Montgomery Planning

THE MARYLAND-NATIONAL CAPITAL PARK AND PLANNING COMMISSION

MCPB
Item No.
Date: 04-15-21

Spring Gardens WWPS Site Selection, Mandatory Referral, MR2021016

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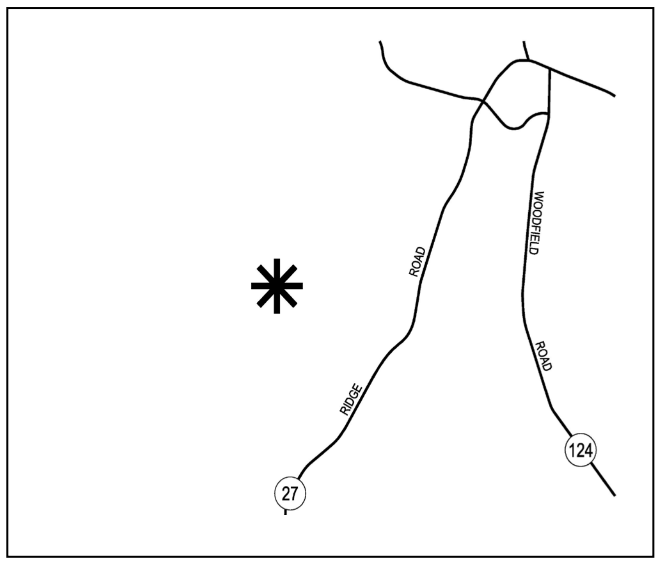
Completed: 4/5/21

Description

Request for Site Selection input for a replacement wastewater pumping station for the existing facility located at 25101 Kings Valley Road about 400 feet south of the intersection of Kings Valley Road and Kingstead Road in Damascus



Size: 0.14 acres
Zone: RE-2C Zone
Master Plan: 1985 *Damascus Master Plan*
Applicant: WSSC
Filing Date: February 5, 2021

Summary

- Staff recommends approval of the mandatory referral for the proposed WSSC WWPS site selection with conditions.
- This mandatory referral review is for site selection only. There are four possible sites, each with unique conditions (Historic, Rustic Roads, Environmental, and Parkland). A subsequent mandatory referral for site design and architecture will be filed at a later date.
- Staff has not received any correspondence on this Application as of the posting date of this report.

RECOMMENDATIONS AND COMMENTS
Staff recommends the Planning Board transmit the following comments to WSSC:

1. The Applicant must submit a separate Mandatory Referral application for review of the building, site design and related improvements.
2. The Applicant must submit a Subdivision Plan for the creation of a new lot to address applicable requirements of Chapter 50.

BACKGROUND AND PROJECT DESCRIPTION
WSSC owns and operates the Spring Gardens Wastewater Pumping Station (WWPS) located about 400 feet south of the intersection of Kings Valley Road and Kingstead Road in Damascus, Maryland. The WWPS and associated 8-inch ductile iron pipe (DIP) force main were built in 1976.

The WWPS is arranged in a wetwell/drywell configuration with two pumps conveying flow. The existing WWPS has a firm capacity of 0.432 million gallons per day (MGD). Hydraulic modeling indicates the existing design flow for the WWPS is 1.23 MGD, exceeding the firm capacity. Furthermore, a new development named Kingstead is planned to be served by this WWPS, requiring an additional 0.082 MGD of flow. The total future firm capacity will be 1.3 MGD.

Due to the age of the WWPS, its capacity issues, proximity to streams and wetlands, history of flooding, and environmental challenges, WSSC has selected four prospective sites for the new WWPS in the vicinity of the existing one, with the intent of permanently replacing the old facility. In December 2019, WSSC Water issued a task order to Mott MacDonald to evaluate these four pre-selected sites in accordance with the M-NCPPC Mandatory Referral requirements for this historically significant and environmentally sensitive area. Key stakeholders include WSSC Water, M-NCPPC, Montgomery County and the community.

In 2015 and 2018, Black and Veatch conducted Business Case Evaluations (BCEs) of the Spring Gardens Wastewater Pumping Station (WWPS). Based on the BCEs, the Washington Suburban Sanitary Commission (WSSC Water) has selected four sites, and Mott MacDonald has performed an evaluation of these alternatives in partnership with WSSC, the Maryland-National Capital Parks and Planning Commission (M-NCPPC), and Montgomery County Department of Environmental Protection (DEP). The purpose of this report is to define the evaluation criteria and weightings, provide the basis of scoring, and identify the best site for the new Spring Gardens WWPS. The results were presented to the community and comments were solicited at a meeting on November 17, 2020.

Mandatory Referral Review
The Mandatory Referral review process is conducted under the Montgomery County Planning Department's Uniform Standards for Mandatory Referral Review. State law requires all federal, state, and local governments and public utilities to submit proposed projects for a Mandatory Referral review and approval by the Commission. The law requires the Planning Board to review and approve the proposed location, character, grade and extent of any road, park, public way or ground, public (including federal) building or structure, or public utility (whether publicly or privately owned) prior to the project being located, constructed, or authorized. Thus, site selection for the relocation of the Spring Gardens wastewater pump station (WWPS) is required.

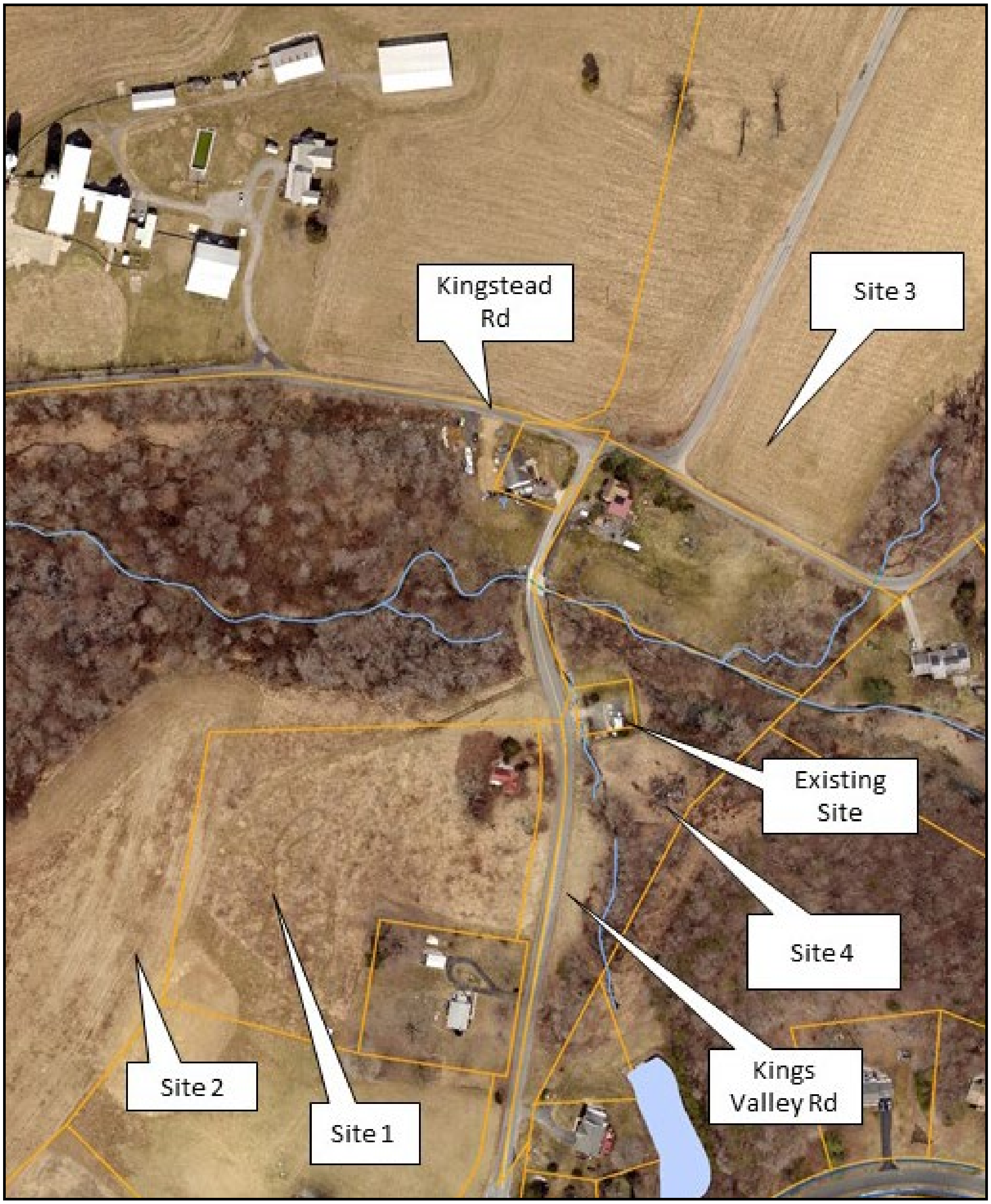


Figure 1: Overall Site Locations

<u>Existing Site</u>

The Spring Gardens WWPS located at 25101 Kings Valley Road, about 400 feet south of the intersection of Kings Valley Road and Kingstead Road in Damascus, Maryland; 0.14 acres; RE-2C Zone; 1985 Damascus Master Plan.

The existing facility has several issues which require the facility to be replaced, these include:

- Undersized for current and future needs
- Flooding
- Old facility (past life expectancy)

Proposed Site #1(as shown in figure 2 below)
This location was chosen because the surface elevation is similar to that of the proposed tie-in gravity manhole. The location also has plenty of open space to accommodate future buildouts as well as a stormwater management facility.

- Rear portion of 25020 Kings Valley Rd
- Private Ownership
- Historic property impacts
- Site is part of Charles M. King farm historic property and identified as an individual resource on the Montgomery County Locational Atlas
- Portion of site is within M-NCPPC 150-foot stream valley buffer (SVB) as defined by the Environmental Guidelines and would have SVB impacts
- Gravity main tie-in manhole will have MDE 25-foot wetland buffer impacts
- Force main will have MDE 25-foot wetland buffer impacts
- Stream crossings and SVB impacts

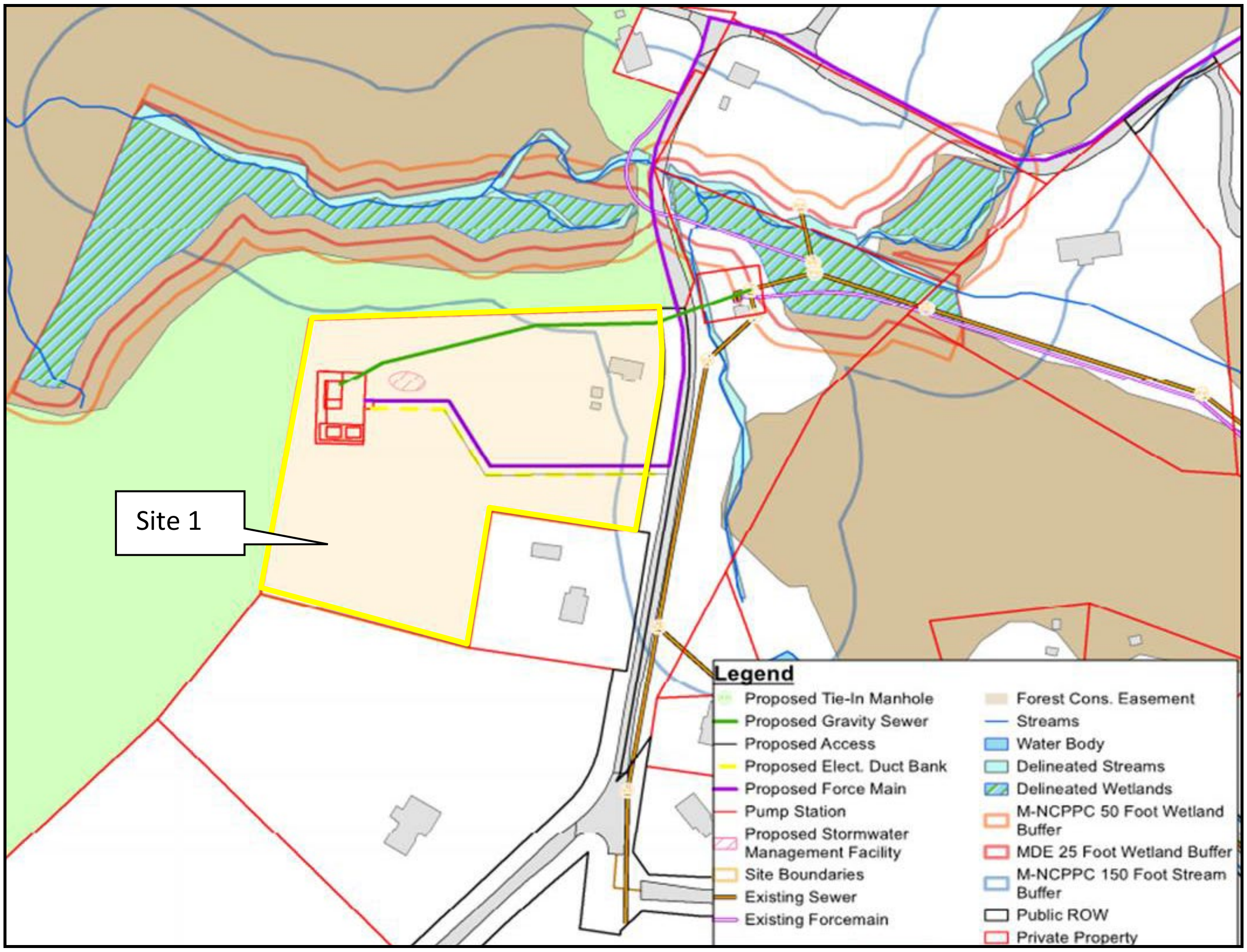


Figure 2: Site 1 (Highlighted in Yellow)

Site 1 includes constructing a new, higher capacity WWPS on a different parcel that is privately-owned and a Locational Atlas Individual Site: Charles M King Farm and then demolishing the existing WWPS. According to Maryland Department of Assessment and Taxation (SDAT), the land use is residential. It is assumed that the construction methodology for the WWPS will be the same for the other identified sites. It is assumed that the force main and gravity main extending from the parcel will be constructed with open cut construction methods. A historic building listed in the Maryland Inventory of Historic Properties (MIHP) is located on the proposed site it is listed as resource 10/040-001A which includes a two-story, three-bay, frame house that faces east, with a one-story porch over the front. Site 1 is located to the west of a proposed rustic road, Kings Valley Road. To the east, the site is adjacent to a wetland and forest owned by M-NCPPC.

Proposed Site #2 (as shown in figure 3 below)
This location was chosen because the surface elevation is similar to that of the proposed tie-in gravity manhole. The location also has plenty of open space to accommodate future buildouts as well as a stormwater management facility, while staying out of the M-NCPPPC 150-foot SVB

- Behind 25020 Kings Valley Rd
- Ownership: M-NCPPC Parkland

- Site is part of Charles M. King farm historic property and identified as an individual resource on the Montgomery County Locational Atlas
- Portion of site is within M-NCPPC 150-foot stream valley buffer (SVB) as defined by the Environmental Guidelines and would have SVB impacts
- Gravity main tie-in manhole located within/near MDE 25-foot wetland buffer
- Force main runs through MDE 25-foot wetland buffer
- Stream crossings

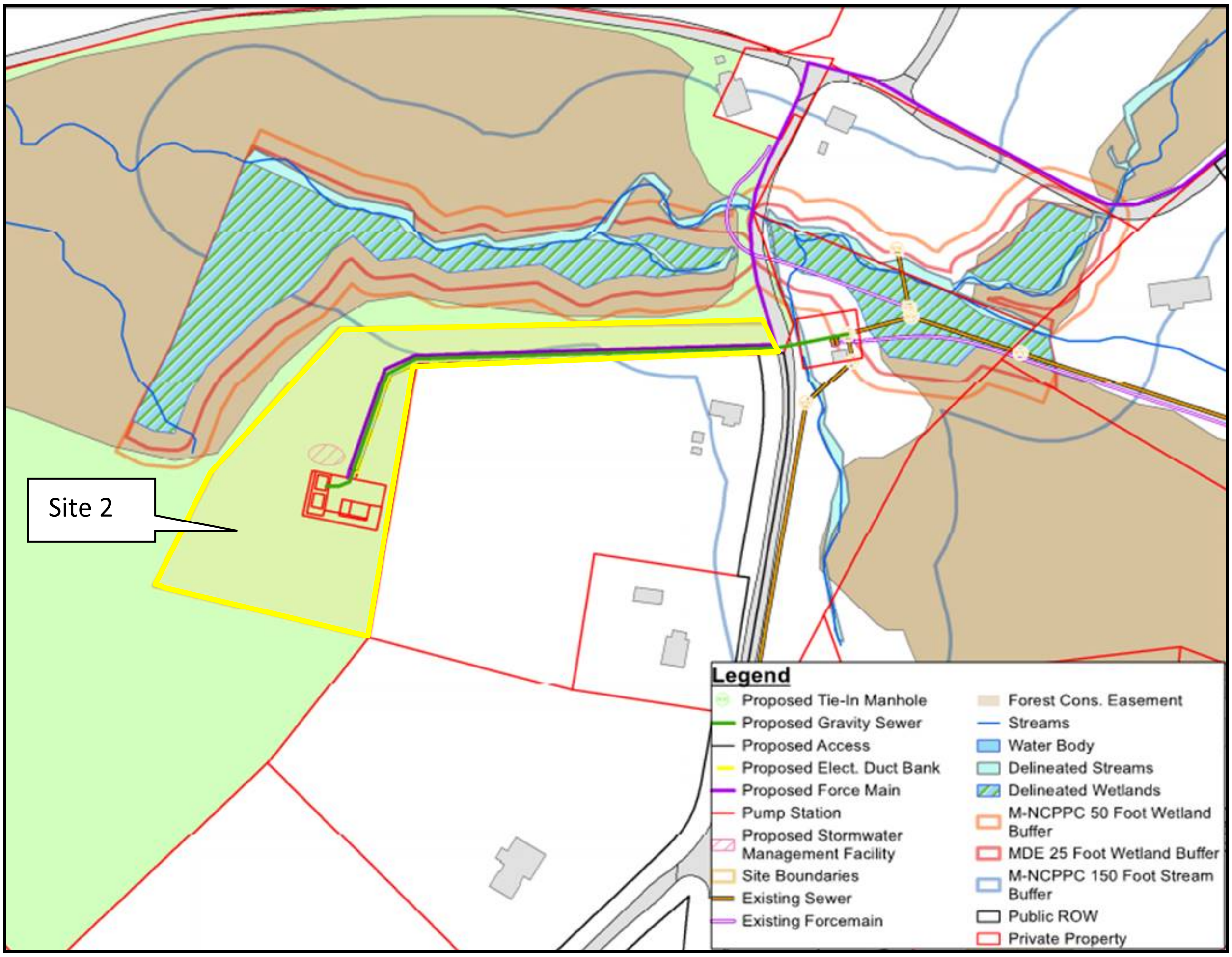


Figure 3: Site 2 (Highlighted in yellow)

Site 2 includes constructing a new, higher capacity WWPS on a different parcel that is historically protected and then demolishing the existing WWPS. According to SDAT, the land use is exempt. It is assumed that the construction methodology for the WWPS will be the same for the different sites. It is assumed that the force main and gravity main extending from the parcel will be constructed with open cut construction methods. The site is located entirely on M-NCPPC-owned parcels. Site 2 is located directly southeast of a delineated wetland and forested area. Site 2 is directly adjacent to the west side of Site 1 with a sliver spanning the north side of Site 1 in order to provide access to Kings Valley Road. The topographical elevation changes of approximately 20 feet which will provide for a relatively flat sight.

Proposed Site #3 (as shown in Figure 4 below)
This location was proposed in the southwest corner of the parcel. This location was chosen because the surface elevation is lower on the southern portion of the site when compared to the northern portion of the site. The location also shortens the length of gravity main that will need to be jack and bored while also staying out of the M-NCPPC 150-foot SVB. The location also has enough open space to accommodate future buildouts as well as a stormwater management facility.

- 11415 Kingstead Rd
- Private Ownership
- A portion of the site is within M-NCPPC 150-foot stream valley buffer (SVB) as defined by the Environmental Guidelines and would have SVB impacts
- Gravity main tie-in manhole located within/near MDE 25-foot wetland buffer
- Gravity main will have to run through or under a wetland and private property
- Steep site
- Due to the site elevation, the WWPS will have a deeper wetwell compared to other Sites

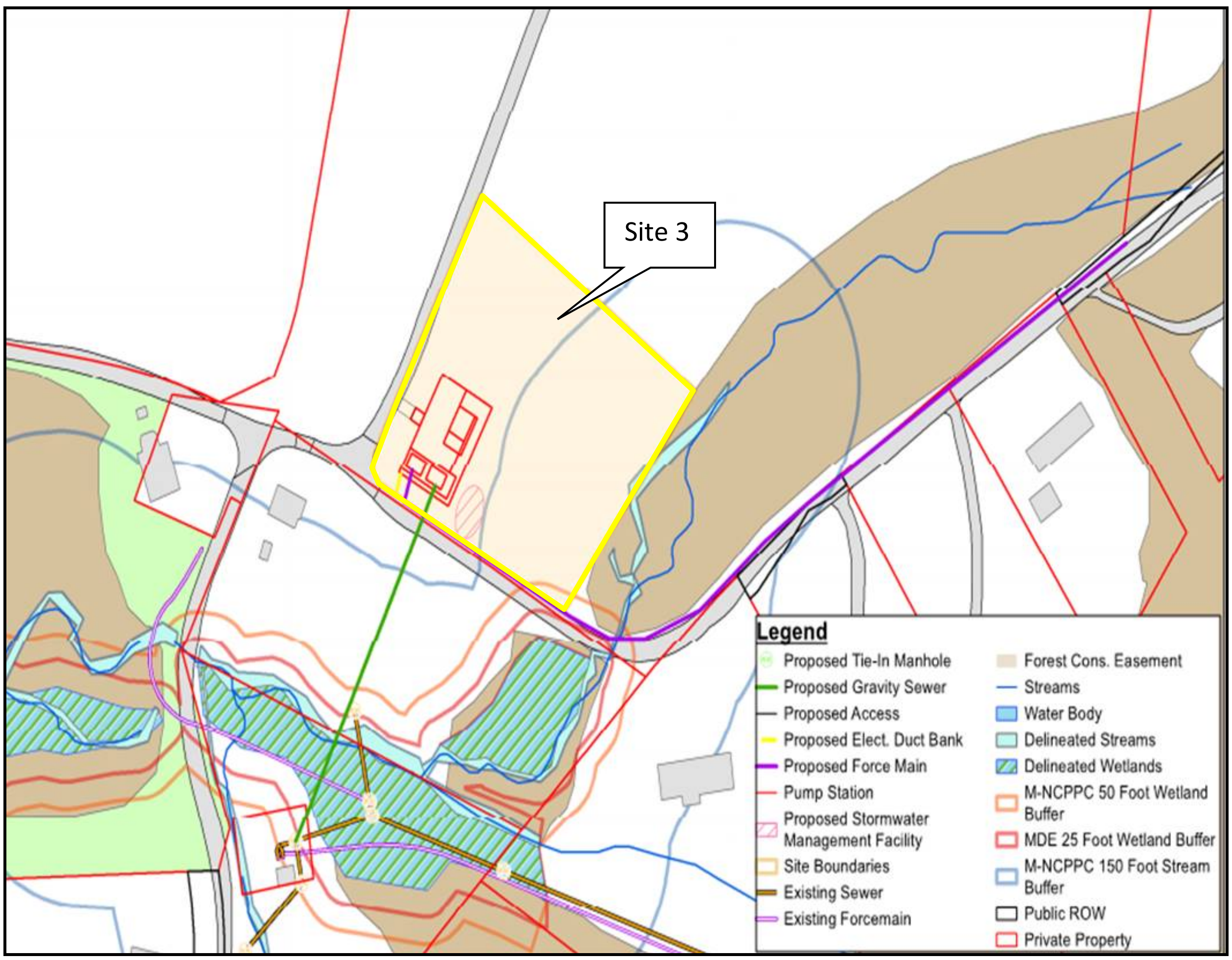


Figure 4: Site 3 (Highlighted in yellow)

Site 3 includes constructing a newer, higher capacity WWPS on a different parcel that is privately-owned and then demolishing the existing WWPS. According to SDAT, the current land use is agricultural. It is assumed that the construction methodology for the WWPS will be the same for the different site. It is assumed that the force main extending from the parcel will be constructed with open cut construction methods, while the gravity main will be constructed using the jack and bore method. This site is located on steeper ground; the topographical elevation changes by 30 feet which means steeper slopes.

Proposed Site #4

This site is located south of the existing WWPS on WSSC owned property and was chosen because it avoids direct construction in forest conservation easements and delineated wetlands.

- Adjacent to 25101 Kings Valley Road
- Ownership: WSSC
- Site is partially within M-NCPPC 150-foot SVB as defined by the Environmental Guidelines and would have SVB impacts
- Portion of site is within MDE 25-foot wetland buffer
- Portion of site is classified as a wetland
- Site located within the 100-year floodplain
- Force main runs through MDE 25-foot wetland buffer
- Stream crossings

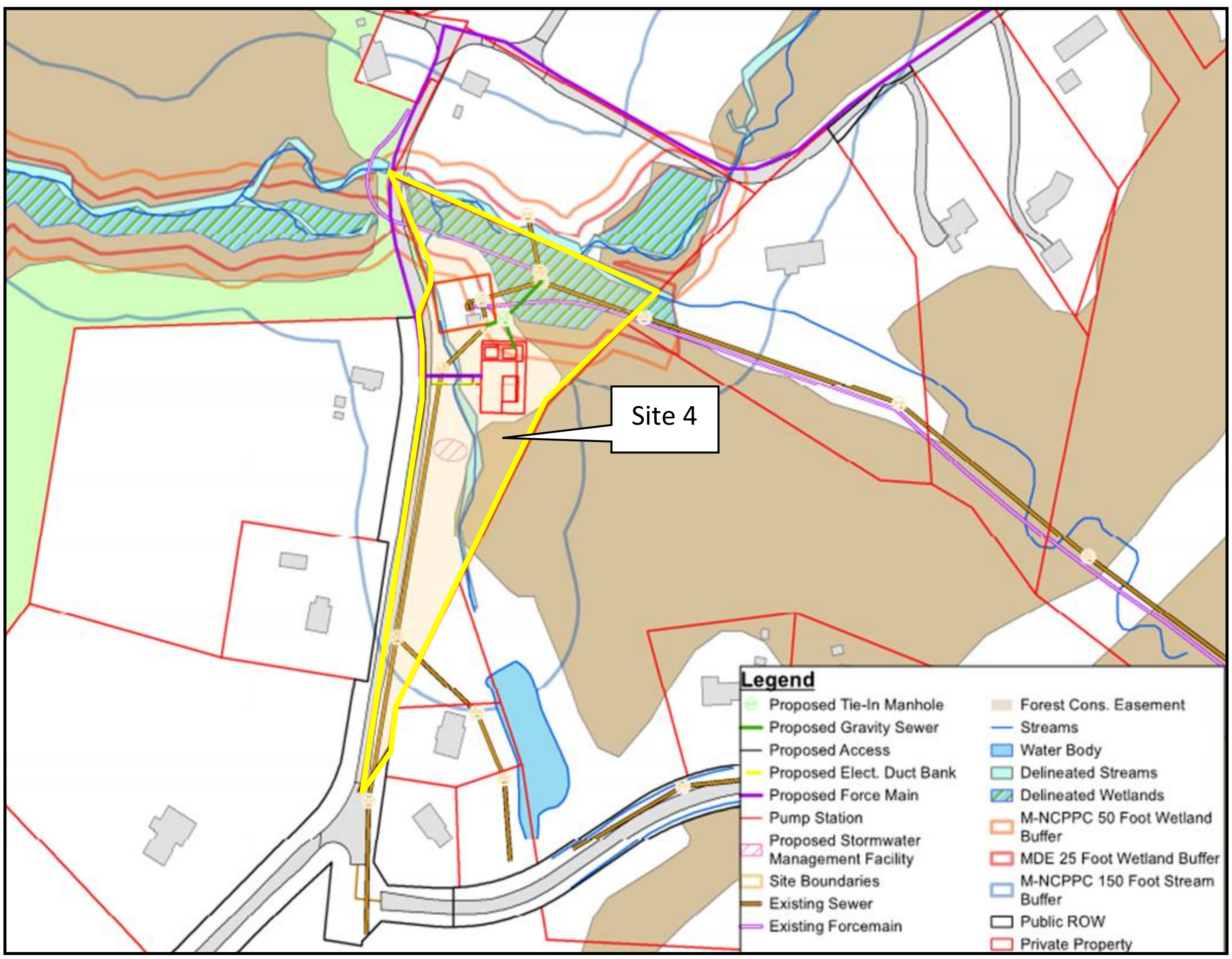


Figure 5: Site 4 (Highlighted in yellow)

Site 4 includes constructing a new, higher capacity WWPS on the same parcel but in a different location and then demolishing the existing WWPS. Site 4 is located on land already owned by WSSC Water. It is assumed that the WWPS construction methodology will be the same for the different sites. It is assumed that the force main and gravity main extending from the parcel will be constructed with open cut construction methods. The topographical elevation changes by 60 feet which means steeper slopes. The existing parcel is prone to flooding due to proximity to a nearby unnamed creek that intersects the site. Previously, a historic building was located on this parcel. The building burned down recently and is no longer considered a historic property.

Site Selection Scoring

A pairwise comparison table (Figure 6) is used to weight the criteria. Each criterion is scored against the eleven other criteria to assess the "relative importance." The sum of the scores for each pair of criteria must add up to ten. For example, if Project Cost is scored as a six as compared to Project Schedule, then Project Schedule is scored as a four compared to Project Cost. The total score for each criterion then becomes its "weighting" compared to the other criteria. The criterion with the highest total score is therefore the most heavily weighted and relatively the most important criterion.

	Total Life Cycle Costs	Schedule Duration	Planning and Future Need	Easement / Right-of-Way	Operation & Maintenance	Constructability Risk	Permitting Requirements	Historic Preservation	Rustic Road Committee Master Planning	Environmental Impact	Community Impact	Parkland Impacts	Total	Relative Weight
Quantitative Criteria														
Total Life Cycle Costs	-	8	5	2	5	5	7	5	5	4	8	3	57	9%
Schedule Duration	2	-	4	1	2	5	5	2	2	3	6	2	34	5%
Qualitative Criteria														
Planning and Future Need	5	6	-	1	5	7	8	2	5	5	7	5	56	8%
Easement / Right-of-Way	8	9	9	-	8	8	8	5	5	7	7	5	79	12%
Operation & Maintenance	5	8	5	2	-	6	7	2	3	5	7	3	53	8%
Constructability Risk	5	5	3	2	4	-	5	2	5	5	5	3	44	7%
Permitting Requirements	3	5	2	2	3	5	-	5	5	3	5	3	41	6%
Historic Preservation	5	8	8	5	8	8	5	-	6	5	5	4	67	10%
Rustic Road Committee Master Planning	5	8	5	5	7	5	5	4	-	5	5	4	58	9%
Environmental Impact	6	7	5	3	5	5	7	5	5	-	5	5	58	9%
Community Impact	2	4	3	3	3	5	5	5	5	5	-	2	42	6%
Parkland Impacts	7	8	5	5	7	7	7	6	6	5	8	-	71	11%

Figure 6: Pairwise Comparison Used to determine Weight of Each Scoring Criteria

On March 2, 2020, Mott MacDonald, WSSC Water, M-NCPPC, and Montgomery County met to weight the criteria.

The final selection process for the four sites considers both quantitative and qualitative criteria. Twelve criteria have been identified to evaluate the sites. The constraint may be property ownership (easement), physical such as land available, environmental conditions or constructability. For a complete definition of each criteria please refer to the full technical report (Attachment A).

1. Total life cycle costs
   Cost estimates have been prepared for the four Sites to further evaluate the projected construction and operating costs. The major differences in costs are the length of the force main, gravity main, electrical duct bank, and access road. Since Site Alternative 4 is estimated to be the least costly alternative, it is assigned the highest score, which is 9. Site Alternative 3 is within 15% of the cost of Site Alternative 4 so it also receives a 9. Site Alternative 1 is within 16%-30% of the cost of Site Alternative 4 so it receives a 7. Site Alternative 2 is within 31%-41% of the cost of Site Alternative 4 so it receives a 5.

2. Schedule duration
   The schedules for the four alternatives have been evaluated by using similar WSSC Water projects to develop laydown rates (feet/week) for the force mains, gravity mains, electrical duct banks, and access roads. The individual linear footage of each item was then divided by the laydown rates to obtain a general idea of the duration. The individual laydown rates can be found in Appendix D. The design, permitting, and bid phase are estimated to have the same duration for the four site alternatives. The major difference in construction duration is in the lengths of the of the force main, gravity main, electrical duct bank, and access road. Since Site Alternative 4 is estimated to have the shortest construction duration, it is assigned the highest score, which is 9. Site Alternatives 1 and 3 are within 10% of the duration of Site Alternative 4 so they receive a 9. Site Alternative 2 is within 11%-30% of the duration of Site Alternative 4, so it receives a 7.

3. Planning and Future Need
   This scoring criterion is based on the size of the parcel. Since the parcel size of Sites 1 through 4 is much larger than 10,000 square feet, they all received a 9. 10,000 square area needed to construct the WWPS site layout. The 10,000 square feet accounts for additional area needed during the construction phase and is based off of the WSSC Water WWPS design guidelines (DG-07).

4. Easements/Rights-of-way
   This scoring criterion is based on the number of private property easements required for each Site. Due to the plats along Kings Valley Road and Kingstead Road extending into the roadway, Sites 1, 2 and 4 will require two private property easements from the Actis and Nagy properties. Therefore, those sites receive a 3. Site 3 only requires one private property easement from the Nagy property, so it receives a 5.

5. <u>Operations and Maintenance</u>
   This scoring criterion is based on the location of work relative to public ROW, whether or not the site housed a historic structure, and the location of the site relative to the floodplain. The work for Sites 1 through 4 will predominately be done outside of public ROW. Therefore, Sites 1 through 4 receive a 1 in that portion of the scoring. Sites 2 through 4 do not have any historic structures located on site and receive a 2 in that portion of the scoring. Site 1 does have a historic building on site and receives a 1 in that portion of the scoring. Sites 1 through 3 are not within the floodplain and receive a 2 in that portion of the scoring. Site 4 is located within a floodplain and receives a 1 in that portion of the scoring. Summing up the individual portions of the scoring for each site results in Sites 1 through 4 receiving a total score of 4, 5, 5, and 4, respectively.

6. <u>Constructability Risk</u>
   The constructability of the sites is evaluated based on the site conditions and the existing utilities and structures. Sites 1, 3, and 4 receive a 9 because the sites do not have any major constructability risks in the form of overhead wires or existing utilities on site that will inhibit construction. While Site 2 does not have any major constructability risks, it does have some overhead wires that could inhibit construction. Therefore, Site 2 receives a 6.

7. <u>Permitting Requirements</u>
   This criterion is scored based on the number of permits required and the assumed risks associated with obtaining the permits. An environmental permit is weighted more heavily than a non-environmental permit. The number of required permits for the sites are based on the stream crossings, parkland impact, wetland impact and other environmental factors. Sites 1 through 4 receive a 1, because each site requires at least two environmental permits.

8. <u>Historic Preservation</u>
   This criterion is scored based on whether the site is designated as a historically significant site or area by M-NCPPC and Montgomery County. This analysis is based on data available on or prior to 12/11/2020. Sites 1, 2, and 4 receive a 5 because the sites are a part of the historic Charles M. King Farm, which is listed on the M-NCPPC Locational Atlas. Sites 1 and 2 will require M-NCPPC oversight but not a HAWP. Site 3 receives a 9, because the site is not considered a historical site.

9. <u>Rustic Roads</u>
   This criterion is scored based on the direct impacts to rustic roads designated by the Montgomery County Rustic Roads Program, and the visibility of the WWPS from the rustic roads. Sites 1 through 4 receive a 7 because the properties are adjacent to Kings Valley Road, which is recommended to become a rustic road. The WWPS will not be visible from the Kings Valley Road for Sites 1 and 2, but it will be visible from the road for Sites 3 and 4. Site 3 is also adjacent to Kingstead Road, but this portion of Kingstead Road is not a current or proposed future rustic road.

10. <u>Environmental Impacts</u>
   The environmental impact of the sites is evaluated and scored based on the amount of impact during construction on environmentally sensitive areas such as wetlands, floodplains, forests, streams, etc. Sites 1 through 3 receive a 5, because the work required to construct the proposed force main and gravity main will result in temporary impacts to streams and the MDE 25-foot

wetland buffer. Site 4 receives a 1, because the work required would impact multiple streams, forested area, and the delineated wetland on the site.

11. Community Impacts
    This criterion is scored based on the disruptions that the proposed work may have on the community such as potential traffic delays, odor, and noise impacts, etc. Sites 1 through 4 received a 7, because the work will have traffic impacts on Kings Valley Road and Kingstead Road. The work can be sequenced in a manner that will only require one lane closure in order to avoid shutting down the entire roadway or working at night.

12. Parkland impacts
    This criterion is scored based on the disruptions that the proposed work may have on parkland. Sites 1, 2, and 4 receive a 5, because the proposed work will impact M-NCPPC parkland property. The work will also require mitigation and a Park Construction Permit. Site 3 receives a 9, because it will not impact any parkland.

Using the weighted factors (Figure 6), Mott MacDonald, WSSC Water, M-NCPPC, and Montgomery County met on June 12, 2020 to score the four sites. The list below shows the final scores for Site 1, 2, 3 and 4.

Final Total Scoring (higher score better):
Site 1: 4962.3
Site 2: 4734.7
Site 3: 5883.0
Site 4: 4645.0

Community Meeting
These final scores and a recommendation for proceeding with Site 3 was presented at the November 17, 2020, community meeting. No objections or concerns for selection of Site 3 were raised at the meeting. The only comment received was a concern regarding the safety of the intersection of Kingstead and Kings Valley Roads, although it was noted that this comment was not related to the Site Selection.

Applicant's Recommendation
Based on scoring results, concurrence among the stakeholders on the results and general acceptance expressed at the Community Meeting, WSSC submitted the Mandatory Referral application for consideration of Site 3 for location of the new Spring Gardens WWPS.

Staff Recommendation
Each Site has specific drawbacks and implications on different policies and regulations and using the weighted criteria developed in cooperation with the involved agencies Site 3 received the highest score. Therefore, Staff recommends Site 3 as the preferred location for the Spring Gardens WWPS replacement facility.

CONCLUSION
Based on information provided by the Applicant and the analysis contained in this report, Staff recommends approval of the Mandatory Referral with comments listed at the beginning of this report to be transmitted to WSSC Water.

Attachments:

A. WSSC Water Spring Gardens Wastewater Pumping Station Site Selection Study Report

Attachment A

WSSC Water Planning Division Contract 1154 Project No. CP6698A19

Replacement Planning BOA

December 23, 2020

Washington Suburban Sanitary Commission

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WSSC Water Planning Division Contract 1154 Project No. CP6698A19

Replacement Planning BOA
Spring Gardens Wastewater Pumping Station
Site Selection Study Report

December 23, 2020

Washington Suburban Sanitary Commission

Issue and revision record

Revision	Date	Originator	Checker	Approver	Description
0	12/23/2020	ZB/DS	TW	BA	FINAL

Document reference:

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1 Introduction

In 2015 and 2018, Black and Veatch conducted Business Case Evaluations (BCEs) of the Spring Gardens Wastewater Pumping Station (WWPS). Based on the BCEs, the Washington Suburban Sanitary Commission (WSSC Water) has selected four sites, and Mott MacDonald has performed an evaluation of these alternatives in partnership with WSSC Water, the Maryland National Capital Parks and Planning Commission (M-NCPPC), and Montgomery County. The purpose of this report is to define the evaluation criteria and weightings, provide the basis of scoring, and identify the best site for the new Spring Gardens WWPS. The results were presented to the community and comments were solicited at a meeting on November 17, 2020.

1.1 Project Background

WSSC Water owns and operates the Spring Gardens WWPS located about 400 feet south of the intersection of Kings Valley Road and Kingstead Road in Damascus, Maryland. The WWPS and associated 8-inch ductile iron pipe (DIP) force main were built in 1976 under contract 71-4656D.

The WWPS is arranged in a wetwell/drywell configuration with two pumps conveying flow. The existing WWPS has a firm capacity of 0.432 million gallons per day (MGD). Hydraulic modeling indicates the existing design flow for the WWPS is 1.23 MGD, exceeding the firm capacity. Furthermore, a new development named Kingstead is planned to be served by this WWPS, requiring an additional 0.082 MGD of flow. The total future firm capacity will be 1.3 MGD.

Due to the age of the WWPS, its capacity issues, proximity to streams and wetlands, history of flooding, and environmental challenges, WSSC Water has selected four prospective sites for the new WWPS in the vicinity of the existing one. In December 2019, WSSC Water issued a task order to Mott MacDonald to evaluate these four pre-selected sites in accordance with the M-NCPPC Mandatory Referral requirements for this historically significant and environmentally sensitive area. Key stakeholders include WSSC Water, M-NCPPC, Montgomery County and the community.

1.2 Prior Planning Efforts

Black and Veatch performed BCEs in 2015 and 2018 of the Spring Gardens WWPS, which can be found in **Appendix A**. The purpose of these reports was to determine which alternatives would be the best selection for WWPS replacement. Five sites were initially considered. Of the five sites, the “Do Nothing” scenario was considered, and ultimately rejected. In this scenario, all ongoing operation and maintenance would cease, allowing the WWPS to run to failure within 2 months and eliminating any existing capacity. 25 force main alternatives were also considered in the 2018 BCE. Of the 25 force main alternatives, 12 were selected for further analysis. Force main Alternative 24 was recommended in the 2018 BCE and is depicted in **Figure 1-1**. For this WSSC Water evaluation, the force main extending from the site will be evaluated up to the cut-off point (shown in blue on **Figure 1-1**) in order to achieve a consistent analysis. Any further evaluation of the force main alternatives past the cut-off point is beyond the scope of this WWPS evaluation.

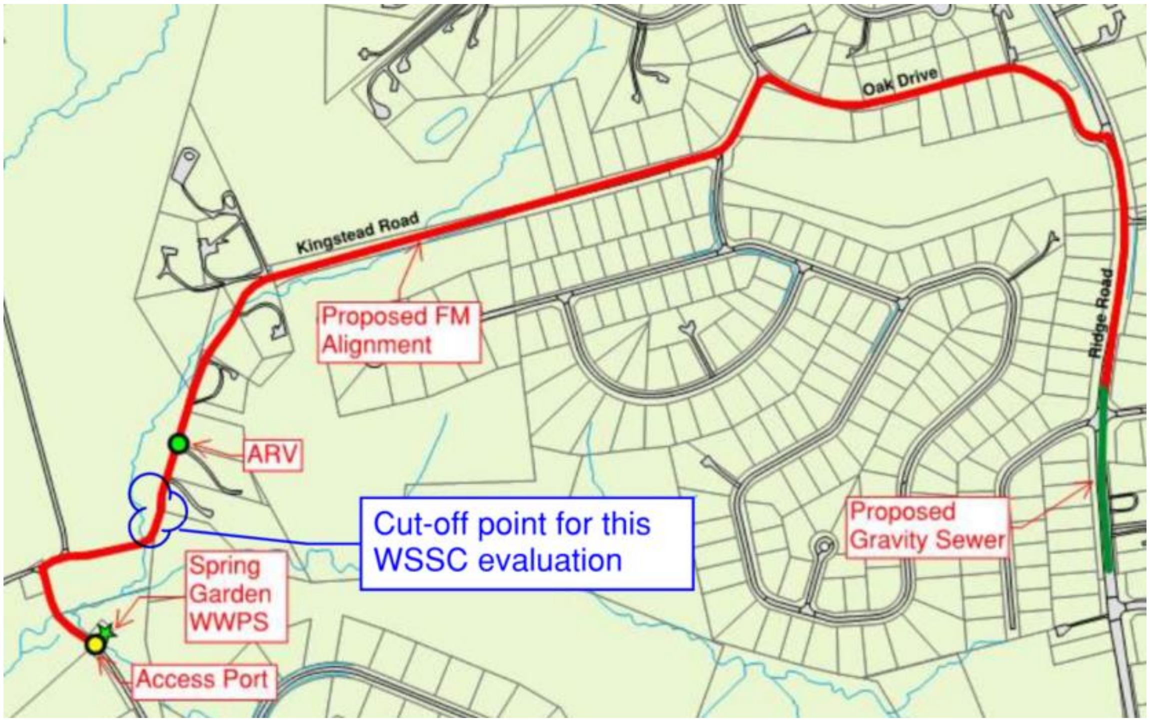


Figure 1-1: 2018 BCE Recommended Force Main Alternative 24

Of the four sites evaluated, Site 4 is the only option from the 2015 BCE. The other three site alternatives were rejected due to proximity to the main roads, and proximity to the new development (Kingstead). This report will discuss the newly proposed sites 1, 2, and 3 as well as the Site 4, proposed in the 2018 BCE.

2 Selection of Final Scoring Criteria

The following sections describe the evaluation criteria and associated weightings used in the evaluation.

2.1 Criteria for Evaluation

The final selection process for the four sites considers both quantitative and qualitative criteria. Twelve criteria have been identified to evaluate the sites. Parcels that are fatally flawed will be eliminated and excluded from scoring. A fatal flaw in this case is defined as the existence of a constraint that prevents the siting at that location. The constraint may be property ownership (easement), physical such as land available, environmental conditions or constructability.

2.1.1 Total Life Cycle Cost

A major driver for the project is total project cost including design, management, permitting, required land and easement acquisition, extension of electrical service and construction. Potential cost savings from coordination with other capital projects will also be considered. WWPS operations and maintenance (O&M) costs for the alternatives were assumed to be equal across the alternatives. However, other costs following construction completion will vary, including stormwater management, roadway maintenance, and any historic building maintenance. These costs were not included in this analysis as they are relatively minor compared to design and construction.

Total project costs will be evaluated using net present value analysis.

Guideline for Scoring Criterion:

9 – Lowest total cost alternative, or less than or equal to 15% of lowest cost alternative

7 – Alternative cost within 16% and 30% of the lowest cost alternative

5 – Alternative cost within 31% and 45% of the lowest cost alternative

3 – Alternative cost within 46% and 60% of the lowest cost alternative

1 – Alternative greater than or equal to 61% of the lowest cost alternative

2.1.2 Schedule Duration

The schedule must consider both construction duration and the time required to secure easements, acquire land, and obtain permits. Projects that demonstrate faster field production rates (i.e. feet per day) and include fewer utility and environmental feature crossings are more favorable. Scheduling impacts from coordination with other WSSC Water and Maryland Department of Transportation (MDOT) capital projects are also considered. The schedules will consider tasks required for project completion (i.e. engineering, permit and easement acquisition, bidding, and construction).

Guideline for Scoring Criterion:

9 – Shortest total duration alternative (including design), or less than or equal to 10% of shortest alternative

7 – Total duration within 11% and 20% of the shortest duration alternative

5 – Total duration within 21% and 30% of the shortest duration alternative

3 – Total duration within 31% and 40% of the shortest duration alternative

1 – Greater than or equal to 41% of the shortest duration alternative.

2.1.3 Planning and Future Need

This criterion considers the area for construction and future expansions of the WWPS. The proposed site must accommodate the proposed WWPS footprint, access and egress for a maintenance truck (based on a 6,000-gallon tanker), landscaping, and space requirements for stormwater management. Difficulty with providing adequate separation from other utilities during installation is also considered to account for problems associated with future maintenance.

