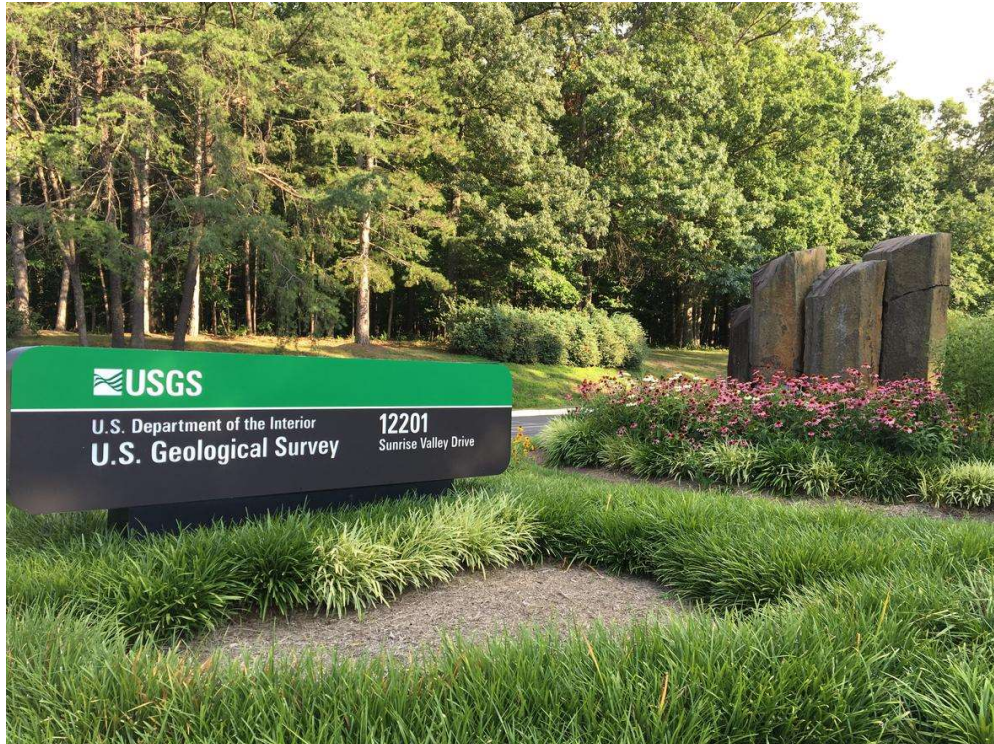


# **Chesapeake Bay TMDL Action Plan**

**General Permit VAR 040126**

**Effective Date: November 1, 2018**

**Expiration Date: October 31, 2023**



**USGS National Center**

**Reston, Virginia**

## INTRODUCTION

The Chesapeake Bay TMDL Action Plan has been prepared to comply with the requirements of the Virginia Pollution Elimination Discharge System (VPDES) General Permit for United States Geological Survey's (USGS) Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (MS4 General Permit). The requirements for the TMDL Action Plan development and update requirements are contained in Part II, Section A of the General Permit VAR040126 dated November 1, 2018.

The USGS headquarters is located south of Sunrise Valley Drive and to the west of Reston Parkway (VA Route 602) in Reston, Fairfax County, VA. A Site Location Map is included in Figure 1. The facility is an office building complex consisting of two parcels, a western and an eastern parcel, and several buildings, numerous parking lots, and a private road (USGS Drive) which runs through the facility near the southern and western boundaries of the site. General Services Administration (GSA) owns both the western and eastern parcels as well most of the buildings and roads within them, but delegates the operations and maintenance of the properties to USGS. In the western parcel, GSA owns the larger J.W. Powell Federal Building, the utilities plant located behind the J.W. Powell Federal Building, and the smaller octagonal star shaped Advanced Systems Center (ASC). The eastern parcel consists of the Solid State Physics Laboratory (SSPL), located near the southern portion of the eastern parcel, and the building is owned by USGS. The northern and eastern portions of the site are forested. Site A site overview and notable features are included in Figure 2. The locations of Outfalls are shown in Figure 3.

A General Stormwater Permit VAR040126 was initially issued on July 1, 2013 and expired on June 30, 2018. Subsequently the stormwater permit was reissued on November 1, 2018 and is due to expire in five years on October 31, 2023. The permit requires general stormwater management at the site, including a public education and outreach; public involvement and participation; illicit discharge detection and elimination; construction site stormwater runoff control; post-construction stormwater management for new development and development on prior developed lands; pollution prevention and good housekeeping (including a nutrient management plan); and outfall mapping. The permit also requires development of Total Maximum Daily Limit (TMDL) Action Plans for all approved TMDLs impacting the site. These requirements are phased in over the life of the permit.

The majority of the site's impervious area, including the parking lots, the western portion of the J.W. Powell Federal Building and the front portion of the SSPL - drains to a wet pond located near the western boundary of the site. Runoff is conveyed to the pond via the site's storm sewer system. The pond was originally constructed in 1975 and was later repaired and upgraded in 1995. According to these drawings, the pond was designed and upgraded to provide sufficient flood protection for the 10-year storm event.

A bioretention cell is located near the entrance to a parking lot near the southeastern portion of the site. The bioretention cell receives runoff from the parking lot to the northeast of the cell.

There are 14 infiltration trenches that line the length of USGS Drive. The trenches were constructed as part of the road improvement project on USGS Drive, which began in 2013.

Runoff from the roadway either enters the trenches by sheet-flow or enters through curb cut inlets. Once the infiltration trenches are filled up, excess runoff is piped to the wet pond via the storm drain system.

The runoff from ASC, rear portion of the SSPL, eastern portion of the J.W. Powell Federal Building, and service road and utility plant located behind the Powell Building is collected via a storm drain system separate from the collection system for the pond and discharged to outfalls located in the forest along the northern and eastern portion of the site. The drainage pattern for the site is shown in Figure 4.

The facility is located within the Sugarland Run Watershed. Runoff from the site enters Sugarland Run through two tributaries. The area draining to the pond and the bioretention cell, along with the area managed by the infiltration trenches along the southern portion of USGS Drive, outfall into Stave Run via the pond. The untreated area behind the J.W. Powell Building, the ASC, and infiltration trenches along the northern western portion of USGS Drive outfall to the northeast of the site into Smilax Branch. Both tributaries connect into Sugarland Run just north of the Dulles Toll Rd (VA State Route 267). Sugarland Run flows through the north western portion of Fairfax County into Loudoun County. Receiving waters in the vicinity of the site are shown in Figure 5. Sugarland Run is also a tributary to the non-tidal portion of the Potomac River Basin which is subject to Chesapeake Bay's nutrient TDMLs. Chesapeake Bay Watershed and Sub-watersheds for the major rivers within the Chesapeake Bay Watershed, including that for Potomac River are shown in Figures 6 and 7, respectively.

### **Chesapeake Bay TMDL Special Condition**

Sugarland Run is a tributary to the non-tidal portion of the Potomac River Basin, which is subject to Chesapeake Bay's nutrient TDMLs<sup>1</sup>. Required reductions in nitrogen, phosphorus, and total suspended solids (TSS) load are calculated as per Part II A 3 (Table 3b of MS4 permit). No new source is anticipated between July 1, 2009 and June 30, 2019, hence provisions of Part II A4 are not applicable. Required reduction for grandfathered projects is calculated as per Part II A 5 for the Potomac River Basin. Reductions required in Part II A 3, and A 5 shall be achieved through one or more of the following:

- BMPs approved by the Chesapeake Bay Program
- BMPs approved by the department

Reductions achieved in accordance with the General VPDES Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems effective July 1, 2013, shall be applied toward the total reduction requirements to demonstrate compliance with Part II A 3 and A 5.

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<sup>1</sup> <https://www.deq.virginia.gov/portals/0/deq/water/guidance/152005.pdf> ,  
[https://www.fairfaxcounty.gov/publicworks/sites/publicworks/files/assets/documents/chesapeake-bay-tmdl\\_0.pdf](https://www.fairfaxcounty.gov/publicworks/sites/publicworks/files/assets/documents/chesapeake-bay-tmdl_0.pdf)

## CHESAPEAKE BAY TMDL ACTION PLAN

A Chesapeake Bay TMDL action plan for the reductions required in Part II A 3 and A 5 is being submitted with the Action Plan. If additional BMPs proposed to meet the reductions not previously approved by the department in the first phase Chesapeake Bay TMDL action plan, USGS will provide opportunity for public comment, prior to the submittal of the plan. The comment period will be open for 15 days. Chesapeake Bay TMDL Action Plan includes the following,

- The load and cumulative reduction calculations calculated in accordance with Part II A 3 and A 5.

The primary stormwater-related concern at the site is runoff from impervious surfaces, including the buildings, roads, and sidewalks. Additional site activity which may impact stormwater runoff include the application of fertilizer in the spring and de-icing activities in the winter. A breakdown of the site impervious and pervious area can be found in Table 1 and is shown in Figure 8. The site is a total of 106 acres with 29 percent impervious cover. Details of the Outfall #1 through 7 are shown in Figures 9, 11, 13, 15, 17, 19, and 21, respectively. Drainage areas associated with Outfall #1 through 7 are shown in Figures 10, 12, 14, 16, 18, 20, and 22, respectively.

The majority of the site's impervious area - including the parking lots, the western portion of the J.W. Powell Federal Building and the front portion of the SSPL - drains to a wet pond located near the western boundary of the site. Runoff is conveyed to the pond via the site's storm sewer system. The pond was originally constructed in 1975 and was later repaired and upgraded in 1995. The pond was designed and upgraded to provide sufficient flood protection for the 10-year storm event. Urban Wetponds are "depressions or basins created by excavation or berm construction that receive sufficient water via runoff, precipitation, and groundwater to contain standing water year-round at depths too deep to support rooted emergent or floating-leaved vegetation (in contrast with dry ponds, which dry out between precipitation events). Nutrients and suspended particles are removed via settling. Nitrogen is further removed primarily via plant and microbial uptake and nitrification-denitrification reactions, while phosphorus is further removed by soil sorption. Urban Wetlands have soils that are saturated with water or flooded with shallow water that support rooted floating or emergent aquatic vegetation (e.g. cattails). Nutrients and suspended particles are removed via settling. Nitrogen is further removed primarily via plant and microbial uptake and nitrification-denitrification reactions, while phosphorus is further removed by soil sorption."<sup>2</sup> Based on these definitions, the pond at the wetland can be better classified as wetland.

