

Crystal City/Potomac Yard Transit Improvements Project

**Water Resources
Technical Memorandum**

September 2006

Water Resources

Crystal City/Potomac Yard Transit Improvements Project

Table of Contents

	Page
1.0 INTRODUCTION	1
2.0 WATER RESOURCES IDENTIFICATION	1
2.1 Investigation Methodology	1
2.2 Existing Conditions	3
2.2.1 Off-Site Data Source Reviews.....	3
2.2.2 On-Site Survey	4
3.0 REGULATORY FRAMEWORK	4
3.1 Federal Regulatory Framework	5
3.2 State Regulatory Framework	5
3.3 Local Regulatory Framework.....	6
3.3.1 Arlington County.....	6
3.3.2 City of Alexandria.....	7
4.0 IMPACTS AND MITIGATION MEASURES	7
4.1 Short-Term (Construction) Impacts and Mitigation Measures	8
4.2 Long-Term (Operation) Impacts and Mitigation Measures	10
5.0 CONCLUSIONS	10

List of Tables

<u>Table No.</u>	<u>Description</u>
Table 1	Area Required for Construction of the Proposed Alignment and Station Stops
Table 2	Summary of Anticipated Reviews and Approvals

List of Figures

<u>Figure No.</u>	<u>Description</u>
Figure 1	Existing Water Resources

Water Resources

Crystal City/Potomac Yard Transit Improvements Project

List of Acronyms

BMP	Best Management Practices
DCR	Virginia Department of Conservation and Recreation
DEQ	Virginia Department of Environmental Quality
ESC	Erosion and Sediment Control
FEMA	Federal Emergency Management Agency
GIS	Geographic Information Systems
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollutant Discharge Elimination System
NWI	National Wetlands Inventory
RMA	Resource Management Area
RPA	Resource Protection Area
SWM	Stormwater Management
SWPPP	Stormwater Pollution Prevention Plan
USGS	United States Geological Survey
VCP	Virginia Coastal Zone Management Program
VDOT	Virginia Department of Transportation
VPDES	Virginia Pollutant Discharge Elimination System
VRE	Virginia Railway Express

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1.0 INTRODUCTION

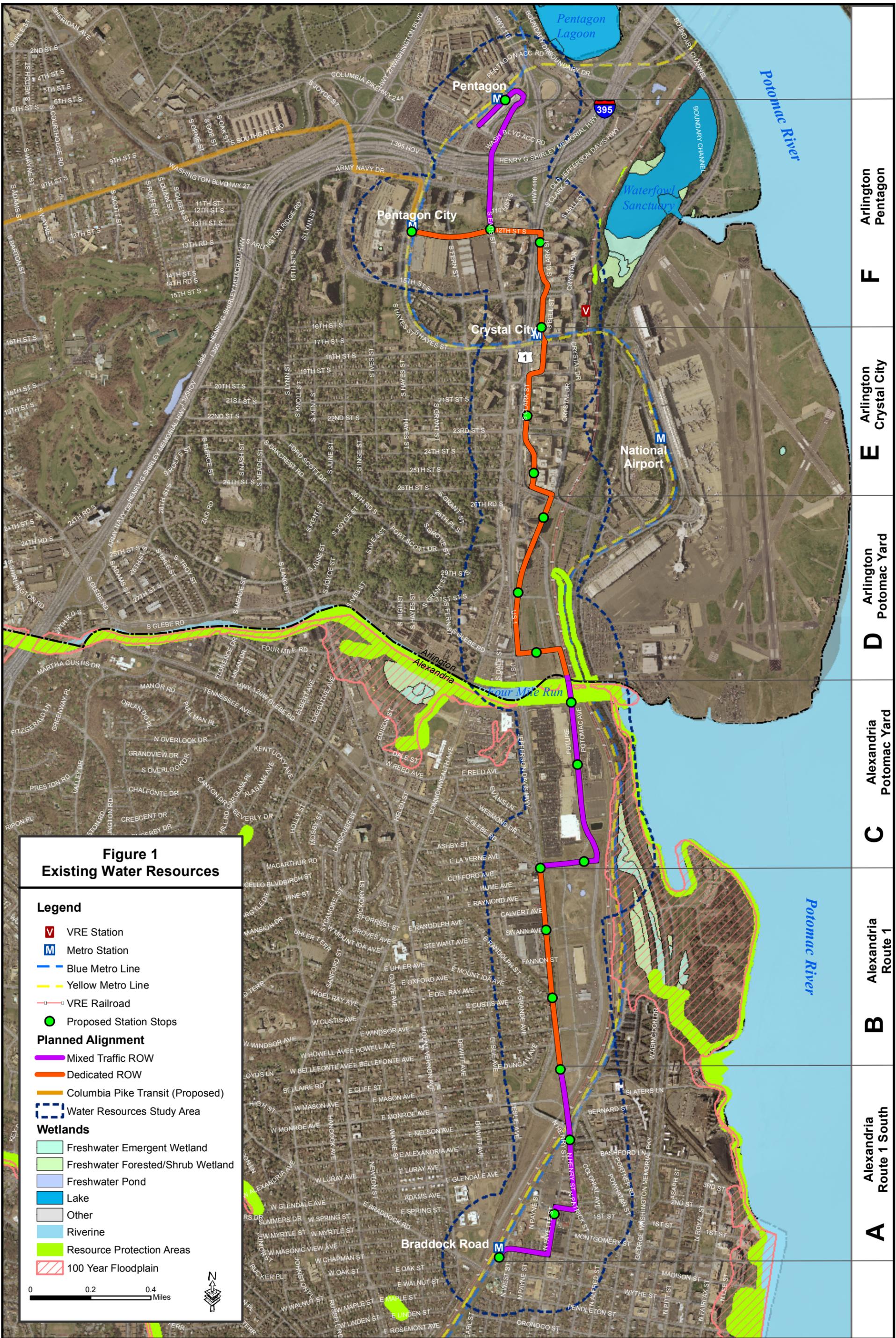
An evaluation was conducted of existing water resources in the vicinity of the proposed Crystal City/Potomac Yard Transit Improvements Project (Project) area and the potential impacts that may result from the Project in those resource areas. For the purposes of this project evaluation, water resources are considered to include wetlands, surface waters, floodplains, groundwater, coastal zones, and other locally-designated water resource protection areas in the project area.