In the 2015 BCE, it was assumed that the new 1.3 million gallon per day (MGD) WWPS would include an 8-foot by 8-foot wetwell, 30-foot by 30-foot drywell, and 30-foot by 30-foot control building (Black and Veatch, 2015, p. 19). Furthermore, WSSC Water's Pipeline Design Manual require 10-foot horizontal and 2-foot vertical separations between water and sewer mains. At a minimum, the selected alternative must be 10,000 square feet in size. The proposed work must also comply with the WSSC Water's Pipeline Design Manual and DG-07 Standard.

As the Damascus service area continues to grow, the Spring Gardens WWPS may need to expand beyond 1.3 MGD according to increased sewerage demands. The ease of future expansion with respect to site size and accessibility will also be considered.

Guideline for Scoring Criterion

9 – Parcel is larger than 10,000 square feet in size. Proposed work complies with the WSSC Water's Pipeline Design Manual and DG-07 Standard.

5 – Parcel is between 6,500 and 10,000 square feet in size. Proposed work complies with the WSSC Water's Pipeline Design Manual and DG-07 Standard.

1 – Parcel is less than 6,500 square feet in size, and/or the proposed work does not comply with the WSSC Water's Pipeline Design Manual and DG-07 Standard.

2.1.4 Easement/Right-of-Way (ROW)

This criterion considers the difficulty of obtaining permanent and temporary easements (construction strips) and ROWs that may be required for the project. The evaluation will consider the number and type of easements required. The evaluation will only consider private property easements and exclude historic sites and park properties in this criterion. Easements for historic sites and park properties will be considered in the Historic Preservation and Permitting Requirements criteria respectfully. WSSC Water has identified past projects where easements were believed to be obtainable via verbal communication or even a Memorandum of Understanding (MOU), but later in the project could not be negotiated or secured. Thus, consideration of this criterion accounts for the risk of a fatal flaw for alternatives if an easement is unobtainable or at risk of becoming unobtainable in the future.

Guideline for Scoring Criterion:

9 – Proposed work located entirely within land owned by WSSC Water, existing easements, or public ROWs. No new easements will be required for the work.

7 – One new easement or ROW required with written agreement(s) in place. Easement or ROW not located in a residential area.

5 – One new easement or ROW required with no written agreement in place. Easement or ROW located in a residential area.

3 – Two new easements or ROWs required, at least one without an agreement in place. At least one easement or ROW located in a residential area.

1 – More than two new easements or ROWs required, and at least two without an agreement in place. Two or more easements or ROWs located in a residential area.

2.1.5 Operation and Maintenance (O&M)

This criterion considers the ability to access the WWPS for O&M and future sewer extensions. This criterion also considers risks from natural events, failures of adjacent facilities, etc.

Given the number of factors under consideration, points shall be awarded according to the following guideline.

Guideline for Scoring Criterion:

<u>Location Relative to Public ROW</u>

5 points – Proposed site is located fully in the public ROW.

3 points – Proposed site is located predominantly in the public ROW.

1 point – Proposed site is located predominantly outside the public ROW.

<u>Historical Structures</u>

2 points – No historical structures located on the proposed site.

1 point – Historical structures located on the proposed site.

<u>Location Relative to Floodplain</u>

2 points – Proposed site is located 5 feet above the floodplain.

1 point – Proposed site is located between 0 and 5 feet above the floodplain.

Any alternatives located at or below the floodplain are considered fatally flawed and are eliminated from further consideration.

2.1.6 Constructability Risk

Constructability risk considers major construction challenges that would be beyond the scope of a typical WWPS installation and sewer extension. Constructability scoring considers geotechnical, soil type, groundwater table, temporary bridge, temporary access road, institutional, and major worker safety considerations. Risks to property, structures, existing utilities, and overhead wires that may inhibit construction are also considered.

Given the number of factors under consideration, points shall be awarded according to the following guideline.

Guideline for Scoring Criterion:

<u>Site Conditions</u>

5 points – Site does not have any major constructability risks.

3 points – Site has identified constructability risks, but they can be mitigated through proper design.

1 point –Site has major constructability risks that cannot be easily mitigated.

Existing Utilities & Structures

4 points – No existing structures, utilities, or overhead wires that may inhibit construction.

1 point – Existing structures, utilities, or overhead wires that inhibit construction.

NOTE: Constructability risk is different from constructability cost. More expensive construction methods are covered under the "Total Project Cost" criterion.

2.1.7 Permitting Requirements

This criterion scores the complexity of acquiring the required permits to perform the work, including the number of permits required and level of difficulty for each. A desktop review will be conducted for the four alternatives to identify potential permitting needs (e.g. proximity to wetlands, alignment within the flood plain, road moratoriums, etc.). Once the permits are identified, initial contact in the subsequent pump station preliminary design phase should be made with the regulating agency to identify any extraordinary requirements (e.g. wetlands mitigation). The relevant regulating agencies include the U.S. Army Corps of Engineering (USACE), Maryland Department of the Environment (MDE), Montgomery County, and M-NCPPC. It is understood that Montgomery County and M-NCPPC have more stringent permitting requirements (e.g. extended buffers) and these will be considered in the scoring.

Guideline for Scoring Criterion:

9 – No permits required.

8 – One permit is required which is not environmental.

7 – Two or three permits are required, none of which are environmental.

6 – Four permits are required, none of which are environmental.

5 – Five permits are required, none of which are environmental.

4 – Six permits are required, none of which are environmental.

3 – Seven or more permits are required, none of which are environmental.

2 – One environmental permit is required.

1 – Two or more environmental permits are required.

In rare cases, it may be understood that certain permits are not obtainable within the required timeframe of the project, creating a fatal flaw which would remove an alternative from further consideration.

NOTE: Schedule impacts for obtaining permits is factored into the scoring of the "Schedule Duration."

2.1.8 Historic Preservation

This criterion considers direct impacts to historically significant sites or areas, especially those designated by M-NCPPC and Montgomery County. These sites are protected from demolition or substantial alteration.

Guideline for Scoring Criterion

9 – Proposed site is not listed on the M-NCPPC Locational Atlas or the Montgomery County Master Plan for historic preservation.

5 – Proposed site is listed on the M-NCPPC Locational Atlas. Proposed work does not a require a Historic Area Work Permit (HAWP), but other building permits may be required. M-NCPPC staff approval is required.

1 – Proposed site is listed in the Montgomery County Master Plan for Historic Preservation as an individual historic site or located in a historic district as defined by the Master Plan. Proposed work requires a HAWP. M-NCPPC staff and commission approval is required.

2.1.9 Rustic Road Committee Master Planning

This criterion considers direct impacts to rustic roads, especially those designated by the Montgomery County Rustic Roads Program. These roads are historic and scenic roadways that are to be preserved by retaining certain physical features and by ROW maintenance procedures.

Guideline for Scoring Criterion

9 – Proposed work is not located on a rustic road and has low visibility from the roadway.

7 – Proposed work is not located on a rustic road, but WWPS is visible from the roadway. Consultation with the Montgomery County Rustic Roads Advisory Committee may be required if road become rustic roadway.

5 – Proposed work is located on a rustic road, but WWPS has low visibility from the rustic road. Consultation with the Montgomery County Rustic Roads Advisory Committee is required.

1 – Proposed work is located on a rustic road, and WWPS is located directly adjacent to the road or has high visibility from the rustic road. Consultation with the Montgomery County Rustic Roads Advisory Committee is required.

2.1.10 Environmental Impact

WSSC Water is dedicated to constructing projects in an environmentally sustainable manner. This criterion considers direct impacts to environmentally significant areas and environmental assets including protected species and habitat, wetlands, forest (especially the cutting of trees greater than 30-inches in trunk diameter), stream valleys, parkland, and steep slopes.

Guideline for Scoring Criterion:

9 – Proposed work will not impact environmental resources.

5 – Proposed work will temporarily impact environmental resources, and temporary mitigation is required.

1 – Proposed work will permanently impact environmental resources and will require mitigation.

2.1.11 Community Impact

This criterion considers disruptions that the proposed work may have on the community. This includes potential traffic delays, odor and noise impacts, impacts to local business operations or residential neighborhoods, and proximity to schools, houses of worship, etc. Public frustrations with additional construction to roads that have recently undergone streetscape or other construction projects are considered.

Guideline for Scoring Criterion:

9 – Proposed work will not require traffic control.

7 – Proposed work requires one lane closure.

5 – Proposed work impacts a school, church, or residences; noise or odor control is required.

3 – Proposed work impacts a road with an existing moratorium or project that has undergone construction within the last three years.

1 – Proposed work requires entire road closure (or work at night required).

2.1.12 Parkland Impacts

This criterion considers disruptions that the proposed work may have on parkland. Where non-parkland alternatives are prohibitive based on environmental, economic, social, or engineering impacts, impacts to parkland will be mitigated. Where impacts are so significant that the parkland must be acquired, parkland replacement and/or a compensation plan may be required. Replacement will be at an equal or greater natural, cultural, and/or recreational value.

Guideline for Scoring Criterion:

9 – Proposed work will not impact parklands.

5 – Proposed work will impact parklands; mitigation and a Park Construction Permit is required.

1 – Proposed work will impact parklands and WSSC Water must permanently take ownership of the parkland; a Park Construction Permit, parkland replacement, and/or a compensation plan are required.

2.2 Criteria Weighting

A pairwise comparison table is used to weight the criteria. Each criterion is scored against the eleven other criteria to assess the "relative importance." The sum of the scores for each pair of criteria must add up to ten. For example, if Project Cost is scored as a six as compared to Project Schedule, then Project Schedule is scored as a four compared to Project Cost. The total score for each criteria then becomes its "weighting" compared to the other criteria. The criterion with the highest total score is therefore the most heavily weighted and relatively the most important criterion.

On March 2, 2020, Mott MacDonald, WSSC Water, M-NCPPC, and Montgomery County met to weight the criteria. The final weightings from the pairwise comparison is included below in **Table 2-1**.

Table 2-1: Pairwise Comparison of Scoring Criteria

	Total Life Cycle Costs	Schedule Duration	Planning and Future Need	Easement / Right-of-Way	Operation & Maintenance	Constructability Risk	Permitting Requirements	Historic Preservation	Rustic Road Committee Master Planning	Environmental Impact	Community Impact	Parkland Impacts	Total	Relative Weight
Quantitative Criteria														
Total Life Cycle Costs	-	8	5	2	5	5	7	5	5	4	8	3	57	9%
Schedule Duration	2	-	4	1	2	5	5	2	2	3	6	2	34	5%
Qualitative Criteria														
Planning and Future Need	5	6	-	1	5	7	8	2	5	5	7	5	56	8%
Easement / Right-of-Way	8	9	9	-	8	8	8	5	5	7	7	5	79	12%
Operation & Maintenance	5	8	5	2	-	6	7	2	3	5	7	3	53	8%
Constructability Risk	5	5	3	2	4	-	5	2	5	5	5	3	44	7%
Permitting Requirements	3	5	2	2	3	5	-	5	5	3	5	3	41	6%
Historic Preservation	5	8	8	5	8	8	5	-	6	5	5	4	67	10%
Rustic Road Committee Master Planning	5	8	5	5	7	5	5	4	-	5	5	4	58	9%
Environmental Impact	6	7	5	3	5	5	7	5	5	-	5	5	58	9%
Community Impact	2	4	3	3	3	5	5	5	5	5	-	2	42	6%
Parkland Impacts	7	8	5	5	7	7	7	6	6	5	8	-	71	11%

3 Alternative Evaluation

The results of site evaluation relative to the weighted criteria are described in this section.

3.1 Additional Investigation and General Observations

The following sections present the field investigations and general observations associated with the project.

3.1.1 Site Investigation

The proposed Sites 1, 2, 3, and 4 were visually inspected by members of the project team on October 31, 2019. The purpose of this site visit was to gain an understanding of the project area and identify possible challenges associated with the proposed alternatives.

3.1.2 CEM Field Investigation

Chesapeake Environmental Management Inc. (CEM) was contracted by Mott MacDonald to perform a field investigation of jurisdictional environmental resources identified within and around the four (4) potential sites. Specifically, CEM performed a field survey to identify the jurisdictional limits of steams, wetlands, and forest resources on April 7, 8, and 20, 2020. A summary of the findings can be found in **Table 3-1.** Refer to **Appendix B** for the full report.

Table 3-1: Delineated Resources Summary

Resources	Site 1	Site 2	Site 3	Site 4
Delineated Wetland (SF)	0	0	11,289	26,319
MDE 25-ft Wetland Buffer (SF)	0	0	21,474	11,944
M-NCPPC 50-ft Wetland Buffer (SF)	0	0	36,890	18,742
Delineated Streams (LF)	0	0	584	671
M-NCPPC 150-ft Stream Buffer (SF)	21,262	21,383	116,659	104,464
Delineated Forest (AC)	0	0	0.71	1.24
Specimen Trees (total)	0	0	0	2

3.1.3 Mott MacDonald Desktop Evaluation

Mott MacDonald conducted a high-level desktop evaluation for each site. The purpose of the desktop evaluation was to identify potential locations for the new WWPS, stormwater management facility, force main alignment, gravity main alignment, electrical duct bank alignment, and site access road location. The desktop evaluation also accounted for the various environmental resources identified by CEM and the potential concerns voiced by the community, M-NCPPC, and WSSC Water. Based on the CEM report and WSSC Water, M-NCPPC, and community concerns, the potential challenges identified include the following:

- **Site 1**
    - Historic property located on site
    - Site is part of Charles M. King farm historic property and identified as an individual resource on the Montgomery County Locational Atlas
    - Portion of site is within M-NCPPC 150-foot stream buffer
    - Gravity main tie-in manhole located within/near MDE 25-foot wetland buffer
    - Force main runs through MDE 25-foot wetland buffer
    - Stream crossings
    - Intersection of Kings Valley Drive and Kings Valley Road has bad visibility and has had multiple complaints by the community
- **Site 2**
    - Site is part of Charles M. King farm historic property and identified as an individual resource on the Montgomery County Locational Atlas
    - Portion of site is within M-NCPPC 150-foot stream buffer
    - Gravity main tie-in manhole located within/near MDE 25-foot wetland buffer
    - Force main runs through MDE 25-foot wetland buffer
    - Stream crossings
    - Intersection of Kings Valley Drive and Kings Valley Road has bad visibility and has had multiple complaints by the community
- **Site 3**
    - Portion of site is within M-NCPPC 150-foot stream buffer
    - Gravity main tie-in manhole located within/near MDE 25-foot wetland buffer
    - Gravity main will have to run through or under a wetland and private property
    - Steep site
    - Due to the site elevation, the WWPS will have a deeper wetwell compared to other Sites
- **Site 4**
    - Site is within M-NCPPC 150-foot stream buffer
    - Portion of site is within MDE 25-foot wetland buffer
    - Portion of site is classified as a wetland
    - Site located within floodplain
    - Force main runs through MDE 25-foot wetland buffer
    - Stream crossings
    - Intersection of Kings Valley Dr and Kings Valley Road has bad visibility and has had multiple complaints by the community

Maps of the sites are included in **Appendix C** and **Table 3-2** contains a summary of the sites under consideration. The full summary Table can be found in **Appendix D**.

Table 3-2: Summary Table of Sites Considered

Site	Total Cost	Construction Duration [years]	Roadway Jurisdiction	Easements	Number of Historic Buildings	Rustic Road Crossings
Site 1	$3.5M	1.8	County	1	1	1
Site 2	$3.9M	1.8	County	1	0	1
Site 3	$2.9M	1.7	County	1	0	0
Site 4	$2.8M	1.6	County	1	0	0

3.2 Site 1

Site 1 includes constructing a new, higher capacity WWPS on a different parcel that is privately-owned and historically protected and then demolishing the existing WWPS. According to Maryland Department of Assessment and Taxation (SDAT), the land use is residential. It is assumed that the construction methodology for the WWPS will be the same for the different sites. It is assumed that the force main and gravity main extending from the parcel will be constructed with open cut construction methods. A historic building listed in the Maryland Inventory of Historic Properties (MIHP) is located on the proposed site. Site 1 is located to the west of a proposed rustic road, Kings Valley Road. To the east, the site is adjacent to a wetland and forest owned by M-NCPPC. The topographical elevation ranges from 580' to 620'.

Figure 3-1 shows an overview of Site 1. **Photo 3-1** shows a google maps image of Site 1 from Kings Valley Road. The proposed WWPS is located on the northwest corner of the parcel. This location was chosen because the surface elevation is similar to that of the proposed tie-in gravity manhole. The location also has plenty of open space to accommodate future buildouts as well as a stormwater management facility. A map of Site 1 is included in **Appendix C**.

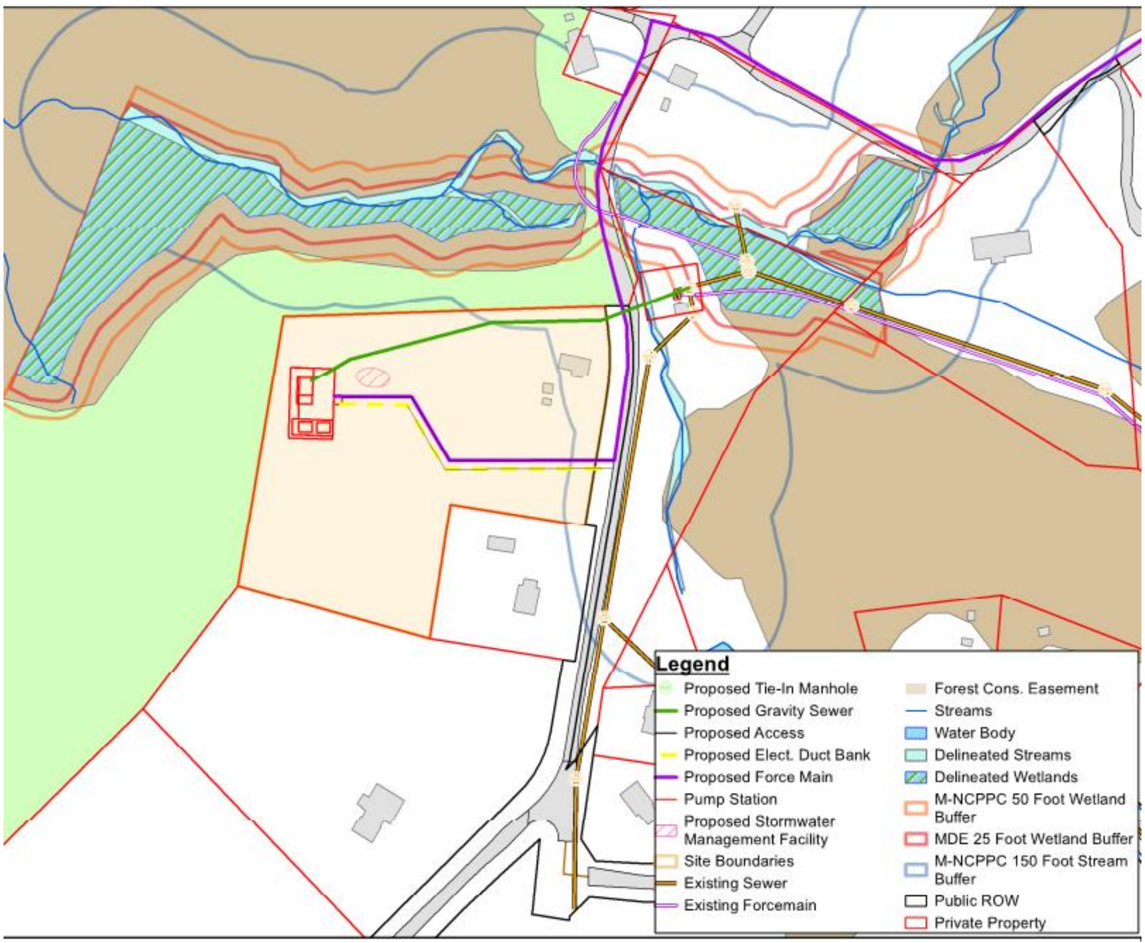


Figure 3-1: Site 1

Photo 3-1: Site 1

3.2.1 Total Life Cycle Cost

The anticipated total construction cost for Site 1, including anticipated easements, engineering, and permitting costs is $3.5M. It is 25% higher than the lowest anticipated construction cost (Site 4). A cost comparison of the different sites can be found in **Table 3-2**.

3.2.2 Construction Duration

The anticipated construction duration for Site 1 is 1.8 years. The anticipated construction duration for this site is 10% longer than the shortest anticipated construction duration (Site 4). A construction duration comparison of the different sites can be found in **Table 3-2**.

3.2.3 Planning and Future Need

Site 1 is located on a parcel of land with an approximate area of 190,000 square feet. The size of the WWPS site layout, which does not include the stormwater management facility, is approximately 7,000 square feet. The size of the parcel will be able to accommodate future WWPS expansion needs as the Damascus service area continues to grow.

3.2.4 Easement / Right-of-Way

Due to the way the deeds were prepared in the past, the plats along Kings Valley Road and Kingstead Road extend into the roadway. Therefore, a permanent easement from the respective owners will be required even though the alignment is within the roadway. **Table 3-3** below contains a list of permanent easements required for this site (excluding historic and park properties). The Actis property is located directly southwest of the Kings Valley Road and Kings Stead Road intersection. The Nagy property is located directly southeast of the Kings Valley Road and Kings Stead Road intersection. Neither property is directly adjacent to Site 1. It is anticipated that WSSC Water will purchase the land associated with Site 1 and therefore a third easement is not required.

Table 3-3: Permanent Easements Required for Site 1

Parcel	Owner	Owner Type	Approximate Length [ft]
160200023136	Actis Robert A&A V	Residential	150
161200924940	Nagy Jeffrey W	Residential	30

As shown above, there are two residential easements to obtain. WSSC Water has had verbal discussions and reached a verbal agreement with Jeffrey Nagy, but no written agreement has been developed. WSSC Water has not had any verbal discussion with Actis and no written agreement has been developed.

3.2.5 Operation and Maintenance

The WWPS will be located within the proposed Site 1 parcel boundary. The majority of the gravity sewer and force main associated with Site 1 will be located within roadways owned by the adjacent properties. The easements are discussed in **Section 3.2.4**. The easements will be needed for regular or emergency maintenance to the mains. Site 1 is not located within a floodplain; therefore flooding will not be a concern. Site 1 has one historic structure located on the proposed site which will need to be maintained or otherwise managed in accordance with historic are requirements.

3.2.6 Constructability

Site 1 does not pose any major constructability risks. While Site 1 does have a historic structure on site, it is anticipated that the structure will not inhibit construction. Based on visual inspection and GIS data, Site 1 does not have any underground water or sewer utilities or overhead wires that will inhibit construction. Underground gas, electric, and fiber optics were not considered in this evaluation. Further investigation into the underground utilities is recommend during design phase.

3.2.7 Permitting Requirements

Site 1 has multiple components that will require permits and/or agreements from Montgomery County, MDE, and M-NCPPC. The components include one Class III-P stream crossings, a gravity sewer tie-in located within/near the MDE 25-foot wetland buffer, and work being performed within the M-NCPPC 150-foot stream buffer and 50-foot wetland buffer. The Class III-P stream crossing will require an MDE Nontidal Wetlands and Waterways Environmental Permit. Work being done within the M-NCPPC 50-foot wetland buffer and 150-foot stream buffer will require a Montgomery Environmental Review Permit. Since the work being performed on site would result in a disturbance greater than one acre, a Department of Natural Resources (DNR) Forest Conservation Environmental Permit and MDE Stormwater NOI will be required. Other non-environmental permits will be required from Montgomery County and MDE.

3.2.8 Historic Preservation

Site 1 has a historic building located in the northeast corner of the parcel. The site is also a part of the historic Charles M. King Farm which is listed as a historic property in the M-NCPPC locational atlas. An HAWP will not be required, but approval from M-NCPPC staff will be required.

3.2.9 Rustic Road Committee Master Planning

Site 1 is adjacent to Kings Valley Road, which is a proposed Rustic Road. Both the force main and gravity main coming from Site 1 will be located within the Kings Valley Road right-of-way. The WWPS will be located on the western portion of the parcel. The lower surface elevation on the western portion of the parcel will limit the visibility of the WWPS from Kings Valley Road. A map depicting the rustic roads of Montgomery county can be found in **Appendix E**.

3.2.10 Environmental Impact

Construction of the WWPS on Site 1 will not have a significant environmental impact. However, construction of the proposed force main and gravity main from Site 1 will temporarily impact the M-NCPPC 150-foot stream buffer. Construction of the force main will also temporarily impact the MDE 25-foot wetland buffer. These impacts to the wetland buffers will need to be mitigated. A standard level of care during construction, including proper erosion and sediment control should mitigate these environmental impacts.

3.2.11 Community Impact

The proposed WWPS is located away from other properties. Due to the location of the WWPS, construction noise issues are not anticipated in the community. A majority of the force main and gravity main alignment extending from Site 1 will be installed within the roadway, resulting in a single lane closure for the entirety of the alignments. The force main alignment will have two intersection crossings at the intersections of Kings Valley Road and Kingstead Road. A proper construction sequence at the intersections will allow for a single lane closure and eliminate the need for entire road closures or night work.

3.2.12 Parkland Impact

Site 1 will impact parklands. The force main alignment extending north from the site along Kings Valley Road is within M-NCPPC parkland property. The force main will veer west from Kings Valley Road in order to cross Little Bennett Creek Class III-P stream before veering east, back into the roadway within M-NCPPC property. This will result in impacts to the parkland, requiring mitigation and a construction permit.

3.3 Site 2

Site 2 includes constructing a new, higher capacity WWPS on a different parcel that is historically protected and then demolishing the existing WWPS. According to SDAT, the land use is exempt. It is assumed that the construction methodology for the WWPS will be the same for the different sites. It is assumed that the force main and gravity main extending from the parcel will be constructed with open cut construction methods. The site is located entirely on M-NCPPC-owned parcels. Site 2 is located directly southeast of a delineated wetland and forested area. Site 2 is directly adjacent to the west side of Site 1 with a sliver spanning the north side of Site 1 in order to provide access to Kings Valley Road. The topographical elevation ranges from 575' to 595'.

Figure 3-2 shows an overview of Site 2. **Photo 3-2** shows a google maps image of Site 2 from Kings Valley Road. The proposed WWPS is located on the southern portion of the parcel. This location was chosen because the surface elevation is similar to that of the proposed tie-in gravity manhole. The location also has plenty of open space to accommodate future buildouts as well as a stormwater management facility, while staying out of the M-NCPPPC 150-foot stream buffer. A map of Site 2 is included in **Appendix C**.

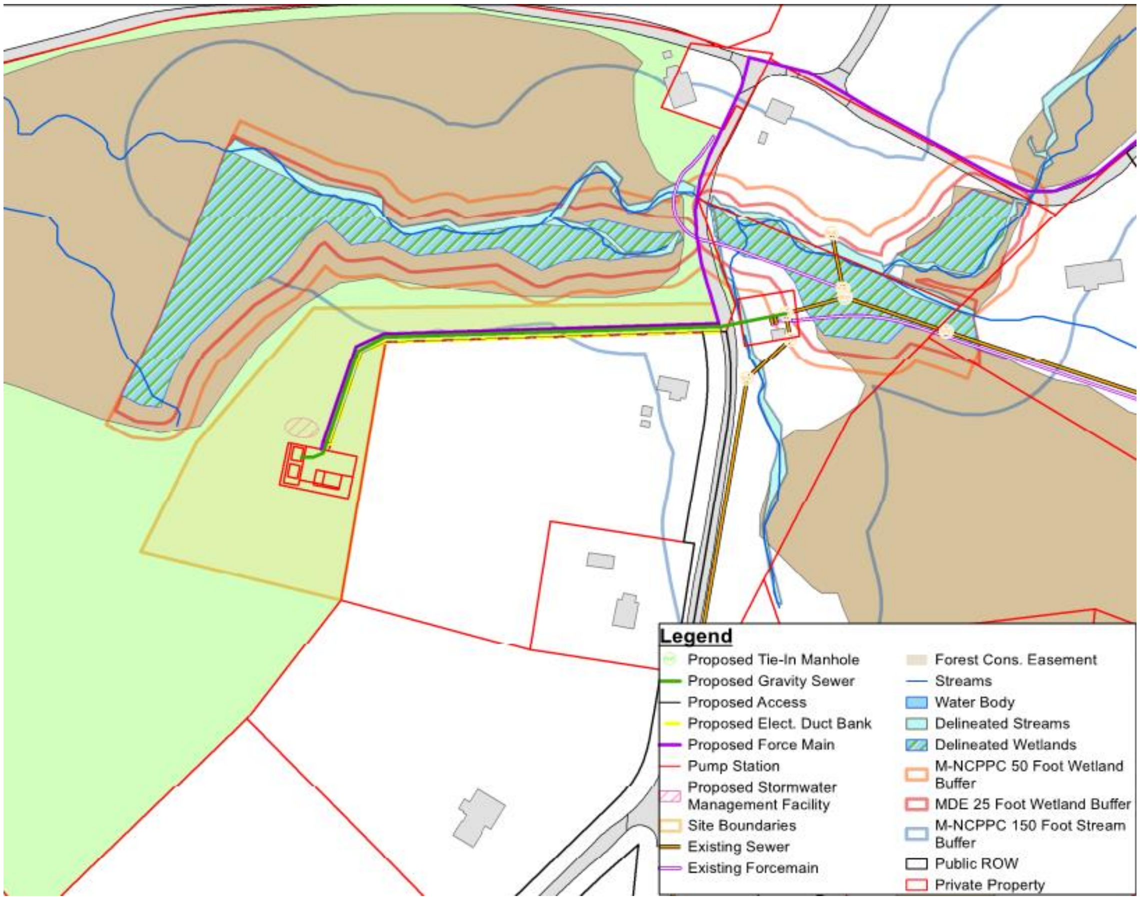


Figure 3-2: Site 2

Photo 3-2: Site 2

3.3.1 Total Life Cycle Cost

The anticipated total construction cost for Site 2, including anticipated easements, engineering, and permitting costs is $3.9M. It is 39% higher than the lowest anticipated construction cost (Site 4). A cost comparison of the different sites can be found in **Table 3-2**.

3.3.2 Construction Duration

The anticipated construction duration for Site 2 is 1.8 years. The anticipated construction duration for this site is 13% longer than the shortest anticipated construction duration (Site 4). A construction duration comparison of the different sites can be found in **Table 3-2**.

3.3.3 Planning and Future Need

Site 2 is located on a 121,000 square foot subsection of the M-NCPPC parcel of land. The size of the WWPS site layout, which does not include the stormwater management facility, is approximately 7,000 square feet. The size of the parcel will be able to accommodate future WWPS expansion needs as the Damascus service area continues to grow.

3.3.4 Easement / Right-of-Way

Due to the way the deeds were prepared in the past, the plats along Kings Valley Road and Kingstead Road extend into the roadway. Therefore, a permanent easement from the properties will be required even though the alignment is within the roadway. **Table 3-4** below contains a list of permanent easements required for this site (excluding historic and park properties). The Actis property is located directly southwest of the Kings Valley Road and Kings Stead Road intersection. The Nagy property is located directly southeast of the Kings Valley Road and Kings Stead Road intersection. Neither property is directly adjacent to Site 2. It is anticipated that WSSC Water would purchase the land associated with Site 2 and therefore an additional easement is not required.

Table 3-4: Permanent Easements Required for Site 2

Parcel	Owner	Owner Type	Approximate Length [ft]
160200023136	Actis Robert A&A V	Residential	150
161200924940	Nagy Jeffrey W	Residential	30

As shown above, there are two residential easements to obtain. WSSC Water has had verbal discussions and reached a verbal agreement with Jeffrey Nagy, but no written agreement has been developed. WSSC Water has not had any verbal discussion with Actis and no written agreement has been developed.

3.3.5 Operation and Maintenance

The WWPS will be located within the proposed Site 2 parcel boundary. The majority of the gravity sewer and force main associated with Site 2 will be located within roadways owned by the adjacent properties. The easements are discussed in **Section 3.3.4**. The easements will be needed for regular or emergency maintenance of the mains. Site 2 is not located within a floodplain; therefore flooding will not be a concern. Site 2 does not have a historic structure located on the proposed site.

3.3.6 Constructability

Site 2 does not pose any major constructability risks that could inhibit construction. Based on visual inspection and GIS data, Site 2 does not have any underground water or sewer utilities that will inhibit construction. However, the site does have overhead electrical wires at the entrance of the site. These overhead wires cannot be avoided and may inhibit construction vehicle and equipment access. Underground gas, electric, and fiber optics were not considered in this evaluation. Further investigation into the underground utilities is recommend during design phase.

3.3.7 Permitting Requirements

Site 2 has multiple components that will require permits and/or agreements from Montgomery County, MDE, and M-NCPPC. The components include one Class III-P stream crossings, a gravity sewer tie-in located within/near the MDE 25-foot wetland buffer, and work being performed within the M-NCPPC 150-foot stream buffer and 50-foot wetland buffer. The Class III-P stream crossing will require an MDE Nontidal Wetlands and Waterways Environmental Permit. Work being done within the M-NCPPC 50-foot wetland buffer and 150-foot stream buffer will require a Montgomery Environmental Review Permit. Since the work being performed on site will result in a disturbance greater than one acre, a Department of Natural Resources (DNR) Forest Conservation Environmental Permit and MDE Stormwater NOI will be required. Other non-environmental permits will be required from Montgomery County and MDE.

3.3.8 Historic Preservation

Site 2 is a part of the historic Charles M. King Farm which is listed as a historic property in the M-NCPPC locational atlas. An HAWP will not be required, but approval from M-NCPPC staff will be required.

3.3.9 Rustic Road Committee Master Planning

Site 2 is located primarily to the west of Site 1, with a sliver of land running along the northern border of Site 1 and connecting to Kings Valley Road. Kings Valley Road is currently not a Rustic Road, but it is recommended to become one. Both the force main and gravity main coming from Site 2 will be located within the Kings Valley Road roadway. The WWPS will be located on the southern portion of the parcel, slightly west of Site 1. The lower surface elevation on the western portion of the parcel will limit the visibility of the WWPS from Kings Valley Road. A map depicting the rustic roads of Montgomery county can be found in **Appendix E**.

3.3.10 Environmental Impact

The proposed location of the WWPS on Site 2 will not have a significant environmental impact. Site 2 is adjacent to the forest conservation easement. While Site 2 is in close proximity to the forest conservation easement, it is not anticipated to directly impact the easement. However, the proposed force main and gravity main alignment coming from Site 2 will have some temporary environmental impacts on the M-NCPPC 150-foot buffer. While a majority of the force main is assumed to be contained within the existing roadway, a portion of the alignment crosses through the MDE 25-foot wetland buffer. Construction of this portion of force main will result in temporary impacts to the MDE 25-foot buffer, which will need to be mitigated. A standard level of care during construction, including proper erosion and sediment control should mitigate these environmental impacts.

3.3.11 Community Impact

The proposed WWPS is located away from other properties. Due to the location of the WWPS, noise issues are not anticipated in the community. A majority of the force main and gravity main alignment extending from Site 2 will be installed within the roadway, resulting in a single lane closure for the entirety of the alignments. The force main alignment will have two intersection crossings at the intersections of Kings Valley Road and Kingstead Road. Proper construction sequencing at the intersections will allow for a single lane closure and eliminate the need for entire road closures or night work.

3.3.12 Parkland Impact

Site 2 will impact parklands. The force main alignment extending north from the site along Kings Valley Road is within M-NCPPC parkland property. The force main will veer west from Kings Valley Road in order to cross a stream before veering east, back into the roadway within M-NCPPC property. This will result in impacts to the parkland and will require mitigation, as well as a construction permit.

3.4 Site 3

Site 3 includes constructing a newer, higher capacity WWPS on a different parcel that is privately-owned and then demolishing the existing WWPS. According to SDAT, the current land use is agricultural. It is assumed that the construction methodology for the WWPS will be the same for the different site. It is assumed that the force main extending from the parcel will be constructed with open cut construction methods, while the gravity main will be constructed using the jack and bore method. This site is located on steeper ground; the topographical elevation ranges from 595' to 630'.

Figure 3-3 shows an overview of Site 3. **Photo 3-3** shows a picture of the site that was taken by a member of the Mott MacDonald project team. The proposed WWPS is located is located on the southwest corner of the parcel. The location was chosen because the surface elevation is lower on the southern portion of the site when compared to the northern portion of the site. The location also shortens the length of gravity main that will need to be jack and bored while also staying out of the M-NCPPC 150-foot stream buffer. The location also has enough open space to accommodate future buildouts as well as a stormwater management facility. A map of Site 3 is included in **Appendix C**.

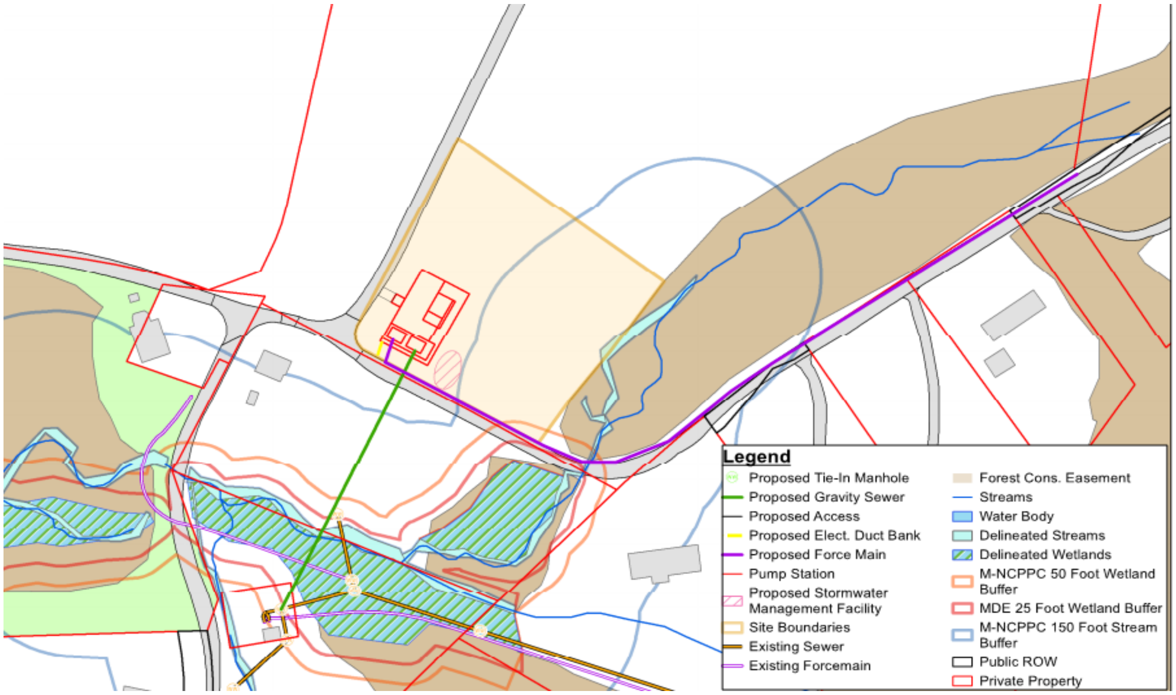


Figure 3-3: Site 3

Photo 3-3: Site 3

3.4.1 Total Life Cycle Cost

The anticipated total construction cost for Site 3 including anticipated easements, engineering and permitting costs is $3.2M. It is 14% higher than the lowest anticipated construction cost (Site 4). The gravity main will jack and bored in order to avoid open cut construction through the delineated wetland and Nagy property north of the tie in manhole. Jack and bore construction is anticipated to be more expensive than open cut construction for the other site, and was accounted for in the cost estimate. A cost comparison of the different sites can be found in **Table 3-2**.

3.4.2 Construction Duration

The anticipated construction duration for Site 3 is 2.0 years. The anticipated construction duration for this alternative is 24% longer than the shortest anticipated construction duration (Site 4). Jack and bore construction of the gravity main is anticipated to take longer than open cut construction for the other site and was accounted for in the construction duration. A construction duration comparison of the different sites can be found in **Table 3-2**.

3.4.3 Planning and Future Need

Site 3 sits on a 78,000 square feet subsection of the King Mary F Trust parcel of land. The size of the WWPS site layout, which does not include the stormwater management facility, is approximately 7,000 square feet. The size of the parcel will be able to accommodate future WWPS expansion needs as the Damascus service area continues to grow.

3.4.4 Easement / Right-of-Way

Table 3-5 below contains a list of permanent easements required for this site (excluding historic and park properties). The Nagy property is located directly south of Site 3, across Kingstead Road. It is anticipated that WSSC Water will purchase the land associated with Site 3 and therefore an additional easement is not required.

Table 3-5: Permanent Easements Required for Site 3

Parcel	Owner	Owner Type	Approximate Length [ft]
161200924940	Nagy Jeffrey W	Residential	250

There is one residential easement that is anticipated to be required to perform the work. WSSC Water has had verbal discussions and reached a verbal agreement with Nagy, but no written agreement has been developed.

3.4.5 Operation and Maintenance

The WWPS will be located within the proposed Site 3 parcel boundary. The majority of the gravity sewer and force main associated with Site 3 will be located within private property that WSSC Water already owns or will have acquired. The easements are discussed in **Section 3.4.4.** The easements will be needed for regular or emergency maintenance to the mains. Site 3 is not located within a floodplain; therefore, flooding will not be a concern. Site 3 does not have a historic structure located on the proposed site.

3.4.6 Constructability

Site 3 does not pose any major constructability risks that could inhibit construction. It is worth noting that the surface elevation at Site 3 is approximately 20 to 30 feet higher than at the other sites. This will result in the construction of a deeper wetwell for the WWPS on Site 3. Based on visual inspection and GIS data, Site 1 does not have any underground water or sewer utilities that will inhibit construction. The site does have some overhead electrical wires at the entrance of the site. It is anticipated that the overhead wires can be avoided and will not inhibit construction. Underground gas, electric, and fiber optics were not considered in this evaluation. Further investigation into the underground utilities is recommend during design phase.

3.4.7 Permitting Requirements

Site 3 has multiple components that will require permits and/or agreements from Montgomery County, MDE, and M-NCPPC. The components include a gravity sewer tie-in located within/near the MDE 25-foot wetland buffer and work being performed within the M-NCPPC 150-foot stream buffer and 50-foot wetland buffer. The work being performed within/near the wetland will require an MDE Nontidal Wetlands and Waterways Environmental Permit. Work being done within the M-NCPPC 50-foot wetland buffer and 150-foot stream buffer will require a Montgomery Environmental Review Permit. Since the work being performed on site will result in a disturbance greater than one acre, a Department of Natural Resources (DNR) Forest Conservation Environmental Permit and MDE Stormwater NOI will be required. Other non-environmental permits will be required from Montgomery County and MDE.

3.4.8 Historic Preservation

Site 3 does not have any historic structures on site. Site 3 is not listed on the M-NCPPC locational atlas and is not part of a historic property. Site 3 does not require historic preservation.

3.4.9 Rustic Road Committee Master Planning

Site 3 is adjacent to Kings Valley Road, which is a proposed rustic road. The portion of Kingstead Road that is west of the intersection of Kings Valley Road and Kingstead Road is a rustic road. The portion east of that intersection is not a rustic road. The WWPS will be located adjacent to Kings Valley Road and the non-rustic road portion of Kingstead Road. However, the construction work will be limited to Kingstead Road and will not impact Kings Valley Road. The proximity to Kingstead Road will result in high visibility from the roadway, which can be mitigated by planting a line of trees or shrubs to obscure the WWPS's visibility. A map depicting the rustic roads of Montgomery county can be found in **Appendix E**.

3.4.10 Environmental Impact

Site 3 will have some environmental impact. While it is assumed that the gravity main will be Jack & Bore in order to avoid disturbing the delineated wetland and Nagy property, the staging and receiving pits will impact the MDE 25-foot wetland buffer. Construction of this portion of gravity main will temporarily impact the MDE 25-foot wetland buffer, which will need to be mitigated. A standard level of care during construction, including proper erosion and sediment control should mitigate environmental impacts.

3.4.11 Community Impact

While the proposed WWPS is located near other properties, significant noise issues are not anticipated in the community. Majority of the gravity main alignment will tunnel under the Nagy property resulting in little to no direct impact on the Nagy property. The force main alignment extending from Site 3 will be installed within the roadway, resulting in a single lane closure for the entirety of the alignments.

3.4.12 Parkland Impact

Site 3 will not impact any parklands.

3.5 Site 4

Site 4 includes constructing a new, higher capacity WWPS on the same parcel but in a different location and then demolishing the existing WWPS. Site 4 is located on land already owned by WSSC Water. It is assumed that the WWPS construction methodology will be the same for the different sites. It is assumed that the force main and gravity main extending from the parcel will be constructed with open cut construction methods. The topographical elevation ranges from 585' to 645'. The existing parcel is prone to flooding due to proximity to a nearby unnamed creek that intersects the site. Previously, a historic building was located on this parcel. The building burned down recently and is no longer considered a historic property.

Figure 3-4 shows an overview of Site 4. The proposed WWPS is located south of the existing WWPS. This location was chosen because it avoids direct construction in the forest conservation easement and delineated wetland. A map of Site 4 is included in **Appendix C**.

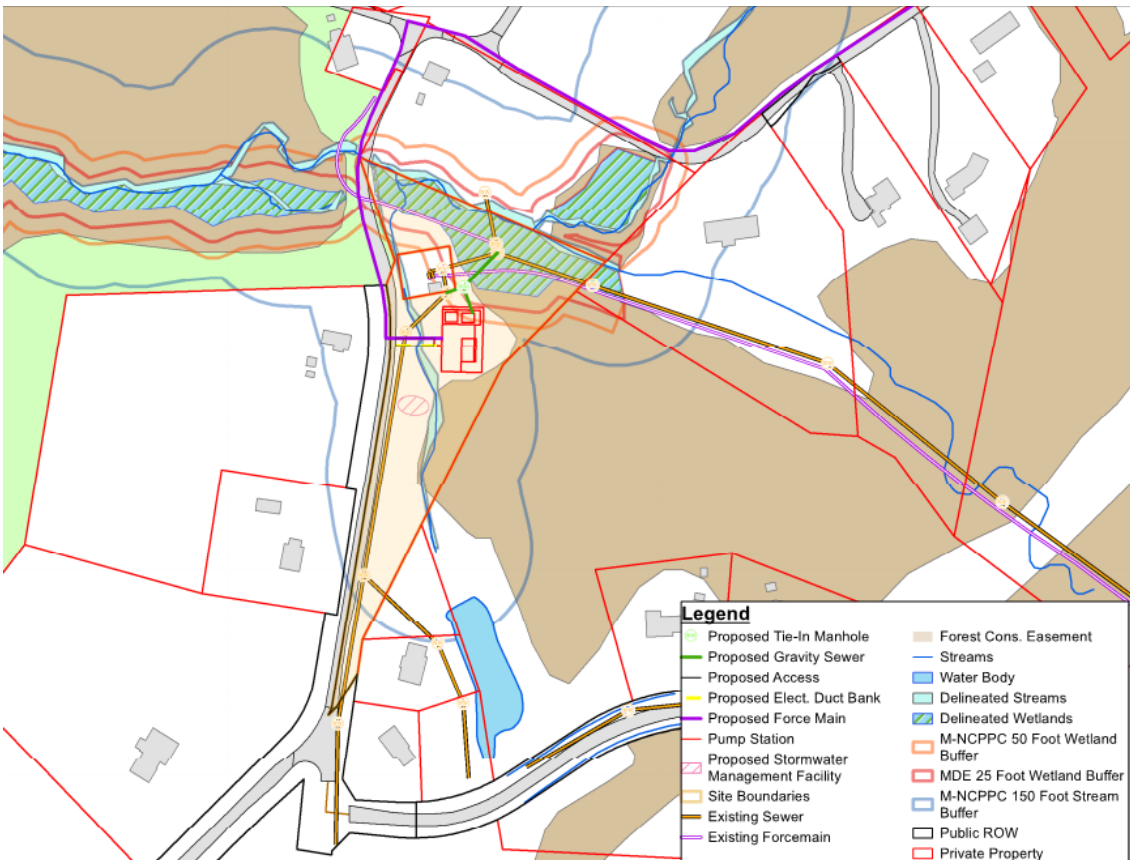


Figure 3-4: Site 4

Photo 3-4: Site 4

3.5.1 Total Life Cycle Cost

The anticipated total construction cost for Site 4, including anticipated easements, engineering, and permitting costs is $2.8M. This is the lowest anticipated construction cost amongst the different sites. A cost comparison of the different sites can be found in **Table 3-2**.