A single bioretention cell located near the entrance to a parking lot near the southeastern portion of the site. It receives runoff from the parking lot to the northeast of the bioretention cell. A bioretention cell is "an excavated pit backfilled with engineered media, topsoil, mulch, and

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<sup>2</sup> Developing Best Management Practice, Definitions and Effectiveness Estimates for Nitrogen, Phosphorus, and Sediment in the Chesapeake Bay Watershed, Final Report, December 2009, Dr. Thomas Simpson and Sarah Weammert, University of Maryland Mid-Atlantic Water Program.



vegetation. These are planting areas installed in shallow basins in which the storm water runoff is temporarily ponded and then treated by filtering through the bed components, and through biological and biochemical reactions within the soil matrix and around the root zones of the plants.”<sup>2</sup>

There are by 14 infiltration trenches that line the length of USGS Drive. An infiltration trench is “a depression to form an infiltration basin where sediment is trapped and water infiltrates the soil. No underdrains are associated with infiltration basins and trenches, because by definition these systems provide complete infiltration.”<sup>2</sup> The 14 infiltration trenches were constructed as part of the road improvement project on USGS Drive, which began in 2013. Runoff from the roadway either sheetflows directly into the infiltration trenches or enters through curb cut inlets. In the event the total runoff exceeds the infiltration trenches capacity, excess runoff is piped to the wet pond via the storm drain system. Stormwater maintenance is performed as needed and is done in both the spring and fall.

The runoff from the impervious area around the ASC, the rear portion of the SSPL, the eastern portion of the J.W. Powell Federal Building, and the service road and utility plant located behind the Powell Building is collected via a storm drain system separate from the collection system for the pond, and discharges to outfalls located in the forest along the northern and eastern portion of the site. A breakdown of both the treated and untreated area for the USGS National Center is provided in Table 1. These treated areas are also shown in Figure 23. The areas treated by infiltration trench, bioretention cell, and pond are shown in Figures 24 through 26, respectively

## **Summary of Runoff Volume and Current Pollutant Loads**

### **Runoff Volumes**

Runoff volumes are estimated using the Simple Method (Schueler, 1987). In Virginia, state stormwater regulations require management of the 1” storm. Therefore, runoff calculations are based on a 1” storm event, with a corresponding runoff coefficient based on the impervious fraction and compacted cover.

The runoff calculations are summarized in Table 2. The runoff volume required to be retained on site to manage a 1” storm at the USGS National Center is equal to about 1.25 million gallons.

### **Baseline Pollutant Loads**

The site’s VPDES permit provides a process for calculating baseline pollutant loads for the facility. Table 3b of the permit, which applies to facilities in the Potomac River Basin, such as the USGS site, outlines the variable used in the calculation. This table indicates that existing source (“baseline”) loads are determined by multiplying the number of regulated pervious and regulated impervious acres at the site by individual loading rates (included in the permit) for each of these areas to calculate loads for total nitrogen (TN), total phosphorus (TP), and total suspended solids (TSS).

Baseline pollutant loads are summarized in Table 3.

## Load Reductions from Existing BMPs

Stormwater loads at the USGS National Center MS4 are reduced by the existing BMPs.

A wet pond is located near the western boundary of the site. Runoff from the parking lots, the western portion of the J.W. Powell Federal Building and the front portion of the SSPL is conveyed to the pond via the site's storm sewer system.

A single bioretention cell located near the entrance to a parking lot near the southeastern portion of the site. It receives runoff from the parking lot to the northeast of the bioretention cell.

The infiltration trenches at the USGS National Center were constructed as part of the 2013 road improvement project and provide treatment for the previously unmanaged USGS Drive.

Removal efficiency associated with a BMP is presented as total mass removal, capturing both reductions in overall runoff volume (runoff reduction) and pollutant concentrations (pollutant removal). Rates are applied to the runoff from acres treated. The equation used to determine total removal is<sup>2</sup>:

$$TR = RR + \{(100-RR) * PR\}$$

TR – total removal is the nutrient mass reduction, which is the product of both runoff reduction and pollutant removal.

RR – runoff removal is defined as the total annual runoff volume reduced through canopy interception, soil infiltration, evaporation, transpiration, rainfall harvesting, engineered infiltration, or extended filtration.

PR – pollutant removal is defined as the change in event mean concentration as runoff flows into and out of a BMP. Pollutant removal is accomplished via processes such as settling, filtering, adsorption, and biological uptake. This does not account for changes in the overall volume of runoff entering and leaving the BMP. PR values are event mean concentration based (defined as the average concentration of a pollutant in runoff for a monitored storm event).

Load reductions from existing BMPs at the USGS National Center MS4 are summarized in Table 4.<sup>2,3</sup>

## Load Reduction Targets

The load reduction target is the amount of pollutant load per acre that must be managed by BMPs. Load reduction targets (on a per acre basis) are provided for sites in the Potomac River basin in Table 3b of the permit. Similarly to the calculation of baseline loads, target load reductions are calculated by multiplying the number of acres of regulated pervious and impervious area by the load reduction targets on a per pollutant basis. As mentioned above, the existing pond, bioretention cell, and infiltration trenches provide credit towards achieving the target pollutant load reductions. These target load reductions are summarized in Table 5.

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<sup>3</sup> Table V.C.1, Chesapeake Bay TMDL Special Condition Guidance, GM15-2005, 05/18/2015

The reduction achieved by the existing BPMS is summarized in Table 6. The error bar for the removal efficiency varies between  $\pm 10\%$  to  $\pm 20\%$ . If we take a more conservative removal efficiency, using the lower removal efficiency, a conservative estimate of the reduction achieved by the existing BMPs is summarized in Table 7.

Part of the land at the National Center is forested. Figure 27 shows the area that is covered by forest. Additional credit for the pollution load reduction may be taken, as presence of forest provides additional reduction in pollutant load, as indicated in Table 8.<sup>4</sup> The pollutant load reduction from the forest cover is summarized in Table 8. Table 9 summarizes the overall pollutant load reduction achieved by BMPs and land cover. Table 10 provides a conservative estimate for the same.

### **Evaluation of Needs for Additional Stormwater Management**

As shown in from Table 7 and Table 8, pond, bioretention system, infiltration trench, and forest cover provide sufficient treatment to address the target load reductions in the facility's VPDES permit.

### **Summary of Stormwater Management Recommendations**

No additional stormwater management is required to meet the pollutant load reduction targets under the VPDES permit, and therefore no additional stormwater management is recommended for this site. However, there are significant portions of untreated area on the site that provide opportunities for additional treatment.

Currently, runoff from both the eastern portion of the J.W. Powell Federal Building and the ASC is pumped via a sump to the storm sewer that outfalls in the woods on the northern portion of the site. The sump can be rerouted into the storm system that drains to the pond. The pond may need to be upgraded to handle the additional load.

### **Public Participation**

A copy of the Chesapeake Bay TMDL Action will be placed on the USGS web site for public review and comments. A summary of any comments received as a result of public participation required in Part II A 12, the USGS response, identification of any public meetings to address public concerns, and any revisions made to Chesapeake Bay TMDL action plan as a result of public participation.

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<sup>4</sup> Table V.H.1, Chesapeake Bay TMDL Special Condition Guidance, GM15-2005, 05/18/2015

## Tables

**Table 1. Proportion of Drainage Area Treated by BMP**

	Impervious Area (Acres)	Pervious Area (Acres)	Total (Acres)	% of total
Treated Area	23.74	13.33		35.0%
Infiltration Trenches <sup>1</sup>	2.80	0.00	2.80	2.6%
Wet Pond <sup>2</sup>	20.30	13.20	33.50	31.6%
Bioretention <sup>3</sup>	0.64	0.13	0.77	0.7%
Untreated Area	7.16	61.77	68.93	65.0%
TOTAL <sup>4</sup>	30.90	75.10	106.00	100%
%	29.2%	70.8%		

1 Figure 24

2 Figure 25

3 Figure 26

4 Figure 8

Untreated Area = Total - Treated Area

Treated Area = Sum of Areas Treated by 3 BMPs



**Table 2. Runoff Volumes for USGS Eastern Geographic Science Center**

Facility	P (in)	Rv <sub>I</sub>	Rv <sub>C</sub>	SA (sq ft)	Impervious Area (sq ft)	% Impervious	Pervious Area (sq ft)	% C	SWR <sub>v</sub> (gal)
USGS National Center	1	0.95	0.25	4,510,894	1,259,904	28%	3,250,990	72%	1,252,686

$$SWR_v = [P \times [(Rv_t \times \%I) + (Rv_c \times \%C)] \times SA] \times 7.48/12$$

$SWR_v$  = volume required to be retained on site (gallons)

$P$  = target percentile rainfall depth event for the District (inches)

$Rv_t$  = 0.95 (runoff coefficient for impervious cover)

$Rv_c$  = 0.25 (runoff coefficient for compacted cover)

$\%I$  = percent of the drainage with impervious cover (decimal)

$\%C$  = percent of the drainage area with compacted cover (decimal)

$SA$  = drainage area (ft<sup>2</sup>)

7.48 = factor for converting cubic feet to gallons

12 = factor for converting inches to feet.

**Table 3. Baseline Pollutant Loads for USGS National Center**

Subsource	Pollutant	Area Served by MS4 (Acres)	2009 EOS Loading Rate (lb/acre/yr)	Estimated Load (lbs/yr)
Regulated Urban Impervious	TN	30.90	16.86	520.97
Regulated Urban Pervious		75.10	10.07	756.26
Total		106.00		1,277.23
Regulated Urban Impervious	TP	30.90	1.62	50.06
Regulated Urban Pervious		75.10	0.41	30.79
Total		106.00		80.85
Regulated Urban Impervious	TSS	30.90	1,171.32	36,193.79
Regulated Urban Pervious		75.10	175.80	13,202.58
Total		106.00		49,396.37

Load = Loading Rate x Area

Loading Rate obtained from Table 3b of the Permit.

**Table 4. Chesapeake Bay Program BMPs, Established Efficiencies**

BMP	Product Removal (PR), %			Run Off Reduction, %	Total Removal (TR), %		
	TN	TP	TSS		TN	TP	TSS
Bioretention, C/D Soil	10	37	50	15	25	45	55
Uncertainty, ±					20	15	15
Conservative Estimate					5	30	40
Infiltration	0	25	95	80	80	85	95
Uncertainty, ±					15	15	10
Conservative Estimate					65	70	85
Wet Pond/wetland					20	45	60

Source:

1. Developing Best Management Practice, Definitions and Effectiveness Estimates for Nitrogenm Phosphorus, and Sediment in the Chesapeake Bay Watershed, Final Report, December 2009, Dr. Thomas Simpson and Sarah Weammert, University of Maryland Mid-Atlantic Water Program

2,. Table V.C.1, Chesapeake Bay TMDL Special Condition Guidance, GM15-2005, 05/18/2015

Effectiveness estimates: Effectiveness estimates are presented as total mass removal, capturing both reductions in  
 $TR = RR + \{(100-RR) * PR\}$

TR – total removal is the nutrient mass reduction, which is the product of both runoff reduction and pollutant removal.

RR – runoff removal is defined as the total annual runoff volume reduced through canopy interception, soil infiltration,

PR – pollutant removal is defined as the change in event mean concentration as runoff flows into and out of a BMP.

Pollutant removal is accomplished via processes such as settling, filtering, adsorption, and biological uptake. This does not account for changes in the overall volume of runoff entering and leaving the BMP. PR values are event mean concentration based (defined as the average concentration of a pollutant in runoff for a monitored storm event).

