FINAL

Chesapeake Bay Phase II
Total Maximum Daily Load Action Plan

JBLE-Eustis, Virginia

Permit Year 3: 1 July 2020 - 30 June 2021

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AFCEC	Air Force Civil Engineer Center
ATSC	Army Training Support Center
BMP	Best management practice
CED	Civil Engineering Division
DBH	Diameter at breast height
EOS	Edge of Stream
EPA	Environmental Protection Agency
GIS	Geographic information system
HSG	Hydrologic soil group
JBLE–Eustis	Joint Base Langley-Eustis – Eustis
JRRF	James River Reserve Fleet
L2	Level 2
lbs/ac/yr	Pounds per acre per year
lbs/yr	Pounds per year
lbs/ft/yr	Pounds per foot per year
MARAD	Maritime Administration
MCM	Minimum control measure
MS4	Municipal Separate Storm Sewer System
NCO	Non-commissioned Officer
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
POC	Pollutant of concern
TMDL	Total Maximum Daily Load
TRADOC	Training and Doctrine Command
TSE	Training Support Enterprise
VAC	Virginia Administrative Code
VDEQ	Virginia Department of Environmental Quality
VGIN	Virginia Geographic Information Network
VPDES	Virginia Pollutant Discharge Elimination System
VSMP	Virginia Stormwater Management Program
WIP	Watershed Implementation Plan

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Chesapeake Bay TMDL Action Plan Requirements Cross-Reference Table		
Guidance Memo 20-2003 Chesapeake Bay TMDL Special Condition Guidance (06 February 2021)		**JBLE–Eustis TMDL Action Plan Section**
1	Current program and existing legal authority	2.0
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1.0 INTRODUCTION

1.1 Purpose and Objective

In 2010 the United States Environmental Protection Agency (EPA) established the Chesapeake Bay Total Maximum Daily Load (TMDL) to address excess nitrogen, phosphorus, and total suspended solids (pollutants of concern or POCs) in the bay (EPA, 2010). A TMDL is the maximum amount of a pollutant that a waterbody can assimilate and still support its designated use. The Chesapeake Bay watershed encompasses over 64,000 square miles across the District of Columbia and large sections of Delaware, Maryland, New York, Pennsylvania, West Virginia, and Virginia.

In the Phase I and Phase II Chesapeake Bay Watershed Implementation Plan (WIP) for the Chesapeake Bay TMDL, the Commonwealth of Virginia committed to a phased approach to reducing nutrients and suspended solids discharging from Municipal Separate Storm Sewer Systems (MS4). Section I.C of the Joint Base Langley-Eustis – Eustis (JBLE–Eustis) MS4 permit (Permit No. VAR040035, effective 01 July 2013) requires the base to prepare a Chesapeake Bay TMDL Action Plan that demonstrates future plans to meet the required nutrient and suspended solids reductions. The plan must be submitted to the Virginia Department of Environmental Quality (VDEQ) for review and approval.

The Action Plan is an annual report on the progress made by the base in meeting the Chesapeake Bay TMDL pollutant reduction requirements, specifically the Level 2 (L2) scoping run as specified in the 2010 Phase I WIP (VDEQ, 2010). The L2 reductions are to be met in phases corresponding to the permit cycles, as outlined in Table 1-1.

Table 1-1. Pollutant Percent Reduction Requirements by Permit Cycle

Permit Cycle	Timeframe	Cycle Percent Reduction	Cumulative Percent Reduction
1	2013-2018	5%	5%
2	2018-2023	35%	40%
3	2023-2028	60%	100%

The Action Plan presents the JBLE–Eustis estimated load contribution, required load reductions, and pollutant reduction credits. The plan also reports progress made toward meeting the 35% pollutant reduction requirement (cumulative 40% pollutant reduction) for the second permit cycle. The methodology used to calculate the pollutant loads and credits is based on VDEQ Guidance Memo No. 20-2003 (Guidance Document) (VDEQ, 2021).

1.2 Installation Description

JBLE–Eustis, formerly Fort Eustis, is located adjacent to the City of Newport News, Virginia which is part of the Norfolk, Hampton, and Newport News metropolitan area. The base is located on Mulberry Island, a small peninsula bordered by the James River to the west, Warwick River to the east, and Skiffes Creek

toward the north. Smaller waterbodies on or bordering the base include Jail Creek, Morrisons Creek, Island Creek, Bailey Creek, and Eustis Lake. The base occupies approximately 8,000 acres and houses a variety of military organizations and support activities on the installation. Most of the development is located at the northern end of the base, while the southern portion of the peninsula remains largely undeveloped. A golf course and an airfield are located near the center of the base. A site location map is presented as Figure 1-1.

The base is the home of the Headquarters United States Army Training and Doctrine Command (TRADOC), the Army Training Support Center (ATSC), and the 7th Transportation Brigade (Expeditionary). TRADOC is responsible for developing, educating, and training soldiers and civilians; supporting unit training; and designing, building, and integrating capabilities, formations, and equipment. The ATSC is responsible for managing the Army Training Support Enterprise (TSE), which provides oversight for programs that enable development, delivery, and sustainment of training and education support capabilities. The 7th Transportation Brigade (Expeditionary) provides logistics support around the world for port, terminal, and watercraft units conducting expeditionary operations in support of land operations. Other units on the base include the Army Aviation Logistics School, Non-commissioned Officer's (NCO) Academy, Aviation Applied Technology Directorate, and the James River Reserve Fleet (JRRF). The JRRF, a tenant managed by the Maritime Administration (MARAD), leases land on base and maintains a number of vessels moored in the James River. The total population of the base is approximately 14,550, comprised of approximately 6,800 military personnel and 2,800 dependents living on base, as well as approximately 4,950 civilian non-residents who commute to the base daily.

1.3 Plan Organization

This TMDL Action Plan is organized into the following sections:

- Section 1.0 presents an overview of the plan purpose and objective, installation description, and plan organization.
- Section 2.0 describes the JBLE–Eustis industrial and MS4 stormwater programs.
- Section 3.0 discusses the JBLE–Eustis MS4 service area.
- Section 4.0 provides the load reduction calculations.
- Section 5.0 discusses the pollutant credit calculations.
- Section 6.0 provides a summary of load reductions and credits for the second permit cycle.
- Section 7.0 discusses the public notice and comments process.
- Section 8.0 contains a list of references used during preparation of this plan.

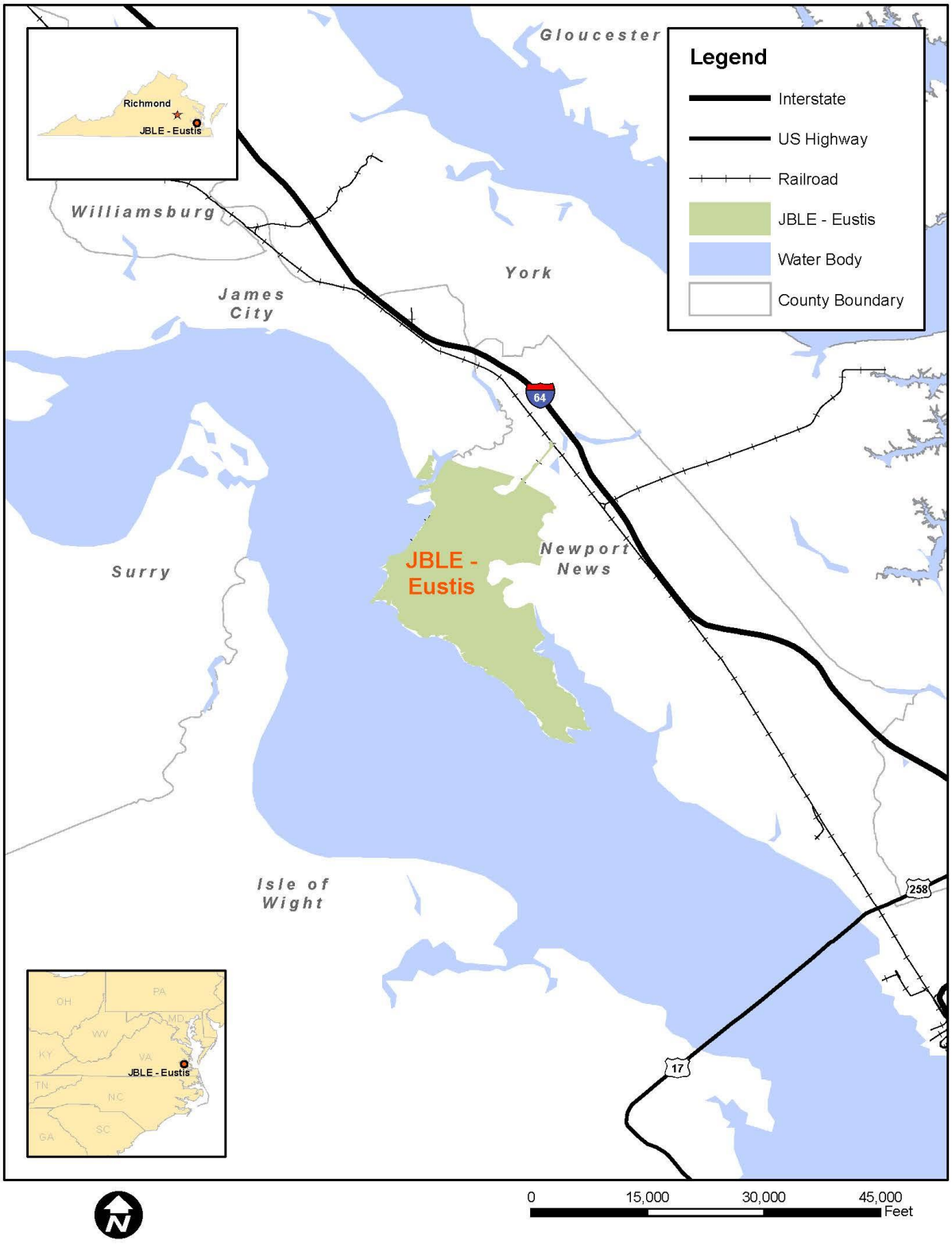

Figure 1-1. Site Location Map, JBLE–Eustis

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2.0 STORMWATER PROGRAM OVERVIEW

JBLE–Eustis is authorized to discharge stormwater from the installation in accordance with two permits issued by the VDEQ as discussed in the subsections below.

