

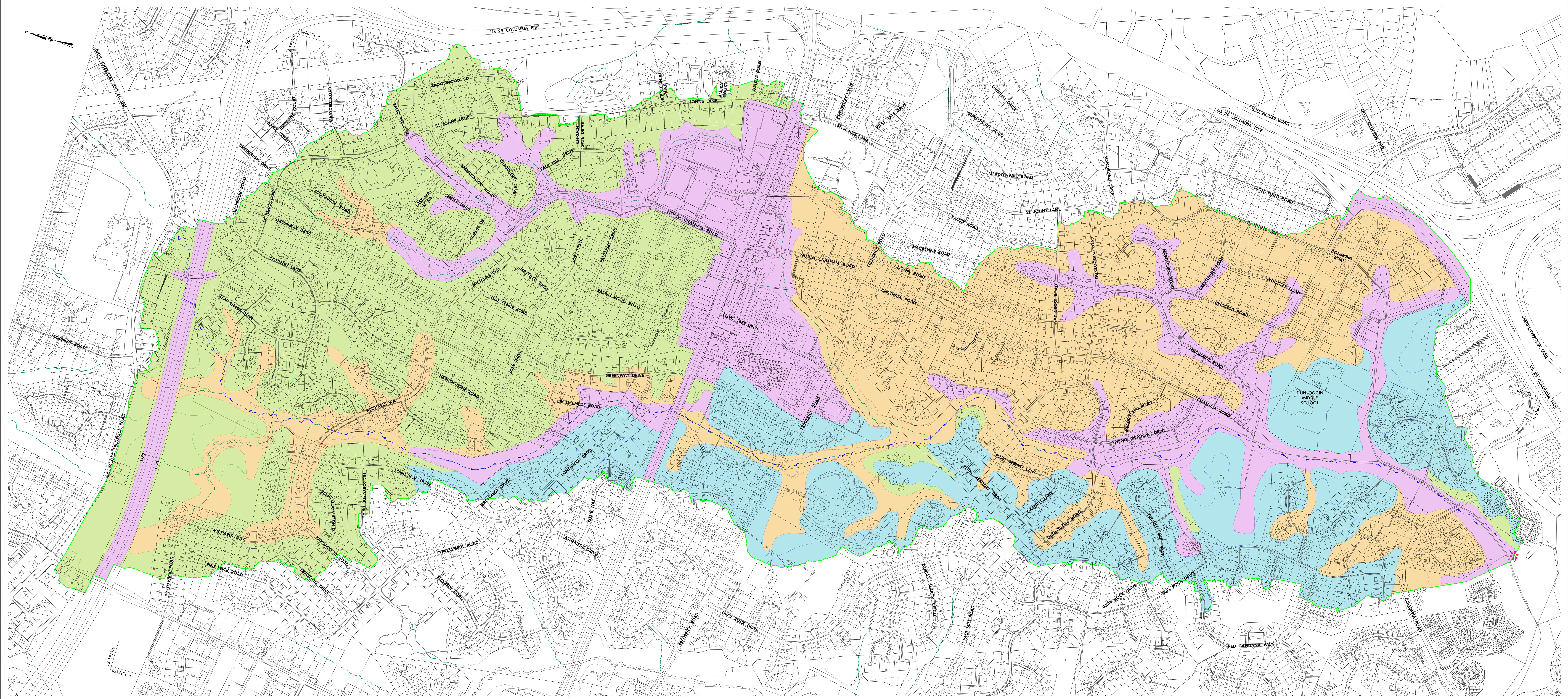
300'

0

300'

600'

SCALE: 1" = 300'



LEGEND

Drainage Area

Tc Pathway

Outlet

Soil A

Soil B

Soil C

Soil D

Plumtree Branch

Hydrologic Soils Map

300'

0

300'

600'

SCALE: 1" = 300'

SCS TR-55 RUNOFF CURVE NUMBER

JOB NAME: Plumtree Branch, Howard County
Existing Land Use, Good Conditions
Overall Drainage Area

DATE: 12/10/18
JOB NO.: 5937-27

COMPUTED BY: CLR/HBH
CHECKED BY: _____

STUDY POINT: Downstream
Study Limit -
Single DA

CONDITION: X ULTIMATE
EXISTING

RUNOFF CURVE NUMBER COMPUTATION

HYDROLOGIC SOIL GROUP	LAND USE	RUNOFF CURVE NO.	Area (ft^2)	AREA (ac)	RCN x A
A	Impervious	98	2,525	0.06	5.68
B	Impervious	98	96	0.00	0.22
C	Impervious	98	52,395	1.20	117.88
D	Impervious	98	1,778,604	40.83	4001.45
A	Open Space (good) - grass >75%	39	690,425	15.85	618.15
B	Open Space (good) - grass >75%	61	2,709,286	62.20	3794.00
C	Open Space (good) - grass >75%	74	3,244,001	74.47	5510.93
D	Open Space (good) - grass >75%	80	3,388,294	77.78	6222.76
A	Residential - 1/2 Acre	54	6,760,508	155.20	8380.80
B	Residential - 1/2 Acre	70	22,766,123	522.64	36584.68
C	Residential - 1/2 Acre	80	16,724,587	383.94	30715.49
D	Residential - 1/2 Acre	85	5,204,199	119.47	10155.12
C	Residential - 1/4 Acre	83	562,377	12.91	1071.56
D	Residential - 1/4 Acre	87	15,821	0.36	31.60
A	Residential - 1/8 Acre or less	77	1,434,437	32.93	2535.62
B	Residential - 1/8 Acre or less	85	1,464,357	33.62	2857.45
C	Residential - 1/8 Acre or less	90	787,890	18.09	1627.87
D	Residential - 1/8 Acre or less	92	1,469,159	33.73	3102.91
A	Urban district - commercial/business	89	322,898	7.41	659.73
B	Urban district - commercial/business	92	215,250	4.94	454.61
C	Urban district - commercial/business	94	306,101	7.03	660.55
D	Urban district - commercial/business	95	3,475,242	79.78	7579.15
A	Urban district - industrial	81	2,007,250	46.08	3732.49
B	Urban district - industrial	88	604,010	13.87	1220.22
C	Urban district - industrial	91	1,038,222	23.83	2168.92
D	Urban district - industrial	93	704,323	16.17	1503.72
A	Residential - 1 Acre	51	291,114	6.68	340.84
C	Residential - 1 Acre	79	1,150,870	26.42	2087.21
D	Residential - 1 Acre	84	288,415	6.62	556.17
A	Residential - 1/3 Acre	57	3,272,041	75.12	4281.60
C	Residential - 1/3 Acre	81	1,072,039	24.61	1993.46
D	Residential - 1/3 Acre	86	113,277	2.60	223.64
A	Residential - 2 Acre	46	1,067,465	24.51	1127.26
B	Residential - 2 Acre	65	77,492	1.78	115.63
C	Residential - 2 Acre	77	67,034	1.54	118.49
D	Residential - 2 Acre	82	667,200	15.32	1255.98
A	Row crops - straight row (SR) - (good)	67	436,175	10.01	670.88
B	Row crops - straight row (SR) - (good)	78	812,417	18.65	1454.74
C	Row crops - straight row (SR) - (good)	85	156,899	3.60	306.16
		TOTAL	87,200,818	2,002	149,846
				MI^2	3.1279

$$\text{WEIGHTED RUNOFF CURVE NUMBER} = \frac{\text{TOT RCN} \times \text{AC}}{\text{TOTAL ACRES}} = \frac{149845.62}{2001.86} = 74.853$$

SCS TR-55 RUNOFF CURVE NUMBER

JOB NAME: Plumtree Branch, Howard County
Ultimate Land Use, Good Conditions
Overall Drainage Area

DATE: 12/10/18
 JOB NO.: 5937-27

COMPUTED BY: CLR/HBH STUDY POINT: Downstream CONDITION: X ULTIMATE
 CHECKED BY: Study Limit - EXISTING
Single DA

RUNOFF CURVE NUMBER COMPUTATION

HYDROLOGIC SOIL GROUP	LAND USE	RUNOFF CURVE NO.	Area (ft^2)	AREA (ac)	RCN x A
A	Impervious	98	173	0.00	0.39
B	Impervious	98	96	0.00	0.22
D	Impervious	98	1,366,240	31.36	3073.73
B	Open Space (Good)	61	41,320	0.95	57.86
A	Residential - 1/2 Acre	54	13,181,709	302.61	16340.96
B	Residential - 1/2 Acre	70	23,213,911	532.92	37304.26
C	Residential - 1/2 Acre	80	21,676,050	497.61	39809.09
D	Residential - 1/2 Acre	85	9,567,859	219.65	18670.06
A	Residential - 1/4 Acre	61	218,584	5.02	306.10
B	Residential - 1/4 Acre	75	434,309	9.97	747.78
C	Residential - 1/4 Acre	83	568,069	13.04	1082.41
D	Residential - 1/4 Acre	87	399,315	9.17	797.53
A	Residential - 1/8 Acre or less	77	1,210,375	27.79	2139.55
B	Residential - 1/8 Acre or less	85	4,151,882	95.31	8101.70
C	Residential - 1/8 Acre or less	90	1,869,180	42.91	3861.94
D	Residential - 1/8 Acre or less	92	1,724,385	39.59	3641.95
A	Urban district - commercial/business	89	321,723	7.39	657.33
B	Urban district - commercial/business	92	207,420	4.76	438.08
C	Urban district - commercial/business	94	295,679	6.79	638.06
D	Urban district - commercial/business	95	3,582,010	82.23	7812.01
A	Urban district - industrial	81	1,352,312	31.04	2514.63
B	Urban district - industrial	88	600,098	13.78	1212.32
C	Urban district - industrial	91	753,500	17.30	1574.12
D	Urban district - industrial	93	464,785	10.67	992.31
		TOTAL	87,200,984	2,002	151,774
				MI^2	3.1279

$$\text{WEIGHTED RUNOFF CURVE NUMBER} = \frac{\text{TOT RCN} \times \text{AC}}{\text{TOTAL ACRES}} = \frac{151774.38}{2001.86} = 75.817$$

SCS TR-55 RUNOFF CURVE NUMBER

JOB NAME: Plumtree Branch, Howard County

Woods in Good Condition

Overall Drainage Area

DATE: 05/16/19

JOB NO.: 5937-27

COMPUTED BY: CLR/HBH

CHECKED BY: _____

STUDY POINT: Downstream

Study Limit -

Single DA

CONDITION: ULTIMATE

EXISTING

X WOODS

RUNOFF CURVE NUMBER COMPUTATION

HYDROLOGIC SOIL GROUP	LAND USE	RUNOFF CURVE NO.	Area (ft^2)	AREA (ac)	RCN x A
A	Woods (good)	30	16,284,879	373.85	11215.48
B	Woods (good)	55	28,649,039	657.69	36173.03
C	Woods (good)	70	25,162,483	577.65	40435.58
D	Woods (good)	77	17,104,599	392.67	30235.40
		TOTAL	87,201,000	2,002	118,059
				MI^2	3.1279

$$\text{WEIGHTED RUNOFF CURVE NUMBER} = \frac{\text{TOT RCN} \times \text{AC}}{\text{TOTAL ACRES}} = \frac{118059.49}{2001.86} = 58.975$$

TR-55 TIME OF CONCENTRATION WORKSHEET

DRAINAGE AREA: **Plumtree Branch**
 Existing Tc
 Single Drainage Area for Total Watershed
 BY: **CLR**

OVERLAND FLOW

Flow Segment Name	AB
Surface Description	Grass (Dense)
Roughness Coefficient	0.24
Land Slope (ft/ft)	0.020
Flow Length (ft) [100' max]	100.00
Two-Year Rainfall (in.)	3.19

Flow Time (hr.)	0.2382
-----------------	---------------

0.238

SHALLOW CONCENTRATED FLOW

Flow Segment Name	BC
Flow Length (ft)	490
Paved or Unpaved	Unpaved
Land Slope (ft/ft)	0.024
Flow Velocity (ft/sec.)	2.5246

Flow Time (hr.)	0.0539
-----------------	---------------

0.054

CHANNEL FLOW

Flow Segment Name	CD	DE	EF	FG	GH	HI	IJ
Flow Depth (ft)	2	2.5	1.75	3	3.5	3	3.5
Bottom Width (ft)	3	3	4	5	6	8	8
Side Slope (Z1)	3	5	10	4	3	5	10
Side Slope (Z2)	3	5	10	4	3	5	10
Manning's Coefficient	0.035	0.035	0.035	0.035	0.035	0.035	0.035
Flow Length (ft)	1524	2164	3471	1753	3852	586	8902
Channel Slope (ft/ft)	0.032	0.013	0.005	0.007	0.004	0.003	0.002
Flow Velocity (ft/sec.)	8.3582	5.9279	2.9763	5.0334	4.2791	3.6546	2.9501

Flow Time (hr.)	0.0506	0.1014	0.3240	0.0967	0.2500	0.0445	0.8382
-----------------	---------------	---------------	---------------	---------------	---------------	---------------	---------------

1.706

PIPE FLOW (Assuming full flow)

Flow Segment Name	
Pipe Diameter (ft)	
Manning's Coefficient	
Pipe Slope (ft/ft)	
Pipe Length (ft)	
Flow Velocity (ft/sec.)	

Flow Time (hr.)	
-----------------	--

0.000

TIME OF CONCENTRATION (hr.)/(min)

1.998 hrs
120 min

TR-55 TIME OF CONCENTRATION WORKSHEET

DRAINAGE AREA: **Plumtree Branch**
 Existing Tc BY: **CLR**
 Single Drainage Area for Total Watershed, Modified for Woods in Good Condition

OVERLAND FLOW

Flow Segment Name	AB
Surface Description	Woods (dense)
Roughness Coefficient	0.80
Land Slope (ft/ft)	0.020
Flow Length (ft) [100' max]	100.00
Two-Year Rainfall (in.)	3.19

Flow Time (hr.)	0.6241
-----------------	---------------

0.624

SHALLOW CONCENTRATED FLOW

Flow Segment Name	BC
Flow Length (ft)	490
Paved or Unpaved	Unpaved
Land Slope (ft/ft)	0.024
Flow Velocity (ft/sec.)	2.5246

Flow Time (hr.)	0.0539
-----------------	---------------

0.054

CHANNEL FLOW

Flow Segment Name	CD	DE	EF	FG	GH	HI	IJ
Flow Depth (ft)	2	2.5	1.75	3	3.5	3	3.5
Bottom Width (ft)	3	3	4	5	6	8	8
Side Slope (Z1)	3	5	10	4	3	5	10
Side Slope (Z2)	3	5	10	4	3	5	10
Manning's Coefficient	0.035	0.035	0.035	0.035	0.035	0.035	0.035
Flow Length (ft)	1524	2164	3471	1753	3852	586	8902
Channel Slope (ft/ft)	0.032	0.013	0.005	0.007	0.004	0.003	0.002
Flow Velocity (ft/sec.)	8.3582	5.9279	2.9763	5.0334	4.2791	3.6546	2.9501

Flow Time (hr.)	0.0506	0.1014	0.3240	0.0967	0.2500	0.0445	0.8382
-----------------	---------------	---------------	---------------	---------------	---------------	---------------	---------------

1.706

PIPE FLOW (Assuming full flow)

Flow Segment Name	
Pipe Diameter (ft)	
Manning's Coefficient	
Pipe Slope (ft/ft)	
Pipe Length (ft)	
Flow Velocity (ft/sec.)	

Flow Time (hr.)	
-----------------	--

0.000

TIME OF CONCENTRATION (hr.)/(min)

2.384 hrs
143 min

WinTR-20: version 3.20 0 0 0.1 0
Plumtree Existing LU, Good Cond, 1DA
7/30/16 and 5/27/18 Events

SUB-AREA:
DA1 Outlet 3.1279 74.853 1.998 Y

STORM ANALYSIS:
7-30-16 6.60 7-30-16 2 3.19
5-27-18 6.36 5-27-18 2

RAINFALL DISTRIBUTION:
7-30-16 0.05
0.0000 0.0061 0.0061 0.0061 0.0061
0.0061 0.0121 0.0242 0.0364 0.0424
0.0424 0.0424 0.0424 0.0485 0.0606
0.0667 0.0727 0.0727 0.0727 0.0727
0.0788 0.0848 0.1030 0.1212 0.1333
0.1576 0.1818 0.1879 0.2000 0.2182
0.2242 0.2303 0.2424 0.2606 0.2909
0.3212 0.3576 0.4061 0.4667 0.5394
0.6061 0.6606 0.7030 0.7394 0.7576
0.7758 0.7939 0.8182 0.8424 0.8788
0.9091 0.9212 0.9333 0.9455 0.9515
0.9576 0.9697 0.9758 0.9818 0.9818
0.9818 0.9818 0.9818 0.9879 0.9879
0.9879 0.9879 0.9939 0.9939 0.9939
0.9939 0.9939 1.0000 1.0000 1.0000
1.0
5-27-18 0.05
0.0000 0.0000 0.0000 0.0063 0.0063
0.0126 0.0377 0.0566 0.1132 0.1258
0.1321 0.1447 0.1509 0.1698 0.1761
0.1761 0.1824 0.2013 0.2201 0.2327
0.2453 0.2579 0.2767 0.3208 0.3522
0.3899 0.4403 0.4906 0.5031 0.5031
0.5031 0.5031 0.5094 0.5094 0.5157
0.5220 0.5409 0.5535 0.5535 0.5535
0.5535 0.5723 0.5975 0.6226 0.6415
0.6541 0.6730 0.6981 0.7233 0.7484
0.7736 0.7987 0.8302 0.8553 0.8868
0.9119 0.9623 0.9811 0.9937 0.9937
1.0000 1.0000 1.0000 1.0000 1.0000

GLOBAL OUTPUT:

.05 YY N NN N

WinTR-20 Printed Page File End of Input Data List

Plumtree Existing LU, Good Cond, 1DA
7/30/16 and 5/27/18 Events

Name of printed page file:
C:\Users\CLReichenbach\Desktop\ptexg.out

STORM 7-30-16

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	----- Elevation (ft)	Peak Flow Time (hr)	Rate (cfs)	Rate (csm)
DA1	3.128		3.784		3.37	3893.0	1244.59

Line Start Time (hr)	----- (cfs)	Flow Values @ time (cfs)	increment of 0.050 hr (cfs)	----- (cfs)	----- (cfs)	----- (cfs)	----- (cfs)
1.150	0.3	0.6	1.6	3.2	4.8	8.7	12.6
1.500	18.0	24.8	31.6	43.9	56.3	74.0	98.3
1.850	122.7	167.6	214.3	273.1	350.2	427.3	531.5
2.200	639.5	759.1	900.0	1040.8	1211.8	1389.1	1574.8
2.550	1779.8	1984.7	2190.7	2397.1	2598.0	2783.2	2968.5
2.900	3130.4	3283.7	3428.4	3540.5	3652.6	3732.7	3798.0
3.250	3855.3	3871.3	3887.2	3874.6	3845.8	3812.7	3745.5
3.600	3678.3	3592.2	3492.9	3392.0	3266.6	3141.3	3011.9
3.950	2879.1	2746.5	2619.9	2493.3	2369.9	2249.8	2129.8
4.300	2016.6	1903.7	1796.4	1695.8	1595.2	1506.7	1419.1
4.650	1335.4	1257.5	1179.6	1111.3	1044.5	981.1	924.3
5.000	867.4	816.8	767.4	719.8	676.5	633.2	594.7
5.350	557.6	521.9	490.1	458.4	429.9	402.6	376.3
5.700	353.4	330.6	310.2	291.1	272.3	256.0	239.7
6.050	224.9	210.9	197.3	185.6	173.9	163.2	153.1
6.400	143.2	134.6	126.0	118.2	111.0	103.8	97.6
6.750	91.5	85.8	80.5	75.3	70.7	66.2	62.0
7.100	58.3	54.5	51.3	48.2	45.2	42.4	39.7
7.450	37.2	34.7	32.3	30.1	27.9	25.9	23.9
7.800	22.0	20.1	18.2	16.4	14.7	13.1	11.6
8.150	10.1	8.8	7.7	6.6	5.8	5.0	4.4
8.500	3.7	3.1	2.6	2.2	1.8	1.5	1.3
8.850	1.1	0.9	0.8	0.7	0.6	0.0	

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	----- Elevation (ft)	Peak Flow Time (hr)	Rate (cfs)	Rate (csm)
OUTLET	3.128		3.784		3.37	3893.0	1244.59

Line Start Time (hr)	----- (cfs)	Flow Values @ time (cfs)	increment of 0.050 hr (cfs)	----- (cfs)	----- (cfs)	----- (cfs)	----- (cfs)
1.150	0.3	0.6	1.6	3.2	4.8	8.7	12.6
1.500	18.0	24.8	31.6	43.9	56.3	74.0	98.3

1.850	122.7	167.6	214.3	273.1	350.2	427.3	531.5
2.200	639.5	759.1	900.0	1040.8	1211.8	1389.1	1574.8
2.550	1779.8	1984.7	2190.7	2397.1	2598.0	2783.2	2968.5
2.900	3130.4	3283.7	3428.4	3540.5	3652.6	3732.7	3798.0

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Plumtree Existing LU, Good Cond, 1DA
7/30/16 and 5/27/18 Events

Line Start Time (hr)	----- (cfs)	Flow Values @ time (cfs)	increment of (cfs)	0.050 hr (cfs)	----- (cfs)	----- (cfs)	----- (cfs)
3.250	3855.3	3871.3	3887.2	3874.6	3845.8	3812.7	3745.5
3.600	3678.3	3592.2	3492.9	3392.0	3266.6	3141.3	3011.9
3.950	2879.1	2746.5	2619.9	2493.3	2369.9	2249.8	2129.8
4.300	2016.6	1903.7	1796.4	1695.8	1595.2	1506.7	1419.1
4.650	1335.4	1257.5	1179.6	1111.3	1044.5	981.1	924.3
5.000	867.4	816.8	767.4	719.8	676.5	633.2	594.7
5.350	557.6	521.9	490.1	458.4	429.9	402.6	376.3
5.700	353.4	330.6	310.2	291.1	272.3	256.0	239.7
6.050	224.9	210.9	197.3	185.6	173.9	163.2	153.1
6.400	143.2	134.6	126.0	118.2	111.0	103.8	97.6
6.750	91.5	85.8	80.5	75.3	70.7	66.2	62.0
7.100	58.3	54.5	51.3	48.2	45.2	42.4	39.7
7.450	37.2	34.7	32.3	30.1	27.9	25.9	23.9
7.800	22.0	20.1	18.2	16.4	14.7	13.1	11.6
8.150	10.1	8.8	7.7	6.6	5.8	5.0	4.4
8.500	3.7	3.1	2.6	2.2	1.8	1.5	1.3
8.850	1.1	0.9	0.8	0.7	0.6	0.0	

STORM 5-27-18

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	----- Elevation (ft)	Peak Flow Time (hr)	Rate (cfs)	Rate (csm)
DA1	3.128		3.576		3.67	3038.6	971.45

Line Start Time (hr)	----- (cfs)	Flow Values @ time (cfs)	increment of (cfs)	0.050 hr (cfs)	----- (cfs)	----- (cfs)	----- (cfs)
0.500	0.3	0.9	1.7	2.6	4.3	6.0	8.7
0.850	12.2	15.8	22.4	29.0	38.7	51.1	63.6
1.200	86.7	109.9	140.2	178.6	217.0	268.5	320.7
1.550	377.6	440.8	504.0	578.3	653.8	732.3	815.7
1.900	899.1	978.4	1056.9	1131.4	1197.2	1263.1	1319.9
2.250	1374.4	1427.2	1475.3	1523.4	1570.8	1618.1	1666.8
2.600	1720.0	1773.3	1834.5	1899.1	1966.3	2044.9	2123.5
2.950	2205.9	2290.1	2374.1	2456.0	2537.9	2616.7	2693.5
3.300	2769.5	2837.3	2905.2	2956.8	2995.6	3033.0	3035.3
3.650	3037.5	3022.1	2990.1	2958.2	2897.9	2837.5	2766.4
4.000	2683.3	2600.1	2502.0	2403.1	2301.6	2196.6	2091.6
4.350	1985.8	1879.9	1774.8	1671.2	1567.5	1469.8	1373.1
4.700	1280.9	1198.0	1115.0	1044.5	977.0	912.8	857.2
5.050	801.6	752.9	706.4	661.7	622.5	583.3	548.1
5.400	514.6	481.8	452.7	423.5	397.3	372.6	348.4
5.750	327.4	306.5	287.5	269.8	252.4	237.2	222.0
6.100	208.2	195.3	182.5	171.5	160.6	150.5	141.1
6.450	131.8	124.0	116.2	109.0	102.4	95.8	90.0
6.800	84.3	78.9	74.0	69.2	64.9	60.6	56.6
7.150	52.9	49.1	45.9	42.7	39.7	37.0	34.3
7.500	32.0	29.9	27.9	26.1	24.4	22.8	21.3



Plumtree Existing LU, Good Cond, 1DA
7/30/16 and 5/27/18 Events

Line	Flow Values @ time increment of 0.050 hr						
Start Time	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
(hr)							
7.850	19.8	18.6	17.3	16.1	14.9	13.8	12.7
8.200	11.7	10.6	9.6	8.5	7.6	6.7	5.8
8.550	5.0	4.2	3.5	2.8	2.3	1.7	1.2
8.900	0.9	0.5	0.0				

Area or	Drainage	Rain Gage	Runoff	Peak Flow			
Reach	Area	ID or	Amount	Elevation	Time	Rate	Rate
Identifier	(sq mi)	Location	(in)	(ft)	(hr)	(cfs)	(csm)
OUTLET	3.128		3.576		3.67	3038.6	971.45

Line	Flow Values @ time increment of 0.050 hr						
Start Time	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
(hr)							
0.500	0.3	0.9	1.7	2.6	4.3	6.0	8.7
0.850	12.2	15.8	22.4	29.0	38.7	51.1	63.6
1.200	86.7	109.9	140.2	178.6	217.0	268.5	320.7
1.550	377.6	440.8	504.0	578.3	653.8	732.3	815.7
1.900	899.1	978.4	1056.9	1131.4	1197.2	1263.1	1319.9
2.250	1374.4	1427.2	1475.3	1523.4	1570.8	1618.1	1666.8
2.600	1720.0	1773.3	1834.5	1899.1	1966.3	2044.9	2123.5
2.950	2205.9	2290.1	2374.1	2456.0	2537.9	2616.7	2693.5
3.300	2769.5	2837.3	2905.2	2956.8	2995.6	3033.0	3035.3
3.650	3037.5	3022.1	2990.1	2958.2	2897.9	2837.5	2766.4
4.000	2683.3	2600.1	2502.0	2403.1	2301.6	2196.6	2091.6
4.350	1985.8	1879.9	1774.8	1671.2	1567.5	1469.8	1373.1
4.700	1280.9	1198.0	1115.0	1044.5	977.0	912.8	857.2
5.050	801.6	752.9	706.4	661.7	622.5	583.3	548.1
5.400	514.6	481.8	452.7	423.5	397.3	372.6	348.4
5.750	327.4	306.5	287.5	269.8	252.4	237.2	222.0
6.100	208.2	195.3	182.5	171.5	160.6	150.5	141.1
6.450	131.8	124.0	116.2	109.0	102.4	95.8	90.0
6.800	84.3	78.9	74.0	69.2	64.9	60.6	56.6
7.150	52.9	49.1	45.9	42.7	39.7	37.0	34.3
7.500	32.0	29.9	27.9	26.1	24.4	22.8	21.3
7.850	19.8	18.6	17.3	16.1	14.9	13.8	12.7
8.200	11.7	10.6	9.6	8.5	7.6	6.7	5.8
8.550	5.0	4.2	3.5	2.8	2.3	1.7	1.2
8.900	0.9	0.5	0.0				



Plumtree Existing LU, Good Cond, 1DA
7/30/16 and 5/27/18 Events

Area or Reach Identifier	Drainage Area (sq mi)	----- Peak Flow by Storm -----				
		7-30-16 (cfs)	5-27-18 (cfs)	(cfs)	(cfs)	(cfs)
DA1	3.128	3893.0	3038.6			
OUTLET	3.128	3893.0	3038.6			



WinTR-20: version 3.20 0 0 0.1 0
Plumtree Ultimate LU, Good Cond, 1DA
7/30/16 and 5/27/18 Events

SUB-AREA:
DA1 Outlet 3.1279 75.817 1.998 Y

STORM ANALYSIS:
7-30-16 6.60 7-30-16 2 3.19
5-27-18 6.36 5-27-18 2

RAINFALL DISTRIBUTION:
7-30-16 0.05
0.0000 0.0061 0.0061 0.0061 0.0061
0.0061 0.0121 0.0242 0.0364 0.0424
0.0424 0.0424 0.0424 0.0485 0.0606
0.0667 0.0727 0.0727 0.0727 0.0727
0.0788 0.0848 0.1030 0.1212 0.1333
0.1576 0.1818 0.1879 0.2000 0.2182
0.2242 0.2303 0.2424 0.2606 0.2909
0.3212 0.3576 0.4061 0.4667 0.5394
0.6061 0.6606 0.7030 0.7394 0.7576
0.7758 0.7939 0.8182 0.8424 0.8788
0.9091 0.9212 0.9333 0.9455 0.9515
0.9576 0.9697 0.9758 0.9818 0.9818
0.9818 0.9818 0.9818 0.9879 0.9879
0.9879 0.9879 0.9939 0.9939 0.9939
0.9939 0.9939 1.0000 1.0000 1.0000
1.0
5-27-18 0.05
0.0000 0.0000 0.0000 0.0063 0.0063
0.0126 0.0377 0.0566 0.1132 0.1258
0.1321 0.1447 0.1509 0.1698 0.1761
0.1761 0.1824 0.2013 0.2201 0.2327
0.2453 0.2579 0.2767 0.3208 0.3522
0.3899 0.4403 0.4906 0.5031 0.5031
0.5031 0.5031 0.5094 0.5094 0.5157
0.5220 0.5409 0.5535 0.5535 0.5535
0.5535 0.5723 0.5975 0.6226 0.6415
0.6541 0.6730 0.6981 0.7233 0.7484
0.7736 0.7987 0.8302 0.8553 0.8868
0.9119 0.9623 0.9811 0.9937 0.9937
1.0000 1.0000 1.0000 1.0000 1.0000

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.05 YY N NN N

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Plumtree Ultimate LU, Good Cond, 1DA
7/30/16 and 5/27/18 Events

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STORM 7-30-16

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	----- Elevation (ft)	Peak Flow Time (hr)	Rate (cfs)	Rate (csm)
DA1	3.128		3.884		3.35	3988.5	1275.15

Line Start Time (hr)	----- (cfs)	Flow Values @ time (cfs)	increment of (cfs)	0.050 hr (cfs)	----- (cfs)	----- (cfs)
1.150	0.4	0.7	2.2	3.9	6.4	10.7
1.500	21.6	29.0	37.8	50.7	63.7	85.2
1.850	139.1	185.8	232.4	299.9	377.0	459.1
2.200	676.2	805.6	947.1	1092.6	1270.6	1448.7
2.550	1851.6	2059.4	2270.9	2482.4	2683.0	2874.4
2.900	3224.6	3383.8	3522.4	3639.8	3757.3	3828.8
3.250	3946.8	3966.8	3986.9	3964.5	3938.5	3896.6
3.600	3764.7	3669.9	3570.8	3462.3	3336.0	3209.7
3.950	2939.7	2805.5	2675.0	2544.5	2419.6	2296.2
4.300	2058.3	1942.0	1834.5	1730.3	1628.8	1537.9
4.650	1362.9	1282.2	1203.2	1133.8	1064.3	1001.5
5.000	884.2	833.0	781.7	734.1	689.2	644.7
5.350	567.6	532.1	499.1	466.3	438.0	409.7
5.700	360.0	336.3	316.2	296.3	277.7	260.8
6.050	229.2	214.8	201.2	189.1	176.9	166.3
6.400	146.0	137.1	128.2	120.5	113.0	105.8
6.750	93.1	87.5	82.0	76.7	72.0	67.3
7.100	59.3	55.5	52.3	49.0	46.0	43.2
7.450	37.8	35.2	32.9	30.6	28.4	26.4
7.800	22.3	20.4	18.5	16.7	14.9	13.3
8.150	10.2	9.0	7.8	6.7	5.9	5.1
8.500	3.8	3.2	2.7	2.2	1.8	1.5
8.850	1.1	0.9	0.8	0.7	0.6	0.0

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	----- Elevation (ft)	Peak Flow Time (hr)	Rate (cfs)	Rate (csm)
OUTLET	3.128		3.884		3.35	3988.5	1275.15

Line Start Time (hr)	----- (cfs)	Flow Values @ time (cfs)	increment of (cfs)	0.050 hr (cfs)	----- (cfs)	----- (cfs)
1.150	0.4	0.7	2.2	3.9	6.4	10.7
1.500	21.6	29.0	37.8	50.7	63.7	85.2

1.850	139.1	185.8	232.4	299.9	377.0	459.1	567.6
2.200	676.2	805.6	947.1	1092.6	1270.6	1448.7	1644.1
2.550	1851.6	2059.4	2270.9	2482.4	2683.0	2874.4	3065.3
2.900	3224.6	3383.8	3522.4	3639.8	3757.3	3828.8	3898.9

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Plumtree Ultimate LU, Good Cond, 1DA
7/30/16 and 5/27/18 Events

Line Start Time (hr)	----- (cfs)	Flow Values @ time (cfs)	increment of (cfs)	0.050 hr (cfs)	----- (cfs)	----- (cfs)	----- (cfs)
3.250	3946.8	3966.8	3986.9	3964.5	3938.5	3896.6	3830.6
3.600	3764.7	3669.9	3570.8	3462.3	3336.0	3209.7	3075.5
3.950	2939.7	2805.5	2675.0	2544.5	2419.6	2296.2	2174.6
4.300	2058.3	1942.0	1834.5	1730.3	1628.8	1537.9	1446.9
4.650	1362.9	1282.2	1203.2	1133.8	1064.3	1001.5	942.4
5.000	884.2	833.0	781.7	734.1	689.2	644.7	606.1
5.350	567.6	532.1	499.1	466.3	438.0	409.7	383.7
5.700	360.0	336.3	316.2	296.3	277.7	260.8	243.9
6.050	229.2	214.8	201.2	189.1	176.9	166.3	155.9
6.400	146.0	137.1	128.2	120.5	113.0	105.8	99.5
6.750	93.1	87.5	82.0	76.7	72.0	67.3	63.2
7.100	59.3	55.5	52.3	49.0	46.0	43.2	40.4
7.450	37.8	35.2	32.9	30.6	28.4	26.4	24.3
7.800	22.3	20.4	18.5	16.7	14.9	13.3	11.7
8.150	10.2	9.0	7.8	6.7	5.9	5.1	4.4
8.500	3.8	3.2	2.7	2.2	1.8	1.5	1.3
8.850	1.1	0.9	0.8	0.7	0.6	0.0	

STORM 5-27-18

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	----- Elevation (ft)	Peak Flow Time (hr)	Rate (cfs)	Rate (csm)
DA1	3.128		3.674		3.67	3100.4	991.19

Line Start Time (hr)	----- (cfs)	Flow Values @ time (cfs)	increment of (cfs)	0.050 hr (cfs)	----- (cfs)	----- (cfs)	----- (cfs)
0.500	0.5	1.2	2.2	3.4	5.4	7.4	10.7
0.850	14.7	19.1	26.5	33.9	45.1	58.6	73.1
1.200	97.7	122.2	155.6	196.0	236.8	291.5	346.3
1.550	406.8	472.6	538.5	616.7	695.1	777.2	863.8
1.900	950.3	1032.3	1113.9	1190.0	1258.2	1326.3	1383.6
2.250	1439.5	1492.7	1541.4	1590.1	1637.6	1685.0	1734.2
2.600	1787.1	1840.1	1901.7	1965.6	2033.3	2111.4	2189.6
2.950	2272.2	2356.4	2440.1	2521.9	2603.8	2681.8	2758.2
3.300	2833.1	2901.3	2969.5	3019.1	3058.9	3093.7	3096.5
3.650	3099.3	3080.8	3048.7	3014.1	2953.0	2891.9	2817.7
4.000	2733.3	2648.2	2547.8	2447.3	2343.4	2236.4	2129.4
4.350	2021.5	1913.6	1806.8	1701.2	1595.6	1496.6	1397.9
4.700	1304.9	1219.8	1134.7	1063.8	994.4	929.7	872.7
5.050	815.7	766.7	719.1	674.0	633.8	593.6	558.1
5.400	523.8	490.7	460.9	431.1	404.7	379.3	354.9
5.750	333.4	311.9	292.8	274.7	257.1	241.5	226.0
6.100	212.0	198.8	185.9	174.7	163.4	153.2	143.7
6.450	134.3	126.3	118.3	111.0	104.3	97.5	91.7
6.800	85.8	80.3	75.3	70.3	66.0	61.7	57.6
7.150	53.8	49.9	46.7	43.4	40.4	37.6	34.8
7.500	32.6	30.4	28.3	26.6	24.8	23.2	21.7



Plumtree Ultimate LU, Good Cond, 1DA
7/30/16 and 5/27/18 Events

Line	Flow Values @ time increment of 0.050 hr						
Start Time	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
(hr)							
7.850	20.2	18.8	17.5	16.3	15.2	14.0	12.9
8.200	11.8	10.8	9.7	8.7	7.7	6.8	5.9
8.550	5.1	4.3	3.6	2.9	2.3	1.8	1.2
8.900	0.9	0.5	0.0				

Area or	Drainage	Rain Gage	Runoff	Peak Flow			
Reach	Area	ID or	Amount	Elevation	Time	Rate	Rate
Identifier	(sq mi)	Location	(in)	(ft)	(hr)	(cfs)	(csm)
OUTLET	3.128		3.674		3.67	3100.4	991.19

Line	Flow Values @ time increment of 0.050 hr						
Start Time	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
(hr)							
0.500	0.5	1.2	2.2	3.4	5.4	7.4	10.7
0.850	14.7	19.1	26.5	33.9	45.1	58.6	73.1
1.200	97.7	122.2	155.6	196.0	236.8	291.5	346.3
1.550	406.8	472.6	538.5	616.7	695.1	777.2	863.8
1.900	950.3	1032.3	1113.9	1190.0	1258.2	1326.3	1383.6
2.250	1439.5	1492.7	1541.4	1590.1	1637.6	1685.0	1734.2
2.600	1787.1	1840.1	1901.7	1965.6	2033.3	2111.4	2189.6
2.950	2272.2	2356.4	2440.1	2521.9	2603.8	2681.8	2758.2
3.300	2833.1	2901.3	2969.5	3019.1	3058.9	3093.7	3096.5
3.650	3099.3	3080.8	3048.7	3014.1	2953.0	2891.9	2817.7
4.000	2733.3	2648.2	2547.8	2447.3	2343.4	2236.4	2129.4
4.350	2021.5	1913.6	1806.8	1701.2	1595.6	1496.6	1397.9
4.700	1304.9	1219.8	1134.7	1063.8	994.4	929.7	872.7
5.050	815.7	766.7	719.1	674.0	633.8	593.6	558.1
5.400	523.8	490.7	460.9	431.1	404.7	379.3	354.9
5.750	333.4	311.9	292.8	274.7	257.1	241.5	226.0
6.100	212.0	198.8	185.9	174.7	163.4	153.2	143.7
6.450	134.3	126.3	118.3	111.0	104.3	97.5	91.7
6.800	85.8	80.3	75.3	70.3	66.0	61.7	57.6
7.150	53.8	49.9	46.7	43.4	40.4	37.6	34.8
7.500	32.6	30.4	28.3	26.6	24.8	23.2	21.7
7.850	20.2	18.8	17.5	16.3	15.2	14.0	12.9
8.200	11.8	10.8	9.7	8.7	7.7	6.8	5.9
8.550	5.1	4.3	3.6	2.9	2.3	1.8	1.2
8.900	0.9	0.5	0.0				



Plumtree Ultimate LU, Good Cond, 1DA
7/30/16 and 5/27/18 Events

Area or Reach Identifier	Drainage Area (sq mi)	----- Peak Flow by Storm -----				
		7-30-16 (cfs)	5-27-18 (cfs)	(cfs)	(cfs)	(cfs)
DA1	3.128	3988.5	3100.4			
OUTLET	3.128	3988.5	3100.4			



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Plumtree Woods in Good Cond, 1DA
7/30/16 and 5/27/18 Events

SUB-AREA:
DA1 Outlet 3.1279 58.975 2.384 Y

STORM ANALYSIS:
7-30-16 6.60 7-30-16 2 3.19
5-27-18 6.36 5-27-18 2

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0.0667 0.0727 0.0727 0.0727 0.0727
0.0788 0.0848 0.1030 0.1212 0.1333
0.1576 0.1818 0.1879 0.2000 0.2182
0.2242 0.2303 0.2424 0.2606 0.2909
0.3212 0.3576 0.4061 0.4667 0.5394
0.6061 0.6606 0.7030 0.7394 0.7576
0.7758 0.7939 0.8182 0.8424 0.8788
0.9091 0.9212 0.9333 0.9455 0.9515
0.9576 0.9697 0.9758 0.9818 0.9818
0.9818 0.9818 0.9818 0.9879 0.9879
0.9879 0.9879 0.9939 0.9939 0.9939
0.9939 0.9939 1.0000 1.0000 1.0000
1.0
5-27-18 0.05
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0.0126 0.0377 0.0566 0.1132 0.1258
0.1321 0.1447 0.1509 0.1698 0.1761
0.1761 0.1824 0.2013 0.2201 0.2327
0.2453 0.2579 0.2767 0.3208 0.3522
0.3899 0.4403 0.4906 0.5031 0.5031
0.5031 0.5031 0.5094 0.5094 0.5157
0.5220 0.5409 0.5535 0.5535 0.5535
0.5535 0.5723 0.5975 0.6226 0.6415
0.6541 0.6730 0.6981 0.7233 0.7484
0.7736 0.7987 0.8302 0.8553 0.8868
0.9119 0.9623 0.9811 0.9937 0.9937
1.0000 1.0000 1.0000 1.0000 1.0000

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Plumtree Woods in Good Cond, 1DA
7/30/16 and 5/27/18 Events

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STORM 7-30-16

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	----- Elevation (ft)	Peak Flow Time (hr)	Rate (cfs)	Rate (csm)
DA1	3.128		2.230		3.69	2028.0	648.35

Line Start Time (hr)	----- (cfs)	Flow Values @ time (cfs)	increment of (cfs)	0.050 hr (cfs)	----- (cfs)	----- (cfs)	----- (cfs)
1.600	0.4	1.0	1.6	3.4	6.9	10.5	17.3
1.950	29.7	42.1	59.2	84.8	110.3	140.8	180.3
2.300	219.8	265.5	323.1	380.7	445.2	523.6	602.1
2.650	685.6	779.6	873.6	968.8	1066.5	1164.2	1259.9
3.000	1350.6	1441.3	1528.0	1604.6	1681.2	1752.2	1808.1
3.350	1864.0	1913.9	1946.8	1979.6	2006.3	2014.1	2022.0
3.700	2024.8	2011.3	1997.7	1980.6	1950.9	1921.2	1888.0
4.050	1841.6	1795.3	1746.7	1689.0	1631.3	1573.1	1512.8
4.400	1452.4	1392.4	1333.8	1275.2	1217.1	1161.4	1105.6
4.750	1050.8	1000.5	950.2	900.9	857.7	814.6	772.2
5.100	735.2	698.1	661.7	629.5	597.2	565.5	537.9
5.450	510.3	483.0	459.3	435.6	412.1	391.5	371.0
5.800	350.6	332.9	315.1	297.6	282.5	267.5	252.6
6.150	240.0	227.3	214.7	203.9	193.1	182.4	173.2
6.500	164.0	154.9	147.2	139.5	131.8	125.1	118.5
6.850	111.9	106.3	100.8	95.2	90.5	85.8	81.1
7.200	77.1	73.0	69.0	65.6	62.2	58.8	55.8
7.550	52.9	50.0	47.5	45.0	42.5	40.4	38.3
7.900	36.2	34.3	32.5	30.6	29.1	27.6	26.2
8.250	24.9	23.7	22.4	21.3	20.2	19.1	18.1
8.600	17.2	16.3	15.4	14.5	13.7	12.8	12.0
8.950	11.2	10.4	9.6	8.8	8.1	7.3	6.6
9.300	5.9	5.2	4.5	4.0	3.5	3.1	2.7
9.650	2.3	2.0	1.7	1.4	1.2	1.0	0.9
10.000	0.7	0.6	0.5	0.0			

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	----- Elevation (ft)	Peak Flow Time (hr)	Rate (cfs)	Rate (csm)
OUTLET	3.128		2.230		3.69	2028.0	648.35

Line Start Time (hr)	----- (cfs)	Flow Values @ time (cfs)	increment of (cfs)	0.050 hr (cfs)	----- (cfs)	----- (cfs)	----- (cfs)
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1.600	0.4	1.0	1.6	3.4	6.9	10.5	17.3
1.950	29.7	42.1	59.2	84.8	110.3	140.8	180.3
2.300	219.8	265.5	323.1	380.7	445.2	523.6	602.1
2.650	685.6	779.6	873.6	968.8	1066.5	1164.2	1259.9

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Plumtree Woods in Good Cond, 1DA
7/30/16 and 5/27/18 Events

Line Start Time (hr)	----- (cfs)	Flow Values @ time (cfs)	increment of (cfs)	0.050 hr (cfs)	----- (cfs)	----- (cfs)	----- (cfs)
3.000	1350.6	1441.3	1528.0	1604.6	1681.2	1752.2	1808.1
3.350	1864.0	1913.9	1946.8	1979.6	2006.3	2014.1	2022.0
3.700	2024.8	2011.3	1997.7	1980.6	1950.9	1921.2	1888.0
4.050	1841.6	1795.3	1746.7	1689.0	1631.3	1573.1	1512.8
4.400	1452.4	1392.4	1333.8	1275.2	1217.1	1161.4	1105.6
4.750	1050.8	1000.5	950.2	900.9	857.7	814.6	772.2
5.100	735.2	698.1	661.7	629.5	597.2	565.5	537.9
5.450	510.3	483.0	459.3	435.6	412.1	391.5	371.0
5.800	350.6	332.9	315.1	297.6	282.5	267.5	252.6
6.150	240.0	227.3	214.7	203.9	193.1	182.4	173.2
6.500	164.0	154.9	147.2	139.5	131.8	125.1	118.5
6.850	111.9	106.3	100.8	95.2	90.5	85.8	81.1
7.200	77.1	73.0	69.0	65.6	62.2	58.8	55.8
7.550	52.9	50.0	47.5	45.0	42.5	40.4	38.3
7.900	36.2	34.3	32.5	30.6	29.1	27.6	26.2
8.250	24.9	23.7	22.4	21.3	20.2	19.1	18.1
8.600	17.2	16.3	15.4	14.5	13.7	12.8	12.0
8.950	11.2	10.4	9.6	8.8	8.1	7.3	6.6
9.300	5.9	5.2	4.5	4.0	3.5	3.1	2.7
9.650	2.3	2.0	1.7	1.4	1.2	1.0	0.9
10.000	0.7	0.6	0.5	0.0			

STORM 5-27-18

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	----- Elevation (ft)	Peak Flow Time (hr)	Rate (cfs)	Rate (csm)
DA1	3.128		2.070		3.91	1733.3	554.15

Line Start Time (hr)	----- (cfs)	Flow Values @ time (cfs)	increment of (cfs)	0.050 hr (cfs)	----- (cfs)	----- (cfs)	----- (cfs)
1.050	0.3	1.3	2.3	3.5	8.2	12.9	17.7
1.400	26.6	35.6	44.6	56.8	68.9	81.1	98.1
1.750	115.1	132.2	155.1	177.9	200.8	228.0	255.2
2.100	282.4	310.4	338.4	366.5	395.4	424.3	453.2
2.450	484.9	516.8	548.7	585.9	623.4	660.9	708.0
2.800	755.8	803.5	858.2	913.3	968.5	1028.5	1089.0
3.150	1149.5	1211.2	1273.1	1335.0	1391.5	1447.4	1503.3
3.500	1548.1	1591.5	1634.8	1662.4	1687.5	1712.7	1721.2
3.850	1726.8	1732.5	1722.2	1709.1	1695.9	1670.5	1642.7
4.200	1614.8	1578.2	1539.7	1501.2	1455.0	1407.1	1359.1
4.550	1308.1	1256.4	1204.6	1152.2	1099.6	1047.1	995.2
4.900	943.6	891.9	843.4	795.8	748.2	706.9	667.7
5.250	628.5	595.1	563.9	532.6	505.1	479.1	453.0
5.600	429.8	407.8	385.8	366.3	347.8	329.4	312.6
5.950	296.6	280.6	266.0	252.1	238.1	225.7	214.0
6.300	202.4	191.9	182.1	172.3	163.4	155.0	146.5
6.650	138.9	131.7	124.5	118.0	111.8	105.7	100.2



Plumtree Woods in Good Cond, 1DA
7/30/16 and 5/27/18 Events

Line Start Time (hr)	Flow Values @ time increment of 0.050 hr						
	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
7.000	95.0	89.8	85.1	80.6	76.2	72.2	68.5
7.350	64.8	61.4	58.4	55.3	52.4	49.8	47.2
7.700	44.7	42.5	40.2	38.1	36.2	34.2	32.4
8.050	30.7	29.0	27.4	25.9	24.5	23.1	21.9
8.400	20.6	19.4	18.4	17.3	16.3	15.4	14.4
8.750	13.6	12.9	12.2	11.5	10.9	10.3	9.7
9.100	9.2	8.6	8.1	7.5	7.0	6.5	5.9
9.450	5.4	4.9	4.4	3.9	3.5	3.1	2.6
9.800	2.2	1.9	1.5	1.2	1.0	0.7	0.0

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	----- Elevation (ft)	Peak Flow Time (hr)	Rate (cfs)	Rate (csm)
OUTLET	3.128		2.070		3.91	1733.3	554.15

Line Start Time (hr)	Flow Values @ time increment of 0.050 hr						
	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
1.050	0.3	1.3	2.3	3.5	8.2	12.9	17.7
1.400	26.6	35.6	44.6	56.8	68.9	81.1	98.1
1.750	115.1	132.2	155.1	177.9	200.8	228.0	255.2
2.100	282.4	310.4	338.4	366.5	395.4	424.3	453.2
2.450	484.9	516.8	548.7	585.9	623.4	660.9	708.0
2.800	755.8	803.5	858.2	913.3	968.5	1028.5	1089.0
3.150	1149.5	1211.2	1273.1	1335.0	1391.5	1447.4	1503.3
3.500	1548.1	1591.5	1634.8	1662.4	1687.5	1712.7	1721.2
3.850	1726.8	1732.5	1722.2	1709.1	1695.9	1670.5	1642.7
4.200	1614.8	1578.2	1539.7	1501.2	1455.0	1407.1	1359.1
4.550	1308.1	1256.4	1204.6	1152.2	1099.6	1047.1	995.2
4.900	943.6	891.9	843.4	795.8	748.2	706.9	667.7
5.250	628.5	595.1	563.9	532.6	505.1	479.1	453.0
5.600	429.8	407.8	385.8	366.3	347.8	329.4	312.6
5.950	296.6	280.6	266.0	252.1	238.1	225.7	214.0
6.300	202.4	191.9	182.1	172.3	163.4	155.0	146.5
6.650	138.9	131.7	124.5	118.0	111.8	105.7	100.2
7.000	95.0	89.8	85.1	80.6	76.2	72.2	68.5
7.350	64.8	61.4	58.4	55.3	52.4	49.8	47.2
7.700	44.7	42.5	40.2	38.1	36.2	34.2	32.4
8.050	30.7	29.0	27.4	25.9	24.5	23.1	21.9
8.400	20.6	19.4	18.4	17.3	16.3	15.4	14.4
8.750	13.6	12.9	12.2	11.5	10.9	10.3	9.7
9.100	9.2	8.6	8.1	7.5	7.0	6.5	5.9
9.450	5.4	4.9	4.4	3.9	3.5	3.1	2.6
9.800	2.2	1.9	1.5	1.2	1.0	0.7	0.0

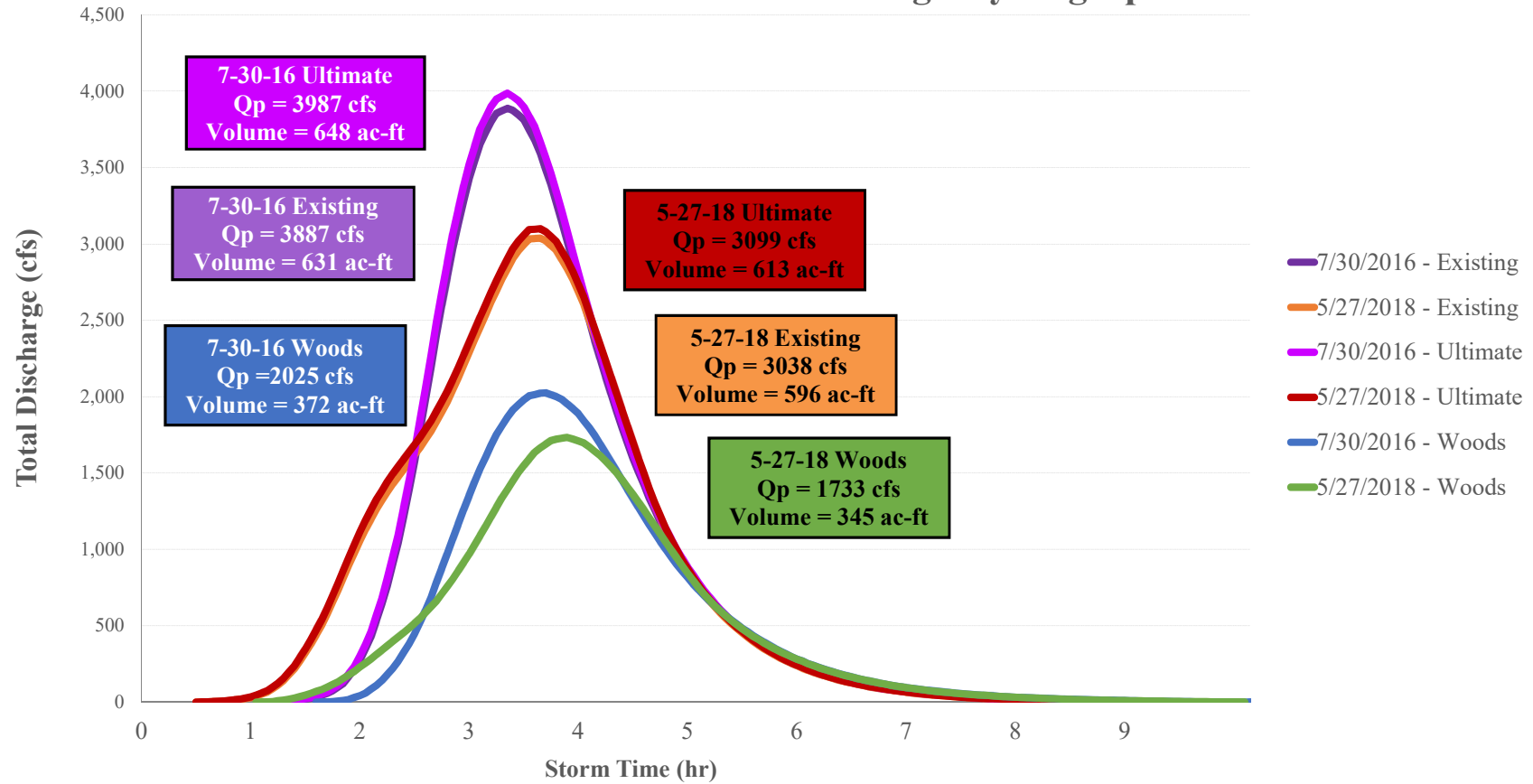


Plumtree Woods in Good Cond, 1DA
7/30/16 and 5/27/18 Events

Area or Reach Identifier	Drainage Area (sq mi)	----- Peak Flow by Storm -----				
		7-30-16 (cfs)	5-27-18 (cfs)	(cfs)	(cfs)	(cfs)
DA1	3.128	2028.0	1733.3			
OUTLET	3.128	2028.0	1733.3			



Plumtree Branch Discharge Hydrograph



APPENDIX C: FIELD ASSESSMENT DOCUMENTATION

Plumtree Branch and Tiber Branch Watershed Stormwater Studies

Best Management Practices for Data Collection

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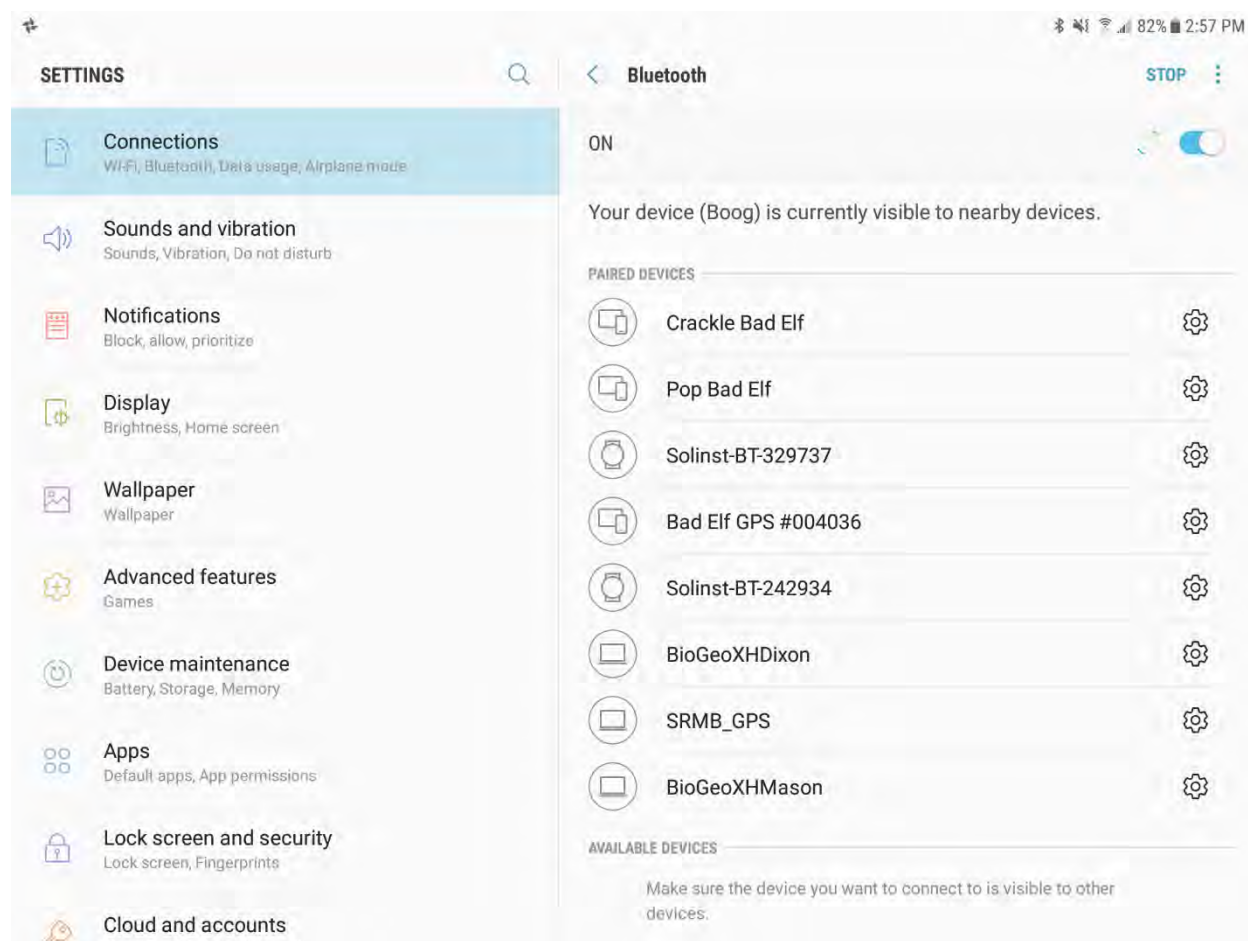
Using Arc Collector in the Field

Arc Collector is an ESRI app that provides an interface to data and maps stored on the cloud. Team members can add and edit data in the app, which are then uploaded to the cloud in real time. Field workers can view the changes to the data as it is updated. The app has some frustrating usability limitations. Most team members should get the hang of the app after the first day or so of field work. This section of the Best Management Practices Guide is meant to guide you through using the app to add and edit data.

Using Collector with an External GPS

For this work, Biohabitats will be using an external GPS to provide the most accurate location estimates of stormwater infrastructure. The external GPS (Bad Elf) will need to be paired with the tablet used for collection via Bluetooth.

1. Go to Tablet -> Settings
2. Click on the Connections Tab



- Ensure Bluetooth is ON
- Select the GPS unit to be paired, if this doesn't work click the gear to the right and unpair and re-pair the device.
- To do this on the GPS press the middle Bluetooth button then when the code pops up on the GPS and tablet first accept the GPS code with the lower button and then tap OK on the tablet.

The Bad Elf user guide can be found here: <https://cdn.shopify.com/s/files/1/0227/2953/files/UserGuide-BE-GPS-3300-20140517.pdf?1710>

The Collector App on Android

Find the Collector app on the Android Homepage by clicking this icon:

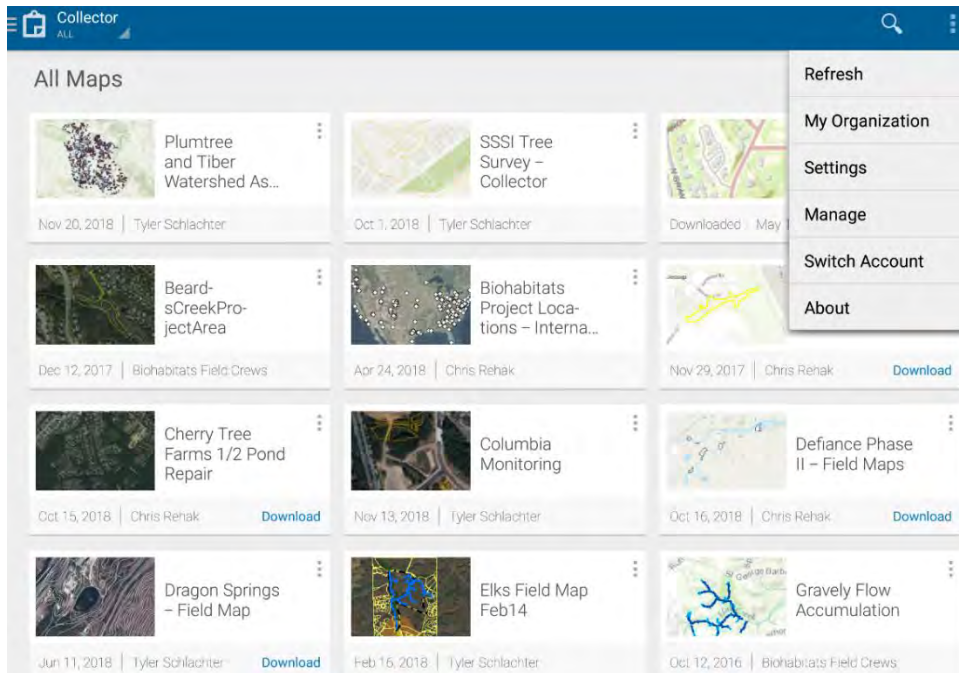


Logging In

It's more than likely that your tablet will already have the proper log-in credentials for accessing the map for this field assessment in Arc Collector. However, if you cannot find the "Plumtree and Tiber Watershed Assessment" map on the "Maps Page", or if you become logged out for some reason, you may have to re-authenticate yourself.

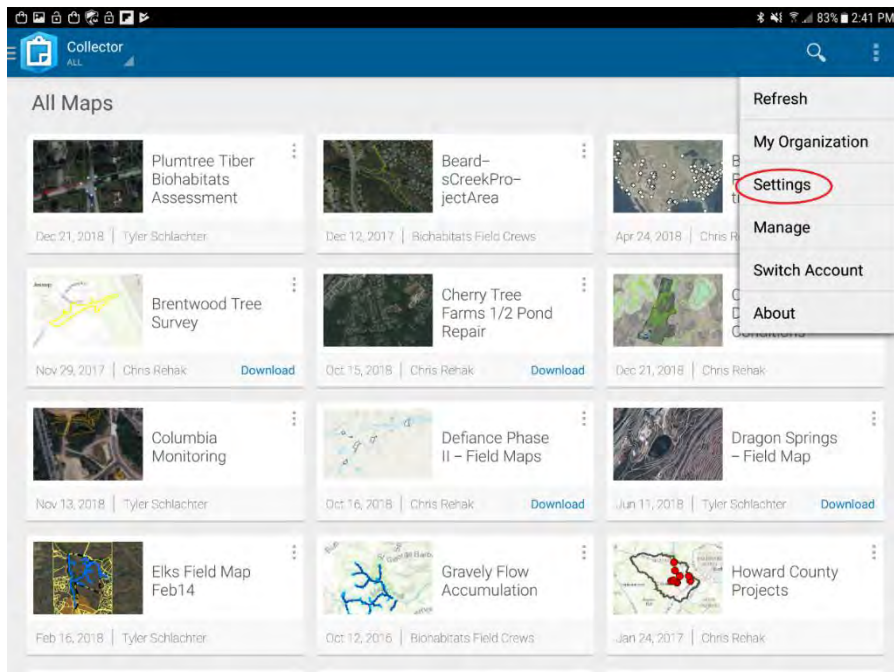
The Maps Page

Once you are logged in, the first page you're likely to see is the 'Maps' page. This page displays all the maps that Biohabitats has enabled for Arc Collector use.

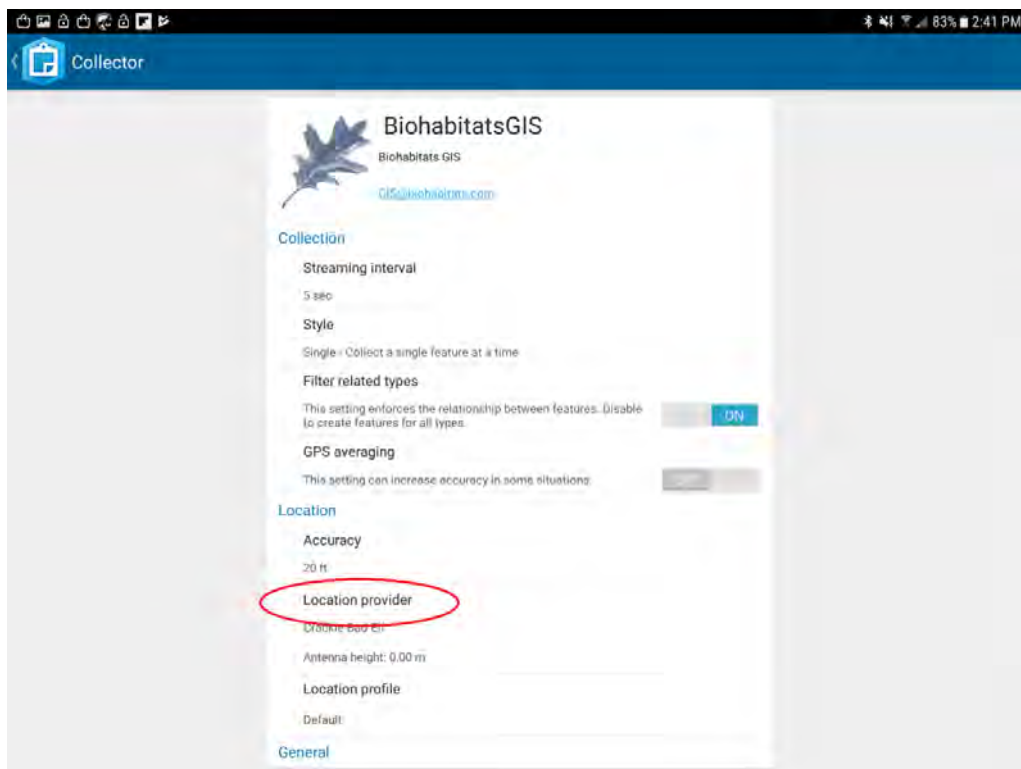


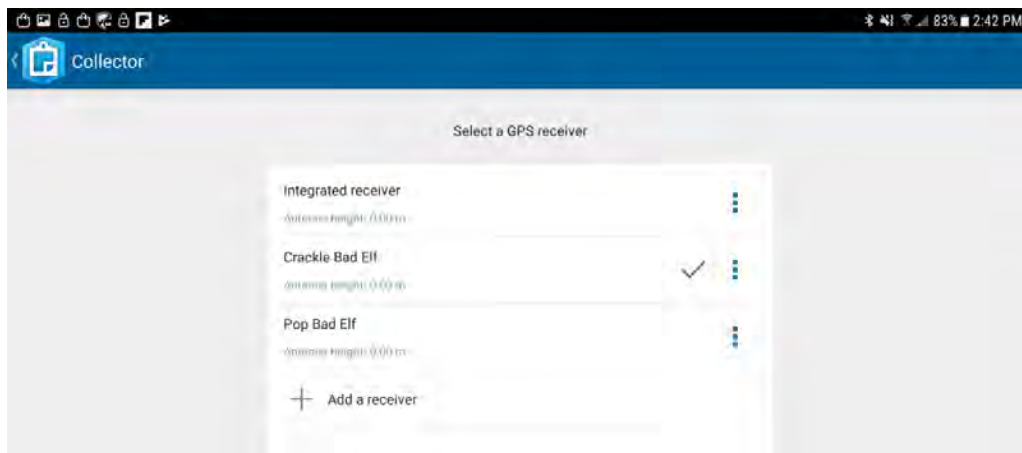
Pairing with the Bad Elf

Select the Settings



Select the “Location Provider” option then select the GPS unit. If the GPS unit doesn’t appear select “Add a Receiver”



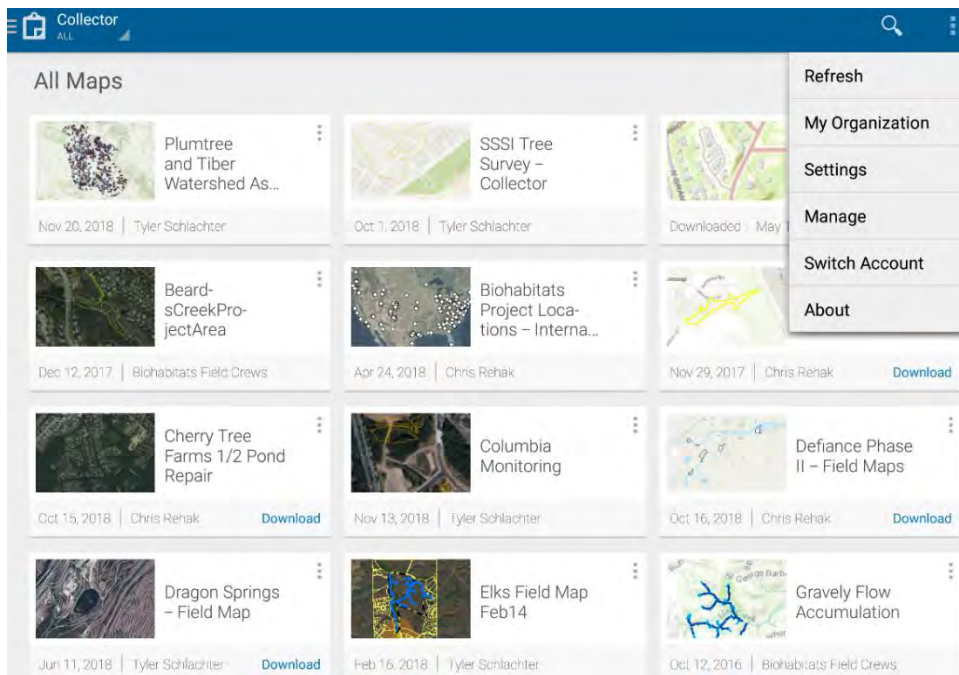


Return to the map selection screen.

Note: If Collector still doesn't recognize the GPS unit close collector and return to the Tablet Settings menu and re-pair the GPS unit then open collector and go right to the project no need to pair the GPS in collector again.

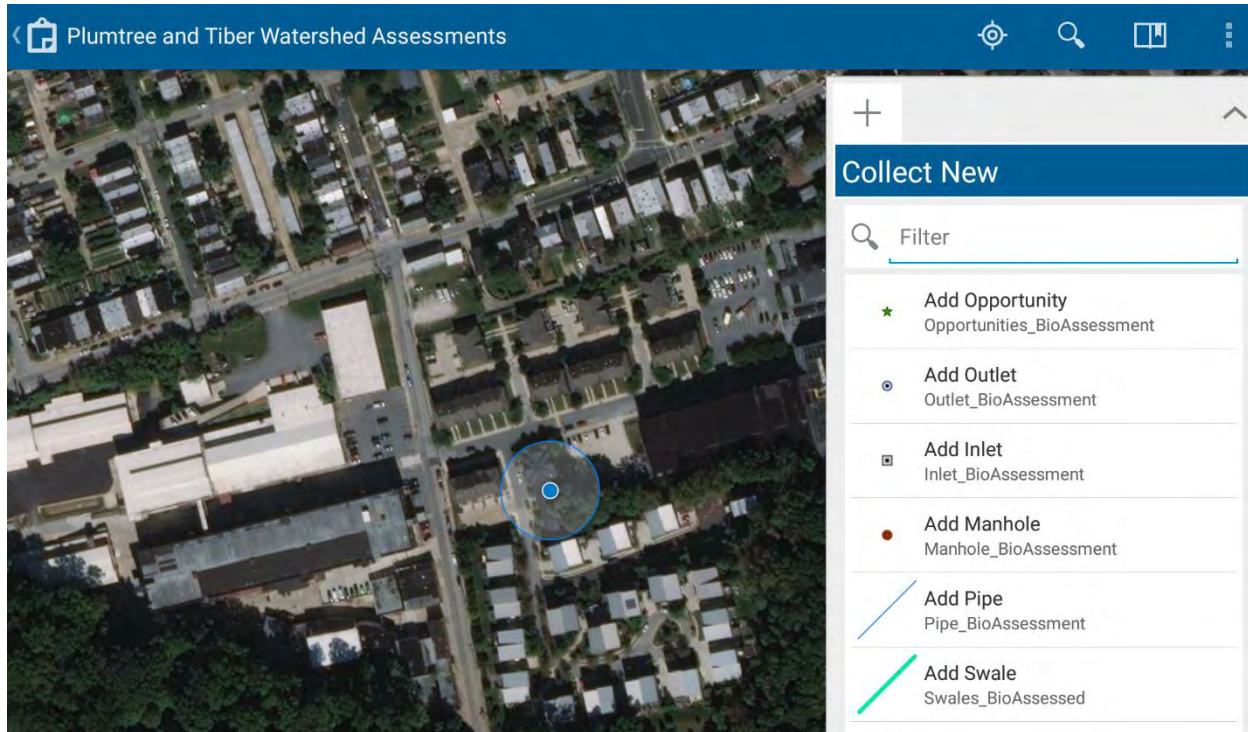
Selecting the appropriate Map

Select the map titled "Plumtree and Tiber Watershed Assessment" for this field work.



The Map

When you open your map, the extent of the map will default to your general proximity. Your location is represented by the blue dot. The layers in the map are shown in the map area. The sidebar on the mapscreen will allow you to add new points to the layers or edit existing data.



Adding and Editing Data

Adding Data

Location Data

While in the map, if the sidebar on the right-side of the screen is titled 'Collect New', when you tap on any of the layer-types in the sidebar, you will create a new data entry.

The data (if it is a point) will automatically be placed on the map according to your tablet's GPS location. Because the accuracy of your tablet GPS varies, the initial point location may not appear accurate against the aerial basemap (the accuracy of your GPS signal is displayed on the bottom left of the map screen, in meters). If this is the case, you can move the point manually by dragging the point on the map to the location that is more visually accurate according to the basemap. To locate the new bit of data as accurately as possible in the field, use a combination of the tablet's internal GPS and the background aerial to position the point on the map.

Point location will be recorded in WGS84. This is the same coordinate system that the base map uses. When you manually move a point on the map, the app records the basemap coordinates, rather than your tablet GPS coordinates. All data will be projected into the State Plane coordinate system for MD after the fieldwork is complete.

The screenshot shows a mobile application interface. On the left is an aerial map with a blue location pin. On the right is a 'Details' sidebar form. The form has a title bar 'Details' and a star icon next to the title 'Biohabitats Opportunity:'. Below the title is the location 'long:-76.647487 lat:39.330931'. The form contains several fields: 'ASSESSED BY BIO' with a dropdown menu showing '<No value>', 'ASSESSED BY' with a dropdown menu showing '<No value>', 'ASSESE BY DATE' with a date input field and a 'Use current' button, 'ASSOCIATED COUNTY SD ID' with a text input field, 'ASSOCIATED COUNTY COMPLAINT' with a text input field, 'TYPE OF OPPORTUNITY (1)' with a dropdown menu showing '<No value>', 'TYPE OF OPPORTUNITY (2)' with a dropdown menu showing '<No value>', and 'TYPE OF OPPORTUNITY (3)' with a dropdown menu showing '<No value>'. At the top of the screen is a dark blue bar with a checkmark icon on the left and three icons (a person, a plus sign, and a gear) on the right.

Detail Data

Once your data location is defined, you can fill out the field data in the sidebar as if it were a form. Use the technical guidance manual when necessary.

Adding attachments

Finally, you can add photos to the data point by tapping the add attachment button. Choose whether to add a photo from the Gallery or from the Camera.

You can add multiple photos. Photos should be added according to the order in which they are referred to in the technical guidance.

Submitting your Data

When the form is filled out and all the attachments are recorded, tap the submit button (✓) in the top left to submit the data. The data will sync with the cloud. Depending on the amount of attachments that you have for your point and the quality of your cell phone signal, this may take some time.

Editing Data

To edit a datapoint, tap on the datapoint in the map screen. The sidebar will now have a new 'tab' with the title 'Features'. Tap on the feature that you would like to edit, this will show the 'Details' of the

feature. Tap the edit button:  . Now you can fill out information in the sidebar as you would during data creation. When you are done making edits, hit the submit button: 

Data Collection Best Practices

General

These fields are included in all data collection layers.

Assessed By Bio

As you assess the storm drain dataset that the county has provided, when you visit a datapoint, change the value of the 'Assessed By Bio' field to 'Yes', even if there are no other edits to make to the data. This will help us track our progress in the field, and will change the symbology of the layer, to make navigation smoother for fieldwork.

Assessed By

Select the name of person operating the tablet. If your name is not available, please use the name of the field crew leader.

Assessment Date

Select Use Current.

Flag for Post

Each layer has a 'Flag for Post' field, with domain values of 'Y/N'. If you have data that either does not conform to schema, you want to verify a selection, accidentally moved an existing point, have a question regarding the data, or should for some reason need to review the data in the office, select Y. This is a catch-all field that will help greatly during initial data clean-up and post processing. During post-processing please resolve as many flags as possible and change the field value to N.

County ID

For components already in the County's GIS layer an ID has been assigned and is included for reference. Please not change or delete this field. Added components will receive a County ID during a subsequent phase of the project.

Plan Number

Plan number refers to the county design plans. They are provided for reference, please do not change this field. The county has provided the referenced plans. They are saved on the server and may be used during post-processing or during the analysis phase to provide additional context or data.

Capture Method

For components already in the County's GIS layer a Capture Method will likely be pre-assigned. If so, leave the value as-is. If not, select Unknown.

For new point components, select In-field using GPS when paired with an Elf.

For new line or polygon components, select In-field using aerial imagery.

Stormdrain data

The following components of the drainage network are to be field verified or located: inlet, outfalls, manholes, pipes, and swales. Please note that swales no currently exist within the County's GIS system. Information is provided below to assist in data collection.