**Table 5. Pollutant Load Reduction Target for USGS National Center**

Subsource	Pollutant	Estimated Load (lbs/yr)	Percentage of MS4 required Chesapeake Bay total L2 loading reduction	Percentage of L2 required reduction by 2023	40% cumulative reduction required by 6/30/2023 (lbs/yr)	Sum of 40% cumulative reduction (lbs/yr)
Regulated Urban Impervious	TN	521.0	9%	40%	18.8	36.91
Regulated Urban Pervious		756.3	6%	40%	18.2	
Regulated Urban Impervious	TP	50.1	16%	40%	3.2	4.10
Regulated Urban Pervious		30.8	7.25%	40%	0.9	
Regulated Urban Impervious	TSS	36,193.8	20%	40%	2,895.5	3,357.59
Regulated Urban Pervious		13,202.6	8.75%	40%	462.1	

Estimated Load from Table 3

Cumulative Reductions Using Formula in Table 3b of the Permit

**Table 6. Pollutant Load Reduction By BMPs for USGS National Center**

Subsource	Pollutant	Estimated Load (lbs/yr)	Reduction from BMP (lbs/yr)
Infiltration	TN	47.2	37.77
Pond/wetland		475.2	95.04
Bioretention Cell		12.1	3.02
Total BMP		534.5	135.83
Infiltration	TP	4.5	3.86
Pond/wetland		38.3	17.23
Bioretention Cell		1.1	0.49
Total BMP		43.9	21.58
Infiltration	TSS	3,279.7	3,115.71
Pond/wetland		26,098.4	15,659.01
Bioretention Cell		772.5	424.87
Total BMP		49,396.4	19,199.60

Load Reduction from % in Table 4.



**Table 7. Pollutant Load Reduction by BMPs for USGS National Center (Conservative Estimate)**

Subsource	Pollutant	Estimated Load (lbs/yr)	Reduction from BMP (lbs/yr)
Infiltration	TN	47.2	30.69
Pond/wetland		475.2	95.04
Bioretention Cell		12.1	0.60
Total BMP		534.5	126.33
Infiltration	TP	4.5	3.18
Pond/wetland		38.3	17.23
Bioretention Cell		1.1	0.33
Total BMP		43.9	20.74
Infiltration	TSS	3,279.7	2,787.74
Pond/wetland		26,098.4	15,659.01
Bioretention Cell		772.5	309.00
Total BMP		49,396.4	18,755.75

Load Reduction Using Conservative % in Table 4

**Table 8. Land Use Change Conversion Efficiency Table and Load Reduction**

Basin	Land Use	Conversion	End of Stream (EOS) Reduction		
			TN	TP	TSS
			lbs/ac/yr	lbs/ac/yr	lbs/ac/yr
Potomac	Pervious	Forest Cover	7.16	0.38	132.96
		Area, Acre	lbs/yr	lbs/yr	lbs/yr
	Total Reduction	34.30	245.59	13.03	4,560.53

Tanken from Table V.H.1, Chesapeake Bay TMDL Special Condition Guidance, GM15-2005, 05/18/2015

**Table 9. Additional Pollutant Load Reduction Required**

Subsource	Pollutant	Reduction (lbs/yr)
Load Reduction Target by 6/30/2023	TN	36.91
Reduction from 3 BMPs		135.83
Reduction from Forest Cover		245.59
Net Reduction Required		<b>-344.51</b>
Net Load		895.82
Load Reduction Target by 6/30/2023	TP	4.10
Reduction from 3 BMPs		21.58
Reduction from Forest Cover		13.03
Net Reduction Required		<b>-30.52</b>
		46.23
Load Reduction Target by 6/30/2023	TSS	3,357.59
Reduction from 3 BMPs		19,199.60
Reduction from Forest Cover		4,560.53
Net Reduction Required		<b>-20,402.53</b>
		25,636.24

Use Tables 5, 6, and 8

**Table 10. Additional Pollutant Load Reduction Required (Conservative Estimate)**

Subsource	Pollutant	Reduction (lbs/yr)
Load Reduction Target by 6/30/2023	TN	36.91
Reduction from 3 BMPs		126.33
Reduction from Forest Cover		245.59
Net Reduction Required		<b>-335.01</b>
Net Load		905.32
Load Reduction Target by 6/30/2023	TP	4.10
Reduction from 3 BMPs		20.74
Reduction from Forest Cover		13.03
Net Reduction Required		<b>-29.67</b>
		47.08
Load Reduction Target by 6/30/2023	TSS	3,357.59
Reduction from 3 BMPs		18,755.75
Reduction from Forest Cover		4,560.53
Net Reduction Required		<b>-19,958.69</b>
		26,080.09