2.1 Industrial Stormwater Program Overview

In November 1990, federal stormwater discharge requirements (known as the Phase I National Pollutant Discharge Elimination System [NPDES] Program) were promulgated as part of the NPDES under the Clean Water Act (55 Federal Register 48062-48901). These regulations, as stated in Title 40 of the Code of Federal Regulations (CFR) Parts 122, 123, and 124, require the owners of "facilities that discharge storm water associated with industrial activity" to apply for a stormwater permit if storm water is discharged to (1) waters of the United States or (2) MS4s.

NPDES permits are issued either by a United States (U.S.) EPA Regional office or by states that have been granted NPDES permitting authority. JBLE–Eustis is located in the Commonwealth of Virginia, which has NPDES permitting authority. VDEQ administers the commonwealth's NPDES program and issues Virginia Pollutant Discharge Elimination System (VPDES) permits. The VDEQ requirements for stormwater permitting are located in the Virginia Administrative Code (VAC), 9VAC25, and are not substantially different from the federal guidelines contained in 40 CFR 122.

A facility is subject to the regulations only if its activities fit the definition of "industrial" as specified by the 11 categories in 40 CFR 122.26(b)(14)(i)-(xi). The industrial stormwater VPDES permit issued to JBLE–Eustis, Permit No. VA0025216 incorporates the definition of industrial activity from 40 CFR 122.26. The primary industrial activities of JBLE–Eustis fall within three sectors: water transportation, land transportation, and air transportation. VPDES Permit No. VA0025216, includes specific stormwater management requirements for each of these three sectors.

2.2 MS4 Program Overview

Discharges from MS4s are regulated under the Virginia Stormwater Management Act, the Virginia Stormwater Management Program (VSMP) Permit regulations, and the Clean Water Act as point source discharges. MS4 regulations were developed and implemented in two phases. Implementation of the first phase began in the early 1990s and required that operators of MS4s serving populations of greater than 100,000 people (per the 1990 decennial census) apply for and obtain a permit to discharge stormwater from their outfalls. The second phase of MS4 regulations became effective 23 March 2003 and required that operators of small MS4s in "urbanized areas" (as defined by the latest census) obtain a permit to discharge stormwater from their outfalls.

VDEQ issued MS4 Permit No. VAR040035 to JBLE–Eustis which became effective on 01 July 2013. The reissuance of the permit for the second permitting cycle became effective on 01 November 2018 (VDEQ, 2018). The permit requires JBLE–Eustis to develop, implement, and enforce an MS4 Program designed to reduce the discharge of pollutants from the MS4 to the maximum extent practicable, to protect water quality.

The permit requires the base to implement six minimum control measures (MCM) or best management practices (BMP) as follows:

- MCM 1: Public education and outreach on stormwater impacts
- MCM 2: Public involvement / participation
- MCM 3: Illicit discharge detection and elimination
- MCM 4: Construction site stormwater runoff control
- MCM 5: Post-construction stormwater management in new development and development on prior developed lands
- MCM 6: Pollution prevention / good housekeeping for municipal operations

In addition to implementing these MCMs, Part II, *TMDL Special Conditions*, of the MS4 permit VAR040035 requires JBLE–Eustis to prepare a Chesapeake Bay TMDL Action Plan that demonstrates future plans to meet the required nutrient and suspended solids reductions.

Each year the base submits to VDEQ an MS4 Annual Report documenting progress toward implementing the MCMs and special conditions identified in the installation MS4 Program Plan.

3.0 MS4 SERVICE AREA

A determination of the base pollutant load requires an estimate of the area served by the permittee's MS4 as of 30 June 2009. This was accomplished by creating a geographic information system (GIS) land cover shapefile based on 2009 aerial imagery obtained from the Virginia GIS Clearinghouse (Virginia Geographic Information Network [VGIN], 2009). The following land cover types were manually delineated across the entire base: impervious, pervious, forest, agriculture (a six-acre horse pasture), natural areas (mostly tidal wetlands and marshes), and open water. Impervious area included buildings, roads, parking lots, sidewalks, railroads, and airport runways. Pervious area included turf and landscaped areas. Forested lands included trees with a minimum diameter at breast height (DBH), which varies according to tree population density, and a minimum contiguous area of 30 meters x 30 meters, as specified in the Guidance Document.

The MS4 service area was conservatively classified as impervious (regulated urban impervious) or pervious (regulated urban pervious). The base is fully covered by the 2010 US Census urban area, so no adjustment to the MS4 service area due to non-overlapping U.S. Census urban area was required. A desktop review of the base topography revealed no receiving/exporting sheet-flow runoff from/to an adjacent permittee, so no adjustment to the MS4 service area was necessary.

The Guidance Document allows for land covered under another VPDES permit to be excluded from the MS4 service area. Portions of the base were covered under industrial permit VA0025216 as of 30 June 2009. The industrial drainage areas covered under permit VA0025216 were delineated to account for this area. The industrial drainage area shapefile was then combined with the 2009 land cover shapefile using the ArcGIS Intersect tool to produce the final 2009 land cover shapefile. The industrial areas were not included in the MS4 service area.

The land cover delineation process outlined above was repeated using 2020 aerial imagery provided by the base. The 2020 imagery was chosen to develop the 2021 land cover layer because it is the most recent data available. The 2021 land cover layer was then combined with the industrial layer to identify "unregulated areas." The final 2021 land cover layer was used to calculate loads due to New Sources (see Section 4.2) and BMP credits (see Section 5.0). A summary of the base's land cover is presented in Table 3-1.

Table 3-1. Land Cover Summary for the 2009 and 2021 Timeframes

Land Use	Acres (2009)	Acres (2021)
Regulated Urban Impervious	559.2	590.5
Regulated Urban Pervious	1,201.9	1,296.4
Regulated Forest	2,487.2	2,285.7
Regulated Pasture	6.0	6.0
Regulated Natural Area	2,869.3	2,845.0
Regulated Water	431.5	522.2
Unregulated Impervious	227.8	244.2
Unregulated Pervious	119.4	127.7
Unregulated Forest	36.2	18.7
Unregulated Pasture	12.6	12.6
Unregulated Natural Area	1.2	3.0
Unregulated Water	1.2	1.4
Total	**7,953.6**	**7,953.6**

Note:
Minor calculation discrepancies are accounted for in rounding

Maps of the industrial permitted areas, 2009 land cover, MS4 service area, and 2021 land cover are presented as Figures 3-1 through 3-4, respectively.