The remainder of this document is divided into the following sections: Water Resources Identification, Regulatory Framework, Impacts and Mitigation Measures, and Conclusions. The Water Resources Identification section describes the methodology and results of the off-site and on-site investigation processes noting specific water resource areas in the vicinity of the proposed activities. The resource areas are identified by their location in the particular segments that have been established along the proposed transit route (i.e., Segments A through F). Figure 1 depicts the proposed transit route and transit station stops by segment. The Regulatory Framework section describes the framework that exists in the federal, state, and local agencies responsible for the protection of the resource areas identified within the Project area, and the anticipated permits and review required for this project. The Impacts and Mitigation Measures section describes the potential short- and long-term impacts of the Project on the identified water resources and potential mitigation measures required. A summary of the anticipated permitting review and approval requirements is provided in the Conclusions section.

2.0 WATER RESOURCES IDENTIFICATION

2.1 Investigation Methodology

Water resources in the vicinity of the Project area were investigated using off-site sources and an on-site survey. The off-site sources consulted and reviewed included: United States Geological Survey (USGS) Topographical Maps; Physiographic Map of Virginia (prepared by C.M. Bailey, College of William and Mary); National Wetlands Inventory (NWI) Geographic Information Systems (GIS) datalayer; Federal Emergency Management Agency (FEMA) Flood GIS datalayers; Arlington County maps and GIS datalayers; City of Alexandria maps and GIS datalayers; aerial photographs; and Commonwealth of Virginia maps. In addition, the following agencies were contacted regarding water resources: Virginia Department of Conservation and Recreation – Soil and Water Conservation; Virginia Department of Environmental Quality (DEQ) – Coastal Zone Management Program (VCP); DEQ – Northern Regional Office of Water Permits; Virginia Marine Resource Commission; Arlington County Department of Environmental Services; and City of Alexandria Transportation and Environmental Services. The on-site survey was conducted on June 27th and 28th, 2006 to confirm the presence of water resources noted during the off-site data review process.