3.5.2 Construction Duration

The anticipated construction duration for Site 4 is 1.6 years. This is the lowest anticipated construction duration amongst the different sites. A construction duration comparison of the different sites can be found in **Table 3-2**.

3.5.3 Planning and Future Need

Site 4 sits on a parcel of land with an approximate area of 115,000 square feet. The size of the WWPS site layout, which does not include the stormwater management facility, is approximately 7,000 square feet. The size of the parcel will be able to accommodate future WWPS expansion needs as the Damascus service area continues to grow. Although technically there is sufficient room, this is the most constrained of all the sites, with forest conservation easements and wetlands/stream buffers in close proximity to the site the pumping station. Thus, location and type of the stormwater management may be an issue.

3.5.4 Easement / Right-of-Way

Due to the way the deeds were prepared in the past, the plats along Kings Valley Road and Kingstead Road extend into the roadway. Therefore, a permanent easement from the properties will be required even if the alignment is within the roadway. **Table 3-6** below contains a list of permanent easements required for this site (excluding historic and park properties). The Actis property is located directly southwest of the Kings Valley Road and Kings Stead Road intersection. The Nagy property is adjacent to the north side of Site 4.

Table 3-6: Permanent Easements Required for Site 4

Parcel	Owner	Owner Type	Approximate Length [ft]
160200023136	Actis Robert A&A V	Residential	150
161200924940	Nagy Jeffrey W	Residential	30

There are two residential easement that is anticipated to be required to perform the work. WSSC Water has had verbal discussions and reached a verbal agreement with Jeffrey Nagy, but no written agreement has been developed. WSSC Water has not had any verbal discussion with Actis and no written agreement has been developed.

3.5.5 Operation and Maintenance

The WWPS will be located within the proposed Site 4 parcel boundary. The majority of the gravity sewer and force main associated with Site 4 will be located within roadways owned by the adjacent properties. The easements are discussed in **Section 3.5.4.** The easements will be needed for regular or emergency maintenance to the mains. Site 4 is located within a floodplain. Flooding issues are a concern due to the stream traversing the site in north-south manner, located on the western portion of the property.

3.5.6 Constructability

Site 4 does not pose any major constructability risks. Based on visual inspection and GIS data, Site 4 does not have any or overhead wires that will inhibit construction. Site 4 does have underground water and sewer utilities stemming from the existing WWPS. It is anticipated that the underground water and sewer utilities will not inhibit construction. Underground gas, electric, and fiber optics were not considered in this evaluation. Further investigation into the underground utilities is recommend during design phase.

3.5.7 Permitting Requirements

Site 4 has multiple components that will require permits and/or agreements from Montgomery County, MDE, and M-NCPPC. The components include one Class III-P stream crossings, a gravity sewer tie-in located within/near the MDE 25-foot wetland buffer, and work being performed within the M-NCPPC 150-foot stream buffer and 50-foot wetland buffer. The Class III-P stream crossing will require an MDE Nontidal Wetlands and Waterways Environmental Permit. Work being done within the M-NCPPC 50-foot wetland buffer and 150-foot stream buffer will require a Montgomery Environmental Review Permit. Since the work being performed on site will result in a disturbance greater than one acre, a Department of Natural Resources (DNR) Forest Conservation Environmental Permit an MDE Stormwater NOI will be required. Other non-environmental permits will be required from Montgomery County and MDE. This site is the most constrained by environmental features and will potentially raise the difficulty of obtaining the permits.

3.5.8 Historic Preservation

Site 4 is a part of the historic Charles M. King Farm which is listed as a historic property in the M-NCPPC locational atlas. An HAWP will not be required, but approval from M-NCPPC staff will be required.

3.5.9 Rustic Road Committee Master Planning

Site 4 is adjacent to Kings Valley Road, which is currently not a Rustic Road, but it is recommended to become one. Both the force main and gravity main coming from Site 4 will be located within the Kings Valley Road right-of-way. The WWPS will be located on the southern portion of the parcel, south of the existing WWPS. The proposed WWPS will be visible from the roadway. A map depicting the rustic roads of Montgomery county can be found in **Appendix E**.

3.5.10 Environmental Impact

Site 4 will have the most environmental impact of all the sites. The proposed WWPS will be constructed entirely in the M-NCPPC 150-foot stream buffer. A portion of the proposed WWPS will also be constructed in the M-NCPPC 50-foot wetland buffer and very close to the MDE 25-foot wetland buffer and forest conservation easement. The proposed force main alignment coming from Site 4 will have some temporary environmental impacts. While a majority of the force main is assumed to be contained within existing roadway, a portion of the alignment crosses through the MDE 25-foot wetland buffer. Construction of this portion of force main will result in temporary impacts to the MDE 25-foot wetland buffer, which will need to be mitigated. Construction of the gravity main would result in impacts to the delineated wetland on the site. A standard level of care during construction, including proper erosion and sediment control should mitigate environmental impacts.

3.5.11 Community Impact

The proposed WWPS is located away from other properties. Due to the location of the WWPS, noise issues are not anticipated in the community. A majority of the force main and gravity main alignment extending from Site 4 will be installed within the roadway, resulting in a single lane closure for the entirety of the alignments. The force main alignment will have two intersection crossings at the intersections of Kings Valley Road and Kingstead Road. Proper construction sequencing at the intersections will allow for a single lane closure and eliminate the need for entire road closures or night work.

3.5.12 Parkland Impact

Site 4 will impact parklands. The force main alignment extending north from the site along Kings Valley Road is within M-NCPPC parkland property. The force main will veer west from Kings Valley Road in order to cross a stream before veering east, back into the roadway within M-NCPPC property. This will result in impacts to the parkland and will require mitigation, as well as a construction permit.

4 Site Scoring

4.1 Description of Scoring Criterion

Using the scoring and evaluation method as described in the WSSC Water Master List of Evaluation Criteria and Scoring Methodology, a table of scores and ranks for the alternate sites have been developed. The scored criteria are discussed below.

4.1.1 Total Life Cycle Cost

Cost estimates have been prepared for the four Sites to further evaluate the projected construction and operating costs. The major differences in costs are the length of the force main, gravity main, electrical duct bank, and access road. Since Site Alternative 4 is estimated to be the least costly alternative, it is assigned the highest score, which is 9. Site Alternative 3 is within 15% of the cost of Site Alternative 4 so it also receives a 9. Site Alternatives 1 is within 16%-30% of the cost of Site Alternative 4 so it receives a 7. Site Alternative 2 is within 31%-41% of the cost of Site Alternative 4 so it receives a 5.

4.1.2 Construction Duration

The schedules for the four alternatives have been evaluated by using similar WSSC Water projects to develop laydown rates (feet/week) for the force mains, gravity mains, electrical duct banks, and access roads. The individual linear footage of each item was then divided by the laydown rates to obtain a general idea of the duration. The individual laydown rates can be found in **Appendix D.** The design, permitting, and bid phase are estimated to have the same duration for the four site alternatives. The major difference in construction duration is in the lengths of the of the force main, gravity main, electrical duct bank, and access road. Since Site Alternative 4 is estimated to have the shortest construction duration, it is assigned the highest score, which is 9. Site Alternatives 1 and 3 are within 10% of the duration of Site Alternative 4 so they receive a 9. Site Alternative 2 is within 11%-30% of the duration of Site Alternative 4, so it receives a 7.

4.1.3 Planning and Future Need

This scoring criterion is based on the size of the parcel. Since the parcel size of Sites 1 through 4 is much larger than 10,000 square feet, they all received a 9. 10,000 square area needed to construct the WWPS site layout. The 10,000 square feet accounts for additional area needed during the construction phase and is based off of the WSSC Water WWPS design guidelines (DG-07).

4.1.4 Easement / Right-of-Way

This scoring criterion is based on the number of private property easements required for each Site. Due to the plats along Kings Valley Road and Kingstead Road extending into the roadway, Sites 1, 2 and 4 will require two private property easements from the Actis and Nagy properties. Therefore, those sites receive a 3. Site 3 only requires one private property easement from the Nagy property, so it receives a 5.

4.1.5 Operation and Maintenance

This scoring criterion is based on the location of work relative to public ROW, whether or not the site housed a historic structure, and the location of the site relative to the floodplain. The work for Sites 1 through 4 will predominately be done outside of public ROW. Therefore, Sites 1 through

4 receive a 1 in that portion of the scoring. Sites 2 through 4 do not have any historic structures located on site and receive a 2 in that portion of the scoring. Site 1 does have a historic building on site and receives a 1 in that portion of the scoring. Sites 1 through 3 are not within the floodplain and receive a 2 in that portion of the scoring. Site 4 is located within a floodplain and receives a 1 in that portion of the scoring. Summing up the individual portions of the scoring for each site results in Sites 1 through 4 receiving a total score of 4, 5, 5, and 4, respectively.

4.1.6 Constructability Risk

The constructability of the sites is evaluated based on the site conditions and the existing utilities and structures. Sites 1, 3, and 4 receive a 9 because the sites do not have any major constructability risks in the form of overhead wires or existing utilities on site that will inhibit construction. While Site 2 does not have any major constructability risks, it does have some overhead wires that could inhibit construction. Therefore, Site 2 receives a 6.

4.1.7 Permitting Requirements

This criterion is scored based on the number of permits required and the assumed risks associated with obtaining the permits. An environmental permit is weighted more heavily than a non-environmental permit. The number of required permits for the sites are based on the stream crossings, parkland impact, wetland impact and other environmental factors. Sites 1 through 4 receive a 1 because each site requires at least two environmental permits.

4.1.8 Historic Preservation

This criterion is scored based on whether the site is designated as a historically significant site or area by M-NCPPC and Montgomery County. This analysis is based on data available on or prior to 12/11/2020. Sites 1, 2, and 4 receive a 5 because the sites are a part of the historic Charles M. King Farm, which is listed on the M-NCPPC Locational Atlas. Sites 1 and 2 will require M-NCPPC oversight but not a HAWP. Site 3 receives a 9 because the site is not considered a historical site.

4.1.9 Rustic Road Committee Master Planning

This criterion is scored based on the direct impacts to rustic roads designated by the Montgomery County Rustic Roads Program, and the visibility of the WWPS from the rustic roads. Sites 1 through 4 receive a 7 because the properties are adjacent to Kings Valley Road, which is recommended to become a rustic road. The WWPS will not be visible from the Kings Valley Road for Sites 1 and 2, but it will be visible from the road for Sites 3 and 4. Site 3 is also adjacent to Kingstead Road, but this portion of Kingstead Road is not a current or proposed future rustic road.

4.1.10 Environmental Impact

The environmental impact of the sites is evaluated and scored based on the amount of impact during construction on environmentally sensitive areas such as wetlands, floodplains, forests, streams, etc. Sites 1 through 3 receive a 5 because the work required to construct the proposed force main and gravity main will result in temporary impacts to streams and the MDE 25-foot wetland buffer. Site 4 receives a 1 because the work required would impact multiple streams, forested area, and the delineated wetland on the site.

4.1.11 Community Impact

This criterion is scored based on the disruptions that the proposed work may have on the community such as potential traffic delays, odor, and noise impacts, etc. Sites 1 through 4 received a 7 because the work will have traffic impacts on Kings Valley Road and Kingstead Road. The work can be sequenced in a manner that will only require one lane closure in order to avoid shutting down the entire roadway or working at night.

4.1.12 Parkland Impacts

This criterion is scored based on the disruptions that the proposed work may have on parkland. Sites 1, 2, and 4 receive a 5 because the proposed work will impact M-NCPPC parkland property. The work will also require mitigation and a Park Construction Permit. Site 3 receives a 9 because it will not impact any parkland.

4.2 Final Scoring

Using the weighted factors, Mott MacDonald, WSSC Water, M-NCPPC, and Montgomery County met on June 12, 2020 to score the four sites. The list below shows the final scores for Site 1, 2, 3 and 4.

Final Total Scoring:

- Site 1: 4962.3
- Site 2: 4734.7
- Site 3: 5883.0
- Site 4: 4645.0

A full breakdown of the scoring can be found in **Table 4-1**. Site 3 received the highest score.

4.3 Community Meeting

These final scores and a recommendation for proceeding with Site 3 was presented at the November 17, 2020, community meeting. No objections or concerns for selection of Site 3 were raised at the meeting. The only comment receive was concern regarding the safety of the intersection of Kingstead and Kings Valley Roads, although it was noted that this comment was not related to the Site Selection.

4.4 Recommendation

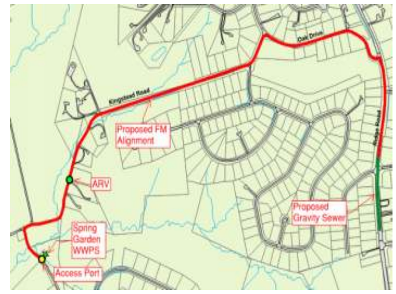
Based on scoring results, concurrence among the stakeholders on the results and general acceptance expressed at the Community Meeting, WSSC will submit the Mandatory Referral application for consideration of Site 3 for location of the new Spring Gardens Wastewater Pump Station.

Table 4-1: Comparison of Scores

Criteria	Weighting	Weight Percentage	Site 1: Historic Property		Site 2: M-NCPPC Property		Site 3: King Farm Property		Site 4: WSSC Property	
			Score	Weighted Score	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score
QUANTITATIVE CRITERIA	**91**	**14%**	**16**	**220.6**	**12**	**165.5**	**14**	**193.0**	**18**	**248.2**
Total Life Cycle Cost	57	9%	**7**	60.5	**5**	43.2	**9**	77.7	**9**	77.7
Construction Duration	34	5%	**9**	46.4	**7**	36.1	**5**	25.8	**9**	46.4
QUALITATIVE CRITERIA	**569**	**86%**	**55**	**4741.7**	**53**	**4569.2**	**66**	**5690.0**	**55**	**4741.7**
Planning & Future Need	56	8%	**9**	76.4	**9**	76.4	**9**	76.4	**9**	76.4
Easement/Right-of-Way*	79	12%	**3**	35.9	**3**	35.9	**5**	59.8	**3**	35.9
Operation & Maintenance	53	8%	**4**	32.1	**5**	40.2	**5**	40.2	**4**	32.1
Constructability Risk	44	7%	**9**	60.0	**6**	40.0	**9**	60.0	**9**	60.0
Permitting Requirements	41	6%	**1**	6.2	**1**	6.2	**1**	6.2	**1**	6.2
Historic Preservation	67	10%	**5**	50.8	**5**	50.8	**9**	91.4	**5**	50.8
Rustic Road Committee Master Planning	58	9%	**7**	61.5	**7**	61.5	**7**	61.5	**7**	61.5
Environmental Impact	58	9%	**5**	43.9	**5**	43.9	**5**	43.9	**1**	8.8
Community Impact	42	6%	**7**	44.5	**7**	44.5	**7**	44.5	**7**	44.5
Parkland Impact	71	11%	**5**	53.8	**5**	53.8	**9**	96.8	**5**	53.8
Total Score	**660**	**100.0%**	**71.0**	**4962.3**	**65.0**	**4734.7**	**80.0**	**5883.0**	**69.0**	**4645.0**

Appendices

A. Black and Veatch Report – 2015 & 2018



BUSINESS CASE EVALUATION

SPRING GARDEN WASTEWATER PUMP STATION AND FORCE MAIN

September 2018

Prepared for

Washington Suburban Sanitary Commission

BLACK & VEATCH
Building a world of difference.

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TABLE OF CONTENTS

TABLES

SECTIONS

1 Executive Summary

1.1 Asset Description

The Spring Garden Wastewater Pump Station (WWPS) and associated force main (FM) are located in the Damascus service area, which is part of the Monocacy Basin (25001). The existing FM is an 8-inch ductile iron pipe (DIP) built in 1976. It is approximately 4,800 feet long and rises approximately 150 feet from the WWPS to the outfall on Ridge Road. The existing Spring Garden WWPS was built in 1976 under contract 71-4656D and has a firm capacity of 0.432 mgd. It discharges through an 8-inch DIP FM to Ridge Road, where flows continue by gravity to the Damascus Wastewater Treatment Plant. Current flow velocity through the FM is 1.91 fps, below the lower limit of 2.0 fps required by WSSC design guidelines for WWPS. Hydraulic modeling results indicate that the design flow for the existing WWPS is 1.23 mgd. This already exceeds the current WWPS firm capacity of 0.432 mgd. A new development named Kingstead is planned for this area and will be served by this WWPS. Hydraulic models indicate that the new development will contribute an additional 0.082 mgd of flow, bringing the total firm capacity required at the WWPS to 1.3 mgd.

1.2 WWPS Business Case

In 2015, Black & Veatch conducted a business case evaluation to determine the optimal alternative to adequately address the capacity issues of the existing WWPS. Five alternatives were considered.

- Alternative 1: Do nothing.
- Alternative 2: Status quo.
- Alternative 3: New WWPS, existing parcel, full bypass.
- Alternative 4: New WWPS, existing parcel, minimal bypass.
- Alternative 5: New WWPS, adjacent parcel, minimal bypass.

The analysis was performed using the following tools provided by WSSC:

- Lifecycle Cost Analysis (LCA) Tool.
- Risk Reduction Analysis (RRA) Tool.

The analysis resulted in Alternative 5 being the preferred alternative. As of 2018, construction has not begun on the new WWPS, however WSSC has purchased the adjacent parcel. The total annuitized cost in 2015, including purchase of the adjacent parcel, was $363,962 over a 50-year analysis period. The final report for this business case is included as Section 1 of this report.

1.3 FM Business Case

Increasing the WWPS flow raises the flow velocity and the total dynamic head through the FM. The new velocity approaches the upper limit of 6 feet per second (fps) allowable under the WSSC design guidelines for a WWPS. The increase in pump capacity and flow velocities coupled with the physical mortality of the FM necessitated a further evaluation of the existing 8-inch FM. A separate business case evaluation was conducted in 2018 to evaluate alternatives for addressing the existing FM. This evaluation started from the assumption that a new 1.3 mgd WWPS would be constructed on the recently acquired lot adjacent to the existing WWPS per the recommendation of the 2015 Spring Gardens WWPS business case.

Following the initial screening, twelve alternatives were selected for further evaluation. All alternatives assume concurrent construction of a new 1.3 mgd WWPS per the 2015 business case results.

- Alternative 1: Do Nothing/Status Quo.
- Alternative 8: New FM, Existing Alignment + Marlboro, Open Cut, WWPS + 1,000' Access, No Redundancy.
- Alternative 12: New FM, Existing Alignment + Marlboro, Open Cut, WWPS Access, No Redundancy.
- Alternative 13: New FM, Existing Alignment + Marlboro, Open Cut, WWPS + 2,500' Access, No Redundancy.
- Alternative 18: New FM, Existing Alignment + Marlboro, HDD, WWPS Access, No Redundancy.
- Alternative 19: New FM, Existing Alignment + Marlboro, HDD, WWPS + 2,500' Access, No Redundancy.
- Alternative 20: New FM, Kings Valley Road, Open Cut, WWPS + 1,000' Access, No Redundancy.
- Alternative 21: New FM, Kings Valley Road, Open Cut, WWPS Access, No Redundancy.
- Alternative 22: New FM, Kings Valley Road, Open Cut, WWPS + 2,500' Access, No Redundancy.
- Alternative 23: New FM, Kingstead Road, Open Cut, WWPS + 1,000' Access, No Redundancy.
- Alternative 24: New FM, Kingstead Road, Open Cut, WWPS Access, No Redundancy.
- Alternative 25: New FM, Kingstead Road, Open Cut, WWPS + 2,500' Access, No Redundancy.

The analysis was performed by utilizing the following tools provided by WSSC:

- LCA Tool.

- RRA Tool.

The analysis resulted in Alternative 24 being the preferred alternative, with a total annuitized cost of $287,604 in 2017 dollars over a 104-year analysis period. The final report for this business case is included as Section 2 of this report.

During the Evaluation Results Workshop, several members of the project team expressed a preference for Alternative 25 due to the increased availability of access ports along the FM compared with Alternative 24. The associated cost increase for Alternative 25 is less than 4% over the cost of the preferred Alternative 24. Given the similarities in costs, it was noted that additional access ports could be considered during detailed design.

1.4 Updated 2015 WWPS Business Case Results

Because the original WWPS business case was conducted in 2015, the results needed to be updated to 2017 before they could be combined with the FM business case results. The FM business case recommendation changed the hydraulics of the WWPS, which required the selection of new pumps. The quotes obtained were significantly less expensive than those provided in the original 2015 business case. Since the original business case, WSSC has purchased the adjacent plot of land, although planning, design, and construction of a new WWPS has not begun.

The WWPS annuitized cost was updated to inflate costs from 2015 to 2017 dollars, the original pump costs were replaced with the pump costs associated with the new FM business case recommendation, and the cost for the parcel of land was removed. The resulting updated WWPS business case annuitized cost is $353,147.

1.5 Combined Business Case Results

Table 1-1 is a summary of the proposed schedule for the combined business case results. This schedule assumes the WWPS and FM are planned, designed, permitted, and constructed concurrently.

Table 1-1 Combined Preliminary Implementation Schedule

Phase	Task	Time Frame
1	Project development	July 2018 – September 2018
2	Land acquisition	N/A
3	Planning, permitting, and design	October 2018 – March 2020
4	Bidding and procurement	April 2020 – September 2020
5	Construction	October 2020 – March 2022

The estimated upfront capital costs required to implement the combined selected alternatives are shown in Table 1-2.

Table 1-2 Summary of Capital Costs Inputs

Task		FY 2019	FY 2020	FY 2021	FY 2022	Total
1	Planning, Design, and Supervision					
	Planning, Permitting, Design	($392,097)	($392,097)	$0	$0	($784,194)
	Design Services During Construction	$0	$0	($261,398)	($261,398)	($522,796)
2	Land	$0	$0	$0	$0	$0
3	Site Improvements and Utilities	$0	$0	$0	$0	$0
4	Construction	$0	$0	($2,613,978)	($2,613,978)	($5,227,955)
5	Other (WSSC Administration)	($58,815)	($58,815)	($431,306)	($431,306)	($980,242)
6	**Total**	**($450,912)**	**($450,912)**	**($3,306,682)**	**($3,306,682)**	**($7,515,187)**

1.6 Capital Improvement Program Budget

After completion of the two business cases, and in coordination with the Planning Division, the schedule and costs presented in Table 1-2 were further revised. The final costs are shown in Table 1-3. These costs will be included in the WSSC Capital Improvement Program budget.

Table 1-3 Capital Improvement Program Budget

	Task	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	Total
1	Planning, Design, and Supervision	($280,000)	($585,000)	($800,000)	($400,000)	($65,000)	($50,000)	($2,190,000)
2	Land	$0	$0	$0	$0	$0	$0	$0
3	Site Improvements and Utilities	$0	$0	$0	$0	$0	$0	$0
4	Construction	$0	$0	$0	($900,000)	($4,750,000)	($1,050,000)	($6,700,000)
5	Other (WSSC Administration)	$0	($89,000)	($120,000)	($195,000)	($722,000)	($165,000)	($1,291,000)
6	**Total**	**($280,000)**	**($684,000)**	**($920,000)**	**($1,495,000)**	**($5,537,000)**	**($1,265,000)**	**($10,181,000)**

Section 1

Spring Garden Pump Station Final Report (2015)



BUSINESS CASE EVALUATION
SPRING GARDEN PUMP STATION

September 2015

Prepared for

Washington Suburban Sanitary Commission

BLACK & VEATCH
Building a world of difference.

Spring Garden Pump Station

Business case evaluation

September 2015

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1 Executive Summary

1.1 Project Description

The Spring Garden Wastewater Pump Station (WWPS) has theoretical firm capacity of 0.432 million gallons per day (MGD), and a pump station capacity evaluation conducted in 2015 by CDM determined the existing firm capacity to be 0.41 MGD. The WWPS requires a future wet-weather capacity of 1.3 MGD. A business case is warranted to determine the optimal alternative to adequately address the capacity issues of this pump station. The following alternatives have been selected for evaluation:

1. Do nothing, defined as no further maintenance or operation of the existing WWPS. The WWPS will be allowed to run to failure. This is included to provide a baseline analysis case for the other alternatives.
2. Status quo, defined as continuing all current operation and maintenance procedures, including regularly scheduled component replacements, but no upgrades to the station capacity.
3. Replace the existing WWPS with a new WWPS built on the existing parcel, assuming that the existing WWPS will be taken completely offline and demolished before the start of new construction and therefore requiring bypass pumping throughout the full construction period.
4. Replace the existing WWPS with a new WWPS built on the existing parcel, assuming a phased construction approach that will keep the existing station operating for as much of the construction period as possible in order to minimize the need for bypass pumping.
5. Replace the existing WWPS with a new WWPS built at a higher elevation on the adjacent non-MNCPPC parcel.

The analysis was performed by utilizing the following tools provided by WSSC:

- Lifecycle Cost Analysis (LCA) Tool
- Risk Reduction Analysis (RRA) Tool

1.2 Alternative Results Summary

Alternative 2 is the highest ranked alternative based on annuitized costs. The second ranked alternative based on annuitized cost is Alternative 5. The margin of difference between the annuitized costs of the top two alternatives is 16%. The highest ranked alternative in terms of the cost effectiveness factor is Alternative 5. The second ranked alternative is Alternative 4.

Table 1-1 Summary of Results

No.	Alternative	Annuitized Cost	Cost Effectiveness Factor
1	Do Nothing	($5,652,184)	0.00
2	Status Quo	($312,206)	1.45
3	New WWPS, Existing Parcel, Full Bypass	($371,784)	2.18
4	New WWPS, Existing Parcel, Minimal Bypass	($368,522)	2.20
5	New WWPS, Adjacent Parcel, Minimal Bypass	($363,962)	2.23

1.3 Recommended Alternative

The project team recommends Alternative 5 as the best alternative. It provides the highest risk reduction cost effectiveness factor along with the second lowest annuitized cost. Alternative 2 has the lowest life cycle cost, but it provides negligible risk reduction when compared to the other alternatives.

Table 1-2 Recommended Alternative Preliminary Implementation Schedule

Phase	Task	Time Frame
1	Project development	October 2015 – December 2015
2	Land Acquisition	July 2016 – December 2016
3	Design and permitting	January 2016 – June 2017
4	Bidding and procurement	July 2017 – December 2017
5	Construction	January 2018 – June 2018

Table 1-3 Summary of Capital Costs Inputs

	Task	FY 2016	FY 2017	FY 2018	Total
1	Planning, Design, and Supervision				
	Planning, Permitting, Design	($107,584)	($143,445)	$0	($251,028)
	Design Services During Construction	$0	$0	$0	$0
2	Land	$0	($140,000)	$0	($140,000)
3	Site Improvements and Utilities	$0	$0	$0	$0
4	Construction	$0	$0	($1,673,523)	($1,673,523)
5	Other (WSSC Administration)	$0	$0	$0	$0
6	**Total**	**($107,584)**	**($283,445)**	**($1,673,523)**	**($2,064,551)**

2 Business Case Evaluation Background

2.1 Business Case Evaluation Process

A business case evaluation is part of the project needs validation process (PNVP), which is used by WSSC as the method through which the AMP identifies needs and evaluates solutions which address the identified needs. The first stage of the PNVP is the completion and approval of a project initiation form (PIF). Upon approval of the PIF by the Project Needs Planning Committee (PNPC), the PNVP may move into the business case evaluation stage. Upon completion of the business case evaluation, the final report with the recommendation of the project team is submitted to the PNPC. After a project is approved by the PNPC, it is submitted to the appropriate group for implementation. Figure 2-1 shows the PNVP. The following sections contain a more detailed discussion of the PIF and business case evaluation stages of the PNVP.

2.1.1 Project Initiation Form

The PIF stage of the PNVP begins when an asset owner, asset strategy manager, or other personnel completes a PIF via the e-Builder[1] website. The purpose of the PIF is to identify basic information that is necessary for the identified need to be validated, including the need, the affected asset(s), the failure mode(s), and initial consideration of alternatives that could be pursued to address the need. Once the PIF is completed by the person initiating the process, the PIF is sent to the appropriate group leader for review. The group leader can approve the PIF to move forward in the approval process, reject the PIF, or request that the initiator revise the PIF. If the PIF is approved by the group leader, then it is forwarded to the appropriate system asset strategy manager (SASM). The SASM is capable of advancing the PIF to the next review stage, rejecting the PIF, requesting that the PIF be updated, or requesting that the Technical Services Group (TSG) undertake an assessment to aid the SASM in their decision-making process.

If the SASM approves the PIF, then the PIF moves ahead in the approval system for review by the appropriate network asset strategy manager (NASM). The NASM has the ability to approve the PIF for further consideration, reject the PIF, or request that the PIF be revised. Upon approval of the PIF by the NASM, the PIF is forwarded to the AMP Manager for review. The AMP Manager can approve the PIF for review by the PNPC, reject the PIF, or request that the PIF be amended. Once the AMP Manager has approved a PIF, it is forwarded to the PNPC for final consideration. The committee is able to reject the PIF, request a revision of the PIF before making its final decision, submit the PIF to TSG for an evaluation to gather information

[1] The e-Builder website is used to track an identified need through the PNVP and to document the comments made by those reviewing a PIF through the approval process.

necessary to its decision-making process prior to its final decision, submit the PIF to the Office of Asset Management (OAM) for a business case evaluation, or approve the PIF for funding[2].

[2] There are only a few circumstances in which a PIF can be approved for funding by the Project Needs Planning Committee without the PIF being submitted to OAM for a business case evaluation. These circumstances are typically limited to the following: 1) the Project Needs Planning Committee has determined through the validation process that there is only one feasible alternative to address the identified need; 2) a regulatory agency has mandated that a particular approach be undertaken to address a regulatory requirement; or 3) the total cost for each of the potential alternatives to address the identified need is not sufficient to warrant a business case evaluation.

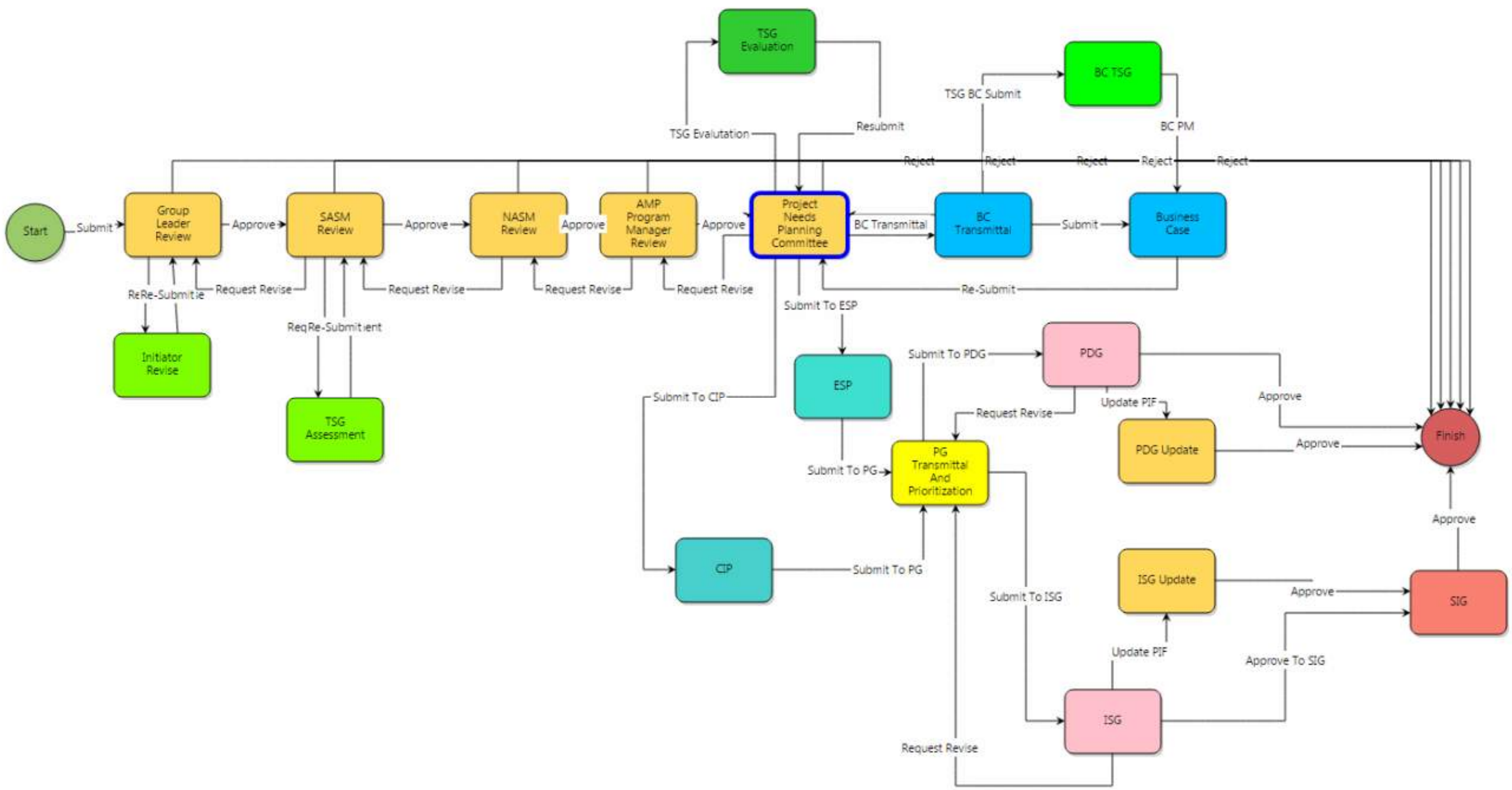


Figure 2-1 Project Needs Validation Process

2.1.2 Business Case Evaluation

After the PNPC submits a PIF to OAM for a business case evaluation, the AMP Manager assigns a project manager and the business case evaluation stage of the PNVP begins. The business case evaluation stage follows a 12-step process as shown in Figure 2-2 and summarized below.

Step 1: The first step in the process is the approved PIF, which is intended to document the information that will serve as the basis for the business case. Based on the information identified in the approved PIF, the project manager assembles a draft scope of work and issues a request to the appropriate groups for project team members.

Step 2: Upon receipt of the suggested team members from the appropriate groups, the project manager advances the business case to the second step in the process by scheduling the internal scope of work meeting The main purpose of the internal scope of work meeting is to gather additional information from the project team regarding the identified need through a thorough discussion of the topic. This discussion is used to refine the draft scope of work and to identify the sources of information for the initial data request. Therefore, one of the key goals of the meeting is to finalize the specific objectives and list of performance measures that are applicable to the business case. Another goal of the internal scope of work meeting is to finalize the members of the project team. The internal scope of work meeting also serves as an opportunity for the project manager to explain the expectations for the business case evaluation to the project team, including the process and expected timeline that will be followed for the business case. The project manager also introduces the project team to tools that will be at their disposal throughout the business case evaluation to document their questions, comments, and suggestions. These tools are the meeting minutes and the comment registry. The purpose of the meeting minutes is to document the discussions held during a meeting. The purpose of the comment registry is to be a living document that records questions raised during meetings of the project team that were not answered during the meetings and to record the editorial comments to the draft report suggested by the project team.

Step 3: The third step in the business case evaluation process is the consultant scoping meeting. The main purpose of the consultant scoping meeting is to discuss and finalize the scope of work with the consultant[3]. At this meeting, the project manager begins the knowledge transfer process with the consultant regarding the identified need. After this initial knowledge transfer, the project manager works with the consultant to develop the project schedule with specific target dates for completion of the scope of work

[3] When a business case is conducted internally, TSG serves in the role of the consultant.

items. These discussions also form the basis for the development of the budget for the business case.

Step 4: After the scope of work, schedule, and budget have been finalized with the consultant and a notice to proceed has been issued, a kick-off meeting for the business case is held with the project team, which now includes the consultant. The primary goal of the kick-off meeting is to provide an opportunity for discussion between the WSSC staff on the project team and the consultant in order to allow for the transfer of knowledge regarding the identified need, specific objectives of the business case, any relevant performance measures, initial proposed alternatives, and other relevant information. Another purpose of the kick-off meeting is to determine the general engineering and technical assumptions which any proposed alternatives must satisfy. Additionally, the kick-off meeting serves as the last opportunity to add a new member to the project team.

Step 5: The fifth step in the business case evaluation is the alternatives screening memorandum. The main purpose of the alternatives screening memorandum is to document and describe all of the alternatives that have been proposed for consideration. The memorandum compares the alternatives to the general engineering and technical assumptions developed by the project team and lists pros and cons for each alternative. The memorandum serves as a tool for the project team in deciding which alternatives will proceed to the evaluation steps of the business case.

Step 6: The next step in the development of the business case after the alternatives screening memorandum is the alternatives screening workshop. The principal objective of the alternatives screening workshop is for the project team to review and discuss the proposed alternatives in order to select the alternatives that will advance to the evaluation portion of the business case. The workshop also serves as the last opportunity to change any of the general engineering and technical assumptions and the last chance to add additional alternatives for consideration. After the workshop, if necessary, the alternatives screening memorandum is updated to reflect any changes made during the meeting.

Step 7: The seventh step in the business case process is the evaluation assumptions memorandum. The main purpose of the evaluation assumptions memorandum is to document and describe the financial and economic assumptions that will be used in the evaluation of the selected alternatives. The memorandum serves as a tool for the project team in evaluating and agreeing to the assumptions to be used in the analysis prior to the evaluation being undertaken.

Step 8: After the evaluation assumptions memorandum is the evaluation assumptions workshop. The evaluation assumptions workshop serves as an opportunity for the project team to collectively review and discuss the assumptions that will be used in the evaluation of the alternatives as detailed in the evaluation assumptions memorandum. The goal of the workshop is for the project team to agree upon the financial and economic assumptions (e.g., inflation rates, construction costs, operating and maintenance costs) to be utilized in the analysis of the selected alternatives. The workshop is the final occasion for the project team to modify any of the assumptions to be used. If necessary, the evaluation assumptions memorandum will be updated after the workshop to reflect any changes made to the assumptions to be used in the analysis.

Step 9: The ninth step in the business case evaluation stage of the project needs validation process is the evaluation results memorandum. The evaluation results memorandum documents and describes the results of the evaluation of the selected alternatives, including the lifecycle costs and risk reduction for each alternative. The memorandum is meant to aid the project team in preparing for the evaluation results workshop and during the discussions at the workshop.

Step 10: The evaluation results workshop is the tenth step in the business case process. The main purpose for the evaluation results workshop is for the project team to review and discuss the results of the evaluation of the selected alternatives. The goal for the project team at the conclusion of the workshop is to have developed a recommendation for submission to the PNPC as to which alternative should be pursued. Any dissents with the project team recommendation are documented for consideration by the PNPC.

Step 11: The next step is the issuance of a draft report. The purpose of the draft report is to provide the project team with an opportunity to suggest editorial comments to the report before it is finalized and sent to the PNPC. The draft report is distributed amongst the project team for their review. The project team documents any editorial comments regarding the draft report in the comment registry for the project.

Step 12: The final step in the business case evaluation stage of the PNVP is the issuance of the final report. The final report documents the entire PNVP from the creation of the PIF through to the final report. Any editorial comments received from the project team on the draft report are addressed, as appropriate, in the final report. The final report contains the recommendation of the project team and is used by the PNPC to make a final decision upon whether or not the project will proceed, the source of funding for the project, and what WSSC group will carry out the implementation of the project. Once the committee reaches its decision, the PNVP concludes and the project is transmitted to the appropriate group for implementation by the AMP Manager if the project has been approved for funding. It is also possible that a project may receive approval of the committee without any funding if the approved solution to the identified need is a contractual or operational change.

Figure 2-2 Business Case Evaluation Process

2.2 Need Description

The Spring Garden WWPS has theoretical firm capacity of 0.432 MGD, and a pump station capacity evaluation conducted in 2015 by CDM determined the existing firm capacity to be 0.41 MGD. The WWPS requires a future capacity of 1.3 MGD. The purpose of this business case is to determine the optimal alternative to adequately address the capacity issues of this WWPS.

2.3 Workshops

Workshops were held at key points throughout the project to discuss the findings and reach consensus among the project team. The following list summarizes these workshops and when they occurred.

- Kickoff Meeting – 3/17/2015
- Alternative Screening Workshop – 5/11/2015
- Evaluation Assumptions/Evaluation Results Workshop – 7/1/2015

3 Assets

3.1 Assets Overview

The Spring Garden WWPS was constructed in 1977 and services a drainage area of approximately 361 acres of which 175 is sewered. The station is arranged in a traditional wetwell/drywell configuration with a separate above ground control building. It is located in a chain link fenced enclosed area off of Kings Valley Road near the intersection with Kingstead Road. The station contains 2 pumps providing 0.41 MGD each and discharges to an approximately 4,800 linear foot, 8” force main.

Figure 3-1 Ex. WWPS Aerial View

Figure 3-2 Ex. WWPS Street View

3.2 Condition of Existing Assets

The existing WWPS has a tested safe capacity of 0.41 MGD which is sufficient to handle current and future projected dry weather flows of 0.07 and 0.09 MGD, respectively. However, hydraulic modeling indicates that future wet-weather flows due to a 10-year storm event are expected to reach 1.3 MGD which far exceeds the current station’s capacity.

4 Alternatives

4.1 Alternatives Considered

WSSC provided an initial list of 5 possible alternatives for providing the required WWPS capacity, which Black and Veatch expanded to 9 possible alternatives, two of which contained two sub-alternatives. These alternatives are listed below:

1. Do nothing.
2. Status quo.
3. Operational changes at the WWPS.
4. Expansion of the existing WWPS.
5. Build additional storage.
6. Continue operation of the current WWPS and construct a new WWPS.
    a. New WWPS located behind 10924 Middleboro Drive.
    b. New WWPS located in the power line right of way.
7. New WWPS on the existing parcel, replacing the existing station.
    a. Full bypass during construction.
    b. Current WWPS to remain in service during construction (phased construction to limit bypass pumping).
8. New WWPS on neighboring MNCPPC parcel, replacing the existing station.
9. New WWPS on adjacent non-MNCPPC parcel, replacing the existing station.

4.2 Alternative Screening Process

Black and Veatch conducted a first-level screening of the alternatives that took into consideration issues such as effectiveness, difficulty of implementation, and community acceptance. The results of this screening were presented to WSSC at a workshop held on May 11, 2015. Based on the results of the workshop, the following five alternatives were selected to move forward for the business case analysis.

1. Do nothing
2. Status quo
3. Replace the existing WWPS with a new WWPS built on the existing parcel; bypass pumping during full construction period
4. Replace the existing WWPS with a new WWPS built on the existing parcel; phased construction to minimize bypass pumping during construction period
5. Replace the existing WWPS with a new WWPS built at a higher elevation on the adjacent non-MNCPPC parcel

4.3 Alternatives Evaluated

4.3.1 Alternative 1: Do Nothing

The “Do Nothing” alternative is included in the analysis as a baseline case for the purposes of comparison with the other alternatives. This alternative assumes that all ongoing maintenance and operation of the station will cease, and the station will be allowed to run to failure. Under these conditions, it is assumed that the station will fail within 2 months. This alternative does not provide the required WWPS capacity improvements and instead results in the elimination of all existing capacity.

4.3.2 Alternative 2: Status Quo

The Status Quo alternative assumes that the current WWPS remains in operation as-is, with will all ongoing maintenance and operation activities continuing unchanged. No upgrades or increases to the station capacity will be implemented. The advantage of this alternative is that it requires the least amount of upfront investment and will be able to provide sufficient capacity to convey all current and future anticipated dry weather flows. The disadvantage is that it cannot convey wet weather flows during 2 or 10 year storm events and will continue to have wet-weather related sanitary sewer overflows (SSOs).

4.3.3 Alternative 3: New WWPS, Existing Parcel, Full Bypass

This alternative consists of completely demolishing the existing WWPS before building a new higher capacity WWPS on the same parcel. The advantage of this is that it does not require acquisition of additional land parcels. By completely demolishing the existing station first, construction can be conducted in the most efficient order. The disadvantage is that this will require full 24/7 bypass pumping throughout the entire construction period, estimated to be approximately 6 months. This adds significantly to the construction costs. The existing parcel is also prone to flooding due to a nearby unnamed creek.

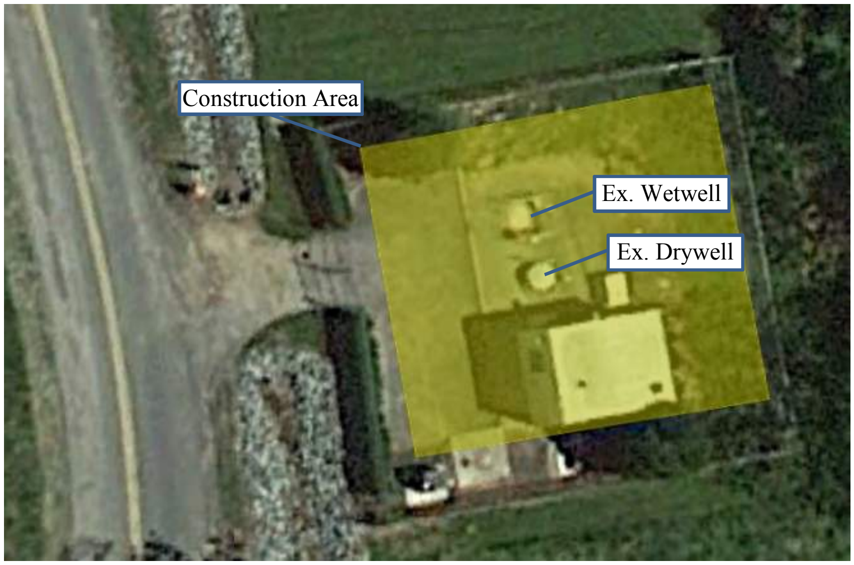


Figure 4-1 Alternative 3: Bypass During Full Construction Period

4.3.4 Alternative 4: New WWPS, Existing Parcel, Minimal Bypass

Similar to Alternative 3, this alternative consists of building a new higher capacity WWPS on the same parcel as the existing station. However, rather than demolishing the existing station prior to construction, this alternative utilizes a phased construction approach to keep the existing station operational for as much of the construction period as possible while the new station is built around it. During Phase 1 the new dry well and a portion of the new wetwell would be constructed under the existing parking lot area. Flows would then be directed from the old wetwell to the new wetwell and the new WWPS activated. During Phase 2 the original wetwell and drywell would be demolished, and the remaining portions of the new wetwell and other associated structures would be completed.

The advantage of this approach is that it minimizes the number of days that bypass pumping will be required during construction, saving on costs. The disadvantage is that this complicates the construction process, extending the length of the construction period to an estimated 8 months. The new station would also still be vulnerable to periodic flooding from the nearby unnamed creek.