Use Tables 5, 7, and 8

## Figures



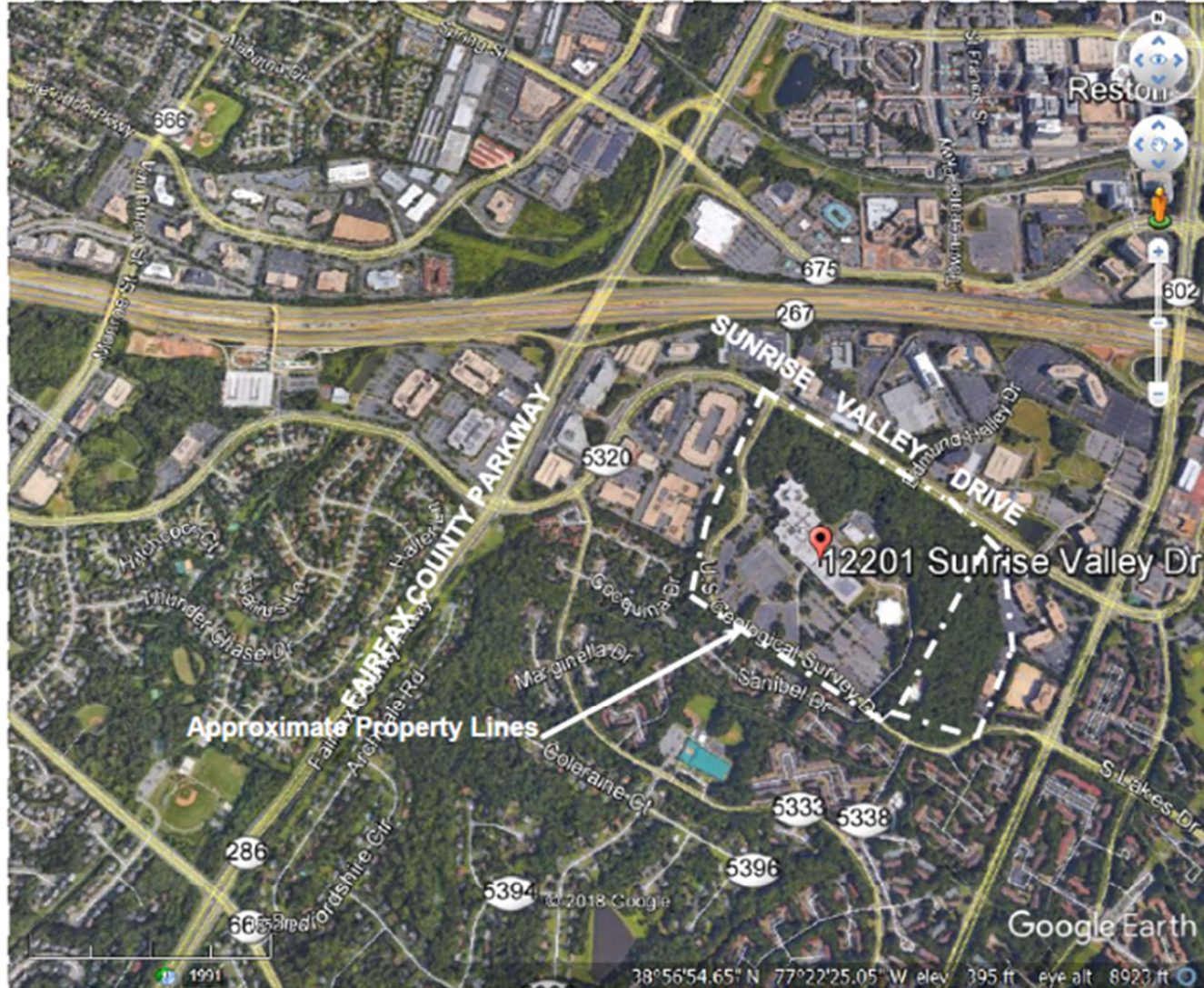


Figure 1. Location Map





**Figure 2. Site Boundary and Features**

CONTROLLED UNCLASSIFIED INFORMATION

## USGS RESTON VA STORM DRAIN DOCUMENTATION

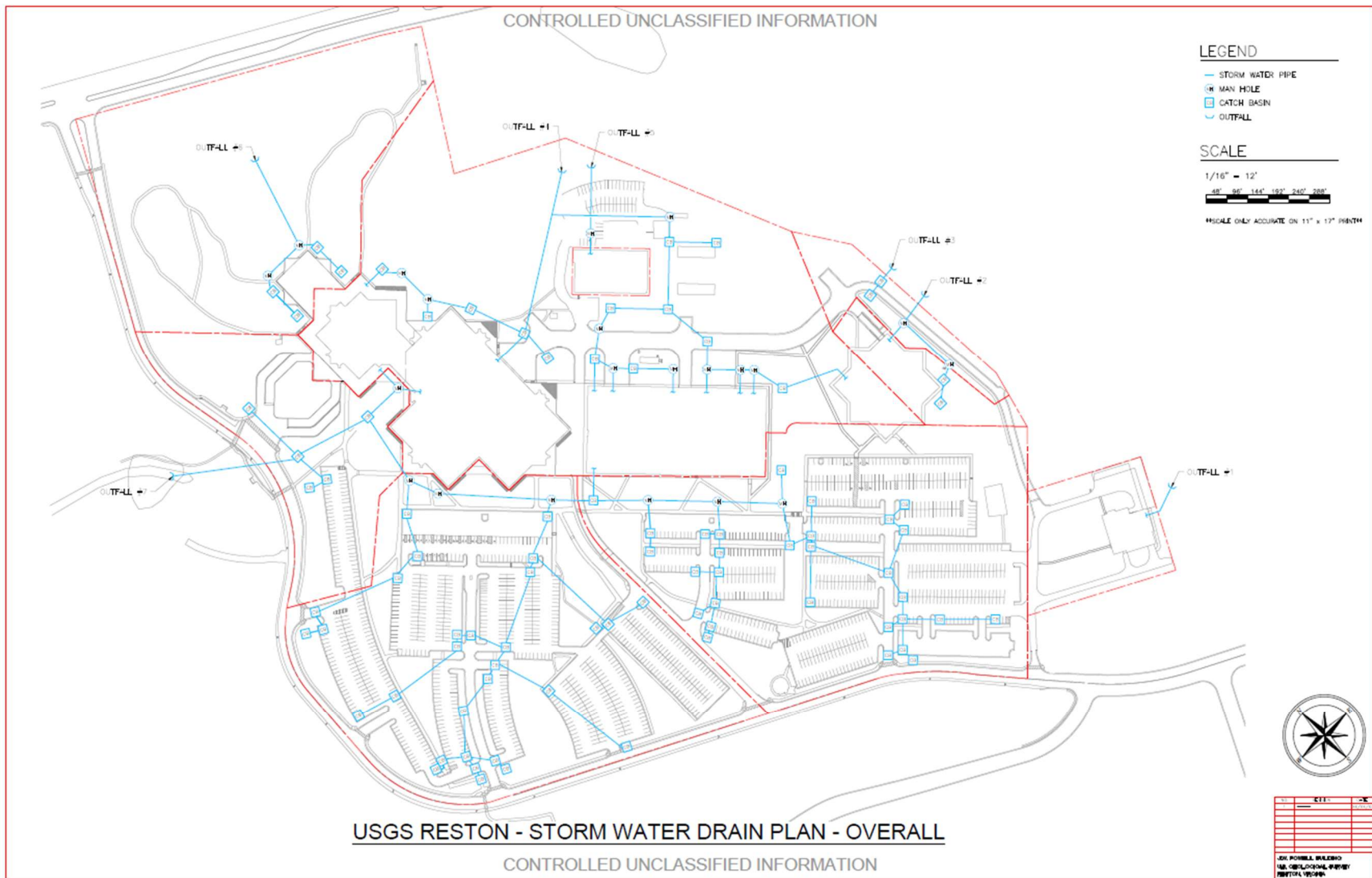


DATE	01/11/2024
BY	JOHN P. WALSH
FOR	USGS RESTON VA
PROJECT	STORM DRAIN DOCUMENTATION

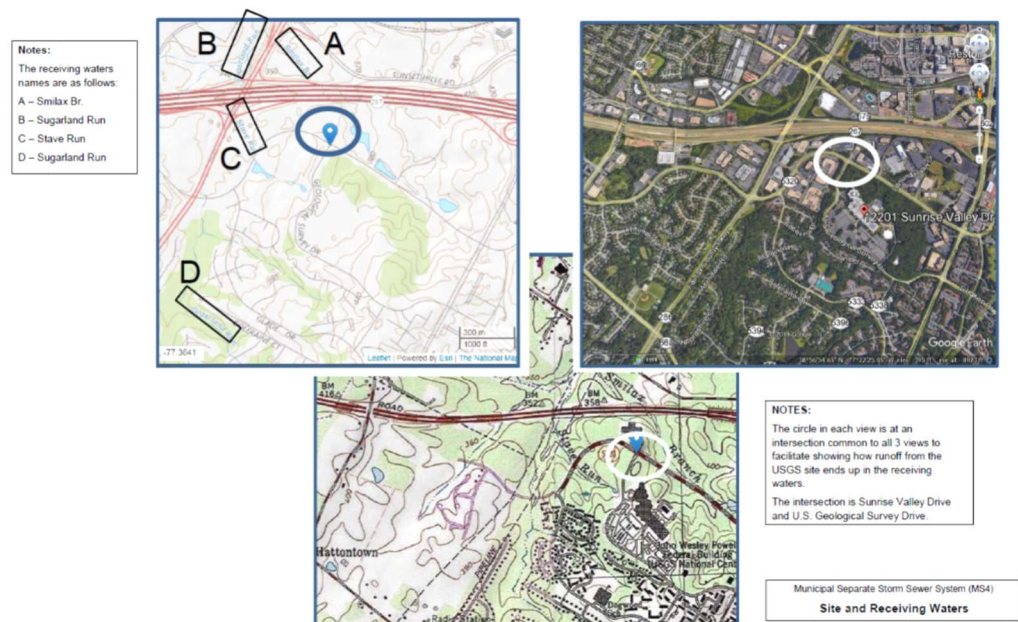
CONTROLLED UNCLASSIFIED INFORMATION

**Figure 3. Aerial View Showing Outfall Locations**



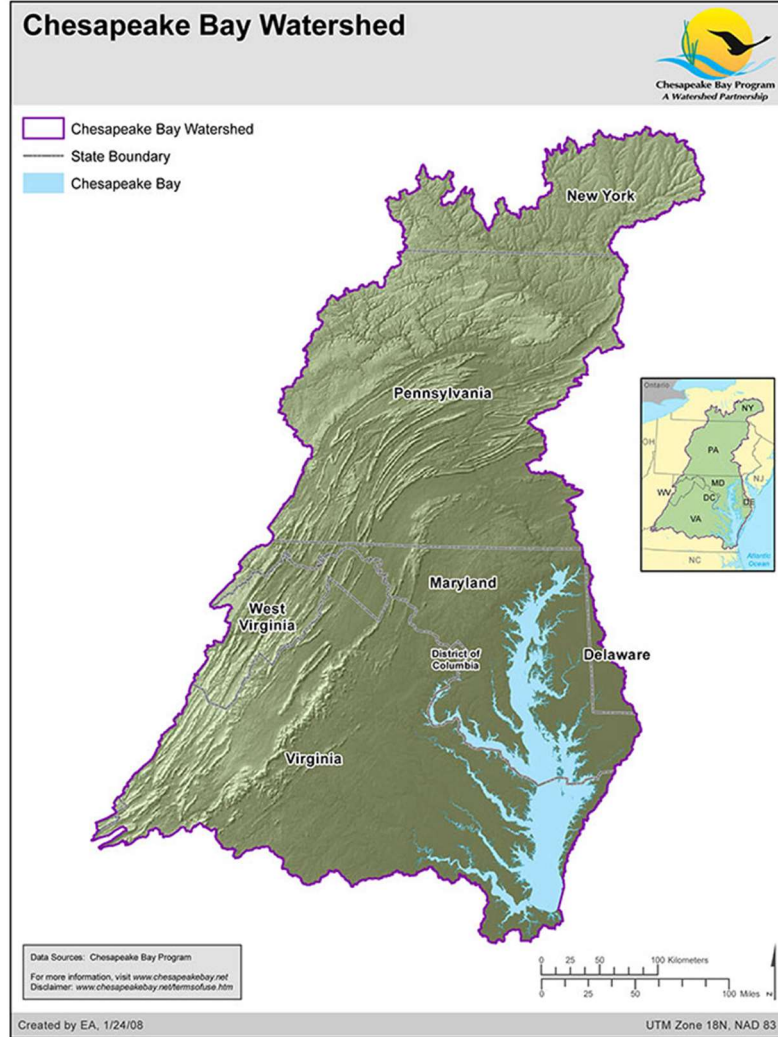


**Figure 4. Stormwater Drainage Plan**



**Figure 5. Receiving Waters**





**Figure 6. Chesapeake Bay Watershed**

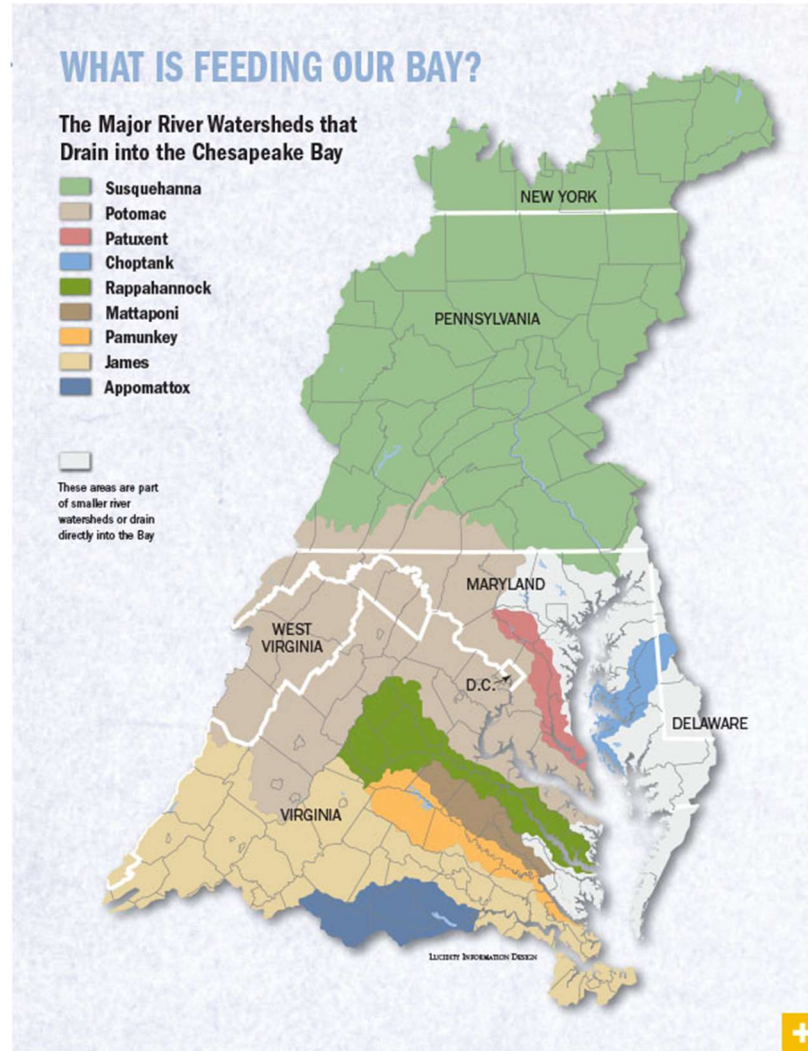
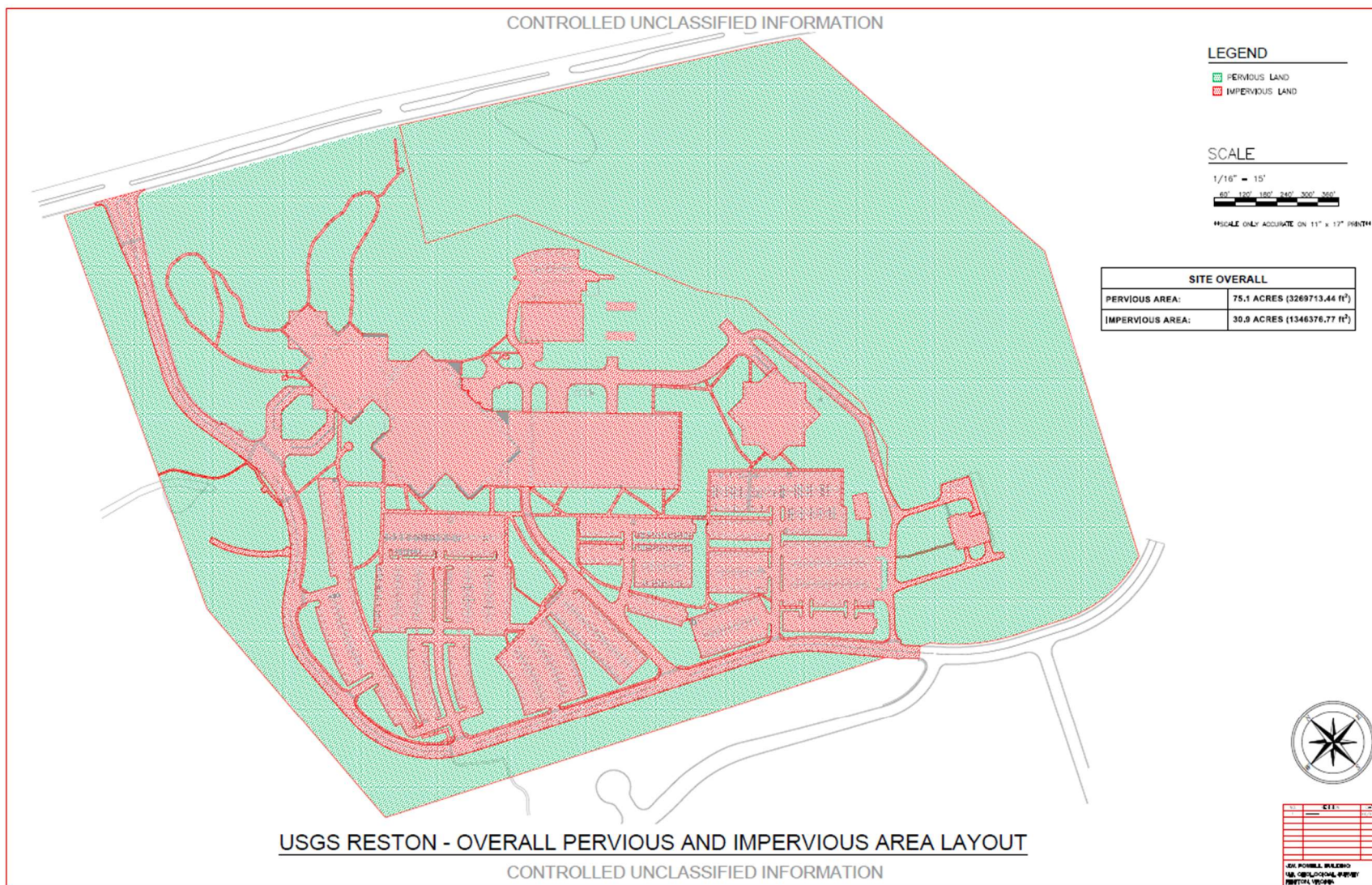