A	Alexandria Route 1 South
B	Alexandria Route 1
C	Alexandria Potomac Yard
D	Arlington Potomac Yard
E	Arlington Crystal City
F	Arlington Pentagon

**Figure 1
Existing Water Resources**

Legend

- VRE Station
- Metro Station
- Blue Metro Line
- Yellow Metro Line
- VRE Railroad
- Proposed Station Stops

Planned Alignment

- Mixed Traffic ROW
- Dedicated ROW
- Columbia Pike Transit (Proposed)
- Water Resources Study Area

Wetlands

- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine
- Resource Protection Areas
- 100 Year Floodplain

0 0.2 0.4 Miles

2.2 Existing Conditions

For the purposes of this evaluation, the study area is considered to extend approximately 1,000 feet from the proposed transit route and the proposed station stops shown on Figure 1. Existing water resource areas are described below.

2.2.1 Off-Site Data Source Reviews

According to the USGS topographical map, the study area is located west of the Potomac River and only in Segment C does the proposed route extend to within 1,000 feet of this river. The Potomac River is used as a drinking water supply for Arlington County and the City of Alexandria (MWCOCG, 2006). Other notable water features in the vicinity of the study area include the Boundary Channel/Waterfowl Sanctuary located just south of Interstate 395, as well as the Pentagon Lagoon located just northeast of the Pentagon facilities. Four Mile Run bisects the project area along the Arlington County/City of Alexandria corporate boundary and is a tidally-influenced tributary to the Potomac River.

According to the Physiographic Map of Virginia, the study area is primarily located within the Coastal Plain physiographic province. A majority of the study area is highly urbanized and the depth to the groundwater table would be anticipated to vary widely due to the disturbed nature of the soils within the project corridor.

The NWI datalayers overlaid onto the study area indicate wetlands within 1,000 feet of the proposed transit route in Segments B, C, D, and F. In Segment B, the NWI map depicts two small freshwater ponds just south of the proposed E. Glebe Road transit route and station stop, as well as a small area of freshwater emergent wetland and forested/shrub wetland just east/southeast of the intersection of E. Glebe Road and (future) Potomac Avenue. In Segment C, at the southern end of (future) Potomac Avenue, areas of freshwater emergent wetland and freshwater forested/shrub wetland are depicted several hundred feet to the east of the proposed route. As noted above, the Potomac River, identified as riverine on the NWI map, is located east of the proposed project area in Segment C, while Four Mile Run, also identified as riverine, crosses through Segment C and the proposed transit route in a west-east direction. Four Mile Run also slightly extends within the study area in Segment D. In Segment F, a small area of freshwater forested/shrub wetland is located several hundred feet east of S. Clark Street.

The FEMA datalayers overlaid onto the proposed project area indicate that a 100-year floodplain is located within the study area in Segments B and C. The floodplain extends from the Potomac River into Segment B southeast of the intersection of E. Glebe Road and (future) Potomac Avenue and continues south roughly parallel to the VRE Railroad. In the northern portion of Segment C, the floodplain is associated with Four Mile Run and abuts the proposed transit route that crosses this river. In the southern portion of this segment, the limit of the 100-year floodplain extends from the Potomac River to the western edge of the Virginia Railway Express (VRE) Railroad at the southern end of (future) Potomac Avenue. No other segments contain 100-year floodplains in the study area.

The proposed activities would be located primarily within the Four Mile Run watershed. A portion of Segment A also abuts and may extend partially into the Hunting Creek/Cameron Run Watershed. The Virginia Coastal Resource Management Map identifies the entirety of both Arlington County and the City of Alexandria as within the Coastal Zone Management Area. Both jurisdictions are also considered part of Tidewater Virginia and border the Potomac River, which eventually discharges into Chesapeake Bay. In accordance with the local Chesapeake Bay Preservation Ordinances, Arlington County and the City of Alexandria have designated Resource Protection Areas (RPAs), which include all tidal wetlands, tidal shores, and all non-

tidal wetlands that are connected by surface flow and contiguous to tidal wetlands, or water bodies with perennial flow, and a 100-foot buffer zone extending from each of these areas. These RPAs are intended to protect the riparian buffers along streams within the County and the City. The RPA datalayers overlaid onto the proposed project area indicate that three segments, C, D, and F, are shown to contain RPAs. In Segment C, an RPA associated with the Potomac River just south of the mouth of Four Mile Run is located approximately 800 feet east of the proposed transit route. Existing railroad tracks separate the proposed transit route from this RPA. Also in Segment C (and within a small portion of Segment D) is an RPA along the northern and southern banks of, and including, Four Mile Run. The proposed transit route crosses this RPA and a proposed station stop is located potentially within the Four Mile Run RPA. Another RPA, associated with an unnamed tributary to Four Mile Run, is located approximately 100 feet east of the proposed transit route in Segment D just north of Four Mile Run. In Segment F, an RPA is shown immediately adjacent to the VRE Railroad east of the proposed transit route. Although not identified as an RPA, a small stream immediately adjacent to the proposed transit route and station stop on S. Glebe Road in Segment D is noted on the Arlington County GIS Mapping Center Interactive Mapping Program. No RPAs are shown in the study area in Segments A, B, or E.