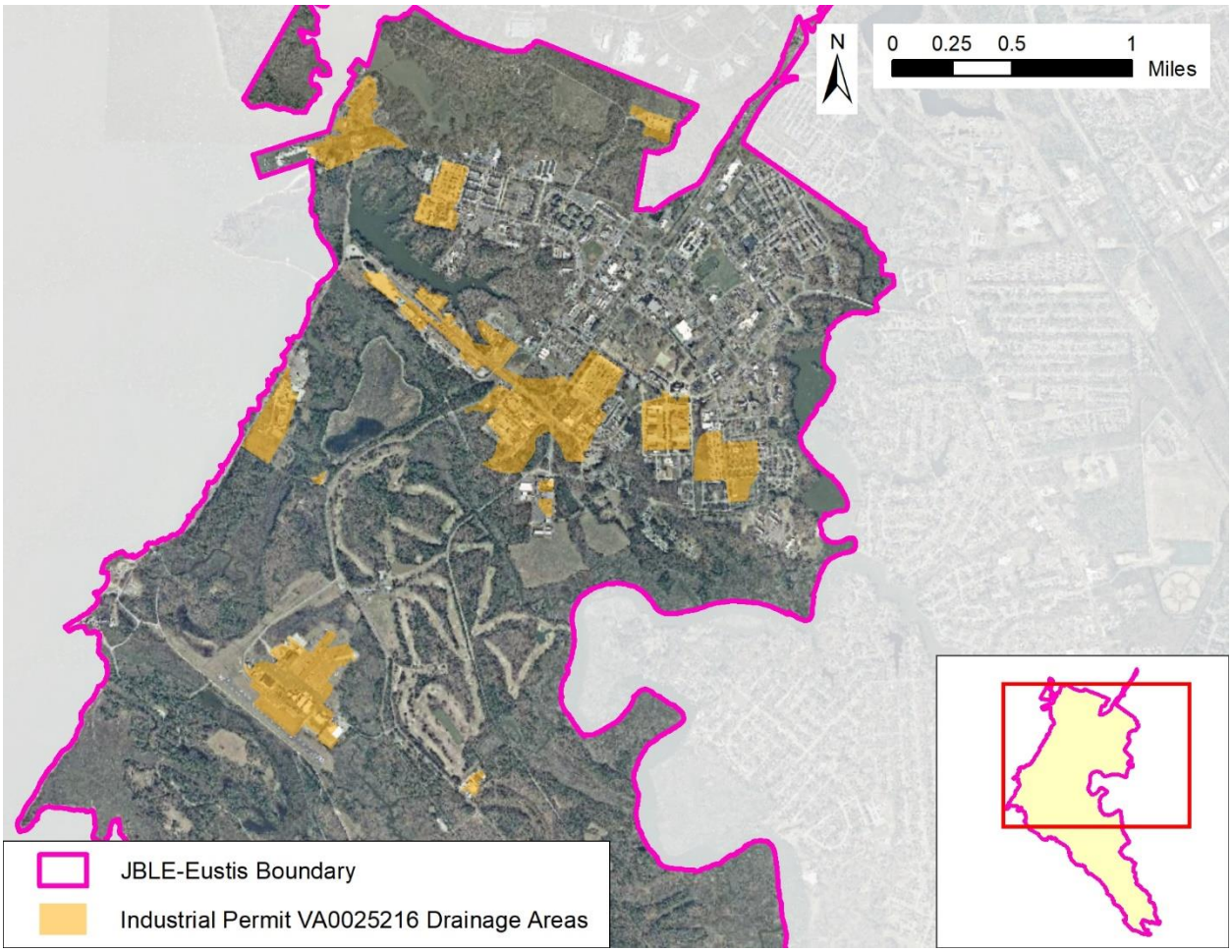

Figure 3-1. JBLE–Eustis Industrial Permit VA0025216 Drainage Areas

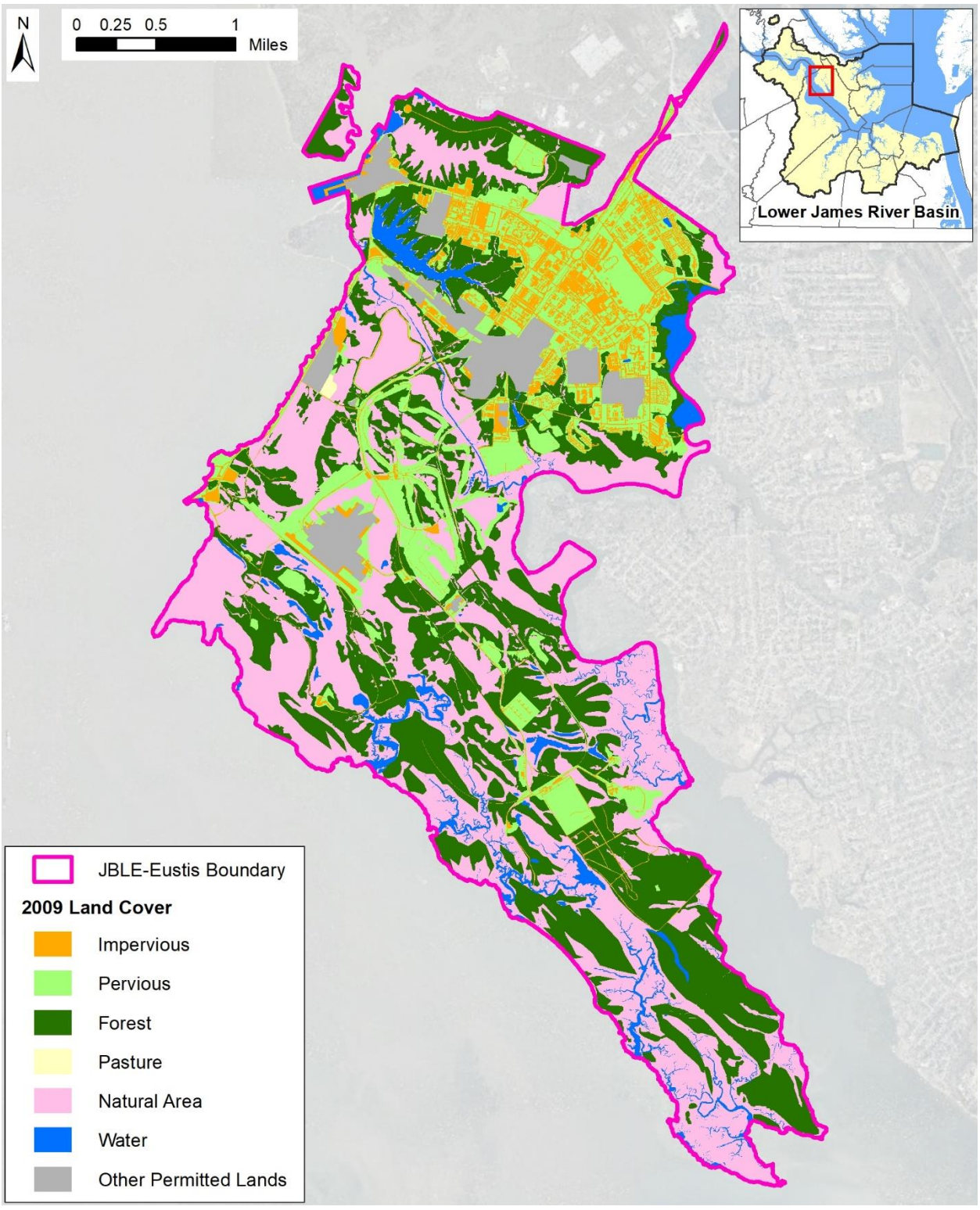

Figure 3-2. JBLE–Eustis Land Cover Present during 2009

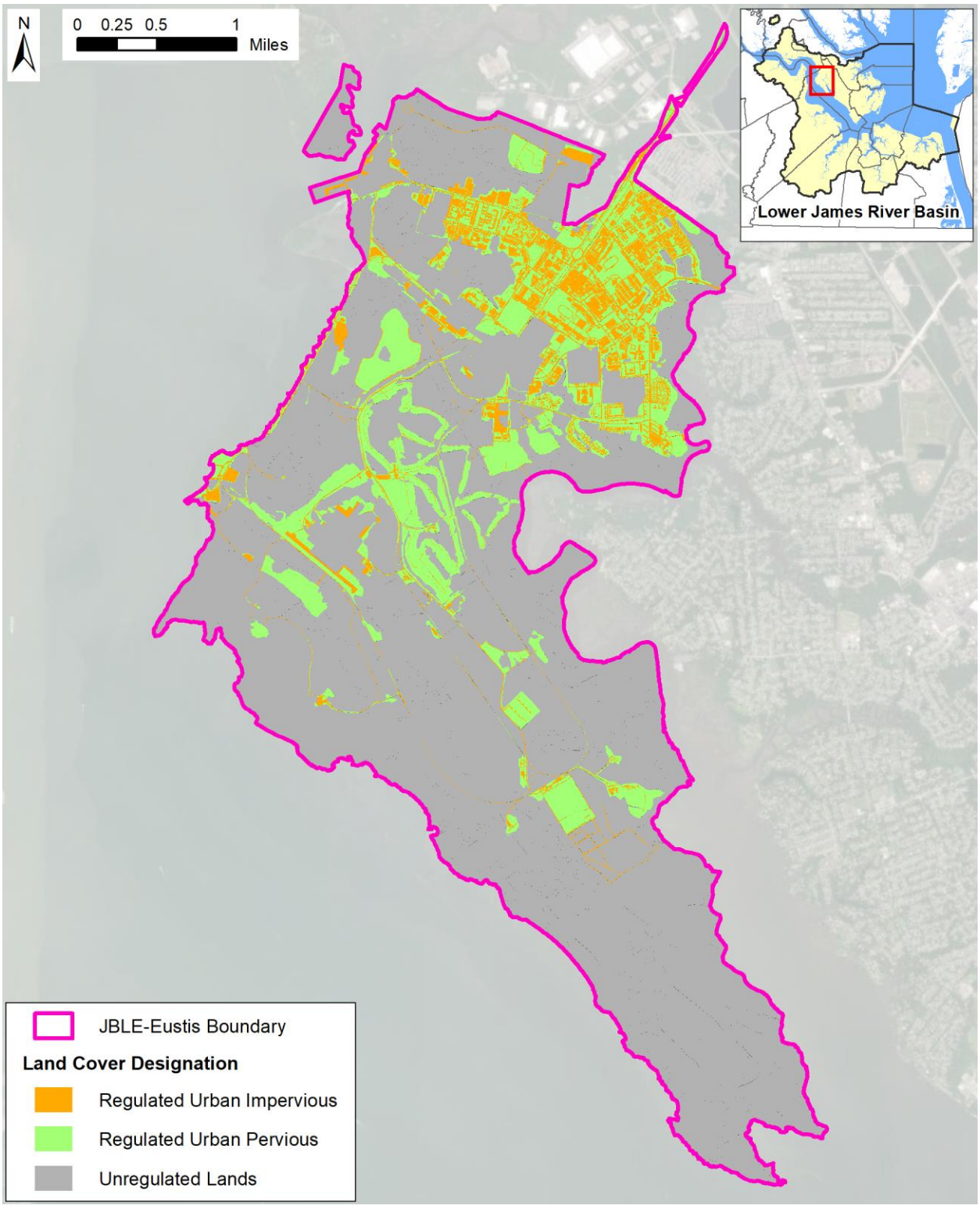

Figure 3-3. JBLE–Eustis MS4 Service Area

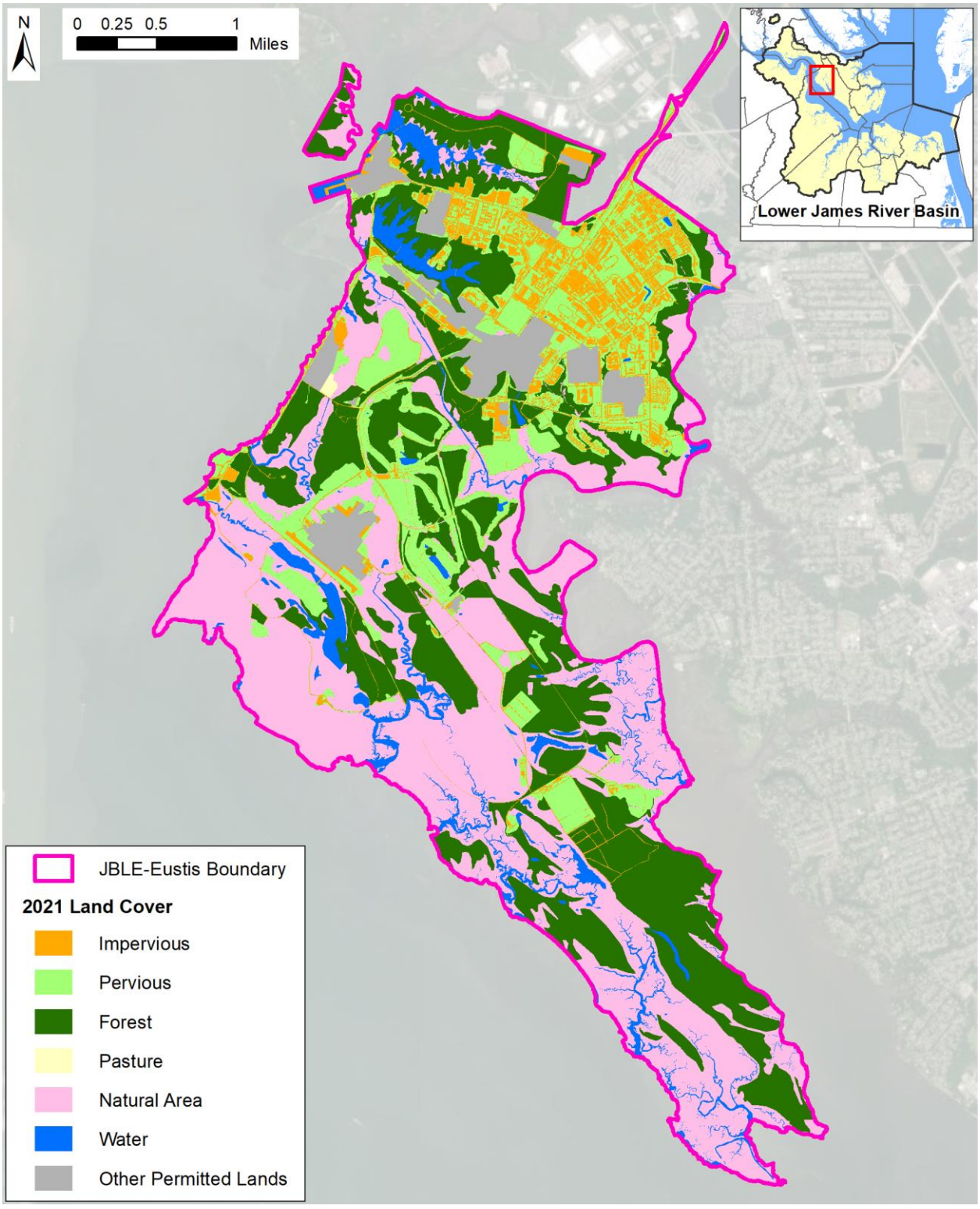

Figure 3-4. JBLE–Eustis 2020 Land Cover

4.0 LOAD REDUCTION CALCULATIONS

Pollutant load reductions for existing sources (contributed by the base as of 30 June 2009), new sources (contributed by the base between 01 July 2009 and 30 June 2021), and grandfathered projects are discussed in the subsections below.

4.1 Existing Source Loads

The Existing Source loads for the base (i.e., the pollutant loads contributed by the base as of 30 June 2009) and the required reductions for the second permit cycle (cumulative 40% of the L2 scoping reduction) were calculated using the Table 3a (James River Basin) template of the Guidance Document (VDEQ, 2021), as presented in Table 4-1.

Table 4-1. Existing Source Loads and Reduction Requirements [Table 3a]

Pollutant	Subsource	A Loading Rate (lbs/ac/yr)[1]	B Existing developed lands as of 6/30/09 served by the MS4 within the 2010 CUA (acres)[2]	C Loads (lbs/yr)[2]	D Percentage of MS4 required Chesapeake Bay total L2 loading	E Percentage of L2 required reduction by 6/30/2023	F 40% cumulative reduction required by 6/30/2023 (lbs/yr)[3]	G Sum of 40% cumulative reduction (lbs/yr)[4]
Nitrogen	Regulated urban impervious	9.39	559.2	5,251	9%	40%	189	391
	Regulated urban pervious	6.99	1,201.9	8,401	6%	40%	202	
Phosphorus	Regulated urban impervious	1.76	559.2	984	16%	40%	63	80
	Regulated urban pervious	0.5	1,201.9	601	7.25%	40%	17	
Total Suspended Solids	Regulated urban impervious	676.94	559.2	378,572	20%	40%	30,286	34,538
	Regulated urban pervious	101.08	1,201.9	121,486	8.75%	40%	4,252	