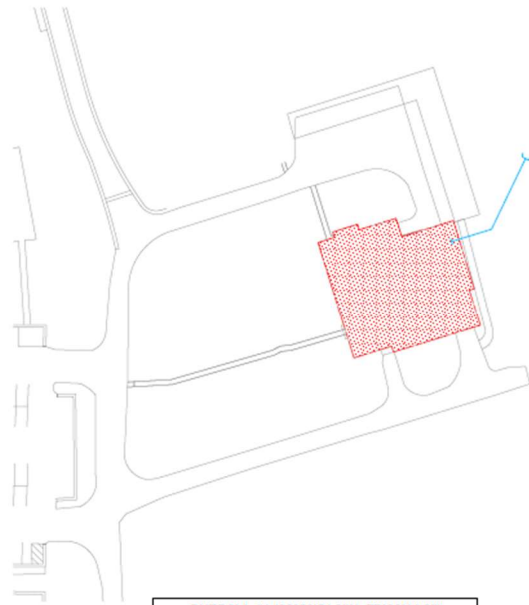
Figure 7. Major River Watershed within Chesapeake Bay Watershed



**Figure 8. Overall Pervious and Impervious Area Breakdown**



CONTROLLED UNCLASSIFIED INFORMATION



OUTFALL #1 (38°56'54.9"N, 77°22'11.9"W)	
WATER RECEIVING DISCHARGES FROM OUTFALL:	SUGARLAND RUN (IMPAIRED)
HYDROLOGIC UNIT CODE (HUC):	HUC8 = 02070008 VAHUS = PL21
APPROXIMATE ACREAGE SERVED:	30.4 ACRES (1324555 M <sup>2</sup> )
PREDOMINATE LAND USE:	INSTITUTIONAL
NAME OF APPROVED TMDL:	CHESAPEAKE BAY TMDL

USGS RESTON - STORM WATER DRAIN PLAN - OUTFALL #1



OUTFALL #1 - VIEW UPSTREAM



OUTFALL #1 - VIEW DOWNSTREAM

#### LEGEND

- STORM WATER PIPE
- MAN HOLE
- CATCH BASIN
- OUTFALL

#### SCALE

1/16" = 5'



SCALE ONLY ACCURATE ON 11" x 17" PRINTS



DATE:	05/05/2010
BY:	DAVID L. BROWN
CHECKED BY:	DAVID L. BROWN
APPROVED BY:	DAVID L. BROWN

CONTROLLED UNCLASSIFIED INFORMATION

**Figure 9. Outfall #1 Details**

CONTROLLED UNCLASSIFIED INFORMATION

LEGEND

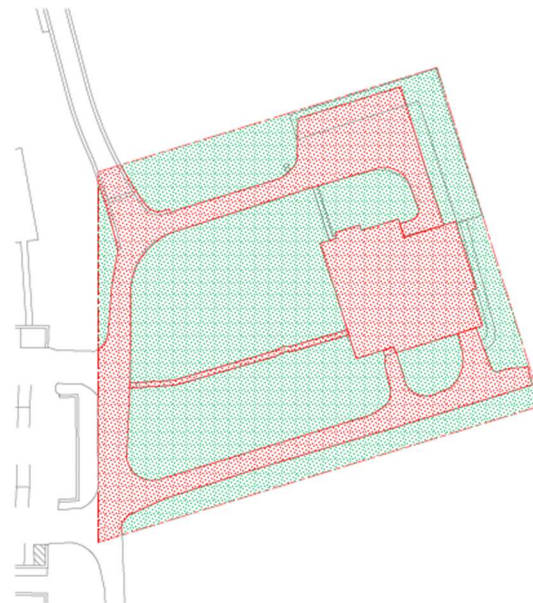
- PERVIOUS LAND
- IMPERVIOUS LAND

SCALE

1/16" = 5'



SCALE ONLY ACCURATE ON 11" x 17" PAPER



OUTFALL #1	
PERVIOUS AREA:	1.3 ACRES (56433 ft <sup>2</sup> )
IMPERVIOUS AREA:	0.73 ACRES (31861.77 ft <sup>2</sup> )

USGS RESTON - PERVIOUS AND IMPERVIOUS LAND - OUTFALL #1

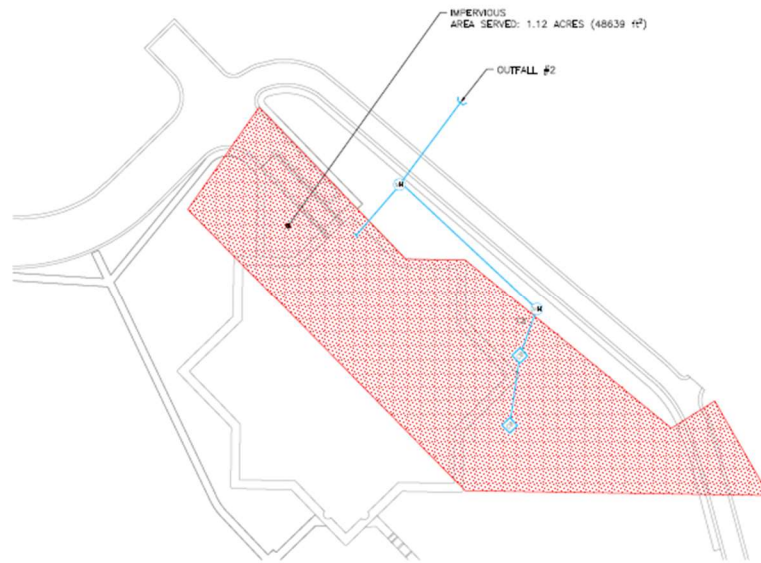


DATE	01/11/2011
BY	USGS
FOR	USGS
PROJECT	RESTON
FILE	RESTON

CONTROLLED UNCLASSIFIED INFORMATION

Figure 10. Drainage Area for Outfall #1

CONTROLLED UNCLASSIFIED INFORMATION



OUTFALL #2 (38°56'46.6"N, 77°21'53.9"W)	
WATER RECEIVING DISCHARGES FROM OUTFALL:	SUGARLAND RUN (IMPAIRED)
HYDROLOGIC UNIT CODE (HUC):	HUC8 = 02070008 VAHJ6 = PL21
APPROXIMATE ACREAGE SERVED:	1.12 ACRES (48639 ft <sup>2</sup> )
PREDOMINATE LAND USE:	INSTITUTIONAL
NAME OF APPROVED TMDL:	CHESAPEAKE BAY TMDL

USGS RESTON - STORM WATER DRAIN PLAN - OUTFALL #2



OUTFALL #2 - VIEW UPSTREAM



OUTFALL #2 - VIEW DOWNSTREAM

#### LEGEND

- STORM WATER PIPE
- MAN HOLE
- CATCH BASIN
- OUTFALL

#### SCALE

1/16" = 5'



SCALE ONLY ACCURATE ON 11" x 17" PRINTS



DATE:	05/05/2010
BY:	DAVID L. BILSBO
QA:	DAVID L. BILSBO
REVISION:	

CONTROLLED UNCLASSIFIED INFORMATION

Figure 11. Outfall #2 Details

CONTROLLED UNCLASSIFIED INFORMATION

LEGEND

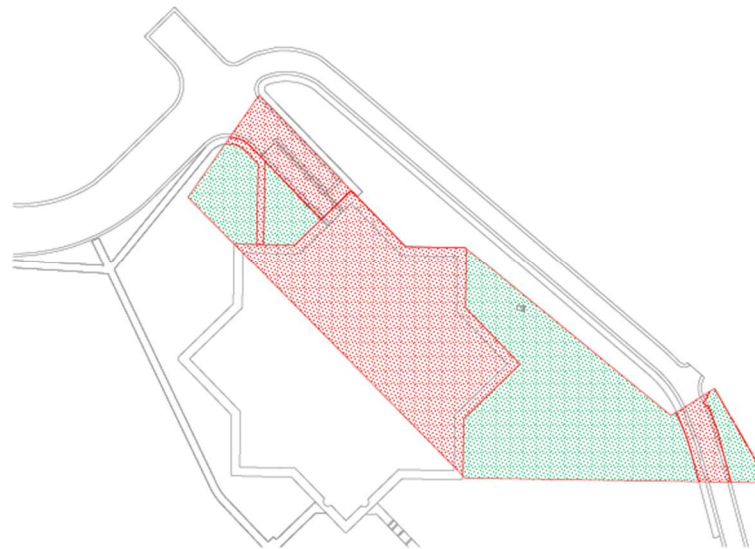
- PERVIOUS LAND
- IMPERVIOUS LAND

SCALE

1/16" = 5'