In addition to RPAs, Arlington County and the City of Alexandria have also designated Resource Management Areas (RMAs) in accordance with the Chesapeake Bay Preservation Plan, which was prepared by the Chesapeake Bay Local Assistance Department and adopted by each of the municipalities as part of their Comprehensive Plans. RMAs, as defined in the local ordinances, include land that, if improperly used or developed, has a potential for causing significant water quality degradation or for diminishing the functional value of an RPA. The function of the Chesapeake Bay Preservation Plan is to identify efforts being taken to protect water quality and to provide a framework for expanding these efforts to help improve water quality within Chesapeake Bay. All areas located outside of RPAs within both Arlington County and the City of Alexandria are designated RMAs; therefore, the entire study area (outside of RPAs) is located within an RMA.

2.2.2 On-Site Survey

During the site visit, the following water resources were confirmed through visual observation: Pentagon Lagoon, Waterfowl Sanctuary, Potomac River, and Four Mile Run. The wetland areas and freshwater ponds identified in Segment B via off-site map review were not accessible due to chain-link fences, private property notices, and/or existing active railroads; however, forested areas were observed east of the VRE Railroad in Segment C where forested/shrub wetlands are identified on the NWI map. The unnamed tributary to Four Mile Run in Segment D was also not accessible for confirmation. The small stream identified on the Arlington County GIS Mapping Center Interactive Mapping Program was not observed. A large active construction staging area now encompasses this location. Various stormwater detention basins were also noted in the study area within Segments B and C; however, these man-made stormwater basins are not protected by federal, state, or local regulations and are not considered sensitive water resources.

3.0 REGULATORY FRAMEWORK

The regulations pertaining to protected water resources within the study area, including wetlands, surface waters, floodplains, coastal zones, RMAs and RPAs were reviewed to identify regulatory thresholds for the purpose of determining potential short- and long-term effects and to identify the permits and approvals required for implementation of this project. From a regulatory standpoint, the proposed construction activity would be considered a single project

for state and federal permitting. However, the work will be conducted in two communities, and the project will be subject to both Arlington County and City of Alexandria regulations and ordinances.

3.1 Federal Regulatory Framework

Projects that are located within the Coastal Zone Management Area in Virginia, and which are at least partially federally-funded or require federal approval, are required to undergo a federal consistency certification process. Projects must be designed to avoid and/or minimize impacts to specific coastal resources as identified in several enforceable policies regarding fisheries, subaqueous land, tidal and non-tidal wetlands, non-point source pollution control, shoreline sanitation, air pollution, and land management. The required Federal Consistency Certification deliverable has a government review period of 180 days following submission of a complete package including project description and an analysis of the project's consistency with the enforceable policies. However, based on discussions with VCP, the anticipated review period for this project is anticipated to be approximately 45 to 60 days (VCP, 2006).

Although areas subject to jurisdiction (e.g. wetlands and surface waters) under Sections 401 and 404 of the federal Clean Water Act were identified in the study area, no dredging or filling within wetlands or waterways is anticipated to be required as part of the Project (DMJM, 2006a), thus no Section 401 or 404 permits is anticipated to be required (DEQ, 2006).

3.2 State Regulatory Framework

The Virginia Department of Environmental Quality (DEQ) issues Virginia Water Protection Permits for projects requiring dredging or filling within regulated wetlands or waterways. As noted above, no dredging or filling in wetlands or waterways is anticipated. Since this project falls within a watershed with at least a 5-mile drainage basin (i.e., Four Mile Run Watershed), the project area is within the jurisdiction of the Virginia Marine Resources Commission (VMRC). For projects under the jurisdiction of the VMRC, a Joint Permit Application is required to be submitted and reviewed by both the Army Corps of Engineers and Virginia DEQ for work in or over wetlands or waterways. Since this project requires no work within or over wetlands and waterways, this permit is not required (VDEQ, 2006; VMRC, 2006).