Inlet

a. Inlet Type:

- i. Type "A-5" Inlet: *Refers to HoCo Design Manual Detail D-4.02. Curb and Gutter, 6" deep opening, 5' wide.*
- ii. Type "A-10" Inlet: *Refers to HoCo Design Manual Detail D-4.03. Curb and Gutter, 6" deep opening, 10' wide.*
- iii. Type "D" Inlet: *Refers to HoCo Design Manual Detail D-4.10. **Not to be used adjacent to public roads or alleys.** Concrete box 3.5' by 3.5'. May have trapezoidal weir, 6" deep and 18" wide or beehive grate (D-4.11).*
- iv. Type "K" Inlet: *Refers to HoCo Design Manual Detail D-4.12 (2007 version of manual). For use with Gutters (or within lined swales). Steel Grate. Grate length (along flow path) varies, but width typically 36".*
- v. Yard Inlet: *Refers to HoCo Design Manual Detail D-4.12. Concrete box 3' x 3'. Grate dimensions 28" x 30". Can be up to 10' deep.*
- vi. Type "C" Inlet: *Refers to HoCo Design Manual Detail D-4.15 (2007 version of manual). For use with Trench Drains. Max depth of 3.5'.*
- vii. Type "E" Inlet: *Refers to HoCo Design Manual Detail D-4.21. Rectangular Grate Dimensions approx. 48" x 20". Max depth of box, 5'.*
- viii. Type "S" Inlet: *Refers to HoCo Design Manual Detail D-4.24. Square Grate Dimension 33" x 33", 2 vanes.. Max Depth of Box, 10'.*
- ix. Double Type "S" Inlet: *Refers to HoCo Design Manual Detail D-4.25. Two Square Grates Dimension 33" x 33", 2 vanes. No divider in box. Max Depth of Box, 10'.*
- x. Type "E" Combination Inlet: *Refers to HoCo Design Manual Detail D-4.22. Rectangular Grate and Curb Inlet. Rectangular Grate Dimensions approx. 48" x 20". Curb Inlet 8" deep. Max depth of box, 10'.*
- xi. Type "S" Combination Inlet: *Refers to HoCo Design Manual Detail D-4.26. Square Grate and Curb Inlet. Square Grate Dimensions 33" x 33", 2 vanes. Curb Inlet size varies. May be depressed (grate slopes to curb by 2.5"), concrete apron defining depression. Max Depth of box, 10'.*
- xii. Double Type "S" Combination Inlet (Normal to Curb): *Two Square Grates and Curb Inlet. Square Grates Dimensions 33" x 33" and are oriented perpendicular to curb (into street/traffic). Curb Inlet size varies. 2 vanes in grates.*

- xiii. Double Type “S” Combination Inlet (Parallel to Curb): *Two Square Grates and Curb Inlet. Square Grates Dimensions 33” x 33” and are oriented parallel to curb (into street/traffic). Curb Inlet size varies. 2 vanes in grate.*
 - xiv. Pre Cast WR Inlet: *Refers to HoCo Design Manual Detail D-4.31. Two Grates and Curb Inlet. Total Grate area 32” x 66”. Curb Inlet 66” wide. Grates do not have vanes – 12 spacers. Max Depth of box, 10’.*
 - xv. Pre Cast Single WR Inlet: *Refers to HoCo Design Manual Detail D-4.32. One Grate and optional Curb Inlet. Total Grate area 32” x 32”. Curb Inlet 32” wide. Grates do not have vanes – 12 spacers. Max Depth of box, 10’.*
 - xvi. Pre Cast NR Inlet: *Refers to HoCo Design Manual Detail D-4.41. One Grate and Curb Inlet. Total Grate area approx. 22” x 45”. No vanes – 8 spacers. Curb Inlet approx. 45” wide. Max Depth of box, 10’.*
 - xvii. Pre Cast Standard Type “D” Inlet: *Same configuration as Type “D” Inlet, two part structure with visible joint. **Not to be used adjacent to public roads or alleys.** Max Depth 8’.*
 - xviii. Pre Cast Standard Type “A-5” Inlet: *Same configuration as Type “A-5” Inlet, visible joint in structure.*
 - xix. Pre Cast Standard Type “A-10” Inlet: *Same configuration as Type “A-10” Inlet, visible joint in structure.*
 - xx. Water Quality Inlet: *Will likely have some inset or feature for water quality. Includes tree pit/boxes.*
 - xxi. S Inlet-Reticular Grate: *Same features as a Type S but does not have grate with vanes. Bike safe.*
 - xxii. E Inlet-Reticular Grate: *Same features as a Type E but with bike safe grate.*
 - xxiii. Non-Standard: *Does not fit into one of the categories above.*
 - xxiv. Unknown: *Cannot identify or distinguish between types*
- b. Entrance Type: *describes how water enters the inlet*
- i. Single Grate: *One grate only.*
 - ii. Double Grate: *Two distinct grates, no curb inlet.*
 - iii. Concrete Lid: *Shouldn’t be used.*
 - iv. Curb Inlet: *Just curb inlet.*
 - v. Combination (Grate and Curb Inlet): *Both a grate (single or double) and a curb inlet.*

- vi. Yard Inlet: *Use for inlets with weirs that are not in a roadway setting (Type D and Yard Inlets with no grates).*
 - vii. Unknown: *Cannot identify or distinguish between types.*
- c. Inlet Box Type
- i. Block: *Visible concrete cinder blocks (like an unfinished basement).*
 - ii. Brick: *Visible bricks.*
 - iii. Combo Brick and Concrete Prefab: *Part concrete and part brick.*
 - iv. Combo Block and Concrete Prefab: *Part concrete blocks and part brick.*
 - v. Concrete Prefab: *All concrete (not block) with visible joints between sections of the structure.*
 - vi. Concrete cast in place: *All concrete with no visible joints.*
 - vii. Other: *Indicate type if known. Also use for unknown.*
- d. Top Elevation: Auto-populated if available. Do not populate or change.
- e. Condition
- i. Good: *Performs intended function, no evidence of debris or clogging, no maintenance needed.*
 - ii. Repair Needed: *Does not perform intended function, extensive debris or clogging, needs maintenance or replacement, or feature is inaccessible.*
- f. Service Type
- i. Clean: *Debris or sedimentation.*
 - ii. Install: *Additional capacity needed.*
 - iii. Repair: *Structural repair needed.*
 - iv. Replacement: *Damage beyond repair, full replacement needed.*
 - v. Inspect: *Features is inaccessible or extent of service is unknown.*
- g. Inlet Comment
- i. *If Material choice is other, state structure material or that material could not be observed.*
 - ii. *State what factors contributed to condition.*
 - iii. *Provide any additional relevant information.*
- h. Photos

- i. *Overview of Inlet and surrounding area*
- ii. *Inside of Inlet Structure*

Outfall

- a. Outlet Type: *Describe outfall end treatment of a single pipe or stormdrain network. Also to be used to describe the upstream end of a culvert.*
 - i. Culvert: *Generally, under roadways.*
 - ii. Endsection: *Typically refers to a flared end section (may be metal, concrete, or plastic).*



- iii. Endwall: *Typically a concrete wall encasing the downstream end of a pipe. May have wingwalls.*



- iv. Headwall: *Typically a concrete wall encasing the upstream end of a pipe. May have wingwalls.*
- v. Inlet: *Upstream end of a culvert or stormdrain system. Unlikely to encounter.*
- vi. Manhole: *Please do not select.*
- vii. Projecting Pipe: *A downstream segment of pipe with only earthen fill surrounding it (no formal end treatment).*



- viii. Other: *Not described above or cannot differentiate between the options above.*

b. Material

- i. Bituminous Coated Corrugated Metal Pipe: *Has distinct corrugations on interior and exterior walls and black coating (coating may be on interior only)*
- ii. Corrugated Metal Pipe: *Has distinct corrugations on interior and exterior walls. May have evidence of rust or corrosion.*
- iii. High Density Polyethylene: *Has smooth interior and corrugated exterior. Typically, black in color.*
- iv. Polyvinyl Chloride (PVC) Pipe: *Has smooth interior and exterior. Typically, white or grey in color. May have perforations.*
- v. Reinforced Concrete Pipe: *Smooth interior and exterior, thick walls. Typically, grey in color.*
- vi. Unknown: *Cannot identify or distinguish between types*
- vii. Other: *Can be identified but not one of the above selections. Indicate type in Outlet Comments field.*
- viii. Aluminum Spiral Rib Pipe: *Unlikely to encounter.*
- ix. Asphalt Coated Corrugated Metal Pipe: *Unlikely to encounter.*
- x. Cast Iron Pipe: *Unlikely to encounter.*
- xi. Concrete: *Unlikely to encounter.*
- xii. Stream: *Unlikely to encounter.*
- xiii. Structural Plate Pipe: *Unlikely to encounter.*
- xiv. Terracotta Pipe: *Typically rust colored, can be square with mitered edges. Unlikely to encounter.*
- xv. Vitrified Clay: *Unlikely to encounter.*

c. Pipe Shape

- i. Round: *Width and height are the same.*

- ii. Ellipse: *Elongated axis (typically x-axis), symmetrical.*
 - iii. Box: *Rectangular. Typically, concrete.*
 - iv. Arch: *Similar to ellipse, but not symmetrical about x-axis (bottom typically flat or natural channel).*
 - v. Unknown: *Cannot identify or distinguish between types*
 - vi. Other: *Can be identified but not one of the above selections. Indicate type in Outlet Comments field.*
 - vii. Trapezoidal: *Unlikely to encounter.*
- d. Condition
- i. Good: *Performs intended function, no erosion downstream, no corrosion observed, no maintenance needed.*
 - ii. Repair Needed: *Unlike to function as intended, extensive debris or clogging, evidence of erosion, evidence of corrosion, needs maintenance or replacement, or is inaccessible.*
- e. Service Type
- i. Clean: *Debris or sedimentation.*
 - ii. Install: *Install riprap or outlet protection measures.*
 - iii. Repair: *Structural repair needed.*
 - iv. Replacement: *Damage beyond repair, full replacement needed.*
 - v. Inspect: *Features is inaccessible or extent of service is unknown.*
- f. Outlet Comment
- i. *Provide additional information for any categories marked as other.*
 - ii. *State what factors contributed to condition.*
 - iii. *Provide any additional relevant information.*
- g. Photos
- i. *Photo 1: Overview of Outlet*

Manhole

- a. Manhole Type: *Select type based first on material and second on function. Additional details may be included in comments.*
 - i. 4' Brick Manhole: *Visible brick, straight side walls, estimated diameter is 4 feet.*

- ii. 5' Brick Manhole: *Visible brick, straight side walls, estimated diameter is 5 feet.*
 - iii. Brick Manhole For use with 42": *Unlikely to encounter.*
 - iv. Brick Manhole With Offset Cover: *Visible brick, at top walls taper to manhole cover (top section may be brick or concrete).*
 - v. Standard Precast Manhole: *All concrete, rectangular, visible joints between parts of structure.*
 - vi. 4' Shallow Precast Manhole: *All concrete, circular, but shallow, 4 foot internal diameter.*
 - vii. 5' Shallow Precast Manhole: *All concrete, circular, but shallow, 5 foot internal diameter.*
 - viii. Precast Manhole Built Over Ex: *Unlikely to encounter.*
 - ix. Standard Drop Manhole: *Same number of pipes entering and leaving. Elevation change within structure.*
 - x. Cleanout: *Same number of pipes entering and leaving. No direction change. No drop across structure.*
 - xi. NonStandard: *Does not meet any of the above criteria.*
 - xii. Bend Structure – Circular Pipe: *One pipe in, one pipe out but direction change. No drop across structure. All pipes circular.*
 - xiii. Bend Structure – Elliptical Pipe: *One pipe in, one pipe out but direction change. No drop across structure. At least one pipe elliptical.*
 - xiv. Brick Y: *Brick structure, 3 pipes. Typically 2 in and one out.*
 - xv. Junction Chamber: *Different number of pipes entering then leaving. May have drop across structure.*
 - xvi. Field Connection: *Unlikely to encounter.*
 - xvii. Unknown: *Cannot observe (manhole lid locked).*
- b. Top Elevation: (do not change)
- c. Condition: *Refers to structure, leave blank if inside of structure not visible.*
- i. Good: *Performs intended function, no evidence of debris or clogging, no maintenance needed.*
 - ii. Repair Needed: *Does not perform intended function, extensive debris or clogging, needs maintenance or replacement, or inaccessible.*
- h. Service Type

- i. Clean: *Debris or sedimentation.*
 - ii. Install: *Probably no need for this option.*
 - iii. Repair: *Structural repair needed.*
 - iv. Replacement: *Damage beyond repair, full replacement needed.*
 - v. Inspect: *Features is inaccessible or extent of service is unknown.*
- d. Manhole Comment
 - i. *State what factors contributed to condition.*
 - ii. *Provide any additional relevant information, e.g., Is there more than one pipe into the manhole?*
- e. Photos
 - i. *Overview of Manhole and surrounding area*
 - ii. *Inside of Manhole, if accessible.*

Pipe

New pipes should be drawn from upstream node to downstream node.

- a. SD_Pipes_ID: *Do not change*
- b. Pipe Material
 - i. Bituminous Coated Corrugated Metal Pipe: *Has distinct corrugations on interior and exterior walls and black coating (coating may be on interior only)*
 - ii. Corrugated Metal Pipe: *Has distinct corrugations on interior and exterior walls. May have evidence of rust or corrosion.*
 - iii. High Density Polyethylene: *Has smooth interior and corrugated exterior. Typically, black in color.*
 - iv. Polyvinyl Chloride (PVC) Pipe: *Has smooth interior and exterior. Typically, white or grey in color. May have perforations.*
 - v. Reinforced Concrete Pipe: *Smooth interior and exterior, thick walls. Typically, grey in color.*
 - vi. Unknown: *Cannot identify or distinguish between types*
 - vii. Other: *Can be identified but not one of the above selections. Indicate type in Pipe Comments field.*
- c. Pipe Shape
 - i. Round: *Height and width are equal.*
 - ii. Ellipse: *Elongated axis (typically x-axis), symmetrical.*

- iii. Box: *Rectangular. Typically, concrete.*
 - iv. Arch: *Similar to ellipse, but not symmetrical about x-axis (bottom typically flat or natural channel).*
 - v. Unknown: *Cannot identify or distinguish between types*
 - vi. Other: *Can be identified but not one of the above selections. Indicate type in Pipe Comments field.*
 - vii. Trapezoidal: *Self-explanatory. Unlikely to encounter.*
- d. Width (inches): *Round to nearest inch*
- e. Height (inches): *Round to nearest inch. Leave blank if shape is round.*
- f. Perforated: *Leave blank if not observed.*
 - i. Yes
 - ii. No
- g. Trench Drain: *Leave blank if not observed.*
 - i. Yes
 - ii. No
- h. Condition
 - i. Good: *Performs intended function, no erosion downstream (if applicable), no corrosion observed, no maintenance needed.*
 - ii. Repair Needed: *Does not perform intended function, extensive debris or clogging, corrosion observed, erosion impacting performance, needs maintenance or replacement, or is inaccessible.*
- i. Service Type
 - i. Clean: *Debris or sedimentation.*
 - ii. Install: *Probably no need for this option.*
 - iii. Repair: *Structural repair needed.*
 - iv. Replacement: *Damage beyond repair, full replacement needed.*
 - v. Inspect: *Feature is inaccessible or extent of service is unknown.*
- j. Pipe Comment
 - i. *Provide additional information for any categories marked as other.*
 - ii. *State what factors contributed to condition.*

- iii. *State if there is a blind connection (pipe connection without a structure) and estimate how far upstream the pipe enters.*
 - iv. *Provide any additional relevant information.*
- k. Reverse Flow Direction in GIS
 - i. *<No Value>: Default. Indicates that pipe was drawn upstream to downstream.*
 - ii. *Yes: Select if pipe was drawn downstream to upstream.*
- l. Upstream Feature ID: *Enter Object ID of upstream structure. This can also be done during post-processing. Will be used to verify pipes snap to appropriate features.*
- m. Downstream Features ID: *Enter Object ID of downstream structure. This can also be done during post-processing. Will be used to verify pipes snap to appropriate features.*
- n. Photos:
 - i. *Dimension at upstream end.*
 - ii. *Sketch if configuration at upstream or downstream end is unique or origin/terminus of pipe is unknown.*

Swale

Swales are to be drawn upstream to downstream.

- a. Swale Lining: *Based on primary cover type.*
 - i. *Grass: Primary cover type is grass or other type of vegetation, no matter the condition.*
 - ii. *Riprap: Use for angular rock material, ungrouted.*
 - iii. *Concrete: Use for smooth concrete, or grouted riprap. Typically, grey or tan in color.*
 - iv. *Bare: Use for bare earth.*
 - v. *Unknown: Cannot identify or distinguish between types.*
 - vi. *Other: Can be identified but not one of the above selections. Indicate type in Swale Comments field. (ex. Planted bioswale)*
- b. Swale Geometry
 - i. *V (Triangle): No measurable bottom width. Defined side slopes.*
 - ii. *Trapezoidal: Measurable bottom width. Defined side slopes.*
 - iii. *Other: Not one of the above selections. If identifiable describe in Swale Comments field.*
- c. Standing Water

- i. Yes
 - ii. No
- d. Signs of Erosion
 - i. Yes
 - ii. No
- e. Bottom Width (feet): *0 for V-shaped. Round to nearest 0.5 feet for trapezoidal.*
- f. Condition:
 - i. *Good: Performs intended function, no evidence of debris or clogging, no maintenance needed.*
 - ii. *Repair Needed: Does not perform intended function, extensive debris or clogging, needs maintenance or replacement.*
- g. Service Type
 - i. *Clean: Debris or sedimentation.*
 - ii. *Install: Install riprap, vegetation, or other armoring. Install driveway culverts to improve conveyance.*
 - iii. *Repair: Adjust grading in one section.*
 - iv. *Replacement: Full scale re-grading of system likely required.*
 - v. *Inspect: Feature is inaccessible or extent of service is unknown.*
- h. Swale Comment:
 - i. *Provide additional information for any categories marked as other.*
 - ii. *If standing water is observed, state weather in past 48 hours.*
 - iii. *If signs of erosion, describe degree of erosion.*
 - iv. *Provide any additional relevant information.*
- i. Photos:
 - i. *Overview of Swale Area.*

Biohabitats opportunity data

There are both point and polygon opportunity layers available for you to add or edit data. The points layer should be used to identify specific opportunities. The polygon layer should be used to identify an area where the recommended practice type applies.

- a. Associated County SD ID: *Please fill in ID of first point in the SD network closest to the opportunity. If not a previously mapped SD network, please leave field blank.*
- b. Associated County Complaint ID: *Please fill in if adjacent property has a complaint shown in the data base. If no complaint, please leave field blank.*
- c. Type of Opportunity: *Practices should be applicable at a neighborhood scale (3-4 lots) and focus on improving drainage through either runoff reduction or improved conveyance.*
 - i. ESD Practice: *Environmental Site Design practices include: Permeable Pavements, Disconnection of Runoff, Submerged Gravel Wetlands, Landscape Infiltration, Dry wells, Bioretention, Rain Gardens, Bioswale, Reforestation. Practice Area to Drainage Area ratios vary but available practice area should be roughly 5-10% of drainage area. Practice depth varies, but area should support 1-3 ft of excavation.*
 - ii. Detention Practice: *Detention Practices include: Wet Ponds, Dry Ponds, and Underground Storage. Practice Area to Drainage Area ratios vary but for ponds the practice area should be roughly 1-3% of the drainage area with the ability to provide 3-6 ft of total storage. Underground storage should have a 1:1 ratio of practice area to treatment area and support 1-3 ft of excavation.*
 - iii. Improve/Repair Open Channel Conveyance Network: *This opportunity type should be recommended when an open channel conveyance network exists in an area but has a system-wide design flaw. Examples of a system-wide design flaw include: consistently undersized features, a lack of defined outlet, disconnection due to lack of driveway culverts or poorly designed sections.*
 - iv. Improve/Repair Stormdrain Network: *This opportunity type should be recommended when a stormdrain network exists in an area but has a system wide design flaw. Examples of a system wise design flaw include: inconsistent or undersized pipe features, lack of inlet in critical area, disconnected area due to a lack of conveyance to inlet or pipe.*
 - v. Maintain Open Channel Conveyance Network: *This opportunity type should be recommended when an open channel conveyance network exists but has a localized issue that prevents it from functioning. Examples of a localized issue include frequently clogged channel, sedimentation that has altered capacity or direction of flow, or undersized/disconnected segments (less than 50 feet).*
 - vi. Maintain Stormdrain Network: *This opportunity type should be recommended when a stormdrain network exists but has a localized issue that prevents it from functioning. Examples of a localized issue include frequently clogged inlet or pipe, sedimentation that has altered pipe capacity, or undersized/disconnected segment (less than 50 feet).*
 - vii. Outlet Restoration: *Outlet Restoration practices include regenerative stormwater conveyance, natural channel design, installation of drop structures, or stream restoration. These practices seek to improve conveyance and protect existing infrastructure through improving outfall stability.*
 - viii. New Conveyance Network: *This opportunity type should be recommended when no conveyance network exists and there is evidence of ponding/flooding. Practice includes both open channel conveyance and stormdrain conveyance.*
 - ix. Other: *This practice type is reserved for unique or non-standard opportunities not encompassed by the categories described above.*

- d. Description of Opportunity:
 - i. *Describe specific practices if opportunity types include more than one practice option.*
 - ii. *Describe site specific considerations.*
- e. Design Consideration Comments:
 - i. *Describe potential constraints.*
 - ii. *Describe potential access challenges.*
- f. Potential Constraints: *Please select Yes for all that apply and No for those that do not apply.*
 - i. *Utilities: Water, sewer, or gas lines likely to be within practice footprint.*
 - ii. *Space: Fixed features (structures, roads, wells, steep slopes, etc) constrain practice footprint.*
 - iii. *Tree Impacts: Mature tree driplines exist within practice footprint.*
 - iv. *Soils: Soil infiltration capacity likely to constrain practice type or highly erodible/unstable soil types exist within practice footprint.*
 - v. *Access: Construction equipment traditionally requires a minimum of 12' wide access road at a maximum slope of 10%. Trench excavation for stormdrain pipes traditionally requires a bottom of width of pipe plus 2 feet and a minimum of 1 foot of width for each foot of depth.*
 - vi. *Other: Site specific constraint exists that is not described above.*
- g. Photos
 - i. *Overview opportunity area,*
 - ii. *Photograph paper/fieldbook with sketch of opportunity to include drainage patterns; impervious areas; locations of utilities, retaining walls, abutments, existing storm drainage system features and outfall.*
 - iii. *Additional photos to characterize the site and opportunity.*

Complaint Data

This dataset provides spatial locations of stormwater complaints made by Howard County citizens within the Plumtree and Tiber-Hudson watersheds. You won't have the ability to edit or add to complaint data. The complaints are accompanied by a 'County Complaint ID' field, which you can use to reference specific complaints in any opportunity observations that you make.

Things to keep in mind:

- Click the...vertical ellipses. You can change the Basemap and turn on and off layers in the map
- You can search for addresses by tapping the magnifying glass
- There is a quick reference for Arc Collector here:
<https://doc.arcgis.com/en/collector/android/collect-data/quick-reference.htm>
- When you delete data, it is gone. If you make a mistake and delete data that you think should not have been deleted, make a note of your location and we can attempt to recover the data from a backup of the geodatabase.
- Copying data from one form to another (e.g, the ID of complaints to an opportunity form), hold a stylus/finger on the data to be copied to select it, choose copy, then paste into the new location.

Data Post-Processing

Crew leaders are expected to use ArcGIS Online to perform the following tasks at a minimum of once a week.

Reviewed flagged components.

- In cases where flag can be resolved, resolve the issue and change Flag for Post field to No.
- In cases where flag cannot be resolved, ensure that reason for flag is clearly stated in comments section.

Adjust linework

- Move pipes to as near upstream and downstream structures as possible.
- Make sure upstream and downstream structure IDs have been entered accurately.
- Verify flow arrows.

Opportunities

- Review design considerations and any applicable site plans.
- When possible, perform rough sizing checks.

Miscellaneous

- Review comments and spelling of entered data.
- Color in area covered on paper map located on third floor.
- Provide summary of any critical resident field interactions in tracking spreadsheet.
- Note any deficiencies of field gear performance.

Guidelines for using ArcGIS Online

A rough guide to post-processing your data in ArcGIS online:

- Go to the webmap, use the credentials in the Best Practices Guide:
<http://biohabitats.maps.arcgis.com/home/webmap/viewer.html?webmap=e082f44918d84043a311bb9126da5249>

Filtering in ArcGIS Online

- You can open the attribute table for a layer and filter the features by your name and the 'Flagged For Post' status
- You can zoom to any selected feature using the 'Options' button on the Attribute Table.
- Click on the feature in the map to open the pop-up. At the bottom of the pop-up click the 'Edit' link. You can now edit fields and geometry.

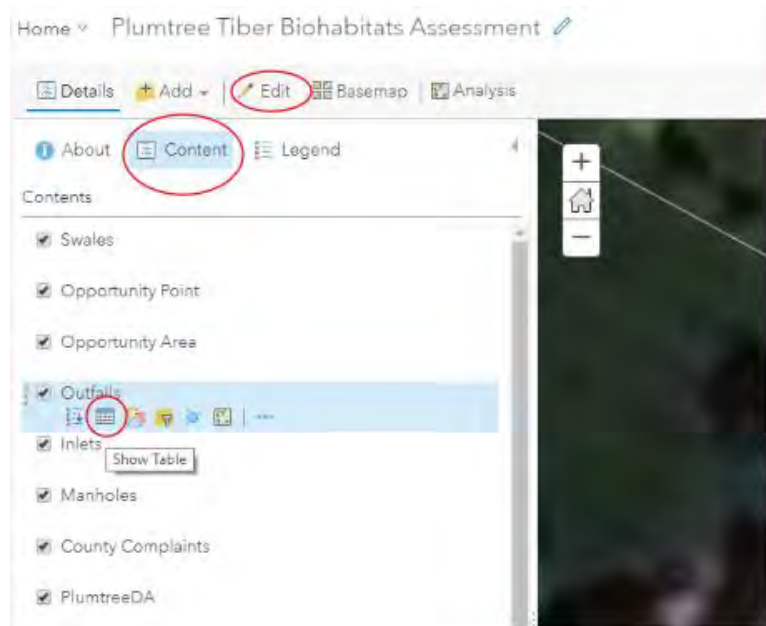


Figure 1: Important navigation buttons



Commonwealth of Virginia, Norfolk

esri

Outfalls (Features: 1113, Selected: 0)

Assessed by bio	Assessed by	Assess Date	TYPE OF OUTFALL	TYPE OF MATERIAL	PLAN NUMBER	Pipe Shape	Capture Method	Condition		
Yes	G. Battersby	12/27/2018, 12:51 PM	Projecting Pipe	Concrete		ROUND	In-field using aerial imagery	Repair Needed	Show Selected Records Center on Selection Clear Selection Show/Hide Columns Filter Add Field	
Yes	B. Forbes	1/3/2019, 9:19 AM	Endsection	Reinforced Concrete Pipe		ROUND	In-field using GPS	Repair Needed		Clean
Yes	G. Battersby	1/3/2019, 9:21 AM	Headwall	Concrete		ROUND	In-field using aerial imagery	Repair Needed		Clean
Yes	G. Battersby	1/3/2019, 9:27 AM	Endwall	Concrete		ROUND	In-field using aerial imagery	Repair Needed		Clean
Yes	G. Battersby	1/3/2019, 11:09 AM	Other	Unknown		Unknown	In-field using aerial imagery			
Yes	G. Battersby	1/3/2019, 11:21 AM	Endsection	Concrete		ROUND	In-field using aerial imagery	Good		

Figure 2: The 'options' button has 3 horizontal lines, you will find filters and 'selection centering' here

Filter: Outfalls

Create

+ Add another expression ☐ Add a set

Display features in the layer that match all of the following expressions ▼

Assessed by ▼ is ▼ M. Gloyd ▼ ✕

☒ Value ☐ Field ☐ Unique

☐ Ask for values +

FLAG FOR POST ▼ is ▼ Yes ▼ ✕

☒ Value ☐ Field ☐ Unique

☐ Ask for values +

APPLY FILTER APPLY FILTER AND ZOOM TO CLOSE

Figure 3: The filtering option screen and how you would set it up to only view points that need post processing

Field Book Requirements

Crew leaders should maintain a field book with the following data recorded:

- Date
- Weather
- Streets Visited (with rough times)
- Field Partner
- Resident Interactions with Name of resident and summary of discussion
- Sketches for any unique infrastructure features
- Sketches for any opportunities

Field Equipment Checklist

- o Tablet
- o Backup Battery (2 recommended if using older tablet, keep in interior pocket if under 35 degrees)
- o Bad Elf GPS unit
- o 100 ft tape (or 300 ft tape)
- o Field Book
- o Pen/Pencil
- o Stylus
- o Phone
- o Flashlight
- o Pocket Rod
- o Manhole Puller
- o PPE: reflective vest, boots with ankle protection
- o Fieldwork Letter
- o Business Cards
- o List of urgent care offices (see below)
- o Bio Magnet (if taking personal vehicle)
- o First Aid Kit (if taking personal vehicle)

Urgent Care Centers

- o [AllCare MD](#), 9396 Baltimore Nat'l Pike, Ellicott City, 410-480-9110
North side of US40 near Plumtree Dr.
- o [Howard County General Emergency Room](#), 5755 Cedar Lane, Columbia, 410-740-7890



HOWARD COUNTY DEPARTMENT OF PUBLIC WORKS

6751 Columbia Gateway Drive, Suite 514 ■ Columbia Maryland 21046 ■ 410-313-6444

Mark DeLuca, P.E., Deputy Director
Chief, Bureau of Environmental Services
mdeluca@howardcountymd.gov

FAX 410-313-6490
TDD 410-313-2323

December 17, 2018

Re: Plumtree Branch Watershed and Tiber Branch Watershed Stormwater Retrofit Studies

Dear Property Owner:

Howard County Department of Public Works is undertaking stormwater retrofit studies in the Plumtree Branch Watershed and Tiber Branch Watershed in the Ellicott City area. The studies will include drainage assessments and improvement studies of:

- Existing stormwater infrastructure (inlets, pipes, manholes, outlets, swales)
- Opportunities for improved stormwater infrastructure and management
- Opportunities for water quality improvement

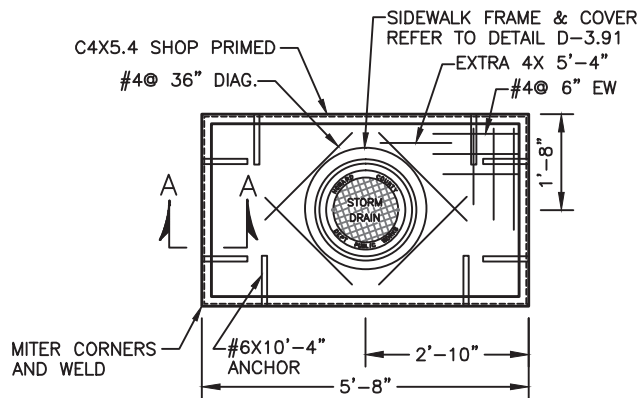
Please be advised that the consulting firms of Biohabitats and McCormick Taylor have been retained by the County to perform field surveys for the project. Part of the field surveys will include and evaluations of drainage infrastructure (stormdrain inlets, pipes and outlets). The employees of the consulting firms acting on behalf of the Department of Public Works may be entering onto your private land for the purpose of making the necessary field surveys in order to perform the assessments and may do so in accordance with Real Property Article Section 12-111, inclusive, of the Annotated Code of Maryland. Our consultants have been advised to take every precaution to limit disturbance to private property. Field work will begin in November 2018. The studies will be complete in Spring 2019.

If you have any questions or concerns please feel free to contact me using the information below.

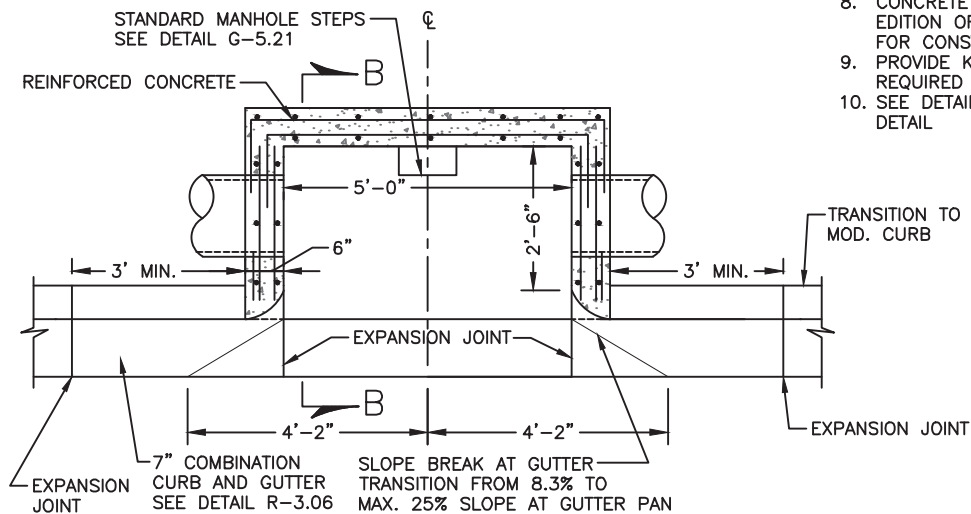
Sincerely,

Christine Lowe, P.E.

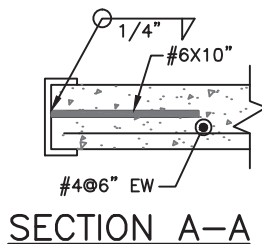
Howard County Government
Stormwater Management Division
Bureau of Environmental Services
6751 Columbia Gateway Drive, Suite 514
Columbia, MD 21046-3143
410-313-0522 (voice)
410-313-6490 (fax)
cslowe@howardcountymd.gov



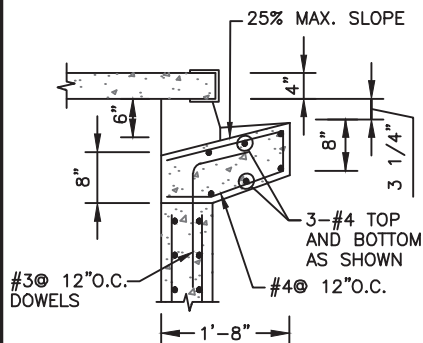
1 PLAN 4" TOP SLAB



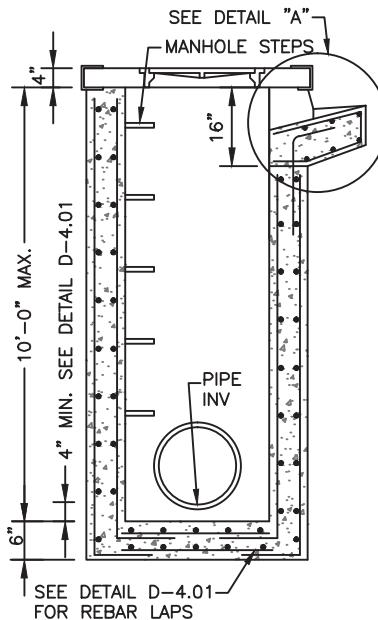
1 PLAN BELOW 4" SLAB



SECTION A-A



1 DETAIL "A"

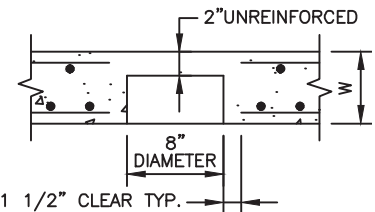


1 SECTION B-B

NOTE: FOR CURB AND GUTTER TRANSITION
SEE DETAIL R-3.06

1 PRECAST NOTES

1. SEE DETAIL D-4.01 FOR GENERAL NOTES APPLICABLE TO ALL STORM DRAIN INLETS.
2. CONCRETE TO BE MIX #6 (4500 PSI).
3. REINFORCING-2 LAYERS OF 4X4-W4.0XW4.0 WELDED WIRE FABRIC.
4. CONCRETE WORK SHALL CONFORM TO THE REQUIREMENTS OF LATEST EDITIONS OF ACI 301 AND ACI 318.
5. PRECAST STRUCTURES SHALL BE DESIGNED BY A PRECAST CONCRETE STRUCTURES MANUFACTURER IN ACCORDANCE TO LOADING SPECIFIED IN LATEST EDITIONS OF ASTM C857 ASTM C890.
6. PRECAST STRUCTURES SHALL CONFORM TO THE REQUIREMENT OF LATEST EDITIONS OF ASTM C858.
7. PROVIDE SOIL TIGHT CONNECTION BETWEEN PIPE AND INLET STRUCTURE.
8. CONCRETE SHALL CONFORM TO LATEST EDITION OF THE SHA STANDARD SPECIFICATION FOR CONSTRUCTION & MATERIALS.
9. PROVIDE KNOCKOUT FOR UNDERDRAIN AS REQUIRED BY DESIGN.
10. SEE DETAIL D-4.03 FOR PIPE PENETRATION DETAIL



**UNDERDRAIN
KNOCKOUT DETAIL**

NOTES:

1. KNOCKOUTS MAY BE PLACED IN BASE UNIT ABOVE CENTER OF OUTLET PIPE.
2. MIN. DEPTH: 3' FROM TOP OF CURB TO TOP OF KNOCKOUT. MIN. 6" FROM EDGE OF KNOCKOUT TO EDGE OF PRECAST UNIT.
3. DESIGN HYDRAULIC GRADIENT IN STORM DRAIN SYSTEM MUST BE 6" BELOW KNOCKOUT INVERT.
4. SEE INLET DETAIL FOR "W".
5. KNOCKOUT LOCATIONS FOR EACH INLET TO BE PROVIDED IN THE DESIGN.

Revised
1 5/30/2017
Revised
5/7/2007
Approved

Howard County, Maryland
Department of Public Works

Approved: *Thomas E. Butler*
Chief, Bureau of Engineering

TYPE A-5 INLET
≤10' Depth

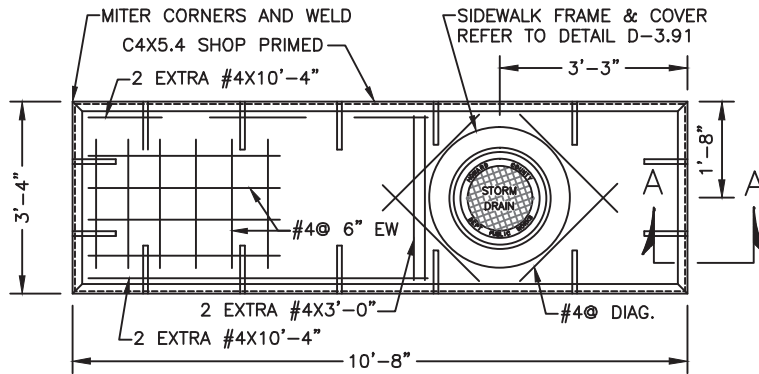
Detail **1**

D-4.02

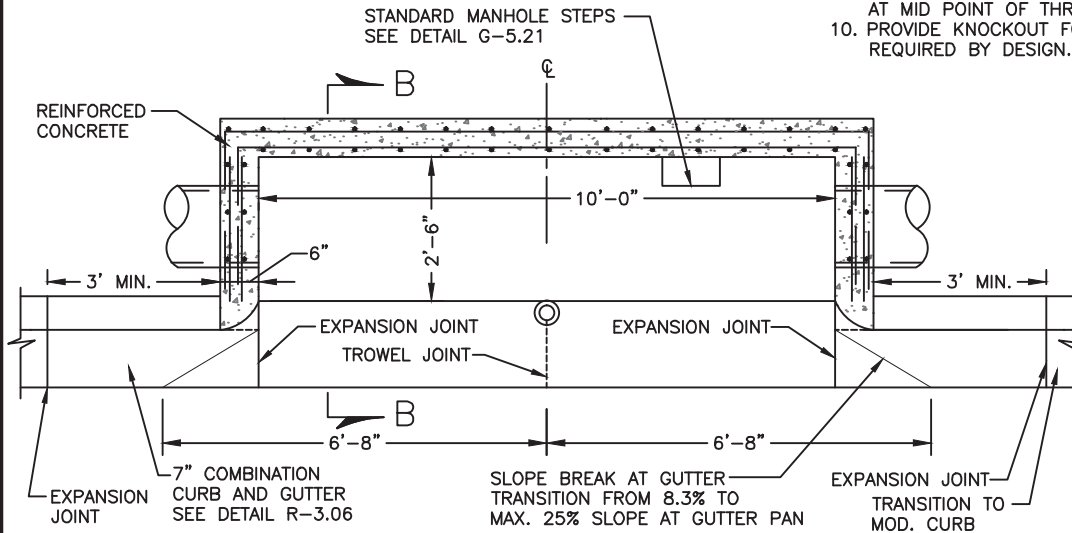
NOTE: FOR CURB AND GUTTER TRANSITION SEE DETAIL R-3.06

PRECAST NOTES

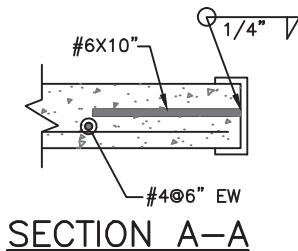
1. SEE DETAIL D-4.01 FOR GENERAL NOTES APPLICABLE TO ALL STORM DRAIN INLETS.
2. CONCRETE TO BE MIX #6 (4500 PSI).
3. REINFORCING-2 LAYERS OF 4X4-W4.0XW4.0 WELDED WIRE FABRIC.
4. CONCRETE WORK SHALL CONFORM TO THE REQUIREMENTS OF LATEST EDITIONS OF ACI 301 AND ACI 318.
5. PRECAST STRUCTURES SHALL BE DESIGNED BY A PRECAST CONCRETE STRUCTURES MANUFACTURER IN ACCORDANCE TO LOADING SPECIFIED IN LATEST EDITIONS OF ASTM C857 ASTM C890.
6. PRECAST STRUCTURES SHALL CONFORM TO THE REQUIREMENT OF LATEST EDITIONS OF ASTM C858.
7. PROVIDE SOIL TIGHT CONNECTION BETWEEN PIPE AND INLET STRUCTURE.
8. CONCRETE SHALL CONFORM TO LATEST EDITION OF THE SHA STANDARD SPECIFICATION FOR CONSTRUCTION & MATERIALS.
9. PROVIDE 3" DIA RUST PROOF STEEL PIPE AND FLANGE FOR HEIGHT ADJUSTMENT, PAINTED GRAY AT MID POINT OF THROAT, FILL WITH CONCRETE.
10. PROVIDE KNOCKOUT FOR UNDERDRAIN AS REQUIRED BY DESIGN. SEE DETAIL D-4.02



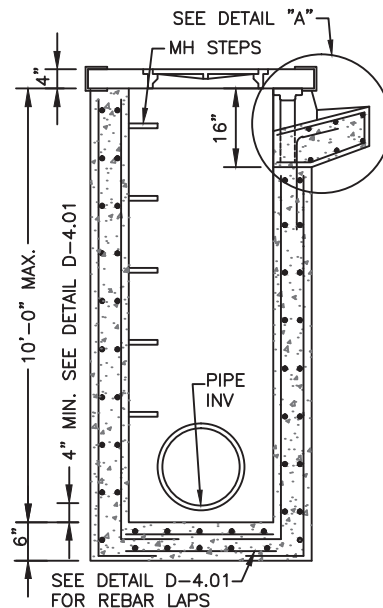
PLAN 4" TOP SLAB



PLAN BELOW 4" SLAB

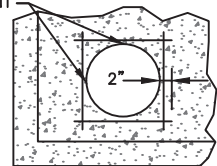


SECTION A-A

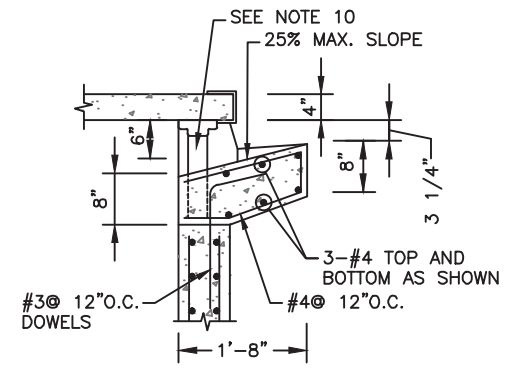


SECTION B-B

REPLACE REINFORCEMENT CUT OUT FOR PIPE PENETRATIONS. PROVIDE THE SAME AS ON EACH SIDE OF HOLE.



PIPE PENETRATION DETAIL



DETAIL "A"

Revised
5/30/2017
Revised
5/7/2007
Approved

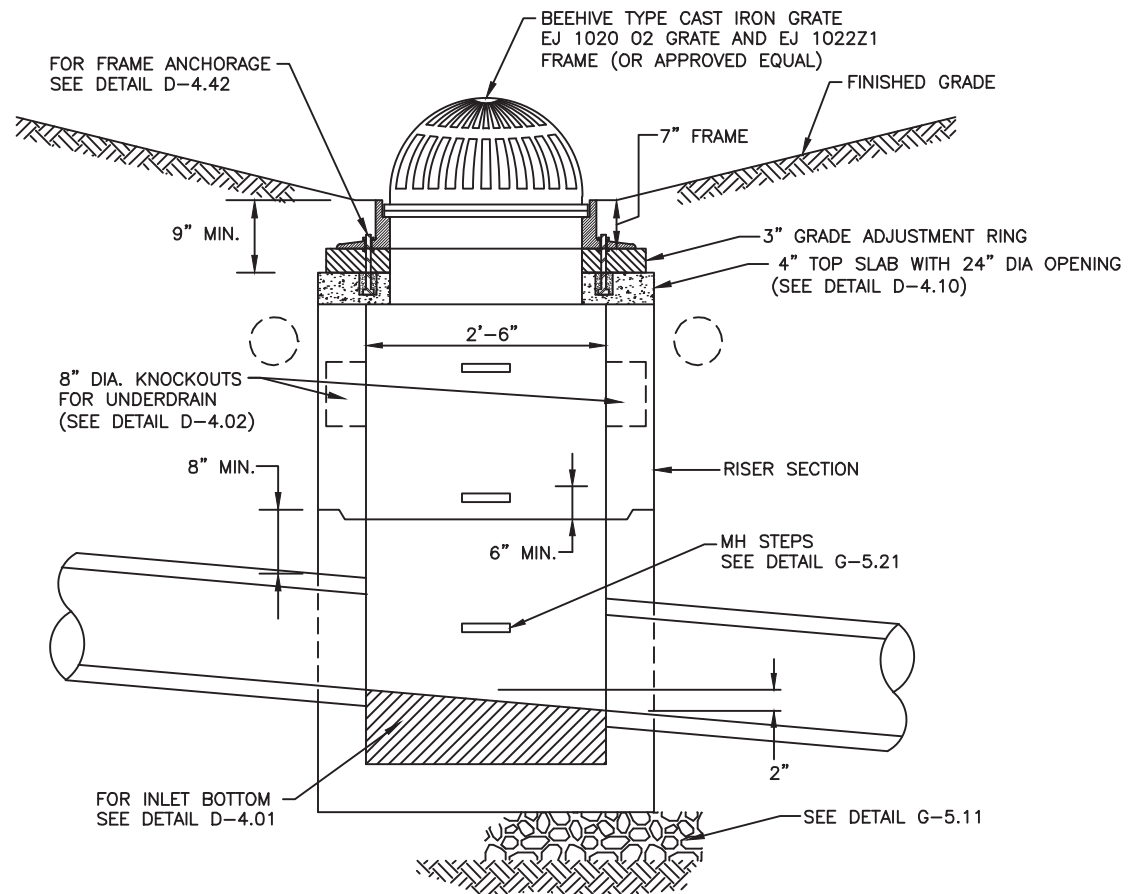
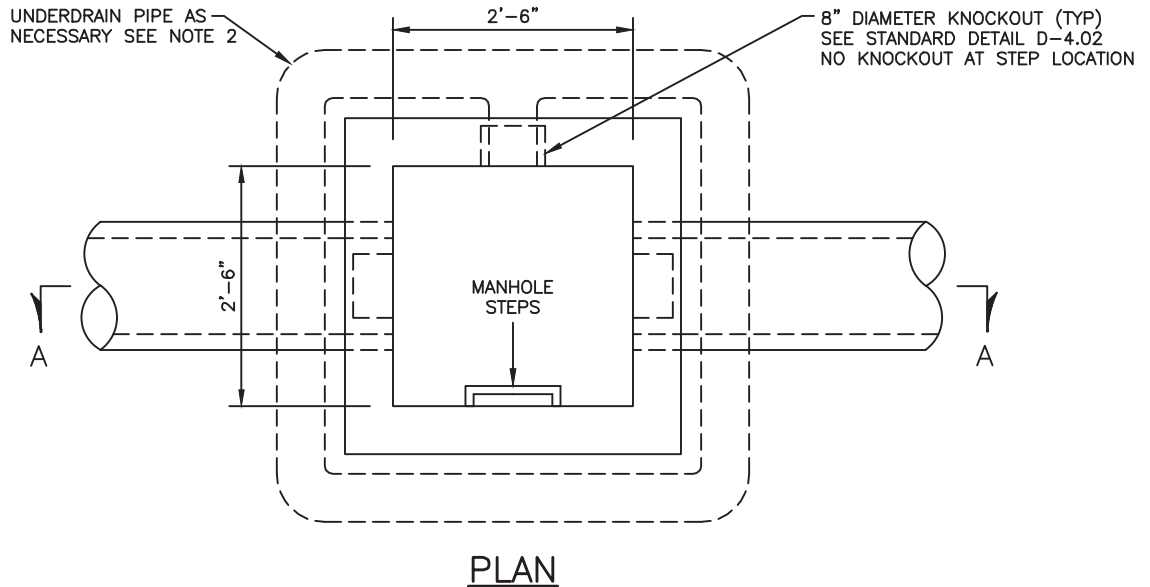
Howard County, Maryland
Department of Public Works

Approved: *Thomas E. Butler*
Chief, Bureau of Engineering

TYPE A-10 INLET
≤10' Depth

Detail

D-4.03



NOTES:

1. INLET TO BE USED IN SUMP (AS SHOWN) OR IN ENVIRONMENTAL SITE DESIGN APPLICATIONS. MAXIMUM DESIGN CAPACITY Q=3.0 CFS. TO BE USED WITH 24" RCCP MAXIMUM CONNECTION. NOT TO BE USED IN ROADWAY OR ADJACENT TO PARKING OR DRIVEWAY AREA. NOT FOR USE ADJACENT TO WOODED AREAS DUE TO POSSIBLE DEBRIS BLOCKAGE.
2. WHEN INLET IS USED IN SUMP AREA, UNDERDRAIN PIPE SHALL BE PROVIDED BELOW THE TOP SLAB ELEVATION TO ALLOW SURFACE WATER DRAIN TO THE INLET. SEE DETAIL R-1.09 FOR UNDERDRAIN DETAIL.
3. WHEN INLET IS USED AS OVERFLOW PROTECTION, UNDERDRAIN PIPE IS NOT NECESSARY.

Revised

Revised
5/30/2017
Approved

Howard County, Maryland
Department of Public Works

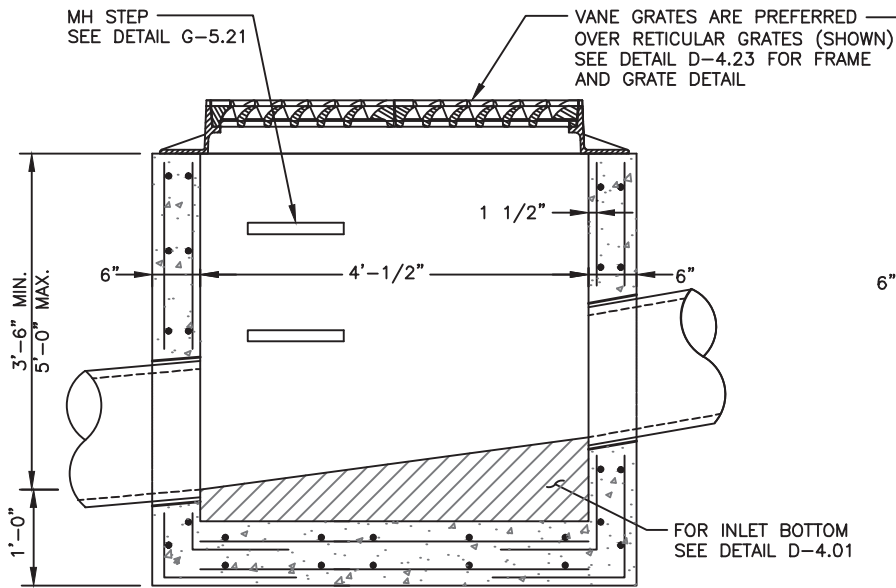
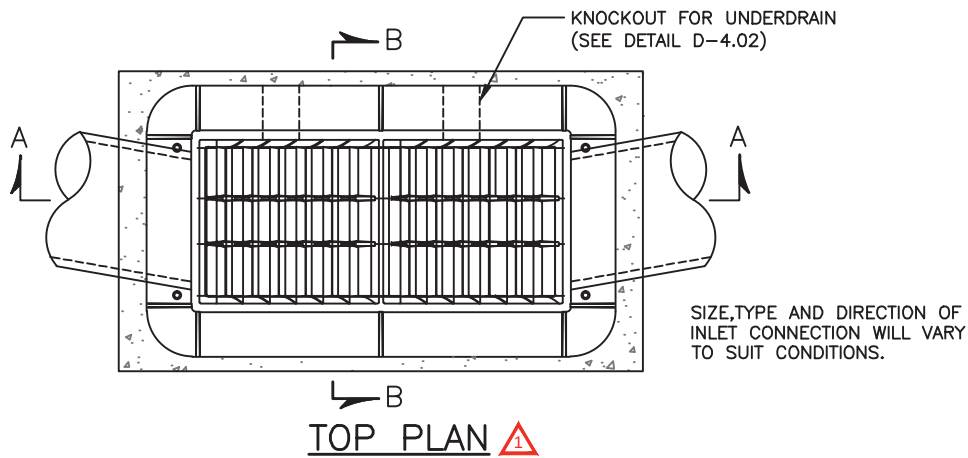
Approved: *Thomas E. Butler*
Chief, Bureau of Engineering

TYPE D INLET
With Beehive Grate

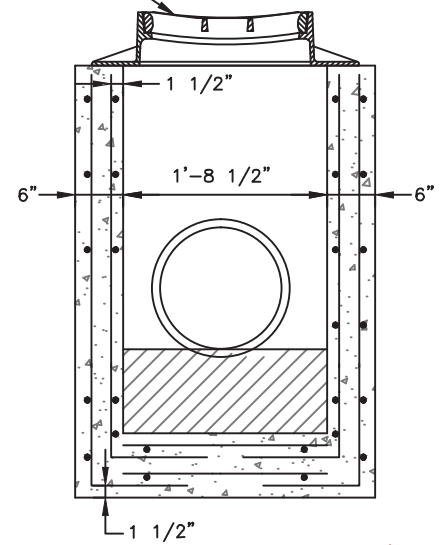
Detail

D-4.11

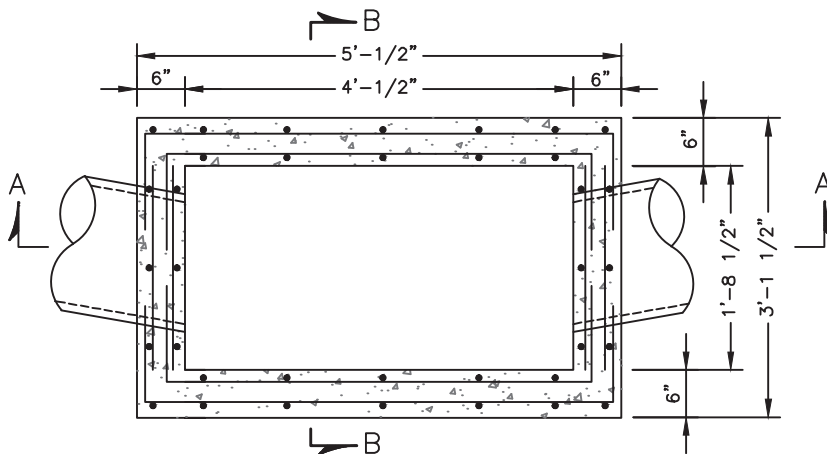
Revised	Howard County, Maryland Department of Public Works Approved: <u><i>Thomas E. Butler</i></u> Chief, Bureau of Engineering	YARD INLET Precast	Detail D-4.12
Revised 5/30/2017			
Approved			



SECTION A-A



SECTION B-B



LOWER PLAN

NOTES

1. SEE DETAIL D-4.01 FOR GENERAL NOTES APPLICABLE TO ALL STORM DRAIN INLETS.
2. CONCRETE TO BE MIX #6 (4500 PSI).
3. REINFORCING-2 LAYERS OF 4X4-W4.0XW4.0 WELDED WIRE FABRIC.

Revised
5/30/2017
Revised
5/7/2007
Approved

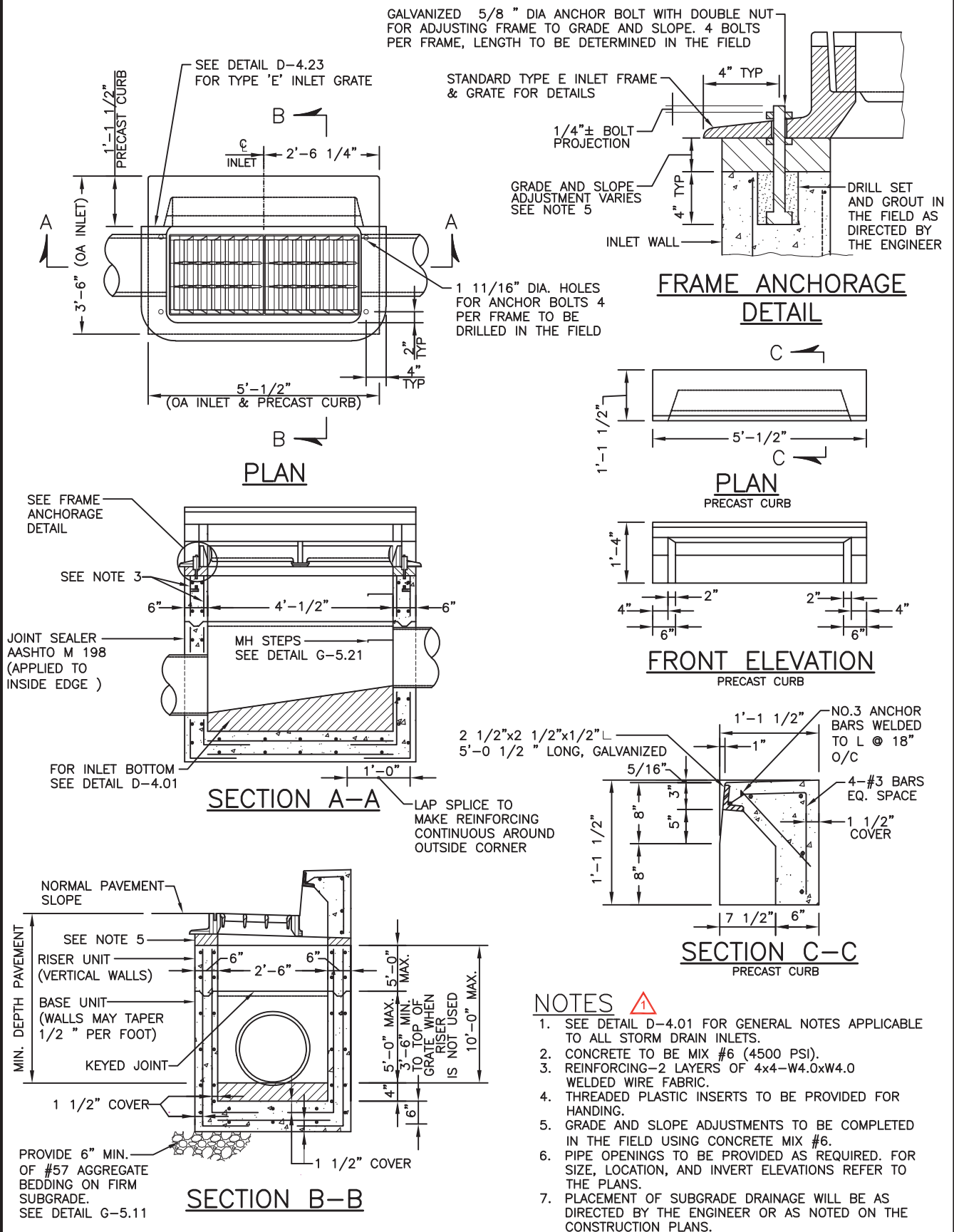
Howard County, Maryland
Department of Public Works

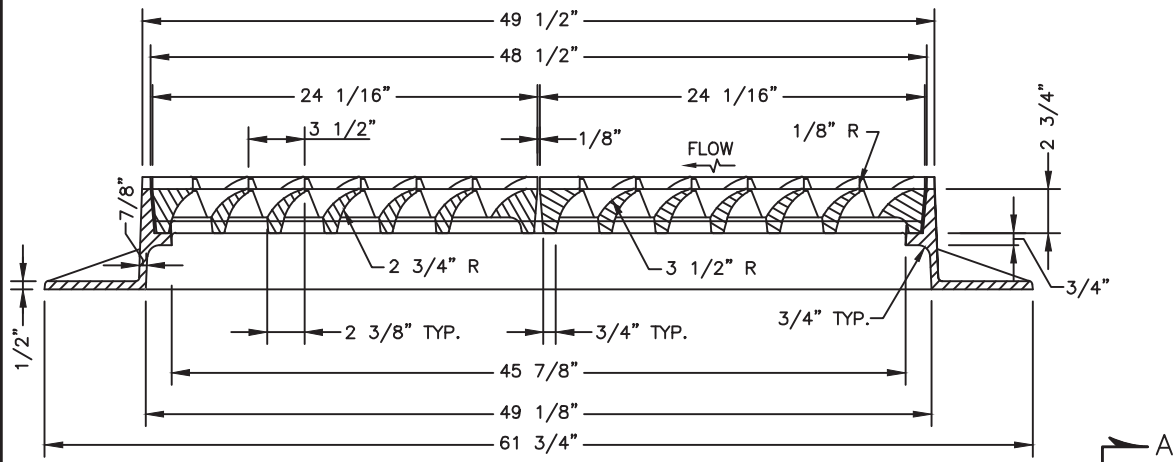
Approved: *Thomas E. Butler*
Chief, Bureau of Engineering

TYPE 'E' INLET

Detail

D-4.21

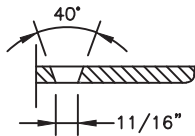




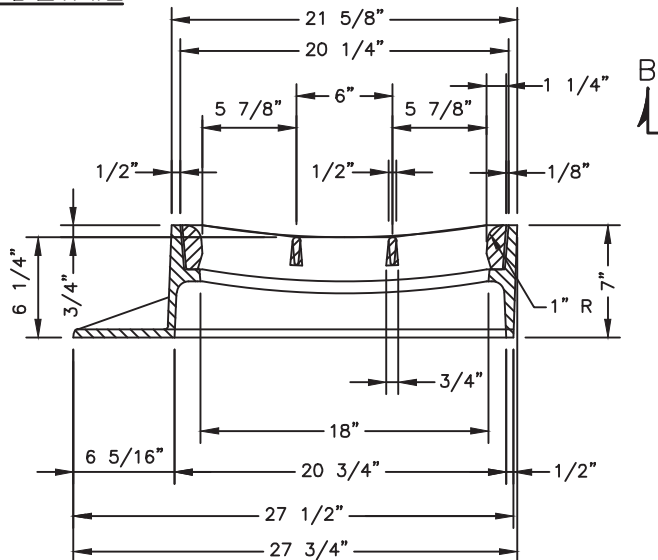
SECTION A-A

NOTES

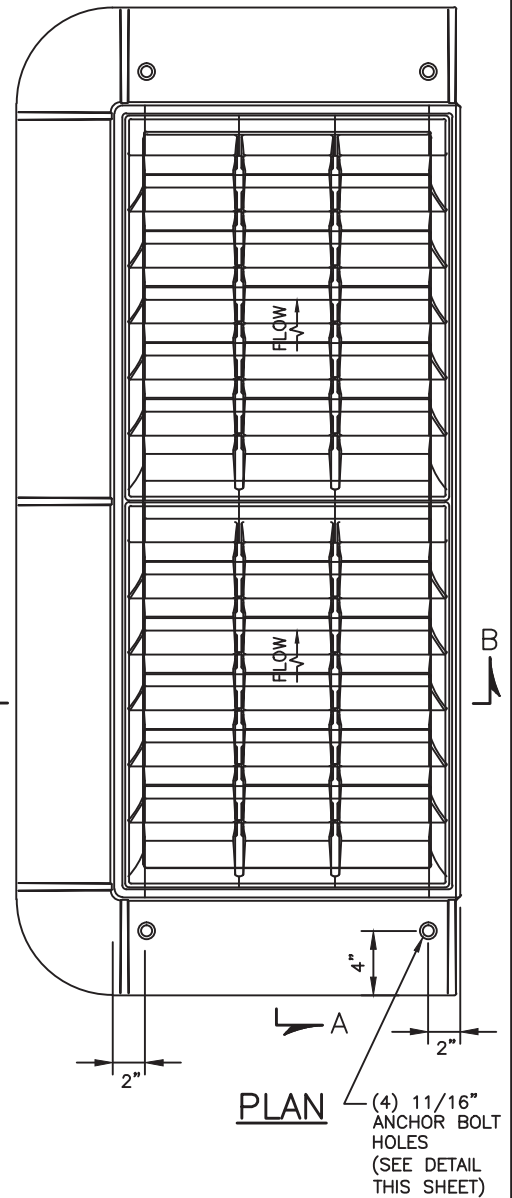
1. FRAME AND GRATE HAVE A RADIAL SEAT OF 52 7/8" RADIUS
2. TOP OF FRAME ALSO HAS RADIUS OF 52 7/8" RADIUS
3. TOP OF GRATE HAS FLAT SURFACES WHICH CLOSELY MATCH THE RADIUS OF THE FRAME.
4. MATERIAL: CAST GRAY IRON ASTM A48, CLASS 35B
5. FINISH: NOT PAINTED
6. FRAMES TO BE CAST WITH FLANGE CUT, AS SHOWN, WHEN INLET TO BE PLACED ADJACENT TO CURB OPENING.



ANCHOR BOLT HOLE DETAIL



SECTION B-B



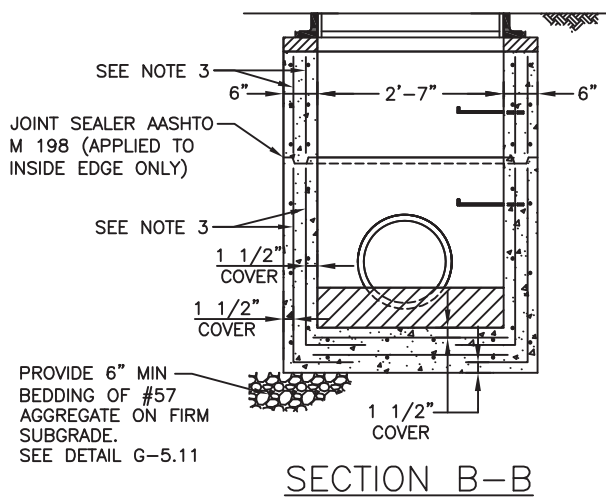
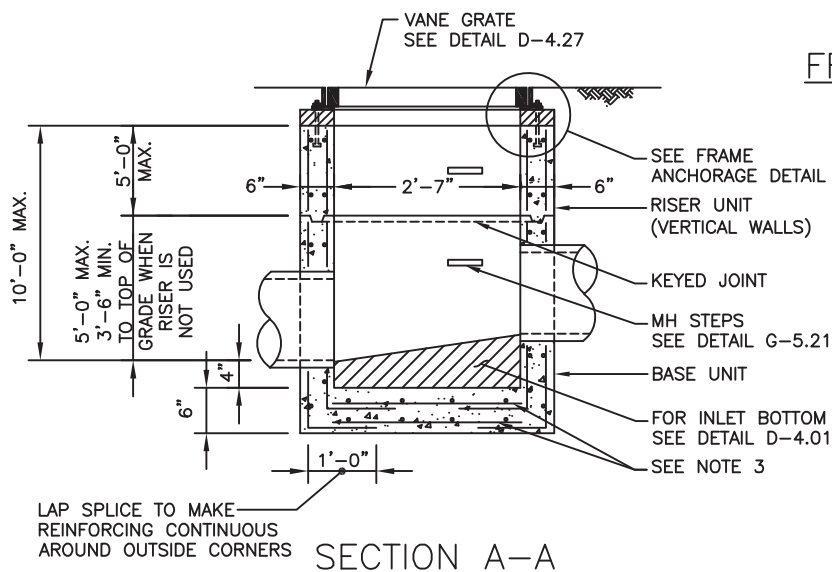
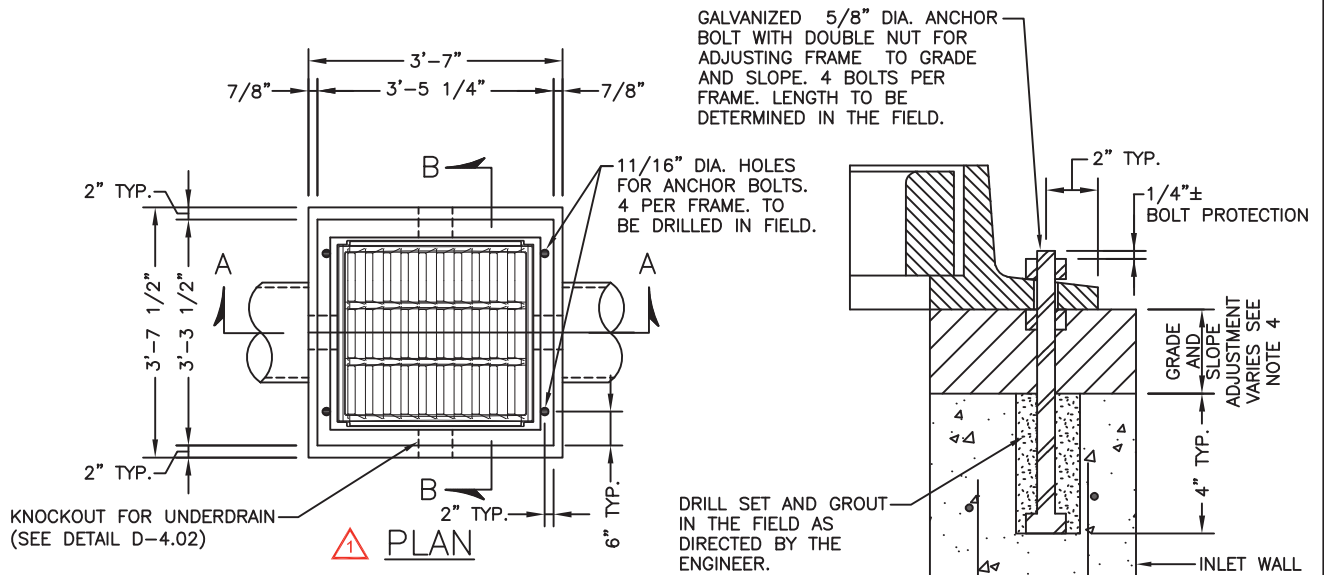
Revised
5/30/2017
Revised
5/7/2007
Approved

Howard County, Maryland
Department of Public Works
Approved: *Thomas E. Butler*
Chief, Bureau of Engineering

TYPE 'E' INLET
Frame & Grate

Detail

D-4.23



NOTES:

1. SEE DETAIL D-4.01 FOR GENERAL NOTES APPLICABLE TO ALL STORM DRAIN INLETS.
2. CONCRETE TO BE MIX #6 (4500PSI).
3. REINFORCING-2 LAYERS OF 4x4 W4.0XW4.0 WELDED WIRE FABRIC.
4. GRADE AND SLOPE ADJUSTMENT TO BE COMPLETED IN THE FIELD USING CONCRETE MIX#6

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5/7/2007
Approved

Howard County, Maryland
Department of Public Works

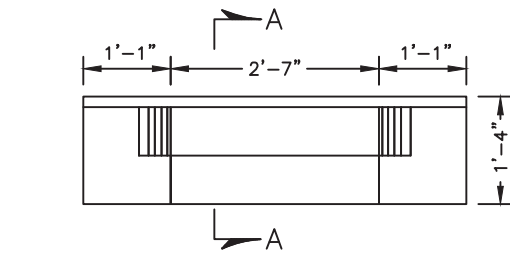
Approved:
Chief, Bureau of Engineering

TYPE 'S' INLET

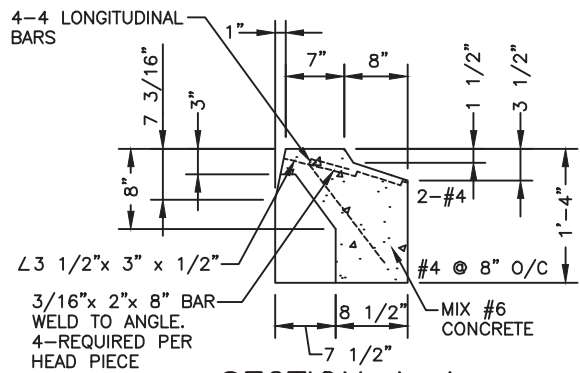
Detail

D-4.24

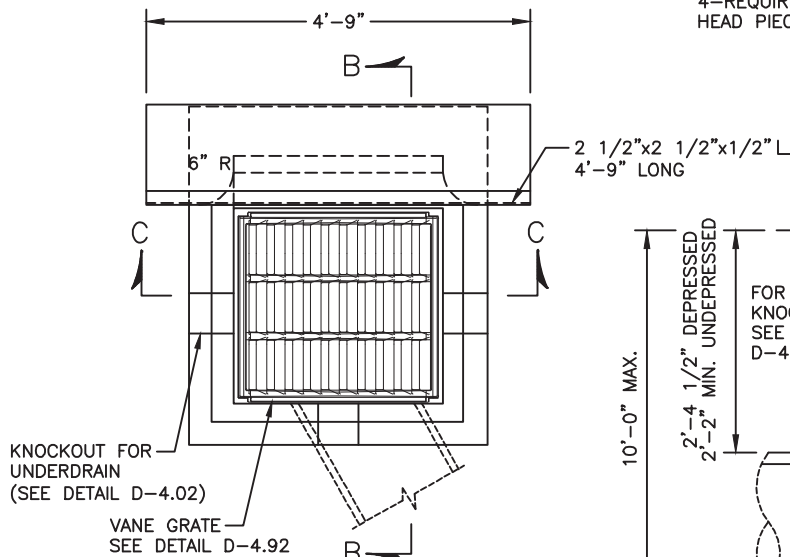
D-4.25



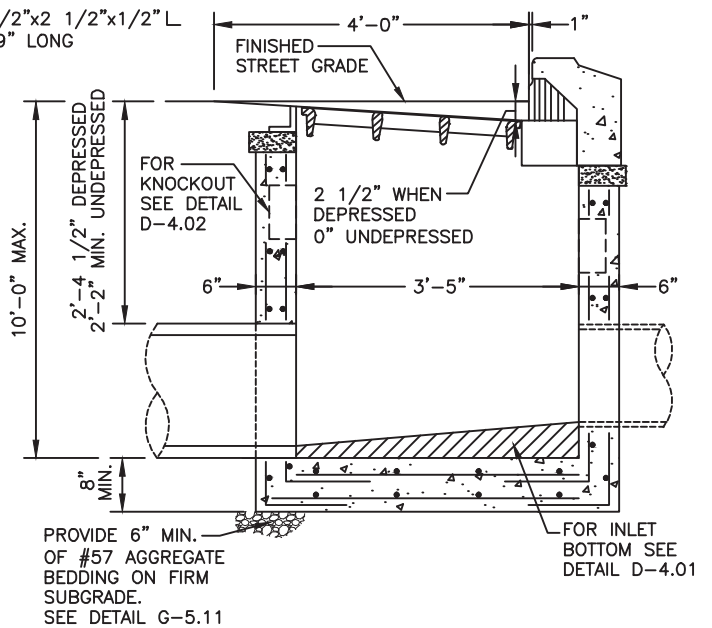
1 CONCRETE HEAD PIECE



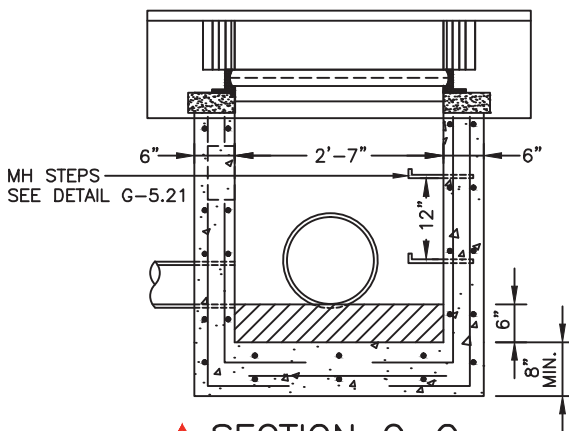
SECTION A-A



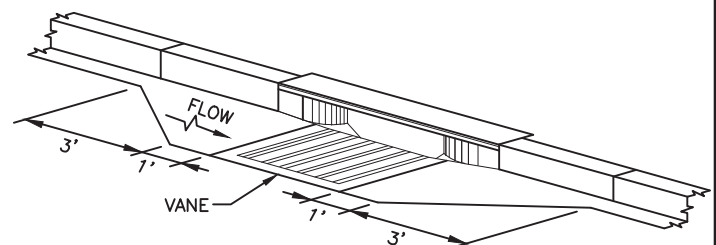
1 PLAN



1 SECTION B-B



1 SECTION C-C



1 PERSPECTIVE VIEW
DEPRESSED INLET (SEE INLET DEPRESSION DETAIL)

NOTES

1. SEE DETAIL D-4.01 FOR GENERAL NOTES APPLICABLE TO ALL STORM DRAIN INLETS.
2. CONCRETE TO BE MIX #6 (4500 PSI).
3. REINFORCING-2 LAYERS OF 4x4-W4.0xW4.0 WELDED WIRE FABRIC.

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1 5/30/2017
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Howard County, Maryland
Department of Public Works

Approved: *Thomas E. Butler*
Chief, Bureau of Engineering

TYPE 'S' COMBINATION INLET

Detail **1**

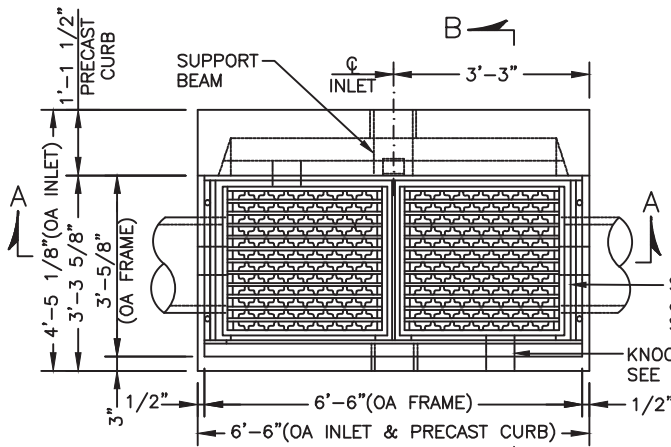
D-4.26



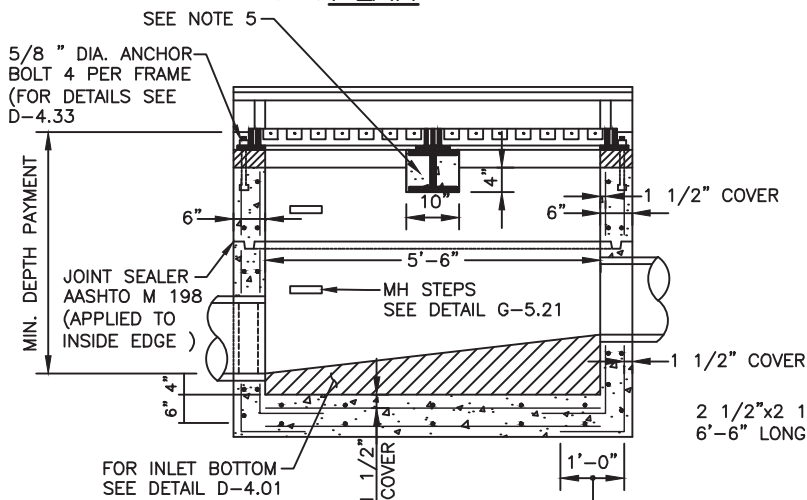
1. MATERIAL: CAST GRAY IRON ASTM A48, CLASS 35B
2. FINISH: NO PAINT
3. WEIGHT (MIN): FRAME 163#, GRATE 295#
4. FRAME TO BE CAST WITH FLANGE CUT, AS SHOWN, WHEN INLET TO E PLACED ADJACENT TO CURB OPENING.
5. CONTRACTOR IS RESPONSIBLE FOR CORRECT ORIENTATION OF THE CV-GRATE TOWARD THE DIRECTION OF FLOW. MANUFACTURER TO VERIFY THAT FRAME IS DESIGNED FOR HS-25 LOADING.



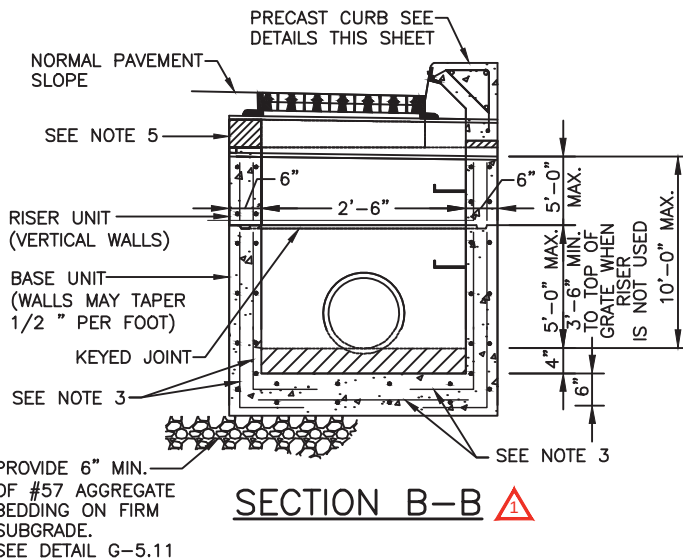
Revised  5/30/2017 Revised 5/7/2007 Approved	Howard County, Maryland Department of Public Works Approved:  Chief, Bureau of Engineering	TYPE 'S' INLET Vane Grate	Detail  D-4.27
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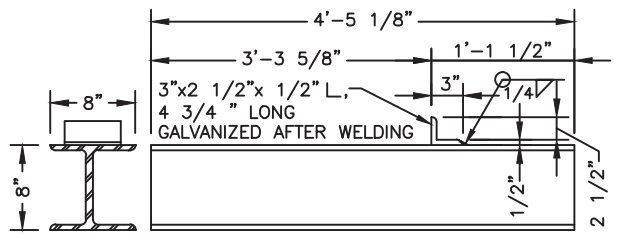
PLAN



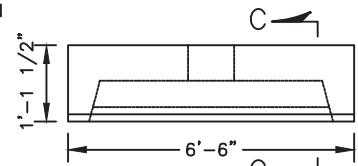
SECTION A-A



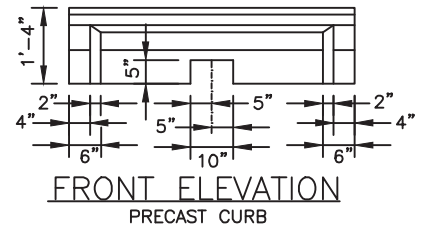
SECTION B-B



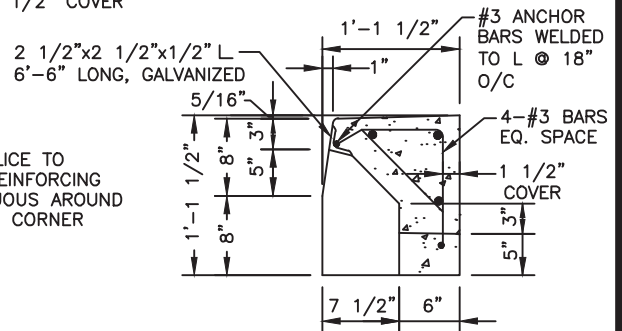
SUPPORT BEAM
W8x31 (GALVANIZED)



PLAN
PRECAST CURB



FRONT ELEVATION
PRECAST CURB



SECTION C-C

NOTES

1. SEE DETAIL D-4.01 FOR GENERAL NOTES APPLICABLE TO ALL STORM DRAIN INLETS
2. CONCRETE TO BE MIX NO.6 (4500PSI).
3. REINFORCING-2 LAYERS OF 4X4-W4.0 X 4.0 WELDED WIRE FABRIC.
4. THREADED PLASTIC INSERTS TO BE PROVIDED FOR HANDLING.
5. GRADE AND SLOPE ADJUSTMENTS COMPLETED IN THE FIELD USING CONCRETE MIX #6.
6. PIPE OPENINGS TO BE PROVIDED AS REQUIRED. FOR SIZE, LOCATION, AND INVERT ELEVATIONS REFER TO CONSTRUCTION PLANS. SEE DETAIL D-4.02 FOR THE KNOCKOUT DETAIL.
7. PLACEMENT OF SUBGRADE DRAINAGE WILL BE AS DIRECTED BY THE ENGINEER OR AS NOTED ON THE CONSTRUCTION PLAN.
8. MINIMUM DEPTH PAYMENT PER "EACH" INLET INCLUDES DEPTHS UP TO 3'-6". VERTICAL DEPTH PAYMENT PER LINEAR FOOT FOR DEPTHS IN EXCESS OF 3'-6".

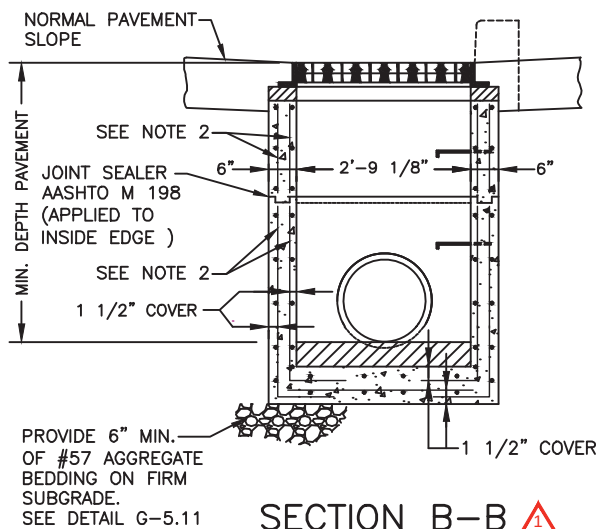
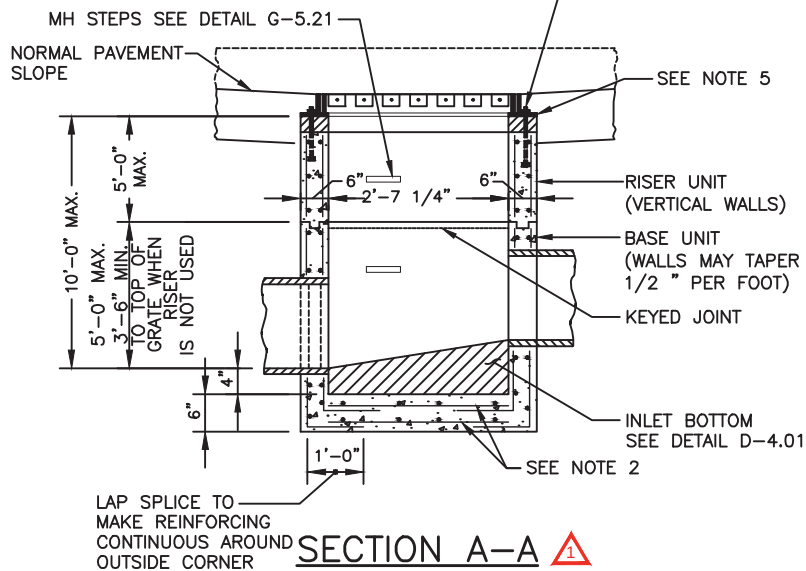
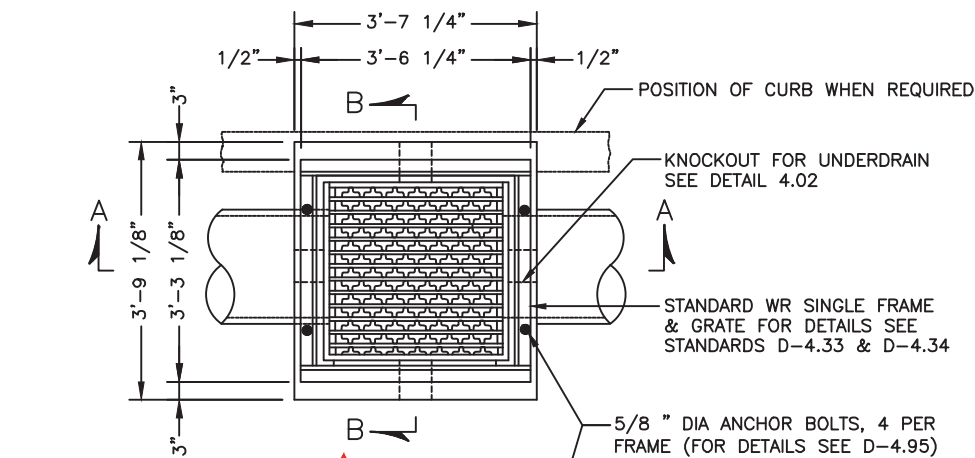
Revised
5/30/2017
Revised
5/7/2007
Approved

Howard County, Maryland
Department of Public Works

Approved: *Thomas E. Butler*
Chief, Bureau of Engineering

DOUBLE WR INLET
Precast

Detail **D-4.31**



NOTES

1. SEE DETAIL D-4.01 FOR GENERAL NOTES APPLICABLE TO ALL STORM DRAIN INLETS
2. CONCRETE TO BE MIX NO.6 (4500PSI).
3. REINFORCING-2 LAYERS OF 4X4-W4.0 X 4.0 WELDED WIRE FABRIC.
4. THREADED PLASTIC INSERTS TO BE PROVIDED FOR HANDLING.
5. GRADE AND SLOPE ADJUSTMENTS COMPLETED IN THE FIELD USING CONCRETE MIX #6.
6. PIPE OPENINGS TO BE PROVIDED AS REQUIRED. FOR SIZE, LOCATION, AND INVERT ELEVATIONS REFER TO CONSTRUCTION PLANS. SEE DETAIL D-4.02 FOR THE KNOCKOUT DETAIL.
7. PLACEMENT OF SUBGRADE DRAINAGE WILL BE AS DIRECTED BY THE ENGINEER OR AS NOTED ON THE CONSTRUCTION PLAN.
8. MINIMUM DEPTH PAYMENT PER "EACH" INLET INCLUDES DEPTHS UP TO 3'-6". VERTICAL DEPTH PAYMENT PER LINEAR FOOT FOR DEPTHS IN EXCESS OF 3'-6".