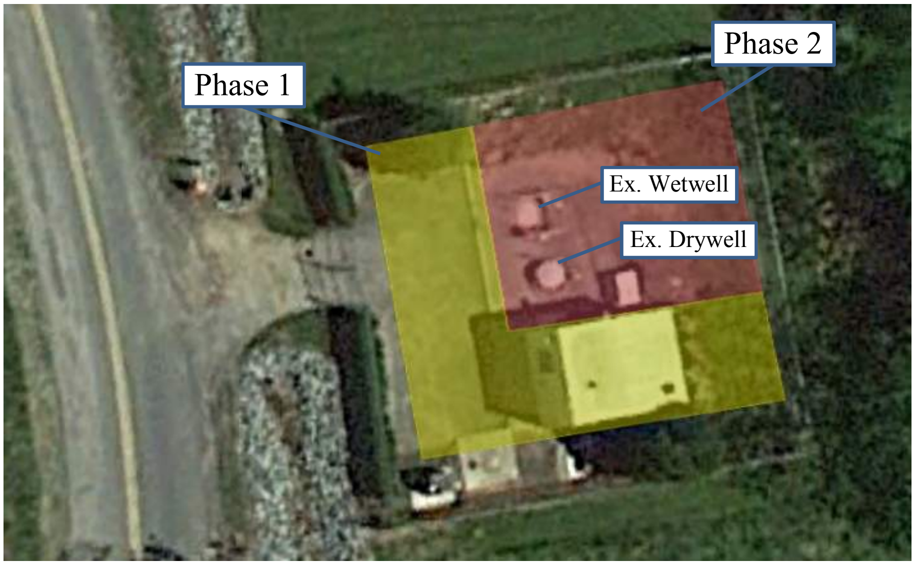


Figure 4-2 Alternative 4: Phased Construction to Minimize Bypass

4.3.5 Alternative 5: New WWPS, Adjacent Parcel, Minimal Bypass

This alternative consists of building a new WWPS just south of the existing station on the adjacent non-MNCPPC parcel. This parcel is not currently owned by WSSC; however, WSSC is pursuing its acquisition. For the purposes of this analysis, it was assumed that the land still needs to be acquired and therefore the associated costs are included. The new WWPS would be located on a small hill such that it is several feet higher in elevation than the existing WWPS. After construction of the new station, the existing WWPS would be taken out of service and demolished.

The advantages of this alternative are that it minimizes the potential for flooding by raising the WWPS elevation, construction is simplified by it utilizing an empty lot, and bypass pumping is minimized since the existing station can remain in service during construction. The primary disadvantage of this alternative over Alternatives 3 or 4 is that it requires the acquisition of additional land, adding to the initial capital cost requirements.

Figure 4-3 Alt. 9: New WWPS

Figure 4-4 Barn on Adjacent Parcel

5 Evaluation

5.1 LCA

5.1.1 LCA Description

A lifecycle cost analysis examines the total cost of ownership over the life of the asset(s) associated with the implementation of each of the alternatives selected for analysis. The analysis examines the expected capital, operations and maintenance, and other costs related to each alternative. The analysis also examines any operating benefits associated with the alternatives. The costs are forecast over the life of the asset(s) taking into account factors such as inflation. The future value of the costs (i.e., nominal costs) for each alternative are then discounted to determine the cumulative net present value for each alternative. The cumulative net present value for each alternative is then annuitized and used in the risk analysis in order to compare the cost effectiveness of each alternative.

5.1.2 LCA Assumptions and Inputs

5.1.2.1 General Assumptions

The following general assumptions are applicable to all alternatives.

- Inflation rate is 3%.
- Discount rate is 4%.
- 50 year analysis period.
- Planning costs are 3% of construction costs.
- Design costs are 7% of construction costs.
- Permitting costs are 5% of construction costs.
- Utilities costs (heat, light, power), based on $0.10/kWh and calibrated to the existing WWPS costs provided by WSSC for the first ten months of FY 2015, will increase by inflation factor each year.
- Operation and maintenance costs, labor salary/benefits, and other miscellaneous costs, based on the existing WWPS costs provided by WSSC for the first ten months of FY 2015, will increase by inflation factor each year.
- Diesel fuel costs are based on replacement of 10% of storage tank volume per month using current average prices and increased by inflation factor each year.
- Wastewater pumps require replacement every 25 years.
- All land parcels assumed sold at the end of the analysis period at a time-adjusted price

based on today's value.

- Fixed cleanup cost per anticipated SSO over the analysis period, weighted by the probability of the associated storm event.
- EPA/MDE fine per anticipated SSO over the analysis period, weighted by the probability of the associated storm event.
- Existing pumps are assumed to have been installed in 2013.

5.1.2.2 Assumptions Specific to Alternatives 3, 4, and 5

The following assumptions are specific to Alternatives 3, 4, and 5 which include construction of a new WWPS.

- The new WWPS is designed to meet the requirements of WSSC Design Guideline DG-07.
- The new WWPS requires two pumps in parallel to achieve the necessary flow rate of 1.3 MGD at the estimated system head of 270'. This results in a total of 4 pumps at the station to meet firm capacity requirements.
- New WWPS wetwell assumed to be square 8'W x 8'L x 22'D with 1' thick walls
- New WWPS drywell assumed to be 30'W x 30'L x 22'D with 1' thick walls. Size based on similar existing WWPS at Clopper Road.
- New WWPS control building assumed to be 30'W x 30'L x 15'H.
- No items are reused from existing WWPS.
- The new wetwell, drywell, and control building have a 100-year expected lifespan. 50 years of life will remain at the end of the analysis period. The value of the remaining life is determined using straight-line depreciation.
- Bypass pump sized for the modeled 2-year wet-weather event inflow of 0.83 MGD
- Bypass pump requires 24/7 monitoring as per WSSC Specification 02960, Section 1.2.C. Assume 1 laborer at $40/hour.

5.1.2.3 Alternative 1 Do Nothing

There are no construction or construction costs associated with Alternative 1. Maintenance is only performed on an emergency basis, so there are no recurring costs other than electricity. Lack of regular maintenance is assumed to lead to frequent WWPS failures, resulting in EPA fines and extensive cleanup costs.

The following table summarizes the LCA inputs for this alternative based on the assumptions detailed above.

Table 5-1 Alternative 1 Summary of Recurring Cost and Benefit Inputs

	Item	Cost	Begin FY	End FY	Frequency
1	Labor and Salary Benefits	$0	2016	2065	1
2	Diesel Fuel	$0			
3	Electricity	($1,702)	2016	2065	1
4	Misc.	$0			
5	Regular Monthly Maintenance	$0			
6	Pump and Motor Replacement	$0			
7	Remaining Life - Pumps and Motors	$0			
8	Remaining Life - Wetwell, Drywell, and Control Building	$0			
9	Land Value of Existing Parcel	$0			
10	Land Value of New Parcel	$0			
11	SSO Cleanup	($2,032,246)	2016	2065	1
12	EPA Consent Decree Fines	($1,744,969)	2016	2065	1

5.1.2.4 Alternative 2 Status Quo

There are no construction costs associated with Alternative 2. Regular maintenance is performed, and assets with remaining useful life at the end of the analysis period are accounted for using straight-line depreciation. The existing motors are two years into their effective lifespan, so they will be replaced in years 23 and 48. No remaining life is assumed for the wetwell, drywell, and control building at the end of the analysis period.

Table 5-2 Alternative 2 Summary of Recurring Cost and Benefit Inputs

	Item	Cost	Begin FY	End FY	Frequency
1	Labor and Salary Benefits	($79,020)	2016	2065	1
2	Diesel Fuel	($2,340)	2016	2065	1
3	Electricity	($10,212)	2016	2065	1
4	Misc.	($18,540)	2016	2065	1
5	Regular Monthly Maintenance	($14,460)	2016	2065	1
6	Pump and Motor Replacement	($50,000)	2038	2065	25
7	Remaining Life - Pumps and Motors	$46,000	2065	2065	1
8	Remaining Life - Wetwell, Drywell, and Control Building	$0			
9	Land Value of Existing Parcel	$65,667	2065	2065	1
10	Land Value of New Parcel	$0			
11	SSO Cleanup	($24,746)	2016	2065	1
12	EPA Consent Decree Fines	($29,469)	2016	2065	1

5.1.2.5 Alternative 3 New WWPS, Existing Parcel, Full Bypass

Construction occurs over a 6-month period. Construction costs include bypass pumping for the full construction period. The following tables summarize the LCA inputs for this alternative based on the assumptions detailed above.

Table 5-3 Alternative 3 Summary of Capital Costs Inputs

Task		FY 2016	FY 2017	FY 2018	Total
1	Planning, Design, and Supervision				
	Planning, Permitting, Design	($119,974)	($159,965)	$0	($279,939)
	Design Services During Construction	$0	$0	$0	$0
2	Land	$0	$0	$0	$0
3	Site Improvements and Utilities	$0	$0	$0	$0
4	Construction	$0	$0	($1,866,263)	($1,866,263)
5	Other (WSSC Administration)	$0	$0	$0	$0
6	**Total**	**($119,974)**	**($159,965)**	**($1,866,263)**	**($2,146,202)**

Table 5-4 Alternative 3 Summary of Recurring Cost and Benefit Inputs

Item		Cost	Begin FY	End FY	Frequency
1	Labor and Salary Benefits	($79,020)	2016	2065	1
2	Diesel Fuel	($3,030)	2016	2065	1
3	Electricity	($16,707)	2016	2065	1
4	Misc.	($18,540)	2016	2065	1
5	Regular Monthly Maintenance	$14,460	2016	2065	1
6	Pump and Motor Replacement	($480,000)	2040	2065	25
7	Remaining Life - Pumps and Motors	$46,000	2065	2065	1
8	Remaining Life - Wetwell, Drywell, and Control Building	$19,410	2065	2065	1
9	Land Value of Existing Parcel	$65,667	2065	2065	1
10	Land Value of New Parcel	$0			
11	SSO Cleanup	($3,758)	2016	2065	1
12	EPA Consent Decree Fines	($3,503)	2016	2065	1

5.1.2.6 Alternative 4 New WWPS, Existing Parcel, Minimal Bypass

Construction occurs over an 8-month period. Construction activities are phased to allow the existing WWPS to operate as long as possible, resulting in only one month of bypass pumping. The following tables summarize the LCA inputs for this alternative based on the assumptions detailed above.

Table 5-5 Alternative 4 Summary of Capital Costs Inputs

	Task	FY 2016	FY 2017	FY 2018	FY 2019	Total
1	Planning, Design, and Supervision					
	Planning, Permitting, Design	($116,058)	($154,744)	$0	$0	($270,802)
	Design Services During Construction	$0	$0	$0	$0	$0
2	Land	$0	$0	$0	$0	$0
3	Site Improvements and Utilities	$0	$0	$0	$0	$0
4	Construction	$0	$0	($1,354,008)	($451,336)	($1,805,344)
5	Other (WSSC Administration)	$0	$0	$0	$0	$0
6	**Total**	**($116,058)**	**($154,744)**	**($1,354,008)**	**($451,336)**	**($2,076,146)**

Table 5-6 Alternative 4 Summary of Recurring Cost and Benefit Inputs

	Item	Cost	Begin FY	End FY	Frequency
1	Labor and Salary Benefits	($79,020)	2016	2065	1
2	Diesel Fuel	($3,030)	2016	2065	1
3	Electricity	($16,707)	2016	2065	1
4	Misc.	($18,540)	2016	2065	1
5	Regular Monthly Maintenance	($14,460)	2016	2065	1
6	Pump and Motor Replacement	($480,000)	2040	2065	25
7	Remaining Life - Pumps and Motors	$46,000	2065	2065	1
8	Remaining Life - Wetwell, Drywell, and Control Building	$19,410	2065	2065	1
9	Land Value of Existing Parcel	$65,667	2065	2065	1
10	Land Value of New Parcel	$0			
11	SSO Cleanup	($3,758)	2016	2065	1
12	EPA Consent Decree Fines	($3,503)	2016	2065	1

5.1.2.7 Alternative 5 New WWPS, Adjacent Parcel, Minimal Bypass

Construction occurs over a 6-month period. The existing WWPS is left in service during construction to minimize bypass pumping, resulting in only one month of bypass pumping. An additional land parcel is also purchased. The following tables summarize the LCA inputs for this alternative based on the assumptions detailed above.

Table 5-7 Alternative 5 Summary of Capital Costs Inputs

Task		FY 2016	FY 2017	FY 2018	Total
1	Planning, Design, and Supervision				
	Planning, Permitting, Design	($107,584)	($143,445)	$0	($251,028)
	Design Services During Construction	$0	$0	$0	$0
2	Land	$0	($140,000)	$0	($140,000)
3	Site Improvements and Utilities	$0	$0	$0	$0
4	Construction	$0	$0	($1,673,523)	($1,673,523)
5	Other (WSSC Administration)	$0	$0	$0	$0
6	**Total**	**($107,584)**	**($283,445)**	**($1,673,523)**	**($2,064,551)**

Table 5-8 Alternative 5 Summary of Recurring Cost and Benefit Inputs

Item		Cost	Begin FY	End FY	Frequency
1	Labor and Salary Benefits	($79,020)	2016	2065	1
2	Diesel Fuel	($3,030)	2016	2065	1
3	Electricity	($16,707)	2016	2065	1
4	Misc.	($18,540)	2016	2065	1
5	Regular Monthly Maintenance	($14,460)	2016	2065	1
6	Pump and Motor Replacement	($480,000)	2040	2065	25
7	Remaining Life - Pumps and Motors	$46,000	2065	2065	1
8	Remaining Life - Wetwell, Drywell, and Control Building	$19,410	2065	2065	1
9	Land Value of Existing Parcel	$65,667	2065	2065	1
10	Land Value of New Parcel	$140,000	2065	2065	1
11	SSO Cleanup	($3,758)	2016	2065	1
12	EPA Consent Decree Fines	($3,503)	2016	2065	1

5.1.3 LCA Results

Alternative 2 Status Quo is the highest ranked alternative in terms of annuitized cost. The second ranked alternative based on the annuitized cost is Alternative 5 New WWPS, Adjacent Parcel, Minimal Bypass. The margin of difference between the annuitized costs of the top two ranked alternatives is 17%. Table 5-9 summarizes the LCA results.

Table 5-9 Summary of LCA Results

#	Alternative	Analysis Period	Annuitized Cost	Marginal Annuitized Cost	Rank
1	Do Nothing	50	($5,652,184)	$0	5
2	Status Quo	50	($312,206)	$5,339,977	1
3	New WWPS, Existing Parcel, Full Bypass	50	($371,784)	$5,280,400	4
4	New WWPS, Existing Parcel, Minimal Bypass	50	($368,522)	$5,283,661	3
5	New WWPS, Adjacent Parcel, Minimal Bypass	50	($363,962)	$5,288,221	2

5.2 RRA

5.2.1 RRA Description

A risk reduction analysis examines the risk outcomes associated with the implementation of each of the alternatives selected for analysis. The analysis examines the potential failure event(s) and the consequence of failure (COF), probability of failure (POF), and mitigation factor (MF) associated with the failure event(s). The COF, POF, and MF are multiplied by each other for each alternative to determine the risk associated with the failure event(s). The risk outcomes for each alternative are then compared to the baseline risk outcome, which in this instance is equivalent to the risk related to Alternative 1, in order to determine the risk reduction afforded by each alternative. Finally, the annual risk reduction is compared to the annuitized cost of each alternative, as determined in the lifecycle cost analysis, in order to compare the cost effectiveness of each alternative on a risk reduced per dollar spent basis.

5.2.2 RRA Assumptions and Inputs

5.2.2.1 Failure Event (FE) Definition

The FE is when an SSO occurs at the WWPS.

5.2.2.2 General

The following general assumptions are applicable to all alternatives.

- The mitigation factor was not used in this analysis. Its value is therefore set to 100% for all alternatives to remove its impacts.
- For the Do Nothing alternative, an SSO is assumed to occur within 2 months. For Status Quo, an SSO is assumed to occur during the 2-year wet-weather event.
- The duration of each SSO event is assumed to be 1 day.

- Leaked sewage has the potential to reach homes at 25115 and 25116 Kings Valley Road. The total damage due to sewage is assumed to be 1% of the home values.
- Public health impacts are assumed to be due to contact with leaked sewage and are limited to the residents of the two nearby homes at 25115 and 25116 Kings Valley Road. The combined population of the two homes is assumed to be 10.
- The sewer basin contains approximately 350 homes and is assumed to have a total population of approximately 1,000.
- To remain consistent with the LCA, the previously determined cleanup cost of $5,500 per SSO was used in place of the cleanup costs calculated by the risk reduction tool.
- To remain consistent with the LCA, the previously determined EPA Consent Decree fines for SSOs were used in place of the fines calculated by the risk reduction tool.
- The area contains no historic sites.
- The area harbors no endangered species.

5.2.2.3 COF Costs

An SSO at the WWPS has the same impact regardless of the alternative selected. The following table summarizing the COF impacts is therefore applicable to all alternatives.

Table 5-10 Summary of COF Economic Cost Inputs

No.	Item	Cost	RRA Tool Generated Value?	Parameters
1	Damage to failed WSSC assets			
2	Damage to adjacent WSSC assets	($7,200)	N/A	1% of adjacent property values
3	Damage to non-WSSC assets			
4	Loss of WSSC asset contents			
5	Value of lost WSSC service			
6	Value of lost non-WSSC services			
7	Cleanup costs	($5,500)	No	#REF!
8	General impacts on the community - level of service loss	($25,000)	Yes	Wastewater: residential, 1,000 people (basin population), 1 day
9	Total cost of injuries	($10)	Yes	Minor inconvenience, 10 people (adjacent properties)
10	Public health impacts	($5,000)	Yes	Minor, 10 people (adjacent properties)
11	Loss of WSSC public image	($5,000)	Yes	Adverse media, 1 week, emergency plan exists

No.	Item	Cost	RRA Tool Generated Value?	Parameters
12	Long term impact on the environment	($700,000)	Yes	Land: riverfront, 1 week, minor Water: river/creek, 1 week, minor
13	Impact on fauna	($100,000)	Yes	Minor, no endangered species
14	WSSC legal costs	($50,000)	Yes	Minor
15	Fines levied on WSSC	($4,700)	No	$4,700/day per EPA Consent Decree
	Total	($902,410)		

5.2.2.4 POF

The POF within one year for each event was based on the probability of a rainfall event of sufficient size to cause the SSO occurring within a given year. Due to lack of maintenance, It is assumed that Alternative 1 will experience an SSO even during dry weather due to lack of maintenance. It is therefore assigned a 100% POF. For Alternative 2, an SSO is expected to occur with the 2-year rainfall event, resulting in a 50% POF. Alternatives 3 through 5 include building a new WWPS sized to accommodate peak flows up to the 10-year rainfall event; therefore, an SSO is not expected until an 11-year rainfall event or greater. This results in a 10% POF.

Table 5-11 summarizes the POFs for each alternative.

Table 5-11 POF Summary

No.	Item	POF
1	Do Nothing	100%
2	Status Quo	50%
3	New WWPS, Existing Parcel, Full Bypass	10%
4	New WWPS, Existing Parcel, Minimal Bypass	10%
5	New WWPS, Adjacent Parcel, Minimal Bypass	10%

5.2.2.5 FE Summary

The following table summarizes the COF, POF, and MF inputs for this failure event for each alternative based on the assumptions detailed in the previous sections. The total annual risk associated with each alternative is the product of the COF, POF, and MF.

Table 5-12 FE Summary

#	Alternative	COF	POF	MF	Annual Risk
1	Do Nothing	($902,410)	100%	100%	($902,410)
2	Status Quo	($902,410)	50%	100%	($451,205)
3	New WWPS, Existing Parcel, Full Bypass	($902,410)	10%	100%	($90,241)
4	New WWPS, Existing Parcel, Minimal Bypass	($902,410)	10%	100%	($90,241)
5	New WWPS, Adjacent Parcel, Minimal Bypass	($902,410)	10%	100%	($90,241)

5.2.3 RRA Results

Alternatives 3, 4 and 5 eliminate the risk of SSO up to the 10-year rainfall event, which was the stated design intent of this project. The highest ranked alternative in terms of the cost effectiveness factor is Alternative 5 – New WWPS, Adjacent Parcel, Minimal Bypass; however, the cost effectiveness factors of alternatives 3, 4, and 5 are all within 2.3% of each other. This shows that the top three alternatives are grouped closely in terms of cost effectiveness factor.

Table 5-13 RRA Results Summary

#	Alternative	Annuitized Cost	Total Annual Risk	Annual Risk Reduction	Cost Effectiveness Factor	Rank
		A	B	C	D = (C ÷ A)	
1	Do Nothing	($5,652,184)	($902,410)	$0	0.00	5
2	Status Quo	($312,206)	($451,205)	($451,205)	1.45	4
3	New WWPS, Existing Parcel, Full Bypass	($371,784)	($90,241)	($812,169)	2.18	3
4	New WWPS, Existing Parcel, Minimal Bypass	($368,522)	($90,241)	($812,169)	2.20	2
5	New WWPS, Adjacent Parcel, Minimal Bypass	($363,962)	($90,241)	($812,169)	2.23	1

5.3 Sensitivity Analysis

5.3.1 Description

The business case analysis is based on a number of assumptions, so a sensitivity analysis is performed to ensure that the optimal alternative is recommended. Different scenarios were evaluated and are summarized in the following sections.

5.3.1.1 Sensitivity Analysis No. 1 – Construction and Cleanup Costs

The areas with the largest uncertainties related to the analysis are construction costs and SSO cleanup costs. Therefore, a sensitivity analysis was conducted in which the construction costs and SSO cleanup costs were both increased and decreased by 20% to assess the impact on the life cycle cost and risk reduction tool outcomes. For this analysis, construction costs included all planning, permitting, design, demolition, materials, electrical, labor/equipment, and bypass pumping/staffing costs. Pump and building replacement and remaining life values were also included. The analysis affected the magnitude of the life cycle costs and risk reduction cost effectiveness factors, but the rankings of the alternatives relative to each other were unaffected. See Table 5-14 for a summary of the results.

Table 5-14 Summary of Key Decision Criteria for Sensitivity Analysis No. 1

Alternative	LCA		RRA	
	Annuitized Cost Stream		Cost Effectiveness Factor	
	+20%	-20%	+20%	-20%
Alternative 2 - Status Quo	($321,930)	($302,483)	1.40	1.49
Alternative 3 - New WWPS, Existing Parcel, Full Bypass	($396,151)	($347,416)	2.05	2.33
Alternative 4 - New WWPS, Existing Parcel, Minimal Bypass	($392,237)	($344,808)	2.07	2.35
Alternative 5 - New WWPS, Adjacent Parcel, Minimal Bypass	($386,266)	($341,659)	2.11	2.37

5.3.1.2 Sensitivity Analysis No. 2 – Construction Costs

Next, an analysis was performed changing just the construction costs by +/- 20% and holding the SSO cleanup costs steady. Similarly to Sensitivity Analysis No. 1, the analysis affected the magnitude of the life cycle costs and risk reduction cost effectiveness factors, but the rankings of the alternatives relative to each other were unaffected. See Table 5-15 for a summary of the results.

Table 5-15 Summary of Key Decision Criteria for Sensitivity Analysis No. 2

Alternative	LCA		RRA	
	Annuitized Cost Stream		Cost Effectiveness Factor	
	+20%	-20%	+20%	-20%
Alternative 2 - Status Quo	($312,608)	($311,805)	1.44	1.45
Alternative 3 - New WWPS, Existing Parcel, Full Bypass	($394,735)	($348,832)	2.06	2.33
Alternative 4 - New WWPS, Existing Parcel, Minimal Bypass	($390,821)	($346,223)	2.08	2.35
Alternative 5 - New WWPS, Adjacent Parcel, Minimal Bypass	($384,850)	($343,075)	2.11	2.37

5.3.1.3 Sensitivity Analysis No. 3 – SSO Cleanup Costs

Finally an analysis was performed changing only the SSO cleanup costs by +/- 20% but holding the construction costs steady. Like Sensitivity Analysis Nos. 1 and 2, the analysis affected the magnitude of the life cycle costs and risk reduction cost effectiveness factors, but the rankings of the alternatives relative to each other were unaffected. See Table 5-16 for a summary of the results.

Table 5-16 Summary of Key Decision Criteria for Sensitivity Analysis No. 3

Alternative	LCA		RRA	
	Annuitized Cost Stream		Cost Effectiveness Factor	
	+20%	-20%	+20%	-20%
Alternative 2 - Status Quo	($321,528)	($302,884)	1.41	1.49
Alternative 3 - New WWPS, Existing Parcel, Full Bypass	($373,199)	($370,368)	2.18	2.19
Alternative 4 - New WWPS, Existing Parcel, Minimal Bypass	($369,938)	($367,107)	2.20	2.21
Alternative 5 - New WWPS, Adjacent Parcel, Minimal Bypass	($365,378)	($362,547)	2.23	2.24

6 Recommended Alternative

Alternative 2 Status Quo has the lowest annuitized cost; however, it ranks fourth in terms of cost effectiveness factor. Alternative 5 New WWPS, Adjacent Parcel, Minimal Bypass ranks highest in terms of cost effectiveness factor and ranked second in terms of annuitized cost. Sensitivity analysis showed that these conditions persisted even when input costs and SSO fines were varied. Alternative 5 is therefore the preferred alternative.

Table 6-1 Recommended Alternative Preliminary Implementation Schedule

Phase	Task	Time Frame
1	Project development	October 2015 – December 2015
2	Land Acquisition	July 2016 – December 2016
3	Design and permitting	January 2016 – June 2017
4	Bidding and procurement	July 2017 – December 2017
5	Construction	January 2018 – June 2018

Table 6-2 Summary of Capital Costs Inputs

	Task	FY 2016	FY 2017	FY 2018	FY 2019	Total
1	Planning, Design, and Supervision					
	Planning, Permitting, Design	($107,584)	($143,445)	$0	$0	($251,028)
	Design Services During Construction	$0	$0	$0	$0	$0
2	Land	$0	($140,000)	$0	$0	($140,000)
3	Site Improvements and Utilities	$0	$0	$0	$0	$0
4	Construction	$0	$0	($1,115,682)	($557,841)	($1,673,523)
5	Other (WSSC Administration)	$0	$0	$0	$0	$0
6	**Total**	**($107,584)**	**($283,445)**	**($1,115,682)**	**($557,841)**	**($2,064,551)**

7 Additional Items

7.1 Items for Consideration Prior to Implementation.

There are two items of note that could have an impact on the final design and implementation of this alternative. These items are described briefly here but were outside the scope of this business case evaluation and so were not investigated further. As they have the potential to impact the scope and cost of the recommended alternative, WSSC may wish to consider them further before final implementation.

7.1.1 Force Main

The existing force main is approximately 4,800 feet in length, 8 inches in diameter, and rises approximately 150 feet from the WWPS to the outfall. The existing pumps operate at 0.41 MGD. Assuming an 8-inch inner diameter, this results in a flow velocity of 1.8 feet per second at approximately 170 feet total dynamic head. Increasing the flow to 1.3 MGD would raise the flow velocity to 5.76 feet per second and the total dynamic head to approximately 270 feet. The new station will require two pumps working in series to meet these conditions, increasing the size and cost of the station. Enlarging the existing force main or installing a parallel force main would reduce the total dynamic head and allow for a smaller, less complex, and less expensive WWPS. It is recommended that WSSC consider addressing the Spring Garden WWPS force main to better handle the increased flows and velocities.

7.1.2 Existing Capacity

As noted, the capacity of the existing station is sufficient to handle all current and future dry-weather flows, but it is insufficient to handle wet-weather flows. Previous flow monitoring studies in the basin have indicated a high level of infiltration into the existing station. The WSSC Utility Services Group has previously investigated this situation and made recommendations. Further investigation was beyond the scope of this business case.

7.2 2018 Spring Gardens WWPS and Force Main business case

Per the recommendation in Section 7.1.1, in 2018 WSSC completed a related business case to study the associated force main. The results of the force main business case impacted the pump selection for the WWPS business case. This final report is being included in a package that also includes the final report from the force main business case as well as a combined executive summary. The combined executive summary updates the costs for the recommended alternative from this business case to account for inflation, include the new pump selections, and to remove the cost of land purchase as WSSC has already purchased the adjacent parcel. The combined executive summary also provides an updated cost and implementation schedule that includes both the WWPS and force main projects.

Appendix A: Revision History

Revision History

Rev No.	Description of Revision	Revised By	Date
0	Initial submittal.		9/30/2015
1	Updated for 2018 force main business case	EBH	7/27/2018
2			
3			
4			

Appendix B: List of Acronyms

List of Acronyms

ACRONYM	PHRASE
AMP	Asset Management Program
ASM	Asset Strategy Manager
BCE	Business Case Evaluation
CBA	Cost Benefit Analysis
CIP	Capital Improvement Program
COF	Consequence of Failure
ESP	Engineering Support Program
LOS PM	Level of Service Performance Measure
LCA	Lifecycle Cost Analysis
MF	Mitigation Factor
NASM	Network Asset Strategy Manager
OAM	Office of Asset Management
PIF	Project Initiation Form
PNPC	Project Needs Planning Committee
PNVP	Project Needs Validation Process
POF	Probability of Failure
RRA	Risk Reduction Analysis
SASM	System Asset Strategy Manager
SSO	Sanitary Sewer Overflow
TSG	Technical Services Group
WSSC	Washington Suburban Sanitary Commission
WWPS	Wastewater Pump Station

Appendix C: Comment Registry

WASHINGTON SUBURBAN SANITARY COMMISION

PROJECT NO:	**23202574C**	***DATE:***	**September 25, 2015**
PROJECT NAME:	**Spring Garden Pump Station Business Case**	***SUBMISSION:***	**Draft Report and Tools (August 6, 2015)**
PROJECT MANAGER:	**Bola Fashokun**	***REVIEWERS:***	**WSSC Project Team**

NUMBER	***REFERENCE***	***COMMENT***		***RESPONSE***
1.	Section 7.6.1	Include a recommendation on minimum force main size to safely carry flows from the new pump station.	**BF**	The existing 8” force main is capable of conveying the proposed 1.3 MGD flow; however, it would be operating at the upper limits of its acceptable range (flow velocity approx. 6 fps, depending on the exact I.D. of the existing FM) and results in very high total dynamic head for the pump station. Increasing the FM to either 10” or 12” nominal diameter significantly reduces the total dynamic head while still maintaining acceptable minimum flow velocities (> 2 fps). Further increases in diameter reduce minimum velocities below acceptable levels. Although flow velocity and system head considerations provide a good starting point for a potential FM design, they are not the only parameters that must be considered. A detailed FM analysis that also takes into account factors such as costs, impacts to pump selection, sewage residence time, O&M, and anticipated future capacity needs would need to be conducted to determine the optimal diameter; however, such a study was not part of the scope of this business case evaluation.
2.	General	How does a new pump station in a different location work with an existing force main?	**BF**	The proposed new location is adjacent to the existing station location. New yard piping would be required to connect both the gravity sewers and the force main to the new station. All required extensions/connections would be confined within the limits of the new parcel acquired for the purposes of the new station’s construction. Other potential locations were considered during the alternatives analysis, each of which would have had its own unique connection challenges; however,

				none were deemed viable and were not developed further.
3.	RR Tool	Remove the Adjustment Factor multiplier used in the calculation of the Risk Reduction Cost Effectiveness Factor. RR Cost Effectiveness Factor should be calculated by dividing Value of Risk Reduction by Project Cost.	**BH**	The Adjustment Factor has been removed from the calculation.
4.	RR Tool	Do Nothing alternative should have the same Consequence of Failure cost as the other alternatives.	**BH**	The Do Nothing CoF has been changed to match that of the other alternatives.

BF – Bola Fashokun
BH – Brian Halloran

Appendix D: Business Case Evaluation Cost Inputs

Alternative 1 Do Nothing

CAPITAL COSTS			
ITEM DESCRIPTION	**TOTAL COST**	**SOURCE**	**ASSUMPTIONS**
None			-
TOTAL CAPITAL COST	**$ -**		

OPERATING COSTS			
ITEM DESCRIPTION	**TOTAL COST**	**SOURCE**	**ASSUMPTIONS**
Heat/light/power costs	$ 1,702	WSSC Expense Account by Facility Report (dated 5/7/2015)	$851/month; assume 2 months to failure
TOTAL ANNUAL COST	**$ 1,702**		

ANNUAL OPERATING BENEFIT			
ITEM DESCRIPTION	**TOTAL BENEFIT**	**SOURCE**	**ASSUMPTIONS**
None			
TOTAL ANNUAL BENEFIT	**$ -**		

MAINTENANCE COSTS			
ITEM DESCRIPTION	**TOTAL COST**	**SOURCE**	**ASSUMPTIONS**
None			-
TOTAL ANNUAL COST	**$ -**		

MAINTENANCE BENEFIT			
ITEM DESCRIPTION	**TOTAL BENEFIT**	**SOURCE**	**ASSUMPTIONS**
None			
TOTAL ANNUAL BENEFIT	**$ -**		

RENEWAL COSTS			
ITEM DESCRIPTION	**TOTAL COST**	**SOURCE**	**ASSUMPTIONS**
None			-
TOTAL ANNUAL COST	**$ -**		

DISPOSAL COSTS			
ITEM DESCRIPTION	**TOTAL COST**	**SOURCE**	**ASSUMPTIONS**
Land Value of Existing Parcel	$ (65,667)	2015 tax assessment	2015 value shifted forward 50 years at inflation. Assume land is sold at 50 years.
TOTAL ANNUAL COST	**$ (65,667)**		

OTHER COSTS			
ITEM DESCRIPTION	**TOTAL COST**	**SOURCE**	**ASSUMPTIONS**
Cleanup after SSO	$ 2,032,246	See rainfall calculation spreadsheet	$5500/cleanup, 1 overflow/day
EPA/MDE Fines	$ 1,744,969	See rainfall calculation spreadsheet	Consent Decree fines, weighted by storm probability
TOTAL ANNUAL COST	**$ 3,777,215**		

Alternative 2 Status Quo

CAPITAL COSTS			
ITEM DESCRIPTION	TOTAL COST	SOURCE	ASSUMPTIONS
None			
TOTAL CAPITAL COST	**$ -**		

ANNUAL OPERATING COSTS			
ITEM DESCRIPTION	TOTAL COST	SOURCE	ASSUMPTIONS
Heat/light/power costs	$ 10,212	WSSC Expense Account by Facility Report (dated 5/7/2015)	$851/month; average monthly cost for first 10 months of FY 2015
Labor salary/benefits	$ 79,020	WSSC Expense Account by Facility Report (dated 5/7/2015)	$6585/month; average monthly cost for first 10 months of FY 2015
Misc.	$ 18,540	WSSC Expense Account by Facility Report (dated 5/7/2015)	$1545/month; Transportation and office building expenses; average monthly cost for first 10 months of FY 2015
Diesel fuel	$ 2,340	AAA average cost for diesel in the Maryland/DC Metro area on 6/9/2015	$3.25/gal; Assume 10% of existing 600 gallon tank capacity replaced per month at current market prices
TOTAL ANNUAL COST	**$ 110,112**		

ANNUAL OPERATING BENEFIT			
ITEM DESCRIPTION	TOTAL BENEFIT	SOURCE	ASSUMPTIONS
None			
TOTAL ANNUAL BENEFIT	**$ -**		

ANNUAL MAINTENANCE COSTS			
ITEM DESCRIPTION	TOTAL COST	SOURCE	ASSUMPTIONS
Regular maintenance	$ 14,460	WSSC Expense Account by Facility Report (dated 5/7/2015)	$1205/month; average monthly cost for first 10 months of FY 2015
TOTAL ANNUAL COST	**$ 14,460**		

ANNUAL MAINTENANCE BENEFIT			
ITEM DESCRIPTION	TOTAL BENEFIT	SOURCE	ASSUMPTIONS
None			
TOTAL ANNUAL BENEFIT	**$ -**		

RENEWAL COSTS			
ITEM DESCRIPTION	TOTAL COST	SOURCE	ASSUMPTIONS
Pump and motor replacement	$ 50,000	Quote from Flygt AC	Existing installed 2 years ago; therefore, assume will be replaced in years 23 and 48.
TOTAL ANNUAL COST	**$ 50,000**		

DISPOSAL COSTS			
ITEM DESCRIPTION	TOTAL COST	SOURCE	ASSUMPTIONS
Pumps/motors remaining life	$ (46,000)		Pumps/motors will be 2 years old at end of analysis period. Straight-line depreciation of the install costs over the 25-year expected life of the pumps, time shifted accordingly.
Land Value of Existing Parcel	$ (65,667)	2015 tax assessment	2015 value shifted forward 50 years at inflation. Assume land is sold at 50 years.
TOTAL ANNUAL COST	**$ (111,667)**		

OTHER COSTS			
ITEM DESCRIPTION	TOTAL COST	SOURCE	ASSUMPTIONS
Cleanup after SSO	$ 24,746	See rainfall calculation spreadsheet	$5500/cleanup, weighted by storm probability
EPA/MDE Fines	$ 29,469	See rainfall calculation spreadsheet	Consent Decree fines, weighted by storm probability
TOTAL COST	**$ 54,215**		

ALTERNATIVE 3 New station, existing parcel, full bypass

CAPITAL COSTS			
ITEM DESCRIPTION	**TOTAL COST**	**SOURCE**	**ASSUMPTIONS**
Planning	$ 55,988		3% of Demolition, Construction, Electrical, and Labor/Equipment Costs
Design	$ 130,638		7% of Demolition, Construction, Electrical, and Labor/Equipment Costs
Permitting	$ 93,313		5% of Demolition, Construction, Electrical, and Labor/Equipment Costs
Demolition	$ 74,963	See Demolition Cost Estimate (Appendix A)	
Construction	$ 709,316	See Construction Cost Estimate (Appendix A)	
Electrical	$ 418,536	See Electrical Cost Estimate (Appendix C)	
Labor/Equipment	$ 432,160	See Labor/Equipment Cost Estimate (Appendix A)	
Bypass Pumping/Staffing	$ 231,288	See Bypass Pumping Cost Estimate (Appendix A)	Assume 1 person, 24 hours a day, $40/hour
TOTAL CAPITAL COST	**$ 2,146,202**		

OPERATING COSTS			
ITEM DESCRIPTION	**TOTAL COST**	**SOURCE**	**ASSUMPTIONS**
Heat/light/power costs	$ 16,707	See Electrical Load Calculation, Operating Cost Estimate (Appendix C)	
Labor salary/benefits	$ 79,020	WSSC Expense Account by Facility Report (dated 5/7/2015)	$6585/month; average monthly cost for first 10 months of FY 2015
Misc.	$ 18,540	WSSC Expense Account by Facility Report (dated 5/7/2015)	$1545/month; Transportation and office building expenses; average monthly cost for first 10 months of FY 2015
Diesel fuel	$ 3,030	AAA average cost for diesel in the Maryland/DC Metro area on 6/9/2015	$3.25/gal; Assume 10% of 777 gal tank replaced per month at current market prices
TOTAL ANNUAL COST	**$ 117,297**		

ANNUAL OPERATING BENEFIT			
ITEM DESCRIPTION	**TOTAL BENEFIT**	**SOURCE**	**ASSUMPTIONS**
None			
TOTAL ANNUAL BENEFIT	**$ -**		

ANNUAL MAINTENANCE COSTS			
ITEM DESCRIPTION	**TOTAL COST**	**SOURCE**	**ASSUMPTIONS**
Regular maintenance	$ 14,460	WSSC Expense Account by Facility Report (dated 5/7/2015)	$1205/month; average monthly cost for first 10 months of FY 2015
TOTAL ANNUAL COST	**$ 14,460**		

ANNUAL MAINTENANCE BENEFIT			
ITEM DESCRIPTION	**TOTAL BENEFIT**	**SOURCE**	**ASSUMPTIONS**
None			
TOTAL ANNUAL BENEFIT	**$ -**		

RENEWAL COSTS			
ITEM DESCRIPTION	**TOTAL COST**	**SOURCE**	**ASSUMPTIONS**
Pump replacement	$ 480,000	See Construction Cost Estimate (Appendix A)	$120000/pump-motor x 4; assume replace every 25 years
TOTAL ANNUAL COST	**$ 480,000**		

DISPOSAL COSTS			
ITEM DESCRIPTION	**TOTAL COST**	**SOURCE**	**ASSUMPTIONS**
Existing Pumps/Motors Remaining Life	$ (46,000)		Existing pumps/motors were new 2 years ago. Assume straight-line depreciation of the install costs over the 25-year expected life of the pumps. Pumps/motors assumed to be 1/3 the cost of new 1.3 MGD pumps/motors.
Building, Wetwell, Drywell Remaining Life	$ (19,410)		Will have 50 years of remaining service life at the end of the analysis period. Assume straight-line depreciation of structure value over the 100-year expected lifespan, time shifted accordingly.
Land Value of Existing Parcel	$ (65,667)	2015 tax assessment	2015 value shifted forward 50 years at inflation. Assume land is sold at 50 years.
TOTAL ANNUAL COST	**$ (131,077)**		

OTHER COSTS			
ITEM DESCRIPTION	**TOTAL COST**	**SOURCE**	**ASSUMPTIONS**
Cleanup after SSO	$ 3,758	See rainfall calculation spreadsheet	$5500/cleanup, weighted by storm probability
EPA/MDE Fines	$ 3,503	See rainfall calculation spreadsheet	Consent Decree fines, weighted by storm probability
TOTAL ANNUAL COST	**$ 7,261**		

ALTERNATIVE 4 New station, existing parcel, phased construction (min. bypass)

CAPITAL COSTS			
ITEM DESCRIPTION	TOTAL COST	SOURCE	ASSUMPTIONS
Planning	$ 54,160		3% of Demolition, Construction, Electrical, and Labor/Equipment Costs
Design	$ 126,374		7% of Demolition, Construction, Electrical, and Labor/Equipment Costs
Permitting	$ 90,267		5% of Demolition, Construction, Electrical, and Labor/Equipment Costs
Demolition	$ 74,963	See Demolition Cost Estimate (Appendix A)	
Construction	$ 709,316	See Construction Cost Estimate (Appendix A)	
Electrical	$ 418,536	See Electrical Cost Estimate (Appendix C)	
Labor/Equipment	$ 563,981	See Labor/Equipment Cost Estimate (Appendix A)	
Bypass Pumping/Staffing	$ 38,548	See Bypass Pumping Cost Estimate (Appendix A)	Assume 1 person, 24 hours a day, $40/hour
TOTAL CAPITAL COST	**$ 2,076,146**		

OPERATING COSTS			
ITEM DESCRIPTION	TOTAL COST	SOURCE	ASSUMPTIONS
Heat/light/power costs	$ 16,707	See Electrical Load Calculation, Operating Cost Estimate (Appendix C)	
Labor salary/benefits	$ 79,020	WSSC Expense Account by Facility Report (dated 5/7/2015)	$6585/month; average monthly cost for first 10 months of FY 2015
Misc.	$ 18,540	WSSC Expense Account by Facility Report (dated 5/7/2015)	$1545/month; Transportation and office building expenses; average monthly cost for first 10 months of FY 2015
Diesel fuel	$ 3,030	AAA average cost for diesel in the Maryland/DC Metro area on 6/9/2015	$3.25/gal; Assume 10% of 777 gal tank replaced per month at current market prices
TOTAL ANNUAL COST	**$ 117,297**		

ANNUAL OPERATING BENEFIT			
ITEM DESCRIPTION	TOTAL BENEFIT	SOURCE	ASSUMPTIONS
None			
TOTAL ANNUAL BENEFIT	**$ -**		

ANNUAL MAINTENANCE COSTS			
ITEM DESCRIPTION	TOTAL COST	SOURCE	ASSUMPTIONS
Regular maintenance	$ 14,460	WSSC Expense Account by Facility Report (dated 5/7/2015)	$1205/month; average monthly cost for first 10 months of FY 2015
TOTAL ANNUAL COST	**$ 14,460**		

ANNUAL MAINTENANCE BENEFIT			
ITEM DESCRIPTION	TOTAL BENEFIT	SOURCE	ASSUMPTIONS
None			
TOTAL ANNUAL BENEFIT	**$ -**		

RENEWAL COSTS			
ITEM DESCRIPTION	TOTAL COST	SOURCE	ASSUMPTIONS
Pump replacement	$ 480,000	See Construction Cost Estimate (Appendix A)	$120000/pump-motor x 4; assume replace every 25 years
TOTAL ANNUAL COST	**$ 480,000**		

DISPOSAL COSTS			
ITEM DESCRIPTION	TOTAL COST	SOURCE	ASSUMPTIONS
Existing Pumps/Motors Remaining Life	$ (46,000)		Existing pumps/motors were new 2 years ago. Assume straight-line depreciation of the install costs over the 25-year expected life of the pumps. Pumps/motors assumed to be 1/3 the cost of new 1.3 MGD pumps/motors.
Building, Wetwell, Drywell Remaining Life	$ (19,410)		Will have 50 years of remaining service life at the end of the analysis period. Assume straight-line depreciation of structure value over the 100-year expected lifespan, time shifted accordingly.
Land Value of Existing Parcel	$ (65,667)	2015 tax assessment	2015 value shifted forward 50 years at inflation. Assume land is sold at 50 years.
TOTAL ANNUAL COST	**$ (131,077)**		

OTHER COSTS			
ITEM DESCRIPTION	TOTAL COST	SOURCE	ASSUMPTIONS
Cleanup after SSO	$ 3,758	See rainfall calculation spreadsheet	$5500/cleanup, weighted by storm probability
EPA/MDE Fines	$ 3,503	See rainfall calculation spreadsheet	Consent Decree fines, weighted by storm probability
TOTAL ANNUAL COST	**$ 7,261**		

ALTERNATIVE 5 New station, adjacent (non-MNCPPC) parcel

CAPITAL COSTS			
ITEM DESCRIPTION	**TOTAL COST**	**SOURCE**	**ASSUMPTIONS**
Planning	$ 50,206		3% of Demolition, Construction, Electrical, and Labor/Equipment Costs
Design	$ 117,147		7% of Demolition, Construction, Electrical, and Labor/Equipment Costs
Permitting	$ 83,676		5% of Demolition, Construction, Electrical, and Labor/Equipment Costs
Land acquisition	$ 140,000	WSSC appraisal	
Demolition	$ 74,963	See Demolition Cost Estimate (Appendix A)	
Construction	$ 709,316	See Construction Cost Estimate (Appendix A)	
Electrical	$ 418,536	See Electrical Cost Estimate (Appendix C)	
Labor/Equipment	$ 432,160	See Labor/Equipment Cost Estimate (Appendix A)	
Bypass Pumping/Staffing	$ 38,548	See Bypass Pumping Cost Estimate (Appendix A)	Assume 1 person, 24 hours a day, $40/hour
TOTAL CAPITAL COST	**$ 2,064,551**		

OPERATING COSTS			
ITEM DESCRIPTION	**TOTAL COST**	**SOURCE**	**ASSUMPTIONS**
Heat/light/power costs	$ 16,707	See Electrical Load Calculation, Operating Cost Estimate (Appendix C)	
Labor salary/benefits	$ 79,020	WSSC Expense Account by Facility Report (dated 5/7/2015)	$6585/month; average monthly cost for first 10 months of FY 2015
Misc.	$ 18,540	WSSC Expense Account by Facility Report (dated 5/7/2015)	$1545/month; Transportation and office building expenses; average monthly cost for first 10 months of FY 2015
Diesel fuel	$ 3,030	AAA average cost for diesel in the Maryland/DC Metro area on 6/9/2015	$3.25/gal; Assume 10% of 777 gal tank replaced per month at current market prices
TOTAL ANNUAL COST	**$ 117,297**		

ANNUAL OPERATING BENEFIT			
ITEM DESCRIPTION	**TOTAL BENEFIT**	**SOURCE**	**ASSUMPTIONS**
None			
TOTAL ANNUAL BENEFIT	**$ -**		

ANNUAL MAINTENANCE COSTS			
ITEM DESCRIPTION	**TOTAL COST**	**SOURCE**	**ASSUMPTIONS**
Regular maintenance	$ 14,460	WSSC Expense Account by Facility Report (dated 5/7/2015)	$1205/month; average monthly cost for first 10 months of FY 2015
TOTAL ANNUAL COST	**$ 14,460**		

ANNUAL MAINTENANCE BENEFIT			
ITEM DESCRIPTION	**TOTAL BENEFIT**	**SOURCE**	**ASSUMPTIONS**
None			
TOTAL ANNUAL BENEFIT	**$ -**		

RENEWAL COSTS			
ITEM DESCRIPTION	**TOTAL COST**	**SOURCE**	**ASSUMPTIONS**
Pump replacement	$ 480,000	See Construction Cost Estimate (Appendix A)	$120000/pump-motor x 4; assume replace every 25 years
TOTAL ANNUAL COST	**$ 480,000**		

DISPOSAL COSTS			
ITEM DESCRIPTION	**TOTAL COST**	**SOURCE**	**ASSUMPTIONS**
Existing Pumps/Motors Remaining Life	$ (46,000)		Existing pumps/motors were new 2 years ago. Assume straight-line depreciation of the install costs over the 25-year expected life of the pumps. Pumps/motors assumed to be 1/3 the cost of new 1.3 MGD pumps/motors.
Building, Wetwell, Drywell Remaining Life	$ (19,410)		Will have 50 years of remaining service life at the end of the analysis period. Assume straight-line depreciation of structure value over the 100-year expected lifespan, time shifted accordingly.
Land Value of Existing Parcel	$ (65,667)	2015 tax assessment	2015 value shifted forward 50 years at inflation. Assume land is sold at 50 years.
Land Value of New Parcel	$ (140,000)	WSSC 2015 appraisal	2015 value shifted forward 50 years at inflation. Assume land is sold at 50 years.
TOTAL ANNUAL COST	**$ (271,077)**		

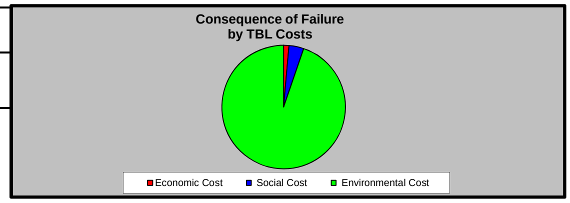
OTHER COSTS			
ITEM DESCRIPTION	**TOTAL COST**	**SOURCE**	**ASSUMPTIONS**
Cleanup after SSO	$ 3,758	See rainfall calculation spreadsheet	$5500/cleanup, weighted by storm probability
EPA/MDE Fines	$ 3,503	See rainfall calculation spreadsheet	Consent Decree fines, weighted by storm probability
TOTAL ANNUAL COST	**$ 7,261**		

Risk Reduction Tool Version 1.0
Washington Suburban Sanitary Commission
Capital Investment Validation Program - Risk Reduction Tool

Project Title:	Spring Garden Wastewter Pumping Station
Project No:	23202574C
Assessor(s):	Black & Veatch
Alternative Name:	Do Nothing
Date (MM/DD/YYYY):	24-Sep-2015
Duration:	**Years** 50 **Months**

Capital Improvement Program

Driver/Failure Mode Level of Service



Consequence of Failure (CoF)

Triple Bottom Line	*Consequences of Failure*	*Calculation*				*Base Calculation*	*Override Value ($)*	*Consequence of Failure (CoF)*
Economic	Damage to Failed WSSC Assets	Cost of Repair ($)				$ -		$ -
	Damage to Adjacent WSSC Assets	Total Damage ($)				$ -		$ -
	Damage to Non-WSSC Assets	Total Damage ($)						
		$7,200				$ 7,200.00		$ 7,200.00
	Loss of WSSC Asset Contents	Asset Contents	No. of Deliveries or Days					
		N/A				$ -		$ -
	Value of Lost WSSC Service	Avg. Flow Rate Loss (MG/D)	Duration (Days)			$ -		$ -
	Value of Lost Non-WSSC Service(s)	Service Type	Customer Type	No. of Customers	Duration			
		N/A	N/A	N/A	N/A			
		N/A	N/A	N/A	N/A			
		N/A	N/A	N/A	N/A	$ -		$ -
	Cleanup Cost	Sewage Spill	Biosolids Spill	Chemical Spill	Waste Oil/ Diesel			
		100 000	N/A	N/A	N/A	$ 100,000.00	$ 5,500.00	$ 5,500.00
	Subtotal							**$ 12,700.00**
Social	General Impacts on the Community - Level of Service Loss	Failure Type	Customer Type	No. of Customers	Duration (Days)			
		Wastewater	Residential	1000	1 Day			
		N/A	N/A	N/A	N/A			
		N/A	N/A	N/A	N/A	$ 25,000.00		$ 25,000.00
	Total Cost of Injuries	Injury Type	No. of People Affected					
		Minor inconvenience	10			$ 10.00		$ 10.00
	Public Health Impacts	Magnitude	No. of People Affected					
		Minor	10			$ 5,000.00		$ 5,000.00
	Loss of WSSC Public Image	WSSC Event Magnitude	Duration	Does Emergency Plan Exist?				
		Adverse media (Media response cost)	1 Week	Yes		$ 5,000.00		$ 5,000.00
	Subtotal							**$ 35,010.00**
Environmental	Long Term Impact on the Environment	Land	Duration	Magnitude				
		Riverfront	1 Week	Minor				
		Water	Duration	Magnitude				
		River/Creek	1 Week	Minor				
		Air	Duration	Magnitude				
		N/A	N/A	N/A		$ 700,000.00		$ 700,000.00
	Impact on Fauna	Magnitude	Endangered Species?					
		Minor	No			$ 100,000.00		$ 100,000.00
	WSSC Legal Costs	Total Costs						
		Minor				$ 50,000.00		$ 50,000.00
	Fines Levied on WSSC	Fine	Number of Violations	Number of Days	Criminal Offense?			
		Clean Air Act			N/A			
		Clean Water Act	100 000	1.00	Civil			
		OSHA	TYPE OF VIOLATION		N/A	$ 1,027,500.00	$ 4,700.00	$ 4,700.00
	Subtotal							**$ 854,700.00**
Total Economic Value of Consequence of Failure								**$ 902,410.00**

This workbook forms part of GHD's Approach to Advanced Life Cycle Asset Management of Infrastructure and other assets.