Virginia is an authorized state under the federal National Pollutant Discharge Elimination System (NPDES) stormwater permitting program. As such, the Department of Conservation and Recreation (DCR) administers the Virginia Pollutant Discharge Elimination System (VPDES) permitting program for the control of stormwater discharges from municipal separate storm sewer systems (MS4s), and land-disturbing activities, under the Virginia *Stormwater Management Regulations* (4VAC3-20). Construction activities equal to or larger than one acre require coverage under the *General Permit for Discharges of Stormwater from Construction Activities*. DCR's construction site stormwater permits are based upon EPA's construction stormwater general permit, and require construction site operators to develop and implement a stormwater pollution prevention plan (SWPPP) that uses best management practices (BMPs) for erosion and sediment control (ESC) at the construction site.

All land-disturbing activities undertaken in Virginia must meet the 19 "minimum standards" for ESC specified in the *Virginia Erosion and Sediment Control Regulations* (4VAC50-30), and detailed in the *Virginia Erosion and Sediment Control Handbook* (DCR, 1992). Permits for construction sites do not typically contain monitoring requirements; however, they do require the operator to regularly inspect stormwater discharges from the site to ensure that the BMPs are controlling the discharge of pollutants to the maximum extent practicable, and are meeting water quality standards. Land-disturbing activities that cross local jurisdictions may be regulated at

either the local or state level. The applicant has the option of submitting the ESC plan to each locality or to DCR. In either case, a SWPPP must be developed. However, the applicant can satisfy identical pollution prevention plan requirements by simply referencing a single approved ESC plan (DCR, 2005). The SWPPP requires the operator to manage other wastes on site, such as building materials, garbage and debris, to have controls to minimize the exposure of these materials to stormwater, and to minimize the discharge of pollutants to state waters. Inspection and enforcement of multi-jurisdictional projects are generally carried out at the local level.

The Virginia Department of Transportation (VDOT) has specific requirements for projects under its jurisdiction, with regard to ESC and stormwater management. These are documented in the *Virginia Department of Transportation Erosion and Sediment Control (ESC) & Stormwater Management (SWM) Program Manual* (VDOT, 2004). Portions of Route 1 in Arlington are maintained by VDOT; therefore, the Project proponent should coordinate with VDOT on applicable portions of the planned improvements.

3.3 Local Regulatory Framework

In recent years, both Arlington County and the City of Alexandria have amended their watershed management plans and stormwater regulations to reflect changes to the Virginia Stormwater Management Program and the recommendations of the Chesapeake Bay Preservation Plan. In addition, Arlington County and the City of Alexandria have recently adopted a joint Four Mile Run Restoration Draft Master Plan (Arlington County and City of Alexandria, 2006). All Project work within either municipality should be consistent with both of these plans.

3.3.1 Arlington County

Arlington County's MS4 permit, originally issued under the NPDES Phase I program, was reissued in 2002. Arlington's MS4 permit authorizes the County to discharge stormwater from its storm sewer system to local streams. The permit requires the County to 1) monitor stormwater discharges from four storm sewer outfalls that drain four types of land uses in the County, 2) inspect storm sewer outfalls during dry weather to screen for illegal discharges, and 3) reduce the discharge of pollution from the storm sewer system to the 'maximum extent practicable.' The maximum extent practicable requirement is not explicitly defined; rather the permit specifies that Arlington County must implement a comprehensive stormwater management program to achieve this level of water resource management. The County has developed a Watershed Management Plan in part to address this requirement.

There are several local regulations directly related to stormwater management that are applicable to the proposed project. The *Stormwater Detention Ordinance* requires that the peak runoff rate from new development and redevelopment be maintained close to predevelopment levels, unless a waiver is granted. Under this ordinance, for projects within the Four Mile Run watershed, stormwater detention must be provided for the 100-year flood from the developed site and released at a maximum rate equivalent to a 10-year flood from the site in its pre-developed condition.

The Arlington County *Erosion and Sediment Control Ordinance* is primarily intended to minimize sediment runoff to streams during construction, when exposed soil is easily transported to streams during storms. Under the ordinance, projects resulting in land-disturbing activities of more than 2,500 square feet (ft²) must submit an erosion and sediment control plan for approval by the County before beginning work.