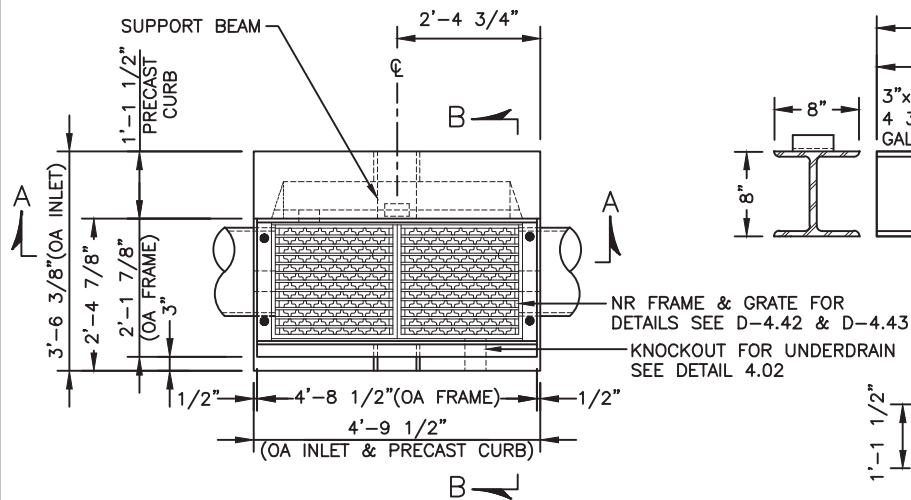
Revised
5/30/2017
Revised
5/7/2007
Approved

Howard County, Maryland
Department of Public Works

Approved: *Thomas E. Butler*
Chief, Bureau of Engineering

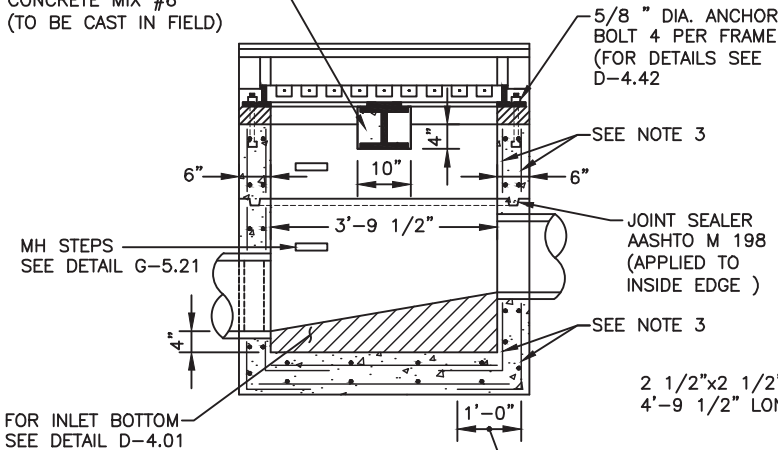
SINGLE WR INLET
Precast

Detail **D-4.32**

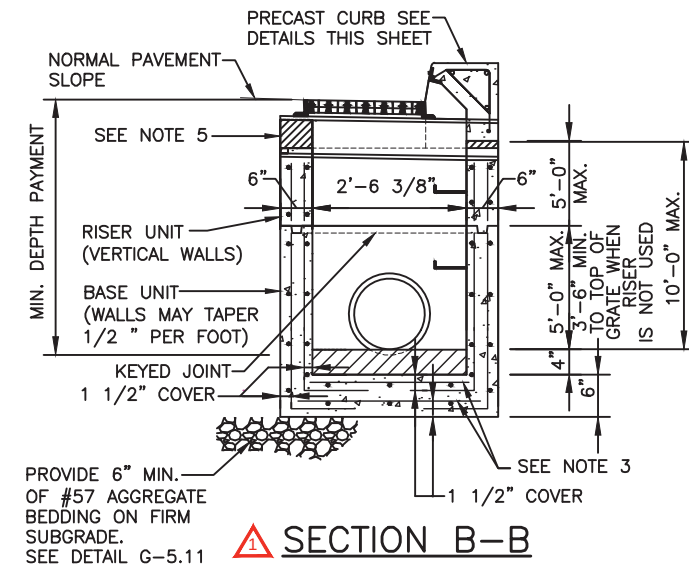


PLAN A-A

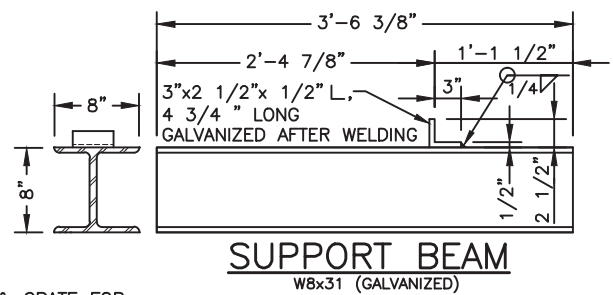
SUPPORT BEAM ANCHORAGE
CONCRETE MIX #6
(TO BE CAST IN FIELD)



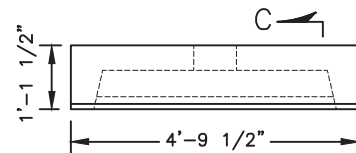
SECTION A-A



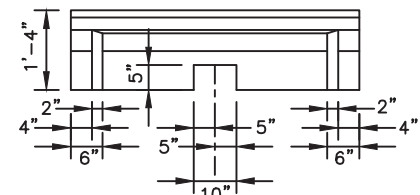
SECTION B-B



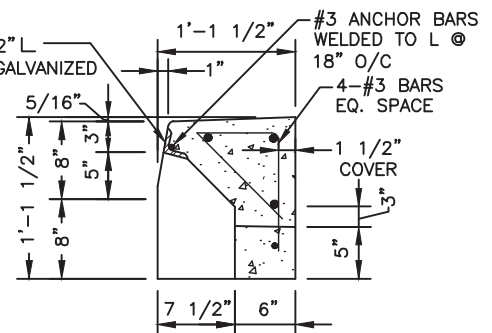
SUPPORT BEAM
W8x31 (GALVANIZED)



PLAN C-C
PRECAST CURB



FRONT ELEVATION
(PRECAST CURB)



SECTION C-C

NOTES

1. SEE DETAIL D-4.01 FOR GENERAL NOTES APPLICABLE TO ALL STORM DRAIN INLETS
2. CONCRETE TO BE MIX #6 (4500PSI).
3. REINFORCING: COVER SHALL BE 1 1/2" FROM BOTH SIDES.
 - WALL - 2 LAYERS OF 4X4-W4.0XW4.0 WELDED WIRE FABRIC.
 - BASE - 2 LAYERS OF 4X4-W6.0XW6.0 WELDED WIRE FABRIC.
4. THREADED PLASTIC INSERTS TO BE PROVIDED FOR HANDLING.
5. GRADE AND SLOPE ADJUSTMENTS COMPLETED IN THE FIELD USING CONCRETE MIX #6.
6. PIPE OPENINGS TO BE PROVIDED AS REQUIRED. FOR SIZE, LOCATION, AND INVERT ELEVATIONS REFER TO CONSTRUCTION PLANS. SEE DETAIL D-4.02 FOR THE KNOCKOUT DETAIL.
7. PLACEMENT OF SUBGRADE DRAINAGE WILL BE AS DIRECTED BY THE ENGINEER OR AS NOTED ON THE CONSTRUCTION PLAN.

Revised
5/30/2017
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5/7/2007
Approved

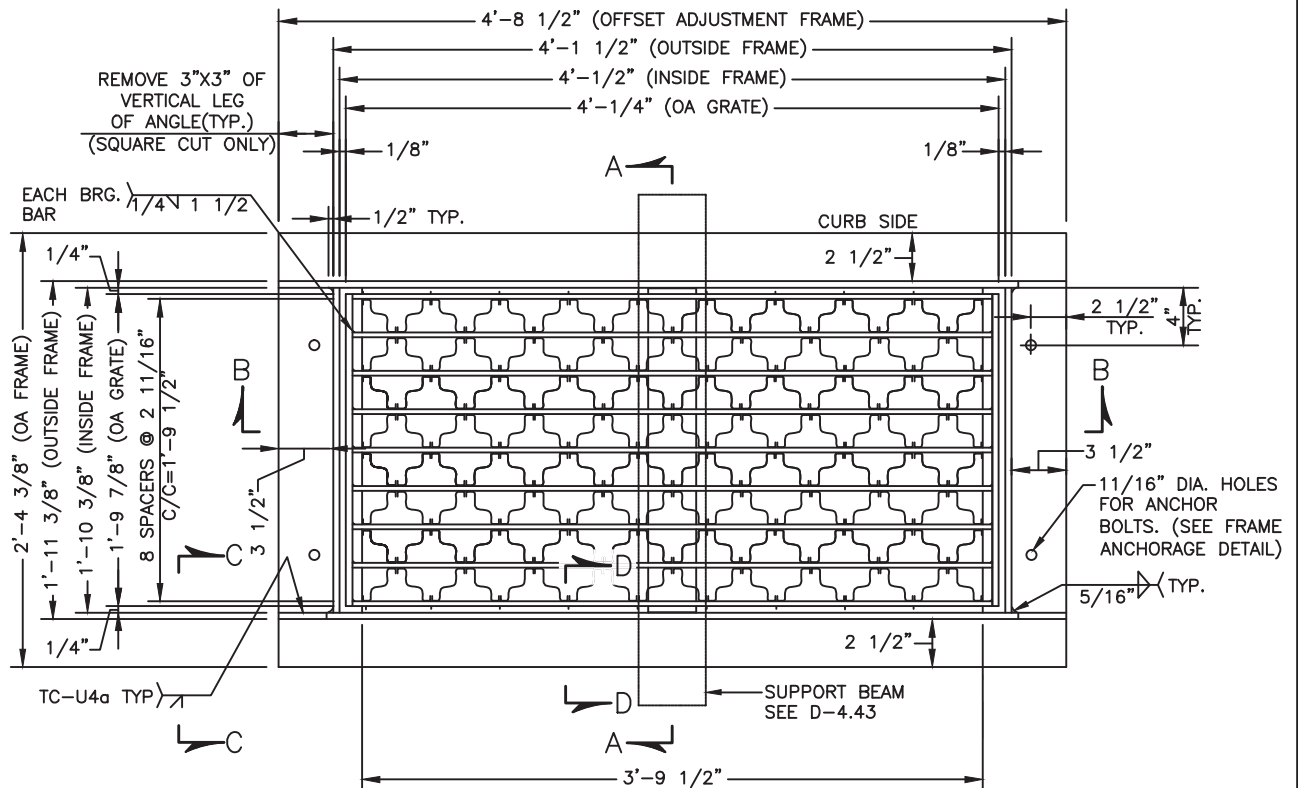
Howard County, Maryland
Department of Public Works

Approved: *Thomas E. Butler*
Chief, Bureau of Engineering

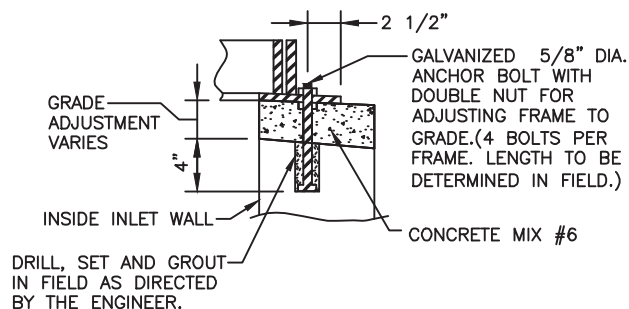
NR INLET
Precast

Detail

D-4.41



PLAN



**FRAME ANCHORAGE
DETAIL**

NOTES

1. FRAMES & GRATES TO BE SQUARE, FLAT AND TRUE.
2. STRUCTURAL STEEL SHALL BE ASTM A36.
3. FRAMES AND GRATES TO BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A123.
4. SEE LATEST SHA SPECIFICATIONS
5. FOR SECTIONS SEE DETAIL D-4.43.

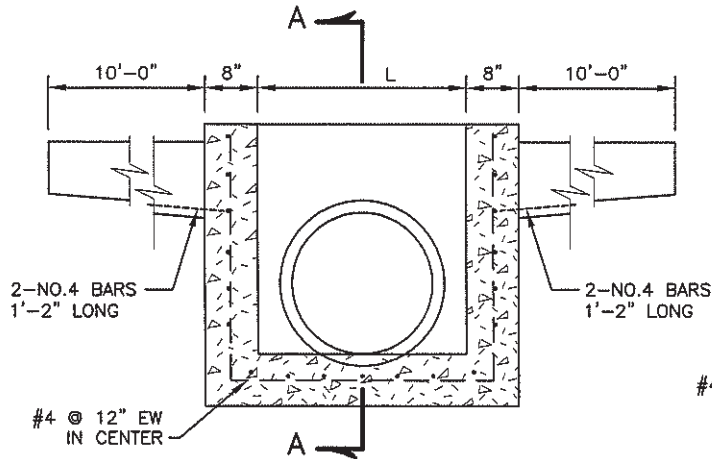
Revised
5/30/2017
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5/7/2007
Approved

Howard County, Maryland
Department of Public Works

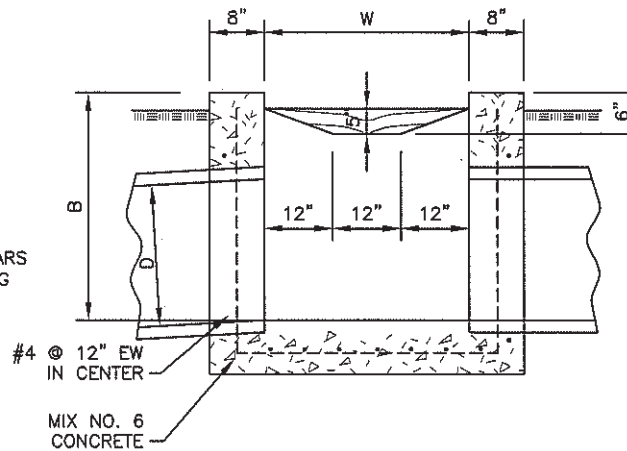
Approved: *Thomas E. Butler*
Chief, Bureau of Engineering

NR INLET
Frame, Grate & Anchorage

Detail **D-4.42**



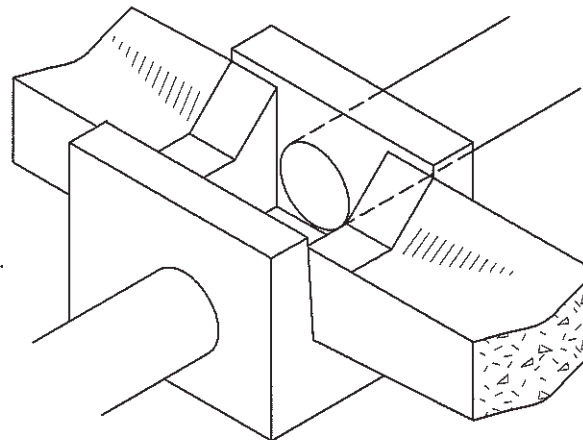
ELEVATION



SECTION A-A

NOTES:

1. THE CONCRETE VALLEY GUTTER TO BE USED IN CONNECTION WITH THIS INLET, WILL BE WARPED FROM THE STANDARD SECTION TO MEET THE SECTION AT THE END OF THE INLET. THIS TRANSITION WILL TAKE PLACE WITHIN A DISTANCE OF TEN (10) FEET FROM THE INLET.
2. CONCRETE GUTTERS OPTIONAL WITH RIP-RAP OR SODDED SWALE.
3. PIPE OUTLETS AND GUTTER APPROACHES CAN BE REVISED TO MEET EXISTING CONDITIONS.
4. QUANTITIES FOR GUTTERS ARE NOT INCLUDED IN TABLE.
5. SIMILAR TO S.R.C. STANDARD DETAIL, INLET SHALL BE REINFORCED CONC.
6. WHEN 'B' EXCEEDS 3'-6" PROVIDE STANDARD MANHOLE STEPS.
7. FOR GRATE SEE DETAIL D-4.13.
8. INLET MAY BE PRECAST AT CONTRACTOR'S OPTION.



ISOMETRIC VIEW
(DOUBLE OPENING SHOW)

GENERAL NOTES:

1. STEEL- #4 BARS 12" C/C - VERTICAL
- #4 BARS 12" C/C - HORIZONTAL
- #4 BARS 12" C/C - BOTTOM
2. CONCRETE- SHA MIX NO.6
3. FOR SINGLE OPENING CLOSE ONE END
4. BATTER- INSIDE FACES 1/4" PER FOOT
CHAMFER- INSIDE CORNERS 3/4"x3/4"

OPENING		DIMENSIONS		
DIA D	AREA SQ FT	L	W	B
12"	0.79	3'-0"	3'-0"	2'-3"
15"	1.23	3'-0"	3'-0"	2'-6"
18	1.78	3'-0"	3'-0"	2'-9"
24"	3.14	3'-0"	3'-0"	3'-3"
30"	4.91	3'-6"	3'-0"	3'-9"
36"	7.07	4'-0"	3'-0"	4'-3"
42"	9.62	4'-6"	3'-0"	4'-9"
48"	12.57	5'-0"	3'-0"	5'-3"

Revised

Revised

5/7/2007

Approved

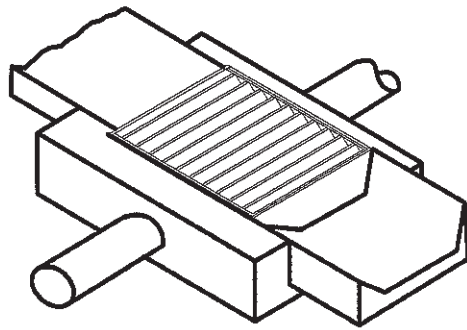
Howard County, Maryland
Department of Public Works

Approved: *[Signature]*
Chief, Bureau of Engineering

Type 'K' Inlet

Detail

D-4.12



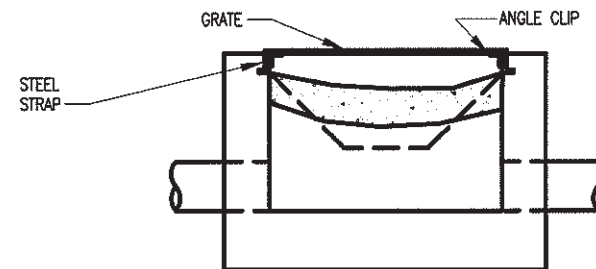
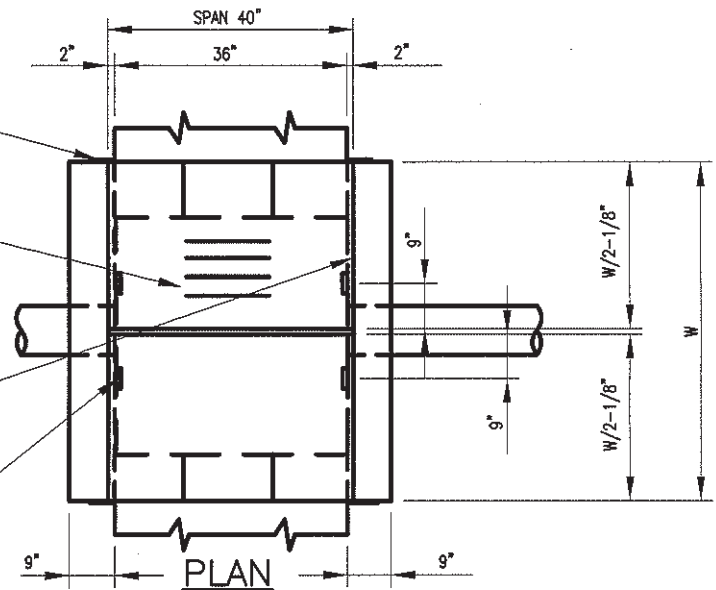
ISOMETRIC
VIEW

4 ANGULAR STEEL
STRAPS BOLTED TO
OUTSIDE BARS OF
GRATING

LONGTUDINAL DIRECTION
OF GRATING

END OR BINDING BARS

4 ANGLE CLIPS
L 2"x 2"x 3/16" x
2 1/2" WELDED TO
BOTTOM OF GRATING



NOTES:

1. RECESSED GRATE TO BE MADE UP IN TWO WIDTHS AND ASSEMBLED IN THE FIELD.
2. ALL MATERIAL TO BE STEEL, HOT DIPPED GALVANIZED AFTER FABRICATION.
3. GRATINGS ARE SUBJECT TO APPROVAL FOR EACH PROJECT.
4. GRATING SHALL SUPPORT MINIMUM UNIFORM LOAD OF 50 LBS/SQ FT

Revised

Revised
5/7/2007

Approved

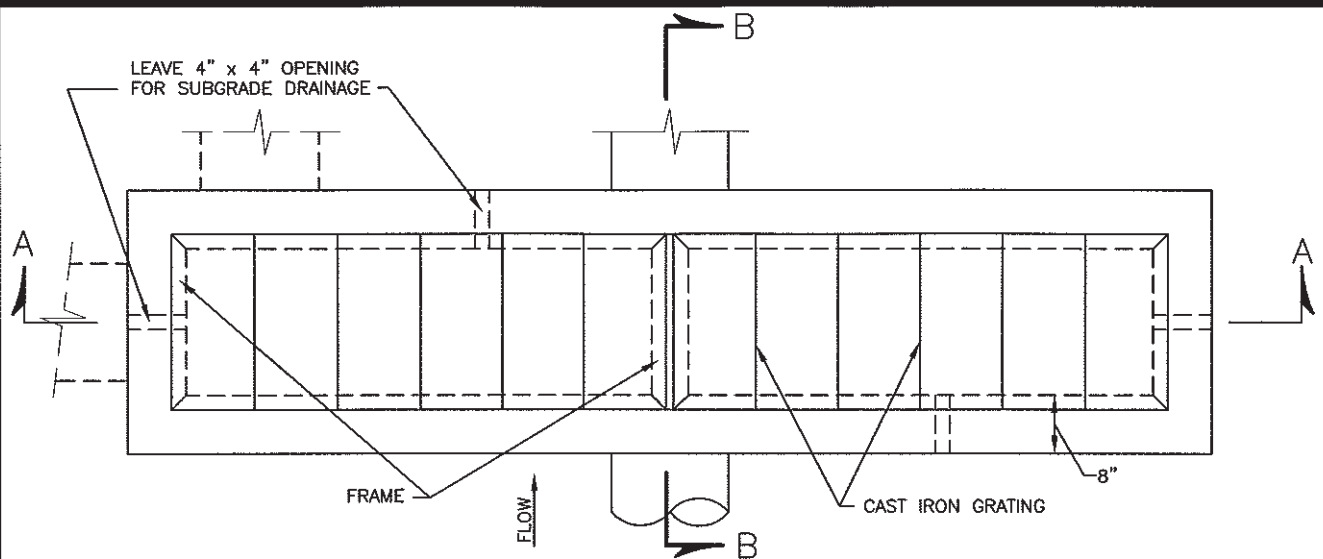
Howard County, Maryland
Department of Public Works

Approved:
Chief, Bureau of Engineering

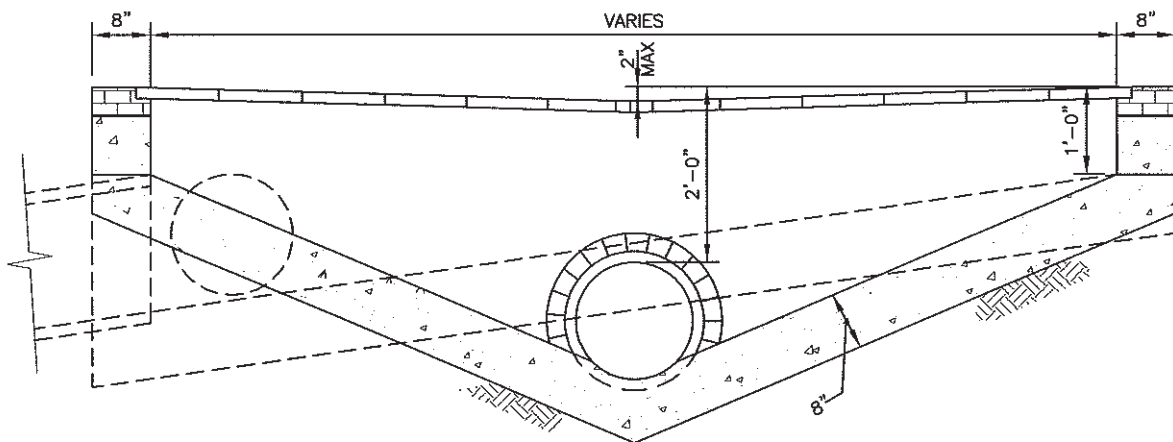
Type 'K' Inlet
Grate

Detail

D-4.13



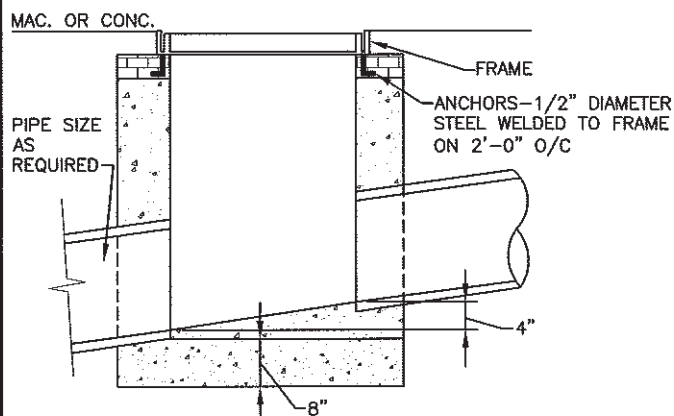
PLANS



SECTION A-A

NOTES:

1. INVERTS SHALL BE CONCRETE MIX NO. 3 OR BRICK, GRADE SM (ASTM C32).
2. WALLS CAN BE GRADE MS BRICK, OR MIX NO. 3 CONCRETE.
3. TOP 4" OF WALL SHALL BE BRICK MASONRY.
4. BOTTOMS SHALL BE MIX NO. 3 CONCRETE.
5. MAXIMUM DEPTH OF WALL SHALL BE 3'-6", WHERE OUTLET PIPE REQUIRES GREATER DEPTH, DROP SECTION SHALL BE FORMED AROUND PIPE.
6. WALL AND SLAB REINFORCEMENT SHALL BE #4@12" EW IN CENTER.
7. PROVIDE HEAVY DUTY TRENCH GRATING AND FRAME SYSTEM FROM SAME MANUFACTURER TO SUIT WIDTH OF TRENCH. GRATING SHALL BE BICYCLE SAFE AND CAPABLE OF VEHICULAR LOADING.



SECTION B-B

Revised	Howard County, Maryland Department of Public Works
Revised 5/7/2007	Approved: <i>[Signature]</i>
Approved	Chief, Bureau of Engineering

Type 'C' Inlet
Trench Drain

Detail
D-4.15

APPENDIX D: COMMUNITY INPUT DOCUMENTATION

Response ID	Property Address	Are there drainage issues as a result of a rain event on your property?	If Yes, what is the issue?	If the issue is ponding water, how deep is the water?	If the issue is ponding water, how long before the water infiltrates?	Aside from the very rainy season of May through October, 2018, has this issue occurred in the past?	If Yes, how often?	If there are drainage issues on your property, where is/ are the issue(s) located?	Where is the water coming from?
SUR0001	2802 Leaf Shade Dr	Yes	Erosion; runoff from 30" drain pipe is eroding swale	<Null>	<Null>	Yes	Every time it rains, regardless of the amount of rain	Back yard; Side yard	Storm drain
SUR0002	2812 Saint Johns Ln	Yes	Ponding water; Erosion; Poor drainage in the swale between our house and our neighbor's house has killed 5 of our 10 Leyland Cypress trees	0-6 inches	Greater than 24 hours	No	<Null>	Front yard; Back yard	<Null>
SUR0003	2884 Country Ln	Yes	Ponding water; Erosion; Water getting into house	0-6 inches	1 to 24 hours	Yes	Every time it rains, regardless of the amount of rain	Front yard; Back yard; Side yard; Driveway; Sidewalk	Neighbor's runoff
SUR0004	2921 Greenway Dr	No	Water getting into house	<Null>	<Null>	Yes	five times in last 30 years	<Null>	<Null>
SUR0005	2973 Hearthstone Rd	Yes	Ponding water; Erosion	0-6 inches	1 to 24 hours	Yes	Only during heavy thunderstorms	Side yard; Sidewalk	Downspouts and roof; Neighbor's runoff
SUR0006	3002 Greenway Dr	Yes	Ponding water; Erosion	6-12 inches	Greater than 24 hours	Yes	Every time it rains, regardless of the amount of rain	Front yard; Back yard; Driveway	Off the road or street; Neighbor's runoff

Response ID	Property Address	Are there any storm drain infrastructure (inlet, outfall, manhole, or pipe) on your property?	If yes, are there problems with this/ these?	If yes, details?	When it rains, ideal conditions on my property would be:	When it rains, ideal conditions in my community would be:	Is there a stream adjacent to your property?	If yes, do you have concerns for, or evidence of your home flooding due to elevated stream levels during rainstorms?	If yes, the adjacent streamside (riparian) area is:
SUR0001	2802 Leaf Shade Dr	Yes	Yes	Erosion at the end of a pipe; erosion along the back of the property (county water easement) is, in some spots 18" deep which is a safety hazard	For some water to temporarily pond or be visible in my yard, then drain away when the rain stops	For runoff to temporarily be visible or pond on the surface, then flow into street inlets and underground pipes, out of sight; For runoff to flow through open channels and grass swales to streams	No	No	<Null>
SUR0002	2812 Saint Johns Ln	No	<Null>	<Null>	For some water to temporarily pond or be visible in my yard, then drain away when the rain stops	For runoff to temporarily be visible or pond on the surface, then flow into street inlets and underground pipes, out of sight; For runoff to flow through open channels and grass swales to streams; For no water to be ponding on the street	No	<Null>	<Null>
SUR0003	2884 Country Ln	Yes	No	<Null>	For no water to be ponding or visible in my yard; For no water from anyone else's property to come into my yard; For some water to temporarily pond or be visible in my yard, then drain away when the rain stops	For all water to flow into street inlets and underground pipes as fast as possible, out of sight	No	<Null>	<Null>
SUR0004	2921 Greenway Dr	No	No	<Null>	For some water to temporarily pond or be visible in my yard, then drain away when the rain stops	<Null>	No	<Null>	<Null>
SUR0005	2973 Hearthstone Rd	Yes	Yes	the water has raised the sidewalk over 3 inches making a hazard on the walk	For no water to be ponding or visible in my yard; For no water from anyone else's property to come into my yard	For all water to flow into street inlets and underground pipes as fast as possible, out of sight	No	No	<Null>
SUR0006	3002 Greenway Dr	No	<Null>	<Null>	For no water to be ponding or visible in my yard; For no water from anyone else's property to come into my yard	For all water to flow into street inlets and underground pipes as fast as possible, out of sight; For no water to be ponding on the street	No	No	<Null>

Response ID	Property Address	My idea(s) of aesthetic and functional stormwater management for my property is/ are:	My idea(s) of aesthetic and functional stormwater management for my neighborhood streets and open areas is/ are:	If there are other areas in your neighborhood where ponding of water or other drainage issues on roadways occur, please provide the location and a brief description of the issue:
SUR0001	2802 Leaf Shade Dr	Pervious pavement	Wet pond; Roadway bumpouts/ bioretention; Roadside grass swale	We have a 30" pipe that drains the water from St. John's Lane and the runoff goes along the entire back of our property. Would like the swale to be rebuilt with rock along the length. We have tried a grass channel but we now have sections where erosion is 18" deep exposing tree roots (3" in diameter). Would like this safety hazard fixed.
SUR0002	2812 Saint Johns Ln	Rain garden	Roadside grass swale; Grass channel	<Null>
SUR0003	2884 Country Ln	Yard with no management	Dry pond; Inlets in a street	<Null>
SUR0004	2921 Greenway Dr	<Null>	Grass channel	<Null>
SUR0005	2973 Hearthstone Rd	Rain garden	Grass channel	<Null>
SUR0006	3002 Greenway Dr	<Null>	Inlets in a street; Roadside grass swale; Grass channel	I am fed up with the poor planning for water runoff on my property. Right side of my driveway in front is inundated and cannot hold soil or grass. Backyard runoff this summer has ruined that lawn as well. In winter, I have an unwanted ice skating rink at foot of my driveway due to the traffic hump that channels water into my driveway and has water added by the poor drainage. I need help.

Response ID	Property Address	Are there drainage issues as a result of a rain event on your property?	If Yes, what is the issue?	If the issue is ponding water, how deep is the water?	If the issue is ponding water, how long before the water infiltrates?	Aside from the very rainy season of May through October, 2018, has this issue occurred in the past?	If Yes, how often?	If there are drainage issues on your property, where is/ are the issue(s) located?	Where is the water coming from?
SUR0007	3017 Center Dr	Yes	Ponding water	0-6 inches	1 to 24 hours	Yes	Only during heavy thunderstorms	Back yard	Off the road or street; Storm drain; Downspouts and roof; Neighbor's runoff
SUR0008	3102 Ramblewood Rd	Yes	Ponding water; Erosion; river running through the backyard from uphill	0-6 inches	Greater than 24 hours	Yes	Only during heavy thunderstorms	Back yard; Side yard	Neighbor's runoff
SUR0009	3105 Brookmede Rd	Yes	Ponding water; Erosion; Water getting into house	0-6 inches	1 to 24 hours	No	<Null>	Front yard; Back yard; Driveway	Downspouts and roof; Neighbor's runoff
SUR0010	3105 Ramblewood Rd	Yes	Ponding water	0-6 inches	1 to 24 hours	Yes	Only during heavy thunderstorms	Back yard; Side yard	Neighbor's runoff
SUR0011	3106 Greenway Dr	Yes	Ponding water; Erosion; Water getting into house; Incresed settling/ sinkhole	0-6 inches	Greater than 24 hours	Yes	Only during heavy thunderstorms	Front yard; Back yard; Side yard	Off the road or street; Outfall; Downspouts and roof; Neighbor's runoff

Response ID	Property Address	Are there any storm drain infrastructure (inlet, outfall, manhole, or pipe) on your property?	If yes, are there problems with this/ these?	If yes, details?	When it rains, ideal conditions on my property would be:	When it rains, ideal conditions in my community would be:	Is there a stream adjacent to your property?	If yes, do you have concerns for, or evidence of your home flooding due to elevated stream levels during rainstorms?	If yes, the adjacent streamside (riparian) area is:
SUR0007	3017 Center Dr	No	No	<Null>	For no water to be ponding or visible in my yard; For no water from anyone else's property to come into my yard	For runoff to temporarily be visible or pond on the surface, then flow into street inlets and underground pipes, out of sight; For runoff to flow through open channels and grass swales to streams	Yes	Yes	Grass that I maintain/mow
SUR0008	3102 Ramblewood Rd	No	No	<Null>	For no water to be ponding or visible in my yard; For no water from anyone else's property to come into my yard; For some water to temporarily pond or be visible in my yard, then drain away when the rain stops	For all water to flow into street inlets and underground pipes as fast as possible, out of sight; For runoff to temporarily be visible or pond on the surface, then flow into street inlets and underground pipes, out of sight; For runoff to flow through open channels and grass swales to streams; For no water to be ponding on the street	Yes	Yes	Woods in natural condition
SUR0009	3105 Brookmede Rd	Uncertain	<Null>	<Null>	For no water to be ponding or visible in my yard; For no water from anyone else's property to come into my yard	For runoff to flow through open channels and grass swales to streams	No	No	Grass that I maintain/mow
SUR0010	3105 Ramblewood Rd	No	No	<Null>	For some water to temporarily pond or be visible in my yard, then drain away when the rain stops	For runoff to flow through open channels and grass swales to streams	No	<Null>	<Null>
SUR0011	3106 Greenway Dr	No	Uncertain	<Null>	For no water to be ponding or visible in my yard; For no water from anyone else's property to come into my yard; For some water to temporarily pond or be visible in my yard, then drain away when the rain stops	For all water to flow into street inlets and underground pipes as fast as possible, out of sight; For runoff to flow through open channels and grass swales to streams; For no water to be ponding on the street	Uncertain	<Null>	<Null>

Response ID	Property Address	My idea(s) of aesthetic and functional stormwater management for my property is/ are:	My idea(s) of aesthetic and functional stormwater management for my neighborhood streets and open areas is/ are:	If there are other areas in your neighborhood where ponding of water or other drainage issues on roadways occur, please provide the location and a brief description of the issue:
SUR0007	3017 Center Dr	Rain barrels; Rain garden; Pervious pavement	Inlets in a street; Roadway bumpouts/ bioretention; Roadside grass swale; Grass channel; Concrete channel	Culvert on corner of Ramblewood and Ramsey blocks/ backs up during heavy rain, which causes stream to flood and has flooded our garage and basement.
SUR0008	3102 Ramblewood Rd	Rain barrels; Rain garden	Wet pond; Dry pond; Inlets in a street; Roadway bumpouts/ bioretention; Roadside grass swale; Grass channel	The intersection of Michael's Way/ Ramblewood/ N. Chatham Rd floods every time it rains. I live at the intersection and personally re-routed traffic during the 5/ 27/ 18 storm when police were stretched thin and couldn't provide support to avoid cars from being pulled into the culvert, as one couple was and citizens saved their lives. A local boy scouts troupe wants to repair the Chatham neighborhood sign, which is on County Land. That small area would be PERFECT for a wet/ dry pond and help keep water out of that intersection. Thank you for the new grate for the street inlet but those inlets need to be cleaned out, as decades of debris sits in them. Simply put, there is too much water coming up hill. Pls make developers pay for stormwater mgmt.!
SUR0009	3105 Brookmede Rd	Rain garden	Concrete channel	The county needs to help residents with the picking up of heavy debris, particularly after storms. We cleaned out several large tree branches and stumps from the storm drains on Brookmede Road (near Longview Drive) following the May 2018 flood. We have no way of getting them off the street and do not have access to chain saws or a truck, or any way to remove them from the area. These stumps will no doubt re-enter and clog the storm drains again once we have the next big storm. Surely the county has the resources to organize some type of pick up or drop off program in neighborhoods with repeat flooding. There is no doubt that the many stumps and tree branches are clogging our stream and storm drains every time it rains leading to unnecessary flooding and ponding. Please help us!
SUR0010	3105 Ramblewood Rd	Rain garden	Wet pond; Roadway bumpouts/ bioretention	I live near Chatham Road/ Ramblewood Road, where the concrete channel and roadways become dangerous during significant rain events. As a resident I'd love to see a creative solution to this problem, while restoring the concrete channel to a more aesthetic and natural state.
SUR0011	3106 Greenway Dr	Rain barrels; Rain garden; Pervious pavement	Wet pond; Dry pond; Inlets in a street; Roadway bumpouts/ bioretention; Roadside grass swale; Grass channel	Speed humps

Response ID	Property Address	Are there drainage issues as a result of a rain event on your property?	If Yes, what is the issue?	If the issue is ponding water, how deep is the water?	If the issue is ponding water, how long before the water infiltrates?	Aside from the very rainy season of May through October, 2018, has this issue occurred in the past?	If Yes, how often?	If there are drainage issues on your property, where is/ are the issue(s) located?	Where is the water coming from?
SUR0012	3114 Ramblewood Rd	Yes	Erosion	<Null>	<Null>	Yes	Only during heavy thunderstorms	Side yard	Off the road or street
SUR0013	3121 Paulskirk Dr	Yes	Ponding water; Erosion	0-6 inches	Right away. Drainage from other houses will flow through to the main drainage on side of house.	Yes	Only during heavy thunderstorms	Back yard	Neighbor's runoff
SUR0014	3221 Birchmede Dr	Yes	<Null>	<Null>	<Null>	<Null>	<Null>	Back yard	Nearby stream
SUR0015	3221 Hearthstone Rd	Yes	Ponding water; Erosion	0-6 inches	1 to 24 hours	Yes	Every time it rains, regardless of the amount of rain	Front yard; Back yard; Side yard	Off the road or street; Neighbor's runoff
SUR0016	3221 Ramblewood Rd	Yes	Ponding water; Water getting into house	greater than 12 inches	1 to 24 hours	Yes	Only during heavy thunderstorms	Back yard	Off the road or street; Outfall; Downspouts and roof
SUR0017	3222 Hearthstone Rd	Yes	Ponding water	greater than 12 inches	Greater than 24 hours	Yes	Only during heavy thunderstorms	Back yard; Side yard	Nearby stream

Response ID	Property Address	Are there any storm drain infrastructure (inlet, outfall, manhole, or pipe) on your property?	If yes, are there problems with this/ these?	If yes, details?	When it rains, ideal conditions on my property would be:	When it rains, ideal conditions in my community would be:	Is there a stream adjacent to your property?	If yes, do you have concerns for, or evidence of your home flooding due to elevated stream levels during rainstorms?	If yes, the adjacent streamside (riparian) area is:
SUR0012	3114 Ramblewood Rd	No	<Null>	<Null>	For some water to temporarily pond or be visible in my yard, then drain away when the rain stops	For runoff to flow through open channels and grass swales to streams; For no water to be ponding on the street	No	<Null>	<Null>
SUR0013	3121 Paulskirk Dr	No	<Null>	<Null>	For no water to be ponding or visible in my yard; For no water from anyone else's property to come into my yard	For runoff to flow through open channels and grass swales to streams	Yes	No	Woods in natural condition
SUR0014	3221 Birchmede Dr	Uncertain	Uncertain	<Null>	For no water to be ponding or visible in my yard	For all water to flow into street inlets and underground pipes as fast as possible, out of sight; For runoff to flow through open channels and grass swales to streams; For no water to be ponding on the street	Yes	No	Grass that I maintain/ mow
SUR0015	3221 Hearthstone Rd	No	<Null>	<Null>	For no water to be ponding or visible in my yard; For no water from anyone else's property to come into my yard	For all water to flow into street inlets and underground pipes as fast as possible, out of sight	No	No	Woods in natural condition
SUR0016	3221 Ramblewood Rd	Yes	Yes	Inlet not draining during heavy rain; Feature is broken or damaged	For no water to be ponding or visible in my yard	<Null>	No	<Null>	<Null>
SUR0017	3222 Hearthstone Rd	No	<Null>	<Null>	For no water to be ponding or visible in my yard	For all water to flow into street inlets and underground pipes as fast as possible, out of sight	Yes	No	Woods in natural condition

Response ID	Property Address	My idea(s) of aesthetic and functional stormwater management for my property is/ are:	My idea(s) of aesthetic and functional stormwater management for my neighborhood streets and open areas is/ are:	If there are other areas in your neighborhood where ponding of water or other drainage issues on roadways occur, please provide the location and a brief description of the issue:
SUR0012	3114 Ramblewood Rd	<Null>	Wet pond; Dry pond	where Ramblewood crosses Michael's Way is ALWAYS a nightmare... not even during thunderstorms. slow to drain/ poorly graded roadway ponds/ puddles on the right side of the roadway. Is Little Plumtree NOT a part of this 'assessment'? If not, then, our inputs are irrelavent.
SUR0013	3121 Paulskirk Dr	Rain barrels; Rain garden; Pervious pavement	Wet pond; Dry pond; Inlets in a street; Roadway bumpouts/ bioretention; Roadside grass swale; Grass channel; Concrete channel	<Null>
SUR0014	3221 Birchmede Dr	Rain garden; Pervious pavement; Yard with no management	Dry pond; Inlets in a street; Roadway bumpouts/ bioretention; Roadside grass swale; Grass channel	Two doors to my left is now a permanent pond that grows very large during rain. I'm concerned about mosquitoes and the pond growing larger.
SUR0015	3221 Hearthstone Rd	Rain garden	Dry pond; Inlets in a street; Roadway bumpouts/ bioretention; Roadside grass swale	When stream on hearthstone overflows—due to pipes being too small it goes over the street and there is ponded water in the street and surrounding around. When is this issue going to be addressed?
SUR0016	3221 Ramblewood Rd	Rain barrels; Rain garden; Pervious pavement; Yard with no management	Wet pond; Dry pond; Inlets in a street; Roadway bumpouts/ bioretention; Roadside grass swale; Grass channel	<Null>
SUR0017	3222 Hearthstone Rd	Rain garden	Dry pond	Because the pipes carrying the Plumtree Branch under Hearthstone Rd are too small, on the occasions that rain comes very hard in a short period of time (6 times over the past 19 years), the pipes can't handle it and water level in the creek on the upstream side of Hearthstone suddenly rises about 7-8 feet. it spreads across my back yard about 5' deep and into adjoining yards, flooding those houses. Once it rises high enough, it flows across Hearthstone and then drops 5' back into the creek bed, causing significant erosion and washing out our neighbors front yard. This has caused the county to have haul in a significant amount of dirt and large rocks to fill it in. This work has not prevented it from washing out during the next storm.

Response ID	Property Address	Are there drainage issues as a result of a rain event on your property?	If Yes, what is the issue?	If the issue is ponding water, how deep is the water?	If the issue is ponding water, how long before the water infiltrates?	Aside from the very rainy season of May through October, 2018, has this issue occurred in the past?	If Yes, how often?	If there are drainage issues on your property, where is/ are the issue(s) located?	Where is the water coming from?
SUR0018	3226 Brookmede Rd	Yes	Ponding water; Erosion; Water getting into car in 1000 year flood events	greater than 12 inches	Really don't know during both water disasters we were away as where neighbors. We can tell height of water by dirt on shrubs and insurance adjusters best guess at water levels. I would say under one hour we have water coming from the stream and water flowing down from underground compromised pipes	Yes	Only during heavy thunderstorms	Back yard; Side yard	Nearby stream; Storm drain; Neighbor's runoff
SUR0019	3229 Hearthstone Rd	Yes	Ponding water; Water getting into house	0-6 inches	Shortly after the rain has stopped	Yes	ponding= anytime we have a rainy period; water in house=only heavy storms	Back yard; Sidewalk	Nearby stream
SUR0020	3233 Hearthstone Rd	No	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
SUR0021	3306 Greenway Dr	Yes	Ponding water; Water getting into house	6-12 inches	1 to 24 hours	Yes	Only during heavy thunderstorms	Front yard; Side yard	Off the road or street
SUR0022	3310 Greenway Dr	Yes	Ponding water	0-6 inches	Greater than 24 hours	Yes	Every time it rains, regardless of the amount of rain	Side yard	Off the road or street

Response ID	Property Address	Are there any storm drain infrastructure (inlet, outfall, manhole, or pipe) on your property?	If yes, are there problems with this/ these?	If yes, details?	When it rains, ideal conditions on my property would be:	When it rains, ideal conditions in my community would be:	Is there a stream adjacent to your property?	If yes, do you have concerns for, or evidence of your home flooding due to elevated stream levels during rainstorms?	If yes, the adjacent streamside (riparian) area is:
SUR0018	3226 Brookmede Rd	Uncertain	Yes	Clogged feature; Inlet not draining during heavy rain; Feature is broken or damaged; Huge crater are developing along the buried pipe	For no water to be ponding or visible in my yard; For no water from anyone else's property to come into my yard	For all water to flow into street inlets and underground pipes as fast as possible, out of sight; For runoff to temporarily be visible or pond on the surface, then flow into street inlets and underground pipes, out of sight; For runoff to flow through open channels and grass swales to streams; For no water to be ponding on the street	No	<Null>	<Null>
SUR0019	3229 Hearthstone Rd	Uncertain	Uncertain	<Null>	For some water to temporarily pond or be visible in my yard, then drain away when the rain stops	For no water to be ponding on the street	Yes	Yes	Woods in natural condition
SUR0020	3233 Hearthstone Rd	No	<Null>	<Null>	For some water to temporarily pond or be visible in my yard, then drain away when the rain stops	For runoff to temporarily be visible or pond on the surface, then flow into street inlets and underground pipes, out of sight	No	<Null>	<Null>
SUR0021	3306 Greenway Dr	Yes	Uncertain	Inlet not draining during heavy rain	For no water to be ponding or visible in my yard	For all water to flow into street inlets and underground pipes as fast as possible, out of sight	Yes	Yes	Woods in natural condition
SUR0022	3310 Greenway Dr	Yes	Uncertain	<Null>	For no water to be ponding or visible in my yard; For some water to temporarily pond or be visible in my yard, then drain away when the rain stops	For all water to flow into street inlets and underground pipes as fast as possible, out of sight; For no water to be ponding on the street	No	Yes	<Null>

Response ID	Property Address	My idea(s) of aesthetic and functional stormwater management for my property is/ are:	My idea(s) of aesthetic and functional stormwater management for my neighborhood streets and open areas is/ are:	If there are other areas in your neighborhood where ponding of water or other drainage issues on roadways occur, please provide the location and a brief description of the issue:
SUR0018	3226 Brookmede Rd	Rain barrels; Rain garden; Pervious pavement	Wet pond; Dry pond; Inlets in a street; Roadway bumpouts/ bioretention; Roadside grass swale; Grass channel	Brookmede Road where stream goes under road - Longview road where stream goes under the road. There have been car rescues at both. Water covers road several inches deep. Someone could drown at either of these places.
SUR0019	3229 Hearthstone Rd	Rain barrels; Rain garden; Pervious pavement; Yard with no management	Wet pond; Inlets in a street; Roadside grass swale; Grass channel	<Null>
SUR0020	3233 Hearthstone Rd	<Null>	Roadside grass swale	<Null>
SUR0021	3306 Greenway Dr	Rain barrels; Rain garden	Wet pond; Inlets in a street; Roadway bumpouts/ bioretention; Grass channel	<Null>
SUR0022	3310 Greenway Dr	Rain barrels; Rain garden	Dry pond; Inlets in a street; Roadside grass swale	<Null>

Response ID	Property Address	Are there drainage issues as a result of a rain event on your property?	If Yes, what is the issue?	If the issue is ponding water, how deep is the water?	If the issue is ponding water, how long before the water infiltrates?	Aside from the very rainy season of May through October, 2018, has this issue occurred in the past?	If Yes, how often?	If there are drainage issues on your property, where is/ are the issue(s) located?	Where is the water coming from?
SUR0023	3423 Arcadia Dr	Yes	Ponding water; Erosion	0-6 inches	Greater than 24 hours	Yes	Every time it rains, regardless of the amount of rain	Front yard; Side yard	Off the road or street; Nearby stream; Storm drain; Neighbor's runoff
SUR0025	3431 Arcadia Dr	Yes	Erosion	<Null>	<Null>	No	Only during heavy thunderstorms	Back yard	Neighbor's runoff
SUR0026	3505 N. Chatham Rd	Yes	Water getting into house	<Null>	<Null>	Yes	Only during heavy thunderstorms	Side yard	Off the road or street
SUR0028	3614 Blue Hill Ct	Yes	Erosion; Water getting into house; Water running down Underoak, jumping the storm drain and rushing next to my house.	<Null>	<Null>	Yes	Only during heavy thunderstorms	Side yard	Off the road or street; Storm drain
SUR0029	3614 Ligon Rd	Yes	Ponding water; Runoff from the street, down my driveway and into the side and back yard. (I did not used to get runoff 10 years ago)	0-6 inches	1 to 24 hours	Yes	Every time it rains, regardless of the amount of rain	Back yard; Side yard; Driveway	Off the road or street

Response ID	Property Address	Are there any storm drain infrastructure (inlet, outfall, manhole, or pipe) on your property?	If yes, are there problems with this/ these?	If yes, details?	When it rains, ideal conditions on my property would be:	When it rains, ideal conditions in my community would be:	Is there a stream adjacent to your property?	If yes, do you have concerns for, or evidence of your home flooding due to elevated stream levels during rainstorms?	If yes, the adjacent streamside (riparian) area is:
SUR0023	3423 Arcadia Dr	No	<Null>	<Null>	For no water to be ponding or visible in my yard; For no water from anyone else's property to come into my yard	For all water to flow into street inlets and underground pipes as fast as possible, out of sight; For runoff to temporarily be visible or pond on the surface, then flow into street inlets and underground pipes, out of sight; For runoff to flow through open channels and grass swales to streams	Yes	Yes	Grass that I maintain/mow
SUR0025	3431 Arcadia Dr	Yes	No	<Null>	For some water to temporarily pond or be visible in my yard, then drain away when the rain stops	For runoff to temporarily be visible or pond on the surface, then flow into street inlets and underground pipes, out of sight; For no water to be ponding on the street	No	<Null>	<Null>
SUR0026	3505 N. Chatham Rd	No	<Null>	<Null>	For no water to be ponding or visible in my yard; For no water from anyone else's property to come into my yard	For runoff to temporarily be visible or pond on the surface, then flow into street inlets and underground pipes, out of sight; For runoff to flow through open channels and grass swales to streams	No	No	<Null>
SUR0028	3614 Blue Hill Ct	Yes	Yes	Inlet not draining during heavy rain; Water jumps over it	For no water from anyone else's property to come into my yard	For no water to be ponding on the street	No	<Null>	<Null>
SUR0029	3614 Ligon Rd	No	<Null>	<Null>	For no water to be ponding or visible in my yard; For no water from anyone else's property to come into my yard	For all water to flow into street inlets and underground pipes as fast as possible, out of sight; For runoff to flow through open channels and grass swales to streams; For no water to be ponding on the street	No	<Null>	<Null>

Response ID	Property Address	My idea(s) of aesthetic and functional stormwater management for my property is/ are:	My idea(s) of aesthetic and functional stormwater management for my neighborhood streets and open areas is/ are:	If there are other areas in your neighborhood where ponding of water or other drainage issues on roadways occur, please provide the location and a brief description of the issue:
SUR0023	3423 Arcadia Dr	<Null>	Wet pond; Roadway bumpouts/ bioretention; Concrete channel	In the end of Arcadia Drive, the front yards along the road are wet and saturated a majority of the year.
SUR0025	3431 Arcadia Dr	Rain garden; Yard with no management	Dry pond; Inlets in a street; Roadway bumpouts/ bioretention; Roadside grass swale; Grass channel	<Null>
SUR0026	3505 N. Chatham Rd	Yard with no management	Wet pond; Inlets in a street; Roadside grass swale; Grass channel; Concrete channel	I get flooded because Howard County put curbs on the east side my street with no thought for what it would do for runoff. Now it flows down the street, goes into my neighbor's drive on the south side and flows into my yard -- on big storms, it floods my basement, forcing us to bail. It forced me to tear up my yard to create a drainage ditch that for now is working, but the real test will come with the next 6" storm. Hey Howard County, fix my street, and compensate me for damages.
SUR0028	3614 Blue Hill Ct	Rain garden	Wet pond; Dry pond; Inlets in a street; Roadway bumpouts/ bioretention; Roadside grass swale; Grass channel	Water from Chatham is drained to Underoak, which rushes down to Blue Hill, jumps drain, and rushes past my house. I have cellphone video from May storm where there were whitewater rapids within 6 feet of my home. This is at least the 4th time in 20 years.
SUR0029	3614 Ligon Rd	Rain barrels; Rain garden; Pervious pavement	Wet pond; Dry pond; Inlets in a street; Roadway bumpouts/ bioretention; Roadside grass swale; Grass channel	<Null>

Response ID	Property Address	Are there drainage issues as a result of a rain event on your property?	If Yes, what is the issue?	If the issue is ponding water, how deep is the water?	If the issue is ponding water, how long before the water infiltrates?	Aside from the very rainy season of May through October, 2018, has this issue occurred in the past?	If Yes, how often?	If there are drainage issues on your property, where is/ are the issue(s) located?	Where is the water coming from?
SUR0030	3625 Underoak Dr	Yes	Erosion; Water getting into house	<Null>	<Null>	Yes	Every time it rains, regardless of the amount of rain	Front yard; Side yard	Outfall; Downspouts and roof; Neighbor's runoff
SUR0031	3626 Ligon Rd	Yes	Water getting into house	<Null>	<Null>	Yes	Only during heavy thunderstorms	Front yard	Downspouts and roof
SUR0035	3721 Spring Meadow Dr	Yes	Ponding water; Increase in run-off volume/ water doesn't generally get into house as long as we are proactive about keeping runoff area cleared.	0-6 inches	Varies depending on ground saturation levels, commonly can last days into drier weather	Yes	during heavy rains with increasing frequency	Side yard; Driveway	Off the road or street; Neighbor's runoff
SUR0036	3732 Springfalls Ct	Yes	Erosion; Water getting into house; running stream from above into yard, tremendous amount at times	<Null>	<Null>	Yes	Every time it rains, regardless of the amount of rain	Back yard; Side yard; Driveway	Neighbor's runoff
SUR0037	3734 Ligon Rd	Yes	Ponding water; We have a french drain and 2 sump pumps, otherwise would be water getting into house	0-6 inches	Back yard has not been dry in months due to excessive rain.	Yes	Only during heavy thunderstorms	Back yard	Neighbor's runoff
SUR0038	3736 Spring Falls Ct	Yes	Ponding water; Erosion; Water getting into house; constant stream of water coming down our property from the woods directly behind our house.	6-12 inches	constant	Yes	constant	Back yard; Side yard	Neighbor's runoff
SUR0039	3742 Ligon Rd	Yes	Ponding water; Erosion; Water getting into house	0-6 inches	Greater than 24 hours	Yes	Only during heavy thunderstorms	Front yard; Back yard	Off the road or street; Downspouts and roof; Neighbor's runoff

Response ID	Property Address	Are there any storm drain infrastructure (inlet, outfall, manhole, or pipe) on your property?	If yes, are there problems with this/ these?	If yes, details?	When it rains, ideal conditions on my property would be:	When it rains, ideal conditions in my community would be:	Is there a stream adjacent to your property?	If yes, do you have concerns for, or evidence of your home flooding due to elevated stream levels during rainstorms?	If yes, the adjacent streamside (riparian) area is:
SUR0030	3625 Underoak Dr	No	<Null>	<Null>	For no water from anyone else's property to come into my yard	For all water to flow into street inlets and underground pipes as fast as possible, out of sight	No	No	<Null>
SUR0031	3626 Ligon Rd	No	<Null>	<Null>	For some water to temporarily pond or be visible in my yard, then drain away when the rain stops	For no water to be ponding on the street	No	<Null>	<Null>
SUR0035	3721 Spring Meadow Dr	No	<Null>	<Null>	For some water to temporarily pond or be visible in my yard, then drain away when the rain stops	For runoff to temporarily be visible or pond on the surface, then flow into street inlets and underground pipes, out of sight	No	<Null>	<Null>
SUR0036	3732 Springfalls Ct	Yes	Uncertain	<Null>	For no water from anyone else's property to come into my yard	For all water to flow into street inlets and underground pipes as fast as possible, out of sight	No	Yes	Grass that I maintain/ mow
SUR0037	3734 Ligon Rd	Yes	Uncertain	<Null>	For some water to temporarily pond or be visible in my yard, then drain away when the rain stops	For all water to flow into street inlets and underground pipes as fast as possible, out of sight	No	<Null>	<Null>
SUR0038	3736 Spring Falls Ct	No	<Null>	<Null>	For no water to be ponding or visible in my yard; For no water from anyone else's property to come into my yard	For runoff to temporarily be visible or pond on the surface, then flow into street inlets and underground pipes, out of sight	Yes	Yes	Woods in natural condition
SUR0039	3742 Ligon Rd	Yes	No	<Null>	For no water to be ponding or visible in my yard; For no water from anyone else's property to come into my yard	For all water to flow into street inlets and underground pipes as fast as possible, out of sight; For no water to be ponding on the street	No	<Null>	<Null>

Response ID	Property Address	My idea(s) of aesthetic and functional stormwater management for my property is/ are:	My idea(s) of aesthetic and functional stormwater management for my neighborhood streets and open areas is/ are:	If there are other areas in your neighborhood where ponding of water or other drainage issues on roadways occur, please provide the location and a brief description of the issue:
SUR0030	3625 Underoak Dr	Rain garden	Dry pond; Inlets in a street; Roadside grass swale; Grass channel	Outfall on our street causes a rush of flowing water downhill in the road.
SUR0031	3626 Ligon Rd	Rain barrels; Rain garden; Pervious pavement	Wet pond; Roadway bumpouts/ bioretention	<Null>
SUR0035	3721 Spring Meadow Dr	<Null>	Roadside grass swale; Grass channel	As a clarification, we have 2 potential water issues. The first is that water ponds at the base of our driveway (house is up on a hill). It stays there for days many times. It is often wide enough to cause difficulty getting the mail, etc. We are relatively agile so not a horrible problem. Would be treacherous for an elderly resident. Better grass channel on our property and our neighbor's as well as some sort of storm pipe running under our driveway would likely fix this problem. The second issue is the natural runoff on the opposite side (from the driveway) ... water flows naturally from our neighbors behind, across our backyard, to our side yard, where the flow creates it's own channel, as it reaches our front hill and flows down the hill to the street runoff. We keep this clear and allow it to flow freely by removing obstructing debris. This runoff has gotten heavier in recent years and takes increasingly more oversight. I don't necessarily see that we need to do anything more to it ... although if water issues continue to increase in the area this could also get worse and cause problems as it is near our basement walkout. We have considered digging the trench deeper and lining with stone ... but don't really know if this is the best solution.
SUR0036	3732 Springfalls Ct	Yard with no management	Inlets in a street	Just that since development has occurred above the woods behind the house, nearly all water that used to get absorbed now runs through my and our neighbors' yards. I have perpetually soaked/ swampy back yard (try mowing that) and built up a dirt pile at my rear fence to divert some of the water down the grassy area between me and my neighbor's house to the street. During the winter, will cause ice slicks and dangerous local driving conditions. Some water now comes out of my driveway which needs a pipe and repair, just a bloody mess. Finally, even if it doesn't rain for several days still have a stream flowing down to the street. Should be added to Google Maps if this keeps up. Really not good. Thanks.
SUR0037	3734 Ligon Rd	Rain garden; Pervious pavement	Roadway bumpouts/ bioretention; Roadside grass swale; Grass channel	I am 3 houses from the bottom of the street on Ligon. It is a hill and all water flows down. I do not believe the house up from my house has ponding water in their yard. Also ponding along Waycross at the bottom of the hill.
SUR0038	3736 Spring Falls Ct	<Null>	<Null>	many homes on Spring Falls Court and Spring Meadow Drive in Dunloggin Community
SUR0039	3742 Ligon Rd	Yard with no management	Inlets in a street; Roadside grass swale; Grass channel	Waycross Rd. between Chatham and Macalpine Rds. Ponding of water in the street

Response ID	Property Address	Are there drainage issues as a result of a rain event on your property?	If Yes, what is the issue?	If the issue is ponding water, how deep is the water?	If the issue is ponding water, how long before the water infiltrates?	Aside from the very rainy season of May through October, 2018, has this issue occurred in the past?	If Yes, how often?	If there are drainage issues on your property, where is/ are the issue(s) located?	Where is the water coming from?
SUR0040	3757 Plum Spring Ln	Yes	Ponding water	0-6 inches	a week or so	Yes	Only during heavy thunderstorms	Back yard	Nearby stream
SUR0041	3765 Spring Meadow Dr	Yes	Ponding water; Erosion; Water getting into house	0-6 inches	1 to 24 hours	Yes	Only during heavy thunderstorms	Front yard; Back yard; Side yard	Neighbor's runoff
SUR0042	3785 Plum Spring Ln	Yes	Ponding water; Erosion; flooding creek washed away trees, grass, topsoil, left trees and branches on floodplane.	0-6 inches	ponding water has been in my backyard for weeks	Yes	Although the creek doesn't flood every time it rains, it has flooded in long light rains and heavy storms.	Back yard; Side yard	Off the road or street; Nearby stream; Storm drain; Neighbor's runoff
SUR0043	3786 Plum Meadow Dr	Yes	Ponding water; Erosion; Water getting into house; overrun gutters	0-6 inches	The ponding on our property takes less time; the gutter has not dried up since May.	Yes	Only during heavy thunderstorms	Front yard; Back yard; Side yard	Storm drain; Downspouts and roof; Neighbor's runoff
SUR0044	3814 Spring Meadow Dr	Yes	Ponding water; The water rose about 1 foot high on my back yard, which is about 3 feet above the flood plain. It has never before risen above the designated flood plain.	0-6 inches	It has not cleared at all this summer. Grass is gone. Water just sits there.	Yes	Only during heavy thunderstorms	Back yard	Nearby stream; Storm drain
SUR0045	3820 Plum Spring Ln	Yes	Ponding water	0-6 inches	Greater than 24 hours	Yes	Only during heavy thunderstorms	Back yard; Driveway	Neighbor's runoff
SUR0046	3826 Spring Meadow Dr	Yes	Ponding water	greater than 12 inches	1 to 24 hours	Yes	Only during heavy thunderstorms	Back yard	Nearby stream

Response ID	Property Address	Are there any storm drain infrastructure (inlet, outfall, manhole, or pipe) on your property?	If yes, are there problems with this/ these?	If yes, details?	When it rains, ideal conditions on my property would be:	When it rains, ideal conditions in my community would be:	Is there a stream adjacent to your property?	If yes, do you have concerns for, or evidence of your home flooding due to elevated stream levels during rainstorms?	If yes, the adjacent streamside (riparian) area is:
SUR0040	3757 Plum Spring Ln	Uncertain	Uncertain	<Null>	For no water to be ponding or visible in my yard	<Null>	Yes	No	Woods in natural condition
SUR0041	3765 Spring Meadow Dr	No	No	<Null>	For no water from anyone else's property to come into my yard; For some water to temporarily pond or be visible in my yard, then drain away when the rain stops	For all water to flow into street inlets and underground pipes as fast as possible, out of sight	No	<Null>	<Null>
SUR0042	3785 Plum Spring Ln	Yes	Uncertain	<Null>	For no water to be ponding or visible in my yard; For no water from anyone else's property to come into my yard	For all water to flow into street inlets and underground pipes as fast as possible, out of sight	Yes	Yes	Grass that I maintain/mow
SUR0043	3786 Plum Meadow Dr	Uncertain	<Null>	<Null>	For no water to be ponding or visible in my yard; For no water from anyone else's property to come into my yard	For runoff to temporarily be visible or pond on the surface, then flow into street inlets and underground pipes, out of sight	No	No	<Null>
SUR0044	3814 Spring Meadow Dr	Yes	Yes	Clogged feature	For no water to be ponding or visible in my yard	For runoff to flow through open channels and grass swales to streams	Yes	Yes	Grass that I maintain/mow
SUR0045	3820 Plum Spring Ln	No	<Null>	<Null>	For no water to be ponding or visible in my yard; For no water from anyone else's property to come into my yard	For all water to flow into street inlets and underground pipes as fast as possible, out of sight	No	No	<Null>
SUR0046	3826 Spring Meadow Dr	No	Uncertain	<Null>	For no water to be ponding or visible in my yard	For all water to flow into street inlets and underground pipes as fast as possible, out of sight	Yes	Yes	Grass that I maintain/mow

Response ID	Property Address	My idea(s) of aesthetic and functional stormwater management for my property is/ are:	My idea(s) of aesthetic and functional stormwater management for my neighborhood streets and open areas is/ are:	If there are other areas in your neighborhood where ponding of water or other drainage issues on roadways occur, please provide the location and a brief description of the issue:
SUR0040	3757 Plum Spring Ln	Rain barrels; Rain garden; Pervious pavement	Wet pond; Dry pond; Roadway bumpouts/ bioretention; Roadside grass swale; Grass channel; Concrete channel	<Null>
SUR0041	3765 Spring Meadow Dr	Rain garden	Inlets in a street; Grass channel	3700 block of spring meadow drive by wooded area next to street - water comes down hill and ponds on road and doesn't dry for weeks at times
SUR0042	3785 Plum Spring Ln	<Null>	<Null>	The concrete channel on the side of my yard is partially responsible for the flooding in my and my neighbors' yards. Either convert this channel to an underground pipe with vegetation planted on top, or redirect the street runoff to a point far downstream and fill in the channel. In addition, log-jams frequently form along the creek. Routine removal of upstream debris is needed.
SUR0043	3786 Plum Meadow Dr	Rain barrels; Rain garden; Pervious pavement	Dry pond; Inlets in a street; Roadway bumpouts/ bioretention; Grass channel	Dunloggin Road by the stream
SUR0044	3814 Spring Meadow Dr	Rain garden	Inlets in a street; Roadside grass swale; Grass channel; Concrete channel	During a storm, there is an unbelievable amount of water that pours down the hill between my neighbors house and my house. The water funnels from the houses across the street which all sit higher than ours. If the dead wood and all other objects obstructing the flow of water in all areas of the stream to the west of my house (behind my house) is not cleared, the flooding is only going to get worse every year. These streams all flow into Ellicott City.
SUR0045	3820 Plum Spring Ln	Rain barrels; Rain garden	Wet pond; Inlets in a street; Roadway bumpouts/ bioretention; Grass channel	The streets and yards in entire neighborhood (Dunloggin) are underwater with either heavy fast rains or long slow rains
SUR0046	3826 Spring Meadow Dr	<Null>	Concrete channel	<Null>

Response ID	Property Address	Are there drainage issues as a result of a rain event on your property?	If Yes, what is the issue?	If the issue is ponding water, how deep is the water?	If the issue is ponding water, how long before the water infiltrates?	Aside from the very rainy season of May through October, 2018, has this issue occurred in the past?	If Yes, how often?	If there are drainage issues on your property, where is/ are the issue(s) located?	Where is the water coming from?
SUR0047	3826 Spring Meadow Dr	Yes	Ponding water; Erosion; VERY wet backyard/ standing water in backyard	0-6 inches	Greater than 24 hours	Yes	alot of rain	Back yard	Nearby stream
SUR0049	3910 Hawthorne Rd	Yes	Ponding water	0-6 inches	Shortly after the rain has stopped	No	<Null>	Back yard	Downspouts and roof
SUR0050	3914 MacAlpine Rd	Yes	Ponding water	0-6 inches	Greater than 24 hours	Yes	Every time it rains, regardless of the amount of rain	Front yard	Off the road or street
SUR0056	3934 Saint Johns Ln	Yes	Ponding water; Erosion; sinking storm drain	0-6 inches	Greater than 24 hours	Yes	Only during heavy thunderstorms	Back yard; Side yard	Off the road or street; Outfall; Storm drain; Neighbor's runoff
SUR0057	4002 Chatham Rd	Yes	Ponding water; Water getting into house	6-12 inches	1 to 24 hours	Yes	Every time it rains, regardless of the amount of rain	Side yard; Driveway; Sidewalk	Off the road or street
SUR0058	4002 Woodley Rd	Yes	Ponding water; Water getting into house; basement flooding	0-6 inches	Greater than 24 hours	Yes	Every time it rains, regardless of the amount of rain	Front yard; Side yard; Driveway	Off the road or street; Neighbor's runoff
SUR0059	4014 Macalpine Rd	Yes	Ponding water; above ground flowing water	0-6 inches	continuous above ground flowing water	Yes	Previous only heavy rain now I have a stream in my back yard and it is ruined. children can not play in the yard anymore	Front yard; Back yard; Side yard; Driveway	Off the road or street; Nearby stream; Neighbor's runoff

Response ID	Property Address	Are there any storm drain infrastructure (inlet, outfall, manhole, or pipe) on your property?	If yes, are there problems with this/ these?	If yes, details?	When it rains, ideal conditions on my property would be:	When it rains, ideal conditions in my community would be:	Is there a stream adjacent to your property?	If yes, do you have concerns for, or evidence of your home flooding due to elevated stream levels during rainstorms?	If yes, the adjacent streamside (riparian) area is:
SUR0047	3826 Spring Meadow Dr	Yes	No	<Null>	For no water to be ponding or visible in my yard	For all water to flow into street inlets and underground pipes as fast as possible, out of sight; For runoff to flow through open channels and grass swales to streams	Yes	Yes	Grass that I maintain/ mow
SUR0049	3910 Hawthorne Rd	No	<Null>	<Null>	For no water to be ponding or visible in my yard	For runoff to temporarily be visible or pond on the surface, then flow into street inlets and underground pipes, out of sight; For runoff to flow through open channels and grass swales to streams	No	<Null>	<Null>
SUR0050	3914 MacAlpine Rd	No	<Null>	<Null>	For no water to be ponding or visible in my yard; For no water from anyone else's property to come into my yard	For all water to flow into street inlets and underground pipes as fast as possible, out of sight; For no water to be ponding on the street	No	<Null>	<Null>
SUR0056	3934 Saint Johns Ln	Yes	Yes	HUGE open pipe (not underground) that discharges between properties	For no water to be ponding or visible in my yard	For runoff to temporarily be visible or pond on the surface, then flow into street inlets and underground pipes, out of sight	No	No	<Null>
SUR0057	4002 Chatham Rd	Yes	Yes	Roadside grass swale doesn't collect all runoff, likely a function of repaving side road, causing water to be directed into yard	For some water to temporarily pond or be visible in my yard, then drain away when the rain stops	For runoff to flow through open channels and grass swales to streams; For no water to be ponding on the street	No	<Null>	<Null>
SUR0058	4002 Woodley Rd	Yes	Yes	Erosion at the end of a pipe; Clogged feature; Inlet not draining during heavy rain	For no water to be ponding or visible in my yard; For no water from anyone else's property to come into my yard	For all water to flow into street inlets and underground pipes as fast as possible, out of sight	No	<Null>	<Null>
SUR0059	4014 Macalpine Rd	No	<Null>	<Null>	For some water to temporarily pond or be visible in my yard, then drain away when the rain stops	For runoff to flow through open channels and grass swales to streams	Yes	Yes	Grass that I maintain/ mow

Response ID	Property Address	My idea(s) of aesthetic and functional stormwater management for my property is/ are:	My idea(s) of aesthetic and functional stormwater management for my neighborhood streets and open areas is/ are:	If there are other areas in your neighborhood where ponding of water or other drainage issues on roadways occur, please provide the location and a brief description of the issue:
SUR0047	3826 Spring Meadow Dr	Rain barrels; Rain garden	Dry pond; Inlets in a street; Grass channel	<Null>
SUR0049	3910 Hawthorne Rd	Rain barrels; Rain garden; Yard with no management	Wet pond; Dry pond; Roadway bumpouts/ bioretention; Roadside grass swale; Grass channel	Center of MacAlpine Road looks like a river when we get heavy rain. Would trees help absorb some of this water?
SUR0050	3914 MacAlpine Rd	Pervious pavement; Yard with no management	Dry pond; Inlets in a street; Roadside grass swale; Grass channel	MacAlpine Road median floods any time we get a fairly heavy rain
SUR0056	3934 Saint Johns Ln	Rain barrels; Rain garden	Dry pond; Inlets in a street; Roadside grass swale; Grass channel	<Null>
SUR0057	4002 Chatham Rd	Rain barrels; Rain garden; Pervious pavement	Wet pond; Roadway bumpouts/ bioretention; Roadside grass swale; Grass channel	I think it's pretty functional overall. I think the paving overlays without removal of old surfaces causes loss of function of the grass swales and interrupts some drainage patterns. Some driveways don't have good conveyance and cause localized issues. There may be more capacity in the swale along Macalpine if the buried pipe was removed and the channel was expanded. That may become a perennial stream in the downstream areas closer to the schools. I would like more of a natural, perennial stream system.
SUR0058	4002 Woodley Rd	Rain garden	Inlets in a street; Roadside grass swale; Grass channel	Large area on Macalpine Road between Crestleigh and Dunloggin Roads.
SUR0059	4014 Macalpine Rd	Yard with no management	Roadside grass swale	my neighbor 4010 MacAlpine has standing water 365 days in front of his house drains to street then to my property

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SUR0060	4018 Spring Meadow Dr	Yes	flood plain starting to fill to over capacity and coming over property line	<Null>	<Null>	Yes	flood plain overflows several times	Back yard	Nearby stream
SUR0061	4019 Macalpine Ct	Yes	Ponding water; Water getting into house	0-6 inches	Greater than 24 hours	Yes	Only during heavy thunderstorms	Back yard; Side yard; Driveway	Downspouts and roof; Neighbor's runoff
SUR0062	4022 Chatham Rd	Yes	Ponding water; Erosion; At different times have had sewage in basement. The water rises from the property onto my property and is only like 4 inches from coming into the house.	6-12 inches	Shortly after the rain has stopped	Yes	If we have at least more than 1 day of steady rain the stream rises and causes the flooding.	Front yard; Side yard	Nearby stream; Storm drain
SUR0063	4026 Pebble Branch Rd	Yes	Water getting into house	0-6 inches	1 to 24 hours	Yes	Only during heavy thunderstorms	Side yard	Off the road or street
SUR0064	4026 Starwreath Way	Yes	Ponding water; Erosion	0-6 inches	Greater than 24 hours	Yes	Only during heavy thunderstorms	Back yard; Side yard	Neighbor's runoff
SUR0065	4030 Crescent Rd	Yes	Water getting into house; Water entering property from street and neighboring properties across the street	<Null>	<Null>	Yes	Only during heavy thunderstorms	Front yard; Side yard; Driveway	Off the road or street; Neighbor's runoff

Response ID	Property Address	Are there any storm drain infrastructure (inlet, outfall, manhole, or pipe) on your property?	If yes, are there problems with this/ these?	If yes, details?	When it rains, ideal conditions on my property would be:	When it rains, ideal conditions in my community would be:	Is there a stream adjacent to your property?	If yes, do you have concerns for, or evidence of your home flooding due to elevated stream levels during rainstorms?	If yes, the adjacent streamside (riparian) area is:
SUR0060	4018 Spring Meadow Dr	Yes	Uncertain	Erosion at the end of a pipe; sink holes next to property line near end of pipe	<Null>	<Null>	Yes	<Null>	Grass that I maintain/ mow
SUR0061	4019 Macalpine Ct	No	<Null>	<Null>	For some water to temporarily pond or be visible in my yard, then drain away when the rain stops	For runoff to flow through open channels and grass swales to streams	No	<Null>	<Null>
SUR0062	4022 Chatham Rd	No	<Null>	<Null>	For no water to be ponding or visible in my yard; For no water from anyone else's property to come into my yard	For runoff to flow through open channels and grass swales to streams	Yes	Yes	Woods in natural condition
SUR0063	4026 Pebble Branch Rd	Uncertain	Uncertain	<Null>	For some water to temporarily pond or be visible in my yard, then drain away when the rain stops	For runoff to flow through open channels and grass swales to streams	No	Yes	<Null>
SUR0064	4026 Starwreath Way	Uncertain	Uncertain	<Null>	For no water to be ponding or visible in my yard; For no water from anyone else's property to come into my yard	For runoff to temporarily be visible or pond on the surface, then flow into street inlets and underground pipes, out of sight	No	<Null>	<Null>
SUR0065	4030 Crescent Rd	No	<Null>	<Null>	For no water to be ponding or visible in my yard; For no water from anyone else's property to come into my yard	For all water to flow into street inlets and underground pipes as fast as possible, out of sight	No	<Null>	<Null>

Response ID	Property Address	My idea(s) of aesthetic and functional stormwater management for my property is/ are:	My idea(s) of aesthetic and functional stormwater management for my neighborhood streets and open areas is/ are:	If there are other areas in your neighborhood where ponding of water or other drainage issues on roadways occur, please provide the location and a brief description of the issue:
SUR0060	4018 Spring Meadow Dr	<Null>	<Null>	<Null>
SUR0061	4019 Macalpine Ct	Yard with no management	Grass channel	<Null>
SUR0062	4022 Chatham Rd	Rain garden	Inlets in a street; Concrete channel	Almost any area in the Dunloggin neighborhood has some kind of issue either from water and or sewage,
SUR0063	4026 Pebble Branch Rd	Rain barrels; Rain garden; Yard with no management	Roadside grass swale; Grass channel; Concrete channel	<Null>
SUR0064	4026 Starwreath Way	Rain garden	Dry pond; Roadside grass swale	<Null>
SUR0065	4030 Crescent Rd	<Null>	Inlets in a street	<Null>

Response ID	Property Address	Are there drainage issues as a result of a rain event on your property?	If Yes, what is the issue?	If the issue is ponding water, how deep is the water?	If the issue is ponding water, how long before the water infiltrates?	Aside from the very rainy season of May through October, 2018, has this issue occurred in the past?	If Yes, how often?	If there are drainage issues on your property, where is/ are the issue(s) located?	Where is the water coming from?
SUR0066	4030 Dado Ct	Yes	Ponding water; Erosion; Water getting into house; Adjacent stormwater system cannot handle capacity of large storms in '11, '16, '18 and the ones no doubt coming in the future. This is causing flooding on my property and my rear neighbor's property. Additionally, the stormwater system is flooding the sewer system in these "1000 year" events. I have recently installed backflow/ check valves both in my basement and on the main in the yard but that is only to try to manage flooding, it is not solving the flooding issue.	0-6 inches	1 to 24 hours	Yes	Only during heavy thunderstorms	Side yard; Driveway	Off the road or street; Storm drain
SUR0067	4030 Spring Meadow Dr	Yes	Ponding water	0-6 inches	Ponding is permanent, but is worse after a recent rain.	Yes	Every time it rains, regardless of the amount of rain	Back yard	Off the road or street; Downspouts and roof; Neighbor's runoff
SUR0068	4033 Chatham Rd	Yes	Ponding water	0-6 inches	Greater than 24 hours	No	<Null>	Front yard	<Null>

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SUR0066	4030 Dado Ct	Yes	Yes	Inlet not draining during heavy rain	For no water to be ponding or visible in my yard	For runoff to flow through open channels and grass swales to streams	Yes	Yes	Grass that I maintain/ mow
SUR0067	4030 Spring Meadow Dr	Uncertain	No	<Null>	For no water to be ponding or visible in my yard; For some water to temporarily pond or be visible in my yard, then drain away when the rain stops	For all water to flow into street inlets and underground pipes as fast as possible, out of sight; For runoff to temporarily be visible or pond on the surface, then flow into street inlets and underground pipes, out of sight; For runoff to flow through open channels and grass swales to streams	Yes	No	Woods in natural condition
SUR0068	4033 Chatham Rd	Uncertain	Uncertain	<Null>	For some water to temporarily pond or be visible in my yard, then drain away when the rain stops	For no water to be ponding on the street	Yes	Yes	Woods in natural condition

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SUR0066	4030 Dado Ct	Rain garden; Pervious pavement	Roadway bumpouts/ bioretention; Roadside grass swale; Grass channel	There needs to be some innovative thinking in the drainage system along MacAlpine Rd. Either replaced or modified until that time. The existing infrastructure cannot handle these massive storm events. Not only is it causing flooding risk to property owners I believe it is also a major safety issue due to all of the roads being impassable. Additionally, there should be public/ private type incentives for homeowners to make upgrades or protective measures. I am inquiring with the county about some type of reimbursement for the backflow/ check valves but also things like rain gardens, pervious pavement, etc that will at least somewhat lessen the runoff in any regular rain event. The entire system built in the early 60's on both public and private land is obsolete.
SUR0067	4030 Spring Meadow Dr	Yard with no management	Grass channel	During heavy rains the southern dead end of chatham road floods consistently where it meets the residential driveway entrance for the historic property. It drains very slowly.
SUR0068	4033 Chatham Rd	Yard with no management	<Null>	4000 Block of Chatham Rd south of Pebble Branch Rd. has sometime become inaccessible during heavy rain events, with water levels reaching the bottom of mailboxes on the street. Although we have never had home flooding, we have concerns that if Howard County does not take corrective action to mitigate stormwater issues along the Plumtree Branch, we could be negatively impacted in the future. We have already experienced the inability to leave our property during major rain events due to the level of water on the street in front of our house. I do not know what the appropriate SWM solution is. I am not a fan of standing water which breeds mosquitoes, however. Another note: It would have been useful to have some terms defined for this survey. Ponding of water in our yard which does not drain off within several hours after it rains is new since the May 2018 rain event. Is it considered "ponding" if the water level on the street reaches the bottom of mailboxes?