SCALE ONLY ACCURATE ON 11" x 17" PRINT



OUTFALL #2	
PERVIOUS AREA:	0.54 ACRES (23354.29 ft <sup>2</sup> )
IMPERVIOUS AREA:	0.58 ACRES (25272.33 ft <sup>2</sup> )

USGS RESTON - PERVIOUS AND IMPERVIOUS LAND - OUTFALL #2

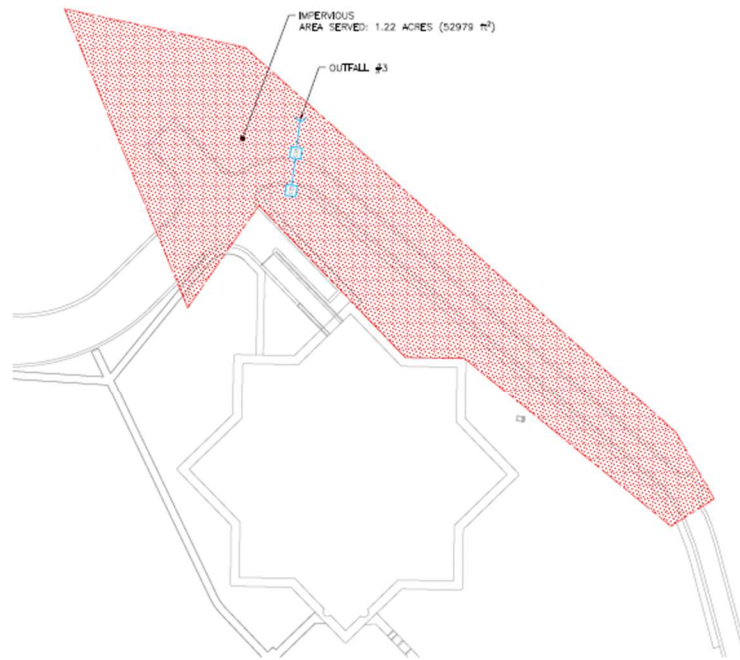


DATE:	05/01/2014
BY:	05/01/2014
FOR:	05/01/2014
PROJECT:	05/01/2014
REVISION:	05/01/2014
APPROVED:	05/01/2014
DATE:	05/01/2014
BY:	05/01/2014
FOR:	05/01/2014
PROJECT:	05/01/2014
REVISION:	05/01/2014
APPROVED:	05/01/2014

CONTROLLED UNCLASSIFIED INFORMATION

Figure 12. Drainage Area for Outfall #2

CONTROLLED UNCLASSIFIED INFORMATION



**LEGEND**

- STORM WATER PIPE
- MAN HOLE
- CATCH BASIN
- OUTFALL

**SCALE**

1/16" = 5'



SCALE ONLY ACCURATE ON 11" x 17" PRINT



OUTFALL #3 - VIEW UPSTREAM



OUTFALL #3 - VIEW DOWNSTREAM

OUTFALL #3 (38°56'47.3"N, 77°21'53.8"W)	
WATER RECEIVING DISCHARGES FROM OUTFALL:	SUGARLAND RUN (IMPAIRED)
HYDROLOGIC UNIT CODE (HUC):	HUC8 = 02070008 VAHJ6 = PL21
APPROXIMATE ACREAGE SERVED:	1.22 ACRES (52979 m²)
PREDOMINATE LAND USE:	INSTITUTIONAL
NAME OF APPROVED TMDL:	CHESAPEAKE BAY TMDL

USGS RESTON - STORM WATER DRAIN PLAN - OUTFALL #3



DATE:	05/05/2014
BY:	DAVID L. WALSH
FOR:	DAVID L. WALSH
PROJECT:	CHESAPEAKE BAY TMDL

CONTROLLED UNCLASSIFIED INFORMATION

**Figure 13. Outfall #3 Details**



CONTROLLED UNCLASSIFIED INFORMATION

LEGEND

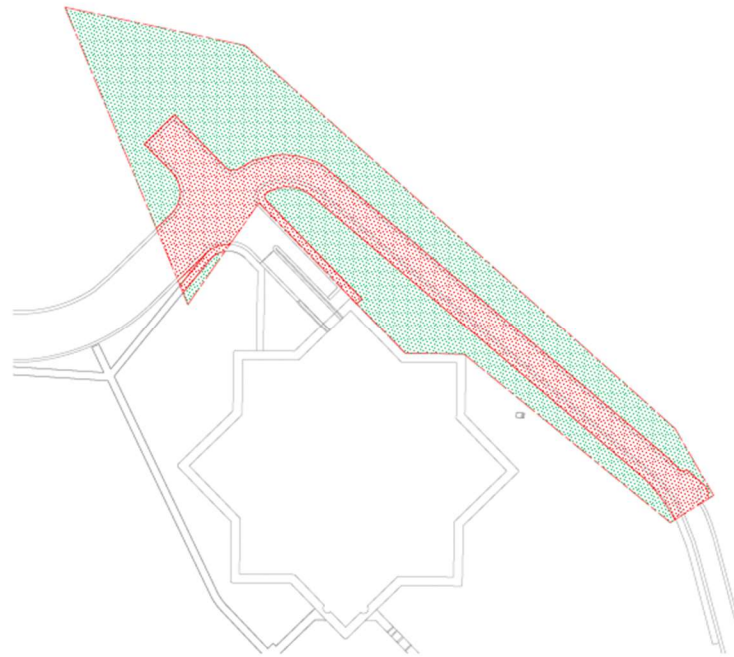
- PERVIOUS LAND
- IMPERVIOUS LAND

SCALE

1/16" = 5'

20' 40' 60' 80' 100' 120'

\*SCALE ONLY ACCURATE ON 11" x 17" PAPER



OUTFALL #3	
PERVIOUS AREA:	0.81 ACRES (35483.79 ft <sup>2</sup> )
IMPERVIOUS AREA:	0.4 ACRES (17411.57 ft <sup>2</sup> )

USGS RESTON - PERVIOUS AND IMPERVIOUS LAND - OUTFALL #3

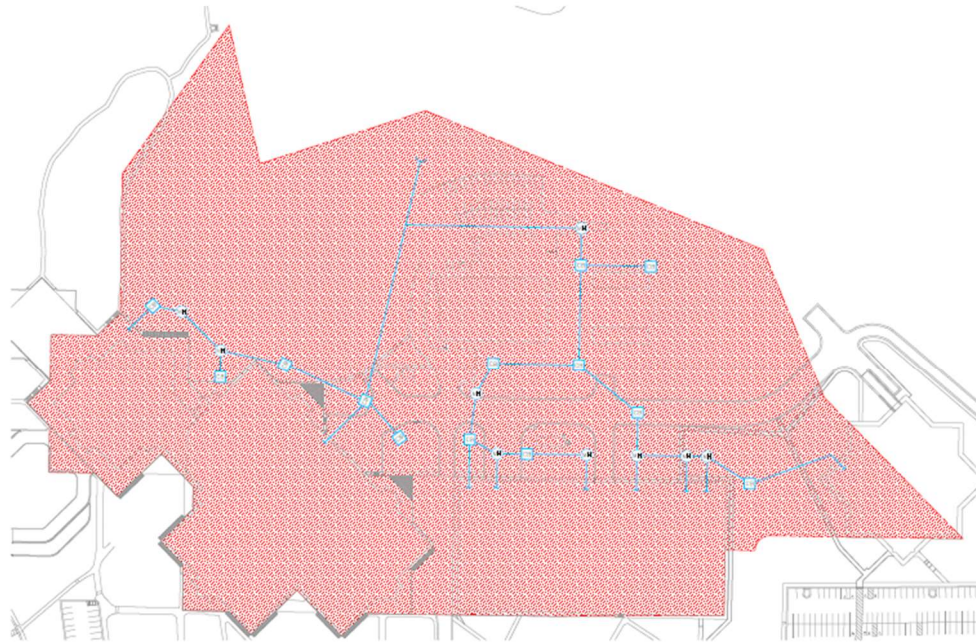


DATE:	06/01/2011
BY:	DAVID M. WILSON
FOR:	USGS RESTON
PROJECT:	RESTON/10/001

CONTROLLED UNCLASSIFIED INFORMATION

**Figure 14. Drainage Area for Outfall #3**

CONTROLLED UNCLASSIFIED INFORMATION



OUTFALL #4 (38°56'53.6"N, 77°21'58.5"W)	
WATER RECEIVING DISCHARGES FROM OUTFALL:	SUGARLAND RUN (IMPAIRED)
HYDROLOGIC UNIT CODE (HUC):	HUC8 = 02070008 VAHUS = PL21
APPROXIMATE ACREAGE SERVED:	2.5 ACRES (760762 ft <sup>2</sup> )
PREDOMINATE LAND USE:	INSTITUTIONAL
NAME OF APPROVED TMDL:	CHESAPEAKE BAY TMDL

USGS RESTON - STORM WATER DRAIN PLAN - OUTFALL #4

#### LEGEND

- STORM WATER PIPE
- MAN HOLE
- CATCH BASIN
- OUTFALL

#### SCALE

1/16" = 10'

0' 50' 100' 150' 200' 250'

SCALE ONLY ACCURATE ON 11" x 17" PAPER



OUTFALL #4 - VIEW UPSTREAM



OUTFALL #4 - VIEW DOWNSTREAM

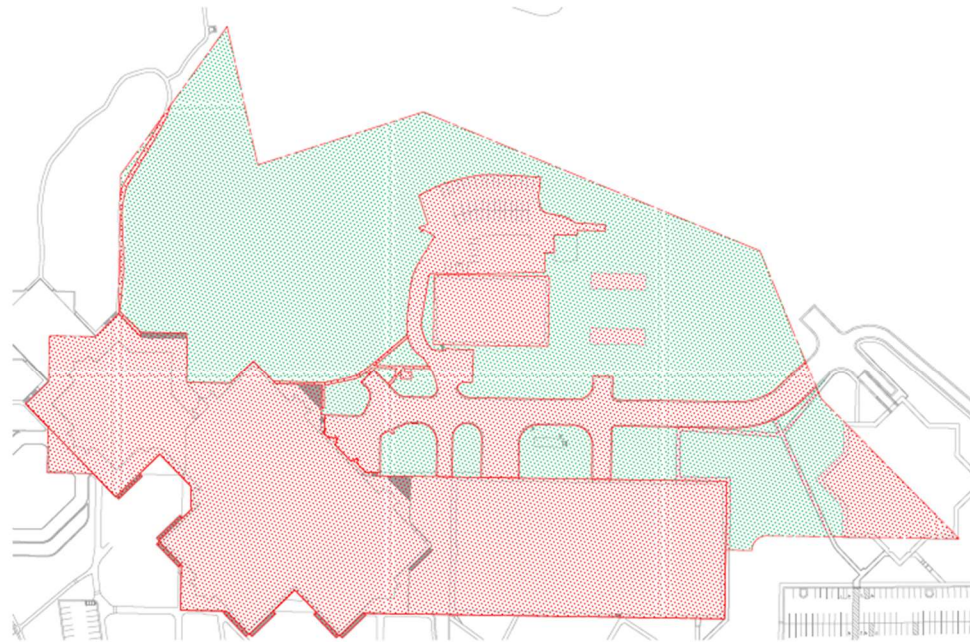


DATE	11/11/14
BY	JOHN P. BROWN
CHECKED	JOHN P. BROWN
APPROVED	JOHN P. BROWN

CONTROLLED UNCLASSIFIED INFORMATION

**Figure 15. Outfall #4 Details**

CONTROLLED UNCLASSIFIED INFORMATION



LEGEND

- PERVIOUS LAND
- IMPERVIOUS LAND

SCALE

1/16" = 10'