Similar to the *Erosion and Sediment Control Ordinance*, the *Chesapeake Bay Preservation Ordinance* requires review and approval by the Arlington County Department of Community

Planning, Housing and Development for projects proposing land disturbance of 2,500 ft² (or more) within RMAs. This Department implements regulations regarding new development and redevelopment in the County to ensure compliance with stormwater management, erosion and sediment control, and landscaping requirements. Specific performance standards must be met to obtain approval to develop within an RMA, including minimization of land disturbance; preservation of existing vegetation and trees to the maximum extent practicable; replanting or retention of trees to provide a certain percentage of tree canopy over the lot after 20 years; minimization of impervious cover; proper erosion and sediment control; and effective stormwater management. Arlington County has indicated that the tree canopy requirements would not apply to this project (Arlington County, 2006); however, final design plans should comply with the remaining performance standards.

3.3.2 City of Alexandria

Unlike Arlington County, the City of Alexandria is classified as a small city (<100,000) under NPDES requirements for MS4s. Alexandria's Stormwater Management Plan, the *Water Quality Management Supplement* to the City's Master Plan, and the *Environmental Management Ordinance* each provide stormwater control guidance that addresses the MS4 permit requirements.

The City's efforts to control stormwater run-off from construction sites are derived from the State's Erosion & Sediment Control Program and Chesapeake Bay Preservation Act. Local compliance of these two programs requires any construction project that disturbs at least 2,500 ft² have a Virginia Stormwater Management Program Permit, and a Stormwater Pollution Prevention Plan (SWPPP). Under the ESC ordinance, project proponents must first submit an erosion and sedimentation control plan to the City Department of Transportation and Environmental Services (City of Alexandria, 2001). Similarly, under the *Environmental Management Ordinance*, the disturbance of 2,500 ft² of area requires a Plan of Development review by the same department (City of Alexandria, 2006a). However, projects that prevent or minimize encroachment into an RPA, comply with the Virginia Erosion and Sediment Control law, and/or are approved under the VPDES program can qualify for an exemption from the Plan of Development review (City of Alexandria, 2006b).

Post-construction management of stormwater BMPs is addressed under Alexandria's stormwater management plan. The city has developed a standard BMP facilities maintenance and monitoring agreement to clarify long-term maintenance obligations (City of Alexandria, 2006c). The city also provides technical guidance for inspecting and maintaining BMPs. The stormwater management system proposed as part of this project must comply with this agreement.

4.0 IMPACTS AND MITIGATION MEASURES

Activities requiring ground disturbance, including proposed roadway re-construction/widening (for the dedicated right-of-way in Segments B and D), station stop construction (all segments), and intersection improvements (Segment F), were identified along the proposed transit route and compared to the location of existing resource areas to determine the extent of impacts to water resources. Short-term impacts would include activities proposed during the construction phase of the project, while long-term impacts would result from operation of the planned transit improvements.

Neither construction nor operation appear to require dredging, filling or otherwise direct alteration within wetlands, waterways, or floodplains (DMJM, 2006a); however, construction and

operation activities are proposed within the remaining three protected resource areas identified in the project area: Coastal Zone Management Area, RPAs and RMAs.

All project components (Segments A through F) are proposed within Virginia's coastal zone management area.

A proposed station stop within Segment C is potentially located within an RPA encompassing the buffer zone (within 100 feet) of Four Mile Run.

All proposed station stops (Segments A through F), in addition to the intersection reconfiguration and roadway re-construction, are within RMAs within both Arlington County and the City of Alexandria.

It should be noted that at this stage of conceptual design it is not clear whether the proposed station stop immediately south of Four Mile Run is within an RPA. An increase in impervious surface within an RPA would not be consistent with the goals of the RPAs, which include the protection of riparian areas adjacent to streams (in this case, Four Mile Run). In accordance with the City of Alexandria's *Environmental Management Ordinance*, this station stop location should be shifted to a location that avoids the creation of additional impervious surface within an RPA.

Both short- and long-term work within the RMA in Arlington County will require Plan of Development review by the Arlington County Department of Community Planning, Housing and Development. Similarly, short- and long-term activities within the City of Alexandria will require review and approval of an erosion and sediment control plan. The project is anticipated to be exempt from further development review in the City of Alexandria if the roadways and appurtenant structures are constructed in compliance with the *Erosion and Sediment Control Ordinance* and the *Virginia Stormwater Management Regulations* (City of Alexandria, 2006b).