Notes and Acronyms:

[1] Edge of stream loading rate based on the Chesapeake Bay Watershed Model Progress Run 5.3.2.

[2] Column C = Column A x Column B.

[3] Column F = Column C x Column D x Column E.

[4] Column G = The sum of the subsource cumulative reduction required by 6/30/23 (lbs/yr) as calculated in Column F.

Minor calculation discrepancies are accounted for in rounding.

CUA – Census urbanized area

lbs/ac/yr – Pounds per acre per year

lbs/yr – Pounds per year

4.2 New Source Loads

In addition to the Existing Source loads, the base is required to offset any additional New Source loads from development that was initiated between 01 July 2009 and 30 June 2021. The New Source loads for the base were calculated using the aggregate accounting method presented in Appendix II of the Guidance Document (VDEQ, 2021). As the first step, the 2021 pollutant loads were calculated using Table II.3 in the Guidance Document, as presented in Table 4-2.

Table 4-2. New Sources Loads [Table II.3]

Land Cover (Subsource)	Pollutant	Total Existing Acres Served by MS4 (30 June 2021)	2009 EOS Loading Rate (lbs/ac/yr)	Estimated Total POC Load as of 30 June 2021 (lbs/yr)	
Regulated Urban Impervious	Nitrogen	590.5	9.4	5,544.9	14,606.9
Regulated Urban Pervious		1,296.4	7.0	9,062.0	
Regulated Urban Impervious	Phosphorus	590.5	1.8	1,039.3	1,687.5
Regulated Urban Pervious		1,296.4	0.5	648.2	
Regulated Urban Impervious	Total Suspended Solids	590.5	676.9	399,744.0	530,786.3
Regulated Urban Pervious		1,296.4	101.1	131,042.3	

Note and Acronyms:
Minor calculation discrepancies are accounted for in rounding.
EOS – Edge of Stream
lbs/ac/yr – Pounds per acre per year
lbs/yr – Pounds per year

The difference or Total Load Change between 2009 (Table 4-1) and 2021 (Table 4-3) was calculated using Table II.4 in the Guidance Document (VDEQ, 2021), as presented in Table 4-3.