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SUR0069	4033 Dado Ct	Yes	Ponding water; Erosion; Water getting into house	6-12 inches	1 to 24 hours	Yes	Only during heavy thunderstorms	Back yard; Side yard	Off the road or street; Neighbor's runoff
SUR0070	4037 Chatham Rd	Yes	Ponding water; Water getting into house; Our car was flooded and made unusable. Water rose above the hood of the car.	greater than 12 inches	Shortly after the rain has stopped	Yes	Only during heavy thunderstorms	Front yard; Side yard	Off the road or street; Nearby stream; Storm drain
SUR0071	4044 Firefly Way	Yes	Ponding water; Erosion; Water getting into house	6-12 inches	Greater than 24 hours	Yes	Only during heavy thunderstorms	Back yard; Side yard; Driveway; Sidewalk	Neighbor's runoff
SUR0072	4056 Saint Johns Ln	Yes	Ponding water; Erosion; Standing water, driveway damage, landscape damage, etc.	0-6 inches	Greater than 2 weeks	Yes	Ever since we bought our house in 2000 when the county mandated drainage field was removed to build our house	Front yard; Back yard; Side yard; Driveway; Sidewalk	Off the road or street; Storm drain; Neighbor's runoff
SUR0080	4209 Bright Bay Way	Yes	Ponding water; Erosion	6-12 inches	1 to 24 hours	Yes	Only during heavy thunderstorms	Back yard	Downspouts and roof; Neighbor's runoff

Response ID	Property Address	Are there any storm drain infrastructure (inlet, outfall, manhole, or pipe) on your property?	If yes, are there problems with this/ these?	If yes, details?	When it rains, ideal conditions on my property would be:	When it rains, ideal conditions in my community would be:	Is there a stream adjacent to your property?	If yes, do you have concerns for, or evidence of your home flooding due to elevated stream levels during rainstorms?	If yes, the adjacent streamside (riparian) area is:
SUR0069	4033 Dado Ct	Yes	Uncertain	<Null>	For some water to temporarily pond or be visible in my yard, then drain away when the rain stops	For runoff to temporarily be visible or pond on the surface, then flow into street inlets and underground pipes, out of sight; For runoff to flow through open channels and grass swales to streams	No	<Null>	<Null>
SUR0070	4037 Chatham Rd	Uncertain	Uncertain	<Null>	For no water to be ponding or visible in my yard; For some water to temporarily pond or be visible in my yard, then drain away when the rain stops	For all water to flow into street inlets and underground pipes as fast as possible, out of sight; For runoff to temporarily be visible or pond on the surface, then flow into street inlets and underground pipes, out of sight; For runoff to flow through open channels and grass swales to streams	Yes	Yes	Woods in natural condition
SUR0071	4044 Firefly Way	Yes	Uncertain	<Null>	For no water to be ponding or visible in my yard	For all water to flow into street inlets and underground pipes as fast as possible, out of sight; For no water to be ponding on the street	No	<Null>	<Null>
SUR0072	4056 Saint Johns Ln	Yes	Yes	old pipes that used to carry water to the storm drain in the neighbors yard are broken	For no water from anyone else's property to come into my yard; For some water to temporarily pond or be visible in my yard, then drain away when the rain stops	For runoff to temporarily be visible or pond on the surface, then flow into street inlets and underground pipes, out of sight; For no water to be ponding on the street	No	<Null>	<Null>
SUR0080	4209 Bright Bay Way	No	<Null>	<Null>	For no water from anyone else's property to come into my yard; For some water to temporarily pond or be visible in my yard, then drain away when the rain stops	For runoff to flow through open channels and grass swales to streams; For no water to be ponding on the street	Yes	No	Woods in natural condition

Response ID	Property Address	My idea(s) of aesthetic and functional stormwater management for my property is/ are:	My idea(s) of aesthetic and functional stormwater management for my neighborhood streets and open areas is/ are:	If there are other areas in your neighborhood where ponding of water or other drainage issues on roadways occur, please provide the location and a brief description of the issue:
SUR0069	4033 Dado Ct	Rain barrels; Rain garden; Pervious pavement	Roadway bumpouts/ bioretention; Roadside grass swale; Grass channel	<Null>
SUR0070	4037 Chatham Rd	Rain garden; Pervious pavement; Yard with no management	Wet pond; Dry pond; Roadway bumpouts/ bioretention; Roadside grass swale; Grass channel; Concrete channel	Adjoining streets near Chatham and Pebble Branch
SUR0071	4044 Firefly Way	<Null>	Inlets in a street	<Null>
SUR0072	4056 Saint Johns Ln	<Null>	Inlets in a street; Roadway bumpouts/ bioretention; Roadside grass swale; Grass channel	Saint John's Lane used to be much lower and would drain to the swale at the Mormon Church. The level of the road has gotten higher each time the road is repaved and now the water rushes down into the yards. Saint John's Lane now floods all of the time creating unsafe driving conditions. The entire Dunloggin neighborhood is in need of storm water management. Very little has been updated in 50 plus years. It would take me pages and pages to address all of the storm water management issues in our 1,000 home neighborhood. Building was allowed in back yards that were supposed to be for drain fields. Building was allowed on yards that would not percolate. The damage has been done by overbuilding and lack of adequate public facilities. Once a home is wet inside, it is never the same.
SUR0080	4209 Bright Bay Way	Rain barrels; Rain garden; Pervious pavement; Yard with no management; Yard with ponded water	Wet pond; Roadway bumpouts/ bioretention	<Null>

Response ID	Property Address	Are there drainage issues as a result of a rain event on your property?	If Yes, what is the issue?	If the issue is ponding water, how deep is the water?	If the issue is ponding water, how long before the water infiltrates?	Aside from the very rainy season of May through October, 2018, has this issue occurred in the past?	If Yes, how often?	If there are drainage issues on your property, where is/ are the issue(s) located?	Where is the water coming from?
SUR0082	4300 Sweet Bell Ct	Yes	Ponding water; Erosion; rapid surface flow into storm sewers	0-6 inches	1 to 24 hours	Yes	Only during heavy thunderstorms	Back yard; Side yard	Downspouts and roof; Neighbor's runoff
SUR0084	4505 Hemlock Cone Way	Yes	Ponding water; Erosion	0-6 inches	Shortly after the rain has stopped	Yes	Only during heavy thunderstorms	Front yard; Side yard; Driveway	Off the road or street; Neighbor's runoff
SUR0086	4605 Old Dragon Path	Yes	Ponding water	0-6 inches	1 to 24 hours	No	Only during heavy thunderstorms	Back yard; Side yard	Off the road or street; Downspouts and roof; Neighbor's runoff
SUR0102	9106 Dunloggin Rd	Yes	Ponding water; Erosion	6-12 inches	Greater than 24 hours	Yes	Every time it rains, regardless of the amount of rain	Front yard; Back yard; Side yard	Off the road or street; Outfall; Neighbor's runoff
SUR0103	9109 Northfield Rd	Yes	Ponding water	0-6 inches	much more than a few days. In some part of the swale along Northfield Road, it can take more than a week.	Yes	Every time it rains, regardless of the amount of rain	Front yard; Driveway	Off the road or street; Downspouts and roof
SUR0104	9117 Northfield Rd	Yes	Ponding water; Water getting into house	0-6 inches	1 to 24 hours	Yes	Every time it rains, regardless of the amount of rain	Back yard; Side yard; Sidewalk	Off the road or street; Downspouts and roof
SUR0105	9117 Northfield Rd	Yes	Water getting into house	<Null>	<Null>	Yes	Only during heavy thunderstorms	Front yard; Back yard	Downspouts and roof
SUR0106	9209 Waycross Rd	Yes	Ponding water; Water getting into house	0-6 inches	1 to 24 hours	Yes	Only during heavy thunderstorms	Front yard; Driveway	Off the road or street; Neighbor's runoff

Response ID	Property Address	Are there any storm drain infrastructure (inlet, outfall, manhole, or pipe) on your property?	If yes, are there problems with this/ these?	If yes, details?	When it rains, ideal conditions on my property would be:	When it rains, ideal conditions in my community would be:	Is there a stream adjacent to your property?	If yes, do you have concerns for, or evidence of your home flooding due to elevated stream levels during rainstorms?	If yes, the adjacent streamside (riparian) area is:
SUR0082	4300 Sweet Bell Ct	Yes	No	<Null>	For no water from anyone else's property to come into my yard; For some water to temporarily pond or be visible in my yard, then drain away when the rain stops	For runoff to temporarily be visible or pond on the surface, then flow into street inlets and underground pipes, out of sight; For runoff to flow through open channels and grass swales to streams	No	No	<Null>
SUR0084	4505 Hemlock Cone Way	Uncertain	No	<Null>	For no water from anyone else's property to come into my yard	For runoff to flow through open channels and grass swales to streams	Yes	No	Woods in natural condition
SUR0086	4605 Old Dragon Path	Uncertain	Uncertain	<Null>	For no water to be ponding or visible in my yard	For all water to flow into street inlets and underground pipes as fast as possible, out of sight	No	No	<Null>
SUR0102	9106 Dunloggin Rd	Yes	Uncertain	<Null>	For no water to be ponding or visible in my yard	For all water to flow into street inlets and underground pipes as fast as possible, out of sight	No	<Null>	<Null>
SUR0103	9109 Northfield Rd	No	<Null>	<Null>	For no water to be ponding or visible in my yard	For all water to flow into street inlets and underground pipes as fast as possible, out of sight	Yes	No	<Null>
SUR0104	9117 Northfield Rd	No	<Null>	<Null>	For no water to be ponding or visible in my yard	For all water to flow into street inlets and underground pipes as fast as possible, out of sight	Yes	No	<Null>
SUR0105	9117 Northfield Rd	No	<Null>	<Null>	For no water to be ponding or visible in my yard	For runoff to flow through open channels and grass swales to streams; For no water to be ponding on the street	No	<Null>	<Null>
SUR0106	9209 Waycross Rd	Yes	Yes	Inlet not draining during heavy rain; use to work like a charm, but erosion,street being repaved ,new houses being built..	For no water from anyone else's property to come into my yard	For all water to flow into street inlets and underground pipes as fast as possible, out of sight	No	<Null>	<Null>

Response ID	Property Address	My idea(s) of aesthetic and functional stormwater management for my property is/ are:	My idea(s) of aesthetic and functional stormwater management for my neighborhood streets and open areas is/ are:	If there are other areas in your neighborhood where ponding of water or other drainage issues on roadways occur, please provide the location and a brief description of the issue:
SUR0082	4300 Sweet Bell Ct	Rain barrels; Rain garden; Pervious pavement	Wet pond; Inlets in a street; Roadway bumpouts/ bioretention; Roadside grass swale; Grass channel	Columbia "open space" is largely area that could not be developed because of proximity to the drainage areas to be studied. Columbia Association manages these areas with insufficient regard for their contribution to problems of surface run off and erosion by using full-sized trucks that straddle pathways on hills and zero-turn mowers on soft ground which denude grass.
SUR0084	4505 Hemlock Cone Way	Rain garden; Pervious pavement	Roadway bumpouts/ bioretention	<Null>
SUR0086	4605 Old Dragon Path	Rain barrels; Rain garden	Inlets in a street; Roadway bumpouts/ bioretention; Roadside grass swale; Grass channel	<Null>
SUR0102	9106 Dunloggin Rd	Rain garden; Yard with no management	Inlets in a street	too many to note, are spread throughout the neighborhood intermittently thank you for your attention to this, it is a major issue in the neighborhood, particularly the areas near Plum Tree and the older section of the neighborhood
SUR0103	9109 Northfield Rd	Rain barrels; Rain garden	Inlets in a street; Roadside grass swale; Grass channel	<Null>
SUR0104	9117 Northfield Rd	Pervious pavement	Dry pond; Inlets in a street; Concrete channel	1/ Need sidewalk/ gutters on South side of Northfield Road 2/ T intersection of Northfield Road/ Columbia Road is crumbling 3/ Houses on Northfield Court get water from road and from stream behind them.
SUR0105	9117 Northfield Rd	Yard with no management	Dry pond; Inlets in a street	If we had a sidewalk on the south side of Northfield Road, we would have gutters and drains attached to something. However, one of four property owners refuses to grant the easements needed and the county declines to condemn this sliver of property.
SUR0106	9209 Waycross Rd	Rain garden; Pervious pavement	<Null>	<Null>

Response ID	Property Address	Are there drainage issues as a result of a rain event on your property?	If Yes, what is the issue?	If the issue is ponding water, how deep is the water?	If the issue is ponding water, how long before the water infiltrates?	Aside from the very rainy season of May through October, 2018, has this issue occurred in the past?	If Yes, how often?	If there are drainage issues on your property, where is/ are the issue(s) located?	Where is the water coming from?
SUR0107	9317 Dunloggin Rd	Yes	Ponding water; Erosion	6-12 inches	Greater than 24 hours	Yes	Every time it rains, regardless of the amount of rain	Front yard; Driveway	Neighbor's runoff
SUR0108	9320 Rock Meadow Dr	Yes	Infill development has change the storm run off pattern	<Null>	<Null>	Yes	Every time it rains, regardless of the amount of rain	Front yard; Back yard	Neighbor's runoff
SUR0109	9328 Frederick Rd	Yes	Ponding water	0-6 inches	It has laid in our backyard since the May flood adjacent to the stream . The stream always overflows after every storm .	Yes	Every time it rains, regardless of the amount of rain	Back yard	Nearby stream
SUR0110	9329 Dunloggin Rd	Yes	Ponding water; Erosion	0-6 inches	1 to 24 hours	Yes	Only during heavy thunderstorms	Back yard; Side yard	Neighbor's runoff
SUR0111	9333 Millbrook Rd	Yes	Ponding water	6-12 inches	Shortly after the rain has stopped	Yes	Only during heavy thunderstorms	Front yard; Back yard	Downspouts and roof; Neighbor's runoff
SUR0112	9395 Paulskirk Dr	Yes	Ponding water	0-6 inches	Shortly after the rain has stopped	No	Only during heavy thunderstorms	Back yard	Neighbor's runoff

Response ID	Property Address	Are there any storm drain infrastructure (inlet, outfall, manhole, or pipe) on your property?	If yes, are there problems with this/ these?	If yes, details?	When it rains, ideal conditions on my property would be:	When it rains, ideal conditions in my community would be:	Is there a stream adjacent to your property?	If yes, do you have concerns for, or evidence of your home flooding due to elevated stream levels during rainstorms?	If yes, the adjacent streamside (riparian) area is:
SUR0107	9317 Dunloggin Rd	Yes	Yes	Inlet not draining during heavy rain	For no water to be ponding or visible in my yard; For no water from anyone else's property to come into my yard; For some water to temporarily pond or be visible in my yard, then drain away when the rain stops	For all water to flow into street inlets and underground pipes as fast as possible, out of sight; For runoff to temporarily be visible or pond on the surface, then flow into street inlets and underground pipes, out of sight; For runoff to flow through open channels and grass swales to streams	No	Yes	Grass that I maintain/mow
SUR0108	9320 Rock Meadow Dr	Yes	Yes	Feature is broken or damaged; Ivy growth in swale reduces water flow to storm drain	For no water from anyone else's property to come into my yard	<Null>	No	<Null>	<Null>
SUR0109	9328 Frederick Rd	No	<Null>	<Null>	For no water to be ponding or visible in my yard	For runoff to flow through open channels and grass swales to streams	Yes	Yes	Grass that I maintain/mow
SUR0110	9329 Dunloggin Rd	No	<Null>	<Null>	For no water from anyone else's property to come into my yard	For runoff to flow through open channels and grass swales to streams	No	<Null>	<Null>
SUR0111	9333 Millbrook Rd	No	<Null>	<Null>	For no water to be ponding or visible in my yard	For runoff to flow through open channels and grass swales to streams	No	<Null>	<Null>
SUR0112	9395 Paulskirk Dr	Uncertain	Uncertain	<Null>	For no water to be ponding or visible in my yard; For no water from anyone else's property to come into my yard; For some water to temporarily pond or be visible in my yard, then drain away when the rain stops	For all water to flow into street inlets and underground pipes as fast as possible, out of sight	Uncertain	No	<Null>

Response ID	Property Address	My idea(s) of aesthetic and functional stormwater management for my property is/ are:	My idea(s) of aesthetic and functional stormwater management for my neighborhood streets and open areas is/ are:	If there are other areas in your neighborhood where ponding of water or other drainage issues on roadways occur, please provide the location and a brief description of the issue:
SUR0107	9317 Dunloggin Rd	Rain barrels	Inlets in a street; Roadside grass swale; Grass channel	water flows, constant and heavy, from neighbors yard, through our yard, under two driveways, then dumps out on the street/ driveway two doors down at their mailbox. Thank you for your attention to this problem.
SUR0108	9320 Rock Meadow Dr	Rain garden; Pervious pavement	Inlets in a street; Roadside grass swale; Grass channel; Concrete channel	<Null>
SUR0109	9328 Frederick Rd	Rain garden; Yard with no management	Grass channel	We live adjacent to Plumtree condos and apts.. The Plumtree stream has been eroding away on both sides for years . The lot adjacent to us is county property. They planted a few trees . Due to the amount of rain and it having nowhere to go our backyard and that county property have been a constant pond since May ... we have often not been able to mow this summer or fall. We have had sewerage issues as well these last 5 years. The little fish are not gone . The erosion is extensive over the last 16 years and getting so much worse. We are losing some of our lot and county side as well .
SUR0110	9329 Dunloggin Rd	Yard with no management	Inlets in a street	<Null>
SUR0111	9333 Millbrook Rd	Rain barrels; Rain garden; Pervious pavement; Yard with no management	Wet pond; Inlets in a street; Roadway bumpouts/ bioretention; Roadside grass swale; Grass channel	All of the front yards except for mine at the top of the hill on Millbrook form large ponds 5-10 feet wide and 6-12" deep during rains. The roadside grass swales from 1959 are interrupted by driveways with no drainage possible over/ under them.
SUR0112	9395 Paulskirk Dr	Yard with no management	Inlets in a street	<Null>

Response ID	Property Address	Are there drainage issues as a result of a rain event on your property?	If Yes, what is the issue?	If the issue is ponding water, how deep is the water?	If the issue is ponding water, how long before the water infiltrates?	Aside from the very rainy season of May through October, 2018, has this issue occurred in the past?	If Yes, how often?	If there are drainage issues on your property, where is/ are the issue(s) located?	Where is the water coming from?
SUR0113	9506 Valley Mede Ct	Yes	Erosion; Water getting into house	<Null>	<Null>	No	<Null>	Back yard; Side yard	Downspouts and roof; Neighbor's runoff
SUR0114	9522 Valley Mede Ct	Yes	The drain gets clogged due to other neighbors leaves and sticks covering the drain which causes flooding	greater than 12 inches	I have to clean off my neighbors debrief when we have bad rains	Yes	Only during heavy thunderstorms	Back yard	Neighbor's runoff
SUR0115	9529 Joey Dr	Yes	Ponding water; Erosion; The stream overflows and comes into the yard, heavy rains the stream becomes a river approx 150 feet across.	0-6 inches	This year, never. the water table is much higher and ponding is closer to the yards then usual.	Yes	More a function of the rain rate and intensity, more than an inch of rain will cause the streams to overflow.	Back yard	Nearby stream
SUR0116	9538 Michaels Way	Yes	Ponding water; Water getting into house	greater than 12 inches	1 to 24 hours	Yes	Only during heavy thunderstorms	Back yard	Nearby stream; Neighbor's runoff
SUR0117	9543 Michaels Way	Yes	Ponding water; Erosion	0-6 inches	Greater than 24 hours	Yes	Only during heavy thunderstorms	Back yard; Side yard; Driveway	Off the road or street; Nearby stream; Storm drain; Neighbor's runoff

Response ID	Property Address	Are there any storm drain infrastructure (inlet, outfall, manhole, or pipe) on your property?	If yes, are there problems with this/ these?	If yes, details?	When it rains, ideal conditions on my property would be:	When it rains, ideal conditions in my community would be:	Is there a stream adjacent to your property?	If yes, do you have concerns for, or evidence of your home flooding due to elevated stream levels during rainstorms?	If yes, the adjacent streamside (riparian) area is:
SUR0113	9506 Valley Mede Ct	No	<Null>	<Null>	For some water to temporarily pond or be visible in my yard, then drain away when the rain stops	For runoff to temporarily be visible or pond on the surface, then flow into street inlets and underground pipes, out of sight	No	<Null>	<Null>
SUR0114	9522 Valley Mede Ct	Yes	Yes	Clogged feature	For no water from anyone else's property to come into my yard; For some water to temporarily pond or be visible in my yard, then drain away when the rain stops	For all water to flow into street inlets and underground pipes as fast as possible, out of sight; For runoff to temporarily be visible or pond on the surface, then flow into street inlets and underground pipes, out of sight	No	<Null>	<Null>
SUR0115	9529 Joey Dr	No	<Null>	<Null>	For some water to temporarily pond or be visible in my yard, then drain away when the rain stops	For runoff to temporarily be visible or pond on the surface, then flow into street inlets and underground pipes, out of sight; For runoff to flow through open channels and grass swales to streams	Yes	No	Woods in natural condition
SUR0116	9538 Michaels Way	Yes	Yes	There is an aqueduct inlet behind my neighbor's house for a stream, I reported to the county that it has partially collapsed and is being investigated. This stream backup up water around my house during very heavy storms.	For no water to be ponding or visible in my yard	For all water to flow into street inlets and underground pipes as fast as possible, out of sight; For no water to be ponding on the street	Yes	Yes	Woods in natural condition
SUR0117	9543 Michaels Way	Yes	Uncertain	<Null>	For no water from anyone else's property to come into my yard; For some water to temporarily pond or be visible in my yard, then drain away when the rain stops	For all water to flow into street inlets and underground pipes as fast as possible, out of sight	Yes	No	Woods in natural condition

Response ID	Property Address	My idea(s) of aesthetic and functional stormwater management for my property is/ are:	My idea(s) of aesthetic and functional stormwater management for my neighborhood streets and open areas is/ are:	If there are other areas in your neighborhood where ponding of water or other drainage issues on roadways occur, please provide the location and a brief description of the issue:
SUR0113	9506 Valley Mede Ct	Rain garden	Dry pond; Inlets in a street; Roadside grass swale; Concrete channel	During heavy storms, the street at the end of Valley Mede Court significantly floods; the drain cannot handle the volume of water. Also Michael's Way between Valley Mede Court and Larchmede Court significantly floods; the drains cannot handle the volume of water.
SUR0114	9522 Valley Mede Ct	Yard with no management	Inlets in a street	The houses behind me are creating the problem because of their rain run off and their debris . I would like to explain further. My cell is 4109600805
SUR0115	9529 Joey Dr	Rain garden; Pervious pavement; Yard with no management	Wet pond; Dry pond; Roadway bumpouts/ bioretention; Roadside grass swale; Grass channel	<Null>
SUR0116	9538 Michaels Way	<Null>	<Null>	Directly in front of my house, on the street itself has ponded several feet deep three times, once in 2011, 2016 and 2018 and cars have gotten stuck trying to pass. Water wasn't flowing down the Plum Tree Branch and ponding on the street and my entire back and side yard of my home. The back was about three feet deep. Water was seeping in through the basement windows on all occasions. Most normal rainfalls also results in ponding in my back yard up to 6 inches deep from run off from the houses behind my home.
SUR0117	9543 Michaels Way	Rain garden	Inlets in a street	<Null>

Response ID	Property Address	Are there drainage issues as a result of a rain event on your property?	If Yes, what is the issue?	If the issue is ponding water, how deep is the water?	If the issue is ponding water, how long before the water infiltrates?	Aside from the very rainy season of May through October, 2018, has this issue occurred in the past?	If Yes, how often?	If there are drainage issues on your property, where is/ are the issue(s) located?	Where is the water coming from?
SUR0118	9547 Michaels Way	Yes	Ponding water; Saturation, soft ground	0-6 inches	Greater than 24 hours	Yes	Only during heavy thunderstorms	Back yard; Driveway	Off the road or street; Nearby stream; Storm drain; Neighbor's runoff
SUR0119	9549 Joey Dr	Yes	Ponding water; Erosion; Water getting into house	6-12 inches	Greater than 24 hours	Yes	Only during heavy thunderstorms	Back yard	Nearby stream; Outfall; Storm drain
SUR0120	9564 Baltimore National Pike	Yes	Erosion	<Null>	<Null>	Yes	Only during heavy thunderstorms	Driveway	Outfall
SUR0121	9609 Longview Dr	Yes	Ponding water	greater than 12 inches	Recently it's taking longer than 24 hrs	Yes	Only during heavy thunderstorms	Back yard	Neighbor's runoff
SUR0122	9754 Michaels Way	Yes	Erosion; Water getting into house; erosion on property and water getting in the house caused by the stream and drain pipe that run along my property line / occurred during the May 2018 storm. We did not own the home during the storm two years ago so we cannot speak to the property's drainage during that storm	<Null>	<Null>	<Null>	Unsure if there were issues during the storm two years ago as we did not own the property , but water issues seem to only happen during heavy rains	<Null>	Nearby stream
SUR0123	9834 Michaels Way	Yes	Erosion	<Null>	<Null>	Yes	Only during heavy thunderstorms	Back yard; Side yard	Off the road or street; Nearby stream; Neighbor's runoff
SUR0124	9839 Longview Dr	Yes	Ponding water; Erosion; Water getting into house	0-6 inches	1 to 24 hours	Yes	Every time it rains, regardless of the amount of rain	Front yard; Side yard	Outfall; Storm drain

Response ID	Property Address	Are there any storm drain infrastructure (inlet, outfall, manhole, or pipe) on your property?	If yes, are there problems with this/ these?	If yes, details?	When it rains, ideal conditions on my property would be:	When it rains, ideal conditions in my community would be:	Is there a stream adjacent to your property?	If yes, do you have concerns for, or evidence of your home flooding due to elevated stream levels during rainstorms?	If yes, the adjacent streamside (riparian) area is:
SUR0118	9547 Michaels Way	Yes	Uncertain	<Null>	For no water to be ponding or visible in my yard; For no water from anyone else's property to come into my yard	For all water to flow into street inlets and underground pipes as fast as possible, out of sight; For runoff to flow through open channels and grass swales to streams; For no water to be ponding on the street	Yes	No	Woods in natural condition
SUR0119	9549 Joey Dr	No	No	<Null>	For no water to be ponding or visible in my yard	For all water to flow into street inlets and underground pipes as fast as possible, out of sight; For runoff to flow through open channels and grass swales to streams	Yes	Yes	Woods in natural condition
SUR0120	9564 Baltimore National Pike	Yes	Uncertain	SWM pond rarely has water	For some water to temporarily pond or be visible in my yard, then drain away when the rain stops	For runoff to flow through open channels and grass swales to streams	Yes	No	<Null>
SUR0121	9609 Longview Dr	Yes	No	<Null>	For no water from anyone else's property to come into my yard	For runoff to flow through open channels and grass swales to streams; For no water to be ponding on the street	No	<Null>	<Null>
SUR0122	9754 Michaels Way	Yes	Yes	Clogged feature; erosion along the drainage stream	For no water from anyone else's property to come into my yard	For no water to be ponding on the street	Yes	Yes	Woods in natural condition
SUR0123	9834 Michaels Way	Yes	No	<Null>	<Null>	<Null>	Yes	Yes	Woods in natural condition
SUR0124	9839 Longview Dr	Yes	Yes	Clogged feature; Inlet not draining during heavy rain	For no water to be ponding or visible in my yard	For all water to flow into street inlets and underground pipes as fast as possible, out of sight	No	<Null>	<Null>

Response ID	Property Address	My idea(s) of aesthetic and functional stormwater management for my property is/ are:	My idea(s) of aesthetic and functional stormwater management for my neighborhood streets and open areas is/ are:	If there are other areas in your neighborhood where ponding of water or other drainage issues on roadways occur, please provide the location and a brief description of the issue:
SUR0118	9547 Michaels Way	Rain barrels; Rain garden; Pervious pavement	Inlets in a street; Roadway bumpouts/ bioretention; Roadside grass swale; Grass channel; Concrete channel	<Null>
SUR0119	9549 Joey Dr	Yard with no management	Roadside grass swale; Grass channel	<Null>
SUR0120	9564 Baltimore National Pike	Rain barrels; Rain garden; Pervious pavement; Yard with no management	Wet pond; Roadway bumpouts/ bioretention; Roadside grass swale; Grass channel	storm water retention facility for plum tree branch itself north of 40. Culvert under neath 40 is insufficient. Water headed for old EC could be retained here, upstream. Also Parking lot F in EC could be lowered to mitigate flooding at next "chokepoint"
SUR0121	9609 Longview Dr	Rain barrels; Rain garden; Pervious pavement; Yard with no management	Wet pond; Roadway bumpouts/ bioretention; Roadside grass swale; Grass channel	Michaels way near longview, Longview near Brookmede, brookmede, hearthstone, old fence road. Many areas
SUR0122	9754 Michaels Way	Rain garden	Inlets in a street; Roadway bumpouts/ bioretention; Roadside grass swale	<Null>
SUR0123	9834 Michaels Way	<Null>	Concrete channel	The focus of the survey appears to be getting water off the roads but not the flow of the water once off the road. Please examine erosion that is caused by road run off running into the Plumtree, I continue to lose property falling into the stream (9834 Michaels Way).
SUR0124	9839 Longview Dr	Yard with ponded water	<Null>	<Null>

Response ID	Property Address	Are there drainage issues as a result of a rain event on your property?	If Yes, what is the issue?	If the issue is ponding water, how deep is the water?	If the issue is ponding water, how long before the water infiltrates?	Aside from the very rainy season of May through October, 2018, has this issue occurred in the past?	If Yes, how often?	If there are drainage issues on your property, where is/ are the issue(s) located?	Where is the water coming from?
SUR0136	9567 Michaels Way	Yes	Ponding water	0-6 inches	Greater than 24 hours	Yes	Every time it rains, regardless of the amount of rain	Side yard	<Null>
SUR0137	4056 Pebble Branch Rd	Yes	Ponding water	0-6 inches	several days	No	<Null>	Back yard	Neighbor's runoff
SUR0139	9454 Dunloggin Rd	Yes	Ponding water, Water getting into house	0-6 inches	There is part of our property where the water does not infiltrate. There is a constant pond.	Yes	Every time it rains, regardless of the amount of rain	Back yard, Side yard	Off the road or street, Neighbor's runoff
SUR0141	4214 Club Ct	Yes	Ponding water, Erosion	0-6 inches	it hasn't	Yes	Only during heavy thunderstorms	Side yard	Neighbor's runoff
SUR0142	3013 Center Dr	Yes	Ponding water	0-6 inches	Greater than 24 hours	Yes	<Null>	Back yard, Side yard	Off the road or street, Nearby stream, Downspouts and roof, Neighbor's runoff
SUR0143	3230 Brookmede Rd	Yes	Ponding water, Water getting into house, Concrete Tube Storm Drain 22 runs under our house.	0-6 inches	Greater than 24 hours	Yes	Only during heavy thunderstorms	Back yard, Side yard	Off the road or street, Nearby stream, Storm drain, Downspouts and roof, Neighbor's runoff

Response ID	Property Address	Are there any storm drain infrastructure (inlet, outfall, manhole, or pipe) on your property?	If yes, are there problems with this/ these?	If yes, details?	When it rains, ideal conditions on my property would be:	When it rains, ideal conditions in my community would be:	Is there a stream adjacent to your property?	If yes, do you have concerns for, or evidence of your home flooding due to elevated stream levels during rainstorms?	If yes, the adjacent streamside (riparian) area is:
SUR0136	9567 Michaels Way	Yes	No	Inlet not draining during heavy rain	For no water to be ponding or visible in my yard	For runoff to temporarily be visible or pond on the surface, then flow into street inlets and underground pipes, out of sight	Yes	No	Grass that I maintain/ mow
SUR0137	4056 Pebble Branch Rd	Yes	Yes	Feature is broken or damaged	For some water to temporarily pond or be visible in my yard, then drain away when the rain stops	For runoff to flow through open channels and grass swales to streams	Yes	No	Woods in natural condition
SUR0139	9454 Dunloggin Rd	No	<Null>	<Null>	For no water to be ponding or visible in my yard, For no water from anyone else's property to come into my yard, For some water to temporarily pond or be visible in my yard, then drain away when the rain stops	For all water to flow into street inlets and underground pipes as fast as possible, out of sight	No	No	<Null>
SUR0141	4214 Club Ct	Yes	Yes	Erosion at the end of a pipe	For no water from anyone else's property to come into my yard	For runoff to temporarily be visible or pond on the surface, then flow into street inlets and underground pipes, out of sight	No	No	<Null>
SUR0142	3013 Center Dr	Yes	Yes	Poor elevation relation to stream	For no water to be ponding or visible in my yard	For all water to flow into street inlets and underground pipes as fast as possible, out of sight	Yes	No	Grass that I maintain/ mow
SUR0143	3230 Brookmede Rd	Yes	Yes	Clogged feature, Feature is broken or damaged, It goes under our house.	For some water to temporarily pond or be visible in my yard, then drain away when the rain stops	For runoff to temporarily be visible or pond on the surface, then flow into street inlets and underground pipes, out of sight, For runoff to flow through open channels and grass swales to streams	Yes	Yes	Woods in natural condition

Response ID	Property Address	My idea(s) of aesthetic and functional stormwater management for my property is/ are:	My idea(s) of aesthetic and functional stormwater management for my neighborhood streets and open areas is/ are:	If there are other areas in your neighborhood where ponding of water or other drainage issues on roadways occur, please provide the location and a brief description of the issue:
SUR0136	9567 Michaels Way	<Null>	Grass channel	The area where the ponding occurs is adjacent to County property. I did not indicate that we have home damage but we have had minor leaks from time to time. Additionally all of our property remains wet for days after rain. Of course the plum tree branch in back of my home, which is normally no more than a trickle becomes a raging river rising between 4-5 feet with major storm events and comes up my backyard about halfway. If feasible and helpful I would suggest widening the stream channel on the county side of the stream.
SUR0137	4056 Pebble Branch Rd	Rain garden	Dry pond, Roadside grass swale	pipe from drain to stream appears to have broken in places where deep holes are
SUR0139	9454 Dunloggin Rd	Rain barrels, Pervious pavement	Inlets in a street, Roadway bumpouts/ bioretention, Roadside grass swale	There are not enough drains on Plum meadow. In May, during the large storm, water came pouring down from Plum meadow into our yard and funneled down to Dunloggin. While this was a once in a 500/ 1000 year storm, adjustments made to the property around the basement stairwell (by previous owners) makes me think that this happens often.
SUR0141	4214 Club Ct	<Null>	<Null>	<Null>
SUR0142	3013 Center Dr	Rain barrels, Rain garden	Inlets in a street	<Null>
SUR0143	3230 Brookmede Rd	Rain barrels, Rain garden, Pervious pavement	Wet pond, Inlets in a street, Roadway bumpouts/ bioretention, Grass channel	Between Hearthstone and Brookmede starting at the plum tree branch and then going up behind the houses.

Complaint ID	Type	Status	Date Created	Address
1172	General	Closed	1/1/2015	3206 Brookmede Rd
1191	General	Closed	1/1/2017	3013 Center Drive
1197	General	Closed	1/1/2011	3117 Chatham Rd
1198	General	Closed	1/1/2010	4033 Chatham Rd
1199	General	Closed	1/1/2016	4009 Chatham Road
1207	General	Closed	1/1/2016	4214 Club Court
1215	General	Closed	1/1/2015	3217 Birchmede Drive
1241	General	Closed	1/1/2017	9226 Crownwood Road
1261	General	Closed	1/1/2016	9106 Dunloggin Road
1278	General	Closed	1/1/2017	4057 Firefly Way
1289	General	Closed	1/1/2011	4049 Fragile Sail Way
1316	General	Closed	1/1/2000	2821 Greenway Drive
1317	General	Closed	1/1/2016	3009 Greenway Drive
1318	General	Closed	1/1/2014	3009 Greenway Drive
1319	General	Closed	1/1/2015	3029 Greenway Drive
1336	General	Closed	1/1/2003	3204 Hearthstone Road
1337	General	Closed	1/1/2001	3214 Hearthstone Road
1338	General	Closed	1/1/2003	3221 Hearthstone Road
1339	General	Closed	1/1/2010	3225 Hearthstone Road
1340	General	Closed	1/1/2005	3225 Hearthstone Road
1378	General	Closed	1/1/2003	4513 Kingscup Ct
1379	General	Closed	1/1/2012	4567 Kingscup Ct
1394	General	Closed	1/1/2002	2802 Leaf Shade
1400	General	Closed	1/1/2000	2633 Liter Drive
1402	General	Closed	1/1/2009	9505 Longview Drive
1403	General	Closed	1/1/1999	9830 Longview Drive
1407	General	Closed	1/1/2010	4012 MacAlpine Drive
1417	General	Closed	1/1/2010	4012 MacAlpine Drive
1424	General	Closed	1/1/2002	9850 Michaels Way
1433	General	Closed	1/1/2005	4608 Morning Ride Court
1437	General	Closed	1/1/2000	3440 Nanmark Court
1438	General	Closed	1/1/2000	3448 Nanmark Court
1439	General	Closed	1/1/2000	3452 Nanmark Court
1440	General	Closed	1/1/2003	3444 Nanmark Court
1441	General	Closed	1/1/2015	3444 Nanmark Court
1450	General	Closed	1/1/2000	9071 North Field Road
1451	General	Closed	1/1/2005	9097 Northfield Road
1468	General	Closed	1/1/2002	4030 Pebble Branch Road
1476	General	Closed	1/1/2016	3784 Plum Spring Lane
1498	General	Closed	1/1/2002	4513 Kingscup Ct
1527	General	Closed	1/1/2011	3746 Spring Meadow Drive
1531	General	Closed	1/1/2003	4022 Spring Meadow Drive
1532	General	Closed	1/1/1998	4026 Spring Meadow Drive
1533	General	Closed	1/1/1999	4026 Spring Meadow Drive
1536	General	Closed	1/1/2017	4052 St. Johns Lane

Complaint ID	Type	Status	Date Created	Address
1625	Drainage	Closed	6/25/2018	2879 Country Lane
1634	General	Closed	6/27/2018	3762 PLUM MEADOW DR
1638	General	Closed	6/27/2018	3918 MACALPINE RD
1642	General	Closed	6/27/2018	4300 TEMORA MANOR LN
1660	Drainage	Closed	6/28/2018	2704 Old Saint JohnsLn
1662	Trash/Debris	Open	6/29/2018	3718 Ligon Road
1665	Drainage	Closed	6/29/2018	2906 Ramblewood Road
1666	Drainage	Closed	6/29/2018	3114 Ramblewood Road
1667	Drainage	Closed	6/29/2018	3006 Ramblewood Road
1684	Drainage	Closed	6/30/2018	9438 JOEY DR
1689	Erosion	Closed	6/30/2018	9839 LONGVIEW DR
1695	General	Closed	7/1/2018	3768 PLUM HILL CT
1700	Erosion	Open	7/1/2018	3009 Greenway Dr
1701	Drainage	Closed	7/1/2018	3113 Hearthstone Rd
1702	Drainage	Closed	7/1/2018	3118 North Chatham
1703	Trash/Debris	Investigating	7/1/2018	3221 Birchmede Drive
1704	Trash/Debris	Closed	7/1/2018	3225 Birchmede Dr
1705	Erosion	Closed	7/1/2018	3225 Hearthstone Road
1706	Trash/Debris	Open	7/1/2018	3452 Nanmark Court
1707	Drainage	Closed	7/1/2018	9302 MICHAELS WAY
1708	Trash/Debris	Investigating	7/1/2018	9306 Michaels Way
1709	General	Closed	7/2/2018	9326 Michaels Way
1711	Erosion	Open	7/2/2018	9513 Longview Drive
1712	Drainage	Open	7/2/2018	9514 Longview Drive
1713	Drainage	Open	7/2/2018	9538 Michaels Way
1714	Drainage	Open	7/2/2018	9542 Michaels Way
1715	Drainage	Open	7/2/2018	9541 Joey Drive
1716	Outfall	Investigating	7/2/2018	3768 Plum Hill Court
1717	Drainage	Open	7/3/2018	3018 Greenway Dr
1718	Drainage	Open	7/3/2018	3009 Greenway Dr
1719	Outfall	Investigating	7/3/2018	9577 Joey Drive
1722	Drainage	Open	7/3/2018	9738 Michaels Way
1723	Drainage	Open	7/3/2018	9758 Michaels Way
1724	Drainage	Open	7/3/2018	3175 Paulskirk Drive
1727	General	Open	7/5/2018	3724 Spring Meadow Rd
1728	Drainage	Open	7/5/2018	3725 Spring MeadowDr
1729	Drainage	Open	7/6/2018	3802 Spring Meadow Dr
1730	Trash/Debris	Open	7/6/2018	3826 Spring Meadow Dr
1731	Trash/Debris	Open	7/6/2018	3781 Plum Spring Ln
1732	Trash/Debris	Open	7/6/2018	3793 Plum Spring Ln
1733	Drainage	Open	7/6/2018	9325 Dunloggin Rd
1735	Drainage	Open	7/6/2018	3929 Hawthorn Rd
1736	Drainage	Open	7/6/2018	3718 Ligon Rd
1737	Drainage	Open	7/6/2018	9109 Northfield Rd
1742	Trash/Debris	Open	7/9/2018	4014 Spring Meadow Dr

Complaint ID	Type	Status	Date Created	Address
1743	Trash/Debris	Open	7/9/2018	3814 Spring Meadow Dr
1744	Drainage	Open	7/9/2018	4006 Spring Meadow Dr
1763	Trash/Debris	Referred	8/8/2018	9542 Michaels Way
1767	Drainage	Referred	8/14/2018	4056 Pebble Branch
1768	Drainage	Open	8/17/2018	4002 Chatham Road
1788	Drainage	Investigating	9/26/2018	3226 Brookmede Road
1791	Drainage	Closed	10/1/2018	4050 Crescent Road
1799	Drainage	Closed	10/11/2018	3826 Spring Meadow Dr
1800	Drainage	Closed	10/11/2018	4014 MacAlpine Road
1801	Drainage	Open	10/11/2018	3215 Ramblewood Road
1814	Erosion	Investigating	11/6/2018	4056 Fragile Sail Way

Date	Property Address	Comment
12/3/2018	4214 Club Ct	Over this period of extreme wet conditions, water drainage has become a greater issue, as the flow makes its way down a slope where infill deeper in the neighborhood has changed the course of streams. I have standing water where there hadn't been. Thankfully, it does not impact my house. My plat shows an easement and for that reason we were careful to install fencing away from the area. However, trees and plants and grass are affected. Water (and trash) comes down through a neighbor's yard into mine. It should never even come through the neighbor's property! I really feel the problem should be addressed at HIGHER ground. Or, there is a drain on Northfield that could collect. The rainwater can be rerouted toward an existing major runoff area expanded by the county last year, that runs behind the east row of houses on Southfield. I would be happy to meet on site.
12/5/2018	4054 Crescent Road	Resident discussed concerns with riprap channel along north property line.
12/12/2018	4030 Spring Meadow Drive	Resident discussed concerns with drainage from surrounding homes directed towards their property and near constant ponded water.
12/12/2018	9317 Dunloggin Road	Resident discussed concerns with standing water and an active spring in their yard.
12/12/2018	9209 Waycross Road	Resident discussed concerns with swales that no longer function.
12/12/2018	9547 Michaels Way	Resident discussed concerns with standing water in yards.
12/12/2018	3002 Greenway Drive	Resident discussed concerns with the flooding of a swale at their driveway.
12/12/2018	2812 Saint Johns Lane	Resident discussed concerns with a swale at the edge of their property.
12/12/2018	2802 Leaf Shade Dr	Resident discussed concerns with the erosion of a swale.
12/17/2018	9540 Joey Drive	The drain coming from the merge at the 3 houses (9548/9540/9522 Joey Dr) starts going underground to a buried drain pipe that runs between 9540/9548 Joey Dr and it is over 30 years old and failing.
12/19/2018	3901 Spring Meadow Drive	Resident discussed concerns with a spring flowing into the street.
12/19/2018	9329 Dunloggin Road	Resident discussed concerns with a spring flowing into the street.
12/19/2018	9325 Dunloggin Road	Resident discussed concerns with a spring flowing into the street.
12/19/2018	9321 Dunloggin Road	Resident discussed concerns with a spring flowing into the street.
12/31/2018	3246 Old Fence Road	Resident discussed concerns with a lack of infrastructure.

Date	Property Address	Comment
12/31/2018	3242 Old Fence Road	Resident discussed concerns with a lack of infrastructure.
12/31/2018	3301 Greenway Drive	Resident discussed concerns with a lack of infrastructure.
12/31/2018	3233 Greenway Drive	Resident discussed concerns with a lack of infrastructure.
12/31/2018	3213 Brookmede Road	Resident discussed concerns with gaps in infrastructure.
12/31/2018	3205 Brookmede Road	Resident discussed concerns with gaps in infrastructure.
12/31/2018	3210 Brookmede Road	Resident discussed concerns with gaps in infrastructure.
12/31/2018	3206 Brookmede Road	Resident discussed concerns with gaps in infrastructure.
1/2/2019	9438 Joey Drive	Our property has developed serious drainage problems this past year and we need to bring the issue to the county's attention.
3/8/2019	3035 Saint Johns Lane	This is the owner of 3035 Saint Johns Lane. Like 2 weeks ago, I met with the consulting firms of Biohabitats and McCormick Taylor during their field surveys assessment. There is storm runoff along my property and I have a complaint regarding this drainage. Most of the time drainage gets clogged and floods my property. It also gets dirty and becomes a site for others to throw trash into. During the summer, the flooding acted as a good media for bugs and insects to grow and negatively affected my family's and my health. The flooding also has a bad smell to it. The flooding runs along the left side of the property for about 290 feet long. It increases the groundwater saturation on my property and negatively affects my house's foundation. I urge you to turn this into a covered pipe drainage system, especially since it is a continuation of a covered pipe drainage system. I don't know why it came as an open drainage in my property. I showed your field survey consultants how bad this drainage is and I asked them while they assess the drainage to include a note about how this drainage filled by trash and how it runs close to my house. I think they did, if not please reassess this drainage and improve it by a covered pipe system. Please find any way to solve my concern and problem.

Field Interaction ID	Date	Address	Summary/Relevant Details
FI02	12/20/2018	3805 Macalpine Rd	Resident has experienced flooding from drainage system behind homes, up to 3" or 4" in garage. The inlet just upslope of their home floods and water stands in yard.
FI03	12/20/2018	3806 Macalpine Rd	Resident discussed inlets in median along Macalpine overflowing and a broken pipe located within the median.
FI05	1/7/2019	4002 Woodley Rd	Homeowner has swale in their side yard within public ROW that has been carrying increasingly heavy flows and is causing flooding in their yard and near their home.
FI15	1/9/2019	3934 St. John's Lane	Homeowner noted high flows in swales through their side yard during storms. Homeowner said that they previously replaced concrete around inlet when it was undermined, but it is now eroding again.
FI28	1/9/2019	9317 Dunloggin Rd	Resident asked if we were going to be fixing his yard. Resident said the swale is flowing worse this year and the corner is always wet.
FI09	1/17/2019	4357 Wild Filly Ct	Homeowner commented on the increase of flows since moving in years ago. Homeowner originally built retaining wall to stabilize their yard, but now a swale has developed at the toe of slope.
FI29	1/25/2019	9549 Westwood Ct	Resident stopped by to describe flooding and storm flow through yard to the adjacent inlet and inquired if we would be fixing the sink by the inlet.
FI22	2/25/2019	9102 Northfield Rd	Resident stated their side yard is entirely ponded from a channel that enters the back right corner of their yard in the tree line. The resident opted out of the capital project last year that was installed in order to protect their trees. The project would have graded a swale through the resident's property. Resident currently has sandbags at their basement door to prevent flooding.
FI21	2/25/2019	9097 Northfield Rd	Resident lives adjacent to the recent capital project and now has a swale and inlets along their yard. While grade changes have somewhat increased flooding on their property, the resident supports the capital project for saving their neighbors' yards. Resident said his property needs to be properly graded away from the house. Resident was very supportive and appreciative of our efforts.
FI23	2/25/2019	9077 Northfield Dr	Resident asserted that the pond across the street frequently overtops the road during heavy thunderstorms and water rushes into their yard. They are constantly maintaining the eroded channel behind their house so that it has capacity and proper drainage. The resident opted out of the previous capital project that would have given them a curb and sidewalk. They are okay with the rain that flows off of Northfield Rd and onto their property, but not when it should be controlled by the pond across the street.

Field Interaction ID	Date	Address	Summary/Relevant Details
FI20	2/25/2019	4214 Club Ct	Resident has had numerous conversations with the county regarding the flooding on their property and asserted that the problem is from the lack of drainage infrastructure to stop the water upstream of her property along northfield road. The flooding along the resident's yard is threatening a fence and has killed several trees that would be expensive to remove. It appears that the previous capital project captured more flow into an outfall behind the resident's house. The resident is also worried about an adjacent lot which may be further developed and the potential drainage problems that would cause. Since the adjacent lot was first developed, water rushes down the driveway and erodes the resident's front lawn around where the county installed a yard inlet. There is also concern that construction in the adjacent lot is threatening a line of large pines within the resident's property.
FI26	2/27/2019	9226 Crownwood Rd	Resident has drainage and erosion issues on their frontyard and backyard. Their property is at bottom of hill, receiving drainage from half of the street with no stormwater management strategies in place. The owner has talked to the Department of Public Works and the Highway Department about their issues. Some have been addressed, but drainage still needs to be improved. Owner is interested in removing impervious track running through their yard, especially if it will facilitate a drainage improvement project.
FI24	3/15/2019	4293 Bright Bay Way	Resident spoke about how flooding on their property has increased over the years.
FI37	1/2/2019	9438 Joey Dr.	Resident expressed concern over ponding water between his home and his neighbors home as well as in the back yard. He pointed out areas where there is constantly ponding water that is not being conveyed to the nearby inlet.
FI36	1/2/2019	3230 Brookmede Rd	Resident pointed out a projecting pipe outfall into the Plumtree branch. The pipe runs under her house to a manhole which backs up and floods her basement during large events.
FI31	1/4/2019	9514 Longveiw Dr	Resident explained that the soil is constantly saturated and the water elevation rises to above the level of his basement during large events. He still owns the house but has since moved out.
FI38	1/8/2019	3134 Hearthstone Rd.	Resident pointed out the outfall channel running through his and his neighbors' back yard. He said that it often overflows and floods his yard all the way up to his house. He expressed concern of water getting into his home.
FI35	2/4/2019	9435 Joey Dr.	Resident pointed out locations along the swale on his yard with large sinkholes and constant standing water.
FI40	2/14/2019	3009 Greenway Dr.	Resident explained that a water main broke and damaged the storm drain, allowing CR6 aggregate to enter and block flow through the pipe. This causes the water to back up onto the street during large events.
FI32	2/21/2019	9387 Paulskirk Dr.	Resident inquired about outfall channel in his side yard. He complained that there is often standing water in this channel and that it does not drain.
FI39	2/21/2019	3035 Saint Johns Ln.	Resident stated that the channel in their side yard is filled with standing water the majority of the time. In the warmer months this attracts bugs and has a foul odor.

Field Interaction ID	Date	Address	Summary/Relevant Details
FI34	2/21/2019	Michaels Way at Ramblewood Rd	Neighbor stopped by when he saw us inspecting an inlet, and informed us that runoff is not captured by the inlet during smaller storms due to a raised portion of asphalt in front of the inlet.
FI33	2/26/2019	Resurrection-St. Paul School	Maintenance worker said that the facility behind the building has not fully drained in the past year, even though it used to drain fully when first constructed.
FI41	2/27/2019	9333 Millbrook Rd	Resident who had already submitted a survey response approached during field investigations to point out the drainage problem in his backyard. He explained that the grading of the newly developed houses causes water to pond behind the highway sound wall and backs up into his yard.

APPENDIX E: OPPORTUNITY ASSESSMENT RESULTS

Assessment Area ID	Opportunity ID	Opportunity Type	Opportunity Description	Design Comments	Priority	Associated Storm Drain Assets*	Associated Resident Interaction
P1	P01-01	Improve Existing Conveyance System	Existing storm drain system is likely not functioning as intended based on field observations. Analyze system and, if necessary, improve system with modified infrastructure.		Low	Outfall 7296	
P1	P01-02	Improve Existing Conveyance System	Existing storm drain system is likely not functioning as intended based on field observations. Analyze system and, if necessary, improve system with modified infrastructure.		Low	Outfall 7300	
P2	P02-01	Improve Existing Conveyance System	Existing storm drain system is likely not functioning as intended based on field observations. Field interaction suggests flooding is an issue. Analyze system and, if necessary, improve system with modified infrastructure.		Low	Outfall 7316	FI24
P3	P03-01	Improve Existing Conveyance System	Existing conveyance system is likely not functioning as intended. Field observations note that conveyance is undefined. Analyze system and, if necessary, improve system with modified infrastructure.	Located on private property.	Low	Outfall 7309	
P8	P08-01	Improve Existing Conveyance System	Existing conveyance system is likely not functioning as intended based on field observations. Field interactions and survey responses suggest that pond's outfall structure is likely not functioning as intended. Analyze system and, if necessary, improve system with modified infrastructure.		High	Outfall 7792	CC165, FI23 SUR0104
P9	P09-01	Install New Conveyance System	Existing conveyance system is likely not functioning as intended. Field observations, field interactions, and survey responses suggest that runoff from roadway is concentrating and flowing across private property. Analyze system and, if necessary, improve system with modified infrastructure.	Potential utility conflicts. Many dead trees nearby due to intensity of flooding. Located on private property.	High	Swale 238	CC121, SUR0103, SUR0140, SUR0105, ACR1, FI20
P10	P10-01	Improve Existing Conveyance System	Existing conveyance system is likely not functioning as intended. Analyze system and, if necessary, improve system with modified infrastructure.		Low	Outfall 7719	CC111
P13	P13-01	Improve Existing Conveyance System	Existing conveyance system is likely not functioning as intended. Field observations and survey responses suggest frequent and significant flooding. Analyze system and, if necessary, improve system with modified infrastructure.	Located on private property. Outfall of system is backwatered by downstream stream.	High	Outfall 7656	CC115, FI10, SUR0137
P13	P13-02	Install New Conveyance System	Add conveyance system to area with no existing conveyance.	Located partially on private property.	Medium	Swale 10	
P15	P15-01	Install New Conveyance System	Add conveyance system to area with no existing conveyance. Survey response suggests that flooding is significant.	Located partially on private property. This system outfalls directly to Plumtree Branch and will be controlled by that system.	High		SUR0057, CC35, CC96, CC98, 0 SUR0062, SUR0067
P15	P15-02	Install New Conveyance System	Add conveyance system to area with no existing infrastructure. Survey response suggests that flooding in this area is significant.	Located on private property.	Medium		0 CC101, C92, CC107, SUR0063
P15	P15-03	Improve Existing Conveyance System	Existing conveyance system is likely not functioning as intended. County complaints and survey responses indicate the area is frequently flooded. Analyze system and, if necessary, improve system with modified infrastructure.	Project should be considered in conjunction with other improvments in area.	High	Inlet 255974	CC108, SUR0062, SUR0070, CC96, CC35, CC98

Assessment Area ID	Opportunity ID	Opportunity Type	Opportunity Description	Design Comments	Priority	Associated Storm Drain Assets*	Associated Resident Interaction
P15	P15-04	Improve Existing Conveyance System	Existing conveyance system is likely not functioning as intended. Field observation notes a culvert under a private driveway carrying Plumtree Branch as potentially being a constriction point. Both field observations and survey responses suggest frequent and significant flooding. Analyze system and, if necessary, improve system with modified infrastructure within available open space.	Located on private property. Potential utility conflicts.	High		CC98, CC96, CC35, CC108, SUR0067, SUR0070, SUR0060, 0 SUR0062, SUR0134, SUR0068
P17	P17-01	Improve Existing Conveyance System	Existing conveyance system is likely not functioning as intended. Field observation notes there is no clear conveyance between the storm drain outfall downstream to the stream channel. Analyze system and, if necessary, improve conveyance with modified infrastructure.	Located on private property. This system outfalls directly to Plumtree Branch and will be controlled by that system.	Low	Outfall 7424	SUR0060
P17	P17-02	Improve Existing Conveyance System	Existing conveyance system is likely not functioning as intended. Field observations note there is no clear conveyance system between the storm drain outfall downstream to the stream channel; ponded water is visible. Analyze system and, if necessary, improve system with modified infrastructure.	Located on private property. This system outfalls directly to Plumtree Branch and will be controlled by that system.	Low	Outfall 7435	
P18	P18-01	Improve Existing Conveyance System	Existing conveyance system is likely not functioning as intended. Analyze system and, if necessary, improve system with modified infrastructure.	Located on private property. Project should be considered in conjunction with other improvements in area.	Medium	Outfall 7652	SUR0065, SUR0069, SUR0061
P18	P18-02	Install New Conveyance System	Field observations, field interactions, and county complaints suggest that runoff from roadway is concentrating and flowing across private property. Add conveyance system to area with no existing conveyance.	Located partially on private property.	High	0	CC172, FI26
P18	P18-03	Install New Conveyance System	Add conveyance system to area with no existing conveyance.	Located partially on private property. Project should be considered in conjunction with other improvments in area.	Low	0	
P19	P19-01	Improve Existing Conveyance System	Existing conveyance system is likely not functioning as intended. Field interaction and survey response suggest that flooding of the area is frequent. Analyze system and, if necessary, improve system with modified infrastructure.	Located partially on private property. Project should be considered in conjunction with other improvements in area.	High	Outfall 7650	SUR0058, FI5
P19	P19-02	Improve Existing Conveyance System	Existing conveyance system is likely not functioning as intended. Field observation notes there is no clear conveyance system between the storm drain outfall downstream to the storm drain system. Both field observations and survey responses suggest frequent and significant flooding. Analyze system and, if necessary, improve conveyance system with modified infrastructure to minimize flooding of private property.	Located on private property.	High	Outfall 7663	SUR0056, FI15
P19	P19-03	Install New Conveyance System	Add conveyance system to area with no existing conveyance.	Located partially on private property. Project should be considered in conjunction with other improvements in area.	Medium		
P19	P19-04	Improve Existing Conveyance System	Existing conveyance system is likely not functioning as intended. Field interactions suggest flooding is an issue. Analyze system and, if necessary, improve system with modified infrastructure.	Located on private property. Storm drain alignment is close to homes.	Medium	Inlet 256030	
P20	P20-01	Install New Conveyance System	Add conveyance system to area with no existing conveyance.	Located partially on privated property.	High		SUR0026

Assessment Area ID	Opportunity ID	Opportunity Type	Opportunity Description	Design Comments	Priority	Associated Storm Drain Assets*	Associated Resident Interaction
P21	P21-01	Improve Existing Conveyance System	Existing conveyance system is likely not functioning as intended. Analyze system and, if necessary, improve system with modified infrastructure.	Located on private property.	Low	Outfall 7720	SUR0064
P22	P22-01	Improve Existing Conveyance System	Existing downstream conveyance is likely not functioning as intended. Survey responses and county complaints indicate area is frequently flooded. Analyze system and, if necessary, improve system with modified infrastructure.	Located on private property.	High	Outfall 7457	SUR0044, CC75, CC84, CC105
P22	P22-02	Detention Practice	Create new detention practice to manage existing water flow (likely from a spring) with outfall tying into adjacent storm drain network. Survey responses, field observation, and drainage complaints indicate area is consistently inundated.	Located partially on private property. Size and location of spring flow should be taken into account.	Medium		SUR0107, SUR0110
P23	P23-01	Detention Practice	Surrounding area has few detention practices. Install stormwater management feature in available open space under existing swale and potentially under roadway. The feature could be located here or further upstream within swale.	Potential utility conflicts within swale. Potential tree impacts. Located on County property.	Medium	Outfall 7272	SUR0049, SUR0050, SUR0057, SUR0058, SUR0059, SUR0066, FI3, CC99, CC92, CC101
P26	P26-01	Improve Existing Conveyance System	Existing conveyance system is likely not functioning as intended. Field interaction suggests that flooding of area is frequent. Analyze system and, if necessary, improve system with modified infrastructure.	Located on private property.	High	Inlet 255961, Inlet 256041, Inlet 255979, Inlet 256043, Inlet 255959, Inlet 256044, Inlet 255944	FI2, SUR102
P26	P26-02	Install New Conveyance System	Add conveyance system to area with no existing infrastructure.	Located partially on private property. Project may impact downstream storm drain infrastructure.	Medium		CC71, CC72, SUR0037, SUR0039
P27	P27-01	Improve Existing Conveyance System	Existing conveyance system is likely not functioning as intended. Field observation notes that a new inlet at Plum Court might be considered. County complaints indicate area is frequently flooded. Analyze system and, if necessary, improve system with modified infrastructure to minimize flooding.	Potential utility conflicts.	High		CC78, CC79
P31	P31-01	Improve Existing Conveyance System	Existing conveyance system is fragmented and likely not functioning as intended. Survey responses suggest that flooding of area is significant. Analyze system and, if necessary, improve system with modified infrastructure.	Located partially on private property. Drainage area may be significant.	High	Outfall 7539	SUR0028, SUR0030
P31	P31-02	Install New Conveyance System	Add conveyance system to areas with no existing infrastructure. Analyze the sections with existing infrastructure and, if necessary, improve system with modified infrastructure.	Located partially on private property.	Medium		SUR0029, SUR0031
P35	P35-01	Improve Existing Conveyance System	Existing storm drain system is not likely functioning as intended. Field observation notes system seems to have limited capture efficiency. Survey responses and field observation indicate roadway experiences flooding frequently. Analyze system and, if necessary, improve system with modified infrastructure.		Medium	Inlet 256430	SUR0025, SUR0023
P39	P39-001	Improve Existing Conveyance System	Field observations and survey response suggest that roadway runoff ponds on properties in this area. Improve conveyance through roadside ditches by regrading and installing driveway culverts.	Potential utility conflicts.	Medium		SUR0111

Assessment Area ID	Opportunity ID	Opportunity Type	Opportunity Description	Design Comments	Priority	Associated Storm Drain Assets*	Associated Resident Interaction
P40	P40-001	Improve Existing Conveyance System/ESD Practice	Field observations and interactions suggest that this infiltration facility is not functioning as intended. Improve conveyance into and out of this facility by cleaning the inflow pipe and clearing the facility of sediment build-up. Investigate infiltration media for maintenance needs.	Located on private property.	Low	Outfall 7602	FI33
P40	P40-002	Improve Existing Conveyance System	Existing infrastructure could not be located during field investigation and is likely buried. Replace outfall structure and improve conveyance from storm drain outfall to downstream channel.	Located partially on private property.	Low	Outfall 7292	
P40	P40-003	Improve Existing Conveyance System	Existing conveyance system is likely not functioning as intended. Improve conveyance from storm drain system outfall to downstream channel.	Located partially on private property.	Low	Outfall 7817	
P42	P42-001	Improve Existing Conveyance System	Existing conveyance system is likely not functioning as intended. Field observations and interactions suggest that channel does not maintain positive flow. Improve conveyance between storm drain outfall and storm drain system to minimize flooding of private property.	Located on private property. Existing fence will be required to be removed and reset.	Low	Outfall 7340, Inlet 30739	FI32
P42	P42-002	Improve Existing Conveyance System	Existing conveyance system is likely not functioning as intended. Field observations and survey responses suggest that channel does not maintain positive flow. Improve conveyance between storm drain outfall and storm drain system to minimize flooding of private property.	Located on private property. Existing fence will be required to be removed and reset.	Low	Outfall 7489, Inlet 30501	SUR0016
P43	P43-001	Detention Practices	Field observations suggest that pond forebay may require maintenance. Improve performance of facility by clearing forebay of sediment and debris.		Low	Pipe 51052	SUR0120
P45	P45-001	Improve Existing Conveyance System	Field observations suggest that existing conveyance system is likely not functioning as intended. Improve conveyance through roadside ditches by regrading and installing driveway culverts.		Medium		
P45	P45-002	Improve Existing Conveyance System	This stormdrain system was likely installed prior to current design standards and could benefit from additional analysis for drainage improvement. Field observations suggest that pipe may be damaged in some areas due to observed sinkholes.	Located partially on private property.	Low	Outfall 7456 and upstream pipes	
P45	P45-003	Improve Existing Conveyance System	Field observations suggest that existing conveyance system is likely not functioning as intended. Improve conveyance through roadside ditches by regrading and installing driveway culverts.		Medium		
P46	P46-001	Improve Existing Conveyance System	Survey responses suggest that runoff from roadway is concentrating and flowing through private property. Improve existing conveyance system through the addition of inlets or higher curb and gutter.	Potential Utility conflicts.	Low		SUR0011
P46	P46-002	Improve Existing Conveyance System/ESD Practice	Field observations and survey response suggest that roadway runoff ponds in this area. Improve existing conveyance system through the addition of an inlet or ESD practice in this location.		Low	Pipe 38987	SUR0006
P46	P46-003	Improve Existing Conveyance System	Field observations suggest that existing conveyance system is likely not functioning as intended. Improve conveyance through roadside ditches by regrading and installing driveway culverts.		Medium		SUR 0021, SUR0022
P46	P46-004	Improve Existing Conveyance System	Field observations suggest that existing conveyance system is likely not functioning as intended. Improve conveyance through roadside ditches by regrading and installing driveway culverts.		Medium		
P46	P46-005	Improve Existing Conveyance System	Field observations and interactions suggest that runoff is not flowing towards existing inlet in this location. Improve existing conveyance by regrading this area to maintain positive flow.	Located partially on private property.	Low	Inlet 24184	FI37

Assessment Area ID	Opportunity ID	Opportunity Type	Opportunity Description	Design Comments	Priority	Associated Storm Drain Assets*	Associated Resident Interaction
P46	P46-006	Improve Existing Conveyance System	This stormdrain system was likely installed prior to current design standards and could benefit from additional analysis for drainage improvement.		High	Pipe 38995 and upstream pipes	
P49	P49-001	Improve Existing Conveyance System	Field observations and interactions suggest that standing water is an issue at this location. Improve existing conveyance by regrading existing channel or extending existing pipe to tie into existing inlet.	Located on private property.	Medium	Outfall 7869, Inlet 24057	FI439
P50	P50-001	Improve Existing Conveyance System	Survey responses and field interactions suggest that flooding is significant at downstream intersection. Improve existing conveyance by adding an additional inlet in this area.		Medium		SUR0008, SUR0010, SUR0012
P50	P50-002	Improve Existing Conveyance System	Survey responses and field interactions suggest that flooding is significant at downstream intersection, and ponding water is common on adjacent properties. Improve existing conveyance by adding additional inlets in this area.		Medium		SUR0008, SUR0010, SUR0012
P50	P50-003	Improve Existing Conveyance System	Field observations and interactions suggest this inlet is likely not functioning as intended. Asphalt to be repaved in this area in order to allow runoff to be conveyed to this inlet.		Low	Inlet 24037	SUR0008, SUR0010, SUR0012, FI34
P50	P50-004	Improve Existing Conveyance System	This stormdrain system was likely installed prior to current design standards and could benefit from additional analysis for drainage improvement. Field observations and storm drain analysis suggests pipe is potentially inefficient.		Medium	Outfall 7744 and upstream pipes	SUR0007, SUR0142
P52	P52-001	Improve Existing Conveyance System	Field observations and interactions suggest that outfall channel consistently backs up and overflows. Regrade outfall channel to provide storage for flow and prevent standing water in backyards, and clean channel of sediment.	Located on private property.	Low	Outfall 7566, Outfall 7812	FI38
P52	P52-002	Improve Existing Conveyance System/ESD Practice	Field observations and survey responses suggest that flooding is significant in this area. Stream restoration should be considered in order to channelize flow away from private properties. ESD facilities to be considered in areas with drainage issues where ample space is available.	Located partially on private property.	High		SUR0014, SUR0017, SUR0115, SUR0117, SUR0118, SUR0119, SUR0136
P53	P53-001	Improve Existing Conveyance System	Field observations and survey responses suggest that ponding water is an issue in this area. Add a yard inlet connecting to existing storm drain network or regrade the yard to better convey flow towards the stream.	Located on private property.	Low	Pipe 38727	SUR0117
P54	P54-001	Improve Existing Conveyance System	Field observations suggest that ponding water is an issue in this area. Add additional inlet upstream of existing inlet to help with the spread and clean existing inlet of any debris.		Low	Inlet 24073	
P55	P55-001	Improve Existing Conveyance System	Existing infrastructure is likely not functioning as intended. Replace outfall structure and improve conveyance from storm drain outfall to downstream channel.	Located partially on private property.	Medium	Outfall 7815	
P56	P56-001	Detention Practices	Field observations suggest that this pond is not functioning as intended. Improve conveyance into and out of this facility by cleaning infow pipes and clearing forebay and outfall channel of sediment and debris.		Medium	Pipes 51037, 50636	
P56	P56-002	Improve Existing Conveyance System	This stormdrain system was likely installed prior to current design standards and could benefit from additional analysis for drainage improvement.		Low	Outfall 7793 and upstream pipes	

Assessment Area ID	Opportunity ID	Opportunity Type	Opportunity Description	Design Comments	Priority	Associated Storm Drain Assets*	Associated Resident Interaction
P57	P57-001	Improve Existing Conveyance System	Field observations and interactions suggest that this storm drain and outfall is not functioning as intended. Clean pipe of gravel and repair/replace disjointed pipe section at the outfall. Investigate need for outfall channel stabilization.	Located partially on private property.	Low	Outfall 7821, Pipe 50669, Inlet 24216	FI40
P59	P59-001	Improve Existing Conveyance System	This stormdrain system was likely installed prior to current design standards and could benefit from additional analysis for drainage improvement.		Low	Outfall 7409 and upstream pipes	
P60	P60-001	Improve Existing Conveyance System	Field observations and survey response suggest ponding water is an issue in this area. Possibly cut opening into back of existing inlet to allow flow to enter from back side.	Located partially on private property.	Low	Inlet 24234	SUR0002
P61	P61-001	Improve Existing Conveyance System	Field observations and survey response suggest that this outfall channel is likely not functioning as intended. Improve conveyance downstream of stormdrain outfall by regrading channel and stabilizing with riprap protection.	Located partially on private property.	Medium	Outfall 7507	SUR0001
P61	P61-002	Detention Practices	Field observations suggest that conveyance downstream of this SWM Pond is likely not functioning as intended. Erosion and debris were evident in the outfall channel. Improve existing conveyance by cleaning the principal spillway pipe and regrading the outfall channel.		Low	Outfall 7814	
P61	P61-003	Detention Practices	Field observations suggest that conveyance into this SWM Pond is not functioning as intended due to buildup of sediment and debris at the inflow. Improve existing conveyance by cleaning inflow pipe and clearing pond of sediment and debris.		Low	Outfall 7538	
P63	P63-001	Improve Existing Conveyance System	Field observations and survey response suggest that existing conveyance is not likely functioning as intended. Existing conveyance to be improved by replacing Pipe 219634 and regrading and stabilizing the downstream channel.	Located partially on private property.	Low	Outfall 7329, Outfall 7856, Pipe 219634	SUR0123

APPENDIX F: STORM DRAIN ANALYSIS DOCUMENTATION

Storm Drain Analysis Methodology

The adequacy of major storm drain networks were assessed for general compliance with sizing guidance, network layout, and condition. A major storm drain network was defined as having 3 or more contributing inlets. In the Plumtree Branch, 74 storm drain systems were analyzed.

A velocity-based approach simplified the inputs required for full hydraulic analysis. Velocity is affected by energy losses within a storm drain system. The Federal Highway Administration defines a minimum velocity of 3 ft/sec in order to maintain a self-cleaning storm drain system. A maximum velocity of 10 ft/sec was selected based on field observation and professional judgement. The analysis utilized the rational method to determine an approximate discharge for the 10-year storm event. A 10-year storm event corresponds to a storm with a 10% chance of occurring in any given year. This event is the industry standard for storm drain design. The rational method uses land use coefficient, drainage area, and storm intensity to compute a peak discharge. A land use coefficient for each network was determined using the predominate Howard County zoning category within the drainage area. Drainage areas were estimated for each storm drain network based on available contour data and storm drain infrastructure features collected during the field analysis. The National Oceanic and Atmospheric Administration's ATLAS 14 website was used to determine the storm intensity. Using the continuity equation, which relates discharge to velocity and area, a maximum and minimum diameter can be determined for each network.

The actual diameter of the terminal pipe segment was then compared to the range computed from the continuity equation. A storm drain system was considered likely adequate if the actual pipe size fell within the computed range. Further analysis of the storm drain network is recommended for systems where the actual pipe size was outside the computed range.

Storm drain systems were visually inspected in GIS to assess the layout of the network. The visual inspection of the network layout consisted of verifying that pipe sizes reflected changes in contributing area and for constrictions. For example, if the contributing area doubled at a confluence the pipe sizing responded to that change. If a downstream pipe segment was significantly smaller than an upstream pipe segment, it was considered a constriction.

Field crews recorded condition for individual pieces of infrastructure during the field assessment. Good condition indicates that the infrastructure was functioning as intended and in working order. Infrastructure with signs of sedimentation, observed debris, corrosion, or damage was marked for maintenance or repair. Inaccessible features were also marked for repair or maintenance.

References

Federal Highway Administration. 2013. HEC No. 22, Third Edition, Urban Drainage Design Manual. Downloaded April 19, 2019.

Assessment Area ID	Assessment Point ID	Approximate Drainage Area (ac)	Primary Zoning Code	Rational Method Coefficient	Intensity (in/hr)	10-year peak discharge (cfs)	Maximum Diameter (in)	Minimum Diameter, (in)	Actual Pipe Diameter* (in)
P01	Outfall 7296	3.5	R-20	0.4	5.23	12.9	28	15	15
P01	Outfall 7300	6.2	R-20	0.4	5.23	6.4	20	11	15
P02	Outfall 3417	23.1	R-20	0.4	5.23	48.3	54	30	45
P02	Outfall 7316	4.6	R-20	0.4	5.23	9.7	24	13	18
P03	Outfall 7309	3.8	R-20	0.4	5.23	8.0	22	12	18
P04	Outfall 7346	13.0		0.5	5.23	33.9	45	25	18
P05	Outfall 7324	5.4	R-20	0.4	5.23	11.3	26	14	21
P06	Outfall 7796	6.2	R-20	0.4	5.23	13.0	28	15	18
P07	Outfall 7341	2.0		0.5	5.23	5.2	18	10	18
P08	Outfall 7353	2.3		0.75	5.23	9.0	23	13	18
P09	Outfall 7797	2.2	R-20	0.4	5.23	4.6	17	9	18
P09	Outfall 7775	9.9	R-20	0.4	5.23	20.7	36	19	24
P10	Outfall 7328	15.9		0.75	5.23	62.4	62	34	18
P11	Outfall 7344	9.8	R-20	0.4	5.23	20.5	35	19	30
P12	Outfall 7362	6.0		0.6	5.23	18.8	34	19	27
P13	Outfall 7660	27.4	R-20	0.4	5.23	57.2	59	32	27
P13	Outfall 7656	20.5	R-20	0.4	5.23	42.9	51	28	30
P16	Outfall 7399	14.5	R-20	0.4	5.23	30.4	43	24	30
P19	Outfall 7414	51.7	R-20	0.4	5.23	108.2	81	45	42
P20	Outfall 7607	2.1	Commerical	0.83	5.23	9.2	24	13	18
P20	Outfall 7615	2.1	Commerical	0.83	5.23	9.2	24	13	24
P21	Outfall 7447	18.8	R-20	0.4	5.23	39.2	49	27	33
P22	Outfall 7669	15.0	R-20	0.4	5.23	31.3	44	24	24
P22	Outfall 7457	5.4	R-20	0.4	5.23	11.2	26	14	18
P24	Outfall 4223	25.1	R-20	0.4	5.23	52.6	57	31	36
P25	Outfall 7473	18.3	R-20	0.4	5.23	38.3	48	27	30
P26	Outfall 7633	8.4	R-20	0.4	5.23	17.6	33	18	15
P26	Outfall 7463	39.2	R-20	0.4	5.23	82.0	71	39	42
P28	Outfall 7654	9.2	R-20	0.4	5.23	19.1	34	19	30
P29	Outfall 7508	8.4	R-20	0.4	5.23	17.5	33	18	21
P29	Outfall 7513	8.4		0.75	5.23	32.8	45	25	36
P30	Outfall 7541	5.3		0.75	5.23	20.9	36	20	24
P31	Outfall 7539	26.6	R-20	0.4	5.23	55.6	58	32	18
P32	Outfall 7563	23.9		0.6	5.23	74.9	68	37	48
P32	Outfall 7577	2.0	Road	0.83	5.23	8.6	23	13	15
P33	Outfall 7532	9.5		0.75	5.23	37.1	48	26	48
P34	Outfall 7575	5.9	R-20	0.4	5.23	12.4	28	15	18
P35	Outfall 7592	6.4	R-20	0.4	5.23	13.5	29	16	24
P35	Outfall 7613	3.2	R-20	0.4	5.23	6.7	20	11	18
P35	Outfall 7352	1.6	Commerical	0.83	5.23	7.0	21	11	18
P36	Outfall 7558	21.8	Apartment	0.6	5.23	68.3	65	35	36
P38	Manhole 8833	5.4	Commerical	0.83	5.23	23.6	38	21	24
P38	Manhole 8831	2.0	Commerical	0.83	5.23	8.9	23	13	21
P40	Outfall 7801	3.2	B-2-TNC	0.8	5.23	13.5	28.7	15.7	27
P40	Outfall 1450	6.4	B-2-TNC	0.8	5.23	26.9	40.6	22.2	36
P41	Manhole 8854	25.1		0.7	5.23	91.7	74.9	41.0	54
P42	Inlet 23957	30.9		0.6	5.23	96.9	77.0	42.2	55
P43	Outfall 7847	9.0		0.3	5.23	14.0	29.3	16.0	16
P45	Outfall 7456	10.6		0.4	5.23	22.1	36.8	20.1	18
P46	Outfall 7612	63.7	R-20	0.4	5.23	133.2	90.2	49.4	48
P47	Outfall 7410	9.7	R-20	0.4	5.23	20.3	35.2	19.3	19
P47	Outfall 7735	4.8	R-20	0.4	5.23	10.1	24.9	13.6	18
P49	Outfall 7490	44.9	R-20	0.4	5.23	93.8	75.7	41.5	42
P50, P58	Outfall 7744	37.7	R-20	0.4	5.23	78.8	69.4	38.0	36
P51	Outfall 7819	8.6	R-20	0.4	5.23	17.9	33.1	18.1	21
P51	Outfall 7820	4.3	R-20	0.4	5.23	9.0	23.4	12.8	18
P52	Outfall 7359	17.5	R-20	0.4	5.23	36.6	47.3	25.9	36
P52	Outfall 7804	10.5		0.4	5.23	22.0	36.6	20.1	21
P52	Outfall 7299	7.0	R-20	0.4	5.23	14.6	29.9	16.4	21
P53	Outfall 1493	40.3	R-20	0.4	5.23	84.3	71.8	39.3	40

*Non-circular pipe features converted to equivalent circular pipe size.

Assessment Area ID	Assessment Point ID	Approximate Drainage Area (ac)	Primary Zoning Code	Rational Method Coefficient	Intensity (in/hr)	10-year peak discharge (cfs)	Maximum Diameter (in)	Minimum Diameter, (in)	Actual Pipe Diameter* (in)
P54	Outfall 7420	53.6	R-20	0.4	5.23	112.2	82.8	45.4	48
P54	Outfall 1466	25.5	R-21	0.4	5.23	53.3	57.1	31.2	36
P55	Outfall 7718	2.9	R-22	0.4	5.23	6.1	19.4	10.6	15
P55	Outfall 7815	2.9	R-23	0.4	5.23	6.1	19.4	10.6	21
P56	Outfall 7793	21.6	R-20	0.4	5.23	45.1	52.5	28.8	27
P56	Outfall 7779	8.6	R-20	0.4	5.23	18.0	33.2	18.2	24
P57	Outfall 7831	4.9	R-20	0.4	5.23	10.3	25.1	13.7	15
P58	Outfall 7834	10.6	R-20	0.4	5.23	22.2	36.8	20.2	24
P59	Outfall 7409	20.9	R-20	0.4	5.23	43.8	51.7	28.3	24 + 30
P60	Outfall 7823	7.0	R-20	0.35	5.23	12.9	28.0	15.3	24
P60	Outfall 7829	7.0	R-20	0.35	5.23	12.9	28.0	15.3	15 x 2
P61	Outfall 7803	8.3	R-20	0.35	5.23	15.2	30.5	16.7	18
P61	Outfall 7810	16.6	R-20	0.35	5.23	30.4	43.1	23.6	24
P63	Outfall 7848	8.2	R-20	0.35	5.23	15.0	30.3	16.6	18

*Non-circular pipe features converted to equivalent circular pipe size.

Assessment Area ID	Assessment Point ID	Approximate Drainage Area (ac)	Maximum Diameter (in)	Minimum Diameter, (in)	Actual Pipe Diameter* (in)	Sizing Comment	Potential Constrictions (Y/N)	System Deficiencies Observed (Y/N)	Recommendation Comment
P01	Outfall 7296	3.5	20	11	15	Within Range	No	Yes	Repair and Maintenance Recommended
P01	Outfall 7300	6.2	28	15	15	Within Range	No	Yes	Repair and Maintenance Recommended
P02	Outfall 3417	23.1	54	30	45	Within Range	No	Yes	Repair and Maintenance Recommended
P02	Outfall 7316	4.6	24	13	18	Within Range	No	Yes	Repair and Maintenance Recommended
P03	Outfall 7309	3.8	22	12	18	Within Range	No	Yes	Repair and Maintenance Recommended
P04	Outfall 7346	13.0	45	25	18	Outside of Range	No	Yes	Conduct More Detailed Analysis of Storm Drain Network
P05	Outfall 7324	5.4	26	14	21	Within Range	No	Yes	Repair and Maintenance Recommended
P06	Outfall 7796	6.2	28	15	18	Within Range	No	Yes	Repair and Maintenance Recommended
P07	Outfall 7341	2.0	18	10	18	Within Range	No	No	Repair and Maintenance Recommended
P08	Outfall 7353	2.3	23	13	18	Within Range	No	Yes	Repair and Maintenance Recommended
P09	Outfall 7797	2.2	17	9	18	Outside of Range	No	Yes	Conduct More Detailed Analysis of Storm Drain Network
P09	Outfall 7775	9.9	36	19	24	Within Range	No	Yes	Repair and Maintenance Recommended
P10	Outfall 7328	15.9	62	34	18	Outside of Range	No	Yes	Conduct More Detailed Analysis of Storm Drain Network
P11	Outfall 7344	9.8	35	19	30	Within Range	No	Yes	Repair and Maintenance Recommended
P12	Outfall 7362	6.0	34	19	27	Within Range	No	Yes	Repair and Maintenance Recommended
P13	Outfall 7660	27.4	59	32	27	Outside of Range	Yes	Yes	Conduct More Detailed Analysis of Storm Drain Network
P13	Outfall 7656	20.5	51	28	30	Within Range	No	Yes	Repair and Maintenance Recommended
P16	Outfall 7399	14.5	43	24	30	Within Range	No	Yes	Repair and Maintenance Recommended
P19	Outfall 7414	51.7	81	45	42	Outside of Range	Yes	Yes	Conduct More Detailed Analysis of Storm Drain Network
P20	Outfall 7607	2.1	24	13	18	Within Range	No	Yes	Repair and Maintenance Recommended
P20	Outfall 7615	2.1	24	13	24	Within Range	No	Yes	Repair and Maintenance Recommended
P21	Outfall 7447	18.8	49	27	33	Within Range	No	Yes	Repair and Maintenance Recommended
P22	Outfall 7669	15.0	44	24	24	Within Range	No	Yes	Conduct More Detailed Analysis of Storm Drain Network
P22	Outfall 7457	5.4	26	14	18	Within Range	No	Yes	Repair and Maintenance Recommended
P24	Outfall 4223	25.1	57	31	36	Within Range	Yes	Yes	Repair and Maintenance Recommended
P25	Outfall 7473	18.3	48	27	30	Within Range	No	Yes	Repair and Maintenance Recommended
P26	Outfall 7633	8.4	33	18	15	Outside of Range	Yes	Yes	Conduct More Detailed Analysis of Storm Drain Network
P26	Outfall 7463	39.2	71	39	42	Within Range	Yes	Yes	Conduct More Detailed Analysis of Storm Drain Network
P28	Outfall 7654	9.2	34	19	30	Within Range	No	Yes	Repair and Maintenance Recommended
P29	Outfall 7508	8.4	33	18	21	Within Range	No	No	Likely Adequate
P29	Outfall 7513	8.4	45	25	36	Within Range	No	No	Likely Adequate
P30	Outfall 7541	5.3	36	20	24	Within Range	No	Yes	Repair and Maintenance Recommended
P31	Outfall 7539	26.6	58	32	18	Outside of Range	No	Yes	Conduct More Detailed Analysis of Storm Drain Network
P32	Outfall 7563	23.9	68	37	48	Within Range	No	Yes	Repair and Maintenance Recommended
P32	Outfall 7577	2.0	23	13	15	Within Range	No	No	Conduct More Detailed Analysis of Storm Drain Network
P33	Outfall 7532	9.5	48	26	48	Within Range	No	Yes	Repair and Maintenance Recommended
P34	Outfall 7575	5.9	28	15	18	Within Range	No	Yes	Repair and Maintenance Recommended
P35	Outfall 7592	6.4	29	16	24	Within Range	No	Yes	Repair and Maintenance Recommended
P35	Outfall 7613	3.2	20	11	18	Within Range	No	Yes	Repair and Maintenance Recommended
P35	Outfall 7352	1.6	21	11	18	Within Range	No	Yes	Repair and Maintenance Recommended
P36	Outfall 7558	21.8	65	35	36	Within Range	No	Yes	Repair and Maintenance Recommended
P38	Manhole 8833	5.4	38	21	24	Within Range	Yes	Yes	Conduct More Detailed Analysis of Storm Drain Network
P38	Manhole 8831	2.0	23	13	21	Within Range	No	Yes	Repair and Maintenance Recommended
P40	Outfall 7801	3.2	29	16	27	Within Range	No	No	Likely Adequate

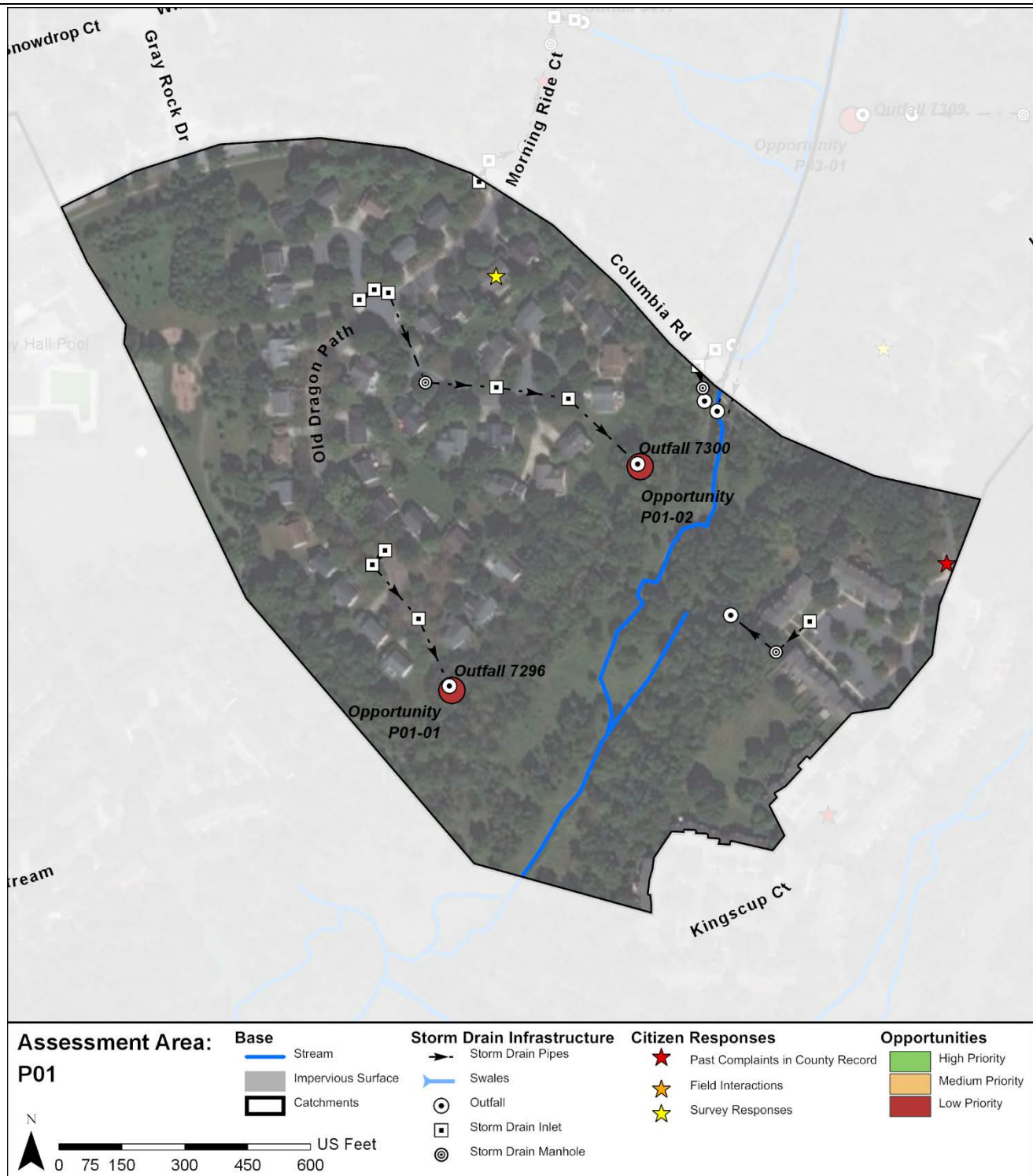
* Non-circular pipe features converted to equivalent circular pipe size.