Risk Reduction Tool Version 1.0
Washington Suburban Sanitary Commission
Capital Investment Validation Program - Risk Reduction Tool

Project Title: Spring Garden Wastewter Pumping Station
Project No: 23202574C
Assessor(s): Black & Veatch

Alternative Name: Status Quo

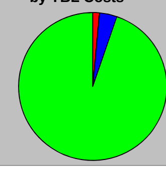
Date (MM/DD/YYYY): 24-Sep-2015

Duration: Years 50 Months

Capital Improvement Program

Driver/Failure Mode: Level of Service

Consequence of Failure by TBL Costs



Consequence of Failure (CoF)

Triple Bottom Line	Consequences of Failure	Calculation				Base Calculation	Override Value ($)	Consequence of Failure (CoF)
Economic	Damage to Failed WSSC Assets	Cost of Repair ($)				$ -		$ -
	Damage to Adjacent WSSC Assets	Total Damage ($)				$ -		$ -
	Damage to Non-WSSC Assets	Total Damage ($): $7,200				$ 7,200.00		$ 7,200.00
	Loss of WSSC Asset Contents	Asset Contents: N/A	No. of Deliveries or Days			$ -		$ -
	Value of Lost WSSC Service	Avg. Flow Rate Loss (MG/D)	Duration (Days)			$ -		$ -
	Value of Lost Non-WSSC Service(s)	Service Type	Customer Type	No. of Customers	Duration			
		N/A	N/A	N/A	N/A			
		N/A	N/A	N/A	N/A			
		N/A	N/A	N/A	N/A	$ -		$ -
	Cleanup Cost	Sewage Spill	Biosolids Spill	Chemical Spill	Waste Oil/ Diesel			
		10 000	N/A	N/A	N/A	$ 50,000.00	$ 5,500.00	$ 5,500.00
	Subtotal							$ 12,700.00
Social	General Impacts on the Community - Level of Service Loss	Failure Type	Customer Type	No. of Customers	Duration (Days)			
		Wastewater	Residential	1000	1 Day			
		N/A	N/A	N/A	N/A			
		N/A	N/A	N/A	N/A	$ 25,000.00		$ 25,000.00
	Total Cost of Injuries	Injury Type	No. of People Affected					
		Minor inconvenience	10			$ 10.00		$ 10.00
	Public Health Impacts	Magnitude	No. of People Affected					
		Minor	10			$ 5,000.00		$ 5,000.00
	Loss of WSSC Public Image	WSSC Event Magnitude	Duration	Does Emergency Plan Exist?				
		Adverse media (Media response cost)	1 Week	Yes		$ 5,000.00		$ 5,000.00
	Subtotal							$ 35,010.00
Environmental	Long Term Impact on the Environment	Land	Duration	Magnitude				
		Riverfront	1 Week	Minor				
		Water	Duration	Magnitude				
		River/Creek	1 Week	Minor				
		Air	Duration	Magnitude				
		N/A	N/A	N/A		$ 700,000.00		$ 700,000.00
	Impact on Fauna	Magnitude	Endangered Species?					
		Minor	No			$ 100,000.00		$ 100,000.00
	WSSC Legal Costs	Total Costs						
		Minor				$ 50,000.00		$ 50,000.00
	Fines Levied on WSSC	Fine	Number of Violations	Number of Days	Criminal Offense?			
		Clean Air Act			N/A			
		Clean Water Act	10 000	1.00	N/A			
		OSHA	TYPE OF VIOLATION		N/A	$ 100,000.00	$ 4,700.00	$ 4,700.00
	Subtotal							$ 854,700.00
Total Economic Value of Consequence of Failure								**$ 902,410.00**

Risk Reduction Tool Version 1.0
Washington Suburban Sanitary Commission
Capital Investment Validation Program - Risk Reduction Tool

Project Title: Spring Garden Wastewter Pumping Station
Project No: 23202574C
Assessor(s): Black & Veatch

Alternative Name:
Alternative 3 - New Pump Station on Existing Parcel; Full Byass During Construction

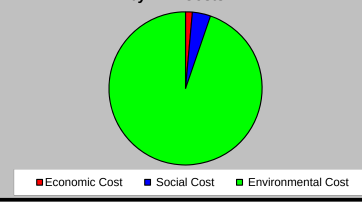
Date (MM/DD/YYYY): 24-Sep-2015

Duration:
Years 50 **Months**

Capital Improvement Program

Driver/Failure Mode Level of Service

Consequence of Failure by TBL Costs



Consequence of Failure (CoF)

Triple Bottom Line	Consequences of Failure	Calculation				Base Calculation	Override Value ($)	Consequence of Failure (CoF)
Economic	Damage to Failed WSSC Assets	Cost of Repair ($)				$ -		$ -
	Damage to Adjacent WSSC Assets	Total Damage ($)				$ -		$ -
	Damage to Non-WSSC Assets	Total Damage ($) $7,200				$ 7,200.00		$ 7,200.00
	Loss of WSSC Asset Contents	Asset Contents N/A	No. of Deliveries or Days			$ -		$ -
	Value of Lost WSSC Service	Avg. Flow Rate Loss (MG/D)	Duration (Days)			$ -		$ -
	Value of Lost Non-WSSC Service(s)	Service Type N/A N/A N/A	Customer Type N/A N/A N/A	No. of Customers N/A N/A N/A	Duration 1 Day N/A N/A	$ -		$ -
	Cleanup Cost	Sewage Spill 10 000	Biosolids Spill N/A	Chemical Spill N/A	Waste Oil/ Diesel N/A	$ 50,000.00	$ 5,500.00	$ 5,500.00
	Subtotal							**$ 12,700.00**
Social	General Impacts on the Community - Level of Service Loss	Failure Type Wastewater N/A N/A	Customer Type Residential N/A N/A	No. of Customers 1000 N/A N/A	Duration (Days) 1 Day N/A N/A	$ 25,000.00		$ 25,000.00
	Total Cost of Injuries	Injury Type Minor inconvenience	No. of People Affected 10			$ 10.00		$ 10.00
	Public Health Impacts	Magnitude Minor	No. of People Affected 10			$ 5,000.00		$ 5,000.00
	Loss of WSSC Public Image	WSSC Event Magnitude Adverse media (Media response cost)	Duration 1 Week	Does Emergency Plan Exist? Yes		$ 5,000.00		$ 5,000.00
	Subtotal							**$ 35,010.00**
Environmental	Long Term Impact on the Environment	Land Riverfront Water River/Creek Air N/A	Duration 1 Week Duration 1 Week Duration N/A	Magnitude Minor Magnitude Minor Magnitude N/A		$ 700,000.00		$ 700,000.00
	Impact on Fauna	Magnitude Minor	Endangered Species? No			$ 100,000.00		$ 100,000.00
	WSSC Legal Costs	Total Costs Minor				$ 50,000.00		$ 50,000.00
	Fines Levied on WSSC	Fine Clean Air Act Clean Water Act OSHA	Number of Violations 10 000 TYPE OF VIOLATION	Number of Days 1.00 	Criminal Offense? N/A N/A N/A	$ 100,000.00	$ 4,700.00	$ 4,700.00
	Subtotal							**$ 854,700.00**
Total Economic Value of Consequence of Failure								**$ 902,410.00**

This workbook forms part of GHD's Approach to Advanced Life Cycle Asset Management of Infrastructure and other assets.

Risk Reduction Tool Version 1.0
Washington Suburban Sanitary Commission
Capital Investment Validation Program - Risk Reduction Tool

Project Title:	Spring Garden Wastewter Pumping Station
Project No:	23202574C
Assessor(s):	Black & Veatch

Alternative Name:

Alternative 4 - New Pump Station on Existing Parcel; Phased Construction to Minimize Bypass

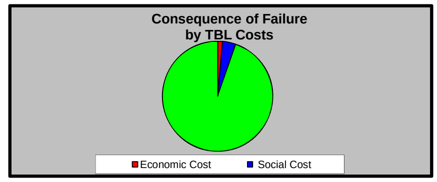
Date (MM/DD/YYYY): 24-Sep-2015

Duration:

Years 50 **Months**

Capital Improvement Program

Driver/Failure Mode Level of Service



Consequence of Failure (CoF)

Triple Bottom Line	Consequences of Failure	Calculation				Base Calculation	Override Value ($)	Consequence of Failure (CoF)
Economic	Damage to Failed WSSC Assets	Cost of Repair ($)				$ -		$ -
	Damage to Adjacent WSSC Assets	Total Damage ($)				$ -		$ -
	Damage to Non-WSSC Assets	Total Damage ($)						
		$7,200				$ 7,200.00		$ 7,200.00
	Loss of WSSC Asset Contents	Asset Contents	No. of Deliveries or Days					
		N/A				$ -		$ -
	Value of Lost WSSC Service	Avg. Flow Rate Loss (MG/D)	Duration (Days)			$ -		$ -
	Value of Lost Non-WSSC Service(s)	Service Type	Customer Type	No. of Customers	Duration			
		N/A	N/A	N/A	1 Day			
		N/A	N/A	N/A	N/A			
		N/A	N/A	N/A	N/A	$ -		$ -
	Cleanup Cost	Sewage Spill	Biosolids Spill	Chemical Spill	Waste Oil/ Diesel			
		10 000	N/A	N/A	N/A	$ 50,000.00	$ 5,500.00	$ 5,500.00
	Subtotal							**$ 12,700.00**
Social	General Impacts on the Community - Level of Service Loss	Failure Type	Customer Type	No. of Customers	Duration (Days)			
		Wastewater	Residential	1000	1 Day			
		N/A	N/A	N/A	N/A			
		N/A	N/A	N/A	N/A	$ 25,000.00		$ 25,000.00
	Total Cost of Injuries	Injury Type	No. of People Affected					
		Minor inconvenience	10			$ 10.00		$ 10.00
	Public Health Impacts	Magnitude	No. of People Affected					
		Minor	10			$ 5,000.00		$ 5,000.00
	Loss of WSSC Public Image	WSSC Event Magnitude	Duration	Does Emergency Plan Exist?				
		Adverse media (Media response cost)	1 Week	Yes		$ 5,000.00		$ 5,000.00
	Subtotal							**$ 35,010.00**
Environmental	Long Term Impact on the Environment	Land	Duration	Magnitude				
		Riverfront	1 Week	Minor				
		Water	Duration	Magnitude				
		River/Creek	1 Week	Minor				
		Air	Duration	Magnitude				
		N/A	N/A	N/A		$ 700,000.00		$ 700,000.00
	Impact on Fauna	Magnitude	Endangered Species?					
		Minor	No			$ 100,000.00		$ 100,000.00
	WSSC Legal Costs	Total Costs						
		Minor				$ 50,000.00		$ 50,000.00
	Fines Levied on WSSC	Fine	Number of Violations	Number of Days	Criminal Offense?			
		Clean Air Act			N/A			
		Clean Water Act	10 000	1.00	N/A			
		OSHA	TYPE OF VIOLATION		N/A	$ 100,000.00	$ 4,700.00	$ 4,700.00
	Subtotal							**$ 854,700.00**
Total Economic Value of Consequence of Failure								**$ 902,410.00**

This workbook forms part of GHD's Approach to Advanced Life Cycle Asset Management of Infrastructure and other assets.

Risk Reduction Tool Version 1.0
Washington Suburban Sanitary Commission
Capital Investment Validation Program - Risk Reduction Tool

Project Title:	Spring Garden Wastewter Pumping Station
Project No:	23202574C
Assessor(s):	Black & Veatch

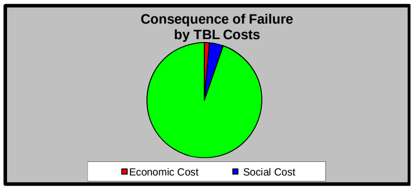
Alternative Name:

Alternative 5 - New Pump Station on Adjacent Non-MNCPPC Parcel

Date (MM/DD/YYYY): 24-Sep-2015

Duration:

Years 50 **Months**



Capital Improvement Program

Driver/Failure Mode: Level of Service

Consequence of Failure (CoF)

Triple Bottom Line	*Consequences of Failure*	*Calculation*				*Base Calculation*	*Override Value ($)*	*Consequence of Failure (CoF)*
Economic	Damage to Failed WSSC Assets	Cost of Repair ($)				$ -		$ -
	Damage to Adjacent WSSC Assets	Total Damage ($)				$ -		$ -
	Damage to Non-WSSC Assets	Total Damage ($): $7,200				$ 7,200.00		$ 7,200.00
	Loss of WSSC Asset Contents	Asset Contents: N/A	No. of Deliveries or Days			$ -		$ -
	Value of Lost WSSC Service	Avg. Flow Rate Loss (MG/D)	Duration (Days)			$ -		$ -
	Value of Lost Non-WSSC Service(s)	Service Type	Customer Type	No. of Customers	Duration			
		N/A	N/A	N/A	1 Day			
		N/A	N/A	N/A	N/A			
		N/A	N/A	N/A	N/A	$ -		$ -
	Cleanup Cost	Sewage Spill	Biosolids Spill	Chemical Spill	Waste Oil/ Diesel			
		10 000	N/A	N/A	N/A	$ 50,000.00	$ 5,500.00	$ 5,500.00
	Subtotal							**$ 12,700.00**
Social	General Impacts on the Community - Level of Service Loss	Failure Type	Customer Type	No. of Customers	Duration (Days)			
		Wastewater	Residential	1000	1 Day			
		N/A	N/A	N/A	N/A			
		N/A	N/A	N/A	N/A	$ 25,000.00		$ 25,000.00
	Total Cost of Injuries	Injury Type	No. of People Affected					
		Minor inconvenience	10			$ 10.00		$ 10.00
	Public Health Impacts	Magnitude	No. of People Affected					
		Minor	10			$ 5,000.00		$ 5,000.00
	Loss of WSSC Public Image	WSSC Event Magnitude	Duration	Does Emergency Plan Exist?				
		Adverse media (Media response cost)	1 Week	Yes		$ 5,000.00		$ 5,000.00
	Subtotal							**$ 35,010.00**
Environmental	Long Term Impact on the Environment	Land	Duration	Magnitude				
		Riverfront	1 Week	Minor				
		Water	Duration	Magnitude				
		River/Creek	1 Week	Minor				
		Air	Duration	Magnitude				
		N/A	N/A	N/A		$ 700,000.00		$ 700,000.00
	Impact on Fauna	Magnitude	Endangered Species?					
		Minor	No			$ 100,000.00		$ 100,000.00
	WSSC Legal Costs	Total Costs: Minor				$ 50,000.00		$ 50,000.00
	Fines Levied on WSSC	Fine	Number of Violations	Number of Days	Criminal Offense?			
		Clean Air Act			N/A			
		Clean Water Act	10 000	1.00	N/A			
		OSHA	TYPE OF VIOLATION		N/A	$ 100,000.00	$ 4,700.00	$ 4,700.00
	Subtotal							**$ 854,700.00**
Total Economic Value of Consequence of Failure								**$ 902,410.00**

This workbook forms part of GHD's Approach to Advanced Life Cycle Asset Management of Infrastructure and other assets.

Demolition of Existing Station						
Item #	Item	Unit	UC	Quantity	Total Cost ($)	Assumption
1	Wetwell	CF	$26	510.25	$13,267	Including all interior items (level sensors, grates, electrical, etc.)
2	Drywell	CF	$26	1100	$28,600	Including all interior items (pumps, piping, meters, etc.)
3	Control Bldg	SF	$25	288	$7,056	16'-0" W x 18'-8" L x 11' H, concrete masonry unit building
4	Asphalt	SF	$4	990	$3,861	Parking area, 22' x 45'
5	Chainlink fence	LF	$12	280	$3,360	7' high chainlink fence with gate
6	Gravel	CY	$80	6	$480	25.5' x 13' area around wetwell/drywell, assume 6" depth
7	Site Restoration	SF	$3	4610	$11,525	Topsoil, re-seed area. 72' x 64'
8	Mobilization			10%	$6,815	
				Total Demo	**$74,963**	

Labor and Equipment - Alternative 3						
#	Item	Unit	UC	Quantity	Cost	Comment
1	Laborer	HR/PER	$ 18	6240	$ 112,320	Per person, per hr. Assume 26 weeks (6 months), 40 hrs/wk, 6 laborers
2	Foreman	HR/PER	$ 38	1040	$ 39,000	Per person, per hr. Assume 26 weeks (6 months), 40 hrs/wk, 1 foreman
3	Operator	HR/PER	$ 22	2080	$ 45,760	Per person, per hr. Assume 26 weeks (6 months), 40 hrs/wk, 2 operators
4	Project Engineer	HR/PER	$ 32	1390	$ 44,480	Per person, per hr. Assume 26 weeks (8 months), 40 hrs/wk, 1 Project Engineer
5	Project Manager	HR/PER	$ 50	640	$ 32,000	Per person, per hr. Assume 26 weeks (8 months), 20 hrs/wk, 1 Project Manager
6	Excavator	Week	$ 5,500	26	$ 143,000	1 excavator. Assume 26 weeks (6 months), 5 days/wk - Changed to Weekly
7	Skidsteer	Week	$ 600	26	$ 15,600	1 skidsteer. Assume 26 weeks (6 months), 5 days/wk - Changed to Weekly
				Total	**$ 432,160**	

Labor and Equipment - Alternative 4						
#	Item	Unit	UC	Quantity	Cost	Comment
1	Laborer	HR/PER	$ 18	8320	$ 149,760	Per person, per hr. Assume 34.675 weeks (8 months), 40 hrs/wk, 6 laborers
2	Foreman	HR/PER	$ 38	1387	$ 52,013	Per person, per hr. Assume 34.675 weeks (8 months), 40 hrs/wk, 1 foreman
3	Operator	HR/PER	$ 22	2774	$ 61,028	Per person, per hr. Assume 34.675 weeks (8 months), 40 hrs/wk, 2 operators
4	Project Engineer	HR/PER	$ 32	1740	$ 55,680	Per person, per hr. Assume 43.5 weeks (10 months), 40 hrs/wk, 1 Project Engineer
5	Project Manager	HR/PER	$ 50	640	$ 32,000	Per person, per hr. Assume 32 weeks (10 months), 20 hrs/wk, 1 Project Manager
6	Excavator	Week	$ 5,500	35	$ 192,500	1 excavator. Assume 26 weeks (6 months), 5 days/wk - Changed to Weekly
7	Skidsteer	Week	$ 600	35	$ 21,000	1 skidsteer. Assume 26 weeks (6 months), 5 days/wk - Changed to Weekly
				Total	**$ 563,981**	

Labor and Equipment - Alternative 5						
#	Item	Unit	UC	Quantity	Cost	Comment
1	Laborer	HR/PER	$ 18	6240	$ 112,320	Per person, per hr. Assume 26 weeks (6 months), 40 hrs/wk, 6 laborers
2	Foreman	HR/PER	$ 38	1040	$ 39,000	Per person, per hr. Assume 26 weeks (6 months), 40 hrs/wk, 1 foreman
3	Operator	HR/PER	$ 22	2080	$ 45,760	Per person, per hr. Assume 26 weeks (6 months), 40 hrs/wk, 2 operators
4	Project Engineer	HR/PER	$ 32	1390	$ 44,480	Per person, per hr. Assume 26 weeks (8 months), 40 hrs/wk, 1 Project Engineer
5	Project Manager	HR/PER	$ 50	640	$ 32,000	Per person, per hr. Assume 26 weeks (8 months), 20 hrs/wk, 1 Project Manager
6	Excavator	Week	$ 5,500	26	$ 143,000	1 excavator. Assume 26 weeks (6 months), 5 days/wk - Changed to Weekly
7	Skidsteer	Week	$ 600	26	$ 15,600	1 skidsteer. Assume 26 weeks (6 months), 5 days/wk - Changed to Weekly
				Total	**$ 432,160**	

Bypass Pumping - Alternative 3						
Item #	Item	Unit	UC	Quantity	Total Cost ($)	Assumption
1	Wastewater temp. bypass pump	Month	$ 9,428	6	56,568	0.83 MGD. Assume 26 weeks (6 months), 7 days/wk (based off quote from Thompson Pump)
2	Wastewater temp. bypass pump non-standard work hour staffing	Month	$ 29,120	6	$ 174,720	24/7 staffing of pump as required by WSSC Std Spec 02960, Section 1.2.C. Assume 1 laborer at $40/hour.
				Total Bypass	**$231,288**	

Bypass Pumping - Alternative 4						
Item #	Item	Unit	UC	Quantity	Total Cost ($)	Assumption
1	Wastewater temp. bypass pump	Month	$ 9,428	1	$ 9,428	0.83 MGD. Assume 26 weeks (6 months), 7 days/wk (based off quote from Thompson Pump)
2	Wastewater temp. bypass pump non-standard work hour staffing	Month	$ 29,120	1	$ 29,120	24/7 staffing of pump as required by WSSC Std Spec 02960, Section 1.2.C. Assume 1 laborer at $40/hour.
				Total Bypass	**$38,548**	

Bypass Pumping - Alternative 5						
Item #	Item	Unit	UC	Quantity	Total Cost ($)	Assumption
1	Wastewater temp. bypass pump	Month	$ 9,428	1	$ 9,428	0.83 MGD. Assume 26 weeks (6 months), 7 days/wk (based off quote from Thompson Pump)
2	Wastewater temp. bypass pump non-standard work hour staffing	Month	$ 29,120	1	$ 29,120	24/7 staffing of pump as required by WSSC Std Spec 02960, Section 1.2.C. Assume 1 laborer at $40/hour.
				Total Bypass	**$38,548**	

Materials Cost Estimate

Item #	Item	Unit	UC	Quantity	Cost	Comment	References
1	Reinforced concrete	CY	115	138	$ 15,870	Covers wetwell and drywell	
2	Removable bar/trash rack (2'x3')	EA	1000	1	$ 1,000	Aluminum with SS fitting, .5" diameter bars at 2.5" on center	http://www.stormwatercenter.net/Manual_Builder/Mainten ance_Manual/7-%20Maintenance%20Frequency%20Table- NA/cost_frequency.pdf (Unit cost for 4' x 6' Trash Rack ~ $1250. Mentioned on pg. 4)
3	Sluice gate	EA	15000	1	$ 15,000	NRS type, suitable for an 8" influent pipe	http://www.allcostdata.info/browse.html/059110009 http://watchtechnologies.com/sluice-gate-slide- gate/?gclid=CjwKEAjw- ZqrBRDt_KjhjcbzhhISJAAlRGvl4G23ybzCbmldz2cWl89HYfublZ gfsM0EXV6ykSh1YhoC0FHw_wcB http://watermanusa.com/products/water-control- equiptment
4	Platform and grating	SF	14	64	$ 896	Serrated, non-slip type, aluminum, 300 psf rating. Ref WSSC Std. Spec. 05500, Subsection II.	
5	Level sensor	EA	1200	2	$ 2,400	Bubbler-type sensor	http://www.burtstore.com/default.aspx?page=item%20detai l&itemcode=LD35-S201&gclid=CjwKEAjwhbCrBRCO7- e7vuXqiT4SJAB2B5u7-nmBgqGuMNlxECyJnHKIklhczPyilg2y5u- uweC-CxoCQxfw_wcB
6	36x36 access hatch	EA	1800	1	$ 1,800	Aluminum, lockable	
7	Ladder	LF	2400	1	$ 2,400	WSSC Std. Det. M/15.0, M/16.0	http://www.hallmann-sales.com/hatches/aluminum-wall- mounted-ladder.htm (estimate includes safety pole)
8	Flow meter (electromagnetic)	EA	3500	2	$ 7,000	Bailey-Fischer & Porter, Foxboro, Rosemount, Sparling Instruments, Endress+Hauser	https://www.instrumart.com/products/31381/rosemount- 8700-series-flanged-flowtube- sensors?gclid=CjwKEAjwhbCrBRCO7- e7vuXqiT4SJAB2B5u7mVmhPeg37YaIQ9DvMI_6yvmf5IkNzBu rxn4Onvb01xoCUtfw_wcB&gclsrc=aw.ds
9	Stairs	LF	4000	22	$ 5,000	Aluminum, non-slip, min. tread depth =11", max. riser height = 7".	
10	Sump pump	EA	1800	2	$ 3,600	120 gpm. Acceptable manufacturers: Hydromatic model SKHS or Goulds model 3887BF series WS.	http://goulds.com/wastewater-drainage-pumps/sewage- pumps/3887bf-ws_bf-series-sewage-pumps/ (Got a quote from a Rep via email) http://www.pumpbiz.com/shopping_product_detail.asp?pid =70893
11	Pressure gage (for pipelines)	EA	1500	6	$ 9,000		http://www.mscdirect.com/browse/tn/Measuring- Inspecting/Pressure-Temperature-Measuring- Instruments/Pressure-Vacuum-Gauges-Instruments/Pressure- Gauges?008=- 99&pcrid=68233987024&007=Search&006=68233987024&00 5=10155003&004=5290967944&002=2167139&mkwid=sOgE 9suCI%7Cdc&cid=ppc-google-Product+- +Measuring+%26+Inspecting+-- +P_sOgE9suCI_pressure+gauges_p_68233987024_c_S&026=- 99&025=c&navid=12108019#008=- 99&pcrid=68233987024&007=Search&006=68233987024&00 5=10155003&004=5290967944&002=2167139&mkwid=sOgE 9suCI%7Cdc&cid=ppc-google-Product+- +Measuring+%26+Inspecting+-- +P_sOgE9suCI_pressure+gauges_p_68233987024_c_S&026=- 99&025=c&navid=12108019&sortby=price&dir=desc
12	8" Eccentric plug valve	EA	3500	7	$ 24,500	Acceptable manufacturers: DeZurik, Val-Matic	http://www.rivercityindustrial.com/new-dezurik-8-3-way- valve-part-9426087r001-style-ptw-body-di-cwp-125 http://www.kennedyvalve.com/upl/downloads/library/entir e-2012-awwa-price-book.pdf (page 17) http://www.usabluebook.com/p-292737-eccentric-plug-valve 8mj-milliken.aspx http://www.ebay.com/itm/DEZURIK-8-3-WAY-ECCENTRIC- PLUG-VALVE-W-ACTUATOR-/280656479271
13	8'' Swing check valve	EA	1000	2	$ 2,000	Acceptable manufacturers: American Flow Control, GA Industries, Apco-Willamette, Val-Matic	http://www.gaindustries.com/products/detail- product/product/Swing-Check-Valve.html (Contacted the Rep for exact rates. Got an invoice) http://www.valmatic.com/swingcheck.html http://www.dezurik.com/products/brands-product/check- valves/swing-check-valves-cvs/2/8/37/ (Contact the Rep for exact rates)
14	8" Dresser coupling	EA	400	6	$ 2,400		http://www.allcostdata.info/browse.html/026611397/Coupli ng-dresser http://www.shopoilsupplies.com/dresser-sleeve-couplings- s/183.htm
15	12" Concrete masonry unit	SF	12.75	1800	$ 22,950	Control building	http://www.get-a- quote.net/QuoteEngine/costbook.asp?WCI=CostFrameSet&B ookId=78&Pattern=12-Inch+Walls
16	1.3 MGD non-clog wastewater pumps	EA	60000	4	$ 240,000	PENTAIR 5400-NONCLOG Synch speed: 1800 rpm	Contact Ames, Inc.: georgeb@amesinc.com. Sent emails to PENTAIR & AMES, Inc.
17	Pump Motor	EA	60000	4	$ 240,000	Constant speed drive, capable of running on 480 V	Contact Ames, Inc.: georgeb@amesinc.com. Sent emails to PENTAIR & AMES, Inc.
18	Overhead roll-up door	EA	1500	1	$ 1,500	Sized for standard flatbed truck	http://www.ebay.com/bhp/12-x-12-roll-up-door http://www.overheaddoor.com/commercial- doors/Pages/rolling-steel-doors.aspx http://www.improvenet.com/r/costs-and-prices/garage-door- installation-cost-estimator
19	7' Chain link fence	LF	100	280	$ 28,000	WSSC Std. Det. M/19.0	Referred to past projects
20	8" flanged DIP (pressure class = 150)	LF	1200	70	$ 84,000		http://www.electrosteelusa.com/pdf/EUSA_Specifications_2 012.pdf Considering 6" Length for 8" pipe (refer Pg. 24)
				Total	**$ 709,316**		

711 Pittman Rd
Curtis Bay, MD 21226
Telephone: (410)799-0451
Facsimile: (410)799-0454
www.thompsonpump.com

June 5, 2015

EBA Engineering
14405 Laurel Place, Suite 300
Laurel, MD 20707
Attention: Mr. Kartik Radhakrishnan

RE: Rental Bypass Pumping System- WSSC SPS

Quote# HB0605201501B
Dear Kartik,

I appreciate the opportunity to provide EBA Engineering with a rental quotation for the sewer bypass portions of the WSSC Sewer Pump Station. Based on the review of the plans for this project you will need two main bypass systems. The bypass will utilize sound attenuated Silent Knight® pump sets to keep noise levels to a minimum. Pumps will be capable of running in manual or automatic modes. The standby and backup pumps will energize automatically off transducers or floats.

The Thompson Pump pumpsets that will be used for this project are equipped with the Enviroprime® priming system which allows the pump to prime and re-prime from a completely dry condition. The Enviroprime® priming system eliminates the need for a venturi waste hose, and increases the service life of the venturi by preventing abrasive and caustic material from passing through it, therefore reducing operating cost. This priming system eliminates “spitting” of waste that is often seen on other manufacturer’s pumps, making the Enviroprime® system a more environmentally friendly system. The pump set can handle 3” solids. The Thompson JSC pumpsets are equipped with a tungsten carbide/silicon carbide mechanical seal and will run dry indefinitely.

Bypass Pumping 1- Full Station Bypass – The pumping system will utilize (2) Thompson Pump 4JSCD diesel driven high head pumpsets. The first Thompson 4JSC pumpset will be used as the primary pump and handle the required peak flow of .83MGD at 200ft. The second Thompson 4JSCD will be utilized as the backup pump and be set to automatically energize in the rare event of a primary pump failure. Each pump will have independent suction and isolated discharge before they manifold into a common discharge pipeline which will carry the flow to the contractor provided bypass connection into the FM. Air release/vacuum valves will be installed as necessary.

It will be the responsibility of the general contractor to provide adequate access for suction lines at each suction point and adequate access for the discharge lines at each discharge point. It will also be the responsibility of the general contractor to provide the following:

1) Material handling equipment for unloading, loading and installation (unless installation by Thompson Pump is chosen)
2) Daily operation of pumps, to include fueling, and suction line cleaning(Unless Thompson is hired for pump watch)
3) Traffic control as necessary
4) Any and all required permits
5) Any right of way or jobsite access as necessary
6) Utility location as necessary
7) Staging area for bypass pumps and pipe
8) Any pump security measures
9) Burial and plating of pipe as needed
10) Any required PE Stamps
11) Hydrostatic testing of the bypass piping(unless Thompson Pump is hired for installation)
12) Flushing of bypass piping upon completion of bypass pumping operation(unless Thompson Pump is hired for complete teardown)
13) Any and all line stopping and plugging

Thompson Pump has provided price breakdowns below for optional installation and teardown for the bypass systems. We have also provided a price breakdown for the fusion of pipe for the bypass setups only. If neither of these options is chosen the contractor is fully responsible for all aspects of the installation and teardown of the bypass systems. The following paragraphs detail what is provided by Thompson Pump for each. It is assumed that the bypasses can be moved from one to another in large sections and will not have to be broken down, if that turns out not to be the case Thompson Pump reserves the right to change installation and fusion pricing to reflect changes in the scope.

Installation/Move/Teardown (Optional):
Installation / Move/Teardown consists of Thompson Pump providing its own equipment, fuel, and labor that is required for the installation, move, and teardown of the bypass project, loading and unloading of equipment and material at the staging area for the bypass project and engineering submittals. The contractor must supply a source of water and Thompson Pump will clean and sanitize all pumps and equipment prior to its movement from the site. Thompson Pump will not be responsible for any occurrences that may arise on the bypass project, which includes, but is not limited to, flows that exceed those provided by the specs, weather events that increase the flow volumes beyond peak flows provided by the specs, bad diesel fuel provided by the contractor that effects the operations of the pumps and any changes to the project that are not included in our submittal packages.

Pump Maintenance (Optional):
Service includes routine maintenance of oil, air, fuel, cooling and compressor systems every 250 hrs of operation per pump. It also includes a full unit inspection. A record of each service will be kept and made available to the contractor. The price breakdown for this is attached. If contractor chooses to perform this service himself, all routine maintenance items listed above must be serviced every 250 hours of use and a record of this service must be kept and furnished to Thompson Pump on request.

Auxiliary Fuel Tanks (Optional):
Thompson can provide 525 gallon double walled fuel tanks to connect to the bypass pumps for longer run times in between fueling. Thompson Pump will connect the fuel tanks to the pumps at no additional charge. Fuel tanks are delivered empty and need to be returned empty to avoid a waste fuel removal fee. The price breakdown for this is attached.

Pump Watch: (Optional)
Pump Watch consist of one (1) technician per shift. Thompson Pump will be responsible for the uninterrupted operations of the bypass by insuring that the stand-by pump engages (should the primary pump fail) and operates until the primary pump is repaired, maintains and cleans the suction lines, keeps the pump impeller clear of debris, maintain flange connections to eliminate leaks that may occur, maintains air relief valves, periodically inspects the discharge lines, and maintain a shift log. The Pump Watch Technician will notify the contractor's onsite supervisor and his Thompson Pump immediate supervisor if any anomalies occur on his shift. Pump Watch does not include the cost of fuel for the pumps, but the Thompson Pump technician can assist in the act of fueling the pumps if scheduled beforehand. Thompson Pump will not be responsible for any occurrences that may arise on the bypass project which includes, but is not limited to, flows that exceed those provided by the specs, weather events that increase the flow volumes beyond peak design, bad diesel fuel provided by the contractor that effects the operations of the pumps, or any changes to the project that are not included in our submittal packages.

Winterization:
If the bypass is to lay dormant during a time period where it will encounter freezing temperatures the bypass system will need to be drained and protected from freezing. Should the bypass run during a time that will encounter freezing temperatures a complete cold weather package will need to be installed on each pump and the piping system. Thompson Pump can install this package for the contractor at an additional charge. Should the contractor prefer to "winterize" the bypass system themselves Thompson will direct the contractor on the measures to be taken.

Mobilization / Demobilization:
Mobilization / Demobilization are the cost of shipping all pumps, pipe and accessories for the bypass. It does not include the unloading of the pumps, pipe and accessories at the job site. The unloading and loading of materials is included if the install / teardown option is purchased, if not contractor is responsible for all loading and unloading. Thompson Pump will instruct the contractor on the day to day operation and use of the pumps, as well as suction line cleaning, vent inspection, and pipe inspection, and fueling/maintenance procedures at no cost to the contractor. After reviewing our proposal, if you have any questions, please do not hesitate to call me at 240-566-8331 or email me at hbrown@thompsonpump.com. We look forward to working with you and appreciate your business.

Sincerely,
Howard Brown
Thompson Pump Northeast
hbrown@thompsonpump.com

THOMPSON PUMP EBA ENGINEERING/WSSC SPS SEWER BYPASS PUMPING PRICING

Bypass	Peak Flow	Monthly Rental	Weekly Rental	Complete Installation	Complete Teardown	Equipment Mobilization:	Equipment Demobilization:
Full Statiion Bypass	.84MGD @200ft	$ 5,145.00	$ 1,715.00	$ 5,000.00	$ 2,600.00	$ 200.00	$ 200.00

Optional Items

	Monthly	Weekly
Fuel Cell 500 Gallon Double Wall	$ 150.00	$ 50.00
Flow Meter Doppler Style with Data logging	$ 300.00	$ 100.00
Auto Dialer: With wireless cell service	$ 300.00	$ 100.00

Fuel Consumption at Peak Operating Conditions

Thompson 4JSCD 5.2GPH

Fuel Consumption estimate at Peak Specified Flows

Lb/Hp-Hr	Horse Power Used at Peak	Fuel Capacity	Gallons Per Hour Estimate		Runtime Estimate at peak flows
0.351	60	114	2.88	GPH	38

value-added or other similar taxes that may apply to this project.
Thompson Pump shall not be held liable for liquidated, incidental, consequential or any other kind of damages.
Payment terms are net 30 days.
Customer agrees to provide full insurance coverage for all equipment rented from Thompson Pump,
designating Thompson Pump as a loss payee. If insurance is not available, customer argees
to purchase the TPM Equipment Protection Plan.
Subject to credit approval

Michael McCarn

From: George Bauer <GeorgeB@amesinc.com>
Sent: Thursday, June 04, 2015 3:31 PM
To: Kartik Radhakrishnan
Cc: Michael McCarn
Subject: RE: High Level Cost Needed for PENTAIR Pump and 480V motor
Attachments: image002.jpg; image001.jpg; image003.jpg

Correct. Per pump/motor.

Sent from my Verizon Wireless 4G LTE smartphone

-------- Original message --------
From: Kartik Radhakrishnan <kartik.radhakrishnan@ebaengineering.com>
Date: 2015/06/04 3:01 PM (GMT-05:00)
To: George Bauer <GeorgeB@amesinc.com>
Cc: Michael McCarn <michael.mccarn@ebaengineering.com>
Subject: RE: High Level Cost Needed for PENTAIR Pump and 480V motor

Thanks George. Just to clarify, this cost is for each pump/motor. So if we have 4 pumps and 4 motors, the total cost will be 8 x 60,000 = $ 480,000. Right ?

Thanks and regards,

Kartik Radhakrishnan, EIT | Project Engineer

EBA Engineering, Inc.

d. (240) 547-1135 | kartik.radhakrishnan@ebaengineering.com

14405 Laurel Place, Suite 300 | Laurel, MD 20707 | www.ebaengineering.com

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From: George Bauer [mailto:GeorgeB@amesinc.com]
Sent: Thursday, June 04, 2015 2:48 PM
To: Kartik Radhakrishnan
Cc: Michael McCarn
Subject: RE: High Level Cost Needed for PENTAIR Pump and 480V motor

Roughly $60,000 each including shipping and start-up.

VERY rough estimate with fudge in it.

George Bauer

Municipal Sales

Ames, Inc.

C: 240-997-8537

From: Kartik Radhakrishnan [mailto:kartik.radhakrishnan@ebaengineering.com]
Sent: Thursday, June 04, 2015 1:30 PM
To: George Bauer
Cc: Michael McCarn
Subject: High Level Cost Needed for PENTAIR Pump and 480V motor

Hi George,

I got your information from Ames, Inc. which I believe is the distributor for the PENTAIR pumps in MD. I am a Project Engineer with EBA Engineering, Inc. and we are currently performing a High Level Cost Estimate for a pump station project for WSSC. I was wondering if you could give me a rough cost estimate for the following (ballpark figures including shipping & labor would be great).

1) PENTAIR pumps for which the pump data sheet has been attached in this email

2) A typical 480V motor. (The motors are expected to run on 480V and will be mounted in the control building above the dry well, not directly to the pumps.)

I'd greatly appreciate if you could give me a rough overall cost estimate for each of the above items at the earliest.

Thanks and regards,

Kartik Radhakrishnan, EIT | Project Engineer

EBA Engineering, Inc.

d. (240) 547-1135 | kartik.radhakrishnan@ebaengineering.com

14405 Laurel Place, Suite 300 | Laurel, MD 20707 | www.ebaengineering.com

Houston, Edward B. (Brian)

Subject: FW: High Level Cost Needed for Flygt AC pumps, Attn: Tiffany G. Bain

From: Tiffany Bain [mailto:TBain@geigerinc.com]
Sent: Monday, June 22, 2015 1:55 PM
To: Kartik Radhakrishnan; Kerri Murphy
Cc: Michael McCarn
Subject: RE: High Level Cost Needed for Flygt AC pumps, Attn: Tiffany G. Bain

Kartik,

Good afternoon. Great to talk to you. As mentioned in our conversation, there are a couple items that are inconsistent with a duplicate NS offering. I've made a selection for you assuming the pump size is the 6x4-14CV with the available 6x4" suction reducer and a 3 phase motor. It is unlikely that the 40 HP motor is 120/208 power as that is a single phase power supply, so that would be something you'd want to double check and I've assumed a 230/480V, 3phase, 60Hz, 40 HP motor. Also, as this project moves forward, I'd be interested to know if you had a SN, static head and any additional design points.

Budget price for a new unit including pump, motor, reducer, frame, coupling, standard mechanical seals and an estimate for freight would be ~$25,500 each.

Thanks and please let me know which pumping station it is that you are working on when you get a chance. Take care.

Tiffany G. Bain, P.E.
Sales Engineer
Geiger Pump and Equipment Co.
phone: 410-682-2660
cell: 443-823-9785
fax: 410-682-4750
www.geigerinc.com

From: Kartik Radhakrishnan [mailto:kartik.radhakrishnan@ebaengineering.com]
Sent: Monday, June 22, 2015 1:39 PM
To: Kerri Murphy
Cc: Michael McCarn; Tiffany Bain
Subject: RE: High Level Cost Needed for Flygt AC pumps, Attn: Tiffany G. Bain

Hi Kerri,

Thanks for your response. Were you able to find some information in this regards?