Table 4-3. Load Changes from New Sources Using the Aggregate Accounting Method [Table II.4]

Land Cover (Subsource)	Pollutant	Estimated Total POC Load as of 30 June 2021 (lbs/yr)	Estimated Total POC Load as of 30 June 2009 (lbs/yr)	Total Load Change (lbs/yr)	
Regulated Urban Impervious	Nitrogen	5,544.9	5,251.3	293.6	954.4
Regulated Urban Pervious		9,062.0	8,401.2	660.8	
Regulated Urban Impervious	Phosphorus	1,039.3	984.3	55.0	102.3
Regulated Urban Pervious		648.2	600.9	47.3	
Regulated Urban Impervious	Total Suspended Solids	399,744.0	378,571.0	21,173.0	30,728.8
Regulated Urban Pervious		131,042.3	121,486.5	9,555.8	

Note and Acronym:
Minor calculation discrepancies are accounted for in rounding.
lbs/yr – Pounds per year

Using Table II.5 in the Guidance Document, the Total Load Change from Table 4-3 is adjusted by any credits earned from BMPs implemented during the 2009–2020 timeframe to arrive at the Net Load Change. BMPs installed after 01 July 2009 were included in this analysis when they were implemented under conditions of redevelopment, as described in Appendix V.E of the Guidance Document. Section 5.1 provides additional information about credits from existing BMPs earned during the 2009–2020 timeframe. The base is required to offset 40% of the Net Load Change by the end of the second permit cycle, as shown in Table 4-4.

Table 4-4. Net Load Changes from New Sources [Table II.5]

Pollutant	Total Load Change (lbs/yr)	Reductions from BMPs Installed between 01 July 2009 and 30 June 2020 (lbs/yr)	Net Load Change (lbs/yr)	Required Reduction by End of Second Permit Cycle	Additional Reductions Required between 01 July 2020 and 30 June 2023 (lbs/yr)	Additional Reductions Required between 01 July 2023 and 30 June 2028 (lbs/yr)
Nitrogen	954.4	474.4	480.0	40%	192.0	288.0
Phosphorus	102.3	83.0	19.3	40%	7.7	11.6
Total Suspended Solids	30,728.8	39,576.0	-8,847.2	40%	0.0	0.0

Note and Acronym:
Minor calculation discrepancies are accounted for in rounding.
lbs/yr – Pounds per year

4.3 Grandfathered Project Loads

Grandfathered projects are those in accordance with 9VAC25-870-48 (previously numbered 4VAC50-60-48) approved site plan prior to 01 July 2012, a state permit issued after 01 July 2014, land disturbance activities commencing after 01 July 2014 that disturb one acre or greater, and where the project utilizes an average land cover condition greater than 16% impervious cover in the design of post-development stormwater management facilities and results in an increased pollutant load (VAC, 2014). The base is required to offset any additional pollutant loads due to grandfathered projects. No grandfathered projects were identified.

4.4 Summary of Load Reduction Requirements

A summary of the JBLE–Eustis required load reductions is presented in Table 4-5. The values presented in this table represent the 40% reduction requirement to be achieved by 30 June 2023.

Table 4-5. Summary of the Second Permit Cycle Required Load Reductions

Pollutant	Second Permit Cycle Required Reductions (lbs/yr)			
	Existing Sources	New Sources[1]	Grandfathered Projects	Total
Nitrogen	390.6	192.0	0.0	582.6
Phosphorus	80.4	7.7	0.0	88.1
Total Suspended Solids	34,537.7	-3,538.9	0.0	30,998.8

Notes and Acronym:
[1] Credits from BMPs installed during the New Sources timeframe have already been accounted for in this column. Minor calculation discrepancies are accounted for in rounding.
lbs/yr – Pounds per year

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5.0 CREDIT CALCULATIONS (MEANS AND METHODS)

The Guidance Document outlines multiple options available to permittees to meet the Chesapeake Bay TMDL pollutant reduction requirements. These options include post-construction BMPs, enhancement of existing BMPs, land use change BMPs, street sweeping programs, storm-drain cleaning, land use change, stream restoration and riparian buffers, and nutrient management plans. Subsequent guidance on credits associated with shoreline restoration are presented in a document titled *Recommendation of the Expert Panel to Define Removal Rates for Shoreline Management Projects* (Forand et al., 2017) and street sweeping and storm drain cleaning are presented in a document titled *Recommendations of the Expert Panel to Define Removal Rates for Street and Storm Drain Cleaning Practices* (Donner et al., 2016). The base's current pollutant credit portfolio includes post-construction BMPs, street sweeping, storm drain cleaning, urban tree canopy expansion, and shoreline management to help meet the 40% pollutant reduction requirement for the second permit cycle as noted in the subsections below. The load reduction credits were calculated using the methods presented in the most recent Guidance Document (VDEQ, 2021) and expert panel guidance (Forand et al., 2017; Donner et al., 2016; and Cappiella et al., 2016). The differences in load reduction credit calculations for Exiting and Land Use Change BMPs between the 2021 and 2020 Action Plan are due to updates in the most recent guidance document.

5.1 Existing BMPs (Post-2006)

A GIS inventory of existing post-construction BMPs present at JBLE–Eustis and their drainage areas, which was developed by AECOM Technical Services, Inc. in 2021, was used to help calculate existing credits for the Action Plan. BMPs installed between 01 January 2006 and 30 June 2009 were included in this analysis. BMPs installed prior to 01 January 2006 are not eligible for credit and were thus excluded from consideration for this Action Plan. BMPs installed after 30 June 2009 were tracked separately to facilitate the calculation of New Source loads.

A two-step process using GIS and Excel was used to determine the pollutant credit for each BMP. Drainage areas for BMPs were delineated in ArcGIS and the layer was used to intersect the 2021 land cover layer. This produced a table denoting the land cover acreages within each BMP drainage area. The land cover acreages were multiplied by the land cover loading rates provided in Table 3a (for impervious and pervious lands) and Table III.1 (for forested lands) and then summed to determine the pollutant load attributed to the drainage area. The load was then multiplied by the pollutant removal efficiency for each BMP type to determine the load removed (i.e., credit). BMP efficiencies provided in Table V.C.1 of the Guidance Document were used for this analysis (VDEQ, 2021). The above process was implemented for all three pollutants of concern.

The effect of BMP treatment trains (BMPs in series, where the effluent from an upstream BMP enters the drainage area of a downstream BMP) was also considered. The cumulative effect of BMPs in series will be less for a given pollutant than the sum of individual BMPs not in series. This is because the removal efficiency of a downstream BMP is applied to runoff that is cleaner.

One benefit of treatment trains is the potential to maximize the load removal efficiency across multiple pollutants of concern. For example, pairing an upstream BMP with a high sediment removal rate with a downstream BMP that carries a high nutrient removal rate may be an excellent use of available space in a developed area.

Credits for BMPs implemented on unregulated lands may be awarded, provided any necessary baseline is first met (Part III.2 of the Guidance Document). No credits have been claimed for BMPs implemented on unregulated lands because the criteria for receiving credits were not achieved.

Part III.3 of the Guidance Document describes that permittees may not receive credit for BMPs that were installed after 30 June 2009 and that were implemented to meet the minimum VSMP technical criteria phosphorous removal requirement for new development or other minimum regulatory requirements. However, permittees may receive credit for those BMPs under circumstances of redevelopment, stricter development requirements, or oversized BMPs. BMPs installed after 30 June 2009 were included in this analysis when they were implemented under conditions of redevelopment, as described in Appendix V.E of the Guidance Document (VDEQ, 2021). Credits from BMPs implemented after 30 June 2009 were calculated separately in order to track net load change due to new source loads (Table 4-4). The effects of BMP treatment trains and unregulated land were also accounted for BMPs implemented during 2009-2020. Summaries of post-construction BMP types and credits are presented in Table 5-1 and Table 5-2, respectively.

Table 5-1. Summary of Existing BMP Types

BMP Type	Timeframe Implemented		
	01 Jan 2006 to 30 June 2009	01 July 2009 to 30 June 2020	Total
Bioretention	2	21	23
Dry Detention Pond	0	6	6
Dry Extended Detention Pond	1	8	9
Permeable Pavement	0	8	8
Rainwater Harvesting	0	1	1
Swale	2	10	12
Wet Pond or Wetland	1	2	3
Infiltration Pond	1	2	3
Hydrodynamic Device	0	6	6
Filtering Device	4	0	4
Total	**11**	**64**	**75**

Table 5-2. Summary of Credits from Existing Post-Construction BMPs

BMP Timeframe	Number of BMPs	Credits (lbs/yr)		
		Nitrogen	Phosphorus	Total Suspended Solids
2006–2009	11	141.1	32.5	15,249.8
2009–2020	64	474.4	83.0	39,576.0

Acronym:

lbs/yr – Pounds per year

A map of existing post-construction BMP locations is presented as Figure 5-1.