Assessment Area ID	Assessment Point ID	Approximate Drainage Area (ac)	Maximum Diameter (in)	Minimum Diameter, (in)	Actual Pipe Diameter* (in)	Sizing Comment	Potential Constrictions (Y/N)	System Deficiencies Observed (Y/N)	Recommendation Comment
P40	Outfall 1450	6.4	41	22	36	Within Range	No	No	Likely Adequate
P41	Manhole 8854	25.1	75	41	54	Within Range	No	Yes	Repair and Maintenance Recommended
P42	Inlet 23957	30.9	77	42	55	Within Range	No	No	Likely Adequate
P43	Outfall 7847	9.0	29	16	16	Within Range	No	Yes	Repair and Maintenance Recommended
P45	Outfall 7456	10.6	37	20	18	Outside of Range	No	Yes	Repair and Maintenance Recommended
P46	Outfall 7612	63.7	90	49	48	Outside of Range	Yes	Yes	Conduct More Detailed Analysis of Storm Drain Network
P47	Outfall 7410	9.7	35	19	19	Within Range	No	Yes	Repair and Maintenance Recommended
P47	Outfall 7735	4.8	25	14	18	Within Range	No	No	Likely Adequate
P49	Outfall 7490	44.9	76	41	42	Within Range	No	No	Likely Adequate
P50, P58	Outfall 7744	37.7	69	38	36	Outside of Range	No	No	Conduct More Detailed Analysis of Storm Drain Network
P51	Outfall 7819	8.6	33	18	21	Within Range	No	No	Likely Adequate
P51	Outfall 7820	4.3	23	13	18	Within Range	No	Yes	Repair and Maintenance Recommended
P52	Outfall 7359	17.5	47	26	36	Within Range	No	Yes	Repair and Maintenance Recommended
P52	Outfall 7804	10.5	37	20	21	Within Range	No	No	Likely Adequate
P52	Outfall 7299	7.0	30	16	21	Within Range	No	No	Likely Adequate
P53	Outfall 1493	40.3	72	39	40	Within Range	Yes	Yes	Conduct More Detailed Analysis of Storm Drain Network
P54	Outfall 7420	53.6	83	45	48	Within Range	No	Yes	Repair and Maintenance Recommended
P54	Outfall 1466	25.5	57	31	36	Within Range	No	No	Likely Adequate
P55	Outfall 7718	2.9	19	11	15	Within Range	No	No	Likely Adequate
P55	Outfall 7815	2.9	19	11	21	Within Range	No	Yes	Repair and Maintenance Recommended
P56	Outfall 7793	21.6	53	29	27	Outside of Range	Yes	No	Conduct More Detailed Analysis of Storm Drain Network
P56	Outfall 7779	8.6	33	18	24	Within Range	No	Yes	Repair and Maintenance Recommended
P57	Outfall 7831	4.9	25	14	15	Within Range	No	Yes	Repair and Maintenance Recommended
P58	Outfall 7834	10.6	37	20	24	Within Range	Yes	Yes	Conduct More Detailed Analysis of Storm Drain Network
P59	Outfall 7409	20.9	52	28	24 + 30	Outside of Range	No	Yes	Conduct More Detailed Analysis of Storm Drain Network
P60	Outfall 7823	7.0	28	15	24	Within Range	No	Yes	Repair and Maintenance Recommended
P60	Outfall 7829	7.0	28	15	15 x 2	Within Range	No	No	Likely Adequate
P61	Outfall 7803	8.3	30	17	18	Within Range	No	Yes	Repair and Maintenance Recommended
P61	Outfall 7810	16.6	43	24	24	Within Range	No	No	Likely Adequate
P63	Outfall 7848	8.2	30	17	18	Within Range	No	No	Likely Adequate

* Non-circular pipe features converted to equivalent circular pipe size.

APPENDIX G: ASSESSMENT AREA PROFILE SHEETS

PLUMTREE BRANCH WATERSHED ASSESSMENT AREA P01



Assessment Area Category:
POTENTIAL REPAIR AND MAINTENANCE PROJECT

Approximate Assessment Area: 30.8 acres
Approximate Imperviousness: 18%

ASSESSMENT AREA DESCRIPTION

The P01 assessment area is a 30.8-acre area in Howard County's Plumtree Branch watershed. The assessment area largely consists of residential houses. The area is bounded to the north by Columbia Road and captures runoff from a short cul-de-sac extending off Old Dragon Path. Captured stormwater within P01 is discharged directly into Plumtree Branch through multiple outfalls. All sections of roadway within P01 are closed section. There are two major storm drain systems within the assessment area.

There was one survey response within the P01 that suggested that drainage may be an issue within the assessment area.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	7	3	3	11
Further Investigation Recommended	3	2	0	2
Total	10	5	3	13

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Outfall 7296

Approximate Drainage Area:	3.5 Acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	Yes
Conclusion:	Repair and Maintenance Recommended

Assessment Point ID: Outfall 7300

Approximate Drainage Area:	6.2 Acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	Yes
Conclusion:	Repair and Maintenance Recommended

OPPORTUNITIES

Opportunities identified in early 2019 focus on improving drainage and addressing expressed concerns.

Type	ID No.	Description & Discussion
Improve Existing Conveyance System	P01-01	Existing storm drain system is likely not functioning as intended based on field observations. Analyze system and, if necessary, improve system with modified infrastructure.
Improve Existing Conveyance System	P01-02	Existing storm drain system is likely not functioning as intended based on field observations. Analyze system and, if necessary, improve system with modified infrastructure.

PHOTOS



Figure 1: Typical inlet along Old Dragon Path.

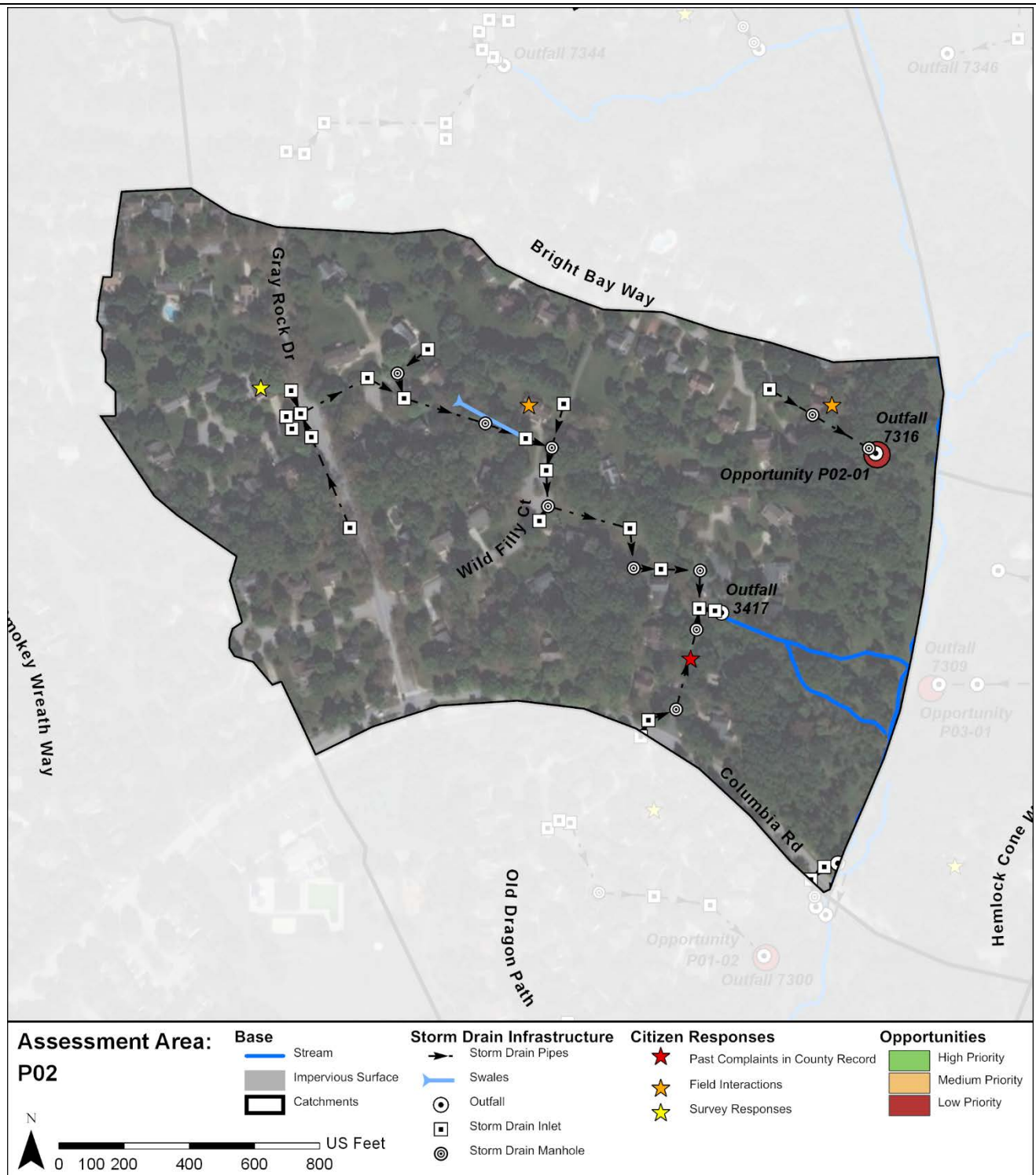


Figure 2: Typical submerged outfall requiring repair.



Figure 3: Opportunity to improve existing conveyance system.

PLUMTREE BRANCH WATERSHED ASSESSMENT AREA P02



Assessment Area Category:
POTENTIAL REPAIR AND MAINTENANCE PROJECT

Approximate Assessment Area: 46.2 acres
Approximate Imperviousness: 20%

ASSESSMENT AREA DESCRIPTION

The P02 assessment area is an approximately 46.2-acre area in Howard County's Plumtree Branch watershed. The assessment area largely consists of medium-density residential. The area captures runoff from Morning Ride Court, the courts along Gray Fox Drive between Columbia Road and Red Bandana Way, and portions of Columbia Road, Red Bandana Way, and Bright Bay Way. P02 contains two outfalls which discharge captured stormwater into Plumtree Branch. All sections of roadway within P02 are closed section. There is one major storm drain system within the assessment area.

Field interactions and a survey response suggest that flooding has been a growing concern within the assessment area during heavy thunderstorms.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	18	2	4	26
Further Investigation Recommended	3	1	6	5
Total	21	3	10	31

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Outfall 7316

Approximate Drainage Area:	4.6 Acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	Yes
Conclusion:	Repair and Maintenance Recommended

Assessment Point ID: Outfall 3417	
Approximate Drainage Area:	23.1 Acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	Yes
Conclusion:	Repair and Maintenance Recommended

OPPORTUNITIES

Opportunities identified in early 2019 focus on improving drainage and addressing expressed concerns.

Type	ID No.	Description & Discussion
Improve Existing Conveyance System	P02-01	Existing storm drain system is likely not functioning as intended based on field observations. Field interaction suggests flooding is an issue. Analyze system and, if necessary, improve system with modified infrastructure.

PHOTOS



Figure 1: Typical inlet along Gray Rock Drive.

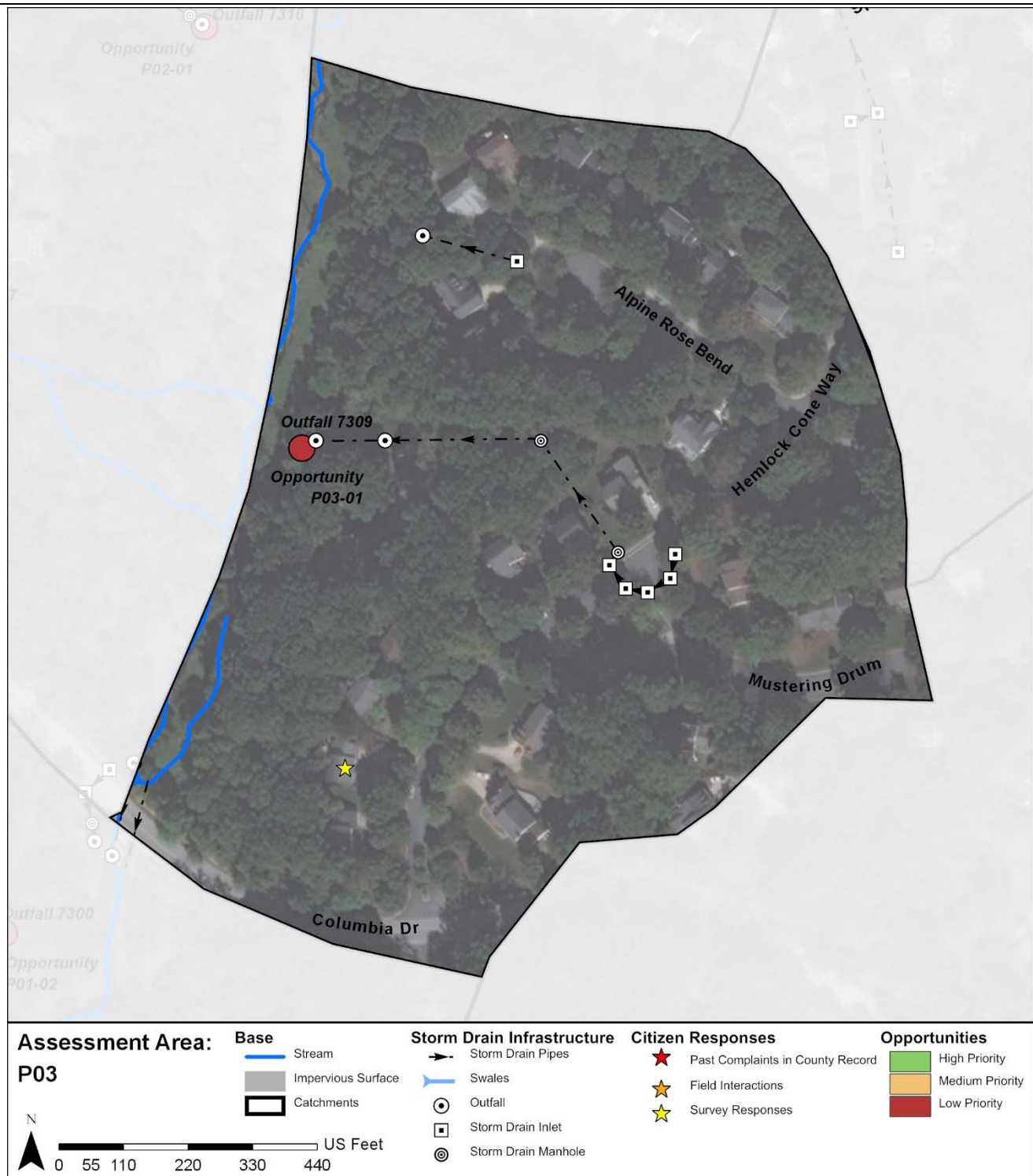


Figure 2: Inlet with observed debris.



Figure 3: Opportunity to improve existing conveyance system.

PLUMTREE BRANCH WATERSHED ASSESSMENT AREA P03



Assessment Area Category:
POTENTIAL REPAIR AND MAINTENANCE PROJECT

Approximate Assessment Area: 19.3 acres
Approximate Imperviousness: 23%

ASSESSMENT AREA DESCRIPTION

The P03 assessment area is an approximately 19.3-acre area in Howard County's Plumtree Branch watershed. The assessment area largely consists of medium-density residential. The area captures runoff from Alpine Rose Bend and portions of Hemlock Cone Way and Columbia Road. P03 contains two outfalls which discharge captured stormwater into Plumtree Branch. All sections of roadway within P03 are closed section. There is one major storm drain system within the assessment area.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	6	1	1	10
Further Investigation Recommended	0	2	1	0
Total	6	3	2	10

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Outfall 7309

Approximate Drainage Area:	3.8 Acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	Yes
Conclusion:	Repair and Maintenance Recommended

OPPORTUNITIES

Opportunities identified in early 2019 focus on improving drainage and addressing expressed concerns.

Type	ID No.	Description & Discussion
Improve Existing Conveyance System	P03-01	Existing conveyance system is likely not functioning as intended. Field observations note that conveyance is undefined. Analyze system and, if necessary, improve system with modified infrastructure.

PHOTOS



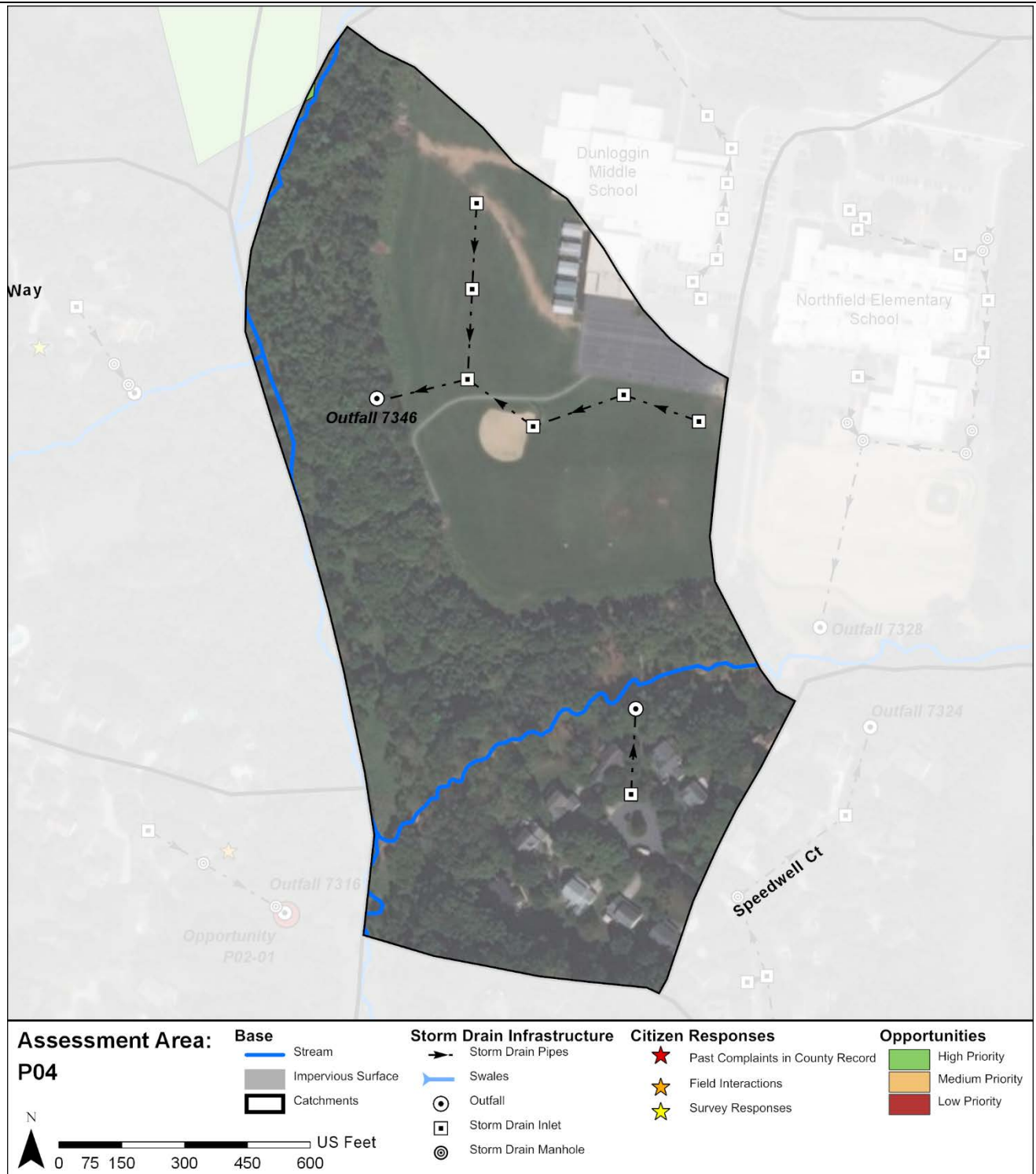
Figure 1: Typical inlet along Hemlock Cone Way.



Figure 2: Opportunity to improve existing conveyance system.

PLUMTREE BRANCH WATERSHED

ASSESSMENT AREA P04



Assessment Area Category:
POTENTIAL CAPITAL IMPROVEMENT PROJECT

Approximate Assessment Area: 25.9 acres
Approximate Imperviousness: 5%

ASSESSMENT AREA DESCRIPTION

The P04 assessment area is an approximately 25.9-acre area in Howard County's Plumtree Branch watershed. The assessment area is largely open space with some institutional use and residential areas. The assessment area includes the athletic fields of Dunloggin Middle School, a small portion of the school building, and a section of residential houses along Hemlock Cone Way. P04 includes two outfalls which convey flows into Plumtree Branch, one on school property and one to the north of Hemlock Cone Way. The only roadway within P04 is a small section of Hemlock Cone Way which is closed section. There is one major conveyance system within the assessment area which drains Dunloggin Middle School's athletic fields.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	7	2	0	6
Further Investigation Recommended	0	0	0	1
Total	7	2	0	7

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Outfall 7346

Approximate Drainage Area:	13.0 Acres
Storm Drain Sizing:	Outside of Range
Potential Constrictions:	No
Observed System Deficiencies:	Yes
Conclusion:	Conduct More Detailed Analysis of Storm Drain Network

OPPORTUNITIES

Opportunities identified in early 2019 focus on improving drainage and addressing expressed concerns.

Type	ID No.	Description & Discussion
Conduct More Detailed Analysis of Storm Drain Network	N/A	The major storm drain network(s) within the assessment area is likely not functioning as intended. More detailed analysis is recommended to determine if improving the network with modified infrastructure is necessary.

PHOTOS

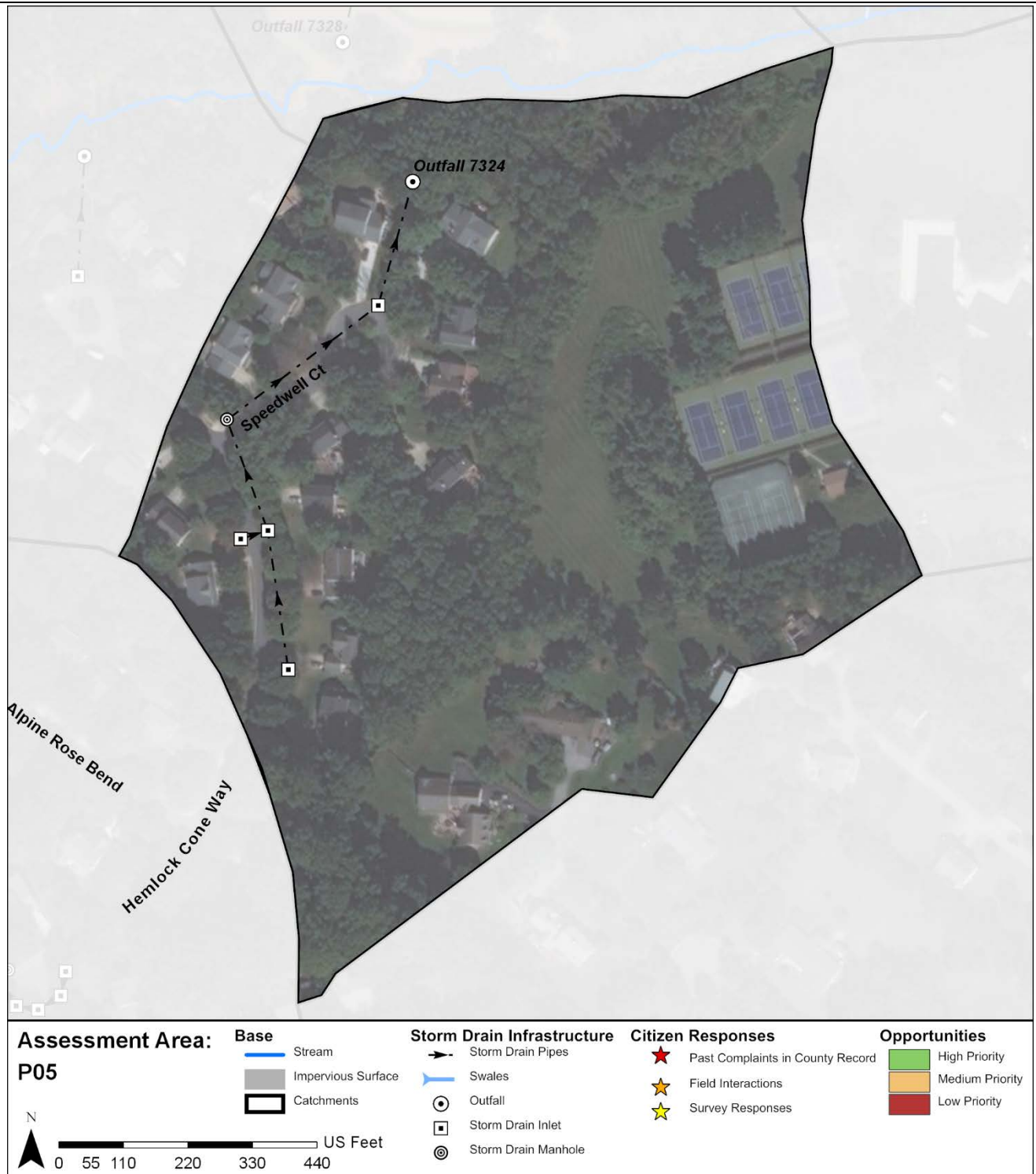


Figure 1: Typical inlet located within Dunloggin Middle School athletic field.



Figure 2: Sinkhole forming above pipe.

PLUMTREE BRANCH WATERSHED ASSESSMENT AREA P05



Assessment Area Category:
POTENTIAL REPAIR AND MAINTENANCE PROJECT

Approximate Assessment Area: 18.0 acres
Approximate Imperviousness: 13%

ASSESSMENT AREA DESCRIPTION

The P05 assessment area is an approximately 18.0-acre area in Howard County's Plumtree Branch watershed. The assessment area includes residential houses as well as a large portion of the Forest Hill Swim and Tennis Club. The area captures runoff from Speedwell Court as well as portions of Hemlock Cone Way and the Forest Hill Swim and Tennis Club. Captured runoff within P05 is conveyed to a single outfall to the north of the Speedwell Court cul-de-sac. All sections of roadway within P05 are closed section. There is one major storm drain system within the assessment area that serves Speedwell Court and a section of Hemlock Cone Way. The rest of the assessment area drains naturally into a tributary of Plumtree Branch.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	4	1	0	5
Further Investigation Recommended	0	0	1	0
Total	4	1	1	5

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Outfall 7324

Approximate Drainage Area:	5.4 Acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	Yes
Conclusion:	Repair and Maintenance Recommended

OPPORTUNITIES

No specific opportunities were identified in this assessment area. However, individuals are encouraged to install environmentally friendly practices that promote infiltration (rain gardens, downspout disconnection, etc.) and improve conveyance (vegetated swales, etc.) on their own properties. In addition, a list of infrastructure assets that may require maintenance and/or repair was submitted to the Bureau of Highways.

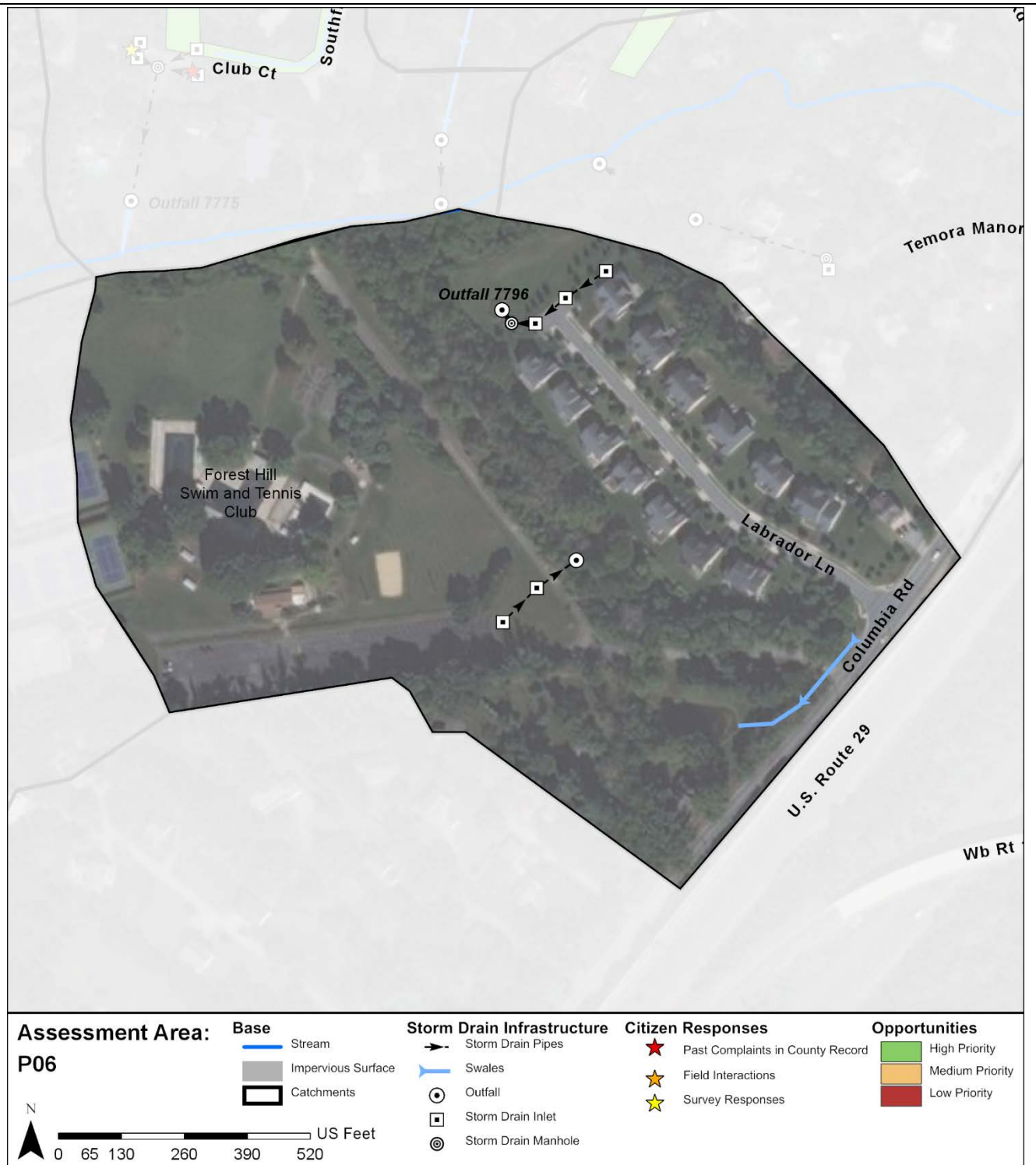
PHOTOS



Figure 1: Typical inlet along Speedwell Court.

PLUMTREE BRANCH WATERSHED

ASSESSMENT AREA P06



Assessment Area Category:
POTENTIAL REPAIR AND MAINTENANCE PROJECT

Approximate Assessment Area: 22.8 acres
Approximate Imperviousness: 18%

ASSESSMENT AREA DESCRIPTION

The P06 assessment area is an approximately 22.8-acre area in Howard County's Plumtree Branch watershed. The assessment area includes residential houses as well as a large portion of the Forest Hill Swim and Tennis Club. The area captures runoff from Labrador Lane, a portion of Columbia Road, and roughly half of the Forest Hill Swim and Tennis Club including its parking lot. Captured runoff within P06 is conveyed towards two outfalls, one within the swim and tennis club, and one within a stormwater management pond at the end of Labrador Lane. All sections of roadway within P06 are closed section excluding the roadway within the Forest Hill Swim and Tennis Club. The parking lot within the club is closed section. Only the storm drain system at the bottom of Labrador Lane met the minimum criteria for analysis.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	2	2	1	4
Further Investigation Recommended	3	0	0	2
Total	5	2	1	6

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Outfall 7796

Approximate Drainage Area:	6.2 Acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	Yes
Conclusion:	Repair and Maintenance Recommended

OPPORTUNITIES

No specific opportunities were identified in this assessment area. However, individuals are encouraged to install environmentally friendly practices that promote infiltration (rain gardens, downspout disconnection, etc.) and improve conveyance (vegetated swales, etc.) on their own properties. In addition, a list of infrastructure assets that may require maintenance and/or repair was submitted to the Bureau of Highways.

PHOTOS

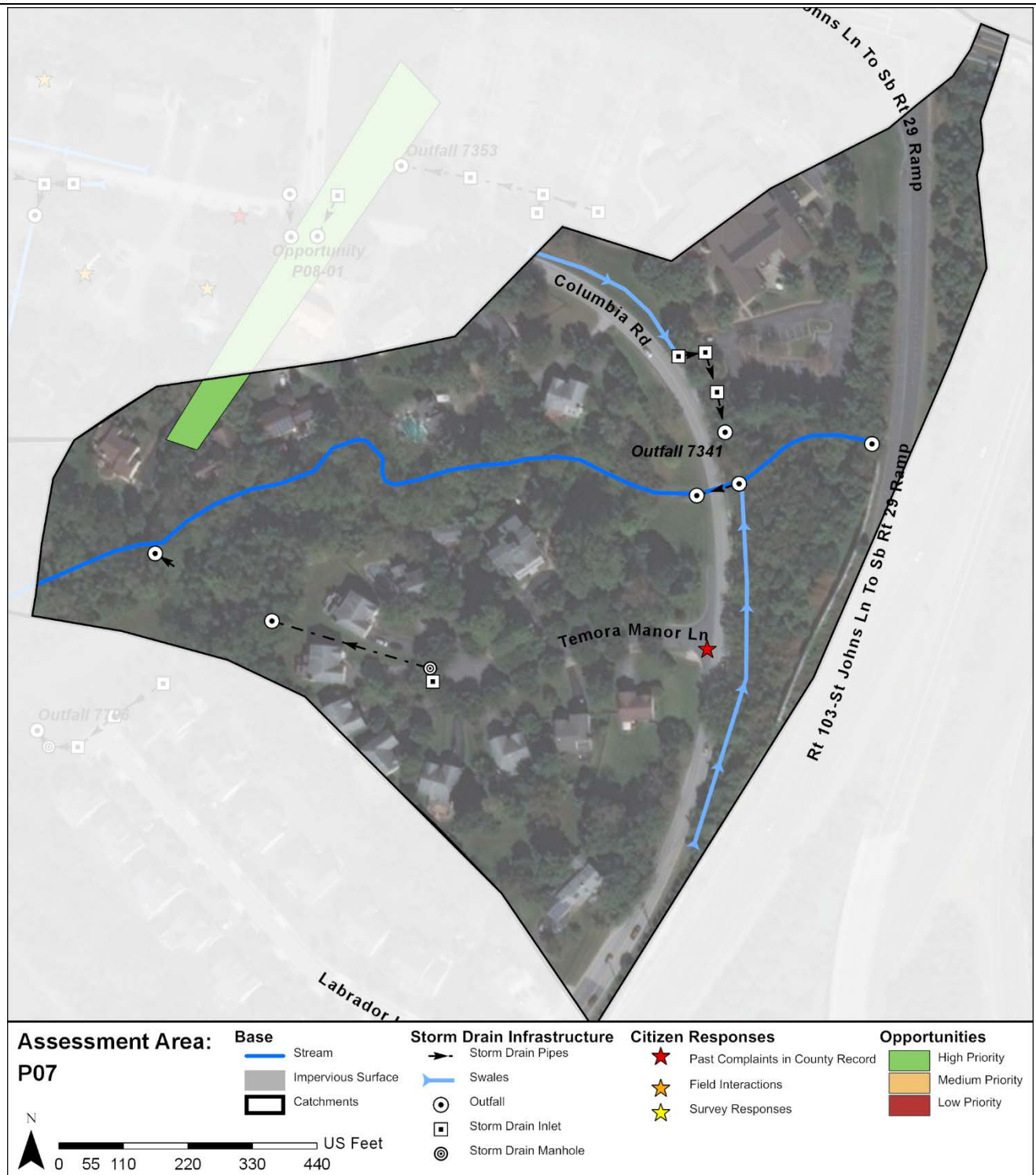


Figure 1: Inlet at Forest Hill Swim and Tennis Club requiring repair.



Figure 2: Inlet at Forest Hill Swim and Tennis Club requiring repair with observed debris.

PLUMTREE BRANCH WATERSHED ASSESSMENT AREA P07



Assessment Area Category:
POTENTIAL REPAIR AND MAINTENANCE PROJECT

Approximate Assessment Area: 17.0 acres
Approximate Imperviousness: 23%

ASSESSMENT AREA DESCRIPTION

The P07 assessment area is an approximately 17.0-acre area in Howard County's Plumtree Branch watershed. The assessment area is mostly residential and also includes some institutional use. The assessment area is bound by U.S. Route 29 to the east and includes Temora Manor Lane, a section of Columbia Road, and a portion of the property owned by The Church of Jesus Christ of Latter-day Saints. Captured stormwater within P07 is conveyed to multiple outfalls along an unnamed tributary to Plumtree Branch. Roughly half of the roadways within the P07 assessment area are closed section. There is one major conveyance system which serves the parking lot of the church.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	3	3	0	6
Further Investigation Recommended	1	3	1	1
Total	4	6	1	7

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Outfall 7341

Approximate Drainage Area:	2.0 Acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	No
Conclusion:	Repair and Maintenance Recommended

OPPORTUNITIES

No specific opportunities were identified in this assessment area. However, individuals are encouraged to install environmentally friendly practices that promote infiltration (rain gardens, downspout disconnection, etc.) and improve conveyance (vegetated swales, etc.) on their own properties. In addition, a list of infrastructure assets that may require maintenance and/or repair was submitted to the Bureau of Highways.

PHOTOS

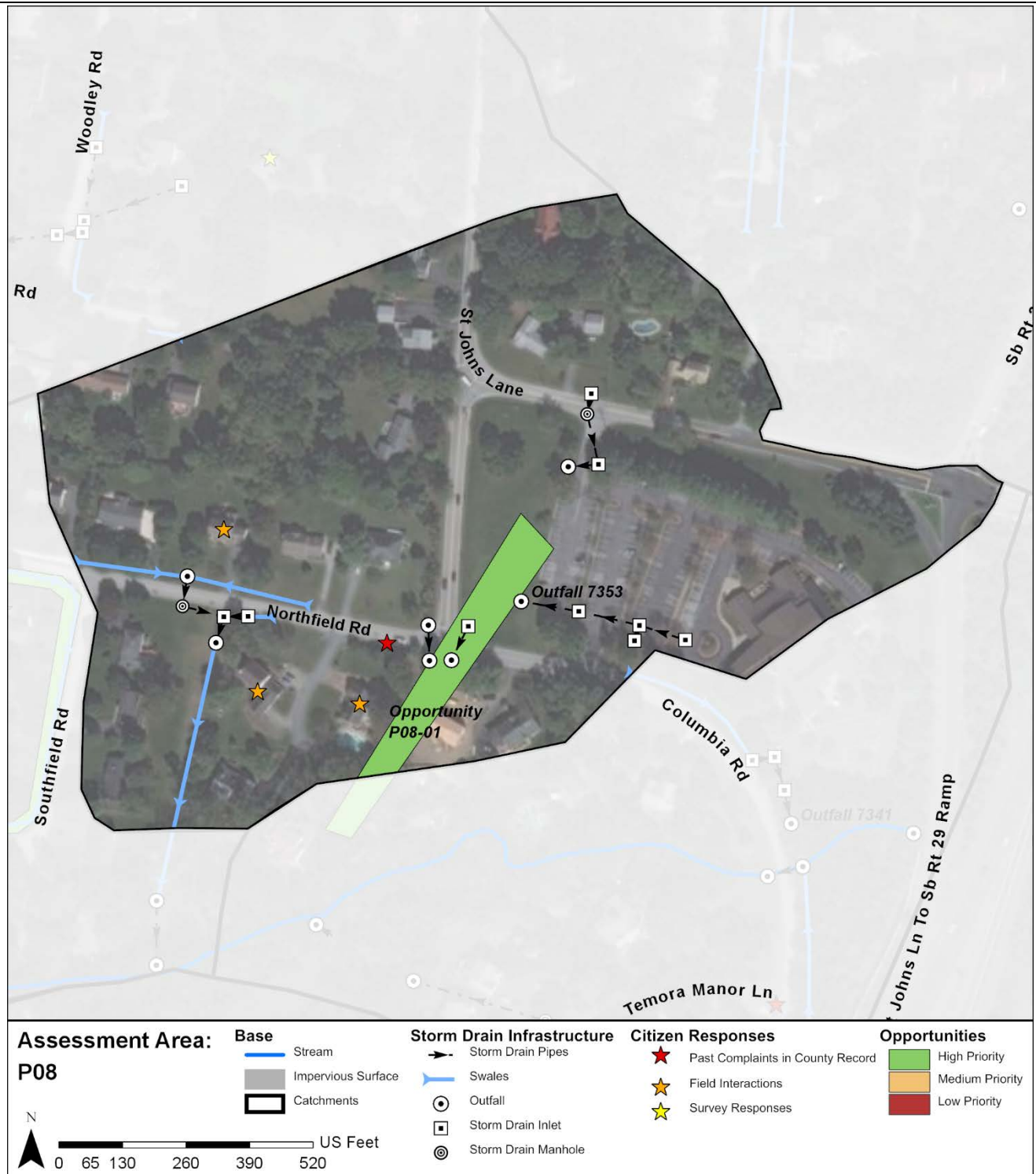


Figure 1: Typical inlet along Columbia Road.



Figure 2: Inlet along Columbia Road with observed debris.

PLUMTREE BRANCH WATERSHED ASSESSMENT AREA P08



Assessment Area Category:
POTENTIAL CAPITAL IMPROVEMENT PROJECT

Approximate Assessment Area: 21.2 acres
Approximate Imperviousness: 28%

ASSESSMENT AREA DESCRIPTION

The P08 assessment area is an approximately 21.2-acre area in Howard County's Plumtree Branch watershed. The assessment area is largely residential with some institutional use as well. The assessment area is intersected by Northfield Road/Columbia Road and St. John's Lane. P08 contains a portion of the Church of Jesus Christ of Latter-day Saints and its adjoining parking lot, as well as a stormwater management (SWM) facility immediately downstream of the parking lot. The SWM facility conveys its discharge through a roadway culvert under Northfield Road into an eroding channel located on private property. All roadways within P08 are open section. Only a small portion of Northfield Road and the drainage area to the stormwater management facility are managed by storm drain infrastructure or swales. The network draining to the stormwater management facility is the only major conveyance system within the assessment area.

Several field interactions suggested that the SWM facility is overtopping and flooding Northfield Road during heavy thunderstorms. Erosion throughout the facility's outfall channel is significant and a frequent issue for residents.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	8	5	1	12
Further Investigation Recommended	1	2	1	1
Total	9	7	2	13

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Outfall 7353

Approximate Drainage Area:	2.3 Acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	Yes
Conclusion:	Repair and Maintenance Recommended

OPPORTUNITIES

Opportunities identified in early 2019 focus on improving drainage and addressing expressed concerns.

Type	ID No.	Description & Discussion
Improve Existing Conveyance System	P08-01	Existing conveyance system is likely not functioning as intended based on field observations. Field interactions and survey responses suggest that pond's outfall structure is likely not functioning as intended. Analyze system and, if necessary, improve system with modified infrastructure.

PHOTOS



Figure 1: Opportunity to improve existing conveyance system.



Figure 2: Opportunity to improve existing conveyance system.

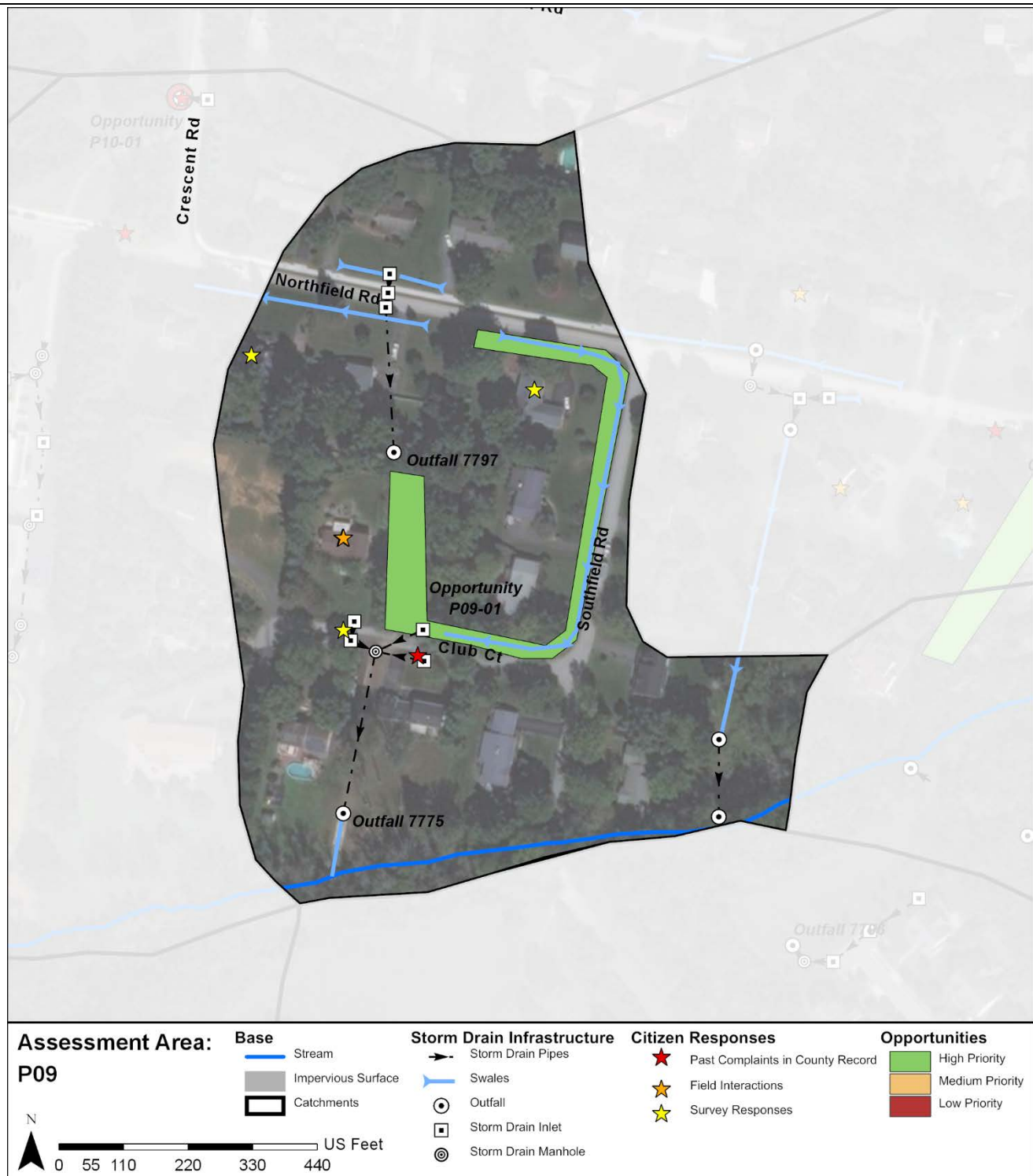


Figure 3: Opportunity to improve existing conveyance system.



Figure 4: Typical inlet within The Church of Jesus Christ of Latter-Day Saints parking lot.

PLUMTREE BRANCH WATERSHED ASSESSMENT AREA P09



Assessment Area Category:
POTENTIAL CAPITAL IMPROVEMENT PROJECT

Approximate Assessment Area: 12.1 acres
Approximate Imperviousness: 17%

ASSESSMENT AREA DESCRIPTION

The P09 assessment area is an approximately 12.1-acre area in Howard County's Plumtree Branch watershed. The assessment area is largely medium-density residential. P09 captures runoff from Southfield Road, Club Court, and a portion of Northfield Road. Stormwater within the assessment area is conveyed to an outfall south of Club Court on an unnamed tributary to Plumtree Branch. The majority of the roadways within P09 are open section. A previous Capital Improvement Project installed curb and gutter on a small section of the northern side of Northfield Road. There are two major conveyance systems within P09.

Survey responses, field observations, and homeowner interactions suggested that flooding is an issue every time it rains. Capacity and condition of downstream conveyance systems should be considered in any further analysis or improvements.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	5	3	1	9
Further Investigation Recommended	2	1	0	0
Total	7	4	1	9

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Outfall 7797

Approximate Drainage Area:	2.2 Acres
Storm Drain Sizing:	Outside of Range
Potential Constrictions:	No
Observed System Deficiencies:	Yes
Conclusion:	Conduct More Detailed Analysis of Storm Drain Network

Assessment Point ID: Outfall 7775	
Approximate Drainage Area:	9.9 Acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	Yes
Conclusion:	Repair and Maintenance Recommended

OPPORTUNITIES

Opportunities identified in early 2019 focus on improving drainage and addressing expressed concerns.

Type	ID No.	Description & Discussion
Install New Conveyance System	P09-01	Existing conveyance system is likely not functioning as intended. Field observations, field interactions, and survey responses suggest that runoff from roadway is concentrating and flowing across private property. Analyze system and, if necessary, improve system with modified infrastructure.
Conduct More Detailed Analysis of Storm Drain Network	N/A	The major storm drain network(s) within the assessment area is likely not functioning as intended. More detailed analysis is recommended to determine if improving the network with modified infrastructure is necessary.

PHOTOS

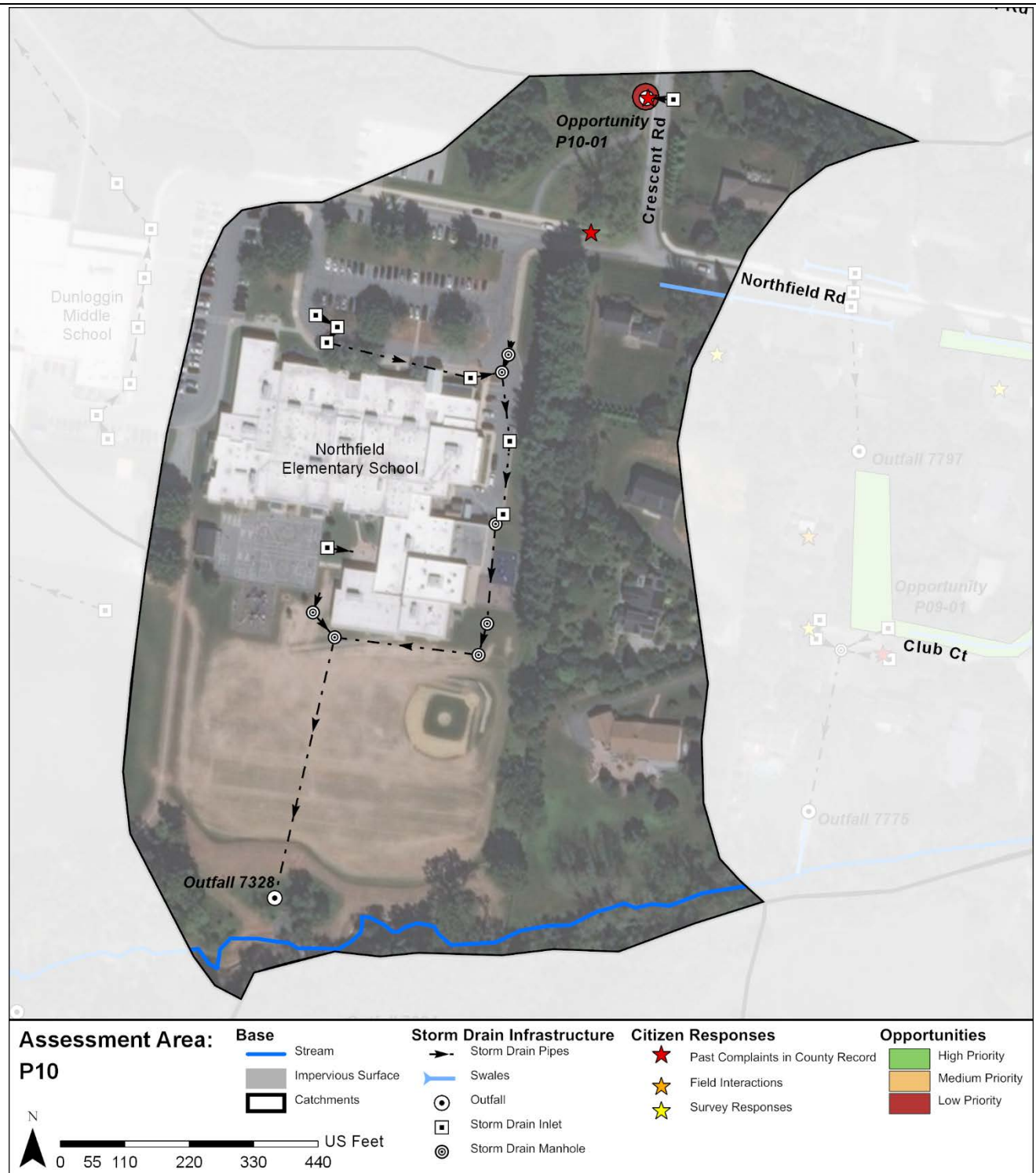


Figure 1: Opportunity to install new conveyance system.



Figure 2: Opportunity to install new conveyance system.

PLUMTREE BRANCH WATERSHED ASSESSMENT AREA P10



Assessment Area Category:
POTENTIAL CAPITAL IMPROVEMENT PROJECT

Approximate Assessment Area: 18.6 acres
Approximate Imperviousness: 24%

ASSESSMENT AREA DESCRIPTION

The P10 assessment area is an approximately 18.6-acre area in Howard County's Plumtree Branch watershed. A majority of the assessment area is comprised of Northfield Elementary School. The assessment area includes the school building, parking lot, and athletic fields, as well as a few residential properties to the east. Stormwater captured within P10 is conveyed to a single outfall to the south of Northfield Elementary School. Roughly half of the roadways within the P10 assessment area are closed section. There is one major conveyance system within the assessment area which drains the entire property of Northfield Elementary School.

Although there were no survey responses or field interactions within the assessment area, there are two complaints in the County database related to drainage within P10.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	7	1	6	16
Further Investigation Recommended	1	1	1	1
Total	8	2	7	17

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Outfall 7328

Approximate Drainage Area:	15.9 Acres
Storm Drain Sizing:	Outside of Range
Potential Constrictions:	No
Observed System Deficiencies:	Yes
Conclusion:	Conduct More Detailed Analysis of Storm Drain Network

OPPORTUNITIES

Opportunities identified in early 2019 focus on improving drainage and addressing expressed concerns.

Type	ID No.	Description & Discussion
Improve Existing Conveyance System	P10-01	Existing conveyance system is likely not functioning as intended. Analyze system and, if necessary, improve system with modified infrastructure.
Conduct More Detailed Analysis of Storm Drain Network	N/A	The major storm drain network(s) within the assessment area is likely not functioning as intended. More detailed analysis is recommended to determine if improving the network with modified infrastructure is necessary.

PHOTOS



Figure 1: Opportunity to improve existing conveyance system.

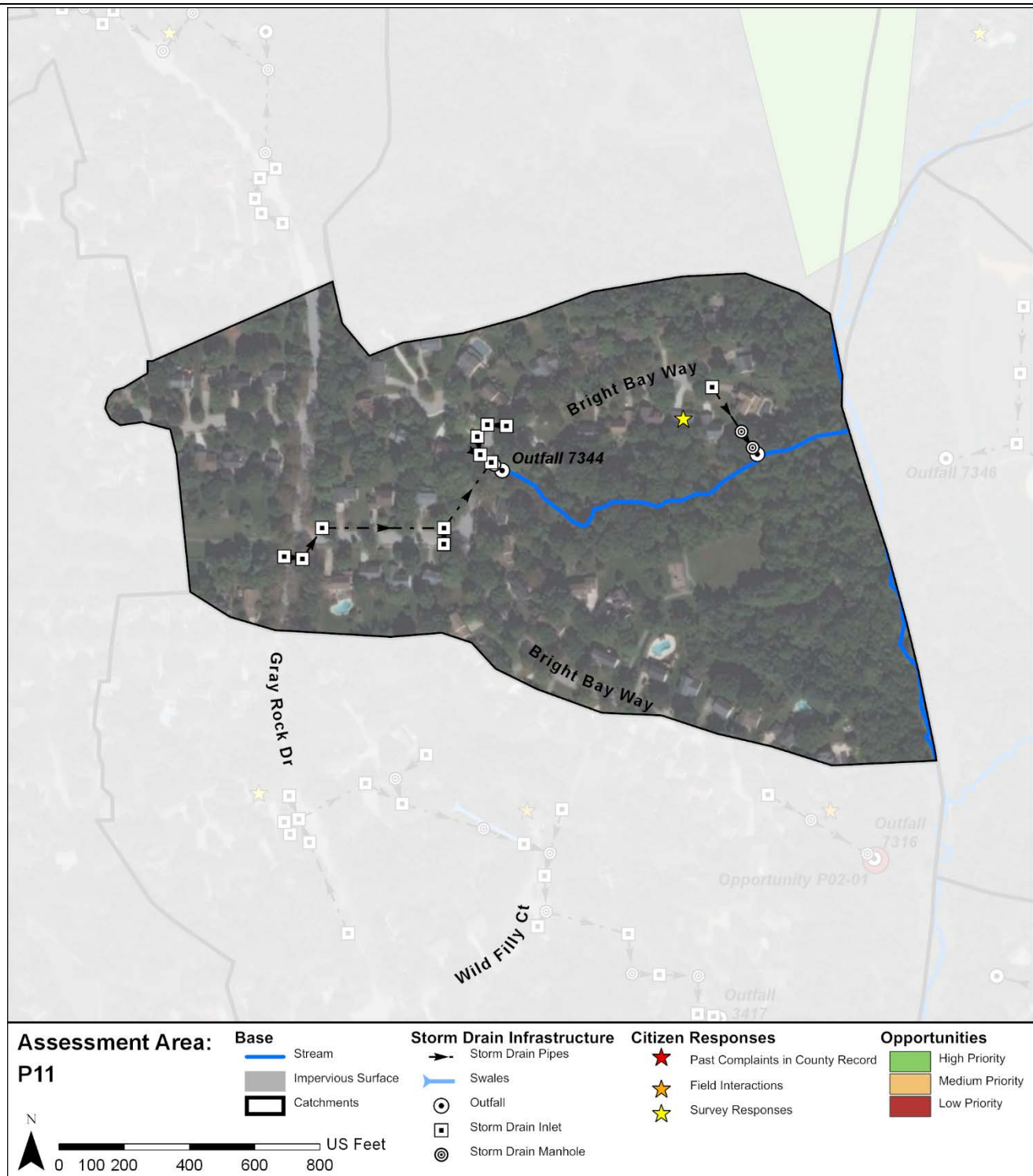


Figure 2: Typical inlet in front of Northfield Elementary School.



Figure 3: Typical inlet with observed debris.

PLUMTREE BRANCH WATERSHED ASSESSMENT AREA P11



Assessment Area Category:
POTENTIAL REPAIR AND MAINTENANCE PROJECT

Approximate Assessment Area: 34.7 acres
Approximate Imperviousness: 17%

ASSESSMENT AREA DESCRIPTION

The P11 assessment area is an approximately 34.7-acre area in Howard County's Plumtree Branch watershed. The assessment area largely includes medium-density residential. The area captures runoff from Dancing Sunbeam Court, Sunlit Passage, and Eagles Wing Court, as well as most of Bright Bay Way and a portion of Gray Rock Drive. Captured runoff within P11 is conveyed towards two outfalls to the east of Bright Bay Way. All sections of roadway within P11 are closed section. There is one major storm drain system within the assessment area.

A survey response indicated that ponding water in the vicinity of a buried outfall is an issue during heavy thunderstorms.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	10	2	1	12
Further Investigation Recommended	1	0	2	3
Total	11	2	3	15

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Outfall 7344

Approximate Drainage Area:	9.8 Acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	Yes
Conclusion:	Repair and Maintenance Recommended

OPPORTUNITIES

No specific opportunities were identified in this assessment area. However, individuals are encouraged to install environmentally friendly practices that promote infiltration (rain gardens, downspout disconnection, etc.) and improve conveyance (vegetated swales, etc.) on their own properties. In addition, a list of infrastructure assets that may require maintenance and/or repair was submitted to the Bureau of Highways.

PHOTOS

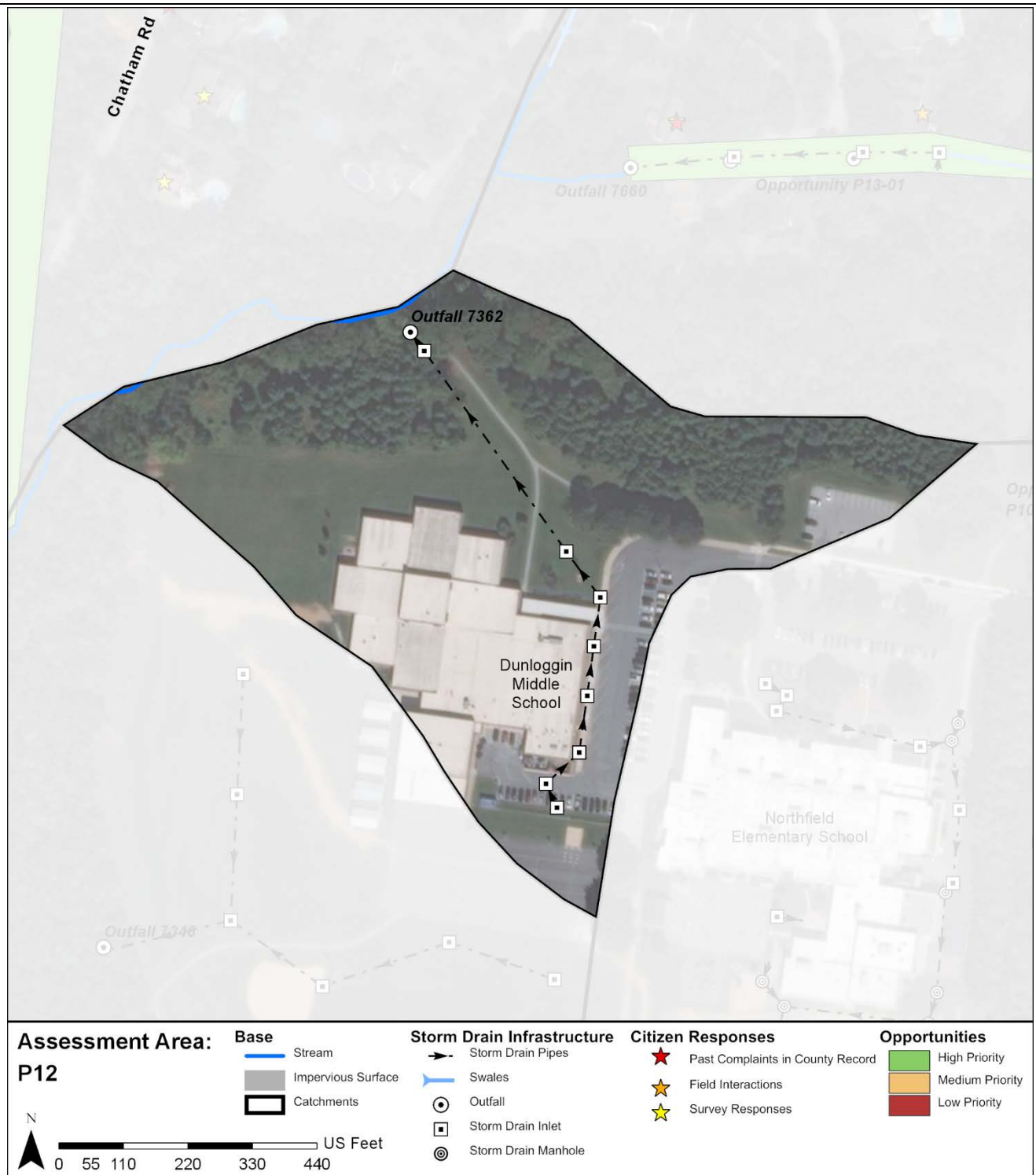


Figure 1: Typical inlet along Sunlit Passage.



Figure 2: Typical outfall along Bright Bay Way.

PLUMTREE BRANCH WATERSHED ASSESSMENT AREA P12



Assessment Area Category:
POTENTIAL REPAIR AND MAINTENANCE PROJECT

Approximate Assessment Area: 9.3 acres
Approximate Imperviousness: 29%

ASSESSMENT AREA DESCRIPTION

The P12 assessment area is an approximately 9.3-acre area in Howard County's Plumtree Branch watershed. A majority of the assessment area is comprised of Dunloggin Middle School. The assessment area includes the school building, sections of two parking lots, and the open space to the north of the school. Stormwater captured within P12 is conveyed to a single outfall to the north of Dunloggin Middle School. A majority of the roadways within the P12 assessment area are closed section. There is one major conveyance system within the assessment area which drains much of the property of the school.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	6	0	0	7
Further Investigation Recommended	2	1	0	1
Total	8	1	0	8

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Outfall 7362

Approximate Drainage Area:	6.0 Acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	Yes
Conclusion:	Repair and Maintenance Recommended

OPPORTUNITIES

No specific opportunities were identified in this assessment area. However, individuals are encouraged to install environmentally friendly practices that promote infiltration (rain gardens, downspout disconnection, etc.) and improve conveyance (vegetated swales, etc.) on their own properties. In addition, a list of infrastructure assets that may require maintenance and/or repair was submitted to the Bureau of Highways.

PHOTOS

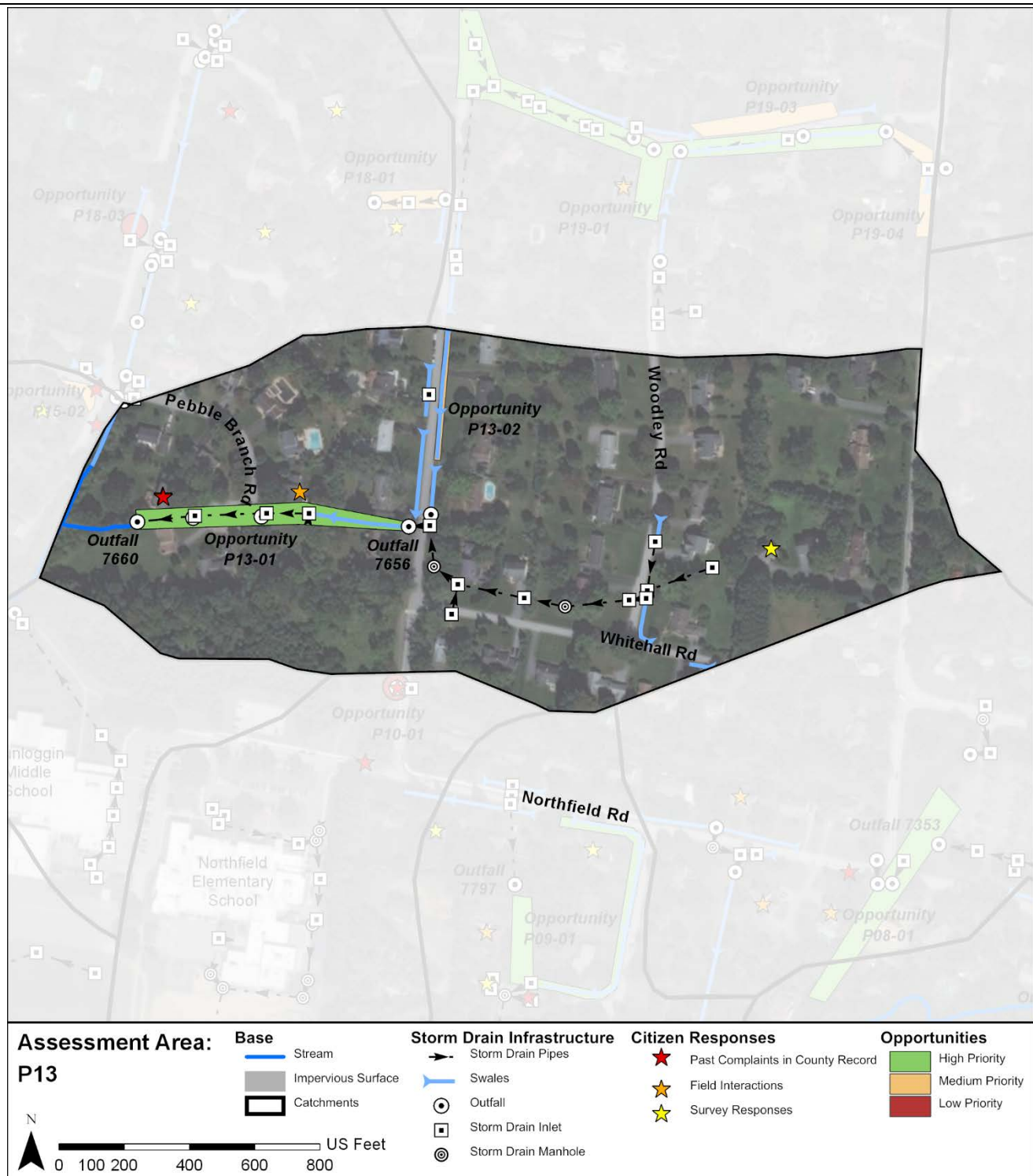


Figure 1: Typical inlet on the campus of Dunloggin Middle School.



Figure 2: Outfall requiring repair on the campus of Dunloggin Middle School.

PLUMTREE BRANCH WATERSHED ASSESSMENT AREA P13



Assessment Area Category:
POTENTIAL CAPITAL IMPROVEMENT PROJECT

Approximate Assessment Area: 34.2 acres
Approximate Imperviousness: 18%

ASSESSMENT AREA DESCRIPTION

The P13 assessment area is an approximately 34.2-acre area in Howard County's Plumtree Branch watershed. The assessment area is largely a mix of low- and medium-density residential. The assessment area captures runoff from Whitehall Road, Pebble Branch Road, and portions of Crescent Road and Woodley Road. Stormwater is conveyed to an outfall to the west of the Pebble Branch Road cul-de-sac. All roadways within P13 are open section. The conveyance system serving the assessment area consists of swales and two major storm drain systems. A riprap and concrete swale connects the two major storm drain systems. Several survey responses and field interactions suggested that conveyance systems, specifically the swale connecting the storm drain systems, may not be functioning as intended.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	9	2	2	12
Further Investigation Recommended	4	3	0	4
Total	13	5	2	16

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Outfall 7660

Approximate Drainage Area:	27.4 Acres
Storm Drain Sizing:	Outside of Range
Potential Constrictions:	Yes
Observed System Deficiencies:	Yes
Conclusion:	Conduct More Detailed Analysis of Storm Drain Network

Assessment Point ID: Outfall 7656

Approximate Drainage Area:	20.5 Acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	Yes
Conclusion:	Repair and Maintenance Recommended

OPPORTUNITIES

Opportunities identified in early 2019 focus on improving drainage and addressing expressed concerns.

Type	ID No.	Description & Discussion
Improve Existing Conveyance System	P13-01	Existing conveyance system is likely not functioning as intended. Field observations and survey responses suggest frequent and significant flooding. Analyze system and, if necessary, improve system with modified infrastructure.
Install New Conveyance System	P13-02	Add conveyance system to area with no existing conveyance.
Conduct More Detailed Analysis of Storm Drain Network	N/A	The major storm drain network(s) within the assessment area is likely not functioning as intended. More detailed analysis is recommended to determine if improving the network with modified infrastructure is necessary.

PHOTOS



Figure 1: Opportunity to install new conveyance system.



Figure 2: Opportunity to improve existing conveyance system.

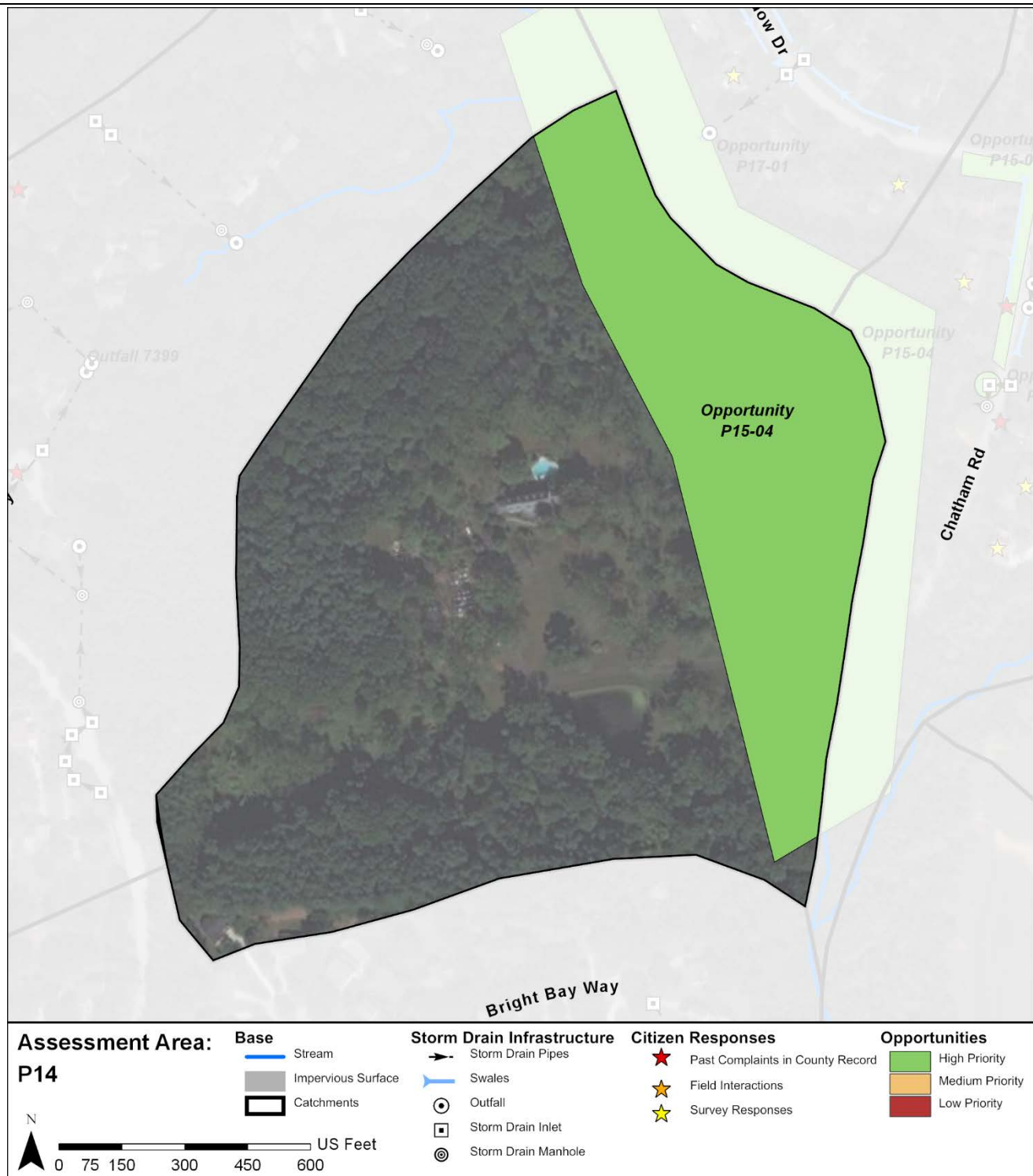


Figure 3: Opportunity to improve existing conveyance system.



Figure 4: Typical inlet along Woodley Road.

PLUMTREE BRANCH WATERSHED ASSESSMENT AREA P14



Assessment Area Category:
POTENTIAL ON-LOT IMPROVEMENTS

Approximate Assessment Area: 31.9 acres
Approximate Imperviousness: 2%

ASSESSMENT AREA DESCRIPTION

The P14 assessment area is an approximately 31.9-acre area in Howard County's Plumtree Branch watershed. The assessment area is mostly comprised of a single, large estate. Runoff within P14 drains naturally into Plumtree Branch which represents the eastern boundary of the assessment area. There are no roadways within P14 outside of the large estate's driveway which is open section. There is no stormwater infrastructure within P14. Individual property owners are encouraged to undertake on-lot improvements to improve stormwater management and conveyance on their properties.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	0	0	0	0
Further Investigation Recommended	0	0	0	0
Total	0	0	0	0

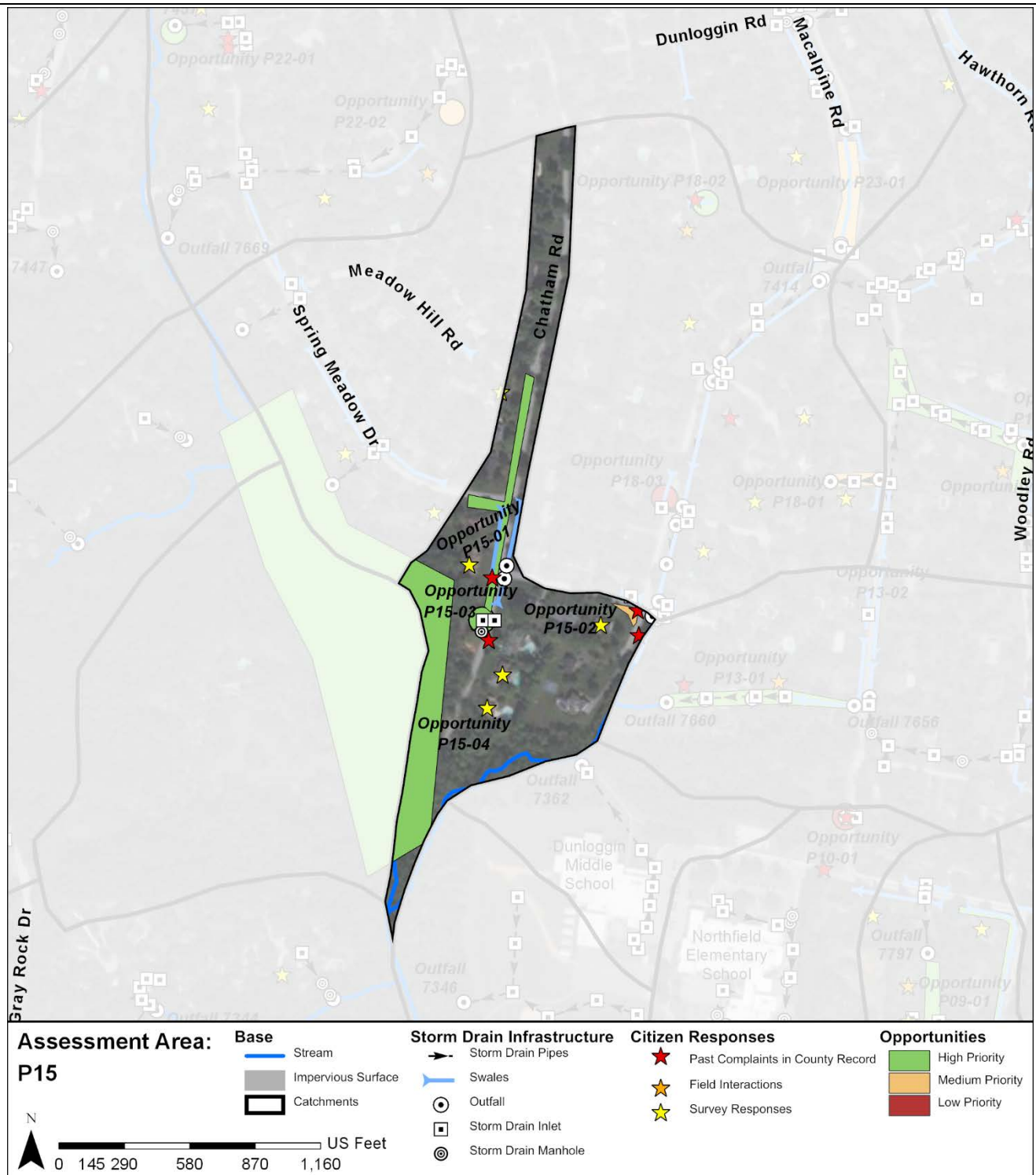
STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. This assessment area does not contain a major storm drain network.

OPPORTUNITIES

No opportunities were identified in this assessment area. However, individuals are encouraged to install environmentally friendly practices that promote infiltration (rain gardens, downspout disconnection, etc.) and improve conveyance (vegetated swales, etc.) on their own properties.

PLUMTREE BRANCH WATERSHED ASSESSMENT AREA P15



Assessment Area Category:
POTENTIAL CAPITAL IMPROVEMENT PROJECT

Approximate Assessment Area: 17.9 acres
Approximate Imperviousness: 19%

ASSESSMENT AREA DESCRIPTION

The P15 assessment area is an approximately 17.9-acre area in Howard County's Plumtree Branch watershed. The assessment area largely consists of medium-density residential. The assessment area captures runoff from portions of Pebble Branch Road, Spring Meadow Drive, and Chatham Road. P15 is located within the Plumtree Branch floodplain. Captured stormwater is conveyed to an outfall on the west side of Chatham Road, south of Pebble Branch Road. All roadways within P15 are open section. Existing conveyance includes inconsistent swales, intermittent inlets, and driveway/roadway culverts. There are no major storm drain systems within the assessment area that met the criteria for the desktop storm drain analysis (three or more contributing inlets).

Several survey responses from and field interactions with homeowners near the southern end the Chatham Road and closer to Plumtree Branch suggested that flooding, originating from both street runoff and from Plumtree Branch, is significant and occurs during heavy thunderstorms. Capacity and condition of downstream conveyance systems should be considered in any further analysis or improvements.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	1	3	0	2
Further Investigation Recommended	1	0	1	2
Total	2	3	1	4

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. This assessment area does not contain a major storm drain network.

OPPORTUNITIES

Opportunities identified in early 2019 focus on improving drainage and addressing expressed concerns.

Type	ID No.	Description & Discussion
Install New Conveyance System	P15-01	Add conveyance system to area with no existing conveyance. Survey response suggests that flooding is significant.
Install New Conveyance System	P15-02	Add conveyance system to area with no existing infrastructure. Survey response suggests that flooding in this area is significant.

Improve Existing Conveyance System	P15-03	Existing conveyance system is likely not functioning as intended. County complaints and survey responses indicate the area is frequently flooded. Analyze system and, if necessary, improve system with modified infrastructure.
Improve Existing Conveyance System	P15-04	Existing conveyance system is likely not functioning as intended. Field observation notes a culvert under a private driveway carrying Plumtree Branch as potentially being a constriction point. Both field observations and survey responses suggest frequent and significant flooding. Analyze system and, if necessary, improve system with modified infrastructure within available open space.

PHOTOS



Figure 1: Opportunity to improve existing conveyance system.



Figure 2: Opportunity to install new conveyance system.

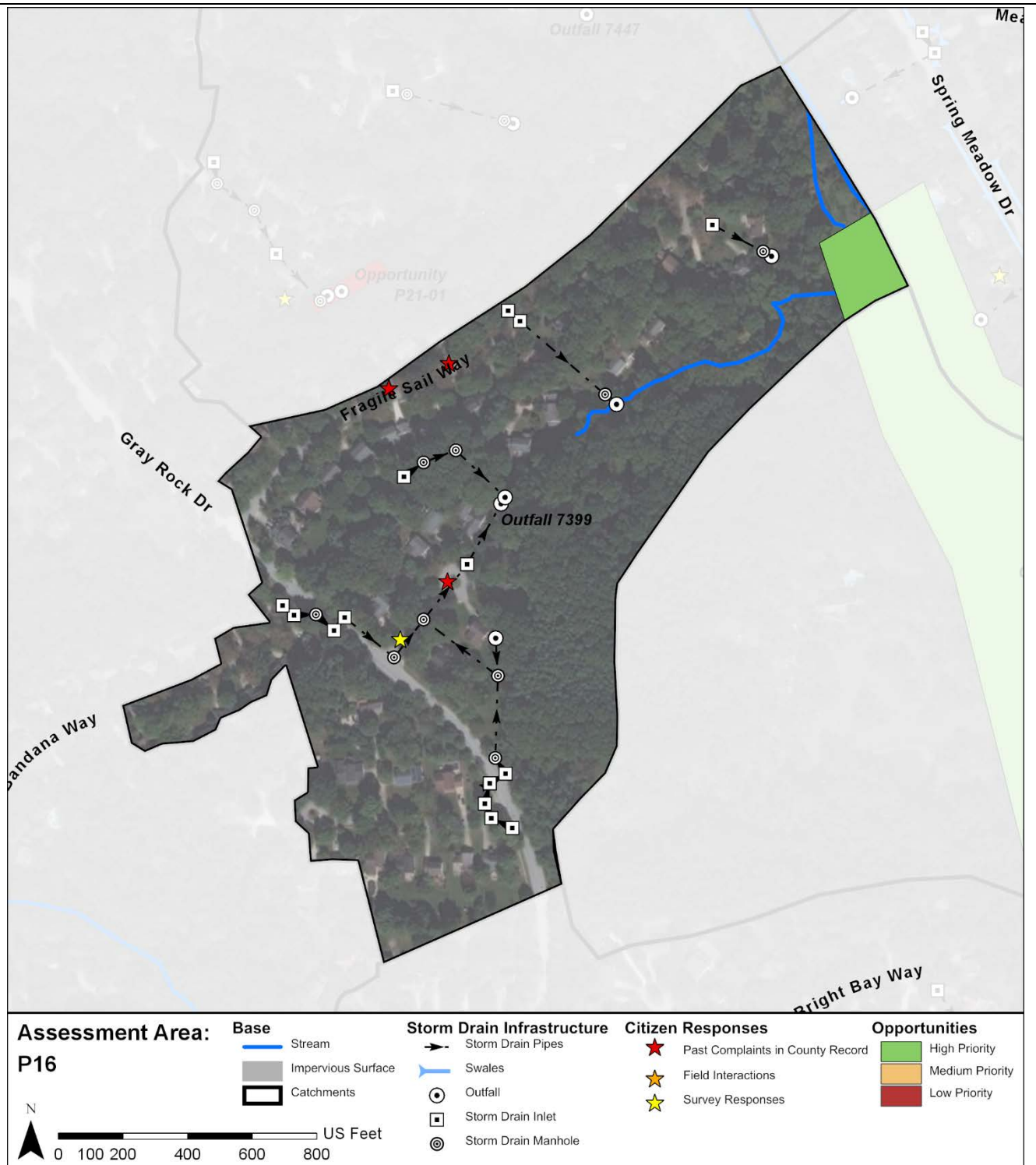


Figure 3: Opportunity to improve existing conveyance system.