Thanks and regards,

Kartik Radhakrishnan, EIT | Project Engineer
EBA Engineering, Inc.
d. (240) 547-1135 | kartik.radhakrishnan@ebaengineering.com
14405 Laurel Place, Suite 300 | Laurel, MD 20707 | www.ebaengineering.com

where
commitment
counts

From: Kerri Murphy [mailto:KMurphy@geigerinc.com]
Sent: Monday, June 15, 2015 2:24 PM
To: Kartik Radhakrishnan
Cc: Michael McCarn; Tiffany Bain
Subject: RE: High Level Cost Needed for Flygt AC pumps, Attn: Tiffany G. Bain

Hi Kartik!

Thanks for the info!

We will be in touch shortly!

Kerri Murphy
Geiger Pump & Equipment
O 610.459.1212 x1242
F 610.459.3992
kmurphy@geigerinc.com

From: Kartik Radhakrishnan [mailto:kartik.radhakrishnan@ebaengineering.com]
Sent: Monday, June 15, 2015 2:26 PM
To: GPEINFO
Cc: Michael McCarn
Subject: High Level Cost Needed for Flygt AC pumps, Attn: Tiffany G. Bain

Hello,

I am a Project Engineer with EBA Engineering, Inc. in Laurel, MD. We are currently performing a High Level Cost Estimate for a pump station project for our municipal client, WSSC. I was wondering if you could give me a **rough** cost estimate for the following set of pumps (ballpark figures including shipping, labor, rental, taxes, etc. would be great).:

Model: Allis Chalmers Model 4"x4"x14 – 300-NSWV
Power: 40 HP
Capacity: 300 GPM @ 162' total dynamic head
Speed: Constant 1770 RPM

PUMP DATA

ALLIS - CHALMERS
Model 300 N.S.W.V. Pump,
4"x 4"x 14", N.S.W.
4" Pump, 1770 R.P.M.
324 Motor Frame, 2 3/8 Shaft.

POWER SUPPLY
120/208 Volt, 3 phase, 4 Wire

Pump end is not submerged. Motor is connected to the pump by shaft. Distance is about 20'.

The pumps were originally installed in 1976. If an exact match cannot be found, it is sufficient to find something similar. We just need a ballpark price that will be used in comparison with the costs of the much larger 1.3 MGD pumps.

Do you think you might have any information in this regards or know someone who can help out with this ? Appreciate your inputs.

Thanks and regards,

Kartik Radhakrishnan, EIT | Project Engineer
EBA Engineering, Inc.
d. (240) 547-1135 | kartik.radhakrishnan@ebaengineering.com
14405 Laurel Place, Suite 300 | Laurel, MD 20707 | www.ebaengineering.com

EBA ENGINEERING

where commitment counts

MONUMENTAL SUPPLY CO., INC.
401 S. HAVEN STREET
BALTIMORE MD 21224-2606
Phone # : 410-732-9300

Ordered By: KARTIK RADHAKRISHNAN ** Bid **
Required : 06/05/15 Page # 1
Writer : CRAIG SIMMS
P/O-JOB : 8M2974

Bid To:	Ship To:
CASH SALES	CASH SALES
1025 S. HAVEN STREET	EBA ENGINEERING
BALTIMORE MD 21224	LAUREL, MD 20707

Phone # : 240-547-1135 ** C.O.D. ** C.O.D. ** C.O.D. **

Bid-Date	Expires	Writer	Terms	Ship Via	Order#
06/05/15	06/10/15	SIMCRA	NET DUE ON INVOICE	OT OUR TRUCK	S1715941

Bid	Qty	Description	Unit Price	Net
1ea	8	MILWAUKEE #2974M CHECK VALVE 125# FLANGED - IBBM #8M2974M	958.00/ea	958.00

BID TOTAL 958.00

Bid Amount 958.00

Estimated Weight: 282

Date: May 7, 2015 16:38:03 FY starts July 1
Facility=2371 (Spring Gardens Est WWPS) No. months 10

Category	Account		Current Year YTD			Current Month (May)			FY YTD Minus Current Month			FY YTD Monthly Avgs		
	#	Description	Total YTD	Direct YTD	Indirect YTD	Total Curr Month	Direct Curr Month	Indirect Curr Month	Total YTD	Direct YTD	Indirect YTD	Total YTD	Direct YTD	Indirect YTD
Fuel	00033	Gasoline & Diesel Oil	$ 763.86		$ 763.86	$ 33.65		$ 33.65	$ 730.21	$ -	$ 730.21	$ 73.02	$ -	$ 73.02
Maintenance	00003	Materials	$ 1,878.53	$ 1,773.10	$ 105.43	$ 3.74		$ 3.74	$ 1,874.79	$ 1,773.10	$ 101.69	$ 187.48	$ 177.31	$ 10.17
Maintenance	00004	Materials, Non-warehouse	$ 5,885.36	$ 4,678.83	$ 1,206.53	$ 12.37		$ 12.37	$ 5,872.99	$ 4,678.83	$ 1,194.16	$ 587.30	$ 467.88	$ 119.42
Maintenance	00029	Mach & Equip Repair Part	$ 3,987.72	$ 3,987.72	$ -			$ -	$ 3,987.72	$ 3,987.72	$ -	$ 398.77	$ 398.77	$ -
Maintenance	00303	Material Overhead	$ 109.58		$ 109.58	$ 0.17		$ 0.17	$ 109.41	$ -	$ 109.41	$ 10.94	$ -	$ 10.94
Maintenance	00880	Mach & Equip Expenses	$ 209.09		$ 209.09	$ 6.42		$ 6.42	$ 202.67	$ -	$ 202.67	$ 20.27	$ -	$ 20.27
Misc	00007	Rental	$ 8.08		$ 8.08			$ -	$ 8.08	$ -	$ 8.08	$ 0.81	$ -	$ 0.81
Misc	00014	Office Supplies & Svcs	$ 284.00		$ 284.00	$ 5.76		$ 5.76	$ 278.24	$ -	$ 278.24	$ 27.82	$ -	$ 27.82
Misc	00018	Mileage, Parking & Tolls	$ 3.61		$ 3.61			$ -	$ 3.61	$ -	$ 3.61	$ 0.36	$ -	$ 0.36
Misc	00040	Professional Services	$ 0.67		$ 0.67			$ -	$ 0.67	$ -	$ 0.67	$ 0.07	$ -	$ 0.07
Misc	00041	Subscriptions & Dues	$ (172.26)		$ (172.26)	$ 2.17		$ 2.17	$ (174.43)	$ -	$ (174.43)	$ (17.44)	$ -	$ (17.44)
Misc	00043	Employee Awards	$ 2.25		$ 2.25			$ -	$ 2.25	$ -	$ 2.25	$ 0.23	$ -	$ 0.23
Misc	00045	Postage	$ 30.63		$ 30.63			$ -	$ 30.63	$ -	$ 30.63	$ 3.06	$ -	$ 3.06
Misc	00081	Travel for Conf, Sem, et	$ 43.36		$ 43.36	$ 0.61		$ 0.61	$ 42.75	$ -	$ 42.75	$ 4.28	$ -	$ 4.28
Misc	00082	Edu Courses & Expenses	$ 5.53		$ 5.53			$ -	$ 5.53	$ -	$ 5.53	$ 0.55	$ -	$ 0.55
Misc	00085	Furn/Equip, Non-Depr	$ 0.23		$ 0.23			$ -	$ 0.23	$ -	$ 0.23	$ 0.02	$ -	$ 0.02
Misc	00086	Tools/Lab/Radio,Non-Depr	$ 15.93		$ 15.93			$ -	$ 15.93	$ -	$ 15.93	$ 1.59	$ -	$ 1.59
Misc	00888	Radio Expenses	$ 208.57		$ 208.57	$ 9.45		$ 9.45	$ 199.12	$ -	$ 199.12	$ 19.91	$ -	$ 19.91
Misc	00890	Transportation Expenses	$ 9,292.18		$ 9,292.18	$ 168.84		$ 168.84	$ 9,123.34	$ -	$ 9,123.34	$ 912.33	$ -	$ 912.33
Misc	00921	Office Building Expenses	$ 6,157.13		$ 6,157.13	$ 239.81		$ 239.81	$ 5,917.32	$ -	$ 5,917.32	$ 591.73	$ -	$ 591.73
Salary	00001	Regular Salaries & Wages	$ 66,319.94	$ 26,473.91	$ 39,846.03	$ 1,501.41	$ 856.31	$ 645.10	$ 64,818.53	$ 25,617.60	$ 39,200.93	$ 6,481.85	$ 2,561.76	$ 3,920.09
Salary	00002	Overtime Salaries & Wage	$ 1,038.66	$ 433.07	$ 605.59	$ 9.09		$ 9.09	$ 1,029.57	$ 433.07	$ 596.50	$ 102.96	$ 43.31	$ 59.65
Utility	00005	Heat, Light & Power	$ 9,714.04	$ 8,860.79	$ 853.25	$ 1,207.52	$ 1,139.79	$ 67.73	$ 8,506.52	$ 7,721.00	$ 785.52	$ 850.65	$ 772.10	$ 78.55

Houston, Edward B. (Brian)

From: Afif, Fady
Sent: Tuesday, June 09, 2015 10:05 AM
To: Houston, Edward B. (Brian); Habibian, Ahmad
Cc: McPherson, Ann
Subject: FW: Spring gardens WWPS, new property aguiring, information needed

Categories: Important

From: Modise, Claude [mailto:Claude.Modise@wsscwater.com]
Sent: June 09, 2015 10:03 AM
To: Afif, Fady
Cc: Fashokun, Adebola
Subject: Spring gardens WWPS, new property aguiring, information needed

Hello Fady,

Paul Gray(WSSC) says if all goes well settlement of the following property should take place in August or September. See the info below.

Parcels: Spring Gardens Property (00 Kings Valley Road in Damascus 20872) Parcel 577, 3.08 Acres
Cost of Purchase which is also the appraisal amount: $140, 000.00

Thanks,

Claude Modise, P.E.
Planning Manager II
Planning Group
Washington Suburban Sanitary Commission
14501 Sweitzer Lane
Laurel, MD 20707-5902
(301) 206-8162
Claude.Modise@wsscwater.com

Real Property Data Search (w3) **Guide to searching the database**

Search Result for MONTGOMERY COUNTY

View Map | View GroundRent Redemption | View GroundRent Registration

Account Identifier: District - **12** Account Number - **01734482**

Owner Information

Owner Name:	**WASH SUBURBAN SANITARY COMM**	**Use:** **Principal Residence:**	**EXEMPT COMMERCIAL** **NO**
Mailing Address:	**4017 HAMILTON ST** **HYATTSVILLE MD 20781**	**Deed Reference:**	**/04761/ 00279**

Location & Structure Information

Premises Address:	**KINGS VALLEY RD** **0-0000**	**Legal Description:**	**HOPE IMPROVED**

Map:	Grid:	Parcel:	Sub District:	Subdivision:	Section:	Block:	Lot:	Assessment Year:	Plat No:
FX11	0000	P558		0001				2014	Plat Ref:

Special Tax Areas:

Town:	**NONE**
Ad Valorem:	
Tax Class:	**42**

Primary Structure Built	Above Grade Enclosed Area	Finished Basement Area	Property Land Area	County Use
	304		5,662 SF	480

Stories	Basement	Type	Exterior	Full/Half Bath	Garage	Last Major Renovation
		STORAGE WAREHOUSE				

Value Information

	Base Value	Value	Phase-in Assessments	
		As of 01/01/2014	As of 07/01/2014	As of 07/01/2015
Land:	4,200	5,000		
Improvements	54,400	64,200		
Total:	58,600	69,200	62,133	65,667
Preferential Land:	0			0

Transfer Information

Seller:	**Date:**	**Price:**
Type:	**Deed1: /04761/ 00279**	**Deed2:**
Seller:	**Date:**	**Price:**
Type:	**Deed1:**	**Deed2:**
Seller:	**Date:**	**Price:**
Type:	**Deed1:**	**Deed2:**

Exemption Information

Partial Exempt Assessments:	Class	07/01/2014	07/01/2015
County:	500	62,133.00	65,667.00
State:	500	62,133.00	65,667.00
Municipal:	500	0.00|0.00	0.00|0.00

Tax Exempt:	**Special Tax Recapture:**
Exempt Class:	**NONE**

Homestead Application Information

Homestead Application Status: No Application

Real Property Data Search (w1)

Guide to searching the database

Search Result for MONTGOMERY COUNTY

View Map | View GroundRent Redemption | View GroundRent Registration

Account Identifier: District - **12** Account Number - **00924940**

Owner Information

Owner Name:	NAGY JEFFREY W	Use: Principal Residence:	RESIDENTIAL YES
Mailing Address:	25115 KINGS VALLEY RD DAMASCUS MD 20872-1636	Deed Reference:	/23095/ 00509

Location & Structure Information

Premises Address:	25115 KINGS VALLEY RD DAMASCUS 20872-1636	Legal Description:	HOPE IMPROVED

Map:	Grid:	Parcel:	Sub District:	Subdivision:	Section:	Block:	Lot:	Assessment Year:	Plat No:
FX11	0000	P505		0001				2013	Plat Ref:

Special Tax Areas:	Town:	NONE
	Ad Valorem:	
	Tax Class:	42

Primary Structure Built	Above Grade Enclosed Area	Finished Basement Area	Property Land Area	County Use
1880	1,600 SF		2.5000 AC	111

Stories	Basement	Type	Exterior	Full/Half Bath	Garage	Last Major Renovation
2	NO	STANDARD UNIT	FRAME	2 full		

Value Information

	Base Value	Value	Phase-in Assessments	
		As of 01/01/2013	As of 07/01/2014	As of 07/01/2015
Land:	226,000	248,600		
Improvements	47,000	35,700		
Total:	273,000	284,300	280,533	284,300
Preferential Land:	0			0

Transfer Information

Seller: NAGY, JEFFREY W & L C	Date: 02/20/2003	Price: $0
Type: NON-ARMS LENGTH OTHER	Deed1: /23095/ 00509	Deed2:
Seller:	Date: 03/22/1985	Price: $44,000
Type: ARMS LENGTH IMPROVED	Deed1: /06683/ 00330	Deed2:
Seller:	Date:	Price:
Type:	Deed1:	Deed2:

Exemption Information

Partial Exempt Assessments:	Class	07/01/2014	07/01/2015
County:	000	0.00	
State:	000	0.00	
Municipal:	000	0.00|0.00	0.00|0.00

Tax Exempt:	Special Tax Recapture:
Exempt Class:	NONE

Homestead Application Information

Homestead Application Status: Approved 01/12/2010

Real Property Data Search (w1) Guide to searching the database

Search Result for MONTGOMERY COUNTY

View Map View GroundRent Redemption View GroundRent Registration

Account Identifier: District - **02** Account Number - **00023136**

Owner Information

Owner Name:	ACTIS ROBERT A & A V	Use: Principal Residence:	RESIDENTIAL YES
Mailing Address:	25116 KINGS VALLEY RD DAMASCUS MD 20872	Deed Reference:	/12664/ 00210

Location & Structure Information

Premises Address:	25116 KINGS VALLEY RD DAMASCUS 20872-0000	Legal Description:	LOT KING VALLEY

Map:	Grid:	Parcel:	Sub District:	Subdivision:	Section:	Block:	Lot:	Assessment Year:	Plat No:
FX11	0000	P470		0001				2013	Plat Ref:

Special Tax Areas:	Town:	NONE
	Ad Valorem:	
	Tax Class:	42

Primary Structure Built	Above Grade Enclosed Area	Finished Basement Area	Property Land Area	County Use
1995	3,340 SF		13,612 SF	111

Stories	Basement	Type	Exterior	Full/Half Bath	Garage	Last Major Renovation
2	YES	STANDARD UNIT	FRAME	1 full/ 1 half		2000

Value Information

	Base Value	Value	Phase-in Assessments	
		As of 01/01/2013	As of 07/01/2014	As of 07/01/2015
Land:	134,700	148,200		
Improvements	341,600	289,600		
Total:	476,300	437,800	437,800	437,800
Preferential Land:	0			0

Transfer Information

Seller: JOSEPH F & S E GODLEWSKI	Date: 06/02/1994	Price: $45,000
Type: ARMS LENGTH VACANT	Deed1: /12664/ 00210	Deed2:
Seller:	Date:	Price:
Type:	Deed1:	Deed2:
Seller:	Date:	Price:
Type:	Deed1:	Deed2:

Exemption Information

Partial Exempt Assessments:	Class	07/01/2014	07/01/2015
County:	000	0.00	
State:	000	0.00	
Municipal:	000	0.00|0.00	0.00|0.00

Tax Exempt:	Special Tax Recapture:
Exempt Class:	NONE

Homestead Application Information

Homestead Application Status: No Application

SSO Cleanup and EPA Fines
Calculations for Alt 1

User input values
Calculated values

Dry Weather flow		0.09	MGD	From Hydraulic Modeling report			
Pump Firm Capacity		0	MGD	Pumps out of service	Year	Adjustment Factors	
Rainfall parameter	a	2.6042		From Rainfall Curve tab	2	0.035	a
Rainfall parameter	b	0.2528		From Rainfall Curve tab	10	0.095	b
I/I Factor	R	0.021		From Hydraulic Modeling report			
	Area	361	acres	175 sewered acres, 361 total acres, from Hydraulic Modeling report			
Model Overflow	2-year	0.025355	MG	From Hydraulic Modeling report			
	10-year	0.099563	MG	From Hydraulic Modeling report			
Adjustment Factors	a	0.007510037		See calculation this sheet			
	b	0.019773888		See calculation this sheet			

EPA Consent Decree Fines:

Less than 100 gallons	$125
100 to 2,499 gallons	$750
2,500 to 9,999 gallons	$1,250
10,000 to 99,999 gallons	$4,700
100,000 to 999,999 gallons	$10,000
1 million gallons	$15,000

Cleanup Cost 5500 $/SSO

Storm Event (year)	Intensity of Event/24hr	Rain Flow Flow Into Sewer (mgd)	DWF (mgd)	Total Flow	Pump Capacity	Overflow	Adjust. Factor	Adjusted Overflow	Cleanup Cost	Prob of Event	Prob. x Cleanup	Fines	Prob. x Fines
										Total	$2,032,246	Total	$ 1,744,969
Dry weather	0	0.00	0.09	0.09	0	0.09	-	0.09	2007500	1	$2,007,500	$1,715,500	$ 1,715,500
1	2.60	0.54	0.09	0.63	0.000	0.63	0.027	0.017	5500	1.00	$5,500	$ 4,700	$ 4,700
2	3.10	0.64	0.09	0.73	0.000	0.73	0.035	0.025	5500	0.50	$2,750	$ 4,700	$ 2,350
3	3.44	0.71	0.09	0.80	0.000	0.80	0.042	0.034	5500	0.33	$1,833	$ 4,700	$ 1,567
4	3.70	0.76	0.09	0.85	0.000	0.85	0.050	0.042	5500	0.25	$1,375	$ 4,700	$ 1,175
5	3.91	0.81	0.09	0.90	0.000	0.90	0.057	0.051	5500	0.20	$1,100	$ 4,700	$ 940
6	4.10	0.84	0.09	0.93	0.000	0.93	0.065	0.061	5500	0.17	$917	$ 4,700	$ 783
7	4.26	0.88	0.09	0.97	0.000	0.97	0.072	0.070	5500	0.14	$786	$ 4,700	$ 671
8	4.41	0.91	0.09	1.00	0.000	1.00	0.080	0.080	5500	0.13	$688	$ 4,700	$ 588
9	4.54	0.93	0.09	1.02	0.000	1.02	0.087	0.089	5500	0.11	$611	$ 4,700	$ 522
10	4.66	0.96	0.09	1.05	0.000	1.05	0.095	0.100	5500	0.10	$550	$ 4,700	$ 470
11	4.77	0.98	0.09	1.07	0.000	1.07	0.102	0.110	5500	0.09	$500	$ 10,000	$ 909
12	4.88	1.00	0.09	1.09	0.000	1.09	0.110	0.120	5500	0.08	$458	$ 10,000	$ 833
13	4.98	1.03	0.09	1.12	0.000	1.12	0.117	0.131	5500	0.08	$423	$ 10,000	$ 769
14	5.07	1.04	0.09	1.13	0.000	1.13	0.125	0.142	5500	0.07	$393	$ 10,000	$ 714
15	5.16	1.06	0.09	1.15	0.000	1.15	0.132	0.153	5500	0.07	$367	$ 10,000	$ 667
16	5.25	1.08	0.09	1.17	0.000	1.17	0.140	0.164	5500	0.06	$344	$ 10,000	$ 625
17	5.33	1.10	0.09	1.19	0.000	1.19	0.147	0.175	5500	0.06	$324	$ 10,000	$ 588
18	5.41	1.11	0.09	1.20	0.000	1.20	0.155	0.186	5500	0.06	$306	$ 10,000	$ 556
19	5.48	1.13	0.09	1.22	0.000	1.22	0.162	0.198	5500	0.05	$289	$ 10,000	$ 526
20	5.55	1.14	0.09	1.23	0.000	1.23	0.170	0.210	5500	0.05	$275	$ 10,000	$ 500
21	5.62	1.16	0.09	1.25	0.000	1.25	0.177	0.221	5500	0.05	$262	$ 10,000	$ 476
22	5.69	1.17	0.09	1.26	0.000	1.26	0.185	0.233	5500	0.05	$250	$ 10,000	$ 455
23	5.75	1.18	0.09	1.27	0.000	1.27	0.193	0.245	5500	0.04	$239	$ 10,000	$ 435
24	5.82	1.20	0.09	1.29	0.000	1.29	0.200	0.257	5500	0.04	$229	$ 10,000	$ 417
25	5.88	1.21	0.09	1.30	0.000	1.30	0.208	0.270	5500	0.04	$220	$ 10,000	$ 400
26	5.93	1.22	0.09	1.31	0.000	1.31	0.215	0.282	5500	0.04	$212	$ 10,000	$ 385
27	5.99	1.23	0.09	1.32	0.000	1.32	0.223	0.294	5500	0.04	$204	$ 10,000	$ 370
28	6.05	1.24	0.09	1.33	0.000	1.33	0.230	0.307	5500	0.04	$196	$ 10,000	$ 357
29	6.10	1.26	0.09	1.35	0.000	1.35	0.238	0.320	5500	0.03	$190	$ 10,000	$ 345
30	6.15	1.27	0.09	1.36	0.000	1.36	0.245	0.332	5500	0.03	$183	$ 10,000	$ 333
31	6.20	1.28	0.09	1.37	0.000	1.37	0.253	0.345	5500	0.03	$177	$ 10,000	$ 323
32	6.25	1.29	0.09	1.38	0.000	1.38	0.260	0.358	5500	0.03	$172	$ 10,000	$ 313
33	6.30	1.30	0.09	1.39	0.000	1.39	0.268	0.371	5500	0.03	$167	$ 10,000	$ 303
34	6.35	1.31	0.09	1.40	0.000	1.40	0.275	0.384	5500	0.03	$162	$ 10,000	$ 294
35	6.40	1.32	0.09	1.41	0.000	1.41	0.283	0.398	5500	0.03	$157	$ 10,000	$ 286
36	6.44	1.33	0.09	1.42	0.000	1.42	0.290	0.411	5500	0.03	$153	$ 10,000	$ 278
37	6.49	1.34	0.09	1.43	0.000	1.43	0.298	0.424	5500	0.03	$149	$ 10,000	$ 270
38	6.53	1.34	0.09	1.43	0.000	1.43	0.305	0.438	5500	0.03	$145	$ 10,000	$ 263
39	6.57	1.35	0.09	1.44	0.000	1.44	0.313	0.451	5500	0.03	$141	$ 10,000	$ 256
40	6.62	1.36	0.09	1.45	0.000	1.45	0.320	0.465	5500	0.03	$138	$ 10,000	$ 250
41	6.66	1.37	0.09	1.46	0.000	1.46	0.328	0.479	5500	0.02	$134	$ 10,000	$ 244
42	6.70	1.38	0.09	1.47	0.000	1.47	0.335	0.492	5500	0.02	$131	$ 10,000	$ 238
43	6.74	1.39	0.09	1.48	0.000	1.48	0.343	0.506	5500	0.02	$128	$ 10,000	$ 233
44	6.78	1.40	0.09	1.49	0.000	1.49	0.350	0.520	5500	0.02	$125	$ 10,000	$ 227
45	6.82	1.40	0.09	1.49	0.000	1.49	0.358	0.534	5500	0.02	$122	$ 10,000	$ 222
46	6.86	1.41	0.09	1.50	0.000	1.50	0.365	0.548	5500	0.02	$120	$ 10,000	$ 217
47	6.89	1.42	0.09	1.51	0.000	1.51	0.373	0.562	5500	0.02	$117	$ 10,000	$ 213
48	6.93	1.43	0.09	1.52	0.000	1.52	0.380	0.577	5500	0.02	$115	$ 10,000	$ 208
49	6.97	1.43	0.09	1.52	0.000	1.52	0.388	0.591	5500	0.02	$112	$ 10,000	$ 204
50	7.00	1.44	0.09	1.53	0.000	1.53	0.395	0.605	5500	0.02	$110	$ 10,000	$ 200

SSO Cleanup and EPA Fines
Calculations for Alt 2

User input values
Calculated values

Dry Weather flow		0.09	MGD	From Hydraulic Modeling report			
Pump Firm Capacity		0.432	MGD	From project Scope of Work	Year	Adjustment Factors	
Rainfall parameter	a	2.6042		From Rainfall Curve tab	2	0.085	a
Rainfall parameter	b	0.2528		From Rainfall Curve tab	10	0.161	b
I/I Factor	R	0.021		From Hydraulic Modeling report			
	Area	361	acres	175 sewered acres, 361 total acres, from Hydraulic Modeling report			
Model Overflow	2-year	0.025355	MG	From Hydraulic Modeling report			
	10-year	0.099563	MG	From Hydraulic Modeling report			
Adjustment Factors	a	0.009475621		See calculation this sheet			
	b	0.066500145		See calculation this sheet			

EPA Consent Decree Fines:

Less than 100 gallons	$125
100 to 2,499 gallons	$750
2,500 to 9,999 gallons	$1,250
10,000 to 99,999 gallons	$4,700
100,000 to 999,999 gallons	$10,000
1 million gallons	$15,000

Cleanup Cost 5500 $/SSO

Storm Event (year)	Intensity of Event/24hr	Rain Flow Flow Into Sewer (mgd)	DWF (mgd)	Total Flow	Pump Capacity	Overflow	Adjust. Factor	Adjusted Overflow	Cleanup Cost	Prob of Event	Prob. x Cleanup	Fines	Prob. x Fines
										Total	$24,746	**Total**	$ 29,469
1	2.60	0.54	0.09	0.63	0.432	0.19	0.076	0.015	5500	1.00	$5,500	$ 4,700	$ 4,700
2	3.10	0.64	0.09	0.73	0.432	0.30	0.085	0.025	5500	0.50	$2,750	$ 4,700	$ 2,350
3	3.44	0.71	0.09	0.80	0.432	0.37	0.095	0.035	5500	0.33	$1,833	$ 4,700	$ 1,567
4	3.70	0.76	0.09	0.85	0.432	0.42	0.104	0.044	5500	0.25	$1,375	$ 4,700	$ 1,175
5	3.91	0.81	0.09	0.90	0.432	0.46	0.114	0.053	5500	0.20	$1,100	$ 4,700	$ 940
6	4.10	0.84	0.09	0.93	0.432	0.50	0.123	0.062	5500	0.17	$917	$ 4,700	$ 783
7	4.26	0.88	0.09	0.97	0.432	0.53	0.133	0.071	5500	0.14	$786	$ 4,700	$ 671
8	4.41	0.91	0.09	1.00	0.432	0.56	0.142	0.080	5500	0.13	$688	$ 4,700	$ 588
9	4.54	0.93	0.09	1.02	0.432	0.59	0.152	0.090	5500	0.11	$611	$ 4,700	$ 522
10	4.66	0.96	0.09	1.05	0.432	0.62	0.161	0.100	5500	0.10	$550	$ 4,700	$ 470
11	4.77	0.98	0.09	1.07	0.432	0.64	0.171	0.109	5500	0.09	$500	$ 10,000	$ 909
12	4.88	1.00	0.09	1.09	0.432	0.66	0.180	0.119	5500	0.08	$458	$ 10,000	$ 833
13	4.98	1.03	0.09	1.12	0.432	0.68	0.190	0.130	5500	0.08	$423	$ 10,000	$ 769
14	5.07	1.04	0.09	1.13	0.432	0.70	0.199	0.140	5500	0.07	$393	$ 10,000	$ 714
15	5.16	1.06	0.09	1.15	0.432	0.72	0.209	0.150	5500	0.07	$367	$ 10,000	$ 667
16	5.25	1.08	0.09	1.17	0.432	0.74	0.218	0.161	5500	0.06	$344	$ 10,000	$ 625
17	5.33	1.10	0.09	1.19	0.432	0.76	0.228	0.172	5500	0.06	$324	$ 10,000	$ 588
18	5.41	1.11	0.09	1.20	0.432	0.77	0.237	0.183	5500	0.06	$306	$ 10,000	$ 556
19	5.48	1.13	0.09	1.22	0.432	0.79	0.247	0.194	5500	0.05	$289	$ 10,000	$ 526
20	5.55	1.14	0.09	1.23	0.432	0.80	0.256	0.205	5500	0.05	$275	$ 10,000	$ 500
21	5.62	1.16	0.09	1.25	0.432	0.82	0.265	0.216	5500	0.05	$262	$ 10,000	$ 476
22	5.69	1.17	0.09	1.26	0.432	0.83	0.275	0.228	5500	0.05	$250	$ 10,000	$ 455
23	5.75	1.18	0.09	1.27	0.432	0.84	0.284	0.240	5500	0.04	$239	$ 10,000	$ 435
24	5.82	1.20	0.09	1.29	0.432	0.86	0.294	0.251	5500	0.04	$229	$ 10,000	$ 417
25	5.88	1.21	0.09	1.30	0.432	0.87	0.303	0.263	5500	0.04	$220	$ 10,000	$ 400
26	5.93	1.22	0.09	1.31	0.432	0.88	0.313	0.275	5500	0.04	$212	$ 10,000	$ 385
27	5.99	1.23	0.09	1.32	0.432	0.89	0.322	0.287	5500	0.04	$204	$ 10,000	$ 370
28	6.05	1.24	0.09	1.33	0.432	0.90	0.332	0.300	5500	0.04	$196	$ 10,000	$ 357
29	6.10	1.26	0.09	1.35	0.432	0.91	0.341	0.312	5500	0.03	$190	$ 10,000	$ 345
30	6.15	1.27	0.09	1.36	0.432	0.92	0.351	0.324	5500	0.03	$183	$ 10,000	$ 333
31	6.20	1.28	0.09	1.37	0.432	0.94	0.360	0.337	5500	0.03	$177	$ 10,000	$ 323
32	6.25	1.29	0.09	1.38	0.432	0.95	0.370	0.350	5500	0.03	$172	$ 10,000	$ 313
33	6.30	1.30	0.09	1.39	0.432	0.96	0.379	0.362	5500	0.03	$167	$ 10,000	$ 303
34	6.35	1.31	0.09	1.40	0.432	0.97	0.389	0.375	5500	0.03	$162	$ 10,000	$ 294
35	6.40	1.32	0.09	1.41	0.432	0.97	0.398	0.388	5500	0.03	$157	$ 10,000	$ 286
36	6.44	1.33	0.09	1.42	0.432	0.98	0.408	0.401	5500	0.03	$153	$ 10,000	$ 278
37	6.49	1.34	0.09	1.43	0.432	0.99	0.417	0.414	5500	0.03	$149	$ 10,000	$ 270
38	6.53	1.34	0.09	1.43	0.432	1.00	0.427	0.428	5500	0.03	$145	$ 10,000	$ 263
39	6.57	1.35	0.09	1.44	0.432	1.01	0.436	0.441	5500	0.03	$141	$ 10,000	$ 256
40	6.62	1.36	0.09	1.45	0.432	1.02	0.446	0.454	5500	0.03	$138	$ 10,000	$ 250
41	6.66	1.37	0.09	1.46	0.432	1.03	0.455	0.468	5500	0.02	$134	$ 10,000	$ 244
42	6.70	1.38	0.09	1.47	0.432	1.04	0.464	0.482	5500	0.02	$131	$ 10,000	$ 238
43	6.74	1.39	0.09	1.48	0.432	1.05	0.474	0.495	5500	0.02	$128	$ 10,000	$ 233
44	6.78	1.40	0.09	1.49	0.432	1.05	0.483	0.509	5500	0.02	$125	$ 10,000	$ 227
45	6.82	1.40	0.09	1.49	0.432	1.06	0.493	0.523	5500	0.02	$122	$ 10,000	$ 222
46	6.86	1.41	0.09	1.50	0.432	1.07	0.502	0.537	5500	0.02	$120	$ 10,000	$ 217
47	6.89	1.42	0.09	1.51	0.432	1.08	0.512	0.551	5500	0.02	$117	$ 10,000	$ 213
48	6.93	1.43	0.09	1.52	0.432	1.08	0.521	0.565	5500	0.02	$115	$ 10,000	$ 208
49	6.97	1.43	0.09	1.52	0.432	1.09	0.531	0.580	5500	0.02	$112	$ 10,000	$ 204
50	7.00	1.44	0.09	1.53	0.432	1.10	0.540	0.594	5500	0.02	$110	$ 10,000	$ 200

SSO Cleanup and EPA Fines
Calculations for Alt2 3 - 5

User input values
Calculated values

Dry Weather flow		0.09	MGD	From Hydraulic Modeling report
Pump Firm Capacity		1.3	MGD	Upgraded Station Capacity
Rainfall parameter	a	2.6042		From Rainfall Curve tab
Rainfall parameter	b	0.2528		From Rainfall Curve tab
I/I Factor	R	0.021		From Hydraulic Modeling report
	Area	361	acres	175 sewered acres, 361 total acres
Adjustment Factors	a	0.009475621		From Alt 2 calculations
	b	0.066500145		From Alt 2 calculations

EPA Consent Decree Fines:

Less than 100 gallons	$125
100 to 2,499 gallons	$750
2,500 to 9,999 gallons	$1,250
10,000 to 99,999 gallons	$4,700
100,000 to 999,999 gallons	$10,000
1 million gallons	$15,000

Cleanup Cost 5500 $/SSO

Total $3,758 (Prob. x Cleanup)

Total $ 3,503 (Prob. x Fines)

Storm Event (year)	Intensity of Event/24hr	Rain Flow Flow Into Sewer (mgd)	DWF (mgd)	Total Flow	Pump Capacity	Overflow	Adjust. Factor	Adjusted Overflow	Cleanup Cost	Prob of Event	Prob. x Cleanup	Fines	Prob. x Fines
1	2.60	0.54	0.09	0.63	1.300	-0.67	0.076	0.000	0	1.00	$0	$ -	$ -
2	3.10	0.64	0.09	0.73	1.300	-0.57	0.085	0.000	0	0.50	$0	$ -	$ -
3	3.44	0.71	0.09	0.80	1.300	-0.50	0.095	0.000	0	0.33	$0	$ -	$ -
4	3.70	0.76	0.09	0.85	1.300	-0.45	0.104	0.000	0	0.25	$0	$ -	$ -
5	3.91	0.81	0.09	0.90	1.300	-0.40	0.114	0.000	0	0.20	$0	$ -	$ -
6	4.10	0.84	0.09	0.93	1.300	-0.37	0.123	0.000	0	0.17	$0	$ -	$ -
7	4.26	0.88	0.09	0.97	1.300	-0.33	0.133	0.000	0	0.14	$0	$ -	$ -
8	4.41	0.91	0.09	1.00	1.300	-0.30	0.142	0.000	0	0.13	$0	$ -	$ -
9	4.54	0.93	0.09	1.02	1.300	-0.28	0.152	0.000	0	0.11	$0	$ -	$ -
10	4.66	0.96	0.09	1.05	1.300	-0.25	0.161	0.000	0	0.10	$0	$ -	$ -
11	4.77	0.98	0.09	1.07	1.300	-0.23	0.171	0.000	0	0.09	$0	$ -	$ -
12	4.88	1.00	0.09	1.09	1.300	-0.21	0.180	0.000	0	0.08	$0	$ -	$ -
13	4.98	1.03	0.09	1.12	1.300	-0.18	0.190	0.000	0	0.08	$0	$ -	$ -
14	5.07	1.04	0.09	1.13	1.300	-0.17	0.199	0.000	0	0.07	$0	$ -	$ -
15	5.16	1.06	0.09	1.15	1.300	-0.15	0.209	0.000	0	0.07	$0	$ -	$ -
16	5.25	1.08	0.09	1.17	1.300	-0.13	0.218	0.000	0	0.06	$0	$ -	$ -
17	5.33	1.10	0.09	1.19	1.300	-0.11	0.228	0.000	0	0.06	$0	$ -	$ -
18	5.41	1.11	0.09	1.20	1.300	-0.10	0.237	0.000	0	0.06	$0	$ -	$ -
19	5.48	1.13	0.09	1.22	1.300	-0.08	0.247	0.000	0	0.05	$0	$ -	$ -
20	5.55	1.14	0.09	1.23	1.300	-0.07	0.256	0.000	0	0.05	$0	$ -	$ -
21	5.62	1.16	0.09	1.25	1.300	-0.05	0.265	0.000	0	0.05	$0	$ -	$ -
22	5.69	1.17	0.09	1.26	1.300	-0.04	0.275	0.000	0	0.05	$0	$ -	$ -
23	5.75	1.18	0.09	1.27	1.300	-0.03	0.284	0.000	0	0.04	$0	$ -	$ -
24	5.82	1.20	0.09	1.29	1.300	-0.01	0.294	0.000	0	0.04	$0	$ -	$ -
25	5.88	1.21	0.09	1.30	1.300	0.00	0.303	0.000	0	0.04	$0	$ -	$ -
26	5.93	1.22	0.09	1.31	1.300	0.01	0.313	0.004	5500	0.04	$212	$ 1,250	$ 48
27	5.99	1.23	0.09	1.32	1.300	0.02	0.322	0.008	5500	0.04	$204	$ 1,250	$ 46
28	6.05	1.24	0.09	1.33	1.300	0.03	0.332	0.012	5500	0.04	$196	$ 4,700	$ 168
29	6.10	1.26	0.09	1.35	1.300	0.05	0.341	0.016	5500	0.03	$190	$ 4,700	$ 162
30	6.15	1.27	0.09	1.36	1.300	0.06	0.351	0.020	5500	0.03	$183	$ 4,700	$ 157
31	6.20	1.28	0.09	1.37	1.300	0.07	0.360	0.024	5500	0.03	$177	$ 4,700	$ 152
32	6.25	1.29	0.09	1.38	1.300	0.08	0.370	0.029	5500	0.03	$172	$ 4,700	$ 147
33	6.30	1.30	0.09	1.39	1.300	0.09	0.379	0.033	5500	0.03	$167	$ 4,700	$ 142
34	6.35	1.31	0.09	1.40	1.300	0.10	0.389	0.038	5500	0.03	$162	$ 4,700	$ 138
35	6.40	1.32	0.09	1.41	1.300	0.11	0.398	0.043	5500	0.03	$157	$ 4,700	$ 134
36	6.44	1.33	0.09	1.42	1.300	0.12	0.408	0.047	5500	0.03	$153	$ 4,700	$ 131
37	6.49	1.34	0.09	1.43	1.300	0.13	0.417	0.052	5500	0.03	$149	$ 4,700	$ 127
38	6.53	1.34	0.09	1.43	1.300	0.13	0.427	0.057	5500	0.03	$145	$ 4,700	$ 124
39	6.57	1.35	0.09	1.44	1.300	0.14	0.436	0.063	5500	0.03	$141	$ 4,700	$ 121
40	6.62	1.36	0.09	1.45	1.300	0.15	0.446	0.068	5500	0.03	$138	$ 4,700	$ 118
41	6.66	1.37	0.09	1.46	1.300	0.16	0.455	0.073	5500	0.02	$134	$ 4,700	$ 115
42	6.70	1.38	0.09	1.47	1.300	0.17	0.464	0.078	5500	0.02	$131	$ 4,700	$ 112
43	6.74	1.39	0.09	1.48	1.300	0.18	0.474	0.084	5500	0.02	$128	$ 4,700	$ 109
44	6.78	1.40	0.09	1.49	1.300	0.19	0.483	0.090	5500	0.02	$125	$ 4,700	$ 107
45	6.82	1.40	0.09	1.49	1.300	0.19	0.493	0.095	5500	0.02	$122	$ 4,700	$ 104
46	6.86	1.41	0.09	1.50	1.300	0.20	0.502	0.101	5500	0.02	$120	$ 10,000	$ 217
47	6.89	1.42	0.09	1.51	1.300	0.21	0.512	0.107	5500	0.02	$117	$ 10,000	$ 213
48	6.93	1.43	0.09	1.52	1.300	0.22	0.521	0.113	5500	0.02	$115	$ 10,000	$ 208
49	6.97	1.43	0.09	1.52	1.300	0.22	0.531	0.119	5500	0.02	$112	$ 10,000	$ 204
50	7.00	1.44	0.09	1.53	1.300	0.23	0.540	0.125	5500	0.02	$110	$ 10,000	$ 200

Appendix E: Electrical, Instrumentation & Communication

Memorandum To: Fady Afif and Bryan Houston, Black & Veatch (B&V)

From: Vaibhav Shah, Shah & Associates, Inc. (S&A)

Project: WSSC Spring Garden Waste Water Pump Station (WWPS) – Business Case

Subject: Electrical and Instrumentation components, capital cost and operating cost for various alternatives

Date: 06/09/2015

Copy To: Ann McPherson (B&V), S. Shah (S&A) and R. Cardinal (S&A)

This memorandum constitutes S&A's assessment of electrical and instrumentation upgrade requirements, and capital cost and operating cost analysis (electrical and instrumentation) for various alternatives for upgrade of the Spring Garden WWPS located in Damascus, Maryland. After an initial analysis of various alternatives for the business case, B&V distributed an alternative screening memo and project history on April 17, 2015. The final five alternatives recommended for further consideration as per the screening memo are listed below:

1. Alternative 1 – Do Nothing
2. Alternative 2 – Status Quo; Continue Operation and Maintenance of the Pump Station As-Is.
3. Alternative 3 – Build New Pump Station on Existing Parcel; Full Bypass During Construction
4. Alternative 4 – Build New Pump Station on Existing Parcel; Current Pump Station Remaining in Service During Construction
5. Alternative 5 – New Pump Station on the Adjacent Parcel; Replace the Existing Station

<u>Alternative 1 – Do Nothing</u>

For this alternative, there will not be any change in electrical operating costs, and there will be no electrical work; hence, no corresponding capital costs for electrical work.

Alternative 2 – Status Quo; Continue Operation and Maintenance of the Pump Station As-Is.

There are two (2) existing sewage pumps in drywell of the Spring Garden WWPS. Both pumps are rated 40 HP, 120/208 VAC. Based on pump operation record for FY 2015, from July, 2015 through March, 2015, one of the two pumps operates an average of 5 hours / day. There is an existing electric unit heater (10KW) located in generator room, assumed to be operating 8 hours per day during winter months. Existing pumps and unit heater constitute the major loads for the WWPS. The total amount of energy (KWH) consumed per day by existing pumps = (HP* .746 * Hours) / (Efficiency) = (40 * .746 * 5)/ .75 = 199 kWh/day by pumps. For unit heater the energy consumed is calculated to be= (KW*H)/(efficiency) = (10*8)/(.8) = 100 kWh/day. Therefore, Total operating cost of the pump station in winter months = (299 Kwh *181 d*.1 $) = $ 5412 (WSSC pays an average electricity cost of $.10 / kWh). Total operating cost of the pump station in summer months (without heater) = (199*184*.1) = $ 3662. Total operating cost of the pump station will be $9074/year approximately. (Winter months = November to April, Summer Months = May to October)

Alternative 3 – Build New Pump Station on existing parcel; Full Bypass during Construction

1. Electrical items that need to be upgraded for new pump station on existing parcel include the following:

   New pump motors are rated 60 HP, 480VAC for four new pumps with the proposed upgrade. Existing electrical distribution system from utility is 120/208 VAC, 3 phase, 4 wire. Existing electrical utility infrastructure cannot accommodate new load. New electrical infrastructure with new electrical service from utility will be required. For new electrical infrastructure, the following will be required

   A. Coordination with electric utility company for new service. Installation of new electrical service as per the utility’s requirement.

   B. New service disconnect, 400A, 480V

   C. New MCC with 400A main breaker to accommodate all electrical load including pumps, starters for HVAC equipment and other needed beakers.

   D. We recommend to provide reduced voltage soft starter in MCC for 60 HP pump motors because RVSS will enhance life of the electric motor and also minimize the inrush current during motor start up.

   E. New pump station will have building foot print of 30’X30’ with dry pit for pumps at lower elevation. Pump motors will be mounted at ground elevation in pump station. New electrical items such as MCC, lighting panels, transformers, SCADA/RTU control panel with PLC will be located at the ground elevation in 30’ X 30’ room

F. New generator need to replace to handle as a minimum startup and operation of two new pumps out of total 4 pumps, RTU panel, Level instruments and HVAC loads. New generator needs to be accommodated in the separate new generator room onsite. New generator with sub base fuel tank will need approximate 21’ X 12’ space for indoor accommodation.

G. As a minimum, new generator shall be

   i. 200 kW, 480V, 3 phase 60 Hz Standby
   ii. EPA Emergency Standby, EPA Tier 2
   iii. EMCP Control Panel
   iv. Jacket Water Heaters
   v. Space Heater
   vi. Engine mounted radiator
   vii. Battery, rack, & cables
   viii. Battery Charger
   ix. Critical Silencer
   x. UL 142 777 gal sub base fuel tank
   xi. 5 gal overfill spill containment

H. New ATS: 400A ATS, 3 Pole, 3 Phase, 4 Wire, 480V, 60 Hz, service entrance rated, contactor type

I. Existing bubbler level control scheme needs to be demolished/upgraded with new pump station and new wet well. Existing bubbler system can be replaced with suitable level monitoring devices. Existing level control scheme shall be upgraded in new PLC and new local level control panel based on the new process control descriptions.

J. WSSC will design and provide SCADA/RTU panel for their remote control of the WWPS. Existing communication services need to be upgraded to latest technology approved by WSSC to accommodate the need of remote communication.

K. Existing discharge flow measuring device should be analyzed and replaced with upgrade of the pump station.

L. New WWPS design shall comply with NFPA 820.

M. New WWPS’s areas are classified as following

   i. Wet well – Class I, Div. 2
   ii. Drywell – Considered an unclassified area
   iii. Electrical room – No classification, but pump control and instrumentation cabinet to be NEMA 4X.

N. New WWPS design shall include fire alarm system and gas monitoring system.

2. New pump station estimated electrical load are as per Appendix A

3. New pump station estimated electrical capital cost are as per Appendix B

4. New pump station estimated electrical operation cost are as per Appendix C

Alternative 4 – Build New Pump Station on Existing Parcel; Current Pump Station Remaining in Service during construction

Electrical consideration are same as alternative 3. Electrical load, capital cost and operational cost are as per appendix A, B and C for alternative 3.

Alternative 5 – New Pump Station on the Adjacent Parcel; Replace the Existing Station

Electrical consideration are same as alternative 3. Electrical load, capital cost and operational cost are as per appendix A, B and C for alternative 3.