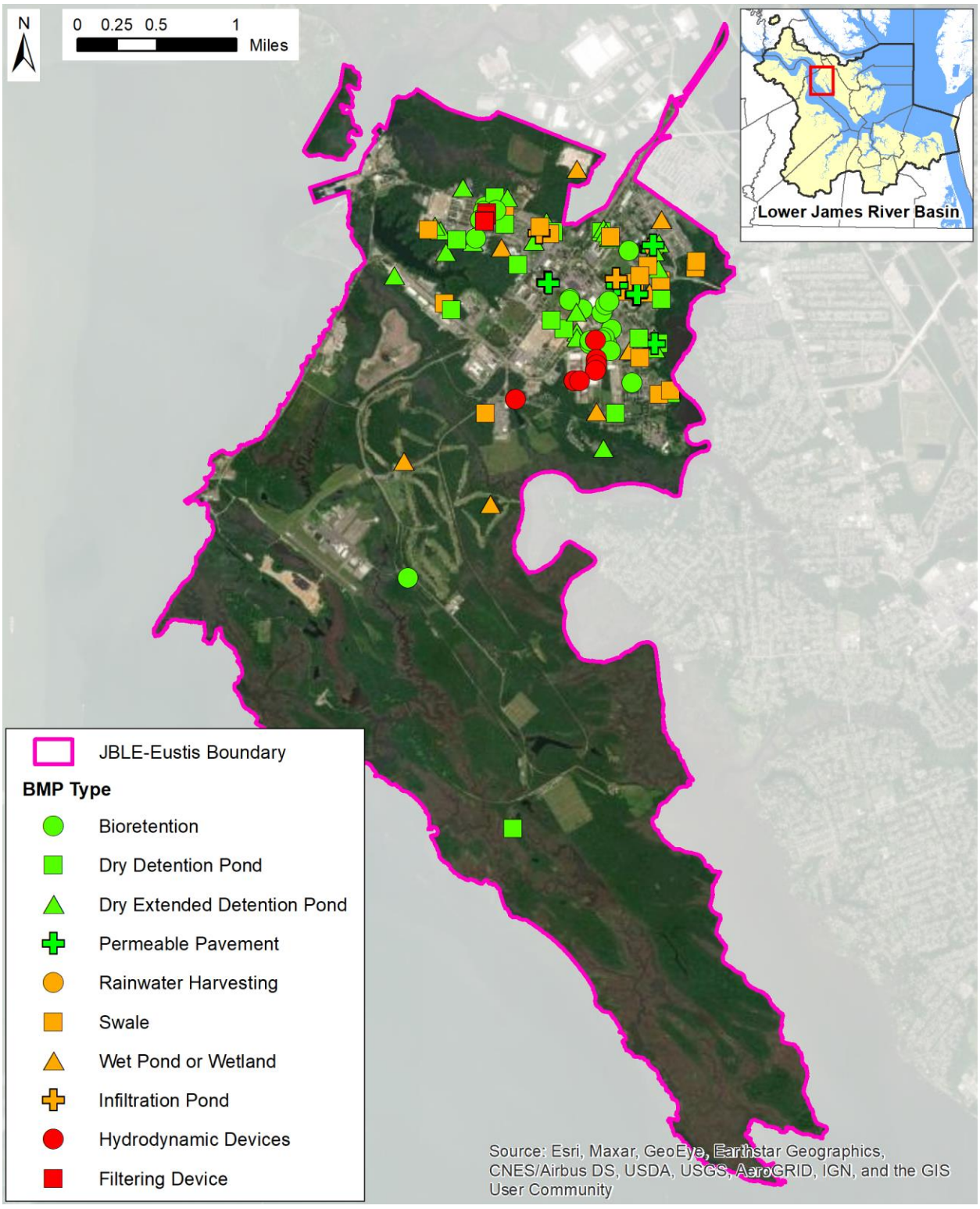

Figure 5-1. JBLE–Eustis Existing Post-Construction BMPs

5.2 Street Sweeping

The base performs vacuum powered street sweeping on primary roads, secondary roads, and parking lots on a regular basis. Street sweeping credits are calculated based on the methodology described in *Recommendations of the Expert Panel to Define Removal Rates for Street and Storm Drain Cleaning Practices* (Donner et al., 2016). Data on frequency and linear miles of sweeping was provided by the base and is used to calculate load reduction credits. A summary of annual street sweeping miles swept during 01 July 2019 through 30 June 2020, along with associated credits, is presented in Table 5-3.

Table 5-3. Summary of Annual Street Sweeping Credits

Lane-Miles Swept	Acres Swept	Credits (lbs/yr)		
		Nitrogen	Phosphorus	Total Suspended Solids
1,383.6	1,685.1	430.6	154.2	207,360.9

Note and Acronym:
lbs/yr – Pounds per year
Street sweeping credits are calculated based on the methodology described in *Recommendations of the Expert Panel to Define Removal Rates for Street and Storm Drain Cleaning Practices* (Donner et al., 2016)

A map of the streets serviced as part of the base's street sweeping program is presented as Figure 5-2.

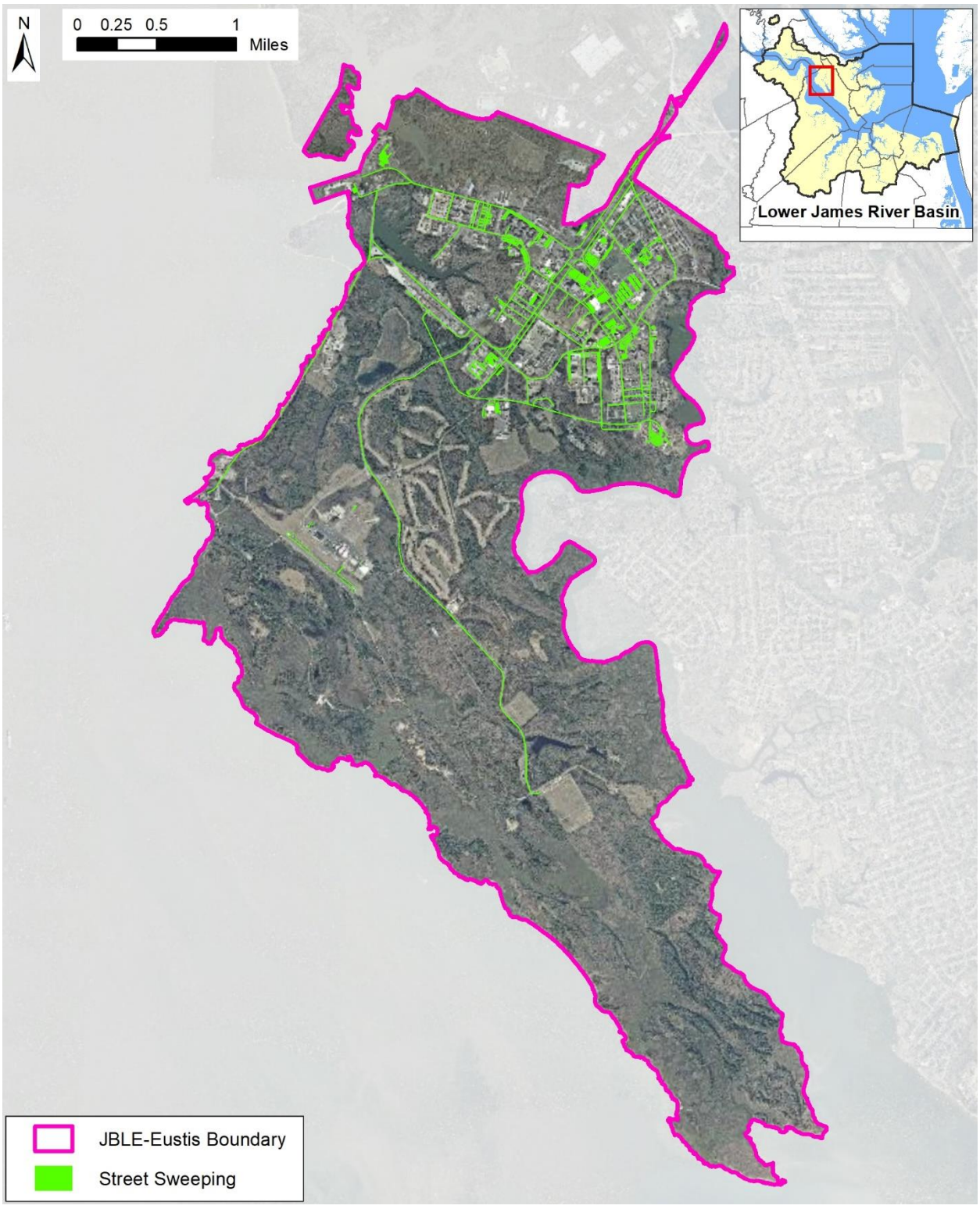

Figure 5-2. Map of Streets Swept

5.3 Storm Drain Cleaning

The base removes debris from outfalls on an annual basis. The base follows the Standard Operating Procedure provided in Appendix B to keep track of the mass of debris that is removed and to ensure the debris is disposed properly to avoid washing back into the watershed. The percent composition of the debris was estimated using the methods described by Law, DiBlasi and Ghosh (2008), where sediment, organic matter, and trash accounted for 39.0%, 52.1%, and 8.9% of the debris respectively. The method used to calculate credits for the storm drain cleaning BMP is described in Appendix V.G of the Guidance Document. A summary of the Storm Drain Cleaning BMP credits is provided in Table 5-4.

Table 5-4. Summary of Storm Drain Cleaning

Wet Weight (lbs/yr)	Dry Weight (lbs/yr)		Nutrients Removed (lbs/yr)					
			Sediment		Organic Matter		Total	
Debris Collected	Sediment	Organic Material	TN	TP	TN	TP	TN	TP
15,400.0	4,204.2	1,604.7	11.4	2.5	17.8	1.9	29.2	4.4

Acronyms:
lbs/yr – Pounds per year
TN – Total nitrogen
TP – Total phosphorus

5.4 Land Use Change

The base is restoring various parcels of turf into native forb and grassland habitats. Approximately 15.33 acres of restoration are currently underway at seven locations, as shown in Figure 5-3. The goal at all locations is to promote early successional habitats made of native species, with no fertilization and minimal maintenance. Periodic maintenance involves removing invasive species and reseeding native species. The land use change credited at all locations is thus based on the turf to mixed-open land use, and the credit reductions were calculated per Appendix V.H of the Guidance Document. A summary of land use change credits is presented in Table 5-5.