Figure 4: Pondered water within inlet along Chatham Road requiring further investigation.

PLUMTREE BRANCH WATERSHED ASSESSMENT AREA P16



Assessment Area Category:
POTENTIAL REPAIR AND MAINTENANCE PROJECT

Approximate Assessment Area: 36.3 acres
Approximate Imperviousness: 18%

ASSESSMENT AREA DESCRIPTION

The P16 assessment area is an approximately 36.3-acre area in Howard County's Plumtree Branch watershed. The assessment area largely consists of medium-density residential. The area captures runoff from Fragile Sail Way, Firefly Way, Henhawk Court, and portions of Red Bandana Way and Gray Rock Drive. All sections of roadway within P16 are closed section. There is one major storm drain system within the assessment area. A majority of the assessment area is served by storm drain infrastructure and outfalls that discharge directly to a tributary to Plumtree Branch.

A survey response suggested that flooding is significant mainly during heavy thunderstorms. Field observations, as well as a complaint in the County database, noted active erosion in the tributary through which stormwater is being conveyed.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	13	0	3	21
Further Investigation Recommended	1	5	6	4
Total	14	5	9	25

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Outfall 7399

Approximate Drainage Area:	14.5 Acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	Yes
Conclusion:	Repair and Maintenance Recommended

OPPORTUNITIES

No specific opportunities were identified in this assessment area. However, individuals are encouraged to install environmentally friendly practices that promote infiltration (rain gardens, downspout disconnection, etc.) and improve conveyance (vegetated swales, etc.) on their own properties. In addition, a list of infrastructure assets that may require maintenance and/or repair was submitted to the Bureau of Highways.

PHOTOS

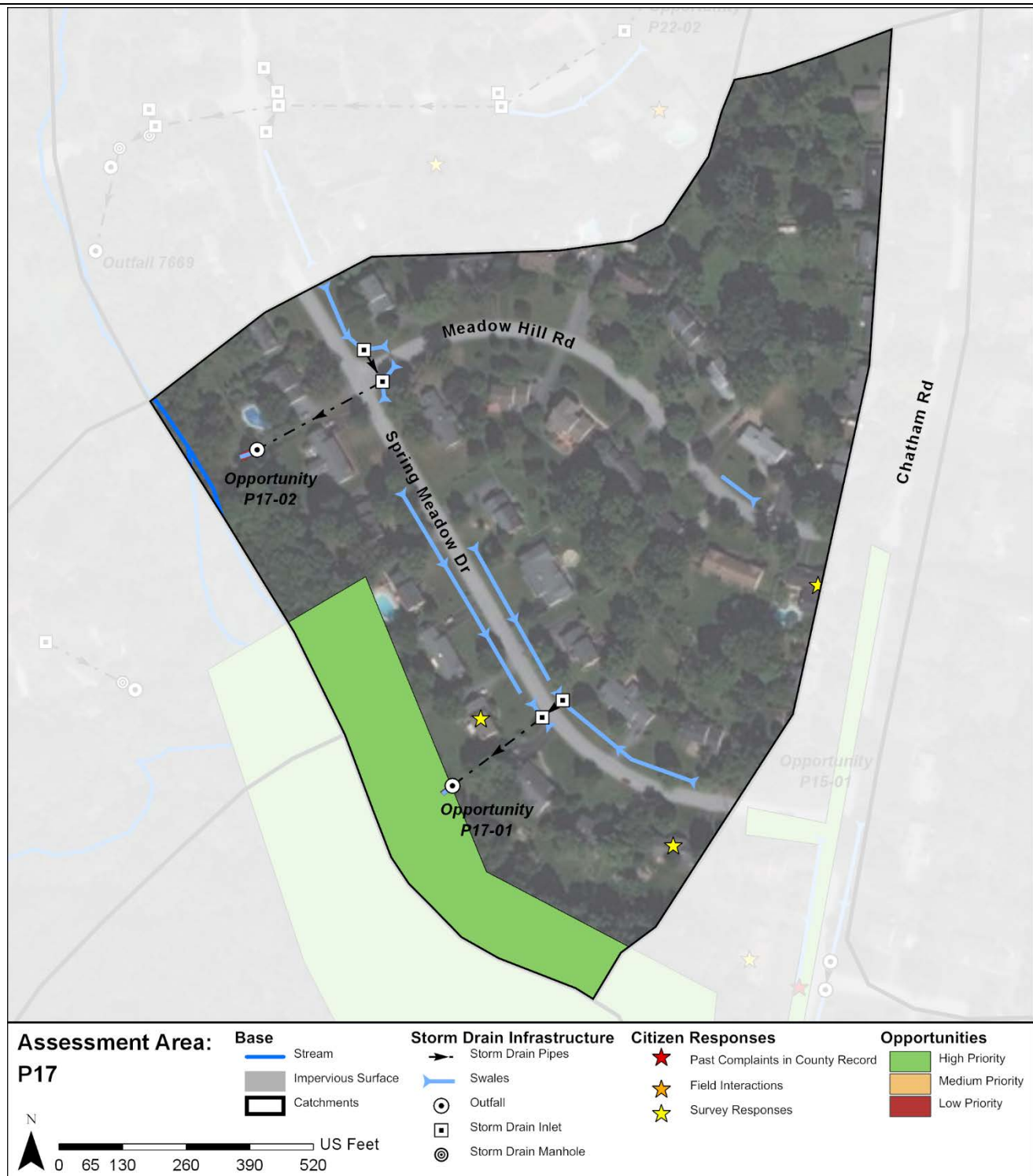


Figure 1: Outfall with detached end section requiring repair.



Figure 2: Typical inlet along Firefly Way.

PLUMTREE BRANCH WATERSHED ASSESSMENT AREA P17



Assessment Area Category:
POTENTIAL CAPITAL IMPROVEMENT PROJECT

Approximate Assessment Area: 22.5 acres
Approximate Imperviousness: 19%

ASSESSMENT AREA DESCRIPTION

The P17 assessment area is an approximately 22.5-acre area in Howard County's Plumtree Branch watershed. The assessment area largely consists of medium-density residential. The assessment area captures runoff from Meadow Hill Road and a portion of Spring Meadow Drive. P17 is located within the Plumtree Branch floodplain. Stormwater within the assessment area is conveyed towards two outfalls to the west of Spring Meadow Drive which direct flows into the floodplain of Plumtree Branch. All roadways within P17 are open section. Existing conveyance utilizes inconsistent swales, intermittent inlets, and driveway/roadway culverts. There are no major storm drain systems within the assessment area that met the criteria for the desktop storm drain analysis (three or more contributing inlets).

Field conditions and survey responses suggested that the existing conveyance systems may not be functioning as intended. Survey responses also suggested that flooding, primarily originating from Plumtree Branch, is significant and occurs every time it rains. Capacity and condition of downstream conveyance systems should be considered in any further analysis or improvements.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	3	1	0	4
Further Investigation Recommended	1	1	0	0
Total	4	2	0	4

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. This assessment area does not contain a major storm drain network.

OPPORTUNITIES

Opportunities identified in early 2019 focus on improving drainage and addressing expressed concerns.

Type	ID No.	Description & Discussion
Improve Existing Conveyance System	P17-01	Existing conveyance system is likely not functioning as intended. Field observation notes there is no clear conveyance between the storm drain outfall downstream to the stream channel. Analyze system and, if necessary, improve conveyance with modified infrastructure.
Improve Existing Conveyance System	P17-02	Existing conveyance system is likely not functioning as intended. Field observations note there is no clear conveyance system between the storm drain outfall downstream to the stream channel; ponded water is visible. Analyze system and, if necessary, improve system with modified infrastructure.

PHOTOS



Figure 1: Opportunity to improve existing conveyance system.



Figure 2: Opportunity to improve existing conveyance system.

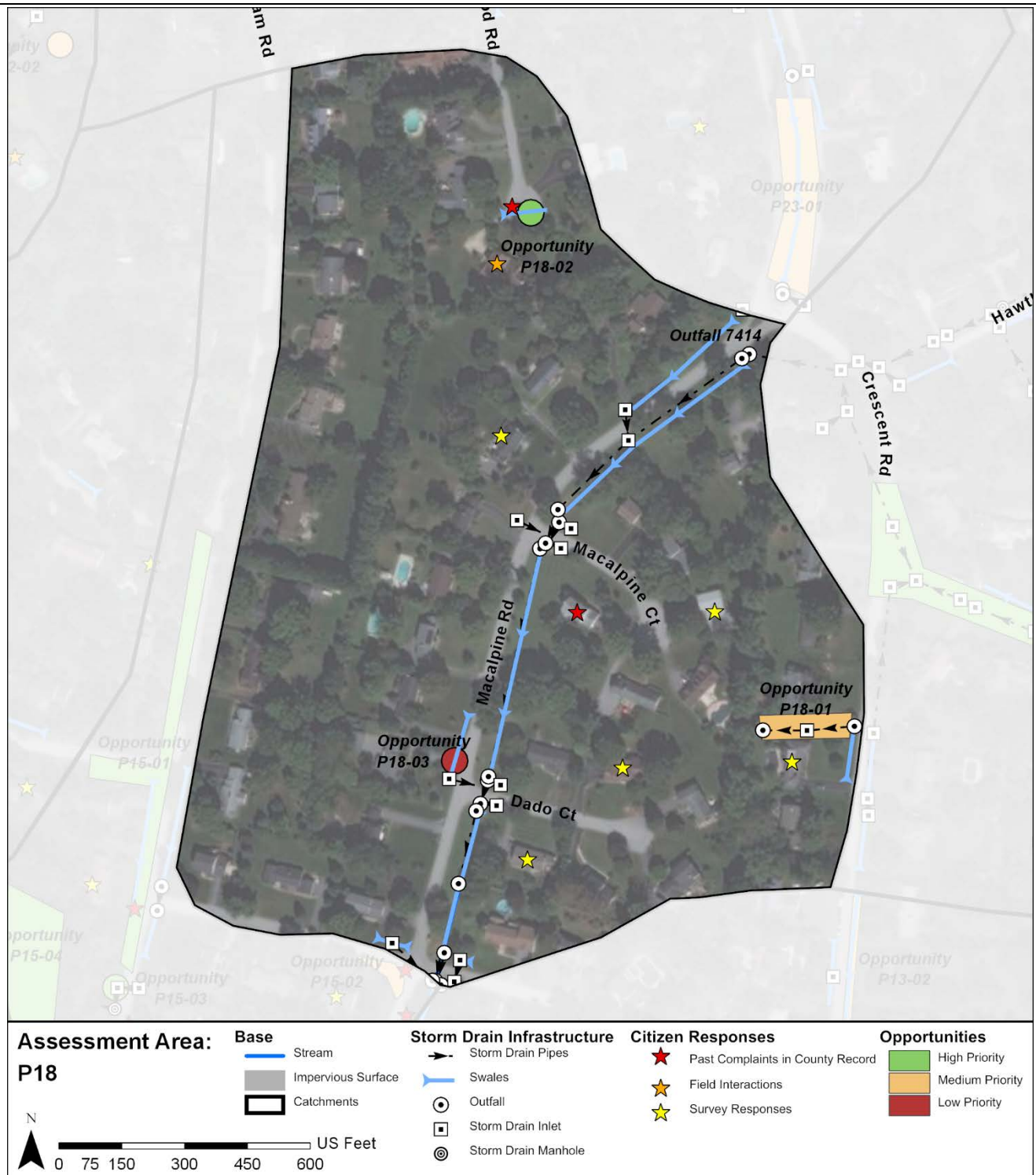


Figure 3: Opportunity to improve existing conveyance system.



Figure 4: Typical inlet along Spring Meadow Drive.

PLUMTREE BRANCH WATERSHED ASSESSMENT AREA P18



Assessment Area Category:
POTENTIAL CAPITAL IMPROVEMENT PROJECT

Approximate Assessment Area: 35.2 acres
Approximate Imperviousness: 20%

ASSESSMENT AREA DESCRIPTION

The P18 assessment area is an approximately 35.2-acre area in Howard County's Plumtree Branch watershed. The assessment area largely consists of medium-density residential. The assessment area captures runoff from MacAlpine Court, Dado Court, and portions of Crownwood Road and MacAlpine Road. P19 contains the downstream-most section of the MacAlpine Road swale, which serves as the outfall for a large portion of Dunloggin. All roadways within P18 are open section. Runoff in this assessment area is directed to the MacAlpine Road swale, either as direct runoff or via short conveyance systems. There are no major storm drain systems within the assessment area that met the criteria for the desktop storm drain analysis (three or more contributing inlets).

Several survey responses suggested that the MacAlpine Road swale experiences frequent flooding and may not be equipped to convey the flows that drain to it. Capacity and condition of downstream conveyance systems should be considered in any further analysis or improvements.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	9	12	0	18
Further Investigation Recommended	3	4	0	4
Total	12	16	0	22

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. This assessment area does not contain a major storm drain network.

OPPORTUNITIES

Opportunities identified in early 2019 focus on improving drainage and addressing expressed concerns.

Type	ID No.	Description & Discussion
Improve Existing Conveyance System	P18-01	Existing conveyance system is likely not functioning as intended. Analyze system and, if necessary, improve system with modified infrastructure.
Install New Conveyance System	P18-02	Field observations, field interactions, and county complaints suggest that runoff from roadway is concentrating and flowing across private property. Add conveyance system to area with no existing conveyance.
Install New Conveyance System	P18-03	Add conveyance system to area with no existing conveyance.

PHOTOS



Figure 1: Opportunity to improve existing conveyance system.

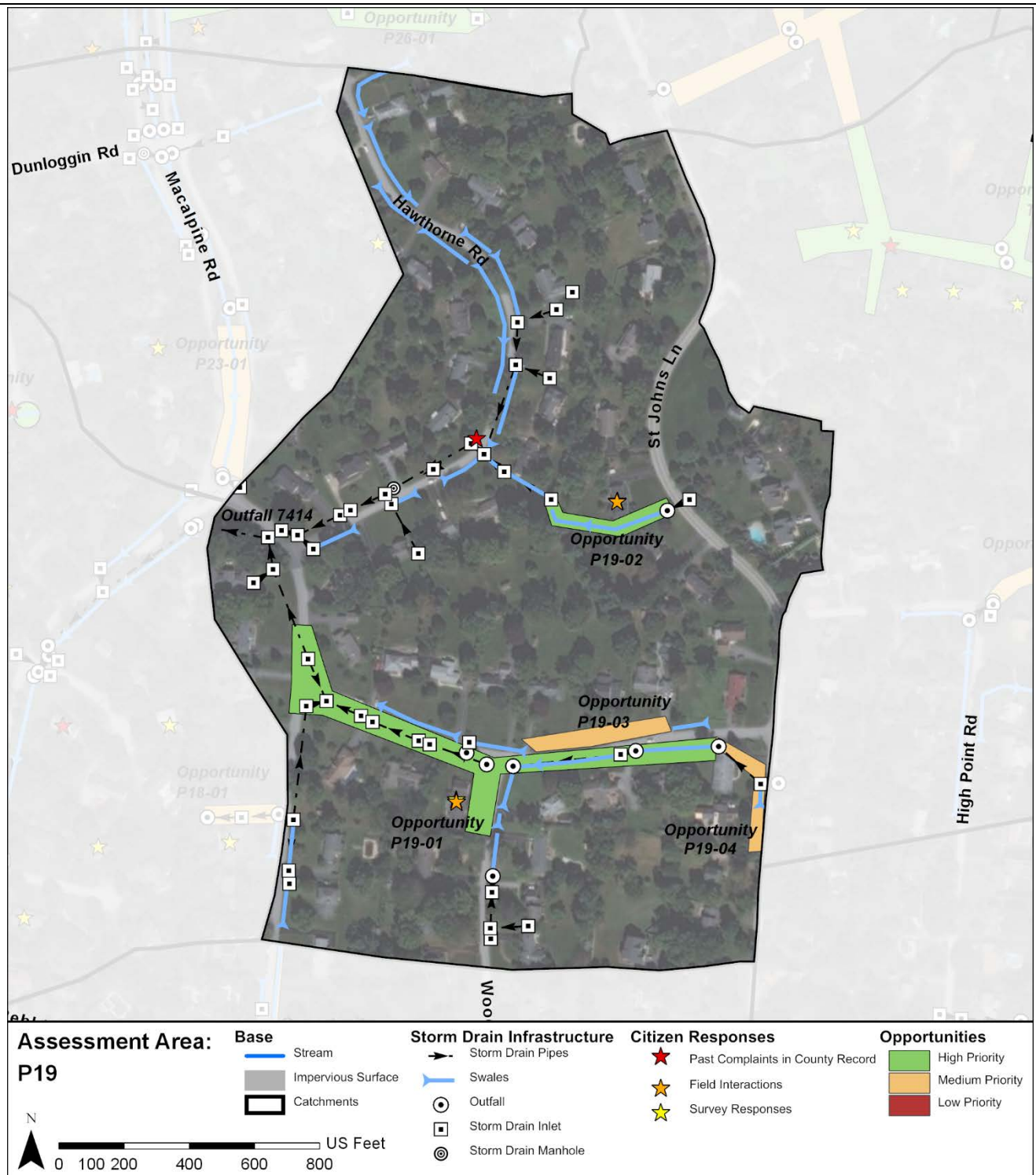


Figure 2: Opportunity to install new conveyance system along Crownwood Road.



Figure 3: Typical inlet along MacAlpine Road requiring repair.

PLUMTREE BRANCH WATERSHED ASSESSMENT AREA P19



Assessment Area Category:
POTENTIAL CAPITAL IMPROVEMENT PROJECT

Approximate Assessment Area: 51.7 acres
Approximate Imperviousness: 20%

ASSESSMENT AREA DESCRIPTION

The P19 assessment area is an approximately 51.7-acre area in Howard County's Plumtree Branch watershed. The assessment area largely consists of low-density residential. The area captures runoff from Hawthorne Road, Crestleigh Road, and portions of Saint John's Lane, Crescent Road, and Woodley Road. Stormwater within P19 is conveyed into the swale located in the right-of-way of MacAlpine Road. Almost all sections of roadway within P19 are open section. There is one major conveyance system serving the assessment area consisting of swales and a storm drain system.

Several survey responses and field interactions suggested that conveyance systems may not be functioning as intended and flooding is widespread every time it rains. Capacity and condition of downstream conveyance systems should be considered in any further analysis or improvements.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	26	2	1	33
Further Investigation Recommended	14	5	0	9
Total	40	7	1	42

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Outfall 7414

Approximate Drainage Area:	51.7 Acres
Storm Drain Sizing:	Outside of Range
Potential Constrictions:	Yes
Observed System Deficiencies:	Yes
Conclusion:	Conduct More Detailed Analysis of Storm Drain Network

OPPORTUNITIES

Opportunities identified in early 2019 focus on improving drainage and addressing expressed concerns.

Type	ID No.	Description & Discussion
Improve Existing Conveyance System	P19-01	Existing conveyance system is likely not functioning as intended. Field interaction and survey response suggest that flooding of the area is frequent. Analyze system and, if necessary, improve system with modified infrastructure.
Improve Existing Conveyance System	P19-02	Existing conveyance system is likely not functioning as intended. Field observation notes there is no clear conveyance system between the storm drain outfall downstream to the storm drain system. Both field observations and survey responses suggest frequent and significant flooding. Analyze system and, if necessary, improve conveyance system with modified infrastructure to minimize flooding of private property.
Install New Conveyance System	P19-03	Add conveyance system to area with no existing conveyance.
Improve Existing Conveyance System	P19-04	Existing conveyance system is likely not functioning as intended. Field interactions suggest flooding is an issue. Analyze system and, if necessary, improve system with modified infrastructure.
Conduct More Detailed Analysis of Storm Drain Network	N/A	The major storm drain network(s) within the assessment area is likely not functioning as intended. More detailed analysis is recommended to determine if improving the network with modified infrastructure is necessary.

PHOTOS



Figure 1: Opportunity to improve existing conveyance system.



Figure 2: Sinkhole forming over pipe along Crestleigh Drive.

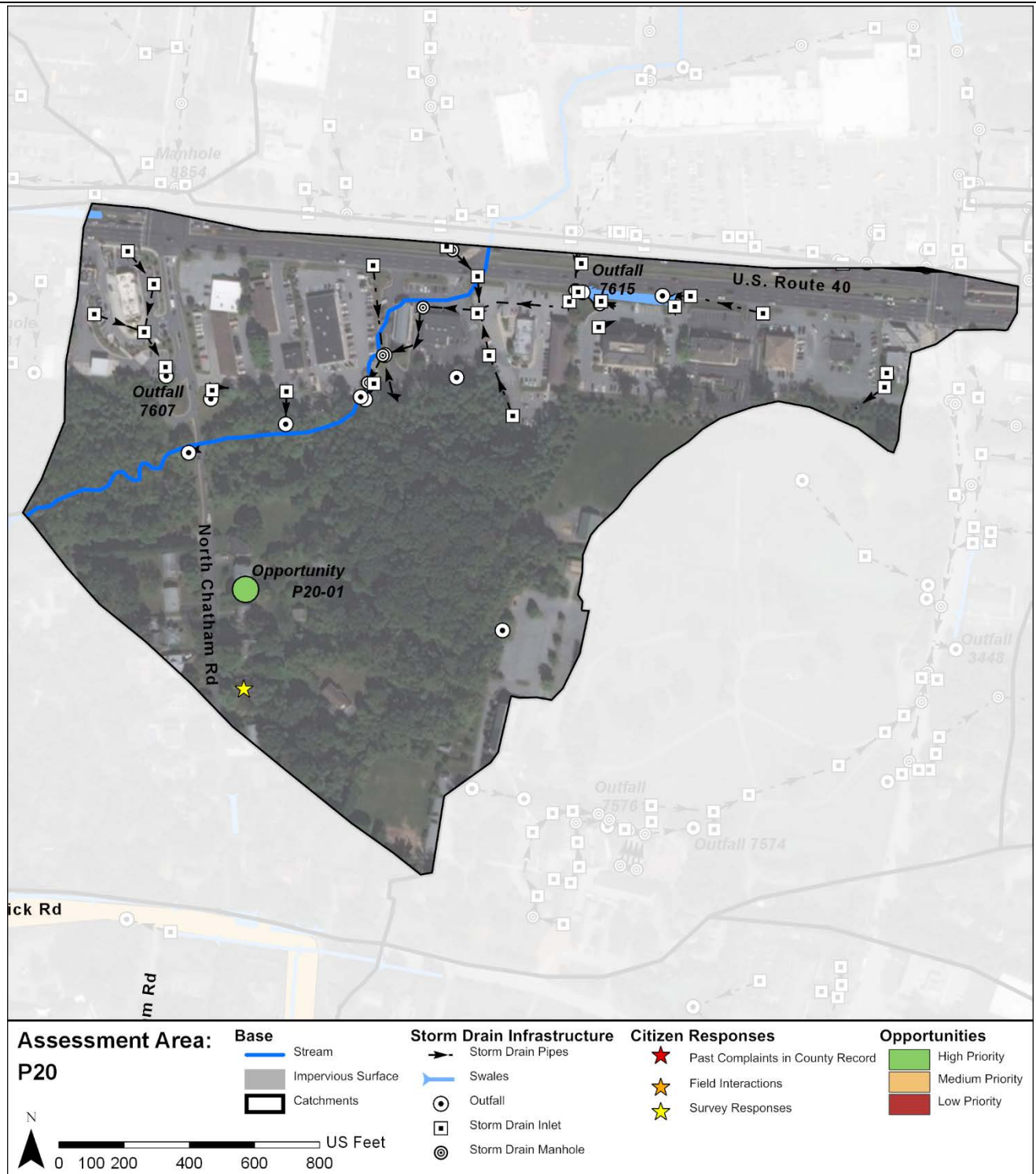


Figure 3: Opportunity to improve existing conveyance system.



Figure 4: Opportunity to improve existing conveyance system.

PLUMTREE BRANCH WATERSHED ASSESSMENT AREA P20



Assessment Area Category:
POTENTIAL CAPITAL IMPROVEMENT PROJECT

Approximate Assessment Area: 42.4 acres
Approximate Imperviousness: 39%

ASSESSMENT AREA DESCRIPTION

The P20 assessment area is an approximately 42.4-acre area in Howard County's Plumtree Branch watershed. The assessment area is mostly commercial with some residential. The area is bounded by U.S. Route 40 to the north and is intersected by North Chatham Road. Included within the assessment area are a series of small shopping centers along U.S. Route 40. The majority of roadways within P20 are closed section. There are two major conveyance systems within the assessment area. Both systems are within the commercial area. The residential area within P20 does not contain stormwater infrastructure.

Field observations and homeowner interactions suggested that the existing curb along North Chatham Road is concentrating flows and, without inlets to capture the runoff, concentrated flows are routed through driveways and onto private property.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	17	6	3	23
Further Investigation Recommended	5	5	3	16
Total	24	11	7	40

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Outfall 7607

Approximate Drainage Area:	2.1 Acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	Yes
Conclusion:	Repair and Maintenance Recommended

Assessment Point ID: Outfall 7615	
Approximate Drainage Area:	2.1 Acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	Yes
Conclusion:	Repair and Maintenance Recommended

OPPORTUNITIES

Opportunities identified in early 2019 focus on improving drainage and addressing expressed concerns.

Type	ID No.	Description & Discussion
Install New Conveyance System	P20-01	Add conveyance system to area with no existing conveyance.

PHOTOS



Figure 1: Opportunity to install new conveyance system.



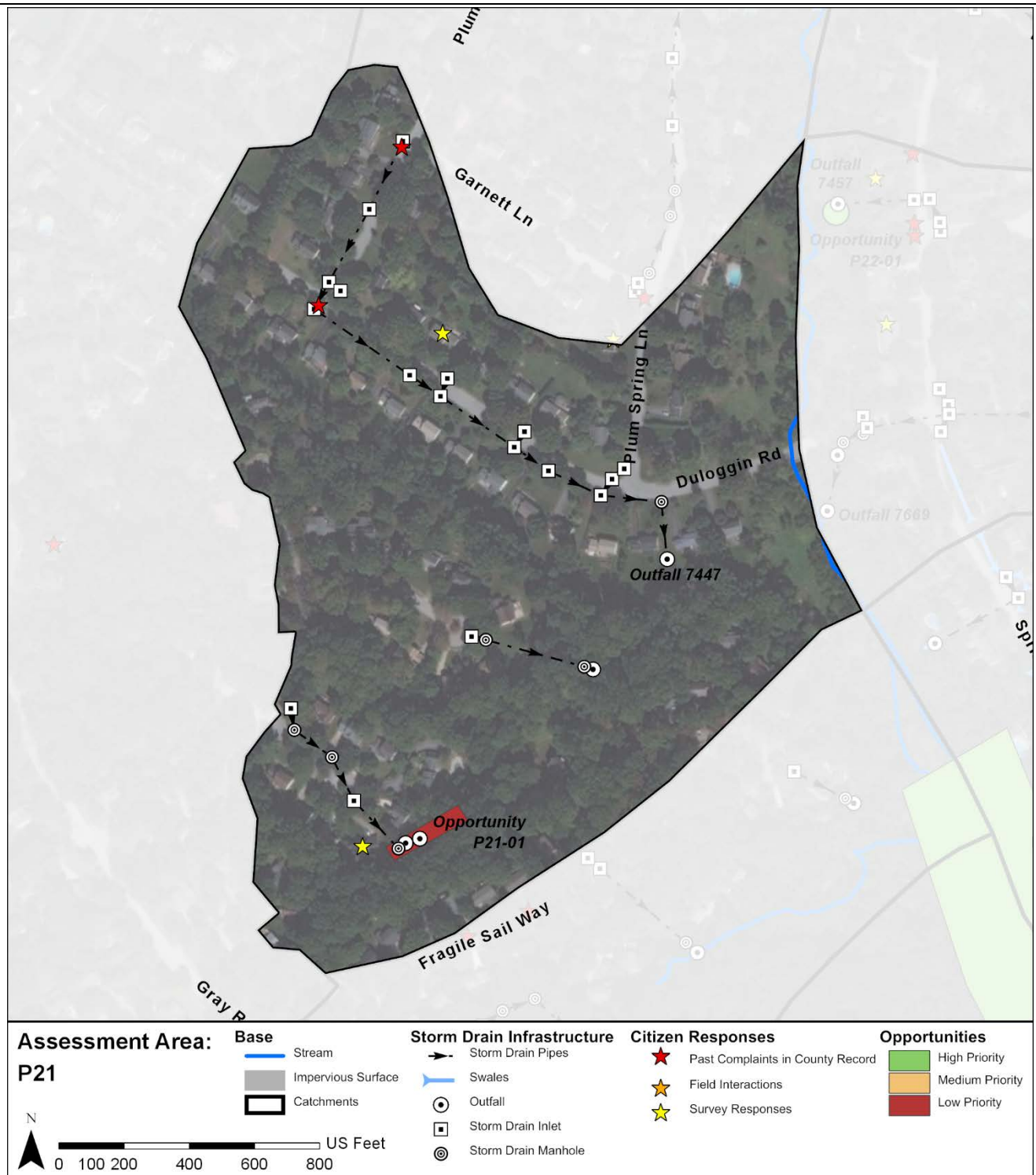
Figure 2: Opportunity to install new conveyance system.



Figure 3: Typical inlet with debris along Baltimore National Pike (U.S. Route 40).

PLUMTREE BRANCH WATERSHED

ASSESSMENT AREA P21



Assessment Area Category:
POTENTIAL REPAIR AND MAINTENANCE PROJECT

Approximate Assessment Area: 46.9 acres
Approximate Imperviousness: 20%

ASSESSMENT AREA DESCRIPTION

The P21 assessment area is an approximately 46.9-acre area in Howard County's Plumtree Branch watershed. The assessment area largely consists of medium-density residential. The area captures runoff from White Star Way, Starwreath Way and portions of Plum Meadow Drive, Dunloggin Road, and Plum Spring Lane. Captured stormwater within P21 is conveyed to multiple outfalls in the wooded area north of Fragile Sail Way. Almost all sections of roadway within P21 are closed section. There is one major storm drain system within the assessment area.

Survey responses, primarily within the northern half of the assessment area, suggested that flooding is significant in some locations every time it rains.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	6	2	1	17
Further Investigation Recommended	11	2	5	6
Total	17	4	6	23

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Outfall 7447

Approximate Drainage Area:	18.8 Acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	Yes
Conclusion:	Repair and Maintenance Recommended

OPPORTUNITIES

Opportunities identified in early 2019 focus on improving drainage and addressing expressed concerns.

Type	ID No.	Description & Discussion
Improve Existing Conveyance System	P21-01	Existing conveyance system is likely not functioning as intended. Analyze system and, if necessary, improve system with modified infrastructure.

PHOTOS



Figure 1: Damaged inlet along Dunloggin Road.



Figure 2: Utilities exposed adjacent to manhole along Dunloggin Road.

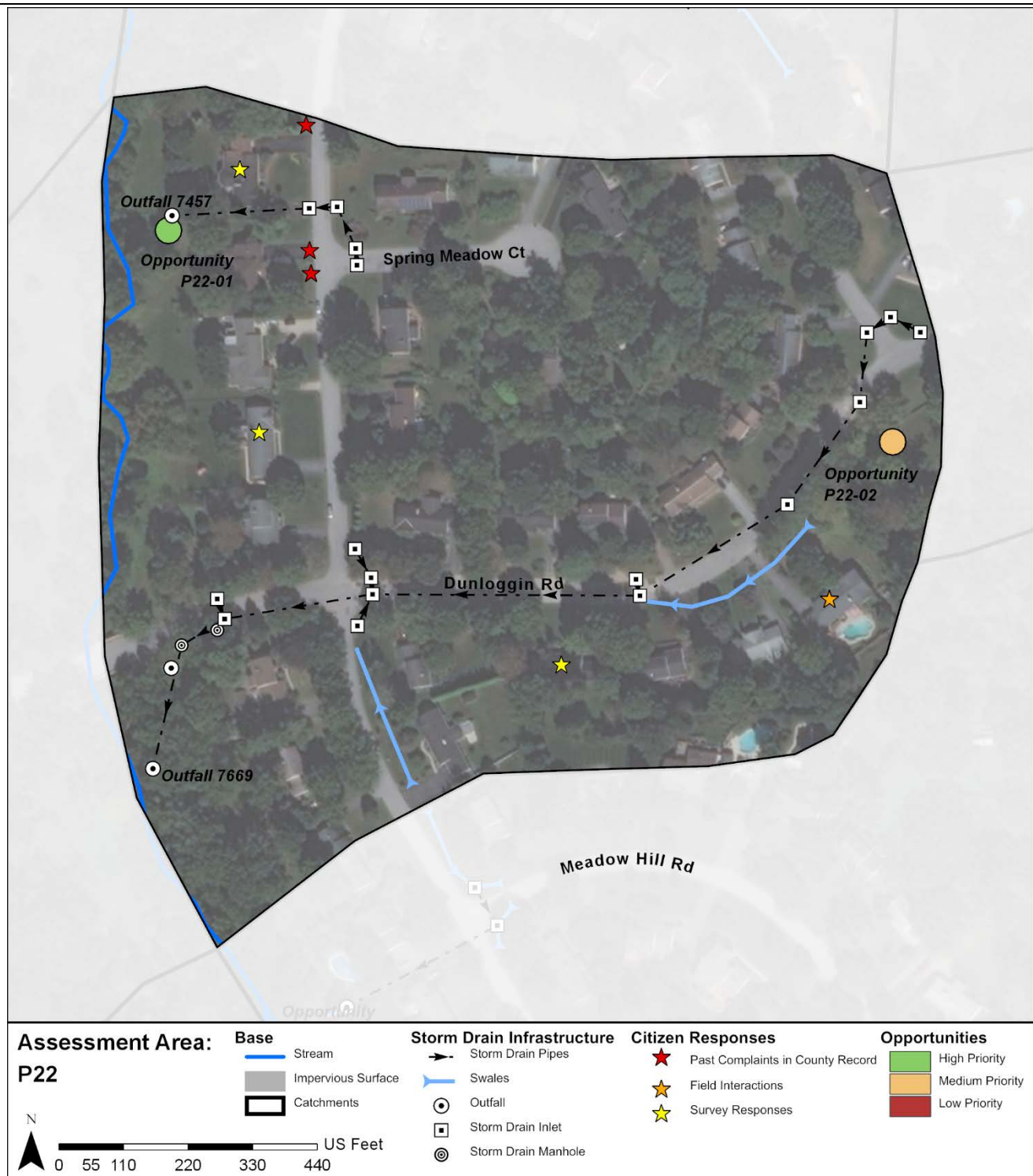


Figure 3: Opportunity to improve existing conveyance system.



Figure 4: Opportunity to improve existing conveyance system.

PLUMTREE BRANCH WATERSHED ASSESSMENT AREA P22



Assessment Area Category:
POTENTIAL CAPITAL IMPROVEMENT PROJECT

Approximate Assessment Area: 21.4 acres
Approximate Imperviousness: 23%

ASSESSMENT AREA DESCRIPTION

The P22 assessment area is an approximately 21.4-acre area in Howard County's Plumtree Branch watershed. The assessment area largely consists of medium-density residential. The assessment area captures runoff from portions of Spring Meadow Drive and Dunloggin Road. Stormwater within P22 is conveyed to two outfalls along Plumtree Branch to the west of Spring Meadow Drive. All roadways within P22 are open section. There are two major storm drain systems within P22. Multiple survey responses from residents within P22 suggested that drainage is an issue within the assessment area and that the outfall of the system is ponding water and may not be functioning as intended. There were also three complaints in the County database in the vicinity of that outfall. Capacity and condition of downstream conveyance systems should be considered in any further analysis or improvements.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	13	0	0	15
Further Investigation Recommended	4	3	2	3
Total	17	3	2	18

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Outfall 7669

Approximate Drainage Area:	15.0 Acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	Yes
Conclusion:	Conduct More Detailed Analysis of Storm Drain Network

Assessment Point ID: Outfall 7457

Approximate Drainage Area:	5.4 Acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	Yes
Conclusion:	Repair and Maintenance Recommended

OPPORTUNITIES

Opportunities identified in early 2019 focus on improving drainage and addressing expressed concerns.

Type	ID No.	Description & Discussion
Improve Existing Conveyance System	P22-01	Existing downstream conveyance is likely not functioning as intended. Survey responses and county complaints indicate area is frequently flooded. Analyze system and, if necessary, improve system with modified infrastructure.
Detention Practice	P22-02	Create new detention practice to manage existing water flow (likely from a spring) with outfall tying into adjacent storm drain network. Survey responses, field observation, and drainage complaints indicate area is consistently inundated.
Conduct More Detailed Analysis of Storm Drain Network	N/A	The major storm drain network(s) within the assessment area is likely not functioning as intended. More detailed analysis is recommended to determine if improving the network with modified infrastructure is necessary.

PHOTOS

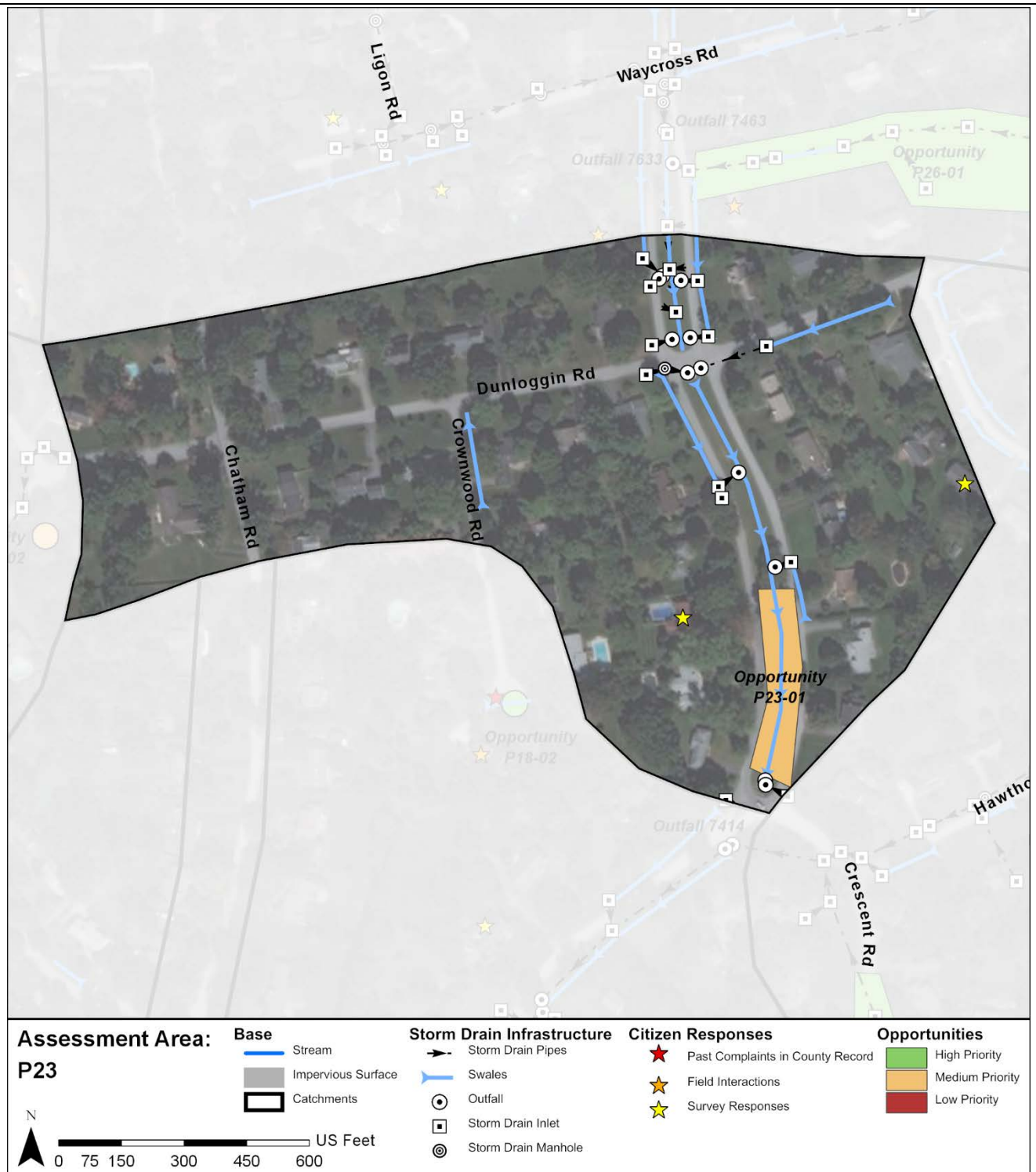


Figure 1: Opportunity to improve existing conveyance system.



Figure 2: Typical inlet with observed debris along Dunloggin Road.

PLUMTREE BRANCH WATERSHED ASSESSMENT AREA P23



Assessment Area Category:
POTENTIAL CAPITAL IMPROVEMENT PROJECT

Approximate Assessment Area: 25.8 acres
Approximate Imperviousness: 22%

ASSESSMENT AREA DESCRIPTION

The P23 assessment area is an approximately 25.8-acre area in Howard County's Plumtree Branch watershed. The assessment area largely consists of medium-density residential. The assessment area is intersected by Dunloggin Road and MacAlpine Road. P23 contains a section of the MacAlpine Road swale, which conveys drainage from a large portion of Dunloggin, including P23. All roadways within P23 are open section. Runoff in this assessment area is directed to the MacAlpine Road swale, either as direct runoff or via short conveyance systems. There are no major storm drain systems within the assessment area that met the criteria for the desktop storm drain analysis (three or more contributing inlets). Several survey responses suggested that the MacAlpine Road swale experiences frequent flooding during heavy thunderstorms and may not be equipped to convey the flows that drain to it. Capacity and condition of downstream conveyance systems should be considered in any further analysis or improvements.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	6	6	0	12
Further Investigation Recommended	7	5	1	4
Total	13	11	1	16

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. This assessment area does not contain a major storm drain network.

OPPORTUNITIES

Opportunities identified in early 2019 focus on improving drainage and addressing expressed concerns.

Type	ID No.	Description & Discussion
Detention Practice	P23-01	Surrounding area has few detention practices. Install stormwater management feature in available open space under existing swale and potentially under roadway. The feature could be located here or further upstream within swale.

PHOTOS

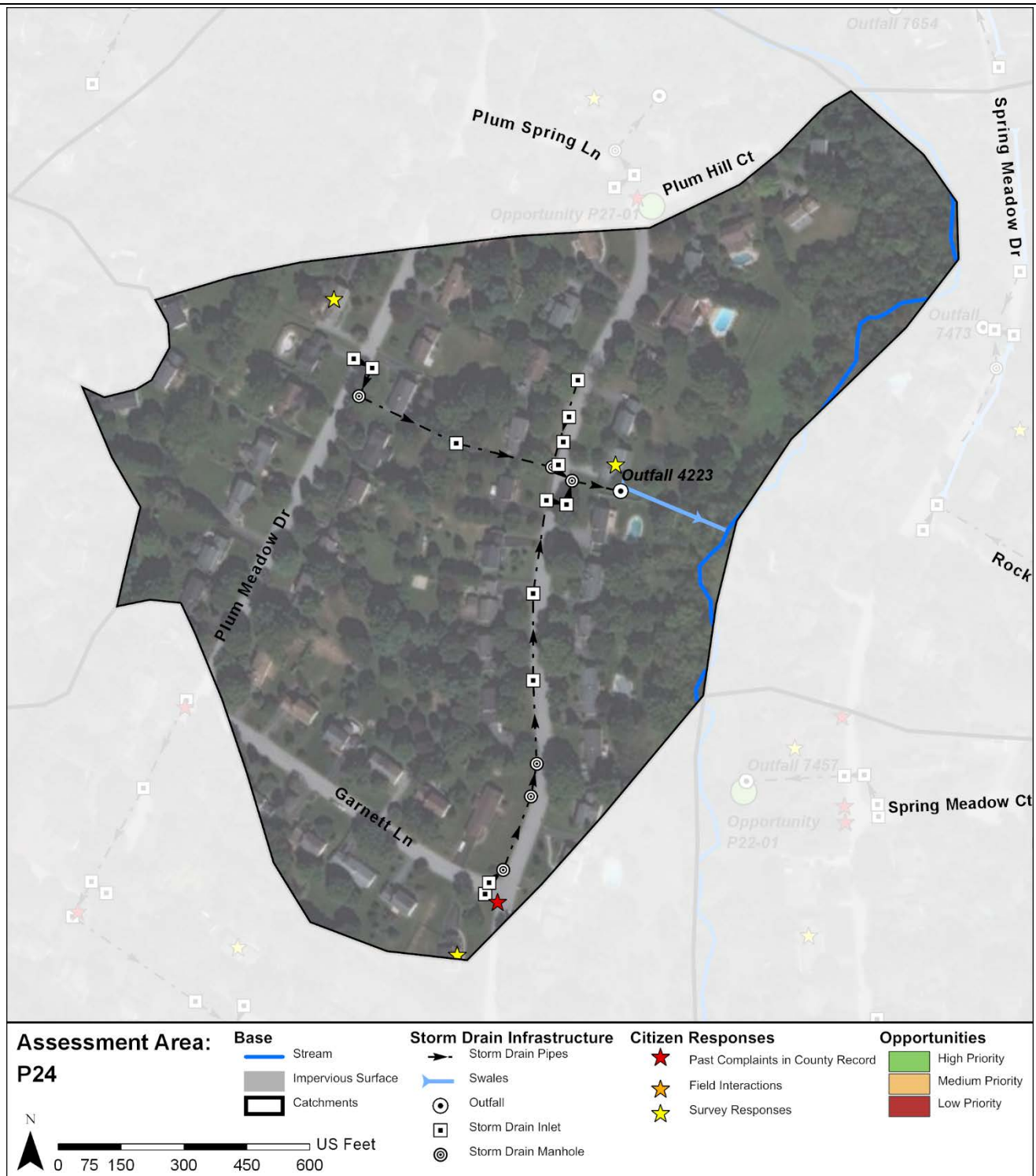


Figure 1: Opportunity to install detention practice.



Figure 2: Typical inlet along MacAlpine Road.

PLUMTREE BRANCH WATERSHED ASSESSMENT AREA P24



Assessment Area Category:
POTENTIAL REPAIR AND MAINTENANCE PROJECT

Approximate Assessment Area: 31.4 acres
Approximate Imperviousness: 19%

ASSESSMENT AREA DESCRIPTION

The P24 assessment area is an approximately 31.4-acre area in Howard County's Plumtree Branch watershed. The assessment area largely includes medium-density residential. The area captures runoff from Garnett Lane and portions of Plum Meadow Drive and Plum Spring Lane. Captured runoff within P24 is conveyed through an outfall and concrete swale into Plumtree Branch to the east of Plum Spring Lane. All sections of roadway within P24 are closed section although the effectiveness of the existing curbs in several locations has been diminished due to frequent repaving. There is one major storm drain system within the assessment area.

A survey response indicated that flooding is an issue in the vicinity of the outfall and concrete swale during both heavy thunderstorms and long-duration rainfall events. An increase in flooding was attributed to frequent log and debris jams within the outfall swale and Plumtree Branch.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	10	1	4	16
Further Investigation Recommended	3	0	2	0
Total	13	1	6	16

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Outfall 4223

Approximate Drainage Area:	25.1 Acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	Yes
Observed System Deficiencies:	Yes
Conclusion:	Repair and Maintenance Recommended

OPPORTUNITIES

No specific opportunities were identified in this assessment area. However, individuals are encouraged to install environmentally friendly practices that promote infiltration (rain gardens, downspout disconnection, etc.) and improve conveyance (vegetated swales, etc.) on their own properties. In addition, a list of infrastructure assets that may require maintenance and/or repair was submitted to the Bureau of Highways.

PHOTOS



Figure 1: Typical inlet along Plum Spring Lane.



Figure 2: Concrete swale conveying stormwater to Plumtree Branch.

PLUMTREE BRANCH WATERSHED ASSESSMENT AREA P25



Assessment Area Category:
POTENTIAL REPAIR AND MAINTENANCE PROJECT

Approximate Assessment Area: 22.9 acres
Approximate Imperviousness: 18%

ASSESSMENT AREA DESCRIPTION

The P25 assessment area is an approximately 22.9-acre area in Howard County's Plumtree Branch watershed. The assessment area is comprised of medium-density residential. The area captures runoff from portions of Spring Meadow Drive and Rock Meadow Drive. Runoff within P25 is conveyed to a single outfall into Plumtree Branch to the west of Spring Meadow Drive. All sections of roadway within P25 are open section. There is one major storm drain system which includes several roadside swales to convey flows towards inlets along Spring Meadow Drive and Rock Meadow Drive. Survey responses suggested that flooding is significant during rain events due to uncontrolled runoff from neighboring properties.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	5	1	1	5
Further Investigation Recommended	1	0	0	2
Total	6	1	1	7

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Outfall 7473

Approximate Drainage Area:	18.3 Acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	Yes
Conclusion:	Repair and Maintenance Recommended

OPPORTUNITIES

No specific opportunities were identified in this assessment area. However, individuals are encouraged to install environmentally friendly practices that promote infiltration (rain gardens, downspout disconnection, etc.) and improve conveyance (vegetated swales, etc.) on their own properties. In addition, a list of infrastructure assets that may require maintenance and/or repair was submitted to the Bureau of Highways.

PHOTOS

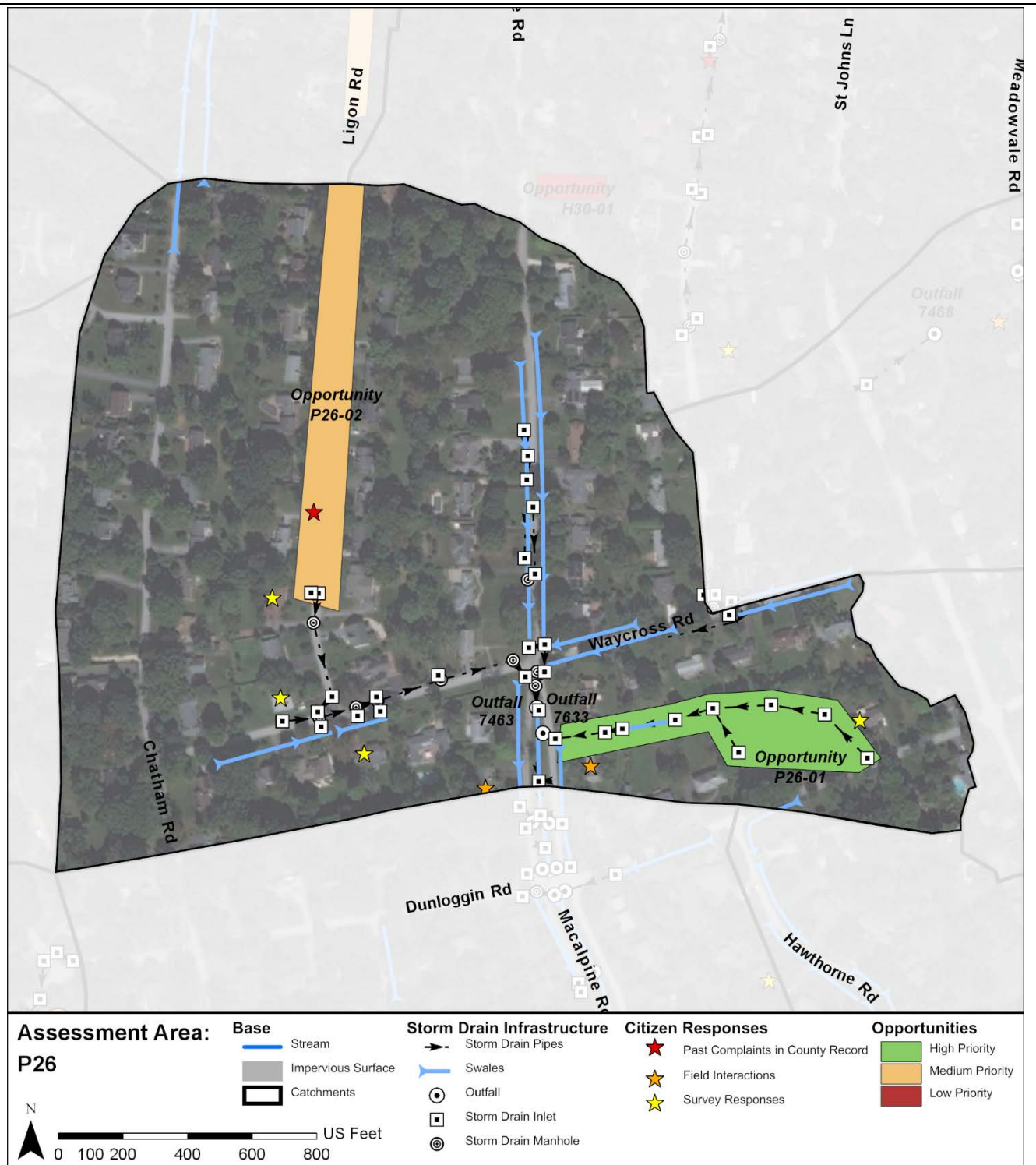


Figure 1: Typical inlet along Spring Meadow Drive.



Figure 2: Typical pipe and outfall with observed debris.

PLUMTREE BRANCH WATERSHED ASSESSMENT AREA P26



Assessment Area Category:
POTENTIAL CAPITAL IMPROVEMENT PROJECT

Approximate Assessment Area: 56.0 acres
Approximate Imperviousness: 24%

ASSESSMENT AREA DESCRIPTION

The P26 assessment area is an approximately 56.0-acre area in Howard County's Plumtree Branch watershed. The assessment area is largely comprised of medium-density residential. The assessment area captures runoff from portions of Waycross Road, Ligon Road, and MacAlpine Road. The eventual outfall of this assessment area is the swale located in the median of MacAlpine Road. All roadways with P26, except for a portion of Ligon Road, are open section. There are two conveyance networks serving the assessment area, both consisting of swales and major storm drain systems. Several survey responses and field interactions suggested that conveyance systems may not be functioning as intended, and flooding is widespread during heavy thunderstorms. Capacity and condition of downstream conveyance systems should be considered in any further analysis or improvements.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	30	2	6	37
Further Investigation Recommended	3	0	3	3
Total	33	2	9	40

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Outfall 7633

Approximate Drainage Area:	8.4 Acres
Storm Drain Sizing:	Outside of Range
Potential Constrictions:	Yes
Observed System Deficiencies:	Yes
Conclusion:	Conduct More Detailed Analysis of Storm Drain Network

Assessment Point ID: Outfall 7463

Approximate Drainage Area:	39.2 Acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	Yes
Observed System Deficiencies:	Yes
Conclusion:	Conduct More Detailed Analysis of Storm Drain Network

OPPORTUNITIES

Opportunities identified in early 2019 focus on improving drainage and addressing expressed concerns.

Type	ID No.	Description & Discussion
Improve Existing Conveyance System	P26-01	Existing conveyance system is likely not functioning as intended. Field interaction suggests that flooding of area is frequent. Analyze system and, if necessary, improve system with modified infrastructure.
Install New Conveyance System	P26-02	Add conveyance system to area with no existing infrastructure.
Conduct More Detailed Analysis of Storm Drain Network	N/A	The major storm drain network(s) within the assessment area is likely not functioning as intended. More detailed analysis is recommended to determine if improving the network with modified infrastructure is necessary.

PHOTOS



Figure 1: Opportunity to improve existing conveyance system.



Figure 2: Opportunity to improve existing conveyance system.



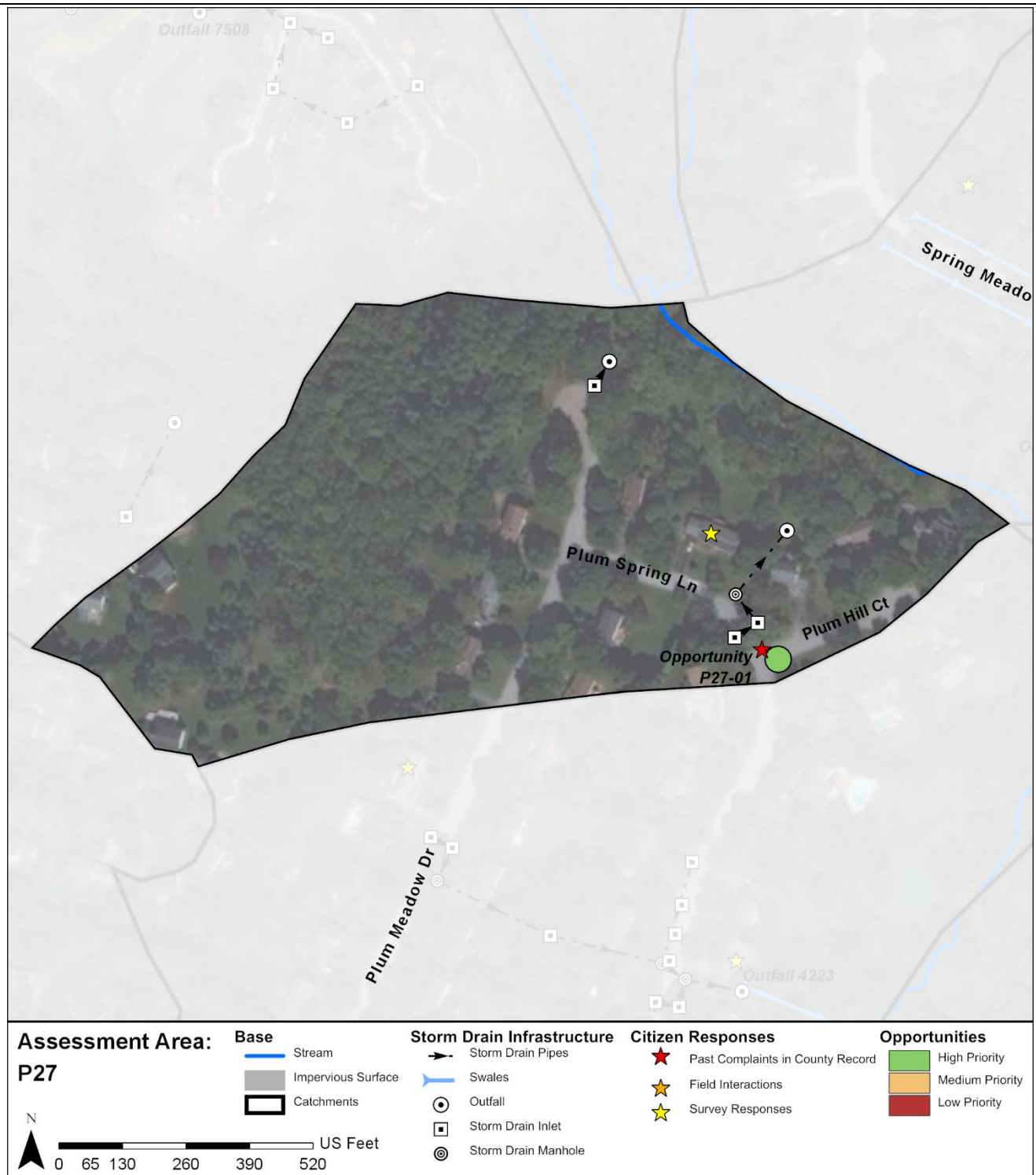
Figure 3: Typical inlet along MacAlpine Road.



Figure 4: Opportunity to install new conveyance system along Ligon Road.

PLUMTREE BRANCH WATERSHED

ASSESSMENT AREA P27



Assessment Area Category:
POTENTIAL CAPITAL IMPROVEMENT PROJECT

Approximate Assessment Area: 15.7 acres
Approximate Imperviousness: 14%

ASSESSMENT AREA DESCRIPTION

The P27 assessment area is an approximately 15.7-acre area in Howard County's Plumtree Branch watershed. The assessment area largely consists of medium-density residential and includes some forested open space. The area captures runoff from Plum Hill Court and portions of Plum Meadow Drive and Plum Spring Lane. Captured stormwater within P27 is conveyed northward into Plumtree Branch through two outfalls. Almost all sections of roadway within P27 are closed section. There are no major storm drain systems within the assessment area that met the criteria for the desktop storm drain analysis (three or more contributing inlets).

Survey responses and a complaint within the County's database noted concerns with the outfall to the north of Plum Hill Ct. The outfall lacks a clear conveyance network downstream to Plumtree Branch.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	2	1	1	4
Further Investigation Recommended	1	1	0	0
Total	3	2	1	4

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. This assessment area does not contain a major storm drain network.

OPPORTUNITIES

Opportunities identified in early 2019 focus on improving drainage and addressing expressed concerns.

Type	ID No.	Description & Discussion
Improve Existing Conveyance System	P27-01	Existing conveyance system is likely not functioning as intended. Field observation notes that a new inlet at Plum Court might be considered. County complaints indicate area is frequently flooded. Analyze system and, if necessary, improve system with modified infrastructure to minimize flooding.

PHOTOS



Figure 1: Opportunity to improve existing conveyance system.

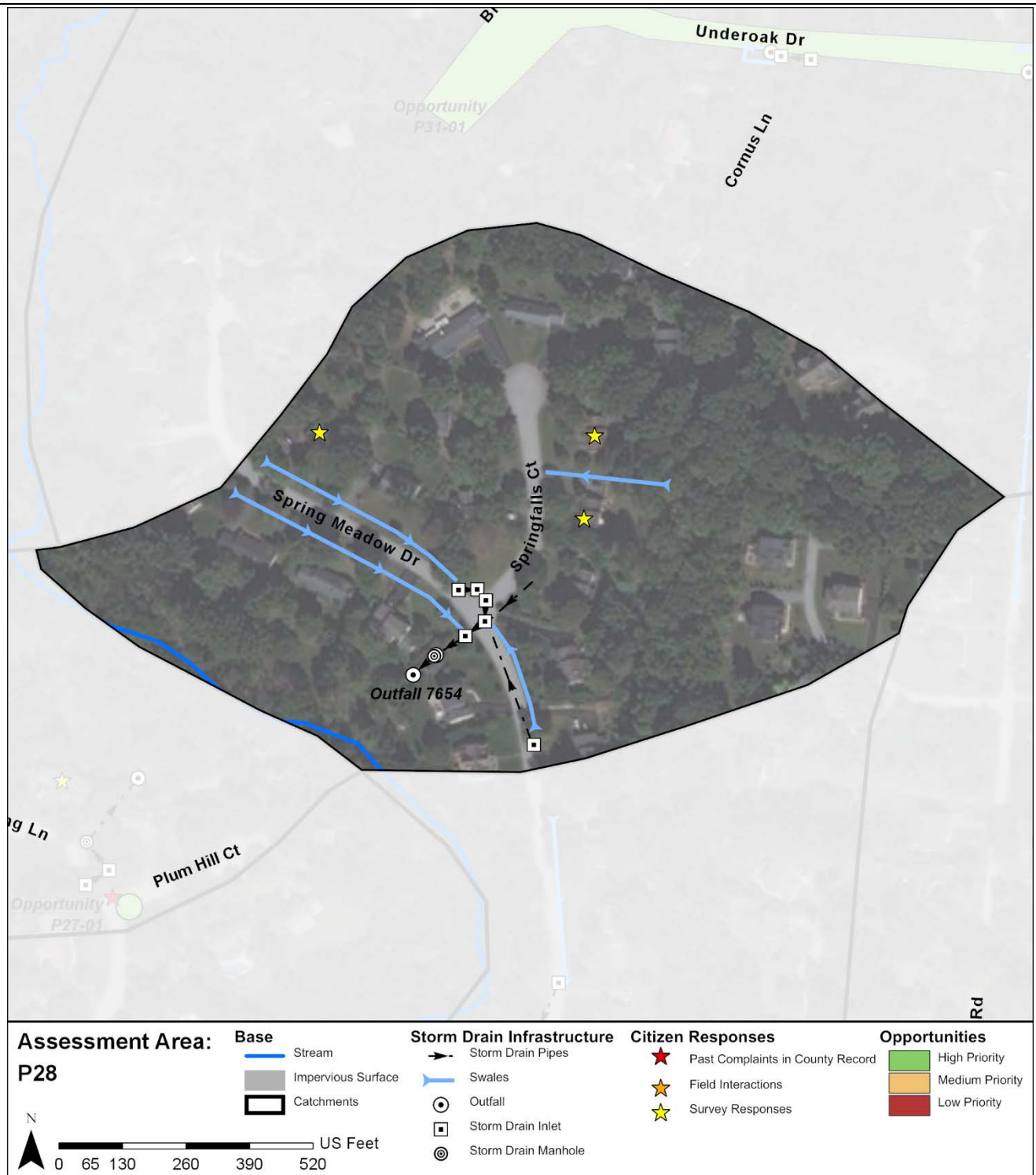


Figure 2: Opportunity to improve existing conveyance system.



Figure 3: Typical inlet with observed debris along Plum Spring Lane.

PLUMTREE BRANCH WATERSHED ASSESSMENT AREA P28



Assessment Area Category:
POTENTIAL REPAIR AND MAINTENANCE PROJECT

Approximate Assessment Area: 18.3 acres
Approximate Imperviousness: 16%

ASSESSMENT AREA DESCRIPTION

The P28 assessment area is an approximately 18.3-acre area in Howard County's Plumtree Branch watershed. The assessment area largely consists of medium-density residential. The area captures runoff from Spring Falls Court and a portion of Spring Meadow Drive. Captured stormwater within P28 is conveyed to an outfall into Plumtree Branch located to the west of Spring Meadow Drive. Spring Falls Court is a closed section roadway while Spring Meadow Drive is an open section roadway. The assessment area is serviced by one major storm drain system which includes grass swales along Spring Meadow Drive leading to inlets in the vicinity of the intersection of Spring Falls Court and Spring Meadow Drive.

Survey responses and field observations suggest that conveyance is an issue within P28, particularly within the existing grassed swales.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	4	1	1	8
Further Investigation Recommended	2	1	0	0
Total	6	2	1	8

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Outfall 7654

Approximate Drainage Area:	9.2 Acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	Yes
Conclusion:	Repair and Maintenance Recommended

OPPORTUNITIES

No specific opportunities were identified in this assessment area. However, individuals are encouraged to install environmentally friendly practices that promote infiltration (rain gardens, downspout disconnection, etc.) and improve conveyance (vegetated swales, etc.) on their own properties. In addition, a list of infrastructure assets that may require maintenance and/or repair was submitted to the Bureau of Highways.

PHOTOS

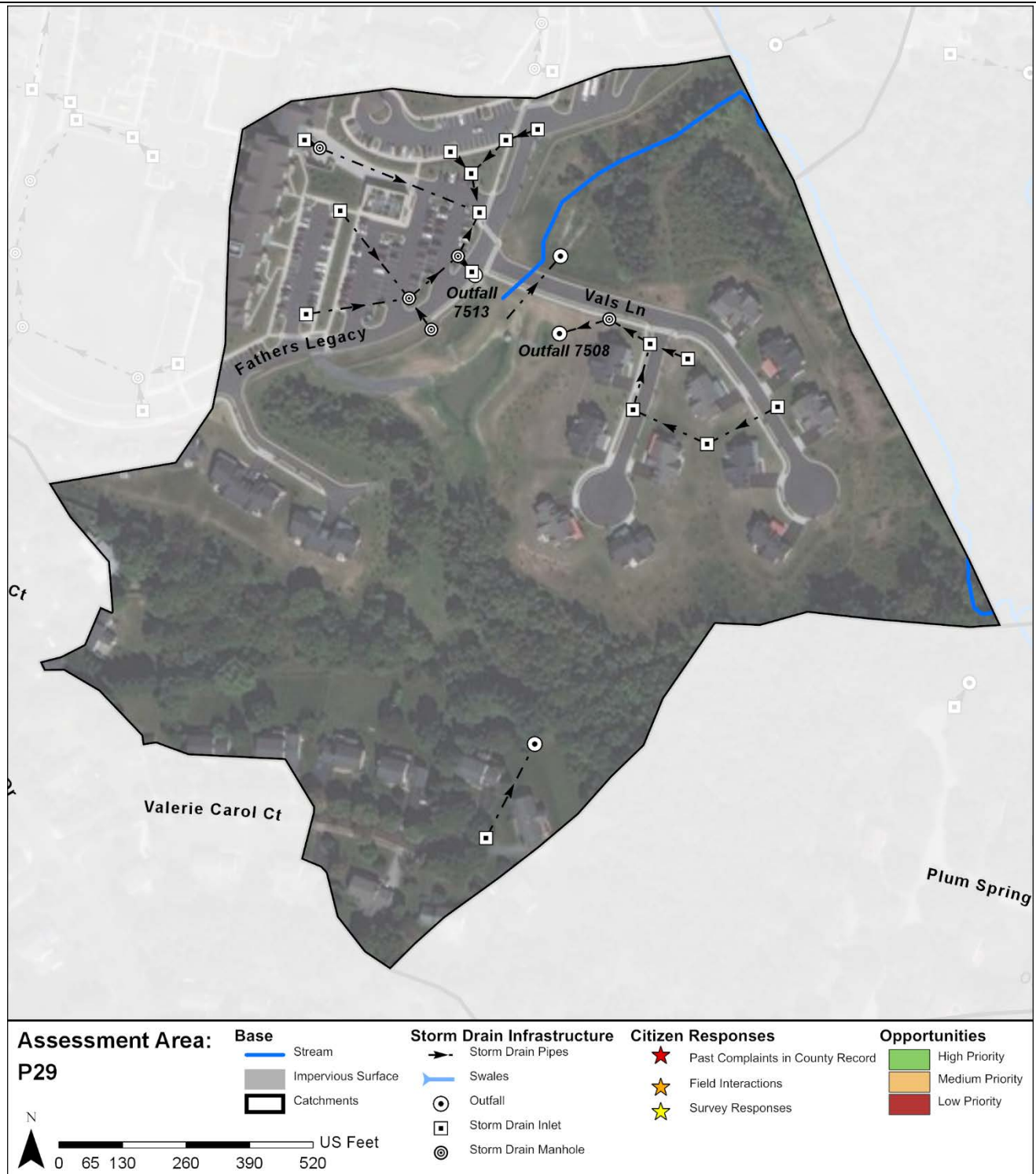


Figure 1: Inlet along Spring Meadow Drive with observed debris and vegetation.



Figure 2: Typical inlet along Spring Falls Court.

PLUMTREE BRANCH WATERSHED ASSESSMENT AREA P29



Assessment Area Category:
POTENTIAL REPAIR AND MAINTENANCE PROJECT

Approximate Assessment Area: 27.9 acres
Approximate Imperviousness: 4%

ASSESSMENT AREA DESCRIPTION

The P29 assessment area is an approximately 27.9-acre area in Howard County's Plumtree Branch watershed. The assessment area is comprised of varying densities of residential development. The area captures runoff from portions of the Lutheran Village at Miller's Grant development as well as Valerie Carol Court. Most of the captured runoff within P29 is within the Lutheran Village development and conveyed into a stormwater management pond which outlets its discharge to the north of Vals Lane. All sections of roadway within P29 are closed section. There are two major storm drain systems within the assessment area.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	15	3	5	21
Further Investigation Recommended	0	1	0	0
Total	15	4	5	21

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Outfall 7508

Approximate Drainage Area:	8.4 Acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	No
Conclusion:	Likely Adequate

Assessment Point ID: Outfall 7513

Approximate Drainage Area:	8.4 Acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	No
Conclusion:	Likely Adequate

OPPORTUNITIES

No specific opportunities were identified in this assessment area. However, individuals are encouraged to install environmentally friendly practices that promote infiltration (rain gardens, downspout disconnection, etc.) and improve conveyance (vegetated swales, etc.) on their own properties. In addition, a list of infrastructure assets that may require maintenance and/or repair was submitted to the Bureau of Highways.

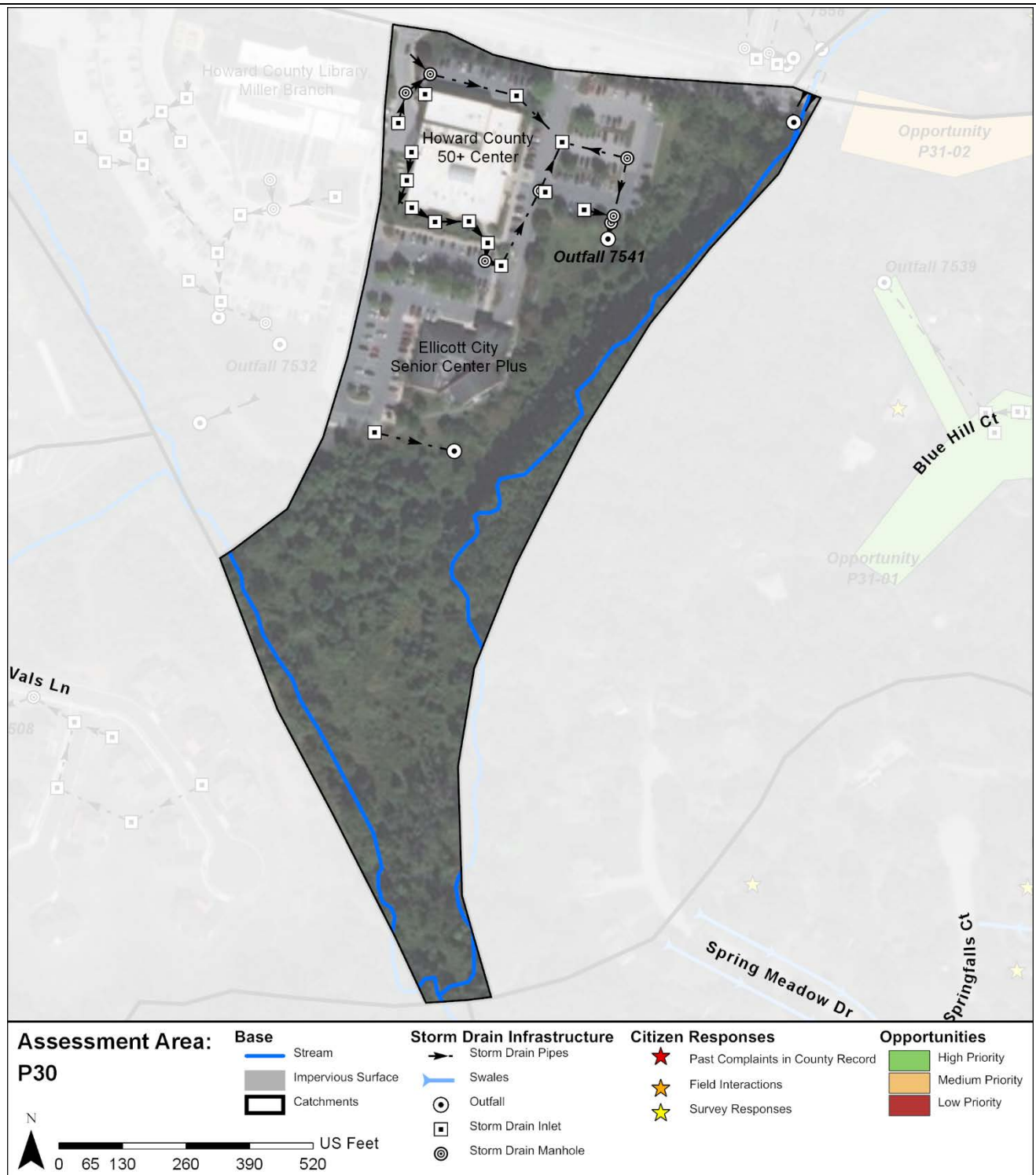
PHOTOS



Figure 1: Typical inlet within The Lutheran Village at Miller's Grant development.

PLUMTREE BRANCH WATERSHED

ASSESSMENT AREA P30



Assessment Area Category:
POTENTIAL REPAIR AND MAINTENANCE PROJECT

Approximate Assessment Area: 13.3 acres
Approximate Imperviousness: 25%

ASSESSMENT AREA DESCRIPTION

The P30 assessment area is an approximately 13.3-acre area in Howard County's Plumtree Branch watershed. The assessment area is comprised of the Howard County 50+ Center and the Ellicott City Senior Center Plus, along with their parking lots and some forested open space. Runoff captured within P30 is conveyed to two outfalls which discharge into Plumtree Branch. All of the parking lots within P30 are closed section. There is one major storm drain system in the assessment area.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	13	2	3	23
Further Investigation Recommended	1	1	4	1
Total	14	3	7	24

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Outfall 7541

Approximate Drainage Area:	5.3 Acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	Yes
Conclusion:	Repair and Maintenance Recommended

OPPORTUNITIES

No specific opportunities were identified in this assessment area. However, individuals are encouraged to install environmentally friendly practices that promote infiltration (rain gardens, downspout disconnection, etc.) and improve conveyance (vegetated swales, etc.) on their own properties. In addition, a list of infrastructure assets that may require maintenance and/or repair was submitted to the Bureau of Highways.

PHOTOS



Figure 1: Typical inlet within the Ellicott City Senior Plus development.



Figure 2: Submerged outfall within the Ellicott City Senior Plus development.

PLUMTREE BRANCH WATERSHED ASSESSMENT AREA P31



ASSESSMENT AREA DESCRIPTION

The P31 assessment area is an approximately 53.2-acre area in Howard County's Plumtree Branch watershed. The assessment area is largely residential with some institutional use. The assessment area captures runoff from Underoak Drive, Blue Hill Court, Cornus Lane, and portions of Chatham Road, Ligon Road, and Frederick Road. Stormwater is conveyed westward towards Plumtree Branch. About half of the roadways within P31 are closed section including Underoak Drive, Blue Hill Court, and Cornus Lane. These closed section roadways represent the only area served by a major conveyance system. The conveyance system utilizes multiple roadside swales in addition to the storm drain network.

Several survey responses and field interactions suggested that conveyance systems along Underoak Drive are being overwhelmed by additional runoff diverted from Chatham Road.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	5	3	0	9
Further Investigation Recommended	3	4	0	3
Total	8	7	0	12

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Outfall 7539

Approximate Drainage Area:	26.6 Acres
Storm Drain Sizing:	Outside of Range
Potential Constrictions:	No
Observed System Deficiencies:	Yes
Conclusion:	Conduct More Detailed Analysis of Storm Drain Network

OPPORTUNITIES

Opportunities identified in early 2019 focus on improving drainage and addressing expressed concerns.

Type	ID No.	Description & Discussion
Improve Existing Conveyance System	P31-01	Existing conveyance system is fragmented and likely not functioning as intended. Survey responses suggest that flooding of area is significant. Analyze system and, if necessary, improve system with modified infrastructure.
Install New Conveyance System	P31-02	Add conveyance system to areas with no existing infrastructure. Analyze the sections with existing infrastructure and, if necessary, improve system with modified infrastructure.
Conduct More Detailed Analysis of Storm Drain Network	N/A	The major storm drain network(s) within the assessment area is likely not functioning as intended. More detailed analysis is recommended to determine if improving the network with modified infrastructure is necessary.

PHOTOS



Figure 1: Opportunity to improve existing conveyance system along Underoak Drive.

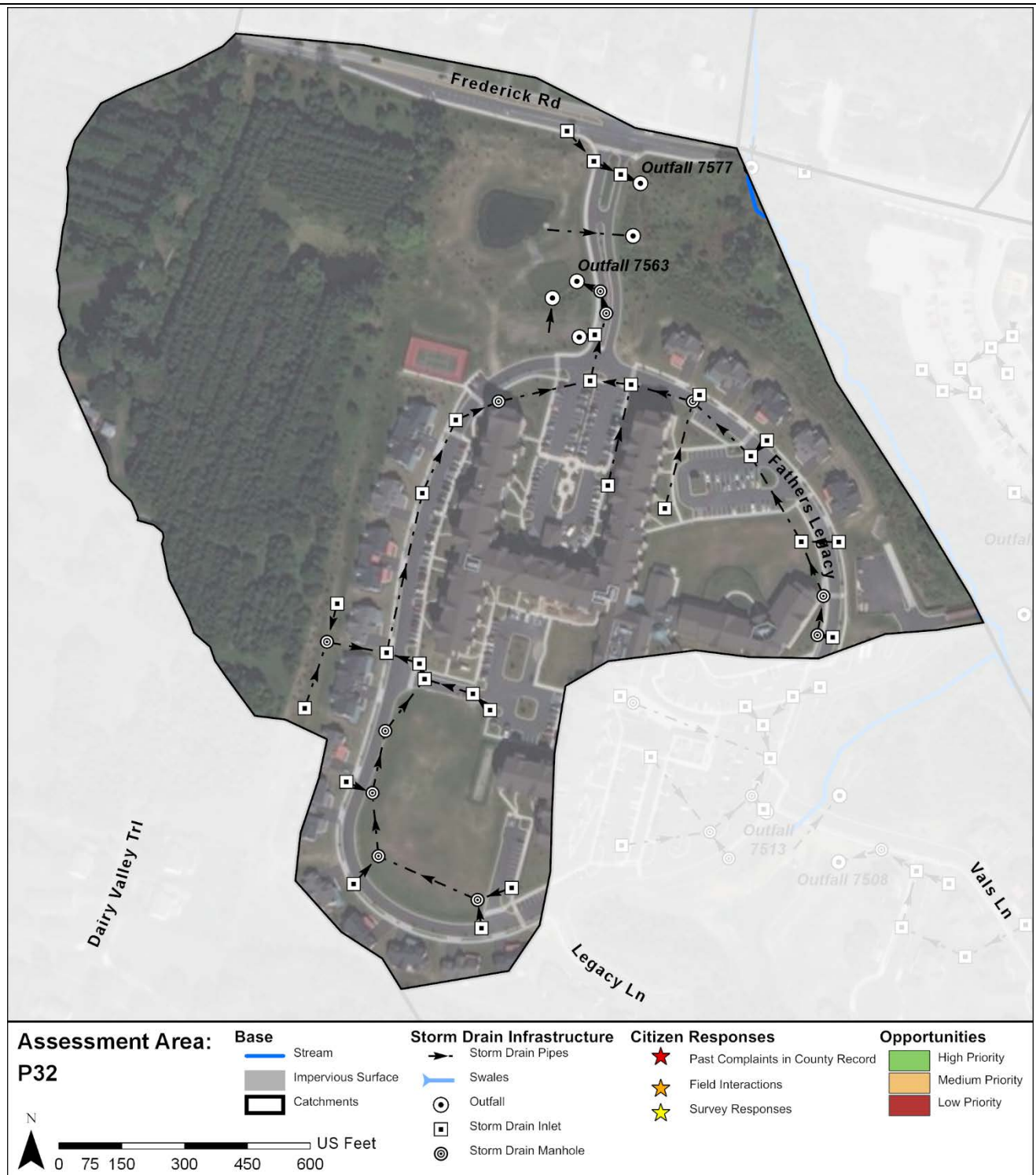


Figure 2: Opportunity to improve existing conveyance system along Underoak Drive.



Figure 3: Opportunity to install new conveyance system along Ligon Road.

PLUMTREE BRANCH WATERSHED ASSESSMENT AREA P32



Assessment Area Category:
POTENTIAL REPAIR AND MAINTENANCE PROJECT

Approximate Assessment Area: 39.8 acres
Approximate Imperviousness: 3%

ASSESSMENT AREA DESCRIPTION

The P32 assessment area is an approximately 39.8-acre area in Howard County's Plumtree Branch watershed. The assessment area is mostly comprised of the Lutheran Village at Miller's Grant development and includes a small portion of Frederick Road. Runoff captured within the development is conveyed to two outfalls along Fathers Legacy near the development's entrance off of Frederick Road. All of the roadways within P32 are closed section roadways. There are two major storm drain systems within the assessment area.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	25	4	11	38
Further Investigation Recommended	2	1	0	2
Total	27	5	11	40

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Outfall 7563

Approximate Drainage Area:	23.9 Acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	Yes
Conclusion:	Repair and Maintenance Recommended

Assessment Point ID: Outfall 7577

Approximate Drainage Area:	2.0 Acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	No
Conclusion:	Likely Adequate

OPPORTUNITIES

No specific opportunities were identified in this assessment area. However, individuals are encouraged to install environmentally friendly practices that promote infiltration (rain gardens, downspout disconnection, etc.) and improve conveyance (vegetated swales, etc.) on their own properties. In addition, a list of infrastructure assets that may require maintenance and/or repair was submitted to the Bureau of Highways.