4.1 Short-Term (Construction) Impacts and Mitigation Measures

Short-term impacts potentially resulting from the project in the coastal zone management area, the RPA, and the RMA are anticipated to be minimal if stormwater is controlled during the construction phase. Table 1 provides a summary of the anticipated total land area required to construct the proposed station stops and transit alignment. The area of land disturbed for each individual station stop location ranges from 720 ft² to 1,500 ft² (assumes two stations per station stop shown on Figure 1 to accommodate northbound and southbound transit routes), while the total area required for the proposed stops is approximately 1.4 acres. In addition, roadway modifications proposed at three locations along the alignment consist of two areas where two-lane dedicated right-of-ways will be constructed, and one intersection, which will be reconfigured. The total area of disturbance resulting from the project will be approximately six (6) acres, located in both the Coastal Zone Management Area and RMAs. One small area of disturbance in an RPA may also result depending on the final location of the proposed station stop immediately south of Four Mile Run.

Table 1: Area Required for Construction of the Proposed Alignment and Station Stops

	Length of Alignment, feet (miles)	Area of Construction, sq. ft. (Acres)	
		Alignment	Stops ⁴
Mixed Traffic¹	13,460 (2.549)	n/a	6,690 (0.154)
Exclusive Lanes (Total)	15,090 (2.858)	n/a	55,100 (1.264) ⁵
New construction for busway ²	7,810 (1.479)	203,060 (4.662)	
New construction by others ³	730 (0.138)	17,520 (0.402)	
Operation along existing lanes ³	6,550 (1.241)	-	

¹ - Portions of street network do not exist today and will be constructed by others.

² - New two-way busways are assumed to be 26 feet wide.

³ - Assumes two 12-foot lanes dedicated for exclusive transit use.

⁴ - Station stops in Alexandria south of the Monroe Ave Bridge are assumed to be 45 feet by 8 feet; other station stops are assumed to be 75 feet by 10 feet on average.

⁵ - Assumes 12-foot continuous strip for stops, left turn pockets, and median area along Segment B.

(Source: DMJM Harris, 2006b)

The project requires a VPDES General Permit for Discharges of Stormwater from Construction Activities due to its disturbance of greater than one acre. Due to the location of the project within Virginia’s Coastal Zone Management Area, combined with the fact that federal funding by the Federal Transit Administration is anticipated, the project must be reviewed for consistency with the enforceable policies of the VCP pertaining to construction, and the final project design should incorporate all requirements of these policies. Due to work within the RMA, an erosion and sediment control plan must be submitted to Arlington County and the City of Alexandria for review and approval prior to the start of work. Several documents exist to provide guidance in the selection, installation, and maintenance of stormwater BMPs in Virginia. These include the *Northern Virginia BMP Handbook* (NVPDC/ESI, 1992) and the City of Alexandria’s supplement to this document (City of Alexandria, 1993), *Virginia Erosion and Sediment Control Handbook* (1992), *VDOT Manual of Practice for Stormwater Management* (2004), and the *Virginia Department of Transportation Erosion and Sediment Control (ESC) & Stormwater Management (SWM) Program Manual* (March, 2004). The project should be designed in accordance with all of these documents to ensure that stormwater impacts are avoided or minimized to the maximum extent practicable.

Due to the expected variable depth to groundwater in the study area, the groundwater table could be intersected during excavation for roadway reconstruction or station stop installation. Geotechnical borings should be completed during the design phase to confirm the depth to groundwater in these areas. Construction should be conducted in a manner that avoids the potential of hazardous materials penetrating and dispersing within the groundwater table. A proper hazardous material management plan should be implemented during construction.

No direct alteration to wetlands, surface waters, floodplains, or RPAs is anticipated unless the proposed station stop south of Four Mile Run requires construction within the designated RPA. However, during construction, maintaining site stability and controlling runoff from the work area are crucial to avoid the migration of pollutants from the various construction sites to nearby sensitive resource areas. The technical criteria stipulated in the Virginia stormwater management regulations should be incorporated into the project’s BMP design, and the construction and post-construction stormwater management regulations established by both Arlington County and the City of Alexandria should be observed. If a proper stormwater management design is implemented during the construction phase of the project, impacts to water resource areas identified within the project area are anticipated to be minor. It is assumed in this evaluation that no modifications to existing stormwater outfalls located within wetlands

and/or surface waters are required as part of the stormwater system modifications along the proposed transit route (DMJM, 2006a). If, as the design progresses, it appears that stormwater management improvements will require work within these resource areas, an additional assessment of impacts and required permits and mitigation associated with the stormwater management design will be necessary.