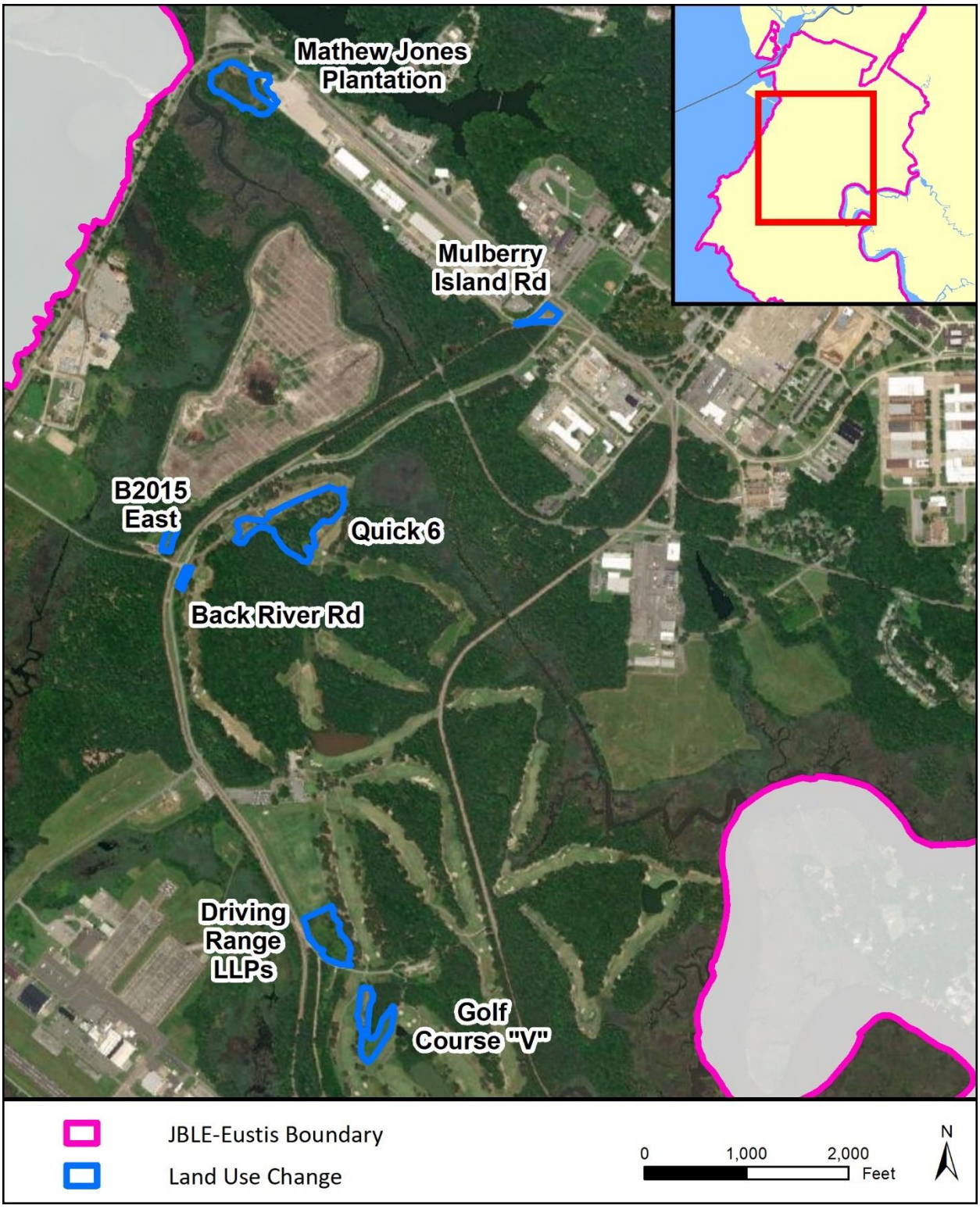

Figure 5-3. Land Use Change BMPs

Table 5-5. Summary of Land Use Change Credits

Pollutant	Turf to Mixed Open Area (acres)	Credit (lbs/yr)
Nitrogen	15.33	90.3
Phosphorus	15.33	17.2
Total Suspended Solids	15.33	0.0

Acronym:
lbs/yr – Pounds per year

5.5 Shoreline Management

Pollutant load reductions from shoreline restoration activities were calculated using loading rates presented in *Recommendations of the Expert Panel to Define Removal Rates for Shoreline Management Projects* (Forand et al., 2017). The report states that when shoreline management practice parameters are not available, the default values of 0.01218, 0.00861, and 42.0 pounds per linear foot per year should be used to determine pollutant load reductions for nitrogen, phosphorus, and total suspended solids respectively. A summary of shoreline management credits is presented in Table 5-6.

Table 5-6. Summary of Shoreline Management Reductions

Pollutant	Shoreline Restoration (linear feet)	Loading Rate (lbs/ft/yr)[1]	Credit (lbs/yr)
Nitrogen	40	0.01218	0.5
Phosphorus	40	0.00861	0.3
Total Suspended Solids	40	42.0	1,680.0

Note and Acronyms:
[1] Source: Forand et al., 2017
lbs/ft/yr – Pounds per foot per year
lbs/yr – Pounds per year

5.6 Future BMPs

The base plans on converting an additional 12.98 acres of turf into native species grass lands in 2021. The base will continue to investigate the applicability and feasibility of additional BMPs and BMP types in order to meet the pollutant load reduction requirements of the Chesapeake Bay TMDL. Opportunities for effective retrofit options will be explored and prioritized to make the best use of available resources.

5.7 BMP Costs

The current JBLE–Eustis pollutant credit portfolio includes post-construction BMPs, street sweeping, shoreline management, and land use change. The implementation cost for the land use change is zero since it is an existing BMP. The base uses a third-party contractor to sweep identified streets and parking lots on

a regular basis. A summary of BMP implementation costs for projects completed between 01 July 2009 and 30 June 2020 is presented in Table 5-7.

Table 5-7. Summary of BMP Implementation Costs for Projects Completed Between 01 July 2009 and 30 June 2020

BMP Strategy	Implementation Costs
Post-construction BMPs	Not available
Street Sweeping	Not available
Storm Drain Cleaning	Not available
Land Use Change BMPs	Not available
Shoreline Management	$2,143

5.8 Summary of Load Reduction Credits

A summary of pollutant credits by BMP strategy is presented in Table 5-8.

Table 5-8. Summary of Load Reduction Credits by BMP Strategy

Pollutant	Credits (lbs/yr)						
	Post-construction BMPs		Street Sweeping	Land Use Change	Shoreline Management	Storm Drain Cleaning	Credits from Existing BMPs[1]
	Completed between 01 Jan 2006 and 30 June 2009	Completed after 01 July 2009					
Nitrogen	141	474	431	90.3	0.5	29	692
Phosphorus	33	83	154	17.2	0.3	4.4	209
Total Suspended Solids	15,250	39,576	207,361	0.0	1,680	4,204	228,495

Note and Acronym:
[1] Does not include credits related to New Sources that were previously accounted for in Table 4-4 [Table II.5].
lbs/yr – Pounds per year

6.0 PROGRESS SUMMARY

Section I.C of the MS4 Permit requires the base to meet the Chesapeake Bay TMDL requirements by reducing nitrogen, phosphorus, and total suspended solid loads by 40% of the Chesapeake Bay L2 scoping reductions by the end of the second permit cycle (30 June 2023). The base's load contribution, required load reductions, and pollutant credits outlined in this Action Plan were calculated using the methodology described in VDEQ's Guidance Document (VDEQ, 2021). A summary of the required load reductions is presented in Table 6-1, and the second permit cycle pollutant credits are presented in Table 6-2.

Table 6-1. Summary of Permit Cycles 1, 2 and 3 Reduction Requirements

Pollutant	Required Load Reduction by 2018 (lbs/yr)	Required Load Reduction by 2023 (lbs/yr)	Required Load Reduction by 2028 (lbs/yr)
Nitrogen	73	583	1,457
Phosphorus	11	88	220
Total Suspended Solids	3,875	30,999	77,497

Acronym:
lbs/yr – Pounds per year

Table 6-2. Summary of Second Permit Cycle Reduction Requirements and Credits

Pollutant	Second Permit Cycle Cumulative Percent Reduction Requirement	Required Load Reduction by 2023 (lbs/yr)	Credits from Existing BMPs (lbs/yr)[1]	Second Permit Cycle Target Met?	Third Permit Cycle Target Met?
Nitrogen	40%	583	692	Yes	No
Phosphorus	40%	88	209	Yes	No
Total Suspended Solids	40%	30,999	228,495	Yes	Yes

Note and Acronym:
[1] Does not include credits related to New Sources that were previously accounted for in Table 4-4 [Table II.5].
lbs/yr – Pounds per year

Assuming the BMPs considered in this analysis are maintained and fully functional to provide the design performance, it is the conclusion of this analysis that the base currently meets the second permit cycle reduction requirement goals for nitrogen, phosphorus, and total suspended solids. However, the base does not currently meet the third permit cycle reduction goals for nitrogen or phosphorus. Additional reductions could be achieved through more frequent street sweeping schedules and additional post-construction BMPs.