PHOTOS



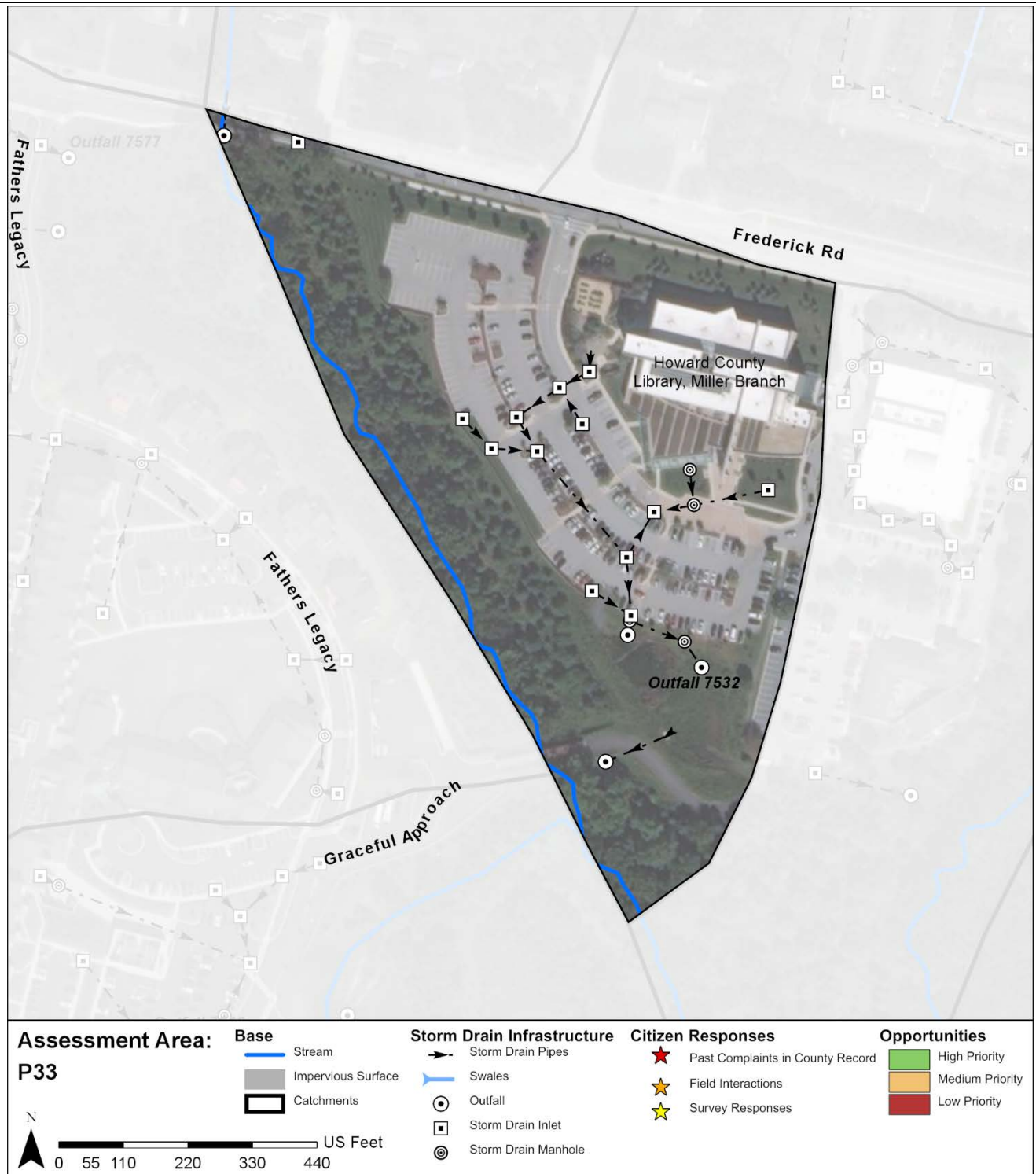
Figure 1: Typical inlet within The Lutheran Village at Miller's Grant development.



Figure 2: Typical stormwater facility outfall within The Lutheran Village at Miller's Grant development.

PLUMTREE BRANCH WATERSHED

ASSESSMENT AREA P33



Assessment Area Category:
POTENTIAL REPAIR AND MAINTENANCE PROJECT

Approximate Assessment Area: 10.5 acres
Approximate Imperviousness: 34%

ASSESSMENT AREA DESCRIPTION

The P33 assessment area is an approximately 10.5-acre area in Howard County's Plumtree Branch watershed. The assessment area includes the Miller Branch of the Howard County Library as well as its parking lot. Stormwater captured within P33 is conveyed to a stormwater management pond to the south of the parking lot. All roadways within P33 are closed section. The assessment area is serviced by one major storm drain system.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	13	3	2	14
Further Investigation Recommended	0	1	2	5
Total	13	4	4	19

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Outfall 7532

Approximate Drainage Area:	9.5 Acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	Yes
Conclusion:	Repair and Maintenance Recommended

OPPORTUNITIES

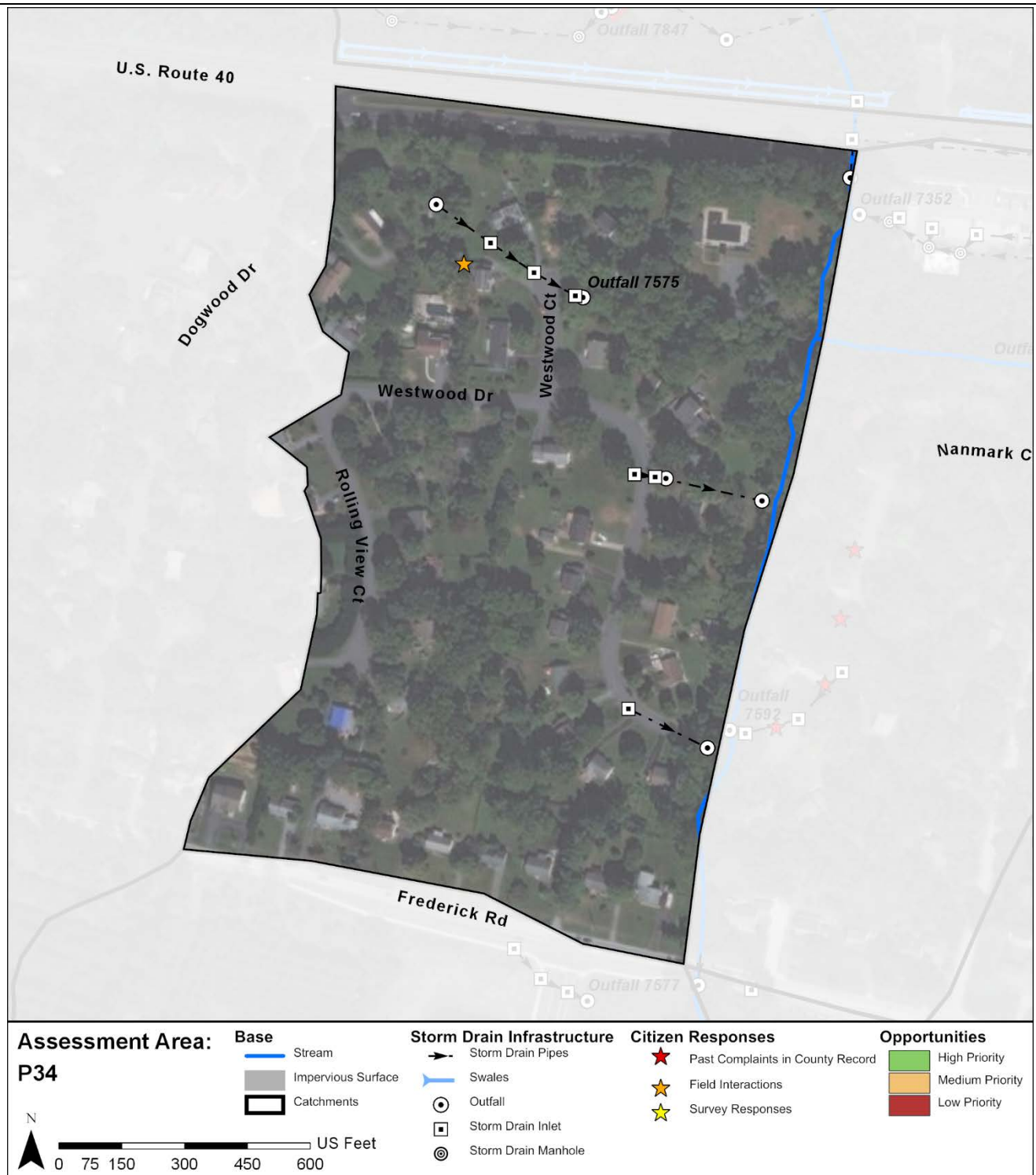
No specific opportunities were identified in this assessment area. However, individuals are encouraged to install environmentally friendly practices that promote infiltration (rain gardens, downspout disconnection, etc.) and improve conveyance (vegetated swales, etc.) on their own properties. In addition, a list of infrastructure assets that may require maintenance and/or repair was submitted to the Bureau of Highways.

PHOTOS



Figure 1: Typical inlet within the Miller Branch Howard County Library.

PLUMTREE BRANCH WATERSHED ASSESSMENT AREA P34



Assessment Area Category:
POTENTIAL REPAIR AND MAINTENANCE PROJECT

Approximate Assessment Area: 29.7 acres
Approximate Imperviousness: 20%

ASSESSMENT AREA DESCRIPTION

The P34 assessment area is an approximately 29.7-acre area in Howard County's Plumtree Branch watershed. The assessment area largely consists of medium-density residential. The assessment area is bound by Frederick Road to the south, Rolling View Court to the west, U.S. Route 40 to the north and Plumtree Branch to the east. Captured stormwater within P34 is conveyed westward to Plumtree Branch through multiple outfalls. The P34 assessment area consists of closed section roadways. The assessment area is serviced by one major storm drain system, as well as two minor systems.

A field interaction within the assessment area described instances of flooding on residential properties and pointed out signs of failed infrastructure.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	1	1	0	5
Further Investigation Recommended	5	4	0	2
Total	6	6	0	7

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Outfall 7575

Approximate Drainage Area:	5.9 Acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	Yes
Conclusion:	Repair and Maintenance Recommended

OPPORTUNITIES

No specific opportunities were identified in this assessment area. However, individuals are encouraged to install environmentally friendly practices that promote infiltration (rain gardens, downspout disconnection, etc.) and improve conveyance (vegetated swales, etc.) on their own properties. In addition, a list of infrastructure assets that may require maintenance and/or repair was submitted to the Bureau of Highways.

PHOTOS

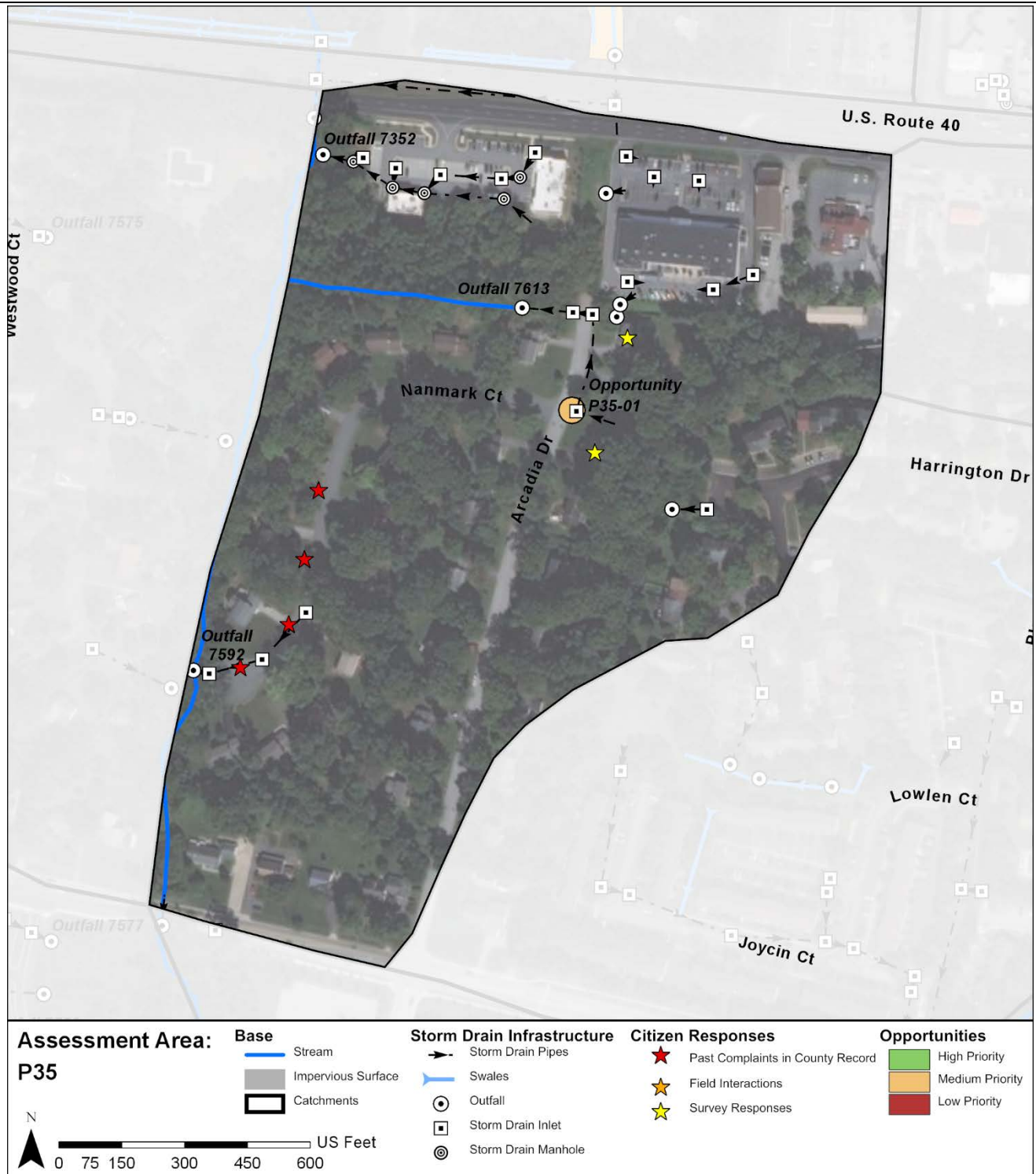


Figure 1: Typical inlet along Westwood Drive with observed debris.



Figure 2: Typical inlet along Westwood Drive with observed debris.

PLUMTREE BRANCH WATERSHED ASSESSMENT AREA P35



Assessment Area Category:
POTENTIAL CAPITAL IMPROVEMENT PROJECT

Approximate Assessment Area: 32.2 acres
Approximate Imperviousness: 30%

ASSESSMENT AREA DESCRIPTION

The P35 assessment area is an approximately 32.2-acre area in Howard County's Plumtree Branch watershed. The assessment area is mostly residential with some commercial use as well. The assessment area is bounded by U.S. Route 40 to the north and Frederick Road to the south. It is intersected by Arcadia Drive and Plumtree Branch represents its western boundary. Most of the area within P35 is covered by open section roadways. There are three major storm drain systems within the assessment area although a large portion of the assessment area is not served by storm drain infrastructure.

Several survey responses and field observations suggested that flooding throughout the assessment area, especially near Plumtree Branch, is significant and occurs at some level every time it rains.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	12	4	3	21
Further Investigation Recommended	6	3	2	7
Total	18	7	5	29

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Outfall 7592

Approximate Drainage Area:	6.4 Acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	Yes
Conclusion:	Repair and Maintenance Recommended

Assessment Point ID: Outfall 7613

Approximate Drainage Area:	3.2 Acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	Yes
Conclusion:	Repair and Maintenance Recommended

Assessment Point ID: Outfall 7352

Approximate Drainage Area:	1.6 Acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	Yes
Conclusion:	Repair and Maintenance Recommended

OPPORTUNITIES

Opportunities identified in early 2019 focus on improving drainage and addressing expressed concerns.

Type	ID No.	Description & Discussion
Improve Existing Conveyance System	P35-01	Existing storm drain system is not likely functioning as intended. Field observation notes system seems to have limited capture efficiency. Survey responses and field observation indicate roadway experiences flooding frequently. Analyze system and, if necessary, improve system with modified infrastructure.

PHOTOS

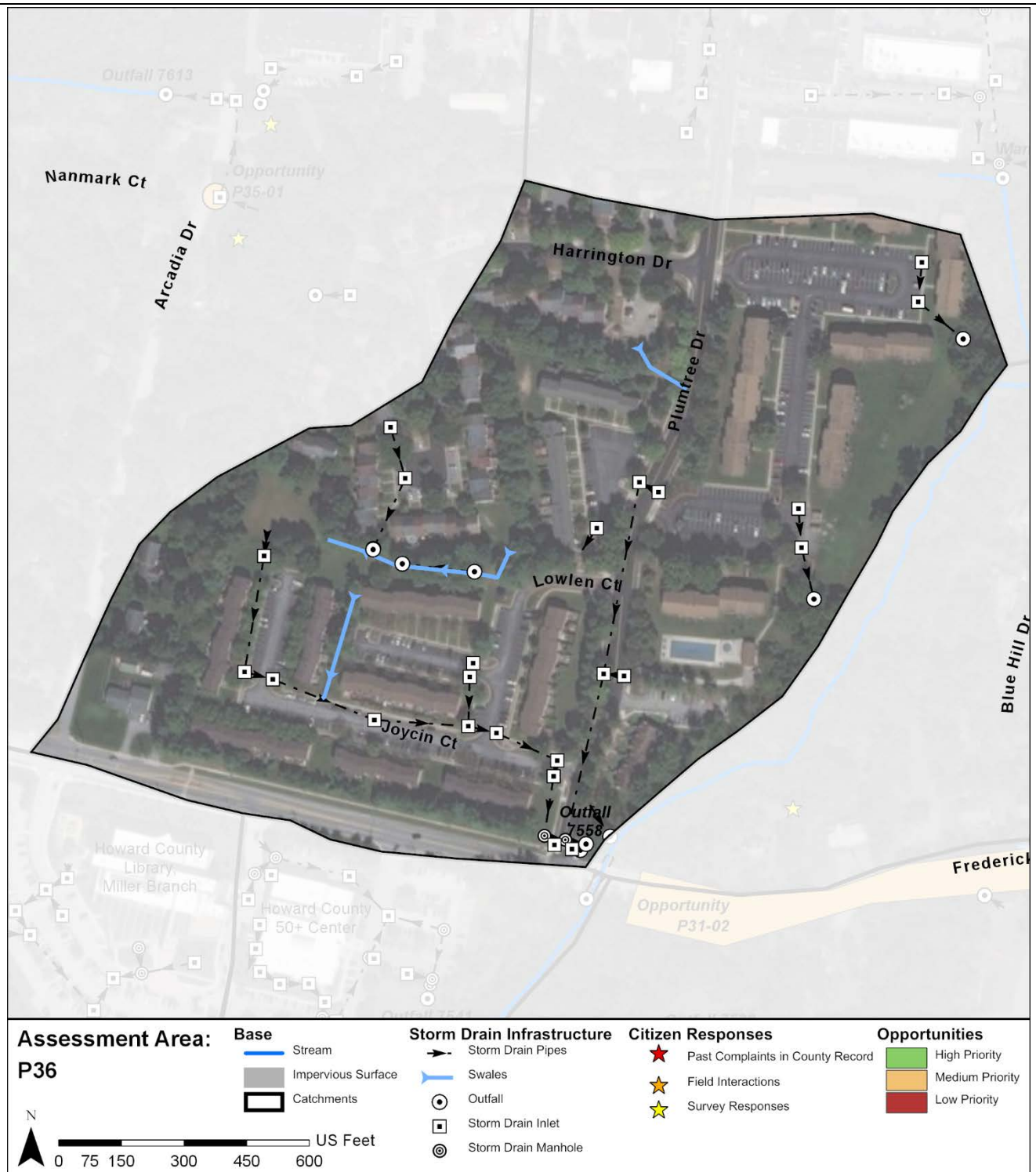


Figure 1: Opportunity to improve existing conveyance system along Acadia Drive.



Figure 2: Typical inlet requiring repair along Nanmark Court.

PLUMTREE BRANCH WATERSHED ASSESSMENT AREA P36



Assessment Area Category:
POTENTIAL REPAIR AND MAINTENANCE PROJECT

Approximate Assessment Area: 31.1 acres
Approximate Imperviousness: 38%

ASSESSMENT AREA DESCRIPTION

The P36 assessment area is an approximately 31.1-acre area in Howard County's Plumtree Branch watershed. The assessment area largely consists of high-density residential. The assessment area captures runoff from Joycin Court, Lowlen Court, portions of Split Rail Lane, Plumtree Drive, and Harrington Drive, as well as the Plum Tree apartment complex. A majority of the captured stormwater within P36 is conveyed towards an outfall near the intersection of Plumtree Drive and Frederick Road. The P36 assessment area consists of closed section roadways. Most of the assessment area is serviced by one major storm drain system.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	19	3	1	24
Further Investigation Recommended	4	5	1	5
Total	23	8	2	29

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Outfall 7558

Approximate Drainage Area:	21.8 Acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	Yes
Conclusion:	Repair and Maintenance Recommended

OPPORTUNITIES

No specific opportunities were identified in this assessment area. However, individuals are encouraged to install environmentally friendly practices that promote infiltration (rain gardens, downspout disconnection, etc.) and improve conveyance (vegetated swales, etc.) on their own properties. In addition, a list of infrastructure assets that may require maintenance and/or repair was submitted to the Bureau of Highways.

PHOTOS

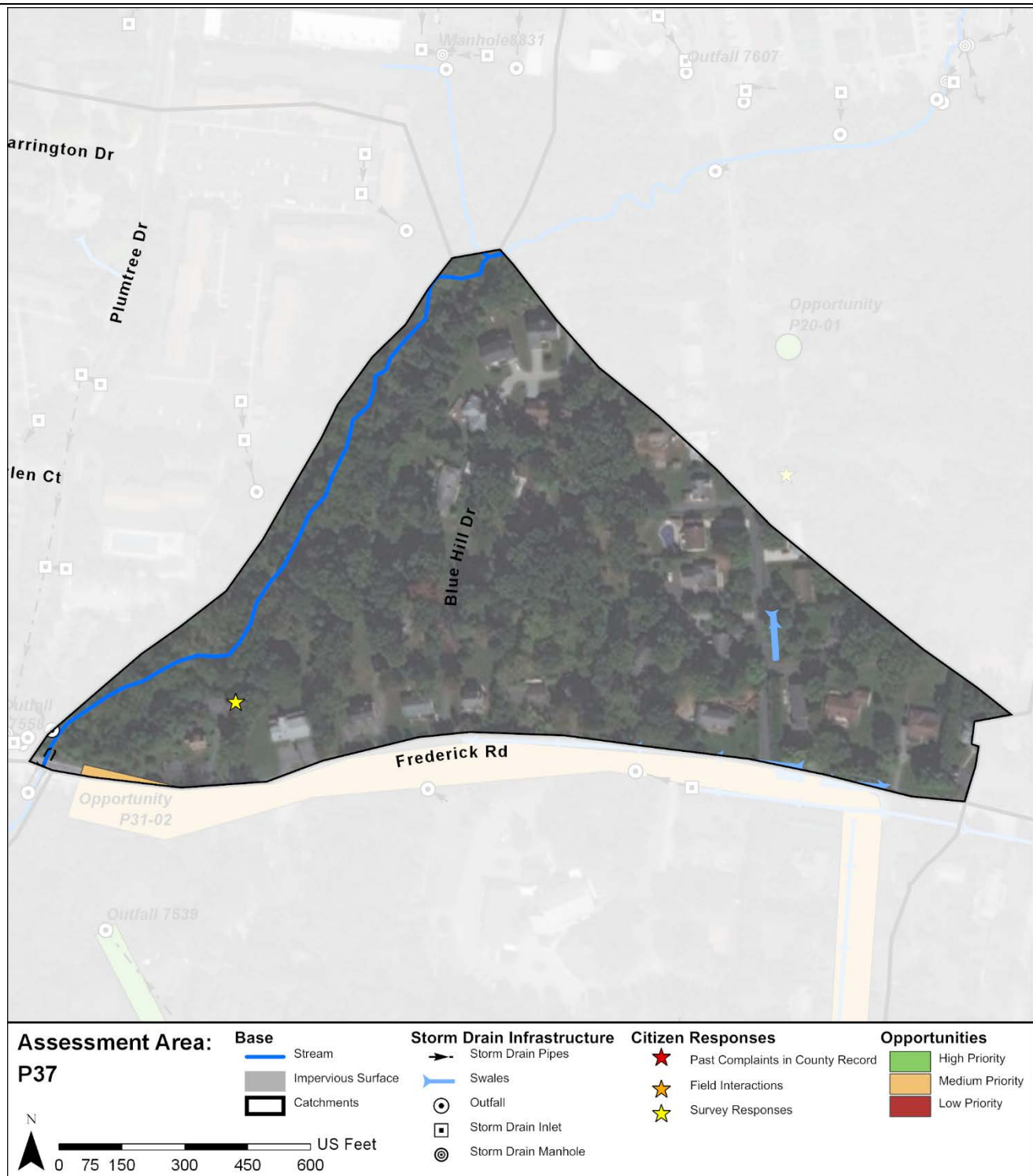


Figure 1: Typical inlet along Lowlen Court.



Figure 2: Typical inlet along Lowlen Court with observed debris.

PLUMTREE BRANCH WATERSHED ASSESSMENT AREA P37



Assessment Area Category:
POTENTIAL REPAIR AND MAINTENANCE PROJECT

Approximate Assessment Area: 20.0 acres
Approximate Imperviousness: 15%

ASSESSMENT AREA DESCRIPTION

The P37 assessment area is an approximately 20.0-acre area in Howard County's Plumtree Branch watershed. The assessment area is mostly medium-density residential. The area is bounded by Frederick Road to the south and includes Blue Hill Drive as well as sections of North Chatham Road. Runoff within drains naturally towards Plumtree Branch to the west. There is a single piece of stormwater infrastructure within the assessment area although some intermittent swales and curbs exist to aid in conveyance.

A survey response with P37 indicated issues with ponding and erosion along Plumtree Branch within the assessment area.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	0	0	0	0
Further Investigation Recommended	0	1	0	0
Total	0	1	0	0

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. This assessment area does not contain a major storm drain network.

OPPORTUNITIES

No specific opportunities were identified in this assessment area. However, individuals are encouraged to install environmentally friendly practices that promote infiltration (rain gardens, downspout disconnection, etc.) and improve conveyance (vegetated swales, etc.) on their own properties. In addition, a list of infrastructure assets that may require maintenance and/or repair was submitted to the Bureau of Highways.

PHOTOS



Figure 1: Outfall requiring repair.

PLUMTREE BRANCH WATERSHED ASSESSMENT AREA P38



Assessment Area Category:
POTENTIAL CAPITAL IMPROVEMENT PROJECT

Approximate Assessment Area: 13.6 acres
Approximate Imperviousness: 61%

ASSESSMENT AREA DESCRIPTION

The P38 assessment area is an approximately 13.6-acre area in Howard County's Plumtree Branch watershed. The assessment area is largely commercial with some high-density residential. The assessment area includes Plumtree Drive and is bound by U.S. Route 40 to the north and Harrington Drive to the south. Stormwater captured within P38 is conveyed to a single outfall to the northeast of the Plum Tree apartment complex. All of the roadways within the P38 assessment area are closed section. There are two major conveyance systems within the assessment area which capture runoff from the commercial area along U.S. Route 40.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	6	1	1	17
Further Investigation Recommended	8	2	3	7
Total	14	3	4	24

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Manhole 8833

Approximate Drainage Area:	5.4 Acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	Yes
Observed System Deficiencies:	Yes
Conclusion:	Conduct More Detailed Analysis of Storm Drain Network

Assessment Point ID: Manhole 8831

Approximate Drainage Area:	2.0 Acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	Yes
Conclusion:	Repair and Maintenance Recommended

OPPORTUNITIES

Opportunities identified in early 2019 focus on improving drainage and addressing expressed concerns.

Type	ID No.	Description & Discussion
Conduct More Detailed Analysis of Storm Drain Network	N/A	The major storm drain network(s) within the assessment area is likely not functioning as intended. More detailed analysis is recommended to determine if improving the network with modified infrastructure is necessary.

PHOTOS



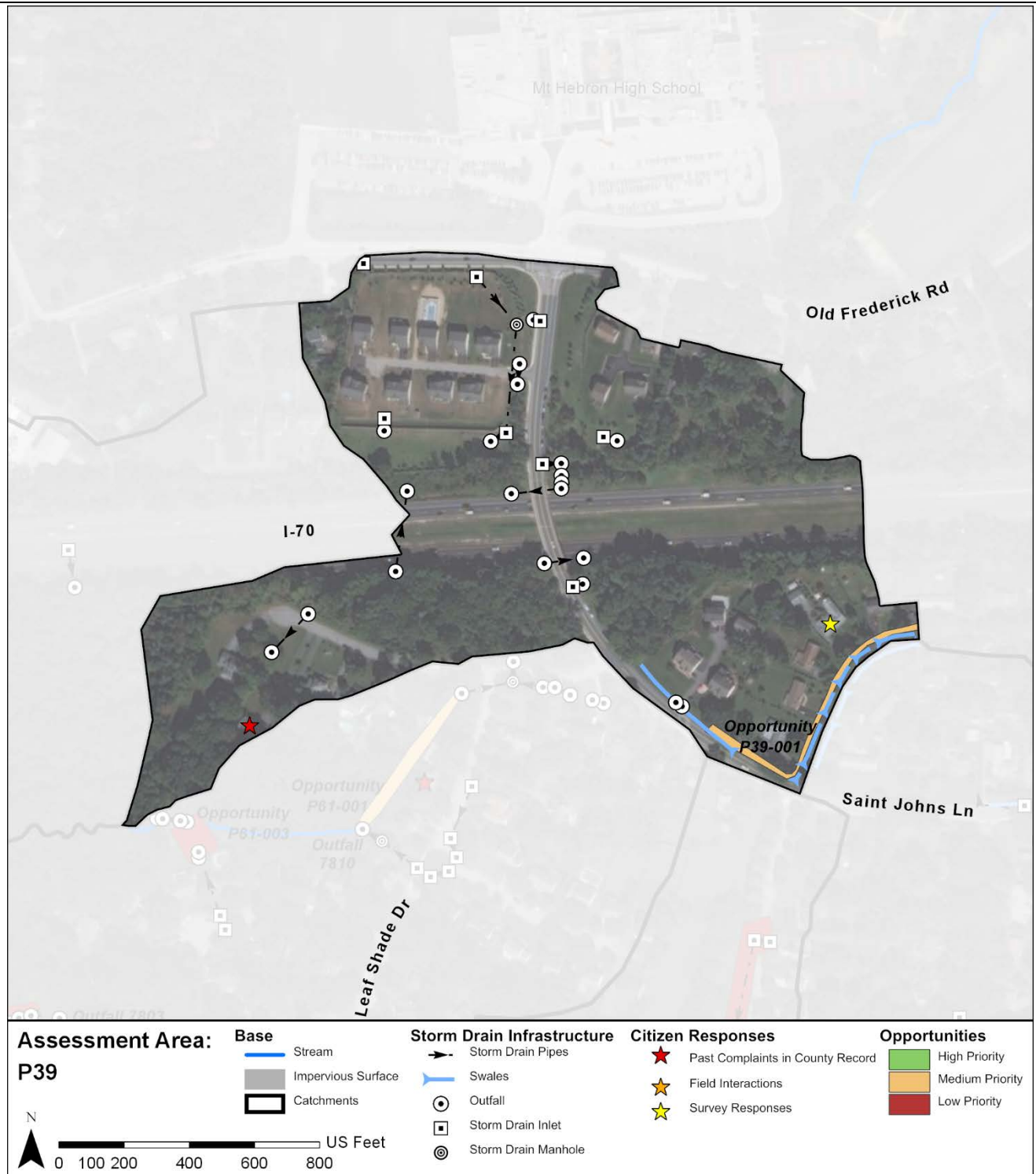
Figure 1: Outfall requiring repair.



Figure 2: Typical inlet along Plumtree Drive.

PLUMTREE BRANCH WATERSHED

ASSESSMENT AREA P39



Assessment Area Category:
POTENTIAL CAPITAL IMPROVEMENT PROJECT

Approximate Assessment Area: 30.6 acres
Approximate Imperviousness: 18 %

ASSESSMENT AREA DESCRIPTION

The P39 assessment area is an approximately 30.6-acre area in Howard County's Plumtree Branch watershed. The assessment area largely consists of medium-density residential houses with some open space land use. The area captures runoff from portions of I-70 and Saint Johns Lane. Captured stormwater within P39 is conveyed to an unnamed tributary to the Plumtree Branch. The P39 assessment area consists of a combination of open and closed-section roadways.

A survey response and field interaction with the homeowner of 9333 Millbrook Road indicated poor drainage in the neighborhood. The open section conveyance systems had grading that does not promote positive drainage.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	7	15	1	13
Further Investigation Recommended	1	5	0	2
Total	8	20	1	15

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. This assessment area does not contain a major storm drain network.

OPPORTUNITIES

Opportunities identified in early 2019 focus on improving drainage and addressing expressed concerns.

Type	ID No.	Description & Discussion
Improve Existing Conveyance System	P39-001	Field observations and survey response suggest that roadway runoff ponds on properties in this area. Improve conveyance through roadside ditches by regrading and installing driveway culverts.

PHOTOS



Figure 1: Standing water in roadside ditch along Millbrook Rd.



Figure 2: Standing water in roadside ditch along Millbrook Rd.

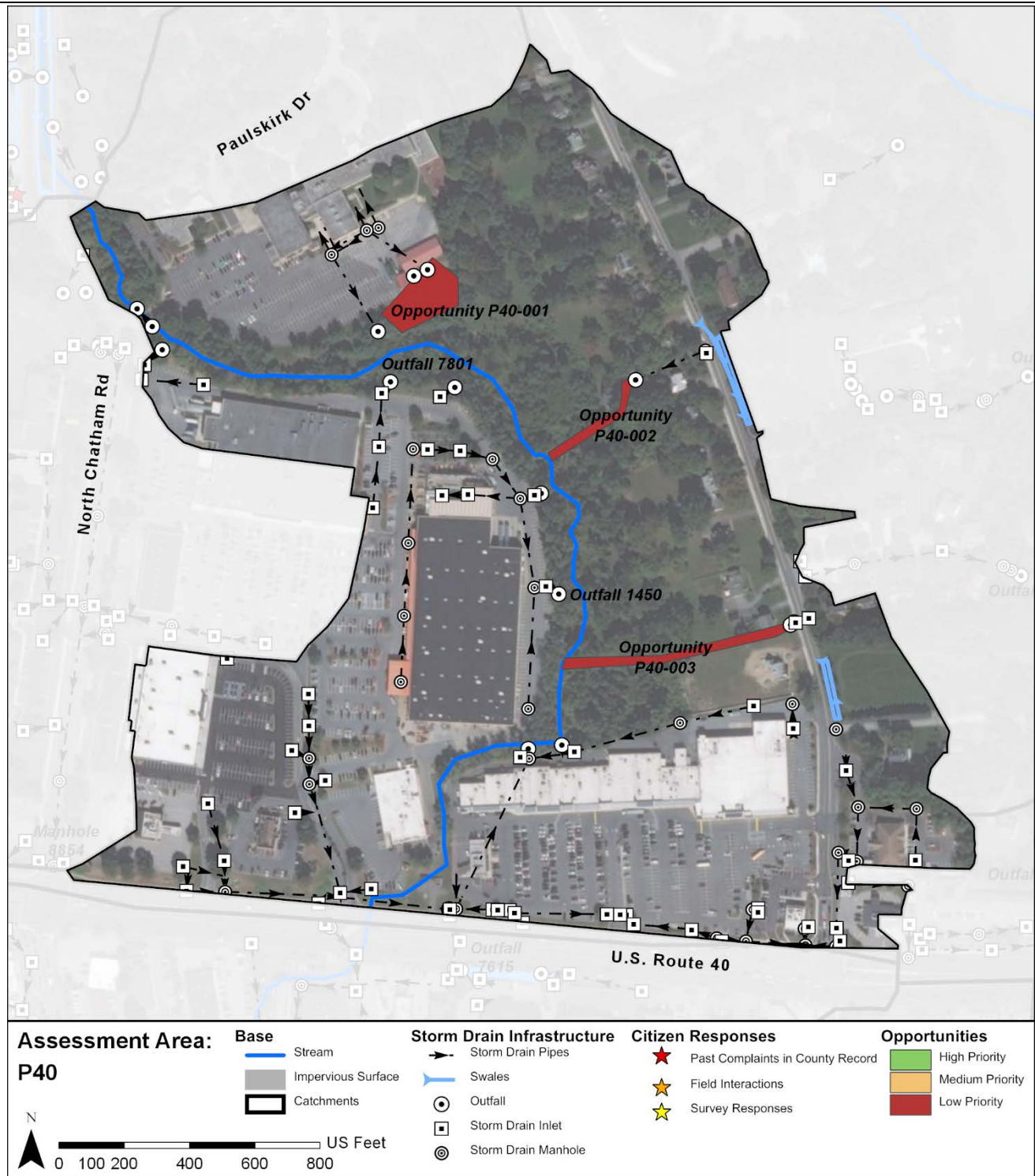


Figure 3: Outfall is deformed and deteriorating.



Figure 4: Severe erosion in the outfall channel downstream of outfall.

PLUMTREE BRANCH WATERSHED ASSESSMENT AREA P40



ASSESSMENT AREA DESCRIPTION

The P40 assessment area is an approximately 64.4-acre area in Howard County's Plumtree Branch watershed. The assessment area largely consists of commercial land use with some areas of medium-density residential houses. The area captures runoff from St. Johns lane, the St. John's Plaza shopping center, the Resurrection-St. Paul School, and part of the Chatham Station Shopping Center. All sections of roadway within P40 are closed section.

A significant amount of runoff from the Resurrection-St. Paul School and its parking lot is conveyed to a pond for treatment. Upon discussion with the facilities manager of the property, the pond has standing water that has not been fully drained for about a year. No survey responses were submitted in the P40 assessment area, however some roadside stormdrain outfalls on private properties were found to be in poor condition during field visits. If these drainage problems do not fall within a county-owned easement, individual property owners are encouraged to undertake on-lot improvements to improve stormwater management and conveyance on their properties.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	31	6	29	96
Further Investigation Recommended	20	7	2	1
Total	51	13	31	97

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Outfall 7801

Approximate Drainage Area:	3.2 acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	No
Conclusion:	Likely Adequate

Assessment Point ID: Outfall 1450

Approximate Drainage Area:	6.4 acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	No
Conclusion:	Likely Adequate

OPPORTUNITIES

Opportunities identified in early 2019 focus on improving drainage and addressing expressed concerns.

Type	ID No.	Description & Discussion
Improve Existing Conveyance System/ESD Practice	P40-001	Field observations and interactions suggest that this infiltration facility is not functioning as intended. Improve conveyance into and out of this facility by cleaning the inflow pipe and clearing the facility of sediment build-up. Investigate infiltration media for maintenance needs.
Improve Existing Conveyance System	P40-002	Existing infrastructure could not be located during field investigation and is likely buried. Replace outfall structure and improve conveyance from storm drain outfall to downstream channel.
Improve Existing Conveyance System	P40-003	Existing conveyance system is likely not functioning as intended. Improve conveyance from storm drain system outfall to downstream channel.

PHOTOS



Figure 1: Infiltration facility is filled with standing water.



Figure 1: Inflow to facility is submerged and filled with sediment.

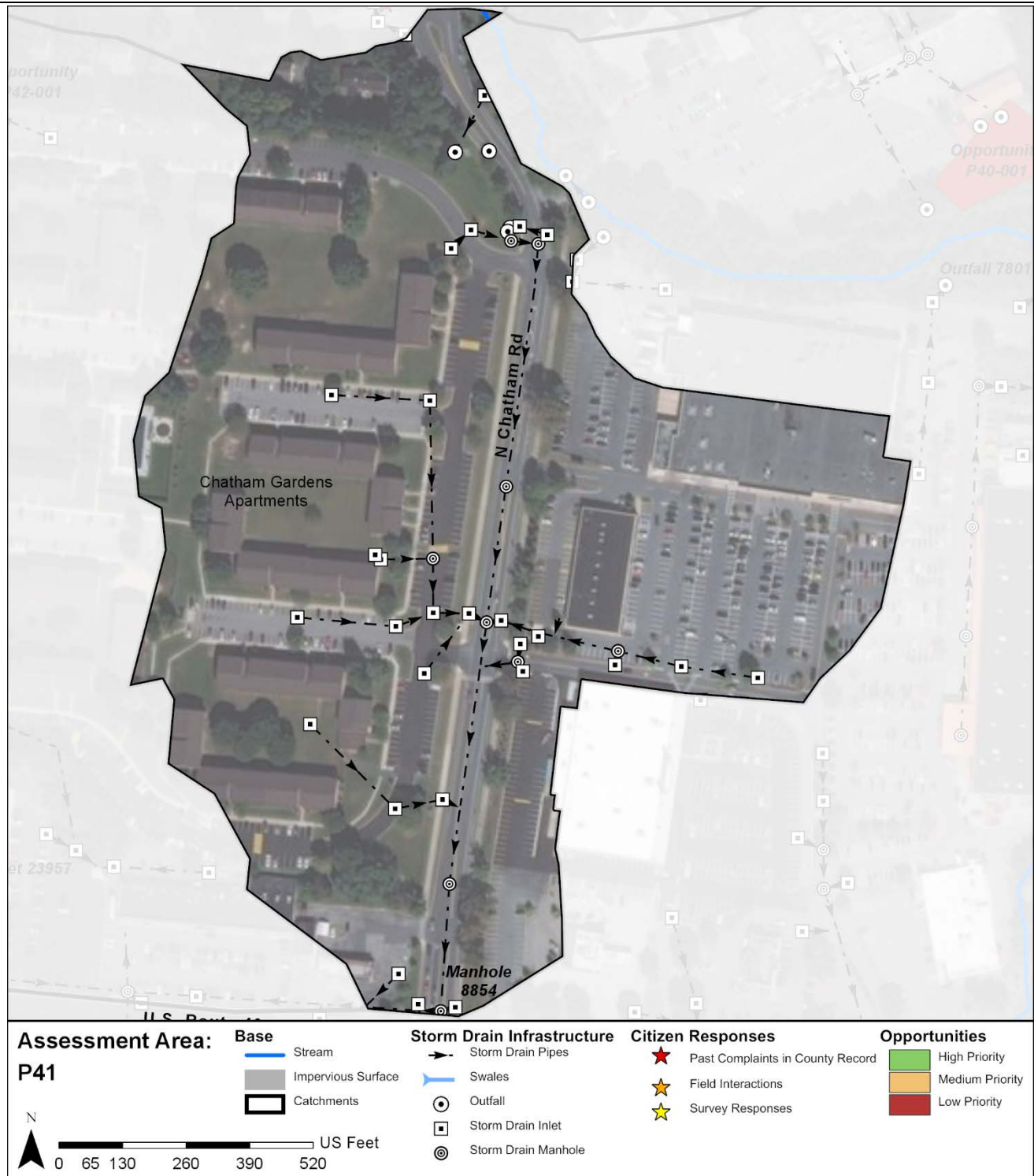


Figure 2: Storm drain outfall approximate location.



Figure 3: Eroded storm drain outfall channel through homeowner's yard.

PLUMTREE BRANCH WATERSHED ASSESSMENT AREA P41



Assessment Area Category:
POTENTIAL REPAIR AND MAINTENANCE PROJECT

Approximate Assessment Area: 25.1 acres
Approximate Imperviousness: 59%

ASSESSMENT AREA DESCRIPTION

The P41 assessment area is an approximately 25.1-acre area in Howard County's Plumtree Branch watershed. Roughly half of the assessment area consists of commercial land use and half consists of high density residential area. The area captures runoff from portions of Chatham Garden apartments, the Chatham Station Shopping Center, and N Chatham Rd below the Paulskirk Drive intersection. All sections of roadway within P41 are closed section. There is one storm drain system serving the assessment area which runs along North Chatham Road, connects into the main network running along the Baltimore National Pike, and ultimately outfalls in the Plumtree Branch. No survey responses were submitted in the assessment area, however some roadside storm drain outfalls on private properties were found to be in poor condition during field visits. If these drainage problems do not fall within a county-owned easement, individual property owners are encouraged to undertake on-lot improvements to improve stormwater management and conveyance on their properties.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	17	1	9	44
Further Investigation Recommended	11	2	0	2
Total	28	3	9	46

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Manhole 8854

Approximate Drainage Area:	25.1 acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	Yes
Conclusion:	Repair and Maintenance Recommended

OPPORTUNITIES

No specific opportunities were identified in this assessment area. However, individuals are encouraged to install environmentally friendly practices that promote infiltration (rain gardens, downspot disconnection, etc.) and improve conveyance (vegetated swales, etc.) on their own properties. In addition, a list of infrastructure assets that may require maintenance and/or repair was submitted to the Bureau of Highways.

PHOTOS

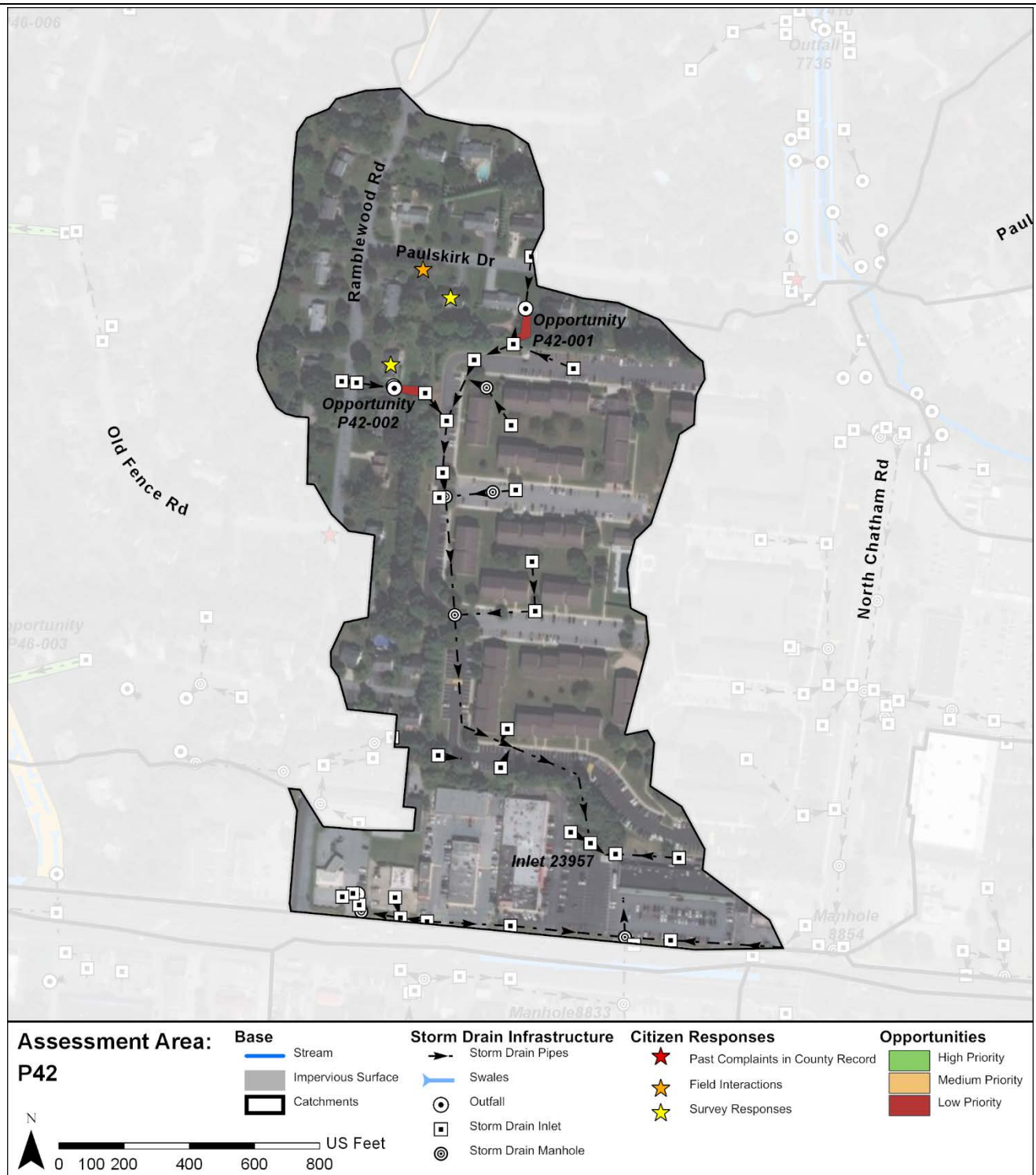


Figure 1: Exposed rebar in pipe.



Figure 2: Cleaning recommended inside inlet.

PLUMTREE BRANCH WATERSHED ASSESSMENT AREA P42



Assessment Area Category:
POTENTIAL REPAIR AND MAINTENANCE PROJECT

Approximate Assessment Area: 34.3 acres
Approximate Imperviousness: 44 %

ASSESSMENT AREA DESCRIPTION

The P42 assessment area is an approximately 34.3-acre area in Howard County's Plumtree Branch watershed. The assessment area largely consists of high and low density residential houses with some areas of commercial land use. The area captures runoff from a portion of the Chatham Gardens apartments, Ramblewood Road, Paulskirk Drive, and the Village Green Shopping Center. All flow and storm drain networks are directed to a culvert under the Baltimore National Pike which ultimately outfalls into the Plumtree Branch. Almost all sections of roadway within P42 are closed section. Survey responses and field interactions suggest that flooding is an issue and has caused erosion in some locations.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	17	2	3	43
Further Investigation Recommended	11	1	3	1
Total	28	3	6	44

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Inlet 23957

Approximate Drainage Area:	30.9 acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	No
Conclusion:	Likely Adequate

OPPORTUNITIES

Opportunities identified in early 2019 focus on improving drainage and addressing expressed concerns.

Type	ID No.	Description & Discussion
Improve Existing Conveyance System	P42-001	Existing conveyance system is likely not functioning as intended. Field observations and interactions suggest that channel does not maintain positive flow. Improve conveyance between storm drain outfall and storm drain system to minimize flooding of private property.

Improve Existing Conveyance System	P42-002	Existing conveyance system is likely not functioning as intended. Field observations and survey responses suggest that channel does not maintain positive flow. Improve conveyance between storm drain outfall and storm drain system to minimize flooding of private property.
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PHOTOS



Figure 1: Storm drain outfall channel with standing water.



Figure 2: Downstream end of outfall channel leading to inlet.



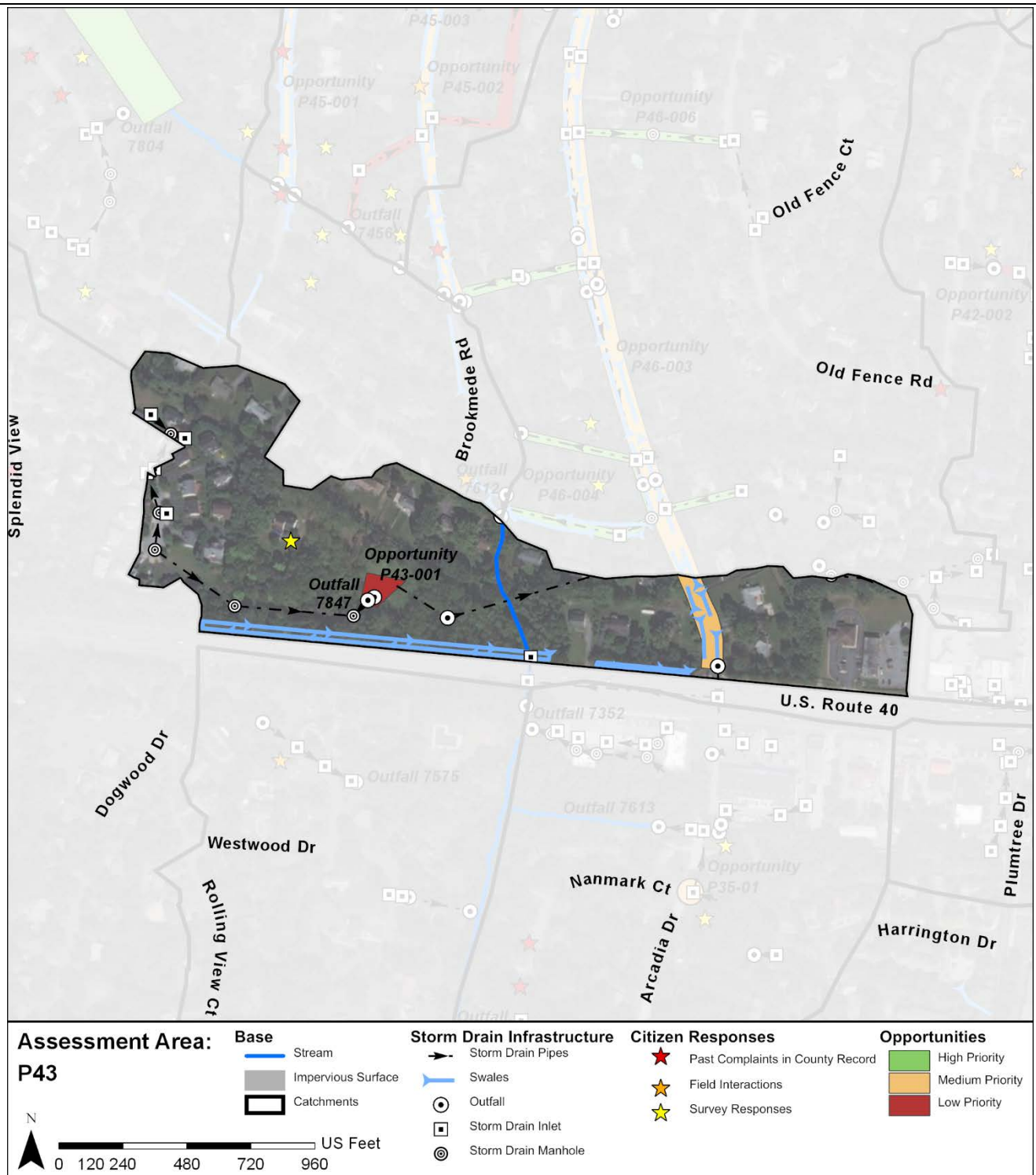
Figure 3: Eroded Outfall Channel.



Figure 4: Outfall partially full with sediment.

PLUMTREE BRANCH WATERSHED

ASSESSMENT AREA P43



Assessment Area Category:
POTENTIAL REPAIR AND MAINTENANCE PROJECT

Approximate Assessment Area: 22.4 acres
Approximate Imperviousness: 17 %

ASSESSMENT AREA DESCRIPTION

The P43 assessment area is an approximately 22.4-acre area in Howard County's Plumtree Branch watershed. The assessment area largely consists of medium density residential area with some areas of open land use. The area captures runoff from portions of Susies Way, Longview Drive, and Greenway Drive. The P43 assessment area consists of closed roadway sections. The main storm drain network collects runoff from Susies Way and conveys it to a SWM retention facility which outfalls to the Plumtree Branch. A survey response suggested that the facility isn't functioning as intended and field observations confirmed this. The facility's forebay is filled with sediment and vegetation which is clogging the inflow pipe. No other infrastructure deficiencies were found through field investigation and storm drain analysis. The property owners of any other found on-lot drainage deficiencies are encouraged to take action to improve conveyance.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	6	2	5	12
Further Investigation Recommended	0	1	0	0
Total	6	3	5	12

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Outfall 7847

Approximate Drainage Area:	9.0 acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	Yes
Conclusion:	Repair and Maintenance Recommended

OPPORTUNITIES

Opportunities identified in early 2019 focus on improving drainage and addressing expressed concerns.

Type	ID No.	Description & Discussion
Detention Practice	P43-001	Field observations suggest that pond forebay may require maintenance. Improve performance of facility by clearing forebay of sediment and debris.

PHOTOS

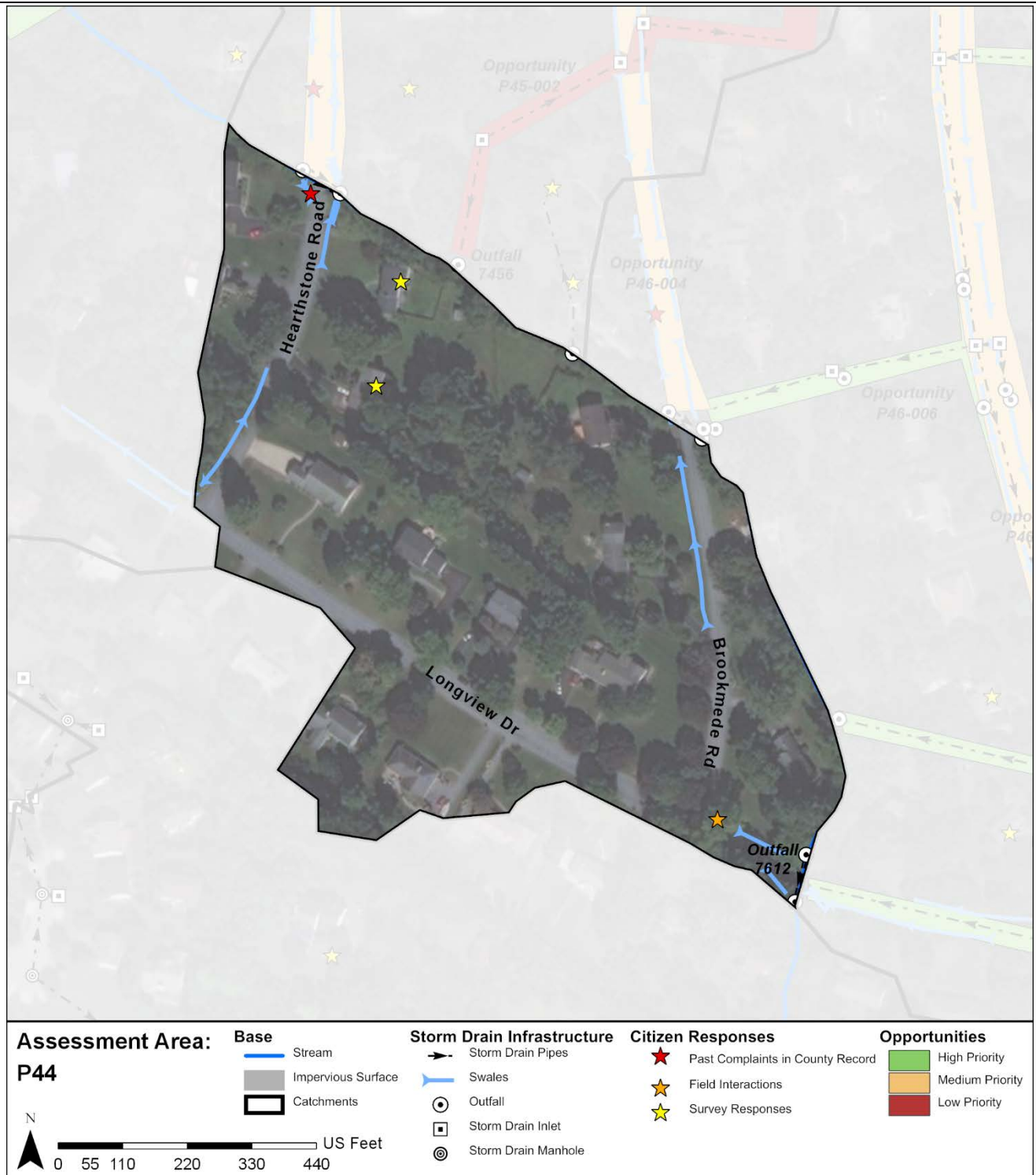


Figure 1: Pond forebay filled with sediment.



Figure 2: Pond inflow submerged and overgrown.

PLUMTREE BRANCH WATERSHED ASSESSMENT AREA P44



Assessment Area Category:
POTENTIAL ON-LOT IMPROVEMENTS

Approximate Assessment Area: 11.2 acres
Approximate Imperviousness: 22 %

ASSESSMENT AREA DESCRIPTION

The P44 assessment area is an approximately 11.2-acre area in Howard County's Plumtree Branch watershed. The assessment area consists of medium density residential area land use. The area captures runoff from the portions of Brookmede Road and Hearthstone Road that are south of the Plumtree Branch and a small portion of Long View Drive. All sections of roadway within P44 are open sections and all flow is directed north into the Plumtree Branch.

There are two survey responses from homeowners who noted ponding water in their backyards. After further investigation the ponding water is due to the close proximity to the Plumtree Branch and 100 year floodplain. Individual property owners are encouraged to undertake on-lot improvements to improve stormwater management and conveyance on their properties.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	0	0	0	0
Further Investigation Recommended	0	0	0	0
Total	0	0	0	0

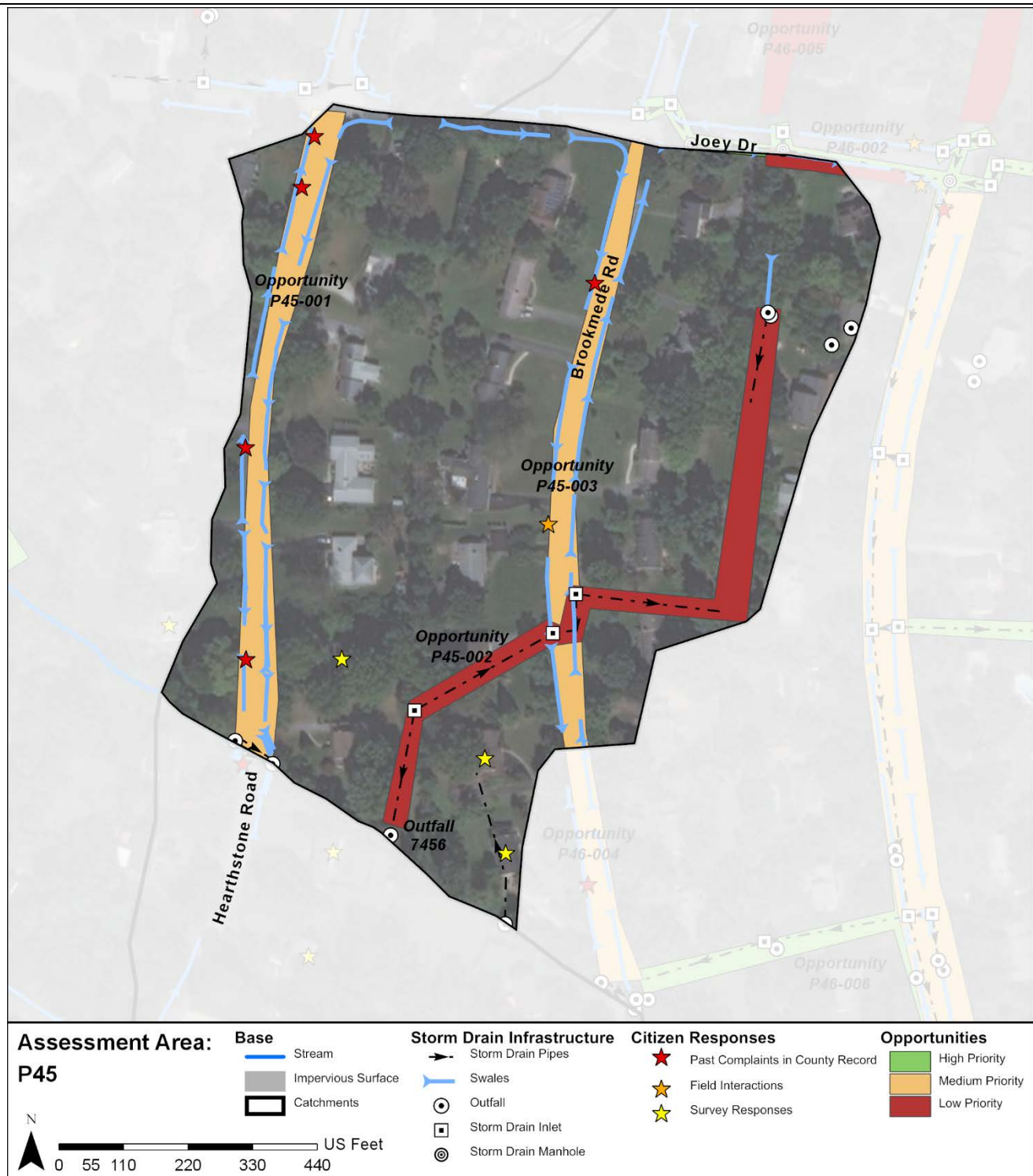
STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. This assessment area does not contain a major storm drain network.

OPPORTUNITIES

No opportunities were identified in this assessment area. However, individuals are encouraged to install environmentally friendly practices that promote infiltration (rain gardens, downspot disconnection, etc.) and improve conveyance (vegetated swales, etc.) on their own properties.

PLUMTREE BRANCH WATERSHED ASSESSMENT AREA P45



Assessment Area Category:
POTENTIAL CAPITAL IMPROVEMENT PROJECT

Approximate Assessment Area: 15.1 acres
Approximate Imperviousness: 21 %

ASSESSMENT AREA DESCRIPTION

The P45 assessment area is an approximately 15.1-acre area in Howard County's Plumtree Branch watershed. The assessment area largely consists of medium density residential houses. The area captures runoff from Brookmede Road and Hearthstone Road between Joey Drive and the Plumtree Branch. The P45 assessment area consists of mainly open section roadways with one storm drain network. The network captures flow from the backyards of houses on Greenway Drive and Brookmede Road and conveys it south and then to a series of inlets at a sump location on Brookmede Road. The flow is then conveyed to the backyards of houses on Brookmede Road and Hearthstone Road where it outfalls directly to the Plumtree Branch. Several survey responses as well as a field interaction suggest that there are areas of potential improvements to better convey flow and prevent flooding during storm events.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	1	3	0	4
Further Investigation Recommended	2	1	0	4
Total	3	4	0	8

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Outfall 7456

Approximate Drainage Area:	6.8 acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	Yes
Conclusion:	Repair and Maintenance Recommended

OPPORTUNITIES

Opportunities identified in early 2019 focus on improving drainage and addressing expressed concerns.

Type	ID No.	Description & Discussion
Improve Existing Conveyance System	P45-001	Field observations suggest that existing conveyance system is likely not functioning as intended. Improve conveyance through roadside ditches by regrading and installing driveway culverts.
Improve Existing Conveyance System	P45-002	This stormdrain system was likely installed prior to current design standards and could benefit from additional analysis for drainage improvement. Field observations suggest that pipe may be damaged in some areas due to observed sinkholes.
Improve Existing Conveyance System	P45-003	Field observations suggest that existing conveyance system is likely not functioning as intended. Improve conveyance through roadside ditches by regrading and installing driveway culverts.

PHOTOS



Figure 1: Standing water adjacent to driveway on Hearthstone Rd.



Figure 2: Sinkhole above assumed location of pipe behind houses on Greenway Dr.



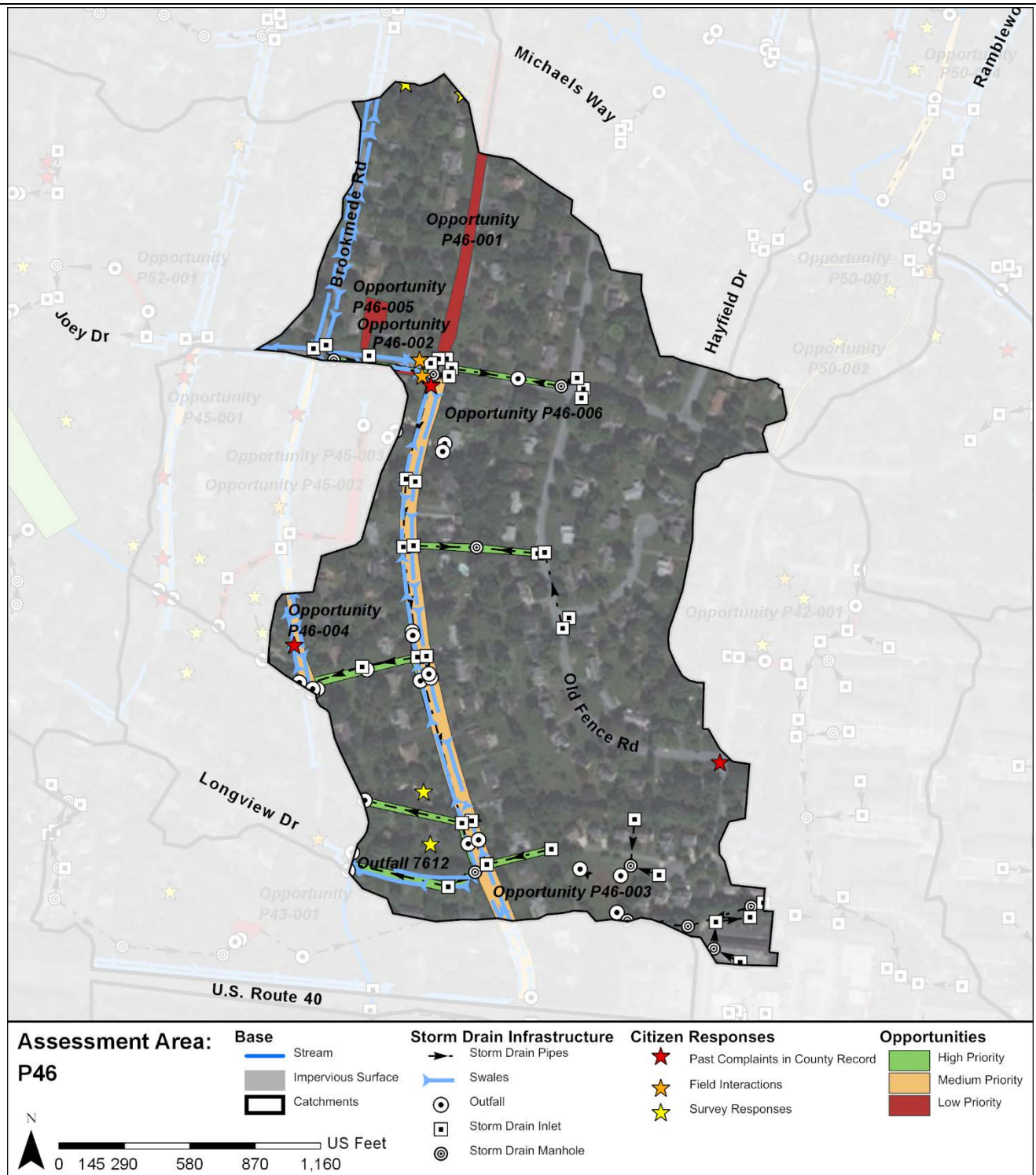
Figure 3: Standing water in ditch along Brookmede Rd.



Figure 4: Channel leading up to pipe is filled with sediment and debris.

PLUMTREE BRANCH WATERSHED

ASSESSMENT AREA P46



Assessment Area Category:
POTENTIAL CAPITAL IMPROVEMENT PROJECT

Approximate Assessment Area: 75.2 acres
Approximate Imperviousness: 24 %

ASSESSMENT AREA DESCRIPTION

The P46 assessment area is an approximately 75.2-acre area in Howard County's Plumtree Branch watershed. The assessment area largely consists of medium density residential houses. The area captures runoff from Greenway Drive, Old Fence Drive, Old Fence Court, and portions of Ramblewood Road, Longview Drive, Brookmede Road, and Joey Drive. This area's outfall is the Plumtree Branch where it crosses under Longview Drive. There is one major conveyance system serving the assessment area consisting of swales and a storm drain system. There is also an existing stormwater pond off of Ramblewood Road which ultimately outfalls to a point upstream of this storm drain system. The P46 assessment area consists of a combination of open and closed-section roadways.

Several survey responses and field interactions suggest that conveyance systems may not be functioning or existent and that flooding is widespread every time it rains. All opportunities identified in this area propose to create more efficiently functioning conveyance systems through improvement of existing infrastructure as well as the improvement of roadside conveyance ditches.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	29	8	11	55
Further Investigation Recommended	5	4	0	1
Total	34	10	11	56

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Outfall 7612

Approximate Drainage Area:	63.9 acres
Storm Drain Sizing:	Outside of Range
Potential Constrictions:	Yes
Observed System Deficiencies:	Yes
Conclusion:	Conduct More Detailed Analysis of Storm Drain Network

OPPORTUNITIES

Opportunities identified in early 2019 focus on improving drainage and addressing expressed concerns.

Type	ID No.	Description & Discussion
Improve Existing Conveyance System	P46-001	Survey responses suggest that runoff from roadway is concentrating and flowing through private property. Improve existing conveyance system through the addition of inlets or higher curb and gutter.
Improve Existing Conveyance System/ESD Practice	P46-002	Field observations and survey response suggest that roadway runoff ponds in this area. Improve existing conveyance system through the addition of an inlet or ESD practice in this location.
Improve Existing Conveyance System	P46-003	Field observations suggest that existing conveyance system is likely not functioning as intended. Improve conveyance through roadside ditches by regrading and installing driveway culverts.
Improve Existing Conveyance System	P46-004	Field observations suggest that existing conveyance system is likely not functioning as intended. Improve conveyance through roadside ditches by regrading and installing driveway culverts.
Improve Existing Conveyance System	P46-005	Field observations and interactions suggest that runoff is not flowing towards existing inlet in this location. Improve existing conveyance by regrading this area to maintain positive flow.
Improve Existing Conveyance System	P46-006	This stormdrain system was likely installed prior to current design standards and could benefit from additional analysis for drainage improvement.

PHOTOS



Figure 1: Standing water along Joey Dr.



Figure 2: Standing water and erosion in roadside ditch along Greenway Dr.

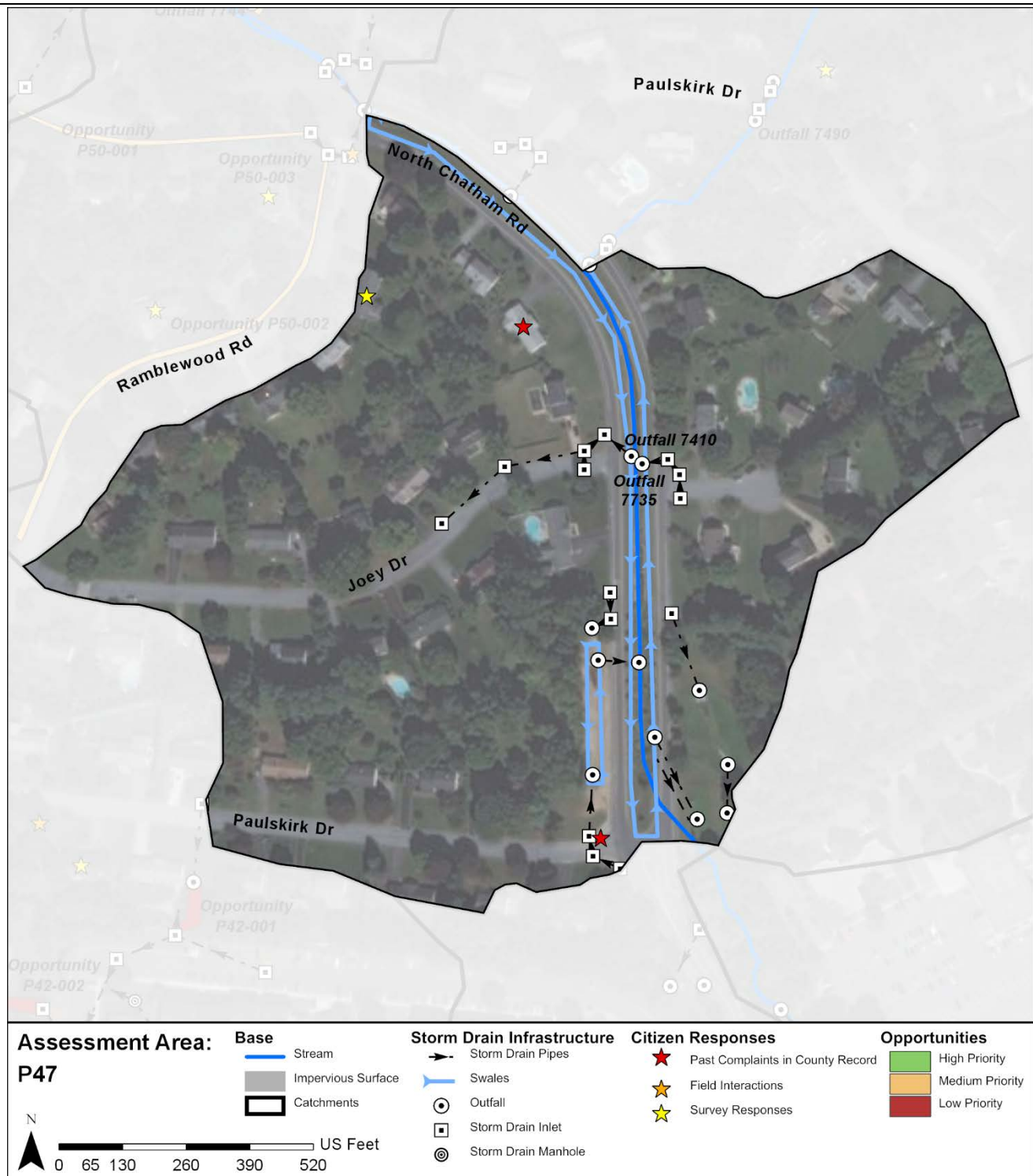


Figure 3: Standing water between houses along Joey Dr.



Figure 4: Outfall is broken at joint.

PLUMTREE BRANCH WATERSHED ASSESSMENT AREA P47



Assessment Area Category:
POTENTIAL REPAIR AND MAINTENANCE PROJECT

Approximate Assessment Area: 24.2 acres
Approximate Imperviousness: 23 %

ASSESSMENT AREA DESCRIPTION

The P47 assessment area is an approximately 24.2-acre area in Howard County's Plumtree Branch watershed. The assessment area largely consists of medium density residential houses. The area captures runoff from portions of Joey Drive, Paulskirk Drive, Chatham Court, and North Chatham Road. All flow and storm drain networks are directed to the concrete channel that runs along N Chatham Road which conveys flow through a culvert and additional storm drain networks until ultimately outfalling into the Plumtree Branch. All sections of roadway within P47 are closed section.

An ongoing project is underway in which the replacement of the North Chatham Road concrete channel and culvert as well as the downstream private driveway crossing on Little Plumtree Branch are being evaluated. Individual property owners are encouraged to undertake on-lot improvements to improve stormwater management and conveyance on their properties.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	11	8	0	18
Further Investigation Recommended	3	3	0	0
Total	14	11	0	18

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Outfall 7410

Approximate Drainage Area:	9.7 acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	Yes
Conclusion:	Repair and Maintenance Recommended

Assessment Point ID: Outfall 7735

Approximate Drainage Area:	4.8 acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	No
Conclusion:	Likely Adequate

OPPORTUNITIES

No specific opportunities were identified in this assessment area. However, individuals are encouraged to install environmentally friendly practices that promote infiltration (rain gardens, downspot disconnection, etc.) and improve conveyance (vegetated swales, etc.) on their own properties. In addition, a list of infrastructure assets that may require maintenance and/or repair was submitted to the Bureau of Highways.

PHOTOS

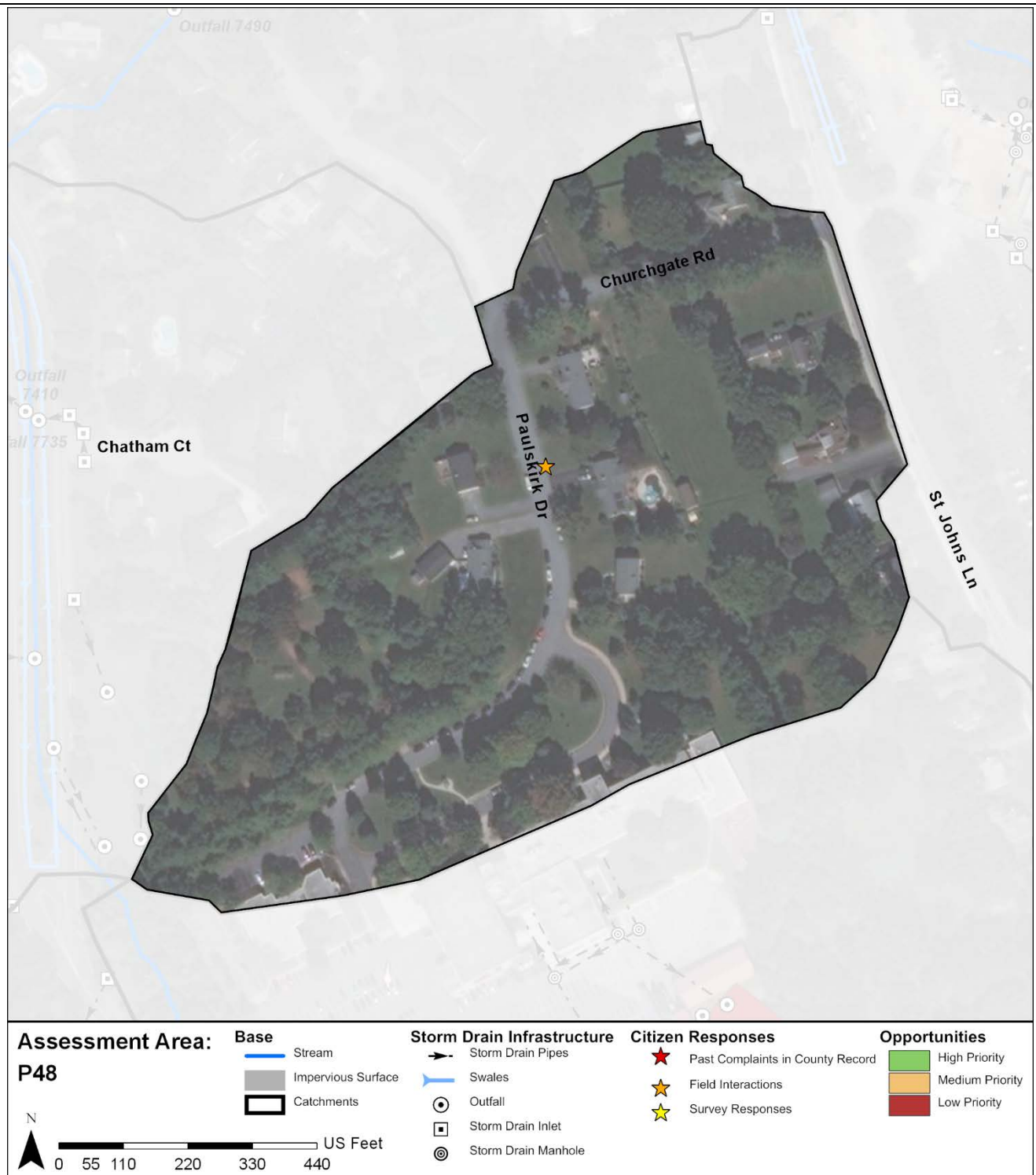


Figure 1: Inlet filled with sediment and debris.



Figure 2: Outfall partially submerged.

PLUMTREE BRANCH WATERSHED ASSESSMENT AREA P48



Assessment Area Category:
POTENTIAL ON-LOT IMPROVEMENTS

Approximate Assessment Area: 14.0 acres
Approximate Imperviousness: 19 %

ASSESSMENT AREA DESCRIPTION

The P48 assessment area is an approximately 14.0-acre area in Howard County's Plumtree Branch watershed. The assessment area largely consists of medium density residential area with a small area consisting of institutional land use. The area captures runoff from Church Gate Road and portions of Paulskirk Drive as well as the Resurrection-St. Paul School. All sections of roadway within P48 are open section and all flow is directed to a grass-lined channel alongside Paulskirk Drive to converge with a tributary to the Plumtree Branch.

There were no survey responses submitted for this area. Should any on-lot drainage problems be discovered, the property owner of the lot is encouraged to address them in order to improve conveyance on their properties.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

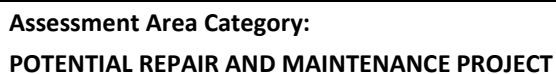
Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	0	0	0	0
Further Investigation Recommended	0	0	0	0
Total	0	0	0	0

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. This assessment area does not contain a major storm drain network.

OPPORTUNITIES

No opportunities were identified in this assessment area. However, individuals are encouraged to install environmentally friendly practices that promote infiltration (rain gardens, downspout disconnection, etc.) and improve conveyance (vegetated swales, etc.) on their own properties.



JUNE 2019

ASSESSMENT AREA DESCRIPTION

The P49 assessment area is an approximately 52.8-acre area in Howard County's Plumtree Branch watershed. The assessment area largely consists of medium density residential area with some small areas of open space. The area captures runoff from portions of Paulskirk Drive, St. John's Lane, Brookwood Road, Woodberry Lane, and Misty Wood Lane. All flow and storm drain networks are directed to outfall into the North Chatham Road concrete channel. The sections of roadway within P49 are a combination of closed section and open section. A field interaction with a homeowner indicated that the channel running through his side yard has constant standing water which attracts bugs and has a foul odor in the warmer months.

An ongoing project is underway in which the replacement of the North Chatham Road concrete channel and culvert as well as the downstream private driveway crossing on Little Plumtree Branch are being evaluated. Opportunities in this area may need to be re-evaluated once a design option is determined. Individual property owners are encouraged to undertake on-lot improvements to improve stormwater management and conveyance on their properties.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	13	9	7	28
Further Investigation Recommended	8	2	1	3
Total	21	11	8	31

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Outfall 7490

Approximate Drainage Area:	44.9 acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	No
Conclusion:	Likely Adequate

OPPORTUNITIES

Opportunities identified in early 2019 focus on improving drainage and addressing expressed concerns.

Type	ID No.	Description & Discussion
Improve Existing Conveyance System	P49-001	Field observations and interactions suggest that standing water is an issue at this location. Improve existing conveyance by regrading existing channel or extending existing pipe to tie into existing inlet.