0' 10' 20' 30' 40' 50' 60' 70' 80' 90' 100' 110' 120' 130' 140' 150' 160' 170' 180' 190' 200' 210' 220' 230' 240' 250'

SCALE ONLY ACCURATE ON 11" x 17" PAPER

OUTFALL #4	
PERVIOUS AREA:	8.62 ACRES (375603.43 FT <sup>2</sup> )
IMPERVIOUS AREA:	9.37 ACRES (407991.16 FT <sup>2</sup> )

USGS RESTON - PERVIOUS AND IMPERVIOUS LAND - OUTFALL #4



DATE	11/11/11
BY	11/11/11
FOR	11/11/11
PROJECT	11/11/11
REVISION	11/11/11
DESCRIPTION	11/11/11
DATE	11/11/11
BY	11/11/11
FOR	11/11/11
PROJECT	11/11/11
REVISION	11/11/11
DESCRIPTION	11/11/11

CONTROLLED UNCLASSIFIED INFORMATION

**Figure 16. Drainage Area for Outfall #4**



CONTROLLED UNCLASSIFIED INFORMATION

# LEGEND

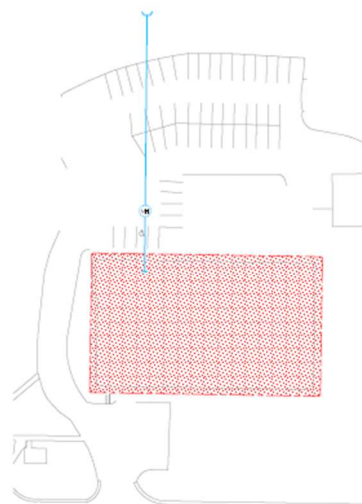
- STORM WATER PIPE
- MAN HOLE
- CATCH BASIN
- OUTFALL

# SCALE

1/16" = 5'



\*\*SCALE ONLY ACCURATE ON 11" x 17" PAPER



OUTFALL #5 (38°56'53.6"N, 77°21'58.2"W)	
WATER RECEIVING DISCHARGES FROM OUTFALL:	SUGARLAND RUN (IMPAIRED)
HYDROLOGIC UNIT CODE (HUC):	HUC8 = 02070008 VAHJ6 = PL21
APPROXIMATE ACREAGE SERVED:	0.45 ACRES (19729 ft²)
PREDOMINATE LAND USE:	INSTITUTIONAL
NAME OF APPROVED TMDL:	CHESAPEAKE BAY TMDL

USGS RESTON - STORM WATER DRAIN PLAN - OUTFALL #5



OUTFALL #5 - VIEW UPSTREAM



OUTFALL #5 - VIEW DOWNSTREAM



DATE	01/11/2011
BY	DAVID L. BROWN
CHECKED BY	DAVID L. BROWN
APPROVED BY	DAVID L. BROWN

CONTROLLED UNCLASSIFIED INFORMATION

**Figure 17. Outfall #5 Details**

CONTROLLED UNCLASSIFIED INFORMATION

LEGEND

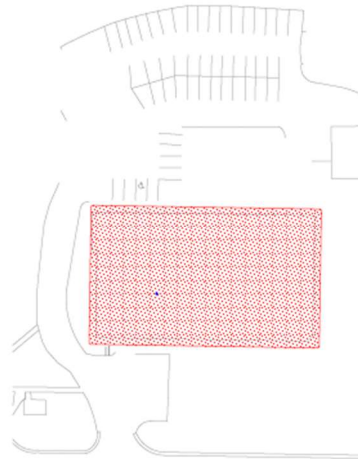
- PERVIOUS LAND
- IMPERVIOUS LAND

SCALE

1/16" = 5'

20' 40' 60' 80' 100' 120'

SCALE ONLY ACCURATE ON 11" x 17" PAPER



OUTFALL #5	
IMPERVIOUS AREA:	0.45 ACRES (19728.33 ft <sup>2</sup> )

USGS RESTON - PERVIOUS AND IMPERVIOUS LAND - OUTFALL #5



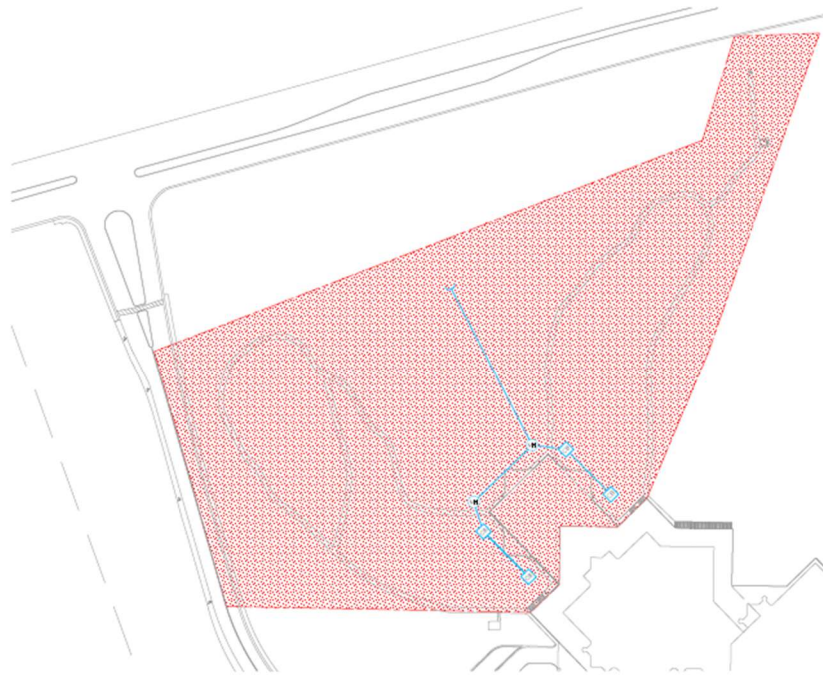
NO.	DATE	BY
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2	10/1/04	WJL
3	10/1/04	WJL
4	10/1/04	WJL
5	10/1/04	WJL
6	10/1/04	WJL
7	10/1/04	WJL
8	10/1/04	WJL
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10	10/1/04	WJL

ON PAPER ONLY  
10/1/04  
10/1/04

CONTROLLED UNCLASSIFIED INFORMATION

**Figure 18. Drainage Area for Outfall #5**

CONTROLLED UNCLASSIFIED INFORMATION



OUTFALL #6 (38°56'28.9"N, 77°22'03.5"W)	
WATER RECEIVING DISCHARGES FROM OUTFALL:	SUGARLAND RUN (IMPAIRED)
HYDROLOGIC UNIT CODE (HUC):	HUC8 = 02070008 VAHUS = PLZ1
APPROXIMATE ACREAGE SERVED:	6.79 ACRES (295816 m²)
PREDOMINATE LAND USE:	INSTITUTIONAL
NAME OF APPROVED TMDL:	CHESAPEAKE BAY TMDL

USGS RESTON - STORM WATER DRAIN PLAN - OUTFALL #6



OUTFALL #6 - VIEW UPSTREAM



OUTFALL #6 - VIEW DOWNSTREAM

#### LEGEND

- STORM WATER PIPE
- MAN HOLE
- CATCH BASIN
- OUTFALL

#### SCALE

1/16" = 8'



SCALE ONLY ACCURATE ON 11" x 17" PRINTS



DATE:	01/11/2011
BY:	JOHN P. WILSON
FOR:	USGS RESTON
PROJECT:	CHESAPEAKE BAY TMDL

CONTROLLED UNCLASSIFIED INFORMATION

Figure 19. Outfall #6 Details

### LEGEND

PERVIOUS LAND  
IMPERVIOUS LAND

SCALE

 $1/16'' - 8'$ 

\*\*\*SCALE ONLY ACCURATE ON 11" x 17" PRINT\*\*\*



OUTFALL #6	
PERVIOUS AREA:	6 ACRES (261071.15 ft <sup>2</sup> )
IMPERVIOUS AREA:	0.8 ACRES (34894.6391 ft <sup>2</sup> )