4.2 Long-Term (Operation) Impacts and Mitigation Measures

The majority of new construction proposed for the project involves permanent roadway modifications. The planned transit improvements will require an increase in impervious surfaces along Route 1, S. Glebe Road, Crystal Drive, and at the intersection of 15th Street and S. Clark Street as well as many of the proposed station stops. The increase in impervious surface would be the primary activity with the potential to cause indirect adverse impacts to wetlands and waterways due to the transport of pollutants from these impervious areas into the stormwater system, and ultimately discharging into wetlands, waterways, RPAs, and the Coastal Zone Management Area. Project operation is not anticipated to impact floodplains since no permanent alterations are proposed within any floodplains identified in the study area. As noted above, the Project must be reviewed by the VCP to obtain a federal consistency certification to document compliance with the enforceable policies pertaining to operation of the Project.

In areas where proposed impervious surface will result in a conversion of otherwise pervious surface (e.g. grass or gravel), a loss of groundwater recharge would be expected. This loss is anticipated to be minor for all new impervious areas associated with station stops due to their small size. An increase in peak runoff flow to receiving waterbodies due to the increased impervious area of the proposed transit route could result in erosion at stormwater discharge points and an increase in downstream flooding. New impervious areas associated with roadway widening for the dedicated right of way (ROW) will require compliance with all regulatory requirements to ensure minimization of the loss of recharge and the potential for erosion and sedimentation. Pervious materials should be incorporated into the design of transit stops and roadway reconstruction wherever feasible since compliance with the federal, state, and local regulations requires minimization of the amount of impervious surface created as part of this project. The VDOT program manual provides detailed guidance on both non-structural and structural stormwater management practices for linear projects, applicable to avoiding the potential impacts associated with stormwater (as described above). These include vegetated filter strips, grassed swales with check dams, infiltration methods, as well as catch basin inserts, hydrodynamic separators, and porous pavement.

Another potential impact during operation of the project is the new airborne pollutants discharged by the increasing number of buses traveling through the proposed transit corridor. The increase in bus service along the proposed routes will likely increase the amount of airborne contaminants that ultimately deposit within wetlands and waterways potentially affecting water quality; however, air quality impacts will be addressed in a separate document entitled Air Quality Assessment Technical Memorandum for this Project (DMJM, 2006c).

5.0 CONCLUSIONS

The Project proposes activities within only three jurisdictional water resource areas: RPAs, RMAs and the Coastal Zone Management Area. The primary source of impact to water resources resulting from the planned improvements in these areas includes stormwater runoff during construction and operation. Review of the project's potential impacts to water resources is required by several agencies as summarized in Table 2. Review at the local level is required by the Arlington County Department of Community Planning, Housing and Development and the

City of Alexandria Department of Transportation and Environmental Services. The project is anticipated to be exempt from the Plan of Development review requirement by the City of Alexandria under their *Environmental Management Ordinance*. Review at the state level is required by the DCR and the VCP. Since this water resources technical memorandum was completed during the conceptual design phase of this project, all final project designs should be reviewed to ensure compliance with all federal, state, and local regulations.

Table 2: Summary of Anticipated Reviews and Approvals

Agency	Permit/Review	Requirement Criteria/Threshold Exceeded
Arlington County Department of Community Planning, Housing and Development	Plan of Development Review	Disturbance of 2,500 ft ² in a Resource Management Area (RMA)
City of Alexandria Department of Transportation and Environmental Services	Erosion and Sediment Control Plan Review	Any construction within City limits
Virginia Department of Conservation and Recreation	VPDES General Permit for Discharges of Stormwater from Construction Activities	Construction activity disturbing greater than one acre
Virginia Department of Environmental Quality, Coastal Zone Management Program (VCP)	Federal Consistency Certification	Utilizing federal funds and/or requiring federal approval for work within the Coastal Zone Management Area

Water Resources

Crystal City/Potomac Yard Transit Improvements Project

References

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