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7.0 PUBLIC COMMENTS

The base encourages the public's participation in the development and implementation of this Chesapeake Bay TMDL Action Plan. In keeping with this objective, the base has uploaded this Action Plan to its website, https://www.jble.af.mil/Units/Army/Eustis-Enviromental. Comments received will be taken into consideration when finalizing the Action Plan with VDEQ.

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Appendix A

BMPs Implemented Prior to 01 July 2020

Appendix A
BMPs Implemented Prior to 01 July 2020

BMP Type	Date Installed	Latitude	Longitude	Reductions within MS4 Service Area (lbs/yr)		
				TN	TP	TSS
Filterra	2009-2011	37.161528	-76.574357	1.02	0.20	82.80
Filterra	2012	37.153537	-76.576999	1.38	0.27	111.62
Filterra	2012	37.15332	-76.577371	1.13	0.21	85.89
Filterra	2012	37.15321	-76.57864	2.57	0.45	174.62
Filterra	2012	37.152942	-76.578657	3.22	0.64	260.49
Swale	2008-2009	37.158847	-76.57065	32.04	3.94	1998.89
Bioretention	2011	37.160689	-76.56662	3.37	0.39	143.40
Swale	2011	37.148811	-76.569332	6.99	0.74	339.94
Swale	2011	37.14844	-76.570632	30.01	4.25	2301.70
Swale	2006	37.156458	-76.595353	3.94	0.74	441.84
Infiltration Pond	2010-2011	37.163137	-76.583012	12.04	1.69	549.90
Swale	2011	37.157827	-76.574959	35.24	5.69	3230.82
Wet Pond or Wetland	2011	37.157728	-76.571953	29.63	9.82	3516.83
Swale	2011	37.158629	-76.573643	21.48	3.24	1797.75
Swale	2010-2011	37.162985	-76.583434	4.48	0.51	250.65
Swale	2012	37.164663	-76.588597	13.18	1.95	1076.90
Swale	2012	37.162797	-76.576495	0.13	0.02	13.78
Dry Extended Detention Pond	2012	37.162704	-76.57653	1.00	0.13	120.77
Bioretention	2012	37.162586	-76.576698	1.21	0.20	79.29
Bioretention	2012	37.163121	-76.576996	3.71	0.70	281.95
Bioretention	2012	37.163515	-76.577336	1.81	0.30	115.83
Bioretention	2012	37.163241	-76.577547	2.72	0.48	188.13
Wet Pond or Wetland	2009	37.164431	-76.570681	52.09	18.03	8656.59
Dry Extended Detention Pond	2012	37.162243	-76.570926	2.88	0.43	460.15
Permeable Pavement	2012	37.161648	-76.571671	0.01	0.00	1.85
Permeable Pavement	2012	37.161713	-76.571835	0.06	0.01	11.30
Dry Extended Detention Pond	2012	37.158426	-76.583483	3.90	0.60	642.73
Rainwater Harvesting	2012	37.161909	-76.57147	0.00	0.00	1.57
Permeable Pavement	2011	37.15748	-76.573475	0.16	0.06	62.93
Permeable Pavement	2011	37.158358	-76.575672	0.08	0.03	31.48
Permeable Pavement	2011	37.158426	-76.583483	0.09	0.02	16.89

Appendix A
BMPs Implemented Prior to 01 July 2020, continued

BMP Type	Date Installed	Latitude	Longitude	Reductions within MS4 Service Area (lbs/yr)		
				TN	TP	TSS
Permeable Pavement	2011	37.1585	-76.583622	0.12	0.02	22.85
Bioretention	2010	37.154312	-76.576227	35.48	5.31	2220.61
Dry Detention Pond	2011	37.148533	-76.56928	2.69	0.69	134.53
Dry Detention Pond	2006	37.155845	-76.594533	0.54	0.16	42.64
Dry Extended Detention Pond	2010-2011	37.158897	-76.601156	11.17	1.83	2028.79
Bioretention	2012	37.153005	-76.576769	10.67	1.60	668.54
Dry Extended Detention Pond	2008	37.161126	-76.595264	1.05	0.10	78.27
Dry Extended Detention Pond	2012	37.153477	-76.580151	3.26	0.45	470.20
Dry Extended Detention Pond	2012	37.153986	-76.580138	1.37	0.20	218.67
Bioretention	2010-2011	37.131255	-76.599021	3.86	0.60	254.37
Dry Detention Pond	2011	37.108496	-76.586527	0.32	0.06	13.81
Bioretention	2008	37.165351	-76.590898	4.86	0.62	243.89
Dry Extended Detention Pond	2010-2011	37.164065	-76.583822	12.57	1.92	1972.02
Dry Extended Detention Pond	2010	37.166219	-76.588358	4.69	0.78	875.37
Dry Detention Pond	2010	37.166244	-76.589781	2.42	0.84	317.17
Permeable Pavement	2012	37.15755	-76.573368	0.16	0.06	60.87
Infiltration Pond	2006	37.16704	-76.593486	42.26	7.72	3232.63
Dry Detention Pond	2017	37.154274	-76.581635	1.05	0.30	102.79
Dry Detention Pond	2014	37.155052	-76.583084	1.22	0.35	122.93
Bioretention	2017	37.156125	-76.579578	12.68	1.92	807.24
Dry Detention Pond	2011	37.146651	-76.575587	2.91	0.73	242.17
Wet Pond or Wetland	2011	37.146752	-76.577756	5.48	1.32	529.02
Swale	1992	37.146442	-76.590457	8.72	1.31	728.58
Bioretention	2017	37.155798	-76.580249	83.45	9.28	3394.92
Filterra	2012	37.155823	-76.577351	3.66	0.62	270.46
Bioretention	2012	37.156567	-76.576938	2.73	0.46	197.99
Bioretention	2012	37.156867	-76.576516	3.31	0.58	252.19
Filterra	2012	37.153304	-76.578011	2.67	0.46	177.08
Hydrodynamic Device (Stormceptor)	2017	37.151525	-76.577871	1.31	0.35	166.20
Hydrodynamic Device (Stormceptor)	2017	37.151033	-76.577862	2.38	0.64	300.90

Appendix A
BMPs Implemented Prior to 01 July 2020, continued

BMP Type	Date Installed	Latitude	Longitude	Reductions within MS4 Service Area (lbs/yr)		
				TN	TP	TSS
Hydrodynamic Device (Stormceptor)	2017	37.15055	-76.577979	1.00	0.29	138.17
Hydrodynamic Device (Stormceptor)	2017	37.14953	-76.580389	1.22	0.35	169.61
Hydrodynamic Device (Stormceptor)	2017	37.149569	-76.579742	0.72	0.21	99.35
Dry Detention Pond	2012	37.160101	-76.587044	0.18	0.07	25.26
Bioretention	2019	37.164932	-76.591067	6.16	0.97	368.08
Bioretention	2019	37.164153	-76.591402	10.36	1.61	602.95
Bioretention	2011	37.160059	-76.566731	7.14	1.26	496.33
Swale	2011	37.159237	-76.573031	10.47	1.66	937.01
Permeable Pavement	2014	37.162083	-76.571644	0.15	0.04	44.47
Hydrodynamic Device (Vortechs)	2014	37.147785	-76.587028	42.24	9.79	8905.02
Swale	2010-2011	37.16358	-76.584594	3.74	0.47	241.81
Filtering Device (StormFilter)	2007	37.164805	-76.590675	2.21	0.39	152.95
Filtering Device (StormFilter)	2007	37.164573	-76.590745	2.41	0.43	171.30
Filtering Device (StormFilter)	2007	37.164053	-76.59091	2.34	0.41	159.80
Filtering Device (StormFilter)	2007	37.164008	-76.590923	2.19	0.40	159.55

Acronym:

lbs/yr – Pounds per year

Appendix B

JBLE–Eustis Storm Drain Cleaning Standard Operation Procedure

Appendix B

JBLE–Eustis Storm Drain Cleaning Standard Operation Procedure

The base routinely removes sediment, debris, and trash from its storm drains to prevent street flooding and trash and sediment from entering downstream waterbodies. The following procedures are used to collect and dispose the sediment, debris, and trash collected during the storm drain cleaning.

1. Storm drains are cleaned biannually at 15 locations throughout the base by a subcontractor. Sediment, debris, and trash are collected through outfall net filters, end of pipe treatment, and traditional catch basin cleanouts.

2. The wet weight of debris/sediment removed is recorded after each cleaning at each location. Debris/sediment weights for each location are compiled in a single spreadsheet.

3. All debris/sediment that is collected from storm drain cleaning is disposed at the recycle center located on the base for disposal. Debris/sediment is contained within the recycle center to ensure it does not wash back into the watershed.