USGS RESTON - PERVIOUS AND IMPERVIOUS LAND - OUTFALL #6

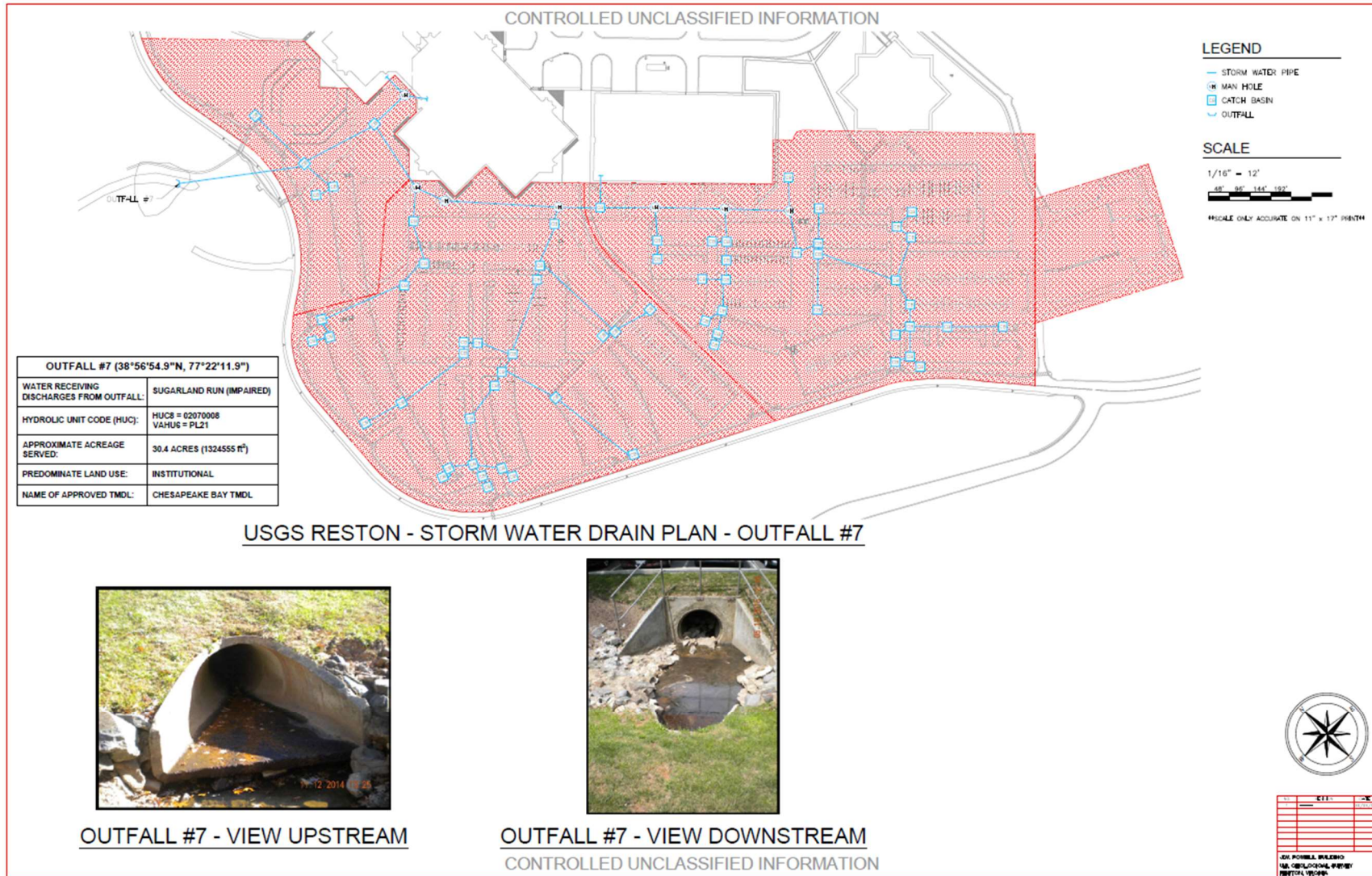
NO.	DATE	BY
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JEN. POSSIBLE BULESHO  
 10/10/2010 10/10/2010 10/10/2010  
 10/10/2010 10/10/2010 10/10/2010

CONTROLLED UNCLASSIFIED INFORMATION

**Figure 20. Drainage Area for Outfall #6**





**Figure 21. Outfall #7 Details**



### LEGEND

SCALE

1/16" - 12'

Age Group	Percentage
40+	40%
96+	96%
144+	144%
192+	192%

\*\*\*SCALE ONLY ACCURATE ON 11" x 17" PRINT\*\*\*



OUTFALL #7	
PERVIOUS AREA:	11.3 ACRES (494264.23 ft <sup>2</sup> )
IMPERVIOUS AREA:	17 ACRES (733891.03 ft <sup>2</sup> )

USGS RESTON - PERVIOUS AND IMPERVIOUS LAND - OUTFALL #7



NO.	NAME	
1	.....	24

JEN. POSSIBLE BULKING:  
 1kg. COLDLOCKING, 半打裝  
 1000000.000000.

CONTROLLED UNCLASSIFIED INFORMATION

**Figure 22. Drainage Area for Outfall #7**

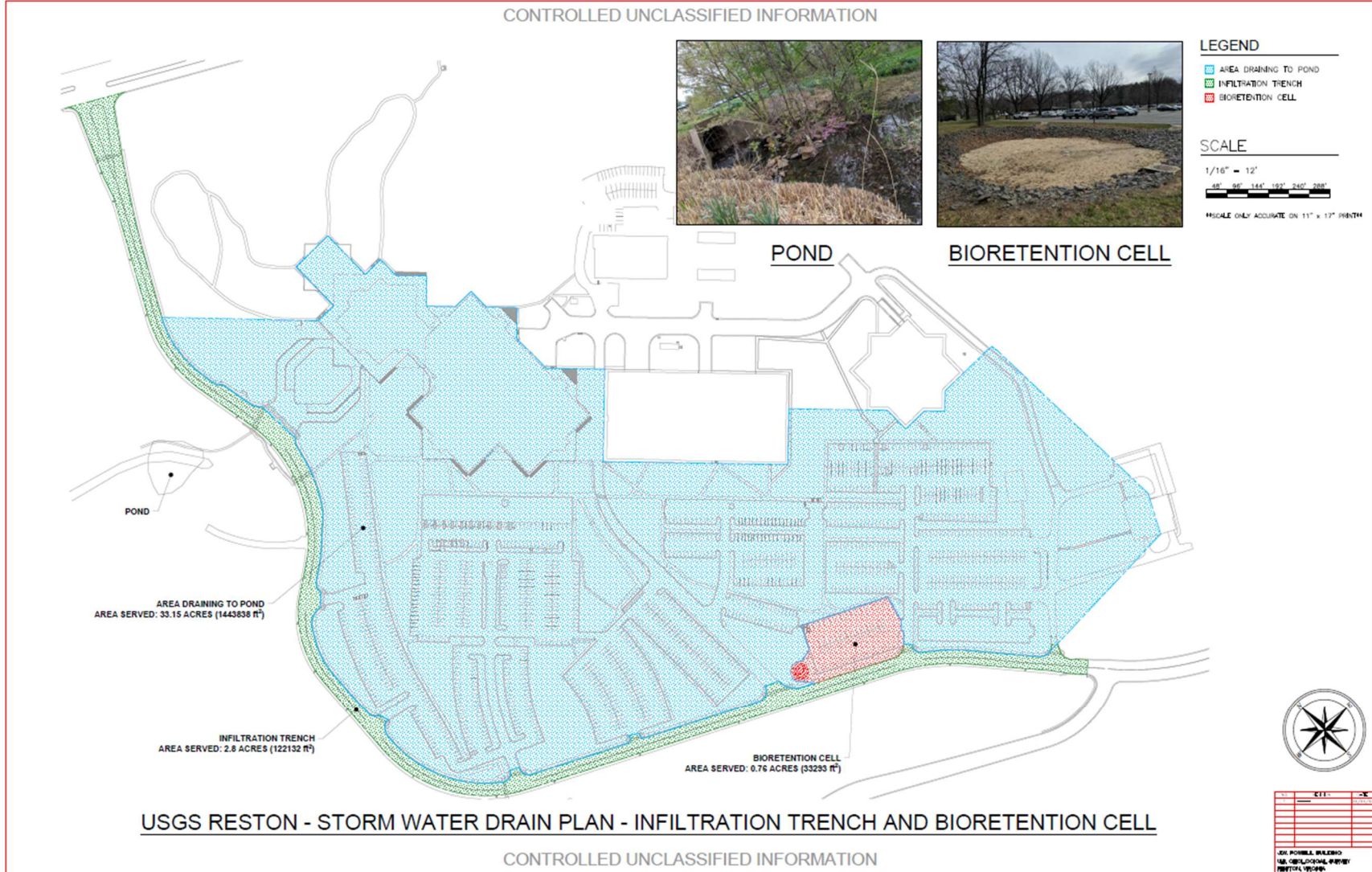
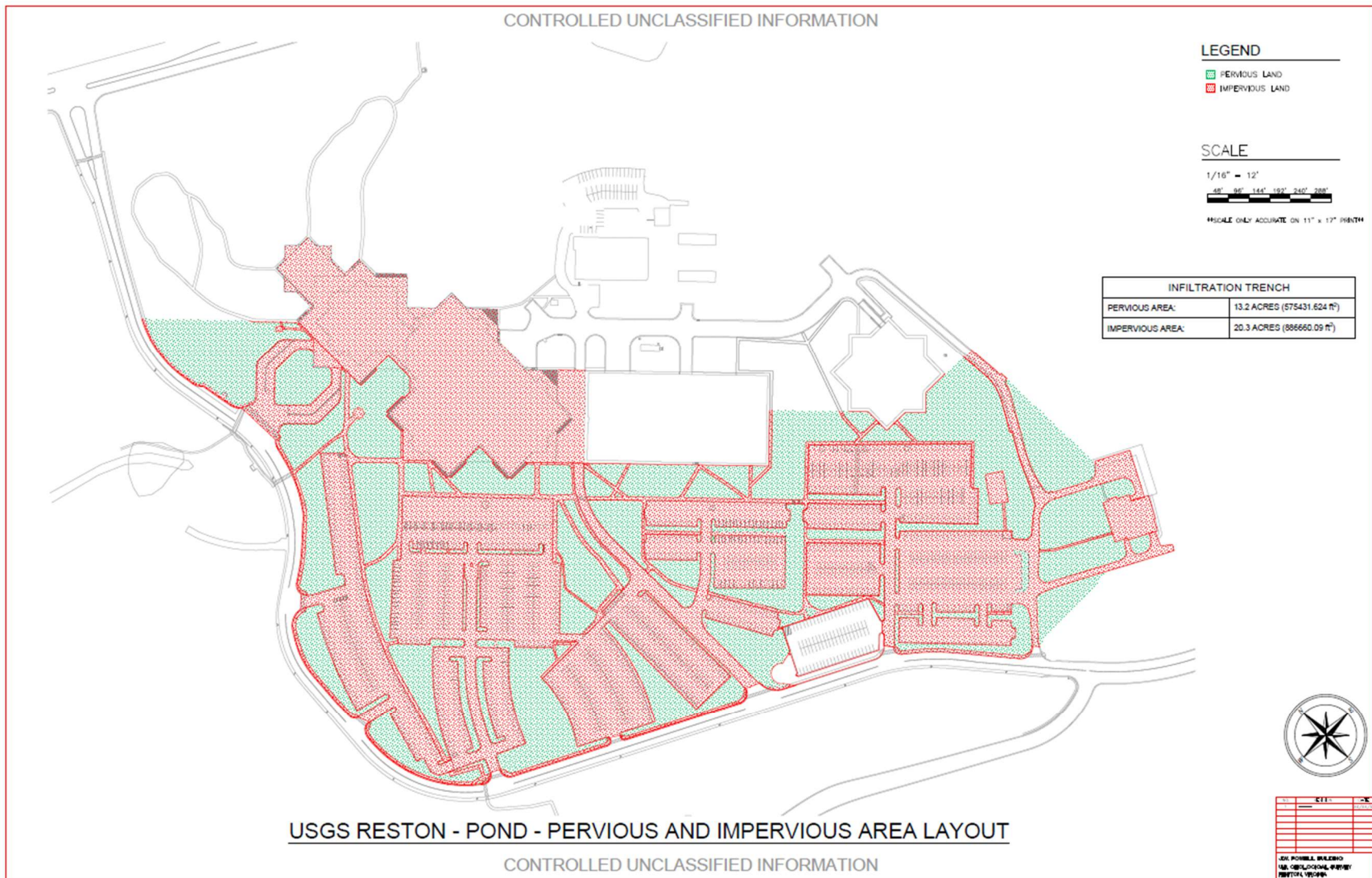


Figure 23. Stormwater BMPss









**Figure 26. Area Managed by Pond**