Appendix A - ELECTRICAL LOAD CALCULATIONS

Project:	**WSSC Business Case - Spring Garden WWPS**	Design Status:	**Business Case**
Rev:			
Site:	**WSSC - Spring Garden WWPS, Damascus**	Prepared by:	**VGS**
Date:	**6/9/15**		

EQUIPMENT DESCRIPTION & DESIGNATION	HP or KW	Connected FLA (1)	Connected KVA	Running Factor	Running FLA	Running KVA	Demand Factor	Demand FLA	Demand KVA	Power Factor (Assumed)	KW
Pump 1A	60.00 HP	73.79	61.35	1	73.79	61.35	1	73.79	61.35	0.85	52.15
Pump 1B	60.00 HP	73.79	61.35	1	73.79	61.35	1	73.79	61.35	0.85	52.15
Pump 2A	60.00 HP	73.79	61.35	0	0.00	0.00	1	0.00	0.00	0.85	0.00
Pump 2B	60.00 HP	73.79	61.35	0	0.00	0.00	1	0.00	0.00	0.85	0.00
HVAC	40KW	42.10	35.00	0.80	33.68	28.00	1	33.68	28.00	1.00	28.00
Lighting Panel VIA XFMR	15 KVA	18.04	15.00	0.80	14.43	12.00	1	14.43	12.00	0.85	10.20
SUBTOTAL - 480V LOADS		**355.31**	**295.40**		**195.70**	**162.70**		**195.70**	**162.70**		**142.49**
ESTIMATED TOTAL LOADS			295 KVA					196 A	163 KVA		142.5 kW
CONTINGENCY LOADS (20%)			59 KVA					39 A	33 KVA		28 KW
ESTIMATED TOTAL + CONTINGENCY LOADS			354 KVA					235 A	195 KVA		171.0 kW

NOTES:

[1] All Voltages to be 480 VAC, 3 Phase unless otherwise specified.

*

Appendix B - CAPITAL COST ESTIMATE

DISCIPLINE/ FIRM: ELECTRICAL AND I&C / SHAH & ASSOCIATES, INC.

ESTIMATED BY: S&A

PROJECT TITLE: WSSC- Spring Garden WWPS_Business Case

DATE: June 16, 2015

STATUS OF DESIGN: Business Case

	ITEM DESCRIPTION	UNIT	QUANTITY	MATERIAL COST		LABOR COST		TOTAL COST
				UNIT COST	TOTAL	UNIT COST	TOTAL	
COST SUMMARY								
1	Demolistion	LS	1	$ -	$ -	$ 5,000.00	$ 5,000.00	$ 5,000.00
2	MCC	1	1	$ 80,000.00	$ 80,000.00	$ 16,000.00	$ 16,000.00	$ 96,000.00
3	400A Service Dsiconnect	1	1	$5,000	$ 5,000.00	$1,000	$ 1,000.00	$ 6,000.00
4	4/O utility Feeder	LF	600	$ 6.24	$ 3,744.00	$ 2.02	$ 1,212.00	$ 4,956.00
5	THHN #6 WIRES (Utility Ground)	LF	250	$ 0.67	$ 167.50	$ 0.62	$ 155.00	$ 322.50
6	THHN #4 WIRES (Motor Power Cables)	LF	1000	$ 1.06	$ 1,060.00	$ 0.76	$ 760.00	$ 1,820.00
7	THHN #8 WIRES (Motor Ground)	LF	300	$ 0.43	$ 129.00	$ 0.70	$ 210.00	$ 339.00
8	THHN #12 WIRES	LF	10000	$ 0.18	$ 1,800.00	$ 0.56	$ 5,600.00	$ 7,400.00
9	THHN #14 WIRES	LF	8,000	$ 0.10	$ 800.00	$ 0.31	$ 2,480.00	$ 3,280.00
10	#16 TWISTED PAIR CABLE	LF	1000	$ 0.23	$ 230.00	$ 0.55	$ 550.00	$ 780.00
11	3/4" RGC	LF	800	$ 3.50	$ 2,800.00	$ 7.50	$ 6,000.00	$ 8,800.00
12	3/4" PVC coated RGS	LF	200	$ 8.00	$ 1,600.00	$ 5.78	$ 1,156.00	$ 2,756.00
13	1" RGC	LF	400	$ 3.95	$ 1,580.00	$ 6.75	$ 2,700.00	$ 4,280.00
14	1" PVC coated RGS	LF	200	$ 9.87	$ 1,974.00	$ 7.35	$ 1,470.00	$ 3,444.00
15	2" RGC	LF	200	$ 13.75	$ 2,750.00	$ 12.00	$ 2,400.00	$ 5,150.00
16	4" PVC SCH-40 CONDUIT (EXPOSED)	LF	50	$ 3.95	$ 197.50	$ 5.45	$ 272.50	$ 470.00
17	4" PVC SCH-40 CONDUIT (UNDERGROUND) (4 ducts including 2 spare)	LF	400	$ 3.95	$ 1,580.00	$ 5.45	$ 2,180.00	$ 3,760.00
18	EXCAVATION	LF	100	$ 2.14	$ 214.00	$ 4.25	$ 425.00	$ 639.00
19	BACKFILL	LF	100	$ 0.59	$ 59.00	$ 1.25	$ 125.00	$ 184.00
20	20 X 20 X 24, NEMA 4X PULL BOX	EA	2	$ 2,700.00	$ 5,400.00	$ 505.00	$ 1,010.00	$ 6,410.00
21	120/208 Panelboard	EA	2	$ 1,050.00	$ 2,100.00	$ 825.00	$ 1,650.00	$ 3,750.00
22	400A, 480V ATS	EA	1	$ 8,000.00	$ 8,000.00	$ 1,600.00	$ 1,600.00	$ 9,600.00
23	15 KVA XFMR (480/ 120-208)	EA	1	$ 1,425.00	$ 1,425.00	$ 970.00	$ 970.00	$ 2,395.00
24	30A Safety/Disconnect Switch	EA	10	$ 113.00	$ 1,130.00	$ 137.00	$ 1,370.00	$ 2,500.00
25	Arc Flash and Cordination Study	LS	1	$ -	$ -	$ 4,000.00	$ 4,000.00	$ 4,000.00
26	Lighting	LS	1	$ 7,500.00	$ 7,500.00	$ 2,500.00	$ 2,000.00	$ 9,500.00
27	Grounding Grid	LS	1	$ 2,500.00	$ 2,500.00	$ 2,500.00	$ 2,500.00	$ 5,000.00
28	200 kW, 480 V, 60 Hz, Standby & (QTY 1) Sub Base Fuel Tank	LS	1	$ 100,000.00	$ 100,000.00	$ 20,000.00	$ 20,000.00	$ 120,000.00
29	Instrumentation and Control System	LS	1	$ 30,000.00	$ 30,000.00	$ 15,000.00	$ 15,000.00	$ 45,000.00
30	Fire alarm System and Alrm monitoring	LS	1	$ 7,500.00	$ 7,500.00	$ 2,500.00	$ 2,500.00	$ 10,000.00
31	Combustibel Gas Monitoring System	LS	1	$ 7,500.00	$ 7,500.00	$ 2,500.00	$ 2,500.00	$ 10,000.00
32	Manufacturer's representative	LS	1	$ -	$ -	$ 10,000.00	$ 10,000.00	$ 10,000.00
33	Utility Upgrade (Note 1)	LS	1	$ 25,000.00	$ 25,000.00	$ 5,000.00	$ 5,000.00	$ 30,000.00
	Total Bare Cost:				$ 303,740.00		$ 114,795.50	$ 418,535.50

Notes

1 Approximate cost for upgrade of utilities from utility company for electrical and communication services upgrade.
2 Cost for design service and design service during construction are separate.
3 Only Bare material and labor cost are provided.
4

Say: **$ -**

Appendix C - Spring Garden WWPS - Operating Cost

Business Case - Atternative 3, 4 and 5						
Facility	**Size of Motor (HP)**	**KW**	**Annual Operating Hours**	**Energy Consumption Per Motor (KWH/year)**	**Cost of Energy $/KWH**	**Annual Opearting Cost**
New Pump 1A and 1B	60	54.000	621 (1.7 hrs/Day)	33,534	$0.10	$ 3,353.40
	60	54.000	621 (1.7 hrs/Day)	33,534	$0.10	$ 3,353.40
Miscellaneous (KW)	50 KW	50.000	2000	100,000	$0.10	$ 10,000.00
TOTAL				**167,068**		**$ 16,706.80**

Appendix F: Environmental Impacts

Washington Suburban Sanitary Commission

Business Case Development Basic Ordering Agreement
WSSC Contract No. PM0018A10

Environmental Assessment of Spring Garden Pump Station Modification Alternatives

Prepared For

Black & Veatch Corporation

Prepared By

PEER
CONSULTANTS, P.C.
Est. 1978

PEER Consultants, P.C.
888 17th Street NW, Suite 850
Washington, DC 20006

May 2005

Engineers • Scientists • Planners

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1 INTRODUCTION

The Spring Garden Pump Station was built around 1977 and serves the communities of Kings Valley Manor, Spring Garden Estates, Cedar Heights and Park Place Ridge in Montgomery County, Maryland. It is located in the Damascus Mini Basin approximately 400 feet south of the intersection of Kings Valley Road and Kingstead Road. The pump station currently contains two pumps each rated at 0.432 mgd with a combined output flow capacity of 0.620 mgd. Modifications to the pump station are being planned to provide adequate pumping capacity to handle current and future pumping requirements for a 10-year design storm.

A new development, Kingstead, is planned to be served by this pump station. It is estimated that this new development will contribute an additional peak flow of 0.082 mgd. Therefore, a new pump station with a capacity of 1.3 mgd with one pump in service is needed to handle the new design flow requirements.

Black and Veatch has completed the Alternative Screening Process in support of the business case analysis. The purpose of this analysis is to develop and evaluate alternatives to identify the best long-term solution for achieving the required pump station capacity. Based on the alternatives screening analysis, the following options were recommended for further evaluation.

- Alternative 1 – Do Nothing
- Alternative 2 – Status Quo; Continue Operation and Maintenance of the Pump Station As-Is.
- Alternative 3 – Build New Pump Station on Existing Parcel; Full Bypass During Construction
- Alternative 4 – Build New Pump Station on Existing Parcel; Current Pump Station Remaining in Service During Construction
- Alternative 5 – New Pump Station on the Adjacent Parcel; Replace the Existing Station

PEER Consultants, P.C. (PEER) was tasked to perform an environmental evaluation for each of the recommended pump station modification alternatives listed above.

This report presents the environmental evaluation and permit requirements for the recommended pump station modification alternatives:

2. ENVIRONMENTAL EVALUATION OF ALTERNATIVES

PEER conducted a site visit on April 16, 2015 to determine if there were any environmentally sensitive areas or features that would be impacted during construction of the proposed alternatives and any permits that might be required. The areas reviewed included the existing facility within the fence, the undeveloped areas immediately surrounding the fence (within 50 feet) and the adjacent parcel (within 50 feet of the yellow construction area shown).

The assessment was made to identify the impacts of each alternative on the following resources.

- Environmentally sensitive areas
- Wildlife habitat
- Floodplains
- Wetlands
- Prime agricultural lands and,
- Water reservoirs

Alternatives 1 and 2

There are no additional environmental impacts or permitting requirements for Alternative 1 (Do Nothing) and Alternative 2 (Status Quo).

Alternatives 3 and 4

Alternatives 3 & 4 involve locating the new pump station on the same parcel on which the existing facility is located as shown in Figure 1.

Figure 1 – Alternatives 3 and 4 Layout: New Pump Station on Existing Parcel (Construction Area Highlighted)

Because these alternatives involve the same construction and disturbed area within the existing facility, they were evaluated together.

No regulated impacts were identified on any of the above listed resources by Alternatives 3 and 4. However, there were some issues of concern, should construction limits extend beyond the facility fence. The current facility is bordered on two sides by regulated streams. The stream to the north which is an unnamed, perennial tributary to Little Bennett Creek, also contains wetland areas that may extend into the maintained areas to the north and east of the existing pump station. The existing pump station was noted to flood frequently even though its location is not mapped as a FEMA Floodplain. Access to the existing facility from Kings Valley Road is via a paved access drive and over a culvert that traverses a small tributary stream that flows parallel to the road. There has been recent bank stabilization of this stream in front of the facility to maintain the integrity of the existing culvert. It was noted that there is active stream undercutting the upper limits of the bank stabilization and further extension of the bank stabilization is recommended. If this is pursued, a Joint Permit Application from the Maryland Department of the Environment (MDE) will be required. If this permit is required, MDE may evaluate any possible floodplain impacts from the new facility construction within the existing fenced area.

The potential impacts on environmental resources that are applicable to Alternatives 3 and 4 are shown in Table 1.

Table 1. Environmental Impacts for Alternatives 3 and 4 for the Spring Garden Pump Station

Area of Impact	Impact	Description of Impact(s)
Environmental Sensitive Areas	0	Impacts to environmental sensitive areas are not anticipated with construction within existing fenced area.
Floodplains	0	No impacts are anticipated to the floodplain under this alternative within existing fenced area (possible review by MDE) with other permitted impacts.
Fish and Wildlife Habitats	0	There will be no impacts to Fish and wildlife habitats associated with this alternative within the existing fenced area.
Wetlands	0	No impacts to wetlands are anticipated for this alternative within existing fenced area.
Prime Agricultural Lands	0	There are no prime agricultural lands in the project area. Therefore, no impact is anticipated.
Water Reservoirs	0	There are no reservoirs in the vicinity of the site. Therefore no impact to reservoirs is anticipated.
Overall Environmental Impact	**0**	Under this alternative, no environmental impacts are expected, provided construction is within existing fenced area.

Alternative 5

Alternative 5 involves locating the new pump station on the adjacent parcel south of the existing pump station as shown in Figure 2. The new pump station will replace the existing pump station.

Figure 2 - Alternative 5 Layout: New Pump Station on Adjacent Parcel (Construction Area highlighted)

For this Alternative, there would be no regulated impacts on wildlife habitat, floodplains, prime agricultural lands or water reservoirs. No forest resources would be impacted by construction on this parcel. Similar to the existing facility, access to the new pump station on this parcel would need to be via a driveway and culvert that traverses the stream that flows parallel to Kings Valley Road. Additionally, there are likely wetland areas adjoining the stream in places on the parcel. Any impacts to the stream and wetland areas for access and/or facility construction would require a Joint Permit Application from the Maryland Department of the Environment.

The potential impacts on environmental resources that are applicable to Alternative 5 are shown in Table 2.

Table 2. Environmental Assessment for Alternative 5 for the Spring Gardens Pump Station

Area of Impact	Impact	Description of Impact(s)
Environmental Sensitive Areas	3000-6000 sf	Impacts to environmental sensitive areas are possible on the adjacent parcel
Floodplains	0	No impacts are anticipated to the floodplain under this alternative.
Fish and Wildlife Habitats	3000-6000 sf	There will be possible impacts to Fish and wildlife habitats associated with this alternative.
Wetlands	3000 – 6000 sf	Impacts to wetlands are anticipated for this alternative (mainly for constructed access)
Prime Agricultural Lands	0	There are no prime agricultural lands in the project area. Therefore, no impact is anticipated.
Water Reservoirs	0	There are no reservoirs in the vicinity of the site. Therefore no impact to reservoirs is anticipated.
Overall Environmental Impact	**3000 -6000 sf**	Under this alternative, some environmental impacts are expected.

Photographs of the project site taken during the site visit on April 16, 2015 are provided in the Appendix.

3. PERMITS AND REGULATORY REQUIREMENTS

For the environmental impacts related to the alternatives evaluated in this report, a Joint Permit Application and Permit Approval will be required before construction can proceed. This permit will require the approval of both the Maryland Department of the Environment and the US Army Corps of Engineers – Regulatory Branch.

4. SUMMARY AND CONCLUSION

Based on the results of our desktop and field assessments, no environmental impacts related to Alternatives 1 through 4 are anticipated, provided the construction limits are within the fenced area of the existing facility. Should the limits extend beyond the fenced limits on the existing facility or construction on the adjacent parcel occur, wetland and stream features will need to be delineated, surveyed and a permit application with regulatory agency approval will be required.

APPENDIX A

SITE VISIT PHOTOGRAPHS

Photo 1 – Bank stabilization in front of existing facility looking south

Photo 2 – Bank stabilization in front of existing facility looking north.

Photo 3 – Maintained area to north of existing facility (possible wetland and floodplain)

Photo 4 – Wetland and stream area to north of existing facility.

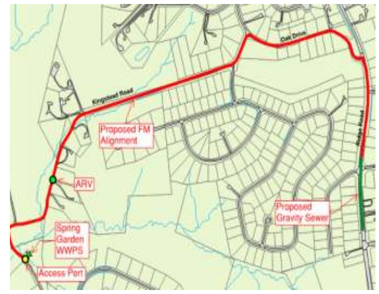
Photo 5- Vegetation on adjacent parcel

Photo 6 – Stream and wetlands on adjacent parcel (looking south)

Photo 7 – Stream downcutting on adjacent parcel looking north toward existing facility

Section 2

Spring Garden WWPS and FM Final Report (2018)



BUSINESS CASE EVALUATION
SPRING GARDEN WWPS AND FM

September 2018

Prepared for:

Washington Suburban Sanitary Commission

Prepared by:

BLACK & VEATCH
Building a world of difference.

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Spring Garden WWPS and FM

Business Case Evaluation

June 2018

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WSSC Where Water Matters

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1 Executive Summary

1.1 Project Description

The Spring Garden Wastewater Pump Station (WWPS) and associated force main (FM) are in the Damascus service area, which is part of the Monocacy Basin (25001). The existing FM is an 8-inch ductile iron pipe (DIP) built in 1976. It is approximately 4,800 feet long and rises approximately 150 feet from the WWPS to the outfall on Ridge Road. The existing Spring Garden WWPS was built in 1976 under contract 71-4656D with a theoretical firm capacity of 0.432 mgd. A pump station capacity evaluation conducted in 2015 by CDM determined the existing firm capacity to be 0.41 mgd. It discharges through an 8-inch DIP FM to Ridge Road, where flows continue by gravity to the Damascus Wastewater Treatment Plant. Current flow velocity through the FM based on a firm capacity of 0.41 mgd is calculated to be 1.82 fps, below the lower limit of 2.0 fps required by WSSC design guidelines for WWPS. Hydraulic modeling results indicate that the design flow for the existing WWPS is 1.23 mgd. This already exceeds the current WWPS firm capacity of 0.41 mgd. A new development named Kingstead is planned for this area and will be served by this WWPS. Hydraulic models indicate that the new development will contribute an additional 0.082 mgd of flow, bringing the total firm capacity required at the WWPS to 1.3 mgd.

The 2015 Spring Garden WWPS business case evaluation recommended constructing a new WWPS with an increased capacity of 1.3 mgd to address sanitary overflows and capacity issues. Increasing the WWPS flow raises the flow velocity and the total dynamic head through the FM. The new velocity approaches the upper limit of 6 feet per second (fps) allowable under the WSSC design guidelines for a WWPS. The increase in pump capacity and flow velocities coupled with the physical mortality of the FM necessitates further evaluation of the existing 8-inch FM. This business case was initiated to evaluate options for addressing the existing FM.

Following the initial screening, 12 alternatives were selected for further evaluation:

- Alternative 1: Do Nothing/Status Quo.
- Alternative 8: New FM, Existing Alignment + Marlboro, Open Cut, WWPS + 1,000' Access, No Redundancy.
- Alternative 12: New FM, Existing Alignment + Marlboro, Open Cut, WWPS Access, No Redundancy.
- Alternative 13: New FM, Existing Alignment + Marlboro, Open Cut, WWPS + 2,500' Access, No Redundancy.
- Alternative 18: New FM, Existing Alignment + Marlboro, horizontal directional drilling (HDD), WWPS Access, No Redundancy.

- Alternative 19: New FM, Existing Alignment + Marlboro, HDD, WWPS + 2,500’ Access, No Redundancy.
- Alternative 20: New FM, Kings Valley Road, Open Cut, WWPS + 1,000’ Access, No Redundancy.
- Alternative 21: New FM, Kings Valley Road, Open Cut, WWPS Access, No Redundancy.
- Alternative 22: New FM, Kings Valley Road, Open Cut, WWPS + 2,500’ Access, No Redundancy.
- Alternative 23: New FM, Kingstead Road, Open Cut, WWPS + 1,000’ Access, No Redundancy.
- Alternative 24: New FM, Kingstead Road, Open Cut, WWPS Access, No Redundancy.
- Alternative 25: New FM, Kingstead Road, Open Cut, WWPS + 2,500’ Access, No Redundancy.

The analysis used the following tools provided by WSSC:

- Lifecycle Cost Analysis (LCA) Tool.
- Risk Reduction Analysis (RRA) Tool.

1.2 Analysis Results Summary

Alternative 12: New FM, Existing Alignment + Marlboro, Open Cut, WWPS Access, No Redundancy is the highest ranked alternative in terms of annuitized cost. The second ranked alternative based on the annuitized cost is Alternative 24 – New FM, Kingstead Road, Open Cut, WWPS Access, No Redundancy. The margin of difference between the annuitized cost of the top two ranked alternatives is 0.9%. The highest ranked alternative in terms of the cost effectiveness factor is Alternative 24 – New FM, Kingstead Road, Open Cut, WWPS Access, No Redundancy. The second ranked alternative is Alternative 12 – New FM, Existing Alignment + Marlboro, Open Cut, WWPS Access, No Redundancy. Both alternatives have a negative cost effectiveness factor because their annuitized costs are lower than the baseline alternative, which leads to positive marginal annuitized costs. Therefore, the method for comparing these alternatives is based on the absolute values of their marginal annuitized costs and annual risk reduction.

Table 1-1 Summary of LCA Results

No.	Alternative	Annuitized Cost	RRA Cost Effectiveness Factor
1	Do Nothing/Status Quo	($296,180)	0.000
8	New FM, Existing Alignment + Marlboro, Open Cut, WWPS + 1,000' Access, No Redundancy	($304,002)	2.95
12	New FM, Existing Alignment + Marlboro, Open Cut, WWPS Access, No Redundancy	($285,175)	(1.93)
13	New FM, Existing Alignment + Marlboro, Open Cut, WWPS + 2,500' Access, No Redundancy	($294,588)	(14.09)
18	New FM, Existing Alignment + Marlboro, HDD, WWPS Access, No Redundancy	($317,886)	0.98
19	New FM, Existing Alignment + Marlboro, HDD, WWPS + 2,500' Access, No Redundancy	($327,182)	0.72
20	New FM, Kings Valley Road, Open Cut, WWPS + 1,000' Access, No Redundancy	($338,035)	0.68
21	New FM, Kings Valley Road, Open Cut, WWPS Access, No Redundancy	($314,736)	1.48
22	New FM, Kings Valley Road, Open Cut, WWPS + 2,500' Access, No Redundancy	($324,042)	1.01
23	New FM, Kingstead Road, Open Cut, WWPS + 1,000' Access, No Redundancy	($315,590)	1.43
24	New FM, Kingstead Road, Open Cut, WWPS Access, No Redundancy	($287,604)	(3.12)
25	New FM, Kingstead Road, Open Cut, WWPS + 2,500' Access, No Redundancy	($296,978)	34.42

1.3 Recommended Alternative

The project team recommends Alternative 24 as the best solution to the Spring Gardens WWPS and FM. Given the results of the primary analysis and that Alternative 24 was the top ranked alternative in over 50.0% of the inflation and discount rate scenarios, Alternative 24 is the preferred alternative.

Table 1-2 Recommended Alternative Preliminary Implementation Schedule

Phase	Task	Time Frame
1	Project development	July 2018 – September 2018
2	Land Acquisition	N/A
3	Design and permitting	October 2018 – March 2020
4	Bidding and procurement	April 2020 – September 2020
5	Construction	October 2020 – March 2022

The Alternative 24 analysis period is 4 years for planning, design, and construction plus 100 years for the life of the new FM for a total of 104 years. Construction costs include open cut installation of all new FM and gravity sewer pipe, installation of one access port at the WWPS, and installation of 1 air release valve (ARV). All new pipes are located within the existing road right-of-way (ROW) and under the pavement. The existing FM remains in service during construction, so no bypass pumping is required. After completion of the new FM, the existing FM is abandoned. To facilitate the abandonment, one access point to the valley is provided at Red Blaze Drive.

Table 1-3 Summary of Capital Costs Inputs

Task		FY 2019	FY 2020	FY 2021	FY 2022	Total
1	Planning, Design, and Supervision					
	Planning, Permitting, Design	($266,582)	($266,582)	$0	$0	($533,164)
	Design Services During Construction	$0	$0	($177,722)	($177,722)	($355,444)
2	Land	$0	$0	$0	$0	$0
3	Site Improvements and Utilities	$0	$0	$0	$0	$0
4	Construction	$0	$0	($1,777,216)	($1,777,216)	($3,554,432)
5	Other (WSSC Administration)	($39,987)	($39,987)	($293,241)	($293,241)	($666,456)
6	**Total**	**($306,569)**	**($306,569)**	**($2,248,179)**	**($2,248,179)**	**($5,109,496)**

2 Business Case Evaluation Background

2.1 Business Case Evaluation Process

A business case evaluation is part of the project needs validation process (PNVP), which is used by WSSC as the method through which it identifies needs and evaluates solutions that address the identified needs. The first stage of the PNVP is the completion and approval of a project initiation form (PIF). After the Project Needs Planning Committee (PNPC) approves the PIF, the PNVP may move into the business case evaluation stage. After the business case evaluation is completed, the final report with the recommendation of the project team is submitted to the PNPC. After a project is approved by the PNPC, it is submitted to the appropriate division for implementation. Figure 2-1 shows the PNVP. The following sections contain a more detailed discussion of the PIF and business case evaluation stages of the PNVP.

2.1.1 Project Initiation Form

The PIF stage of the PNVP begins when an asset owner, asset strategy manager, or other personnel completes a PIF via the e-Builder[1] website. The purpose of the PIF is to identify basic information that is necessary for the identified need to be validated, including the need, the affected asset(s), the failure mode(s), and initial consideration of alternatives that could be pursued to address the need. Once the PIF is completed by the person initiating the process, the PIF is sent to the appropriate division manager for review. The division manager can approve the PIF to move forward in the approval process, reject the PIF, or request that the initiator revise the PIF. If the PIF is approved by the division manager, then it is forwarded to the appropriate system asset strategy manager (SASM). The SASM can advance the PIF to the next review stage, reject the PIF, request that the PIF be updated, or request that the Engineering and Environmental Services Division (EESD) undertake an assessment to aid the SASM in their decision-making process.

If the SASM approves the PIF, then the PIF moves ahead in the approval system for review by the appropriate network asset strategy manager (NASM). The NASM has the ability to approve the PIF for further consideration, reject the PIF, or request that the PIF be revised. After the NASM approves the PIF, the PIF is forwarded to the Asset Management Office (AMO) Manager for review. The AMO Manager can approve the PIF for review by the PNPC, reject the PIF, or request that the PIF be amended. Once the AMO Manager has approved a PIF, it is forwarded to the PNPC for final consideration. The committee can reject the PIF, request a revision of the PIF before making its final decision, submit the PIF to EESD for an evaluation to gather information necessary to its decision-making process prior to its final decision, submit the PIF to

[1] The e-Builder website is used to track an identified need through the PNVP and to document the comments made by those reviewing a PIF through the approval process.

the Asset Management Office (AMO) for a business case evaluation, or approve the PIF for funding[2].

[2] There are only a few circumstances in which a PIF can be approved for funding by the Project Needs Planning Committee without the PIF being submitted to AMO for a business case evaluation. These circumstances are typically limited to the following: 1) the Project Needs Planning Committee has determined through the validation process that there is only one feasible alternative to address the identified need; 2) a regulatory agency has mandated that a particular approach be undertaken to address a regulatory requirement; or 3) the total cost for each of the potential alternatives to address the identified need is not sufficient to warrant a business case evaluation.

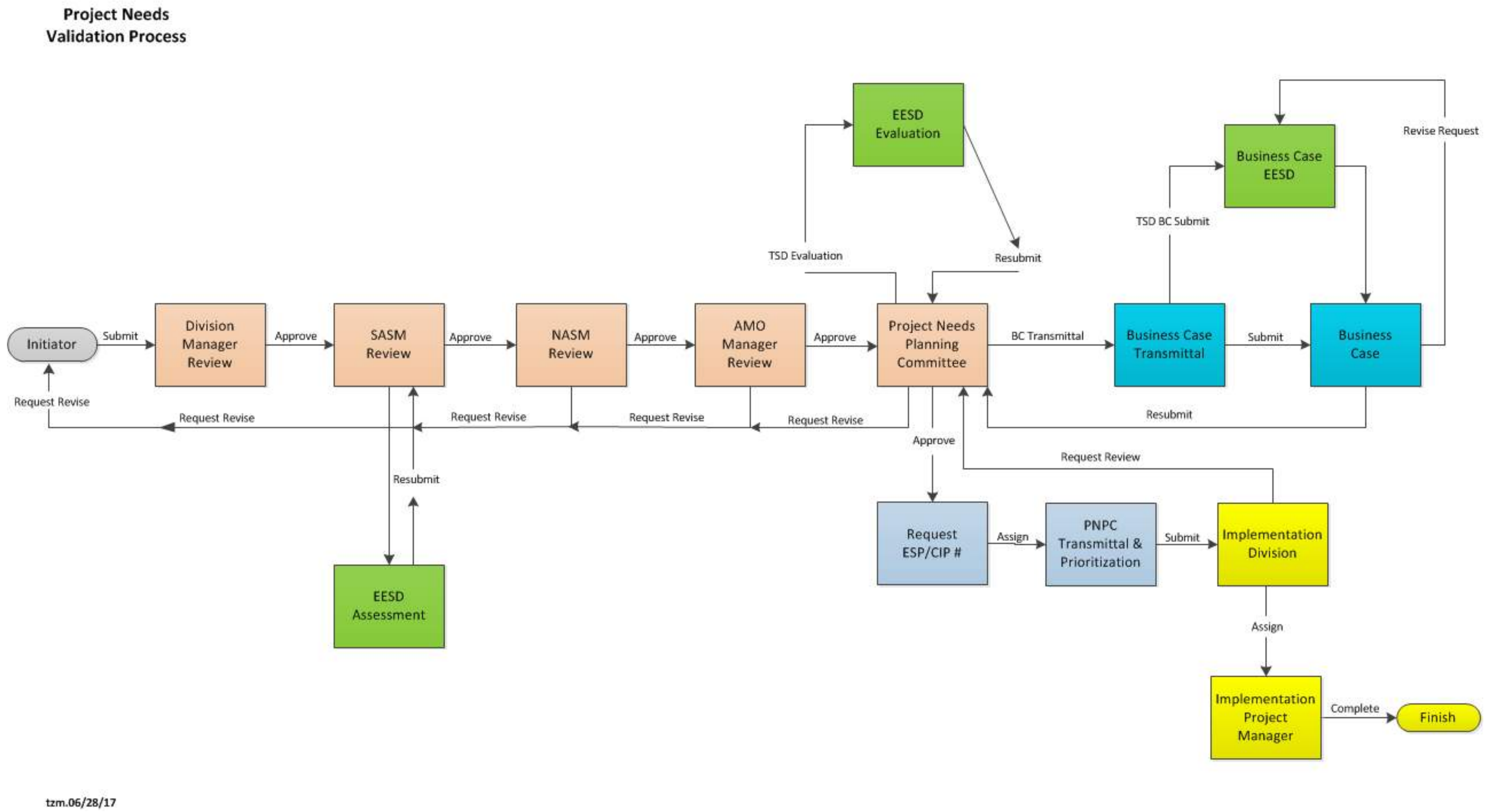

Figure 2-1 Project Needs Validation Process

2.1.2 Business Case Evaluation

After the PNPC submits a PIF to AMO for a business case evaluation, the AMO Manager assigns a project manager and the business case evaluation stage of the PNVP begins. The business case evaluation stage follows a 12-step process, as shown in Figure 2-2 and summarized below.

Step 1: The first step in the process is the approved PIF, which is intended to document the information that will serve as the basis for the business case. Based on the information identified in the approved PIF, the project manager assembles a draft scope of work and issues a request to the appropriate divisions for project team members.

Step 2: After receipt of the suggested team members from the appropriate divisions, the project manager advances the business case to the second step in the process by scheduling the internal scope of work meeting. The main purpose of the internal scope of work meeting is to gather additional information from the project team regarding the identified need through a thorough discussion of the topic. This discussion is used to refine the draft scope of work and to identify the sources of information for the initial data request. Therefore, one of the key goals of the meeting is to finalize the specific objectives and list of performance measures that are applicable to the business case. Another goal of the internal scope of work meeting is to finalize the members of the project team. The internal scope of work meeting also serves as an opportunity for the project manager to explain the expectations for the business case evaluation to the project team, including the process and expected timeline that will be followed for the business case. The project manager also introduces the project team to tools that will be at its disposal throughout the business case evaluation to document questions, comments, and suggestions. These tools are the meeting minutes and the comment registry. The purpose of the meeting minutes is to document the discussions held during a meeting. The purpose of the comment registry is to be a living document that records questions raised during meetings of the project team that were not answered during the meetings and to record the editorial comments to the draft report suggested by the project team.

Step 3: The third step in the business case evaluation process is the consultant scoping meeting. The main purpose of the consultant scoping meeting is to discuss and finalize the scope of work with the consultant[3]. At this meeting, the project manager begins the knowledge transfer process with the consultant regarding the identified need. After this initial knowledge transfer, the project manager works with the consultant to develop

[3] When a business case is conducted internally, EESE serves in the role of the consultant.

the project schedule with specific target dates for completion of the scope of work items. These discussions also form the basis for the development of the budget for the business case.

Step 4: After the scope of work, schedule, and budget have been finalized with the consultant and a notice to proceed has been issued, a kick-off meeting for the business case is held with the project team, which now includes the consultant. The primary goal of the kick-off meeting is to provide an opportunity for discussion between the WSSC staff on the project team and the consultant to allow for the transfer of knowledge regarding the identified need, specific objectives of the business case, any relevant performance measures, initial proposed alternatives, and other relevant information. Another purpose of the kick-off meeting is to determine the general engineering and technical assumptions that any proposed alternatives must satisfy. Additionally, the kick-off meeting serves as the last opportunity to add a new member to the project team.

Step 5: The fifth step in the business case evaluation is the alternatives screening memorandum. The main purpose of the alternatives screening memorandum is to document and describe all of the alternatives that have been proposed for consideration. The memorandum compares the alternatives to the general engineering and technical assumptions developed by the project team and lists pros and cons for each alternative. The memorandum serves as a tool for the project team when deciding which alternatives will proceed to the evaluation steps of the business case.

Step 6: The next step in the development of the business case after the alternatives screening memorandum is the alternatives screening workshop. The principal objective of the alternatives screening workshop is for the project team to review and discuss the proposed alternatives to select the alternatives that will advance to the evaluation portion of the business case. The workshop also serves as the last opportunity to change any of the general engineering and technical assumptions and the last chance to add additional alternatives for consideration. After the workshop, if necessary, the alternatives screening memorandum is updated to reflect any changes made during the meeting.

Step 7: The seventh step in the business case process is the evaluation assumptions memorandum. The main purpose of the evaluation assumptions memorandum is to document and describe the financial and economic assumptions that will be used in the evaluation of the selected alternatives. The memorandum serves as a tool for the project team in evaluating and agreeing to the assumptions to be used in the analysis prior to the evaluation being undertaken.

Step 8: After the evaluation assumptions memorandum is the evaluation assumptions workshop. The evaluation assumptions workshop serves as an opportunity for the project team to collectively review and discuss the assumptions that will be used in the evaluation of the alternatives as detailed in the evaluation assumptions memorandum. The goal of the workshop is for the project team to agree on the financial and economic assumptions (e.g., inflation rates, construction costs, operating and maintenance costs) to be utilized in the analysis of the selected alternatives. The workshop is the final occasion for the project team to modify any of the assumptions to be used. If necessary, the evaluation assumptions memorandum will be updated after the workshop to reflect any changes made to the assumptions to be used in the analysis.

Step 9: The ninth step in the business case evaluation stage of the project needs validation process is the evaluation results memorandum. The evaluation results memorandum documents and describes the results of the evaluation of the selected alternatives, including the lifecycle costs and risk reduction for each alternative. The memorandum is meant to aid the project team in preparing for the evaluation results workshop and during the discussions at the workshop.

Step 10: The evaluation results workshop is the tenth step in the business case process. The main purpose for the evaluation results workshop is for the project team to review and discuss the results of the evaluation of the selected alternatives. The goal of the workshop for the project team is to have developed a recommendation to submit to the PNPC about which alternative should be pursued. Any dissents with the project team recommendation are documented for consideration by the PNPC.

Step 11: The next step is the issuance of a draft report. The purpose of the draft report is to provide the project team with an opportunity to suggest editorial comments to the report before it is finalized and sent to the PNPC. The draft report is distributed amongst the project team for their review. The project team documents any editorial comments regarding the draft report in the comment registry for the project.

Step 12: The final step in the business case evaluation stage of the PNVP is the issuance of the final report. The final report documents the entire PNVP from the creation of the PIF through to the final report. Any editorial comments received from the project team on the draft report are addressed, as appropriate, in the final report. The final report contains the recommendation of the project team and is used by the PNPC to make a final decision about whether or not the project will proceed, the source of funding for the project, and what WSSC division will carry out the implementation of the project. Once the committee reaches its decision, the PNVP concludes and the project is transmitted to the appropriate division for implementation by the AMO Manager if the project has been approved for funding. It is also possible that a project may receive approval by the committee without any funding if the approved solution to the identified need is a contractual or operational change.

Figure 2-2 Business Case Evaluation Process

2.2 Spring Garden WWPS and FM PIF Summary

2.2.1 Need Description

The Spring Garden WWPS and associated FM are in the Damascus service area, which is part of the Monocacy Basin (25001). The existing FM is an 8-inch DIP built in 1976. It is approximately 4,800 feet long and rises approximately 150 feet from the WWPS to the outfall on Ridge Road. The existing WWPS was designed to operate with a firm capacity of 0.432 million gallons per day (mgd); however, a pump station capacity evaluation conducted in 2015 by CDM determined the actual firm capacity to be only 0.41 mgd. The 2015 Spring Garden WWPS business case evaluation recommended construction of a new WWPS with an increased capacity of 1.3 mgd to address sanitary overflows and capacity issues. Increasing the WWPS flow raises the flow velocity and the total dynamic head through the FM. The new velocity approaches the upper limit of 6 feet per second (fps) allowable under the WSSC design guidelines for a WWPS. The increase in pump capacity and flow velocities coupled with the physical mortality of the FM necessitates further evaluation of the existing 8-inch FM.

2.3 Workshops

Workshops were held at key points throughout the project to discuss the findings and reach consensus among the project team. The following list summarizes these workshops and when they occurred.

- Kickoff Meeting/Alternative Screening Workshop – 10/23/2017
- Evaluation Assumptions Workshop – 1/10/2018
- Evaluation Results Workshop – 4/26/2018

3 Asset Description

The Spring Garden WWPS and associated FM are in the Damascus service area, which is part of the Monocacy Basin (25001). The WWPS was built in 1976 under contract 71-4656D with a theoretical firm capacity of 0.432 mgd. A pump station capacity evaluation conducted in 2015 by CDM determined the existing firm capacity to be 0.41 mgd. It discharges through an 8-inch DIP FM. The FM is approximately 4,800 feet long and rises approximately 150 feet from the WWPS to the outfall on Ridge Road. From there, flows continue by gravity to the Damascus Wastewater Treatment Plant. Current flow velocity through the FM based on a firm capacity of 0.41 mgd is calculated to be 1.82 fps, below the lower limit of 2.0 fps required by WSSC design guidelines for WWPS. Hydraulic modeling results indicate that the design flow for the existing WWPS is 1.23 mgd. This already exceeds the current WWPS firm capacity of 0.41 mgd. A new development named Kingstead is planned for this area and will be served by this WWPS. Hydraulic models indicate that the new development will contribute an additional 0.082 mgd of flow, bringing the total firm capacity required at the WWPS to 1.3 mgd.

Figure 3-1 Existing Pump Station Aerial View

Figure 3-2 Existing Pump Station Street View

4 Alternatives

4.1 Alternatives considered

The following alternatives were considered.

4.1.1 Alternative 1: Do Nothing

This alternative represents existing conditions. Since the current FM is at the end of its life, it is replaced in-trench with a new 8-inch DIP CL 54 FM. However, instead of following the existing easement between homes it continues along Marlboro Drive to Ridge Road and additional 10-inch PVC SDR 35 gravity sewer is installed along Ridge Road between the end of the new FM and the existing transition manhole. No access ports or ARVs are included. No redundancy is added, and limited maintenance is performed other than on an emergency basis. Figure 4-1 shows the alignment.

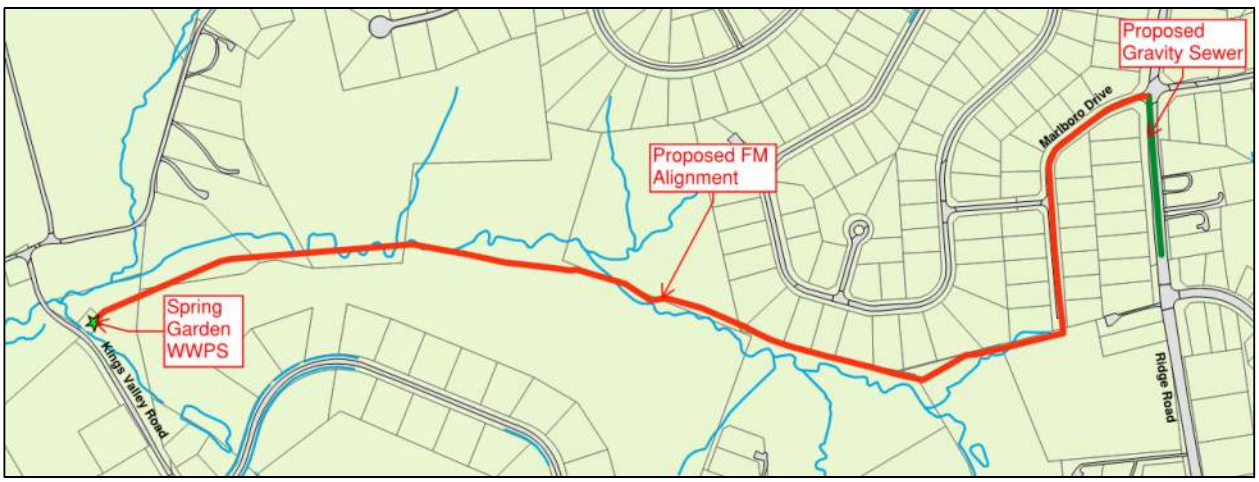

Figure 4-1 Alternative 1 Alignment

Construction costs include open cut installation of new 8-inch DIP CL 54 FM along the existing alignment. Installation is in the original FM trench, so bypass pumping is required during construction. No access ports or ARVs are installed. Approximately 300 feet of stream is stabilized to prevent future exposures. Access to the valley is from the existing WWPS and from Marlboro Drive.

Table 4-1 Alternative 1 Screening Summary

No.	Pros	Cons
1	50 year PEL.	High flow velocities.
2		Alignment remains in stream valley.
3		Additional gravity sewer required.

4.1.2 Alternative 2: Retrofit Existing FM, WWPS + 1,000-Foot Access, No Redundancy

This alternative includes rehabilitating the existing FM with a cured-in-place pipe (CIPP) liner, retrofitting it with access ports approximately every 1,000 feet, and performing periodic inspections and cleaning. Figure 4-2 shows the alignment and Table 4-2 summarizes the parameters for this alternative.

Figure 4-2 Alternative 2 Alignment

Table 4-2 Alternative 2 Parameter Summary

Parameter	Value
Material	DIP
Length (ft)	4,824
Nominal Diameter (in)	8.00
Actual ID (in)	8.00
HW Coefficient	120
Start Elev. (ft)	571
End Elev. (ft)	717
Static Head (ft)	146
Total Dynamic Head (ft)	236
Velocity (fps)	5.76

The CIPP liner typically provides 50 years of additional PEL for the FM but reduces the ID, which increases flow velocities. A full inspection of the FM is required to determine CIPP lining feasibility. If the existing FM condition is sufficiently deteriorated, CIPP lining may not be possible. The access ports facilitate periodic inspection and maintenance. Temporary access will be required at four locations along the existing alignment, resulting in environmental impacts and significant costs.

Table 4-3 Alternative 2 Screening Summary

No.	Pros	Cons
1	Access ports for maintenance.	High flow velocities.
2	50 year PEL.	Alignment remains in stream valley.
3		Reduced existing FM ID.

4.1.3 Alternative 3: Retrofit Existing FM, WWPS + 1,000-Foot Access, Partial Redundancy

This alternative is identical to Alternative 2 except that it includes installing approximately 3,000 feet of redundant 10-inch HDPE DR 11 FM via open cut beginning at the WWPS. Figure 4-3 shows the alignment and Table 4-4 summarizes the parameters for this alternative.

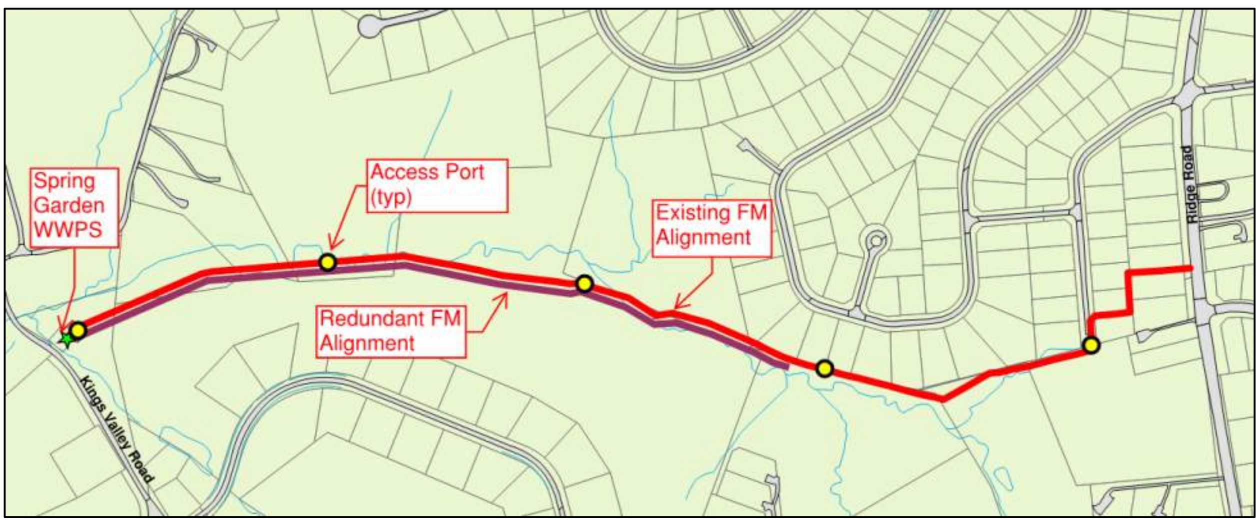

Figure 4-3 Alternative 3 Alignment

Table 4-4 Alternative 3 Parameter Summary

Parameter	Existing FM Value	Redundant FM Value
Material	DIP	DIP CL54
Length (ft)	4,824	3,000
Nominal Diameter (in)	8.00	8.00
Actual ID (in)	8.00	8.19
HW Coefficient	120	120
Start Elev. (ft)	571	571
End Elev. (ft)	717	642
Static Head (ft)	146	71

Parameter	Existing FM Value	Redundant FM Value
Total Dynamic Head (ft)	236	152
Velocity (fps)	5.76	5.50

The redundant FM provides backup through the least accessible portion of the stream valley, which reduces the need for future access to the stream valley and minimizes maintenance shutdowns. Temporary access is required along the full length of the redundant FM for installation, resulting in environmental impacts and significant costs. All other assumptions are identical to Alternative 2.