PHOTOS

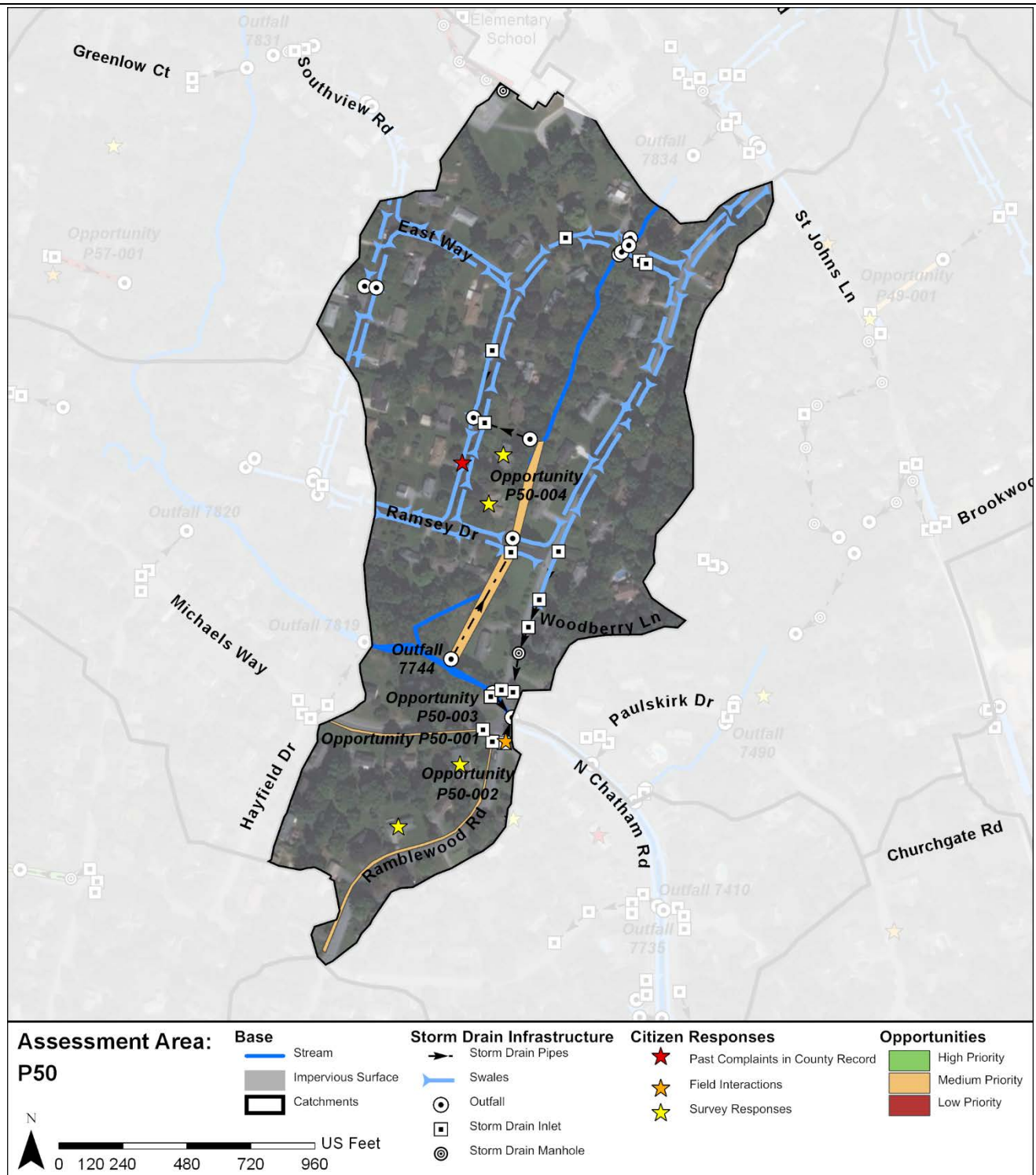


Figure 1: Stormdrain outfall channel with standing water leading to existing inlet.



Figure 2: Outfall at upstream end of channel with standing water observed.

PLUMTREE BRANCH WATERSHED ASSESSMENT AREA P50



Assessment Area Category:
POTENTIAL CAPITAL IMPROVEMENT PROJECT

Approximate Assessment Area: 41.8 acres
Approximate Imperviousness: 23 %

ASSESSMENT AREA DESCRIPTION

The P50 assessment area is an approximately 41.7-acre area in Howard County's Plumtree Branch watershed. The assessment area largely consists of medium density residential area with some areas of institutional and open land use. The area captures runoff from Center Drive, East Way, Ramsey Drive, and portions of Southview Road, Ramblewood Road, and Michaels Way. All of the flow in this area is directed to the start of the North Chatham Road concrete channel through a series of various storm drain networks and open channel flow. The P50 assessment area consists of a combination of open and closed-section roadways. Two survey responses from residents on Center Drive indicated poor drainage in their back yards.

An ongoing project is underway in which the replacement of the North Chatham Road concrete channel and culvert as well as the downstream private driveway crossing on Little Plumtree Branch are being evaluated. The drainage in this area may need to be re-evaluated once a design option is determined.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	13	8	1	21
Further Investigation Recommended	2	4	0	1
Total	15	12	1	22

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Outfall 7744

Approximate Drainage Area:	37.7 acres
Storm Drain Sizing:	Outside of Range
Potential Constrictions:	No
Observed System Deficiencies:	Yes
Conclusion:	Conduct More Detailed Analysis of Storm Drain Network

OPPORTUNITIES

Opportunities identified in early 2019 focus on improving drainage and addressing expressed concerns.

Type	ID No.	Description & Discussion
Improve Existing Conveyance System	P50-001	Survey responses and field interactions suggest that flooding is significant at downstream intersection. Improve existing conveyance by adding an additional inlet in this area.
Improve Existing Conveyance System	P50-002	Survey responses and field interactions suggest that flooding is significant at downstream intersection, and ponding water is common on adjacent properties. Improve existing conveyance by adding additional inlets in this area.
Improve Existing Conveyance System	P50-003	Field observations and interactions suggest this inlet is likely not functioning as intended. Asphalt to be repaved in this area in order to allow runoff to be conveyed to this inlet.
Improve Existing Conveyance System	P50-004	This stormdrain system was likely installed prior to current design standards and could benefit from additional analysis for drainage improvement. Field observations and storm drain analysis suggests pipe is potentially inefficient.

PHOTOS



Figure 1: Intersection of Michaels Way and Ramblewood Rd. several survey responses were made of flooding at this intersection.



Figure 2: Uneven asphalt in front of inlet at intersection of Michaels Way and Ramblewood Rd.



Figure 3: Stream channel upstream of pipe network that is potentially inefficient.



Figure 4: Outfall of storm drain network that is potentially inefficient.



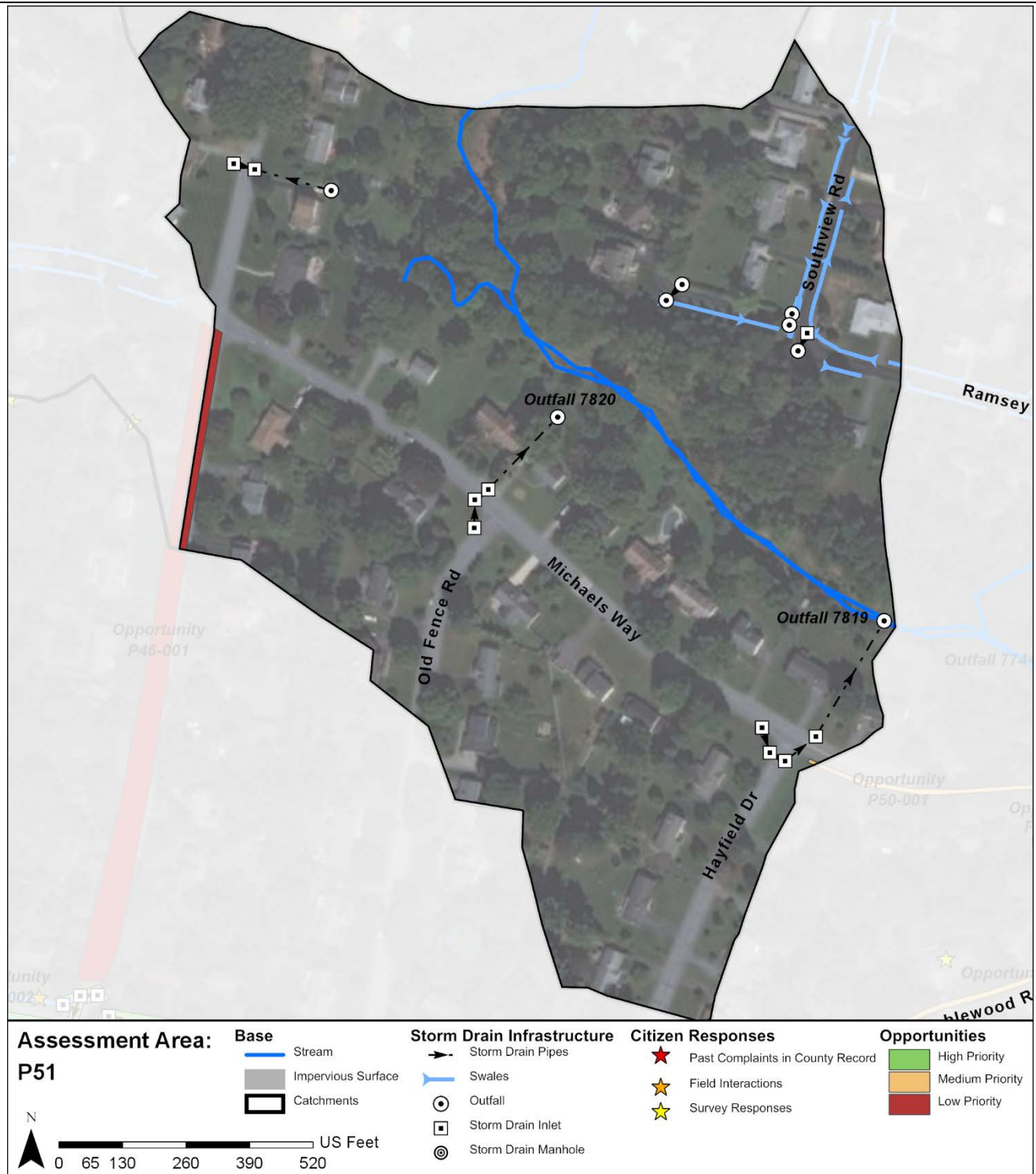
Figure 5: Outfall and downstream channel submerged in standing water.



Figure 6: Outfall is deformed and partially buried.

PLUMTREE BRANCH WATERSHED

ASSESSMENT AREA P51



Assessment Area Category:
POTENTIAL REPAIR AND MAINTENANCE PROJECT

Approximate Assessment Area: 28.6 acres
Approximate Imperviousness: 20 %

ASSESSMENT AREA DESCRIPTION

The P51 assessment area is an approximately 28.6-acre area in Howard County's Plumtree Branch watershed. The assessment area largely consists of medium density residential area with some areas of open space land use. The area captures runoff from portions of Michaels Way, Greenway Drive, Old Fence Road, Hayfield Drive, and Southview Road. Most of the sections of roadway within P51 are open section and all flow and storm drain networks are directed to outfall in a tributary of the Plumtree Branch.

No survey responses were submitted in the P51 assessment area, however some roadside stormdrain outfalls on private properties were found to be in poor condition during field visits. If these drainage problems do not fall within a county-owned easement, individual property owners are encouraged to undertake on-lot improvements to improve stormwater management and conveyance on their properties.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	8	6	0	11
Further Investigation Recommended	2	2	0	1
Total	10	8	0	12

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Outfall 7819

Approximate Drainage Area:	8.6 acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	No
Conclusion:	Likely Adequate

Assessment Point ID: Outfall 7820

Approximate Drainage Area:	4.3 acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	Yes
Conclusion:	Repair and Maintenance Recommended

OPPORTUNITIES

No specific opportunities were identified in this assessment area. However, individuals are encouraged to install environmentally friendly practices that promote infiltration (rain gardens, downspot disconnection, etc.) and improve conveyance (vegetated swales, etc.) on their own properties. In addition, a list of infrastructure assets that may require maintenance and/or repair was submitted to the Bureau of Highways.

PHOTOS



Figure 1: Storm drain top exposed.



Figure 2: Storm drain partially filled with sediment.

ASSESSMENT AREA DESCRIPTION

The P52 assessment area is an approximately 67.1-acre area in Howard County's Plumtree Branch watershed. The assessment area largely consists of medium-density residential houses with some open space land use. The area captures runoff from portions of Joey Drive, Hearthstone Road, Birchmede Drive, Long View Drive, and Hollowood Court. All flow and storm drain networks are directed to outfall directly to the Plumtree Branch. The P52 assessment area consists of a combination of open and closed-section roadways.

This specific section of Plumtree Branch is not well defined and is in poor condition which is affecting several homeowners in the area. Survey responses emphasized that the stream often floods the backyards and basements of many homes that back up to the stream. Field investigation confirmed the saturated state of the soils in these yards. In addition, some infrastructure showed signs of a need of repair and maintenance.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	19	4	5	19
Further Investigation Recommended	2	4	0	3
Total	21	8	5	22

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Outfall 7359

Approximate Drainage Area:	17.5 acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	Yes
Conclusion:	Repair and Maintenance Recommended

Assessment Point ID: Outfall 7804

Approximate Drainage Area:	10.5 acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	No
Conclusion:	Likely Adequate

Assessment Point ID: Outfall 7299	
Approximate Drainage Area:	17.5 acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	No
Conclusion:	Likely Adequate

OPPORTUNITIES

Opportunities identified in early 2019 focus on improving drainage and addressing expressed concerns.

Type	ID No.	Description & Discussion
Improve Existing Conveyance System	P52-001	Field observations and interactions suggest that outfall channel consistently backs up and overflows. Regrade outfall channel to provide storage for flow and prevent standing water in backyards, and clean channel of sediment.
Improve Existing Conveyance System/ESD Practice	P52-002	Field observations and survey responses suggest that flooding is significant in this area. Stream restoration should be considered in order to channelize flow away from private properties. ESD facilities to be considered in areas with drainage issues where ample space is available.

PHOTOS



Figure 1: Channel running through back yard at 3134 Hearthstone Rd.



Figure 2: Standing water and sediment buildup under fence between 3134 Hearthstone Rd. and 9522 Joey Dr.



Figure 3: Eroded channel running behind house at 9522 Joey Dr.



Figure 4: Water ponds behind houses along Joey Dr. before entering Plumtree Branch.



Figure 5: Stream channel behind houses on Joey Dr. Stream meanders and has various flow paths.



Figure 6: Outfall with highly eroded outfall channel.

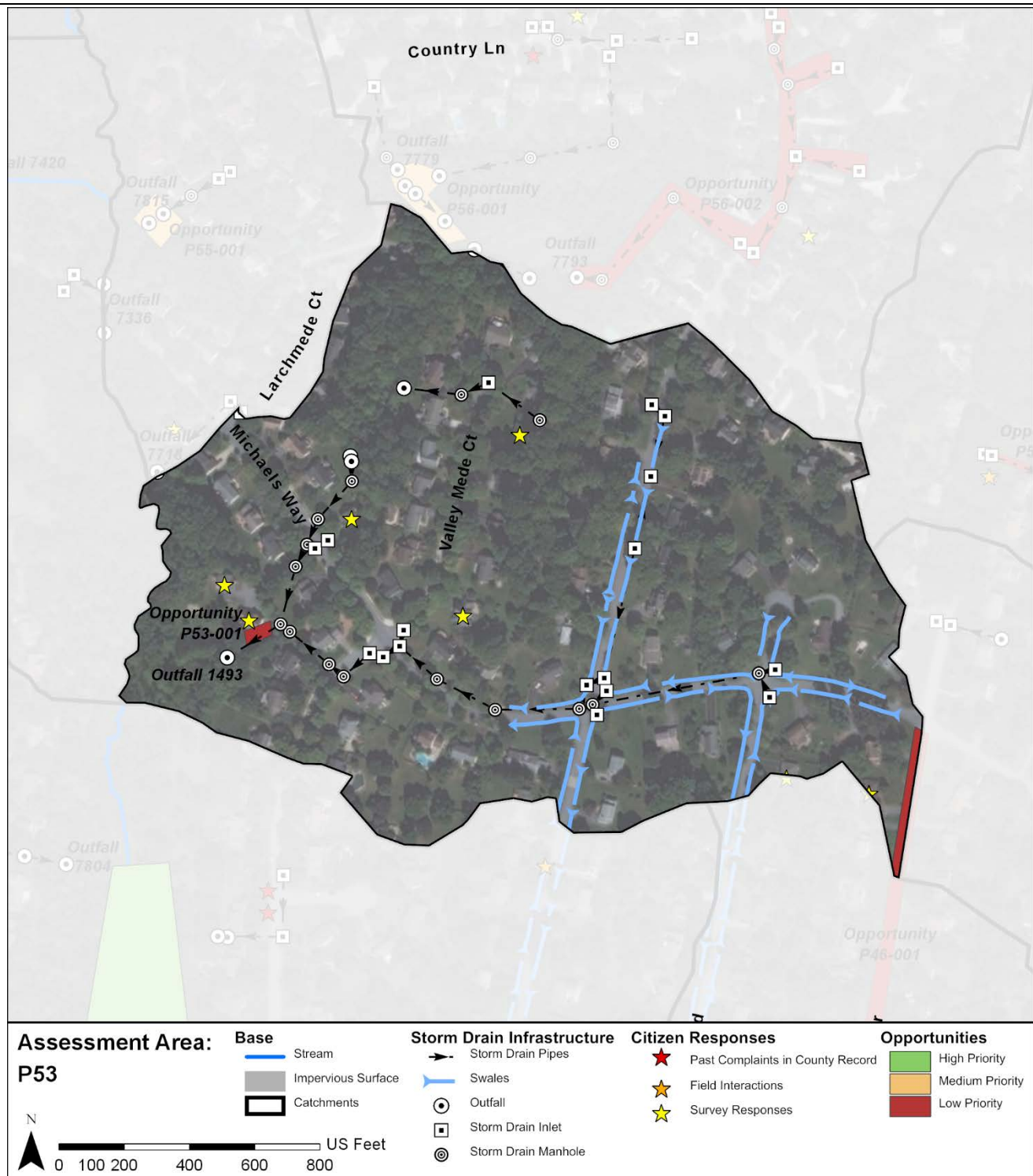


Figure 7: Outfall and outfall channel is buried in sediment and debris.



Figure 8: Outfall is partially submerged and overgrown with vegetation.

PLUMTREE BRANCH WATERSHED ASSESSMENT AREA P53



Assessment Area Category:
POTENTIAL REPAIR AND MAINTENANCE PROJECT

Approximate Assessment Area: 42.4 acres
Approximate Imperviousness: 22 %

ASSESSMENT AREA DESCRIPTION

The P53 assessment area is an approximately 42.4-acre area in Howard County's Plumtree Branch watershed. The assessment area largely consists of medium density residential area with some areas of open space land use. The area captures runoff from portions of Michaels Way, Joey Drive, Hearthstone Road, Brookemede Road, Brookmede Court, and Valley Mede Court. There is one main stormdrain network serving the assessment area, which captures flow from a smaller upstream network. Runoff from Valley Mede Court is captured by an inlet at the end of the court which outfalls to an unnamed tributary of Plumtree Branch. The P53 assessment area consists of a combination of open and closed-section roadways. Survey responses and field observations suggest that the surface drainage and some infrastructure within this area may require maintenance.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	15	1	14	33
Further Investigation Recommended	2	2	1	2
Total	17	3	15	35

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Outfall 1493

Approximate Drainage Area:	40.3 acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	Yes
Observed System Deficiencies:	Yes
Conclusion:	Conduct More Detailed Analysis of Storm Drain Network

OPPORTUNITIES

Opportunities identified in early 2019 focus on improving drainage and addressing expressed concerns.

Type	ID No.	Description & Discussion
Improve Existing Conveyance System	P53-001	Field observations and survey responses suggest that ponding water is an issue in this area. Add a yard inlet connecting to existing storm drain network or regrade the yard to better convey flow towards the stream.

PHOTOS



Figure 1: Ponding water beside home at 9543 Michaels Way.



Figure 2: Ponding water behind home at 9543 Michaels Way.



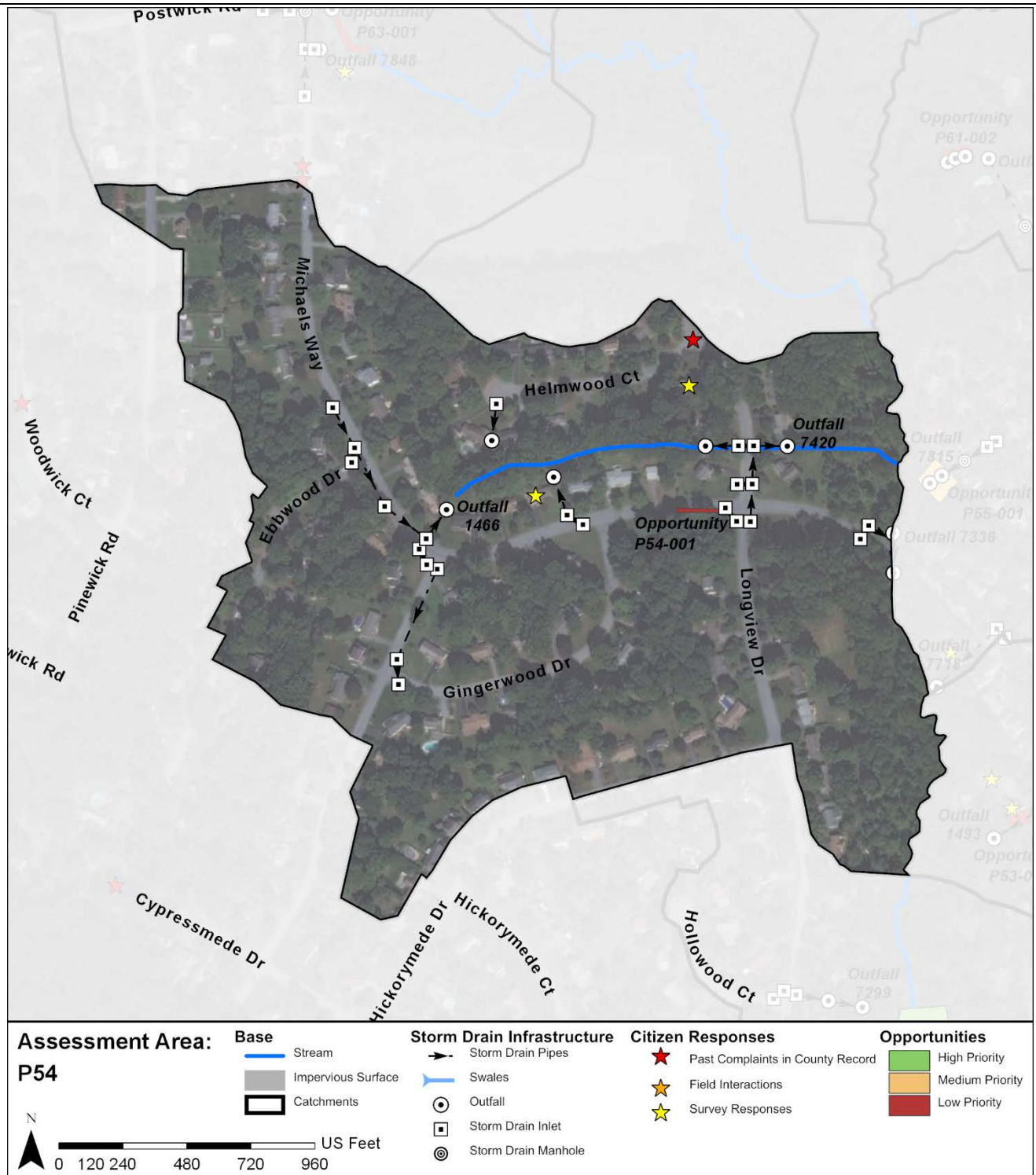
Figure 3: Outfall is submerged and buried.



Figure 4: Disjointed end section at outfall and erosion is in the process of being repaired.

PLUMTREE BRANCH WATERSHED

ASSESSMENT AREA P54



Assessment Area Category:
POTENTIAL REPAIR AND MAINTENANCE PROJECT

Approximate Assessment Area: 67.0 acres
Approximate Imperviousness: 22 %

ASSESSMENT AREA DESCRIPTION

The P54 assessment area is an approximately 67.0-acre area in Howard County's Plumtree Branch watershed. The assessment area largely consists of medium density residential area with some areas of open space land use. The area captures runoff from portions of Michaels Way, Longview Drive, Helmwood Court, Gingerwood Drive, Fawnwood Drive, Hickory Mede Drive, and Ebbwood Drive. All flow and storm drain networks outfall directly into the Plumtree Branch. The P54 assessment area consists of a combination of open and closed-section roadways. Survey responses and field observations suggest that the surface drainage and some infrastructure within this assessment area may require maintenance. If these drainage problems do not fall within a county-owned easement, individual property owners are encouraged to undertake on-lot improvements to improve stormwater management and conveyance on their properties.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	21	6	0	26
Further Investigation Recommended	1	1	0	0
Total	22	7	0	26

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Outfall 7420

Approximate Drainage Area:	53.6 acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	Yes
Conclusion:	Repair and Maintenance Recommended

Assessment Point ID: Outfall 1466

Approximate Drainage Area:	25.5 acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	No
Conclusion:	Likely Adequate

OPPORTUNITIES

Opportunities identified in early 2019 focus on improving drainage and addressing expressed concerns.

Type	ID No.	Description & Discussion
Improve Existing Conveyance System	P54-001	Field observations suggest that ponding water is an issue in this area. Add additional inlet upstream of existing inlet to help with the spread and clean existing inlet of any debris.

PHOTOS

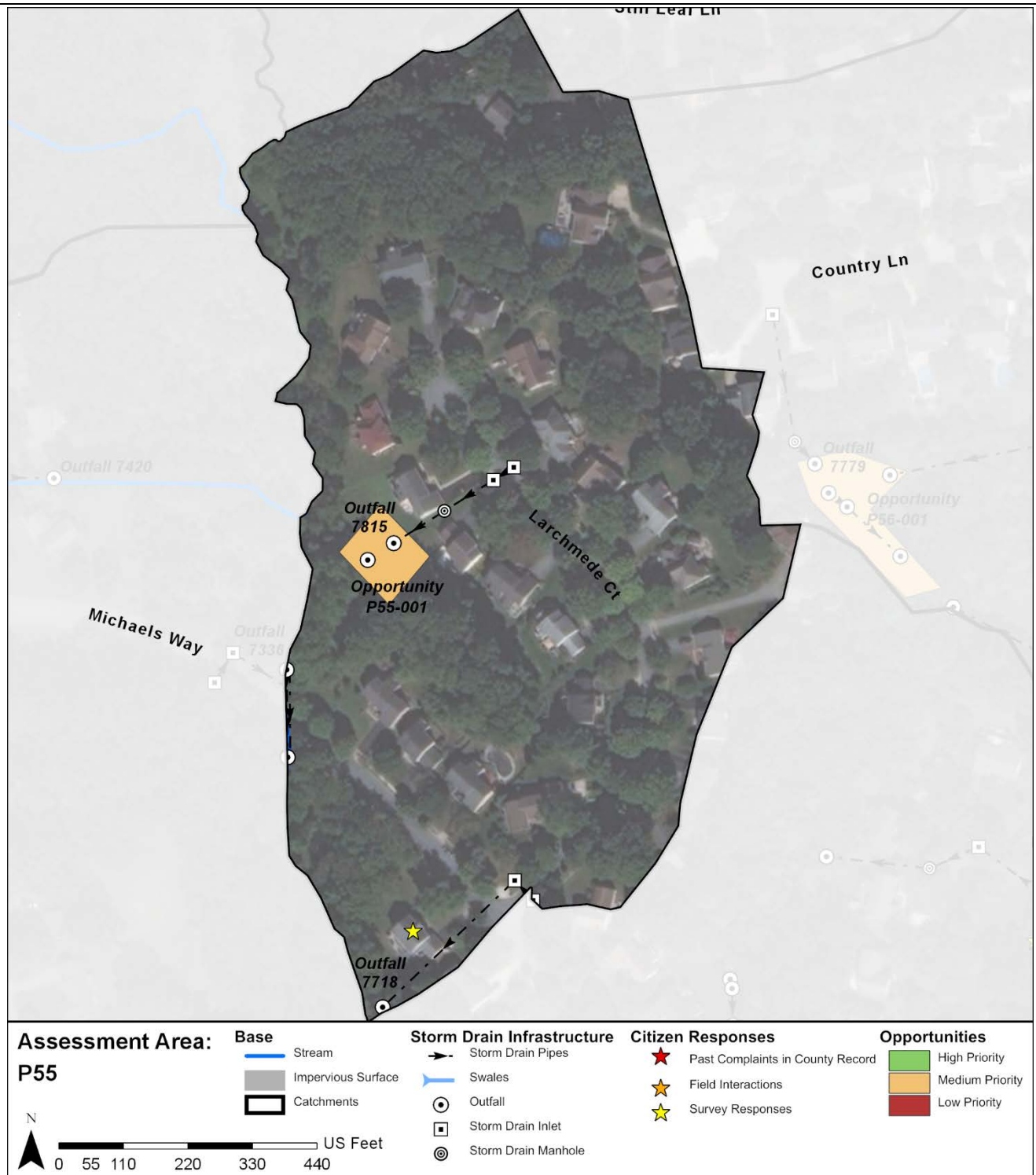


Figure 1: Ice buildup behind inlet at Michaels Way and Longview Dr.



Figure 2: Outfall partially submerged due to sediment and debris buildup.

PLUMTREE BRANCH WATERSHED ASSESSMENT AREA P55



Assessment Area Category:
POTENTIAL REPAIR AND MAINTENANCE PROJECT

Approximate Assessment Area: 14.3 acres
Approximate Imperviousness: 22 %

ASSESSMENT AREA DESCRIPTION

The P55 assessment area is an approximately 14.3-acre area in Howard County's Plumtree Branch watershed. The assessment area largely consists of medium density residential area with some areas of open space land use. The area captures runoff from Larchmede Court and a portion of Michaels Way. All flow and storm drain networks are directed to outfall directly to the Plumtree Branch. All sections of roadway within P55 are closed section.

Survey responses and field observations suggest that the surface drainage and some infrastructure within this area may require maintenance. If these drainage problems do not fall within county-owned easements, individual property owners are encouraged to address these on-lot opportunities in order to improve conveyance on their properties.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	4	1	1	4
Further Investigation Recommended	0	1	0	1
Total	4	2	1	5

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Outfall 7718

Approximate Drainage Area:	2.9 acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	No
Conclusion:	Likely Adequate

Assessment Point ID: Outfall 7815

Approximate Drainage Area:	2.9 acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	Yes
Conclusion:	Repair and Maintenance Recommended

OPPORTUNITIES

Opportunities identified in early 2019 focus on improving drainage and addressing expressed concerns.

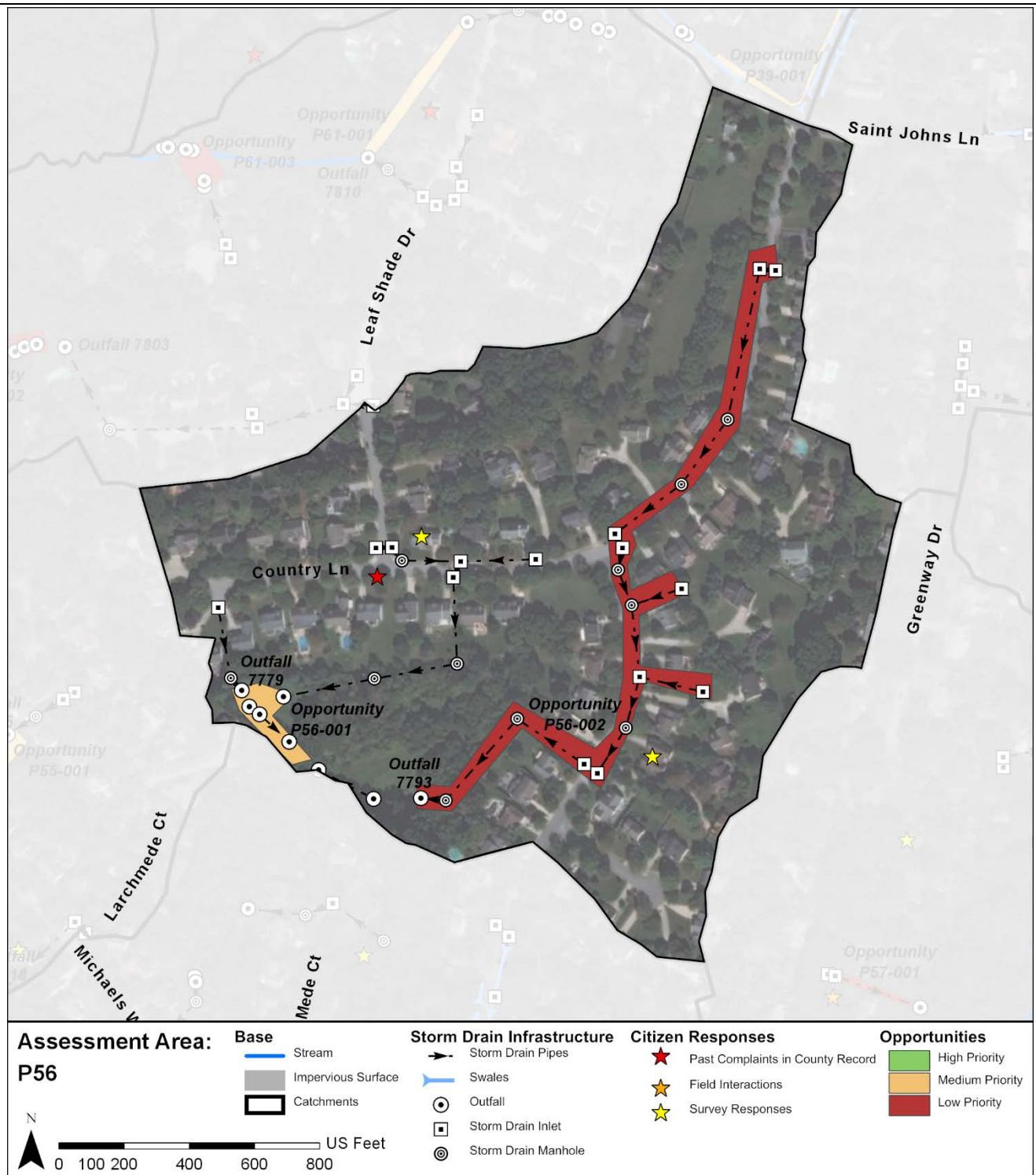
Type	ID No.	Description & Discussion
Improve Existing Conveyance System	P55-001	Existing infrastructure is likely not functioning as intended. Replace outfall structure and improve conveyance from storm drain outfall to downstream channel.

PHOTOS



Figure 1: Storm drain outfall is damaged and partially buried.

PLUMTREE BRANCH WATERSHED ASSESSMENT AREA P56



Assessment Area Category:
POTENTIAL REPAIR AND MAINTENANCE PROJECT

Approximate Assessment Area: 43.1 acres
Approximate Imperviousness: 22 %

ASSESSMENT AREA DESCRIPTION

The P56 assessment area is an approximately 43.1-acre area in Howard County's Plumtree Branch watershed. The assessment area largely consists of medium density residential area with some areas of open space land use. The area captures runoff from Country Lane and portions of Leaf Shade Drive, Hearthstone Road, and Crabapple Lane. All flow and storm drain networks are directed to two SWM facilities which ultimately outfall to an unnamed tributary to the Plumtree Branch. All sections of roadway within P56 are closed section.

Survey responses and field observations suggest that the surface drainage and some infrastructure in both of the SWM facilities and throughout the assessment area may require maintenance. If these drainage problems do not fall within a county-owned easement, individual property owners are encouraged to undertake on-lot improvements to improve stormwater management and conveyance on their properties.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	13	4	7	27
Further Investigation Recommended	2	3	4	2
Total	15	7	11	29

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Outfall 7793

Approximate Drainage Area:	21.6 acres
Storm Drain Sizing:	Outside of Range
Potential Constrictions:	Yes
Observed System Deficiencies:	No
Conclusion:	Conduct More Detailed Analysis of Storm Drain Network

Assessment Point ID: Outfall 7779

Approximate Drainage Area:	8.6 acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	Yes
Conclusion:	Repair and Maintenance Recommended

OPPORTUNITIES

Opportunities identified in early 2019 focus on improving drainage and addressing expressed concerns.

Type	ID No.	Description & Discussion
Detention Practice	P56-001	Field observations suggest that this pond is not functioning as intended. Improve conveyance into and out of this facility by cleaning infow pipes and clearing forebay and outfall channel of sediment and debris.
Improve Existing Conveyance System	P56-002	This stormdrain system was likely installed prior to current design standards and could benefit from additional analysis for drainage improvement.

PHOTOS



Figure 1: Outfall into pond unable to be located. Forebay is inundated with water.

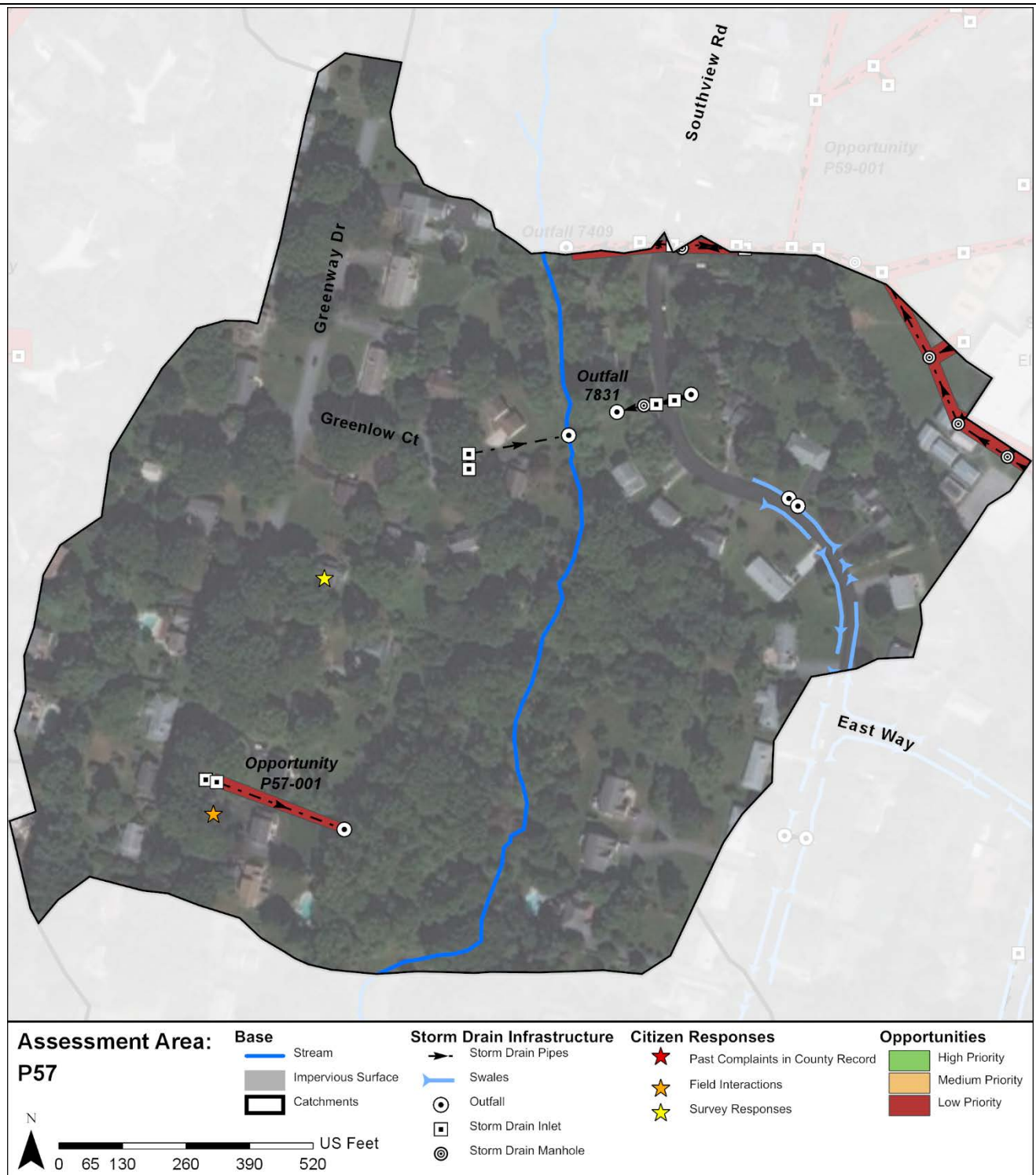


Figure 2: Outfall into pond backfilled with water.



Figure 3: Water in outfall channel is backing up into outfall pipe.

PLUMTREE BRANCH WATERSHED ASSESSMENT AREA P57



Assessment Area Category:
POTENTIAL REPAIR AND MAINTENANCE PROJECT

Approximate Assessment Area: 32.8 acres
Approximate Imperviousness: 16 %

ASSESSMENT AREA DESCRIPTION

The P57 assessment area is an approximately 32.8-acre area in Howard County's Plumtree Branch watershed. The assessment area largely consists of medium density residential area with some areas of industrial and open space land uses. The area captures runoff from portions of Greenway Drive, Greenlow Court, and Southview Road. All flow and storm drains are directed into a tributary which leads into the North Chatham Rd. channel via a culvert and ultimately outfalls into the Plumtree Branch. The P57 assessment area consists of a combination of open and closed-section roadways. A survey response and field interaction suggest poor drainage in this area. The interaction in the field was with a homeowner who described a pipe that is partially filled with gravel and is disjointed at the end section. Additionally the outfall channel is severely eroded.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	4	3	5	17
Further Investigation Recommended	2	3	0	3
Total	6	6	5	20

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Outfall 7831

Approximate Drainage Area:	4.9 acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	Yes
Conclusion:	Repair and Maintenance Recommended

OPPORTUNITIES

Opportunities identified in early 2019 focus on improving drainage and addressing expressed concerns.

Type	ID No.	Description & Discussion
Improve Existing Conveyance System	P57-001	Field observations and interactions suggest that this storm drain and outfall is not functioning as intended. Clean pipe of gravel and repair/replace disjointed pipe section at the outfall. Investigate need for outfall channel stabilization.

PHOTOS



Figure 1: Unstable outfall and disjointed pipe section at outfall.



Figure 2: Disjointed pipe at outfall.



Figure 3: Gravel inside inlet.



Figure 4: Gravel blocking flow within pipe.



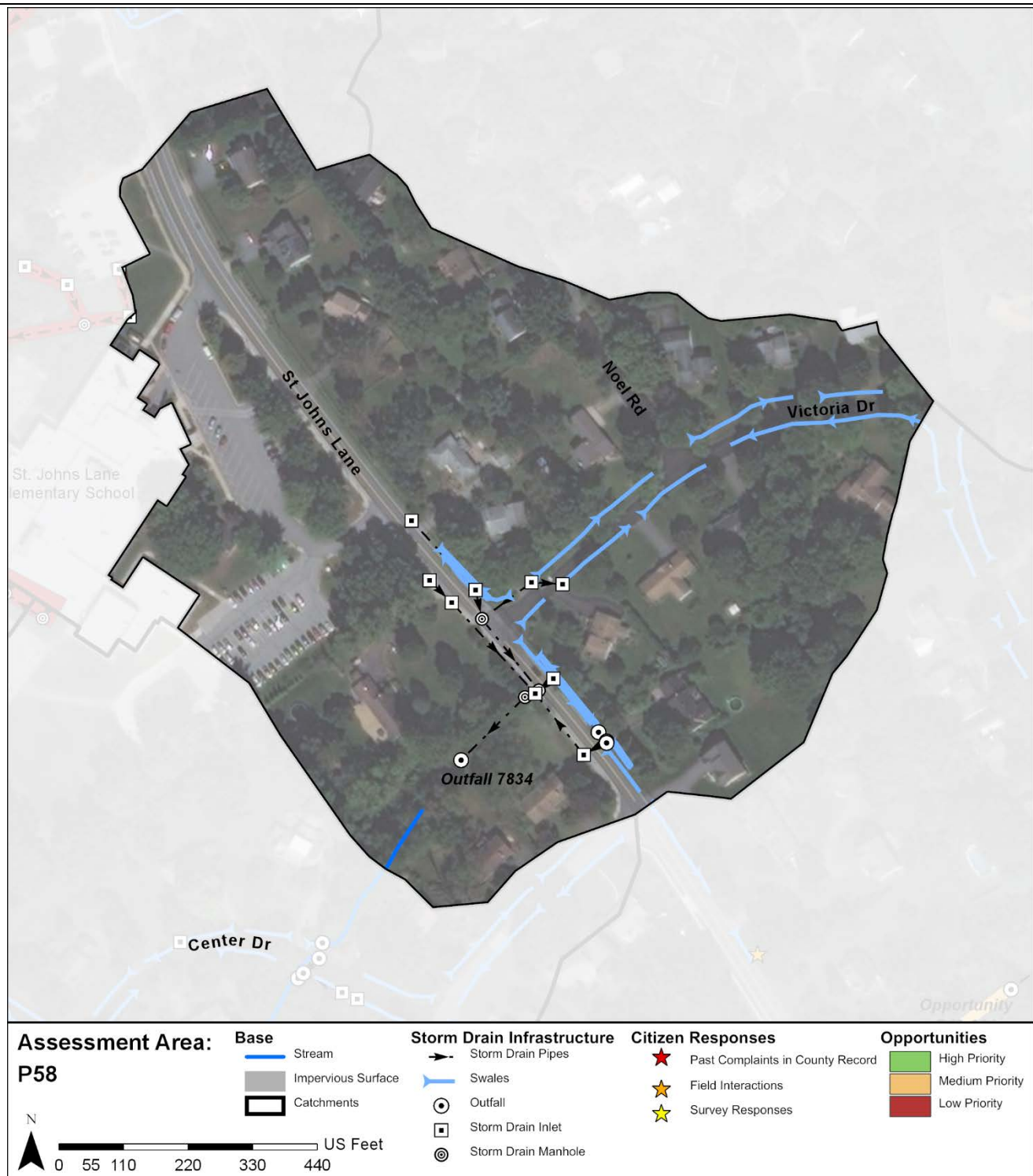
Figure 5: Outfall is deformed and partially buried.



Figure 6: Outfall and associated pipe is damaged.

PLUMTREE BRANCH WATERSHED

ASSESSMENT AREA P58



Assessment Area Category:
POTENTIAL REPAIR AND MAINTENANCE PROJECT

Approximate Assessment Area: 16.3 acres
Approximate Imperviousness: 25 %

ASSESSMENT AREA DESCRIPTION

The P58 assessment area is an approximately 16.3-acre area in Howard County's Plumtree Branch watershed. The assessment area largely consists of medium density residential area with some areas of industrial land use. The area captures runoff from a portion of Saint Johns Lane, Noel Road, and Victoria Drive. All flow and storm drain networks are directed to a culvert under Center Drive which daylight for about 400 feet before entering another storm drain system, outfalling into the North Chatham Rd. channel and ultimately the Plumtree Branch. Assessment area P58 is a combination of open and closed section roadway.

No survey responses were submitted in the P58 assessment area, however some roadside stormdrain outfalls on private properties were found to be in poor condition during field visits. If these drainage problems do not fall within a county-owned easement, individual property owners are encouraged to undertake on-lot improvements to improve stormwater management and conveyance on their properties.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	5	2	3	14
Further Investigation Recommended	4	2	0	1
Total	9	4	3	15

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Outfall 7834

Approximate Drainage Area:	10.6 acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	Yes
Observed System Deficiencies:	Yes
Conclusion:	Conduct More Detailed Analysis of Storm Drain Network

OPPORTUNITIES

No specific opportunities were identified in this assessment area. However, individuals are encouraged to install environmentally friendly practices that promote infiltration (rain gardens, downspot disconnection, etc.) and improve conveyance (vegetated swales, etc.) on their own properties. In addition, a list of infrastructure assets that may require maintenance and/or repair was submitted to the Bureau of Highways.

PHOTOS



Figure 1: Damaged concrete at inlet.



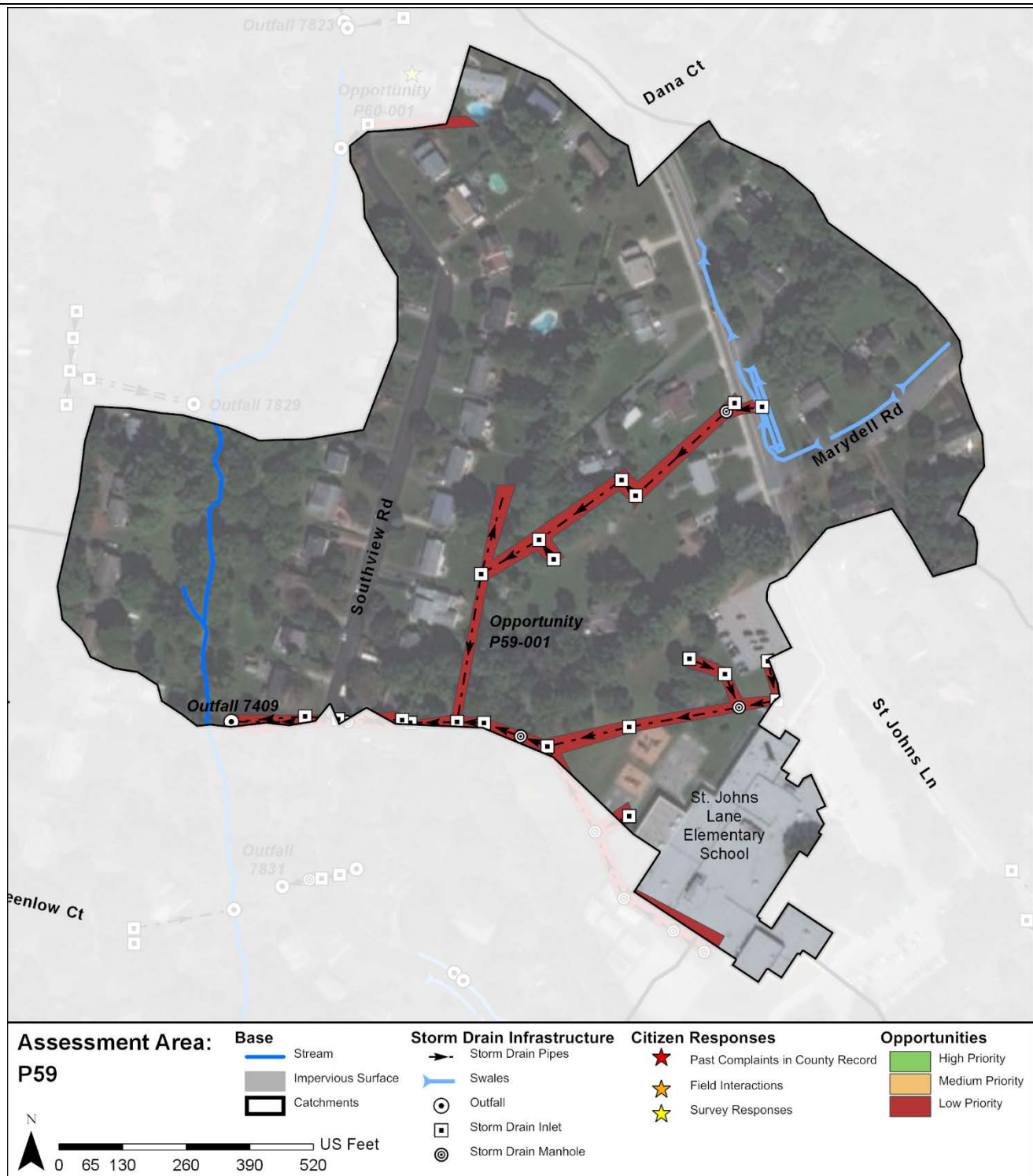
Figure 2: The back of inlet is raised, causing a safety hazard for pedestrians.



Figure 3: Damage on the front right side of inlet.

PLUMTREE BRANCH WATERSHED

ASSESSMENT AREA P59



Assessment Area Category:
POTENTIAL REPAIR AND MAINTENANCE PROJECT

Approximate Assessment Area: 24.6 acres
Approximate Imperviousness: 26 %

ASSESSMENT AREA DESCRIPTION

The P59 assessment area is an approximately 24.6-acre area in Howard County's Plumtree Branch watershed. The assessment area largely consists of medium density residential area with some areas of open space land use. The area captures runoff from portions of Saint Johns Lane and Southview Road. All flow and storm drain networks are directed to an unnamed tributary to the Plumtree Branch. All sections of roadway within P59 are closed section.

No survey responses were submitted in the P59 assessment area, however some roadside stormdrain outfalls on private properties were found to be in poor condition during field visits. If these drainage problems do not fall within a county-owned easement, individual property owners are encouraged to undertake on-lot improvements to improve stormwater management and conveyance on their properties.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	18	0	3	28
Further Investigation Recommended	1	1	0	0
Total	19	1	3	28

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Outfall 7409

Approximate Drainage Area:	20.9 acres
Storm Drain Sizing:	Outside of Range
Potential Constrictions:	No
Observed System Deficiencies:	Yes
Conclusion:	Conduct More Detailed Analysis of Storm Drain Network

OPPORTUNITIES

Opportunities identified in early 2019 focus on improving drainage and addressing expressed concerns.

Type	ID No.	Description & Discussion
Improve Existing Conveyance System	P59-001	This stormdrain system was likely installed prior to current design standards and could benefit from additional analysis for drainage improvement.

PHOTOS

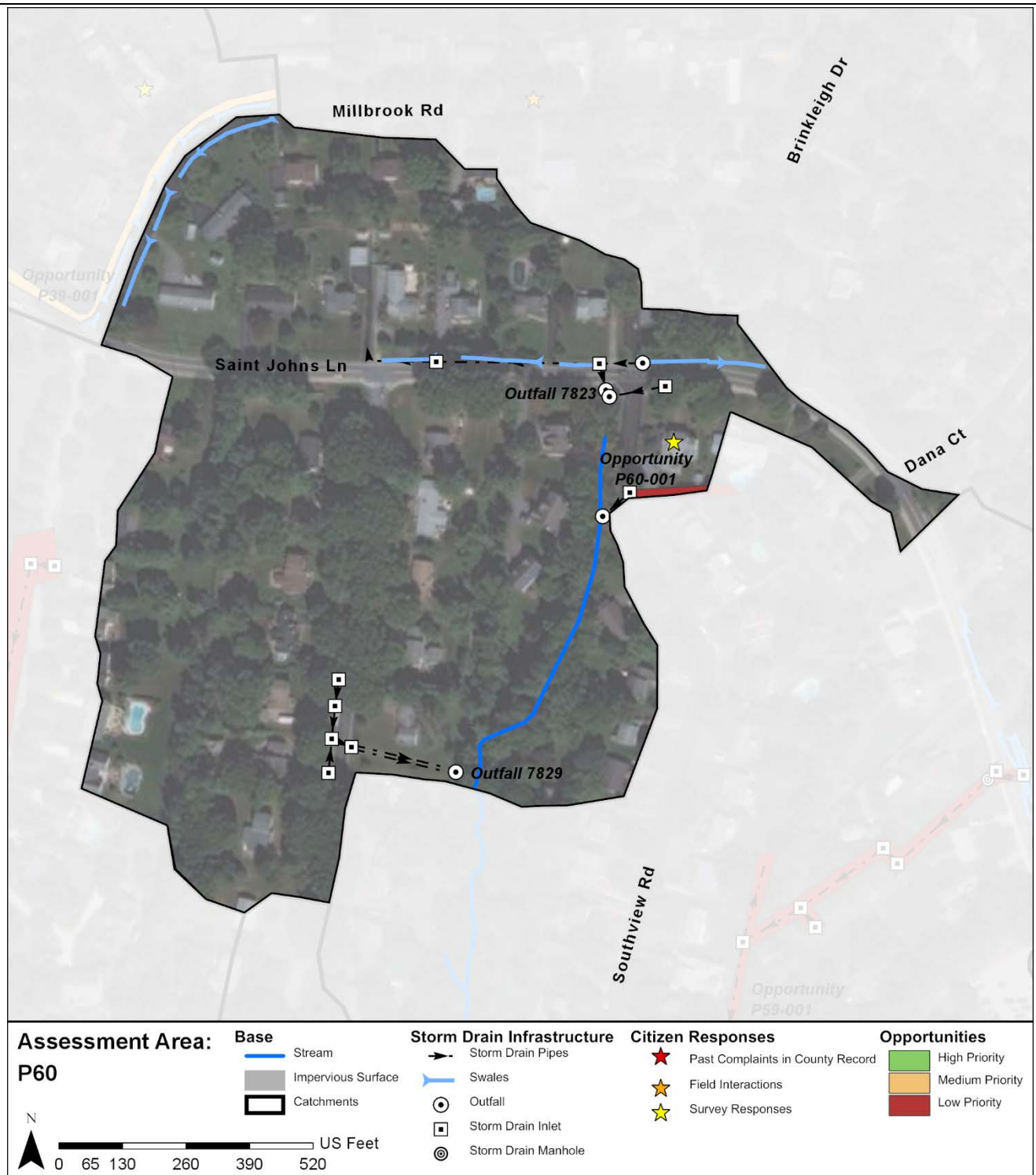


Figure 1: Damage along inlet opening.



Figure 2: Branches partially blocking outfall.

PLUMTREE BRANCH WATERSHED ASSESSMENT AREA P60



Assessment Area Category:
POTENTIAL REPAIR AND MAINTENANCE PROJECT

Approximate Assessment Area: 21.3 acres
Approximate Imperviousness: 21 %

ASSESSMENT AREA DESCRIPTION

The P60 assessment area is an approximately 21.3-acre area in Howard County's Plumtree Branch watershed. The assessment area consists of medium density residential area. The area captures runoff from portions of Saint Johns Lane and Greenway Drive. All flow and storm drain networks are directed to an unnamed tributary to the Plumtree Branch. All sections of roadway within P60 are closed section.

A survey response and field observation suggest poor drainage in the yard of the homeowner. The water is ponding and the slope of the channel is not providing positive drainage. At the downstream end of the slope there is a curb inlet but the back side does not have a cut out for flow to enter.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	8	3	0	12
Further Investigation Recommended	1	2	0	1
Total	9	5	0	13

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Outfall 7823

Approximate Drainage Area:	9.6 acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	Yes
Conclusion:	Repair and Maintenance Recommended

Assessment Point ID: Outfall 7829

Approximate Drainage Area:	9.6 acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	No
Conclusion:	Likely Adequate

OPPORTUNITIES

Opportunities identified in early 2019 focus on improving drainage and addressing expressed concerns.

Type	ID No.	Description & Discussion
Improve Existing Conveyance System	P60-001	Field observations and survey response suggest ponding water is an issue in this area. Possibly cut opening into back of existing inlet to allow flow to enter from back side.

PHOTOS



Figure 1: Back of inlet could be opened to allow existing conveyance ditch to outfall.



Figure 2: Localized ponding in area between houses.



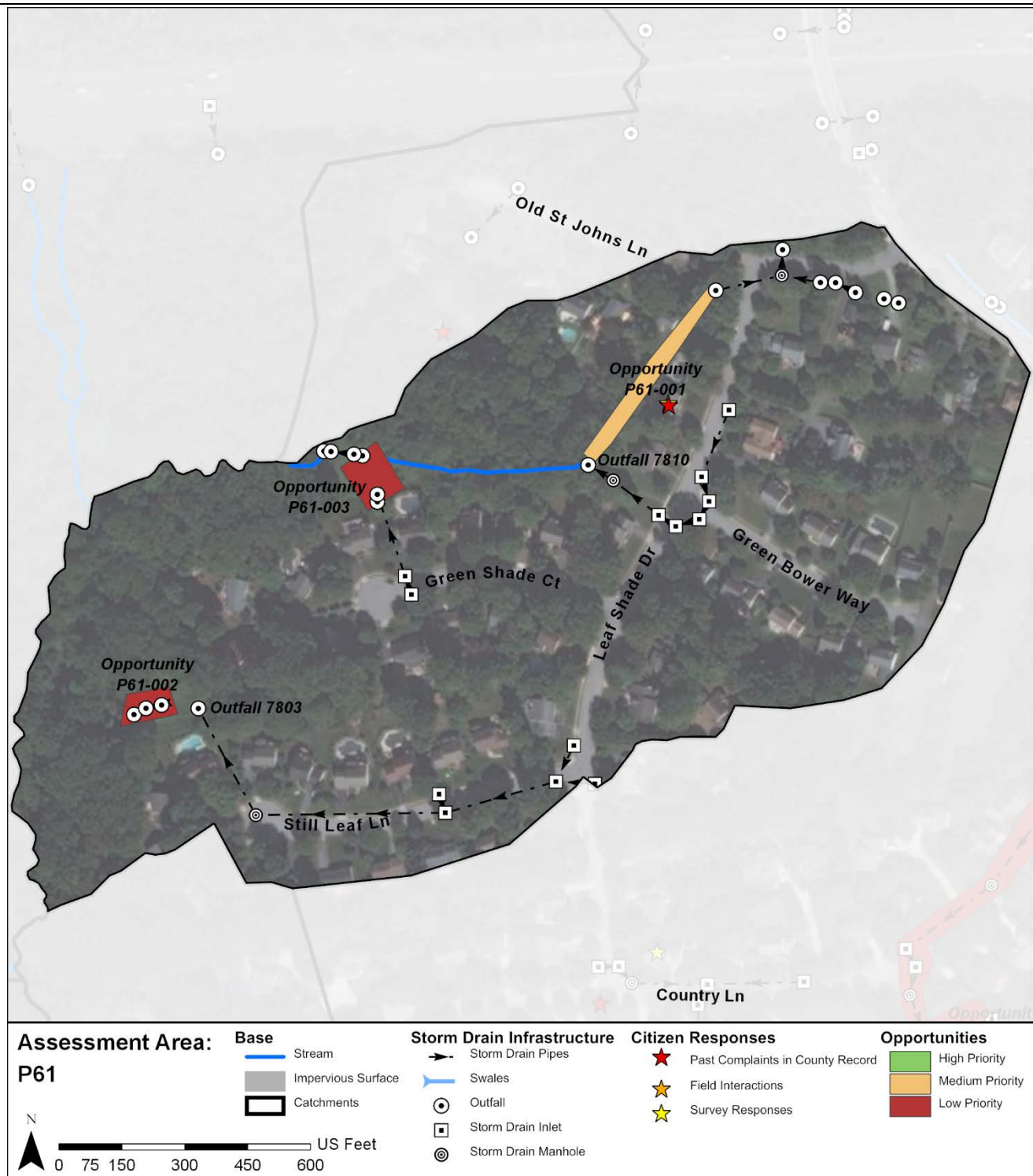
Figure 3: Pipe is disjointed and upstream end could not be located.



Figure 4: Outfall is collapsed.

PLUMTREE BRANCH WATERSHED

ASSESSMENT AREA P61



Assessment Area Category:
POTENTIAL REPAIR AND MAINTENANCE PROJECT

Approximate Assessment Area: 33.2 acres
Approximate Imperviousness: 20 %

ASSESSMENT AREA DESCRIPTION

The P61 assessment area is an approximately 33.2-acre area in Howard County's Plumtree Branch watershed. The assessment area largely consists of medium density residential area with some areas of open space land use. The area captures runoff from portions of Old Saint Johns Lane, Leaf Shade Drive, Green Bower Way, Green Shade Court, and Still Leaf Lane. All flow and storm drain networks are directed into two separate SWM ponds which ultimately outfall into an unnamed tributary to the Plumtree Branch. All sections of roadway within P61 are closed section. A survey response indicated erosion of a storm drain outfall channel through their yard and field observations confirmed the severity of the erosion. Individual property owners are encouraged to undertake on-lot improvements to improve stormwater management and conveyance on their properties.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	11	8	1	22
Further Investigation Recommended	2	6	2	2
Total	13	14	3	24

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Outfall 7803

Approximate Drainage Area:	8.3 acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	Yes
Conclusion:	Repair and Maintenance Recommended

Assessment Point ID: Outfall 7810

Approximate Drainage Area:	16.6 acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	No
Conclusion:	Likely Adequate

OPPORTUNITIES

Opportunities identified in early 2019 focus on improving drainage and addressing expressed concerns.

Type	ID No.	Description & Discussion
Improve Existing Conveyance System	P61-001	Field observations and survey response suggest that this outfall channel is likely not functioning as intended. Improve conveyance downstream of outfall by regrading channel and stabilizing with riprap protection.
Detention Practice	P61-002	Field observations suggest that conveyance downstream of this SWM Pond is likely not functioning as intended. Erosion and debris were evident in the outfall channel. Improve existing conveyance by cleaning the principal spillway pipe and regrading the outfall channel.
Detention Practice	P61-003	Field observations suggest that conveyance into this SWM Pond is not functioning as intended due to buildup of sediment and debris at the inflow. Improve existing conveyance by cleaning inflow pipe and clearing pond of sediment and debris.

PHOTOS



Figure 1: Outfall channel running behind back yard at 2802 Leaf Shade Drive is severely eroded.



Figure 2: Outfall is partially blocked.



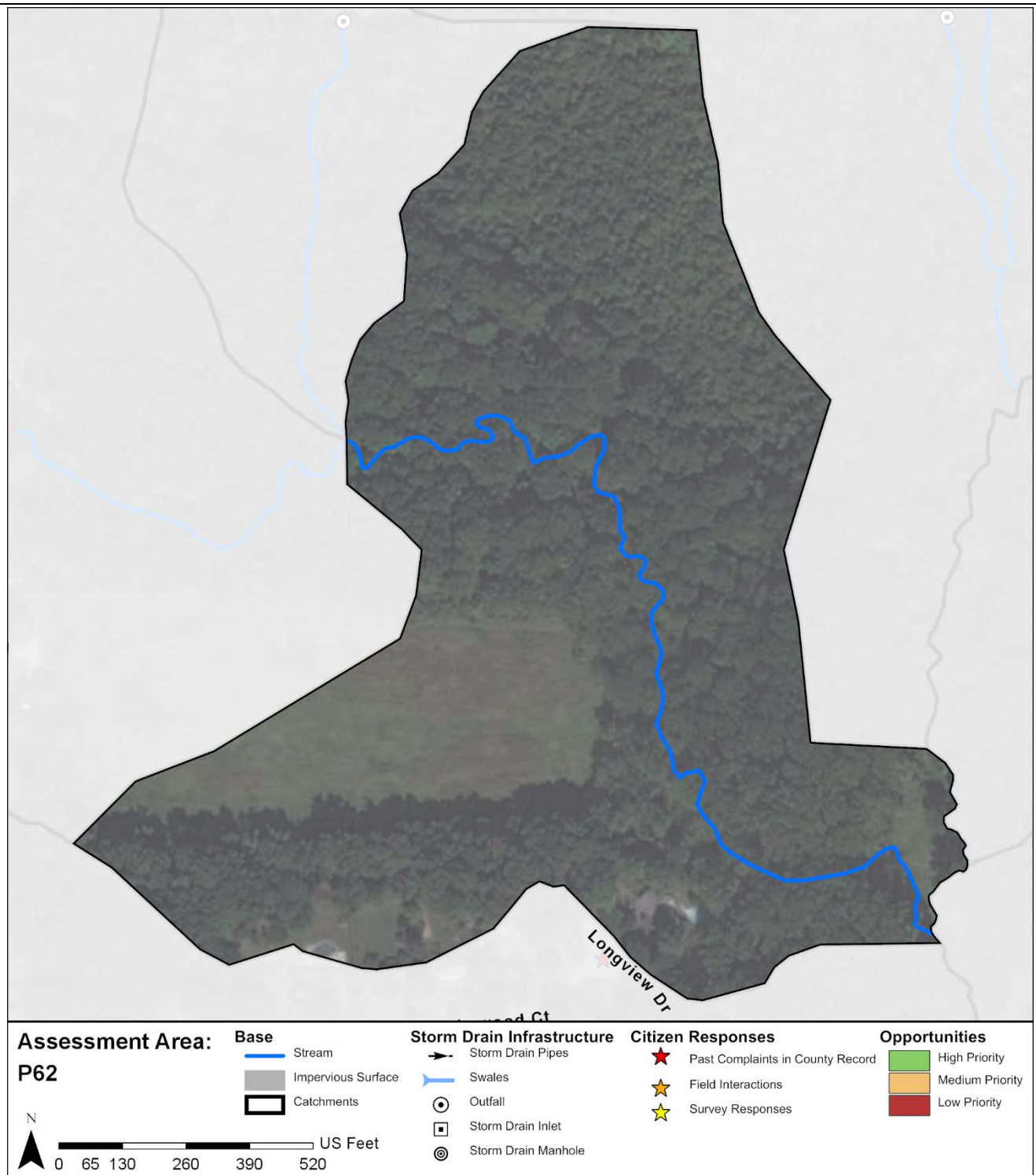
Figure 3: Significant erosion and debris in outfall channel.



Figure 4: Buildup of sediment and debris at pond inflow.

PLUMTREE BRANCH WATERSHED

ASSESSMENT AREA P62



Assessment Area Category:
POTENTIAL ON-LOT IMPROVEMENTS

Approximate Assessment Area: 25.1 acres
Approximate Imperviousness: 1 %

ASSESSMENT AREA DESCRIPTION

The P62 assessment area is an approximately 25.1-acre area in Howard County's Plumtree Branch watershed. The assessment area largely consists of open space area with some areas of medium density residential land use. The area captures runoff from a portion of the residential lots along Helmwood Court and Longview Drive, and from open space and wooded area to the south of I-70. All flow from the P62 assessment area enters the Plumtree Branch as sheet flow. No survey responses were submitted in the assessment area. Individual property owners are encouraged to undertake on-lot improvements to improve stormwater management and conveyance on their properties.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	0	0	0	0
Further Investigation Recommended	0	0	0	0
Total	0	0	0	0

STORM DRAIN ANALYSIS FINDINGS

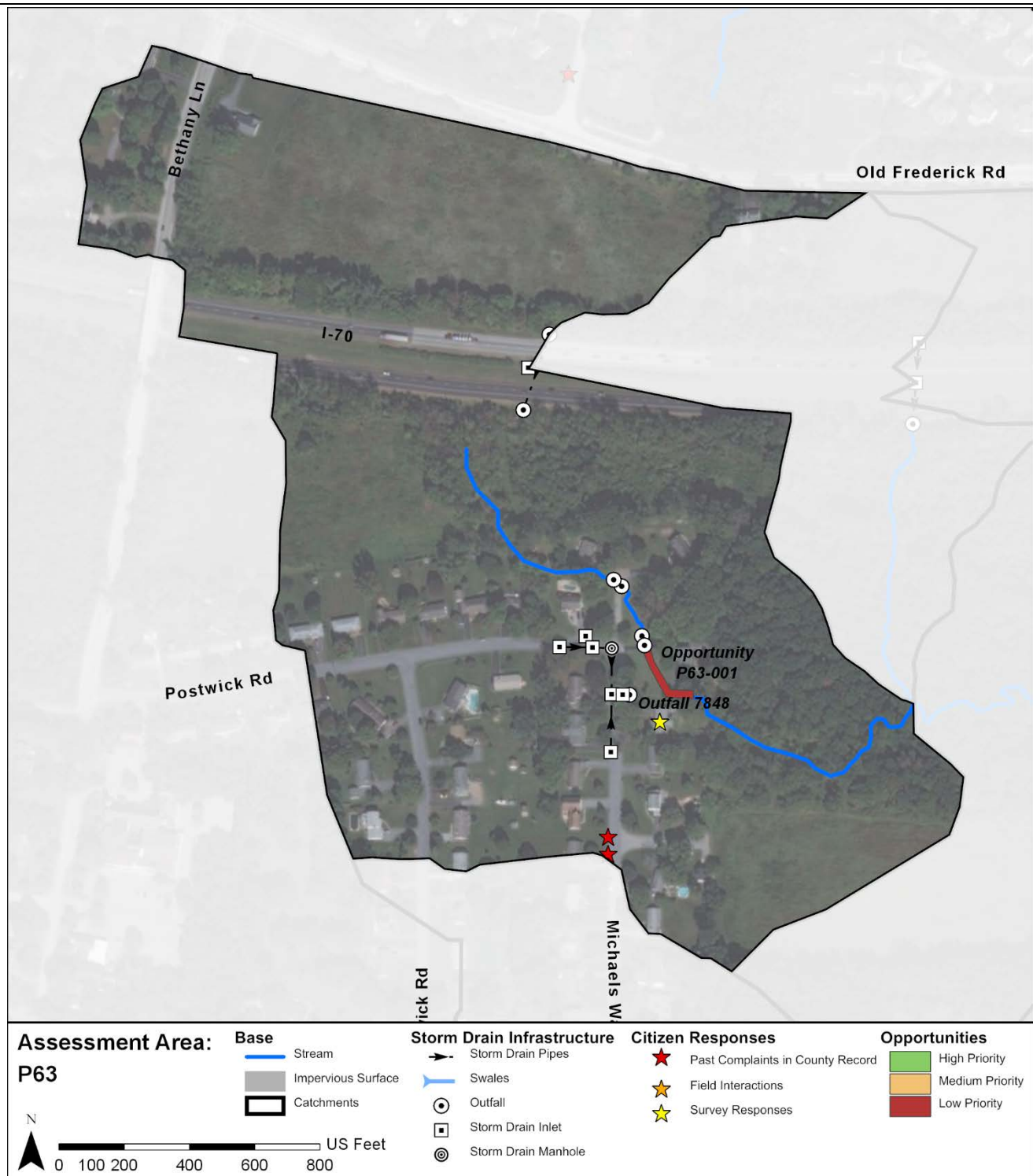
A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. This assessment area does not contain a major storm drain network.

OPPORTUNITIES

No opportunities were identified in this assessment area. However, individuals are encouraged to install environmentally friendly practices that promote infiltration (rain gardens, downspot disconnection, etc.) and improve conveyance (vegetated swales, etc.) on their own properties.

PLUMTREE BRANCH WATERSHED

ASSESSMENT AREA P63



Assessment Area Category:
POTENTIAL REPAIR AND MAINTENANCE PROJECT

Approximate Assessment Area: 54.7 acres
Approximate Imperviousness: 12 %

ASSESSMENT AREA DESCRIPTION

The P63 assessment area is an approximately 54.7-acre area in Howard County's Plumtree Branch watershed. The assessment area largely consists of medium density residential area with some areas open space and impervious land uses. The area captures runoff from portions of Michaels Way, Nollwick Road, Postwick Road, Fenwick Road, I-70, and Bethany Lane. All flow and storm drain networks are directed to the northern end of the Plumtree Branch. The roadways within P63 are a mix of closed and open section.

A survey response indicated that the Plumtree Branch was eroding away the homeowners side yard. Upon field inspection, the severity of the erosion was confirmed. Individual property owners are encouraged to undertake on-lot improvements to improve stormwater management and conveyance on their properties.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	6	4	1	8
Further Investigation Recommended	1	2	0	2
Total	7	6	1	10

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. The diameter of the existing downstream storm drain was compared to a diameter range identified using commonly accepted storm drain sizing approaches. Pipes smaller than this range are noted as *Outside of Range*. A review of storm drain mapping flagged potential constrictions (e.g., the downstream storm drain has a smaller diameter than contributing storm drains). System deficiencies were noted during field assessments in early 2019 (e.g., sedimentation, repair needed, etc.).

Assessment Point ID: Outfall 7848

Approximate Drainage Area:	8.2 acres
Storm Drain Sizing:	Within Range
Potential Constrictions:	No
Observed System Deficiencies:	No
Conclusion:	Likely Adequate

OPPORTUNITIES

Opportunities identified in early 2019 focus on improving drainage and addressing expressed concerns.

Type	ID No.	Description & Discussion
Improve Existing Conveyance	P63-001	Field observations and survey response suggest that existing conveyance is not likely functioning as intended. Existing conveyance to be improved by replacing Pipe 219634 and regrading and stabilizing the downstream channel.

PHOTOS



Figure 1: Significant erosion in outfall channel.



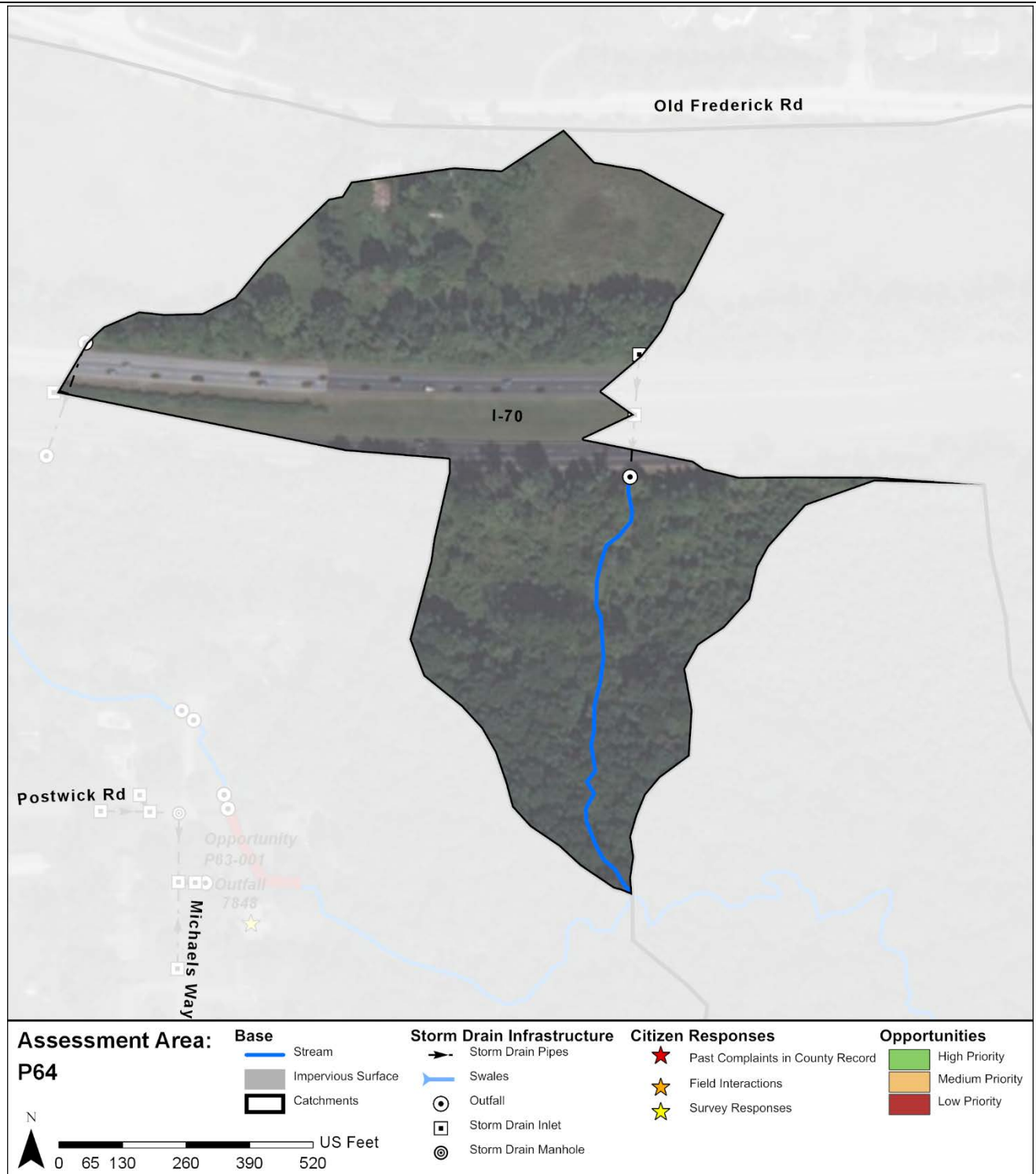
Figure 2: Upstream end of driveway culvert.



Figure 3: Downstream end of driveway culvert.

PLUMTREE BRANCH WATERSHED

ASSESSMENT AREA P64



Assessment Area Category:
POTENTIAL ON-LOT IMPROVEMENTS

Approximate Assessment Area: 13.4 acres
Approximate Imperviousness: 9 %

ASSESSMENT AREA DESCRIPTION

The P64 assessment area is an approximately 13.4-acre area in Howard County's Plumtree Branch watershed. The assessment area largely consists of open space area with some areas of medium density residential and impervious land uses. The area captures runoff from a portion of I-70.

All sections of roadway within P64 are open section and all flow and storm drains are directed to an unnamed tributary to the Plumtree Branch. No survey responses were submitted in the assessment area. Individual property owners are encouraged to undertake on-lot improvements to improve stormwater management and conveyance on their properties.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	2	1	0	2
Further Investigation Recommended	0	0	0	0
Total	2	1	0	2

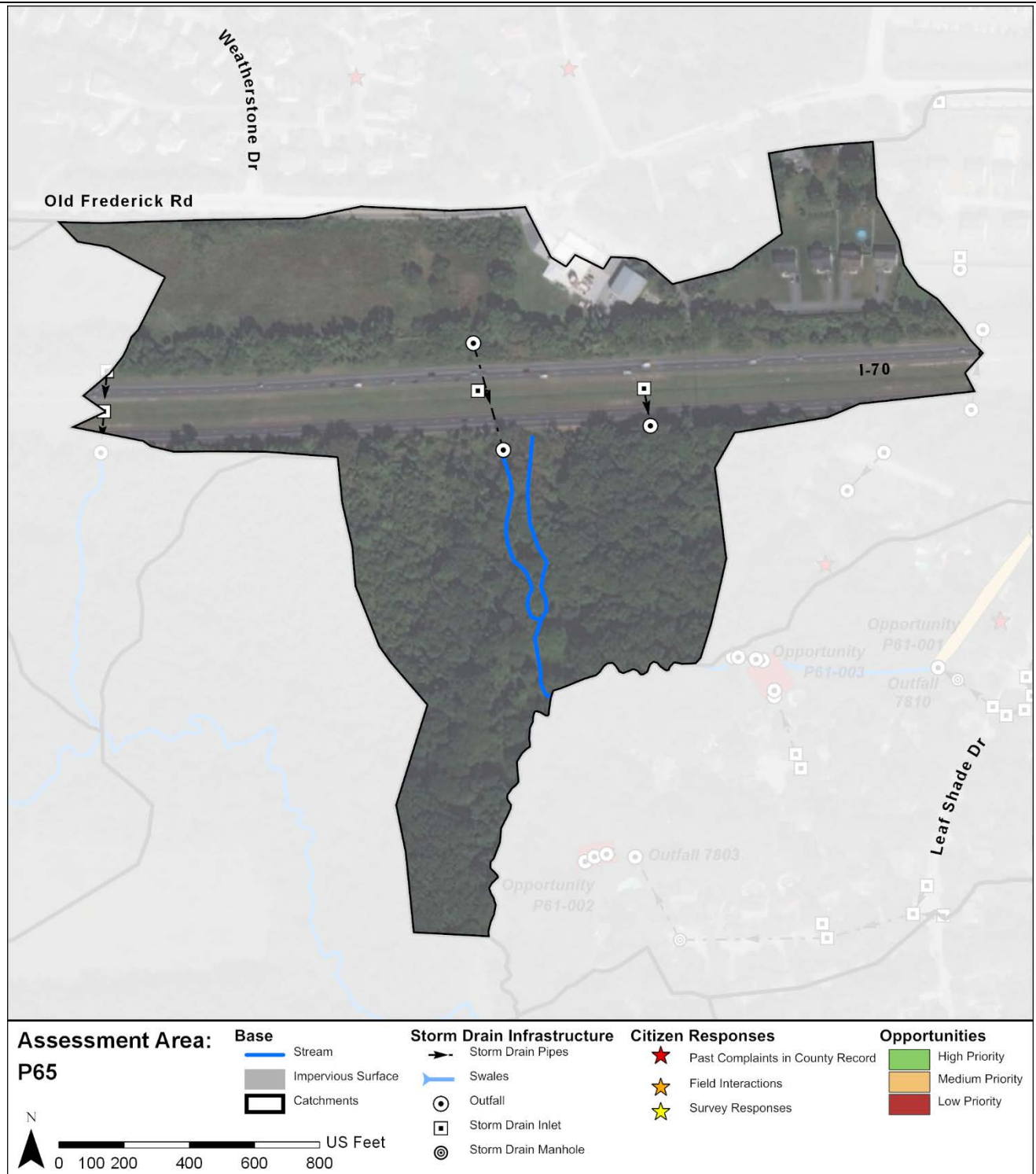
STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. This assessment area does not contain a major storm drain network.

OPPORTUNITIES

No opportunities were identified in this assessment area. However, individuals are encouraged to install environmentally friendly practices that promote infiltration (rain gardens, downspot disconnection, etc.) and improve conveyance (vegetated swales, etc.) on their own properties.

PLUMTREE BRANCH WATERSHED ASSESSMENT AREA P65



Assessment Area Category:
POTENTIAL REPAIR AND MAINTENANCE PROJECT

Approximate Assessment Area: 37.6 acres
Approximate Imperviousness: 13 %

ASSESSMENT AREA DESCRIPTION

The P65 assessment area is an approximately 37.6-acre area in Howard County's Plumtree Branch watershed. The assessment area largely consists of open space area with some areas of medium density residential and impervious land uses. The area captures runoff from a portion of I-70 and Old St. Johns Lane.

All sections of roadway within P65 are open section and all flow and storm drains are directed to an unnamed tributary to the Plumtree Branch. No survey responses were submitted in the assessment area. Individual property owners are encouraged to undertake on-lot improvements to improve stormwater management and conveyance on their properties.

INFRASTRUCTURE FINDINGS

The condition of storm drain infrastructure components was assessed in early 2019. *Good Condition* indicates infrastructure is functioning as intended. *Further Investigation Recommended* indicates infrastructure needs to be cleaned, is in disrepair, requires further inspection or is inaccessible.

Condition/Repair	Inlets (#)	Outfalls (#)	Manholes (#)	Pipes (#)
Good Condition	0	1	0	3
Further Investigation Recommended	2	2	0	0
Total	2	3	0	3

STORM DRAIN ANALYSIS FINDINGS

A qualitative, desktop analysis of major storm drain network(s) within the assessment area evaluated storm drain size and identified potential constriction points and system deficiencies. A major storm drain network is defined as having three or more contributing inlets – some assessment areas have multiple networks. This assessment area does not contain a major storm drain network.

OPPORTUNITIES

No specific opportunities were identified in this assessment area. However, individuals are encouraged to install environmentally friendly practices that promote infiltration (rain gardens, downspot disconnection, etc.) and improve conveyance (vegetated swales, etc.) on their own properties. In addition, a list of infrastructure assets that may require maintenance and/or repair was submitted to the Bureau of Highways.

PHOTOS



Figure 1: Grate missing from inlet.



Figure 2: Grate detached from inlet.



Figure 3: Erosion surrounding outfall channel of outfall.



Figure 4: Erosion surrounding outfall channel, and damage to concrete channel of outfall.