Table 4-5 Alternative 3 Screening Summary

No.	Pros	Cons
1	Access ports for maintenance.	High flow velocities.
2	50 year PEL.	Alignment remains in stream valley.
3	Partial redundancy.	Reduced existing FM ID.

4.1.4 Alternative 4: Retrofit Existing FM, WWPS + 1,000-Foot Access, Full Redundancy

This alternative is identical to Alternative 2 except that it includes installing a redundant 10-inch HDPE DR 11 FM via open cut along the entire alignment. Figure 4-4 shows the alignment and

Table 4-6 summarizes the parameters for this alternative.

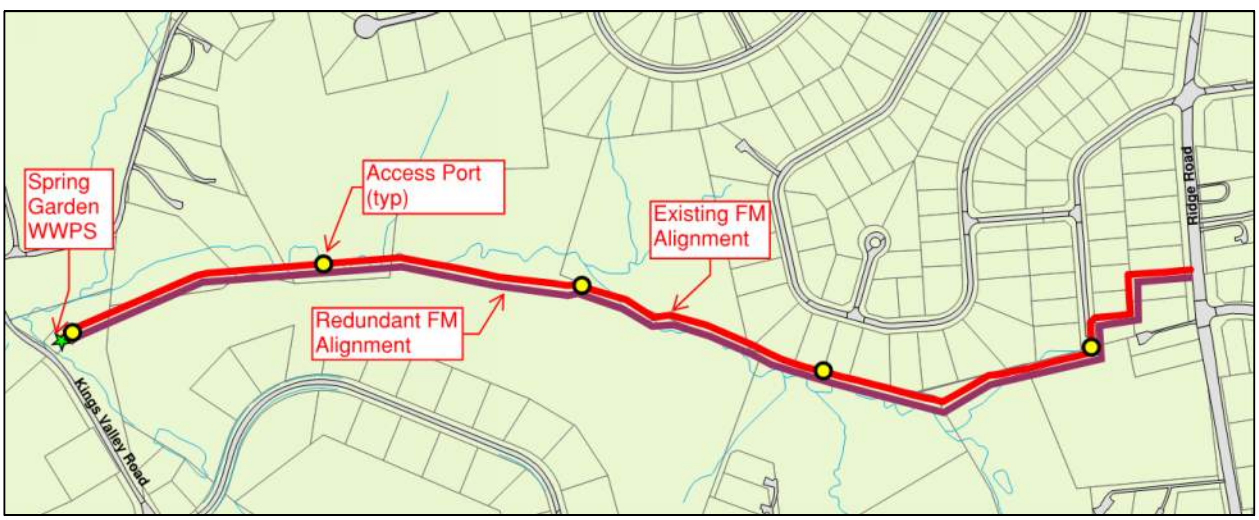

Figure 4-4 Alternative 4 Alignment

Table 4-6 Alternative 4 Parameter Summary

Parameter	Existing FM Value	Redundant FM Value
Material	DIP	DIP CL54
Length (ft)	4,824	4,824
Nominal Diameter (in)	8.00	8.00
Actual ID (in)	8.00	8.19
HW Coefficient	120	120
Start Elev. (ft)	571	571
End Elev. (ft)	717	717
Static Head (ft)	146	146
Total Dynamic Head (ft)	236	227
Velocity (fps)	5.76	5.50

The redundant FM provides a backup flow path, which reduces the need for future access to the stream valley and minimizes maintenance shutdowns. Temporary access is required along the full length of the redundant FM for installation, resulting in environmental impacts and significant costs. All other assumptions are identical to Alternative 2.

Table 4-7 Alternative 4 Screening Summary

No.	Pros	Cons
1	Access ports for maintenance.	High flow velocities.
2	50 year PEL.	Alignment remains in stream valley.
3	Full redundancy.	Reduced existing FM ID.

4.1.5 Alternative 5: Retrofit Existing FM, WWPS Access, Full Redundancy

This alternative is identical to Alternative 4 except that no access ports are installed along the FM alignment. An access port is still installed at the WWPS. Figure 4-5 shows the alignment and Table 4-8 summarizes the parameters for this alternative.

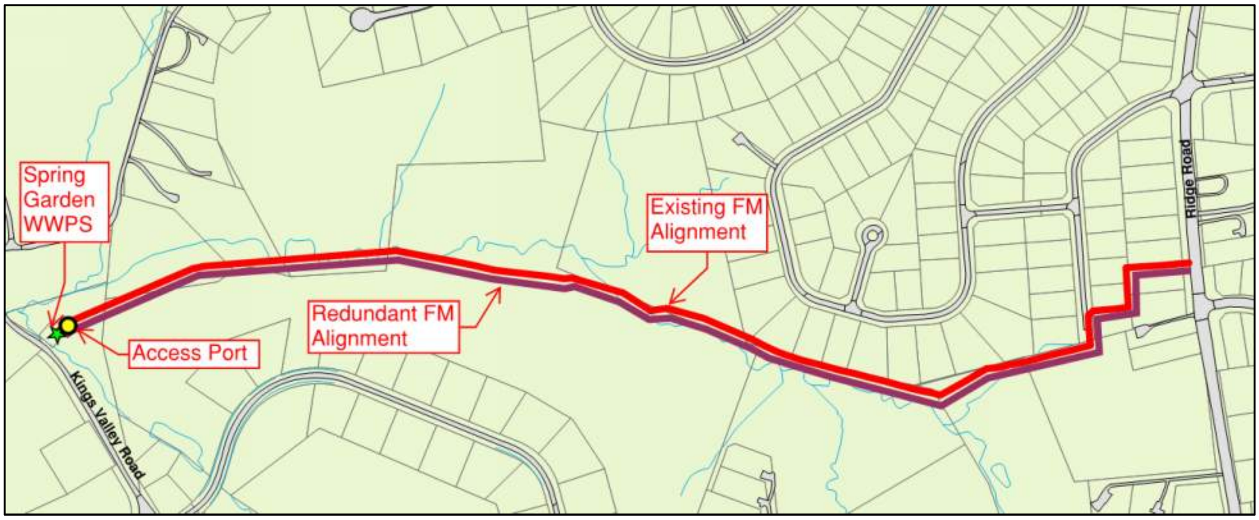

Figure 4-5 Alternative 5 Alignment

Table 4-8 Alternative 5 Parameter Summary

Parameter	Existing FM Value	Redundant FM Value
Material	DIP	DIP CL54
Length (ft)	4,824	4,824
Nominal Diameter (in)	8.00	8.00
Actual ID (in)	8.00	8.19
HW Coefficient	120	120
Start Elev. (ft)	571	571
End Elev. (ft)	717	717
Static Head (ft)	146	146
Total Dynamic Head (ft)	236	227
Velocity (fps)	5.76	5.50

The access port at the new WWPS helps facilitate maintenance access; however, some common inspection and maintenance technologies are not able to extend the full length of the FM. The redundant FM provides a backup flow path, which reduces the need for future access to the stream valley and minimizes maintenance shutdowns. Temporary access is required along the full length of the redundant FM for installation, resulting in environmental impacts and significant costs. All other assumptions are identical to Alternative 4.

Table 4-9 Alternative 5 Screening Summary

No.	Pros	Cons
1	Access port for limited maintenance.	High flow velocities.
2	50 year PEL.	Alignment remains in stream valley.
3	Full redundancy.	Reduced existing FM ID.

4.1.6 Alternative 6: Retrofit Existing FM, WWPS Access, No Redundancy

This alternative is identical to Alternative 2 except that no access ports are installed along the FM alignment. An access port is still installed at the WWPS. Figure 4-6 shows the alignment and Table 4-10 summarizes the parameters for this alternative.

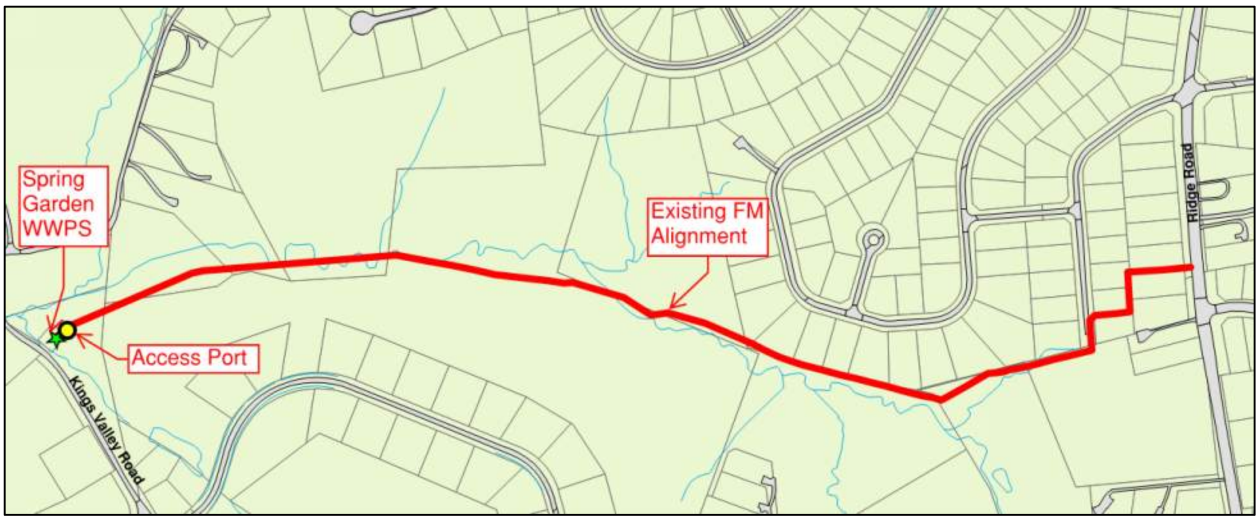

Figure 4-6 Alternative 6 Alignment

Table 4-10 Alternative 6 Parameter Summary

Parameter	Value
Material	DIP
Length (ft)	4,824
Nominal Diameter (in)	8.00
Actual ID (in)	8.00
HW Coefficient	120
Start Elev. (ft)	571
End Elev. (ft)	717
Static Head (ft)	146
Total Dynamic Head (ft)	236
Velocity (fps)	5.76

The access port at the new WWPS helps facilitate maintenance access; however, some common inspection and maintenance technologies are not able to extend the full length of the FM. All other assumptions are identical to Alternative 2.

Table 4-11 Alternative 6 Screening Summary

No.	Pros	Cons
1	Access port for limited maintenance.	High flow velocities.
2	50 year PEL.	Alignment remains in stream valley.
3		Reduced existing FM ID.

4.1.7 Alternative 7: Retrofit Existing FM, WWPS + 2,500-Foot Access, No Redundancy

This alternative is identical to Alternative 2 except that the spacing for the access ports installed along the FM alignment is approximately every 2,500 feet. An access port is still installed at the WWPS. Figure 4-7 shows the alignment and Table 4-12 summarizes the parameters for this alternative.

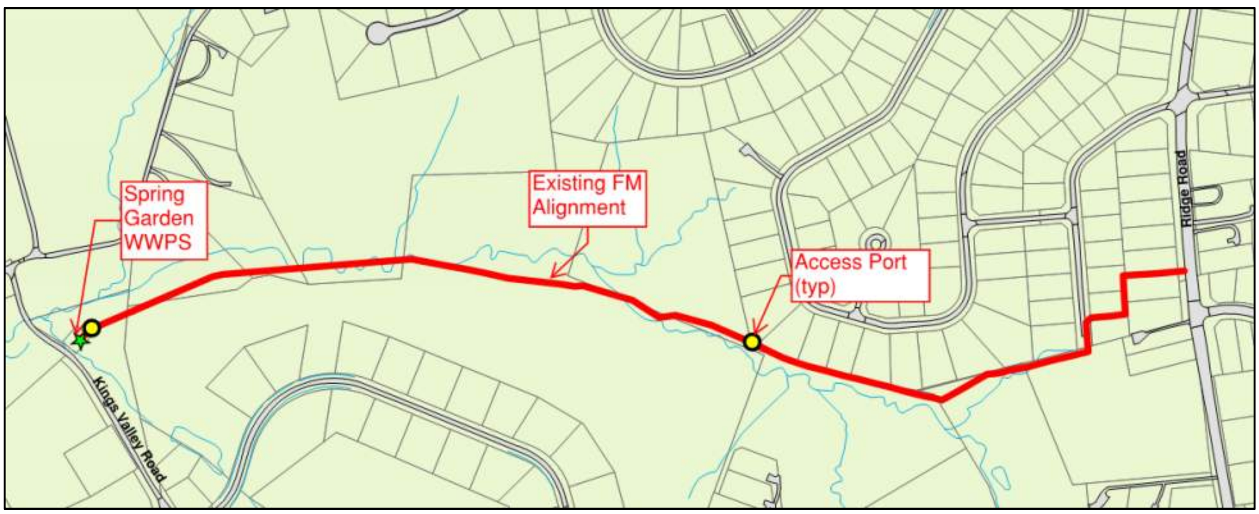

Figure 4-7 Alternative 7 Alignment

Table 4-12 Alternative 7 Parameter Summary

Parameter	Value
Material	DIP
Length (ft)	4,824
Nominal Diameter (in)	8.00
Actual ID (in)	8.00
HW Coefficient	120
Start Elev. (ft)	571

Parameter	Value
End Elev. (ft)	717
Static Head (ft)	146
Total Dynamic Head (ft)	236
Velocity (fps)	5.76

All additional assumptions are identical to Alternative 2.

Table 4-13 Alternative 7 Screening Summary

No.	Pros	Cons
1	Access port for limited maintenance.	High flow velocities.
2	50 year PEL.	Alignment remains in stream valley.
3		Reduced existing FM ID.

4.1.8 Alternative 8: New FM, Existing Alignment + Marlboro, Open Cut, WWPS + 1,000 Foot Access, No Redundancy

This alternative includes abandoning the existing 8-inch FM, installing a new 10-inch HDPE DR 11 FM via open cut, installing access ports at the WWPS and approximately every 1,000 feet along the alignment, and performing periodic inspections and cleaning. The new FM parallels the existing FM through the stream valley, but instead of following the existing easement between homes it continues along Marlboro Drive to Ridge Road. Additional 10-inch PVC SDR 35 gravity sewer is installed along Ridge Road between the end of the new FM and the existing FM transition manhole. Figure 4-8 shows the alignment and Table 4-14 summarizes the parameters for this alternative.

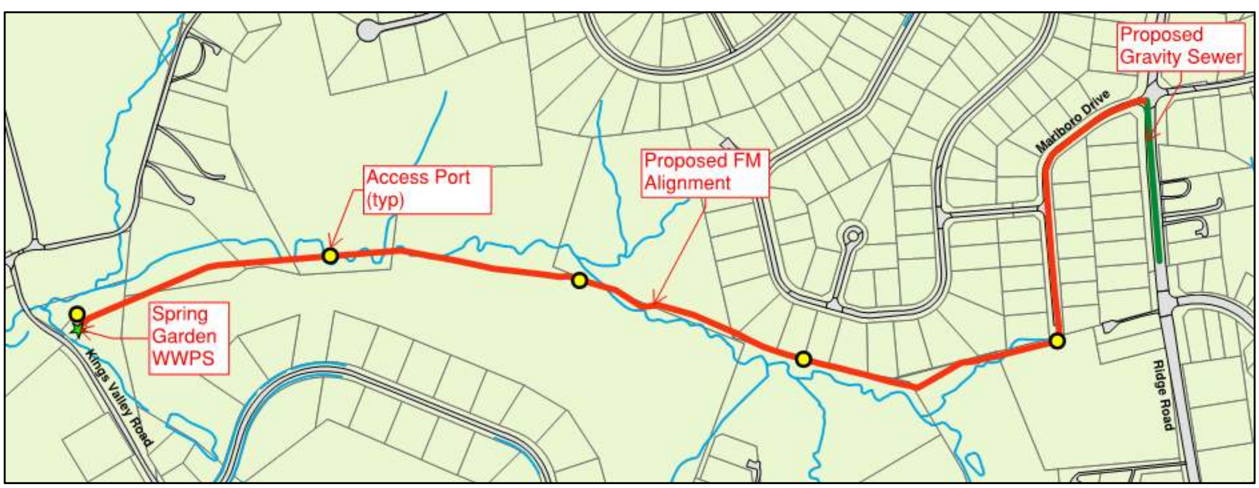

Figure 4-8 Alternative 8 Alignment

Table 4-14 Alternative 8 Parameter Summary

Parameter	Value
Material	HDPE DR11
Length (ft)	5,383
Nominal Diameter (in)	10.00
Actual ID (in)	8.96
HW Coefficient	120
Start Elev. (ft)	571
End Elev. (ft)	751
Static Head (ft)	180
Total Dynamic Head (ft)	238
Velocity (fps)	4.59

Construction costs include open cut installation of 5,383 LF of a new FM parallel to the existing alignment in the stream valley, open cut installation of 1,183 LF of a new FM along Marlboro Drive, open cut installation of 680 LF of a new gravity sewer along Ridge Road, installation of 1 access port at the WWPS and 4 along the alignment. Approximately 300 feet of stream is stabilized to prevent future exposures. Access to the valley is from the existing WWPS and from Marlboro Drive. The existing FM remains in service during construction, so no bypass pumping is required. After completion of the new FM, the existing FM is abandoned and filled with flowable fill. Since the new FM is not an in-trench replacement of the existing one, the existing easement is widened by 10 feet to accommodate the new FM pipe.

Installation of a new, larger FM provides increased PEL, decreased velocities, and reduced total system head. The access ports facilitate periodic inspection and maintenance. Temporary access is required along the full length of the alignment during construction, resulting in environmental impacts and significant costs.

Table 4-15 Alternative 8 Screening Summary

No.	Pros	Cons
1	Access ports for maintenance.	Alignment remains in stream valley.
2	100 year PEL.	Additional gravity sewer required.
3	Lowest total dynamic head.	

4.1.9 Alternative 9: New FM, Existing Alignment + Marlboro, Open Cut, WWPS + 1,000-Foot Access, Partial Redundancy

This alternative is identical to Alternative 8 except that it includes installing approximately 3,000 feet of redundant 10-inch HDPE DR 11 FM via open cut beginning at the WWPS. Figure 4-9 shows the alignment and Table 4-16 summarizes the parameters for this alternative.

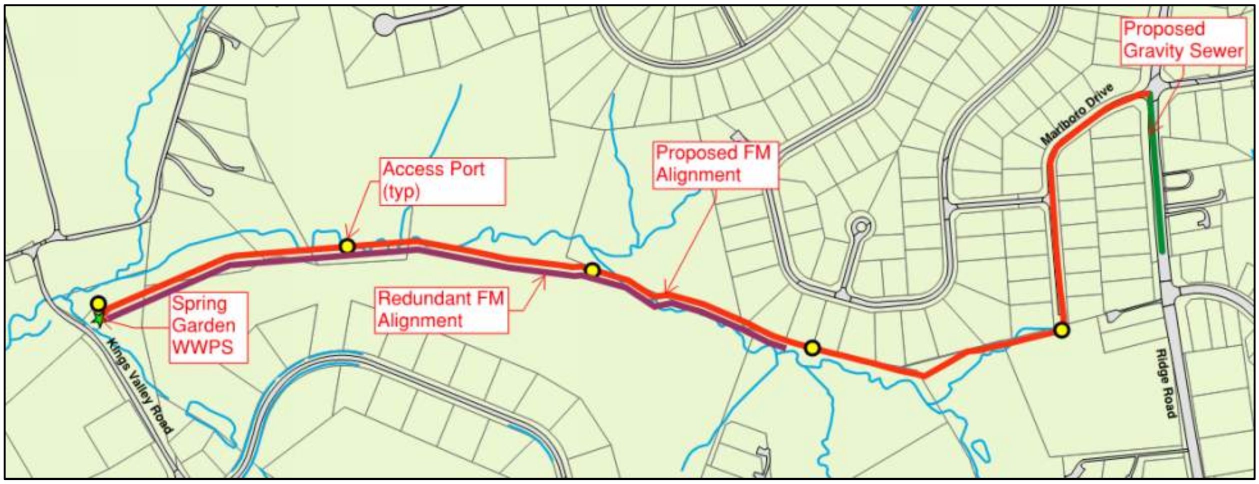

Figure 4-9 Alternative 9 Alignment

Table 4-16 Alternative 9 Parameter Summary

Parameter	Primary FM Value	Redundant FM Value
Material	HDPE DR11	HDPE DR11
Length (ft)	5,383	3,000
Nominal Diameter (in)	10.00	10.00
Actual ID (in)	8.96	8.96
HW Coefficient	120	120
Start Elev. (ft)	571	571
End Elev. (ft)	751	642
Static Head (ft)	180	71
Total Dynamic Head (ft)	238	105
Velocity (fps)	4.59	4.59

The redundant FM provides backup through the least accessible portion of the stream valley, which reduces the need for future access to the stream valley and minimizes maintenance shutdowns. All other assumptions are identical to Alternative 8.

Table 4-17 Alternative 9 Screening Summary

No.	Pros	Cons
1	Access ports for maintenance.	Alignment remains in stream valley.
2	100 year PEL.	Additional gravity sewer required.
3	Lowest total dynamic head.	
4	Partial redundancy.	

4.1.10 Alternative 10: New FM, Existing Alignment + Marlboro, Open Cut, WWPS + 1,000-Foot Access, Full Redundancy

This alternative is identical to Alternative 8 except that it includes installing a redundant 10-inch HDPE DR 11 FM via open cut along the entire alignment. Figure 4-10 shows the alignment and Table 4-18 summarizes the parameters for this alternative.

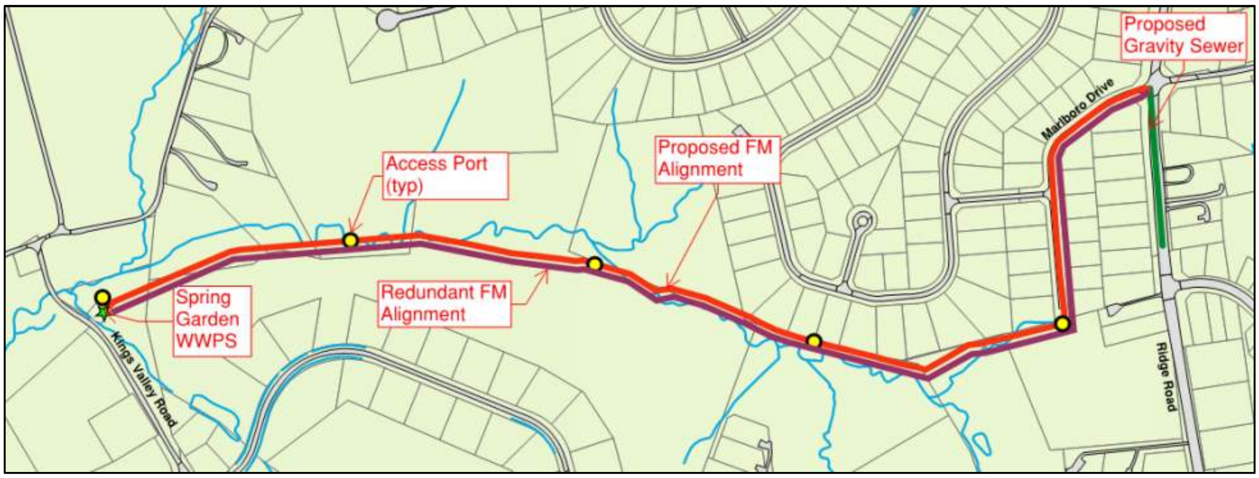

Figure 4-10 Alternative 10 Alignment

Table 4-18 Alternative 10 Parameter Summary

Parameter	Primary FM Value	Redundant FM Value
Material	HDPE DR11	HDPE DR11
Length (ft)	5,383	5,383
Nominal Diameter (in)	10.00	10.00
Actual ID (in)	8.96	8.96
HW Coefficient	120	120
Start Elev. (ft)	571	571
End Elev. (ft)	751	751
Static Head (ft)	180	180
Total Dynamic Head (ft)	238	238
Velocity (fps)	4.59	4.59

The redundant FM provides a backup flow path, which reduces the need for future access to the stream valley and minimizes maintenance shutdowns. All other assumptions are identical to Alternative 8.

Table 4-19 Alternative 10 Screening Summary

No.	Pros	Cons
1	Access ports for maintenance.	Alignment remains in stream valley.
2	100 year PEL.	Additional gravity sewer required.
3	Lowest total dynamic head.	
4	Full redundancy.	

4.1.11 Alternative 11: New FM, Existing Alignment + Marlboro, Open Cut, WWPS Access, Full Redundancy

This alternative is identical to Alternative 10 except that no access ports are installed along the FM alignment. An access port is still installed at the WWPS. Figure 4-11 shows the alignment and Table 4-20 summarizes the parameters for this alternative.

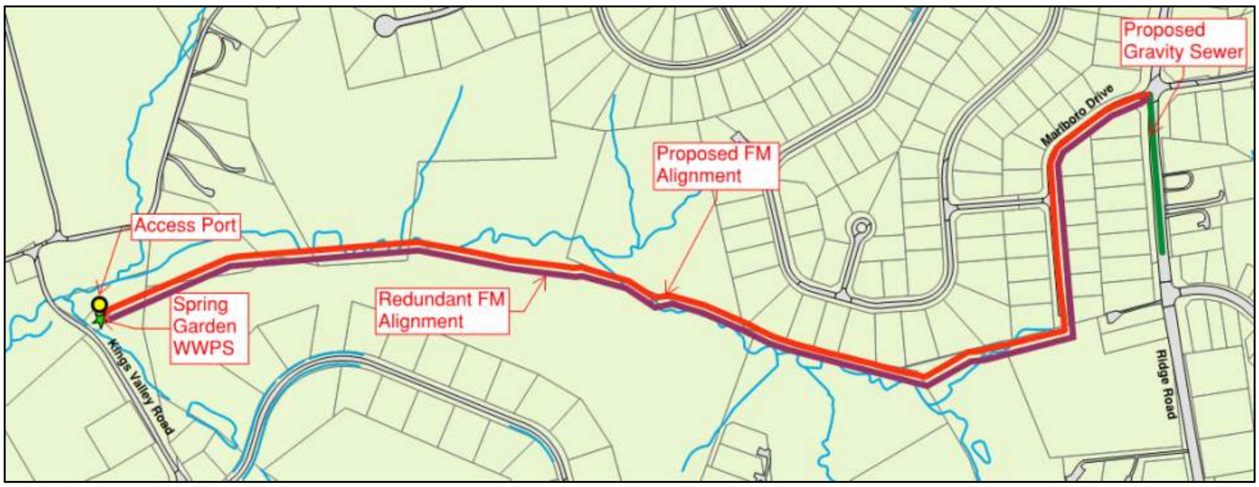

Figure 4-11 Alternative 11 Alignment

Table 4-20 Alternative 11 Parameter Summary

Parameter	Primary FM Value	Redundant FM Value
Material	HDPE DR11	HDPE DR11
Length (ft)	5,383	5,383
Nominal Diameter (in)	10.00	10.00
Actual ID (in)	8.96	8.96
HW Coefficient	120	120
Start Elev. (ft)	571	571
End Elev. (ft)	751	751
Static Head (ft)	180	180
Total Dynamic Head (ft)	238	238
Velocity (fps)	4.59	4.59

The access port at the new WWPS helps facilitate maintenance access; however, some common inspection and maintenance technologies are not able to extend the full length of the FM. The redundant FM provides a backup flow path, which reduces the need for future access to the stream valley and minimizes maintenance shutdowns. All other assumptions are identical to Alternative 10.

Table 4-21 Alternative 11 Screening Summary

No.	Pros	Cons
1	Access port for limited maintenance.	Alignment remains in stream valley.
2	100 year PEL.	Additional gravity sewer required.
3	Lowest total dynamic head.	
4	Full redundancy.	

4.1.12 Alternative 12: New FM, Existing Alignment + Marlboro, Open Cut, WWPS Access, No Redundancy

This alternative is identical to Alternative 8 except no access ports are installed along the FM alignment. An access port is still installed at the WWPS. Figure 4-12 shows the alignment and Table 4-22 summarizes the parameters for this alternative.

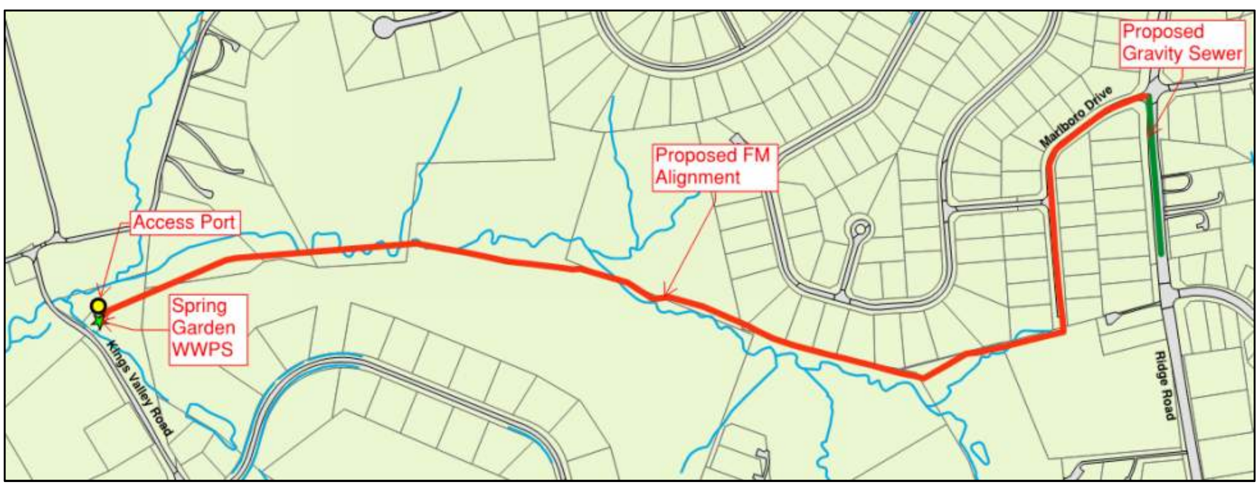

Figure 4-12 Alternative 12 Alignment

Table 4-22 Alternative 12 Parameter Summary

Parameter	Value
Material	HDPE DR11
Length (ft)	5,383
Nominal Diameter (in)	10.00
Actual ID (in)	8.96

Parameter	Value
HW Coefficient	120
Start Elev. (ft)	571
End Elev. (ft)	751
Static Head (ft)	180
Total Dynamic Head (ft)	238
Velocity (fps)	4.59

The assumptions for this alternative are identical to the assumptions for Alternative 8 with the exception that no access ports are constructed along the FM alignment. One access port is still constructed at the WWPS.

Table 4-23 Alternative 12 Screening Summary

No.	Pros	Cons
1	Access port for limited maintenance.	Alignment remains in stream valley.
2	100 year PEL.	Additional gravity sewer required.
3	Lowest total dynamic head.	

4.1.13 Alternative 13: New FM, Existing Alignment + Marlboro, Open Cut, WWPS + 2,500-Foot Access, No Redundancy

This alternative is identical to Alternative 8 except that the spacing for the access ports installed along the FM alignment is approximately every 2,500 feet. An access port is still installed at the WWPS. Figure 4-13 shows the alignment and Table 4-24 summarizes the parameters for this alternative.

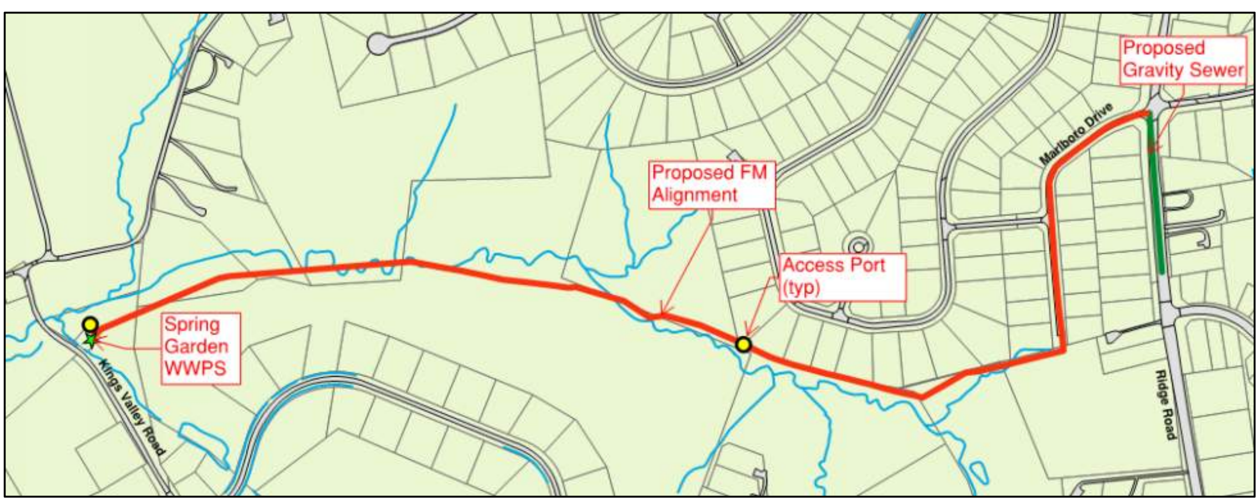

Figure 4-13 Alternative 13 Alignment

Table 4-24 Alternative 13 Parameter Summary

Parameter	Value
Material	HDPE DR11
Length (ft)	5,383
Nominal Diameter (in)	10.00
Actual ID (in)	8.96
HW Coefficient	120
Start Elev. (ft)	571
End Elev. (ft)	751
Static Head (ft)	180
Total Dynamic Head (ft)	238
Velocity (fps)	4.59

All additional assumptions are identical to Alternative 8.

Table 4-25 Alternative 13 Screening Summary

No.	Pros	Cons
1	Access port for maintenance.	Alignment remains in stream valley.
2	100 year PEL.	Additional gravity sewer required.
3	Lowest total dynamic head.	

4.1.14 Alternative 14: New FM, Existing Alignment + Marlboro, HDD, WWPS + 1,000-Foot Access, No Redundancy

This alternative includes abandoning the existing 8-inch FM, installing a new 10-inch HDPE DR 11 FM via HDD and open cut along the same alignment, installing access ports at the WWPS and approximately every 1,000 feet along the alignment, and performing periodic inspections and cleaning. Additional 10-inch PVC SDR 35 gravity sewer is installed along Ridge Road between the end of the new FM and the existing FM transition manhole. Figure 4-14 shows the alignment and Table 4-26 summarizes the parameters for this alternative.

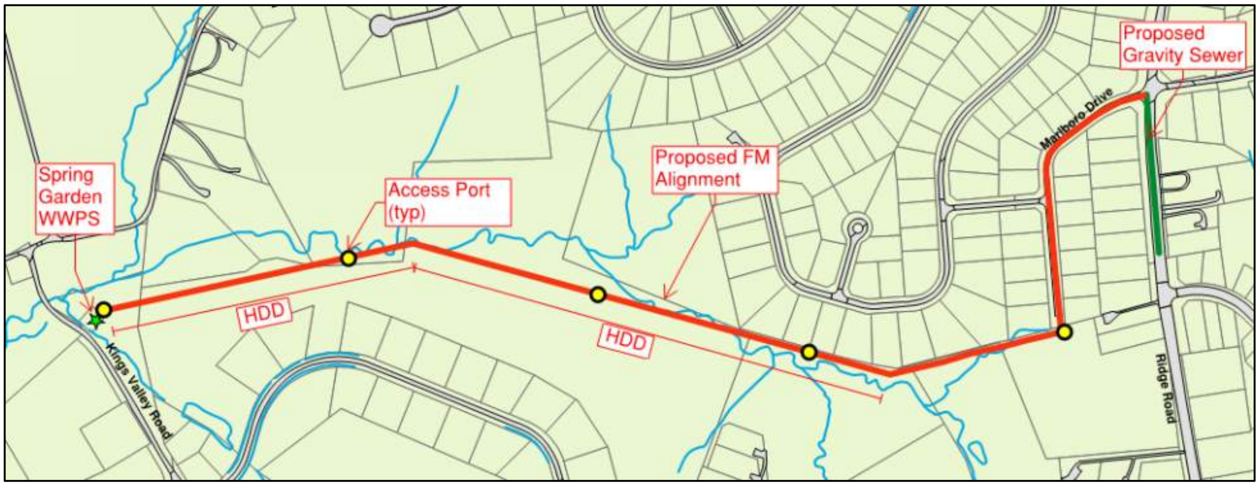

Figure 4-14 Alternative 14 Alignment

Table 4-26 Alternative 14 Parameter Summary

Parameter	Value
Material	HDPE DR11
Length (ft)	5,383
Nominal Diameter (in)	10.00
Actual ID (in)	8.96
HW Coefficient	120
Start Elev. (ft)	571
End Elev. (ft)	751
Static Head (ft)	180
Total Dynamic Head (ft)	238
Velocity (fps)	4.59

Construction costs include HDD installation of 3,300 LF and open cut installation of 900 LF of new FM along the existing alignment in the stream valley, open cut installation of 1,183 LF of new FM along Marlboro Drive, open cut installation of 680 LF of new gravity sewer along Ridge Road, and installation of 1 access port at the WWPS and 4 along the alignment. For HDD operations, an entry pit is located at approximately station 21+00 (see existing FM profile in Appendix D). All HDPE pipe is fused at this location then pulled toward either the existing WWPS or Marlboro Drive. Because HDD is installed in straight lines, it cannot follow the existing easement. Therefore, new easements are required. Approximately 300 feet of stream is stabilized to prevent future exposures. The existing FM remains in service during construction, so no bypass pumping is required. After completing the new FM, the existing FM is abandoned and filled with flowable fill. Access is provided from Bellehaven Boulevard, Marlboro Drive, and the WWPS to the existing alignment.

Installation of a new, larger FM provides increased PEL, decreased velocities, and reduced total system head. HDD installation requires one access point to the stream valley and no access roads along the valley in the western two thirds of the alignment. This minimizes the amount of construction access required along with most environmental impacts. Typically, HDD installation is more costly than open cut, but some cost savings are achieved by limiting the length of constructed access. The access ports facilitate periodic inspection and maintenance.

Table 4-27 Alternative 14 Screening Summary

No.	Pros	Cons
1	Access ports for maintenance.	Alignment remains in stream valley.
2	100 year PEL.	Additional gravity sewer required.
3	Lowest total dynamic head.	
4	Reduced environmental impacts.	

4.1.15 Alternative 15: New FM, Existing Alignment + Marlboro, HDD, WWPS + 1,000-Foot Access, Partial Redundancy

This alternative is identical to Alternative 14 except that it includes installing approximately 3,000 feet of redundant 10-inch HDPE DR 11 FM via HDD beginning at the WWPS. Figure 4-15 shows the alignment and Table 4-28 summarizes the parameters for this alternative.

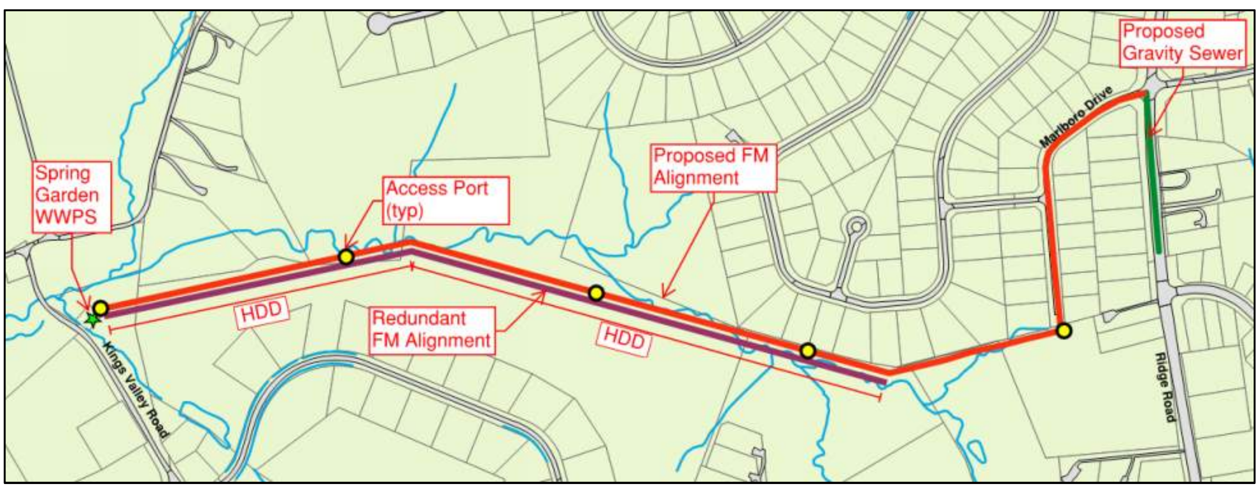

Figure 4-15 Alternative 15 Alignment

Table 4-28 Alternative 15 Parameter Summary

Parameter	Primary FM Value	Redundant FM Value
Material	HDPE DR11	HDPE DR11
Length (ft)	5,383	3,000
Nominal Diameter (in)	10.00	10.00
Actual ID (in)	8.96	8.96
HW Coefficient	120	120
Start Elev. (ft)	571	571
End Elev. (ft)	751	642
Static Head (ft)	180	71
Total Dynamic Head (ft)	238	129
Velocity (fps)	4.59	4.59

The redundant FM provides backup through the least accessible portion of the stream valley, which reduces the need for future access to the stream valley and minimizes maintenance shutdowns. The redundant FM is installed via HDD and uses the same launch and receiving pits as the primary FM. All other assumptions are identical to Alternative 14.

Table 4-29 Alternative 15 Screening Summary

No.	Pros	Cons
1	Access ports for maintenance.	Alignment remains in stream valley.
2	100 year PEL.	Additional gravity sewer required.
3	Lowest total dynamic head.	
4	Reduced environmental impacts.	
5	Partial redundancy.	

4.1.16 Alternative 16: New FM, Existing Alignment + Marlboro, HDD, WWPS + 1,000-Foot Access, Full Redundancy

This alternative is identical to Alternative 14 except that it includes installing a redundant 10-inch HDPE DR 11 FM via HDD and open cut along the entire alignment. Figure 4-16 shows the alignment and Table 4-30 summarizes the parameters for this alternative.

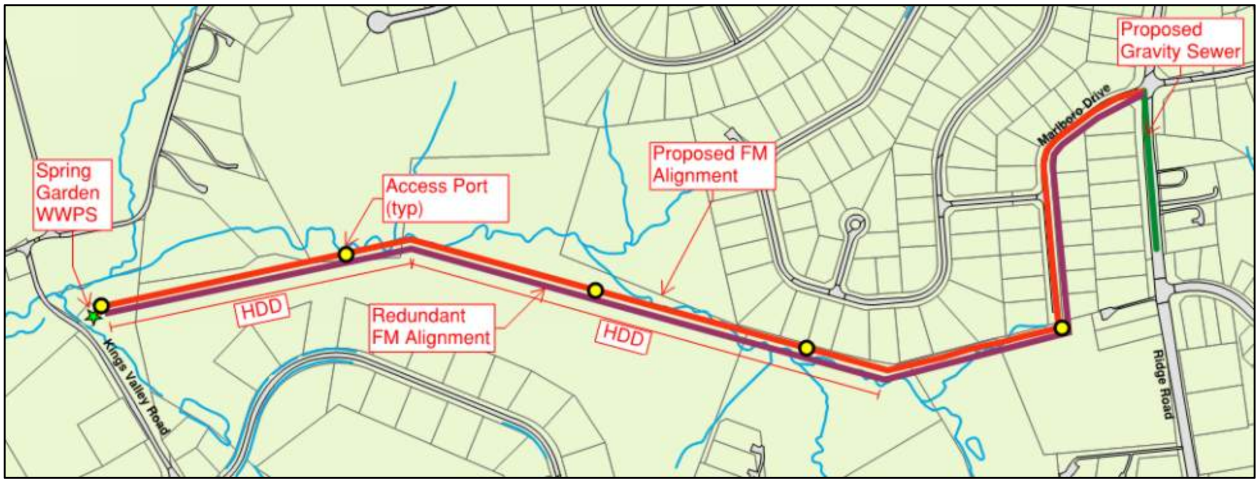

Figure 4-16 Alternative 16 Alignment

Table 4-30 Alternative 16 Parameter Summary

Parameter	Primary FM Value	Redundant FM Value
Material	HDPE DR11	HDPE DR11
Length (ft)	5,383	5,383
Nominal Diameter (in)	10.00	10.00
Actual ID (in)	8.96	8.96
HW Coefficient	120	120
Start Elev. (ft)	571	571
End Elev. (ft)	751	751
Static Head (ft)	180	180
Total Dynamic Head (ft)	238	238
Velocity (fps)	4.59	4.59

The redundant FM provides a backup flow path, which reduces the need for future access to the stream valley and minimizes maintenance shutdowns. The redundant FM is installed via HDD and open cut and uses the same launch and receiving pits as the primary FM. All other assumptions are identical to Alternative 14.

Table 4-31 Alternative 16 Screening Summary

No.	Pros	Cons
1	Access ports for maintenance.	Alignment remains in stream valley.
2	100 year PEL.	Additional gravity sewer required.
3	Lowest total dynamic head.	
4	Reduced environmental impacts.	
5	Full redundancy.	

4.1.17 Alternative 17: New FM, Existing Alignment + Marlboro, HDD, WWPS Access, Full Redundancy

This alternative is identical to Alternative 16 except that no access ports are installed along the FM alignment. An access port is still installed at the WWPS. Figure 4-17 shows the alignment and Table 4-32 summarizes the parameters for this alternative.

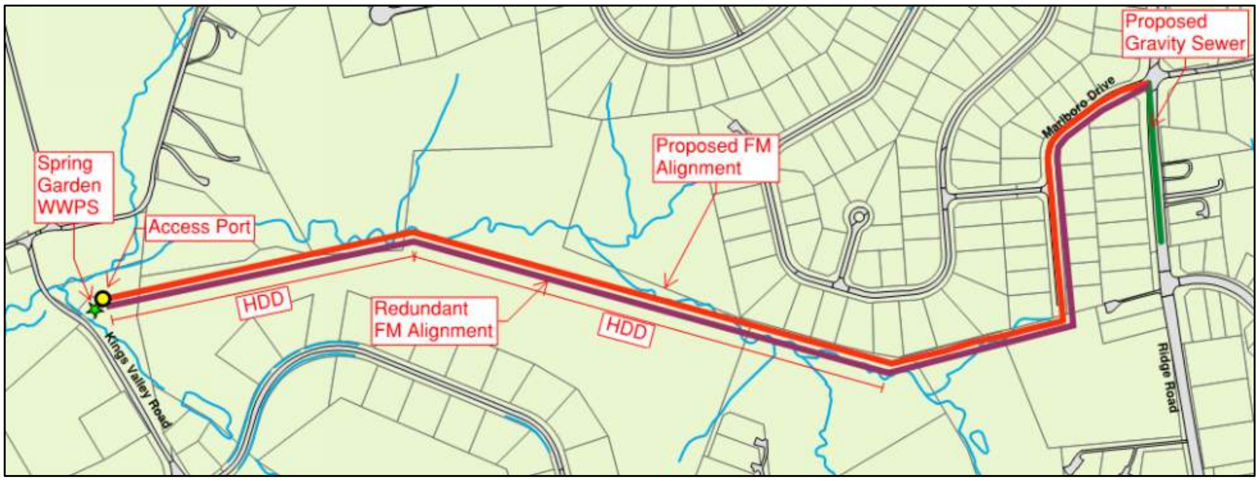

Figure 4-17 Alternative 17 Alignment

Table 4-32 Alternative 17 Parameter Summary

Parameter	Primary FM Value	Redundant FM Value
Material	HDPE DR11	HDPE DR11
Length (ft.)	5,383	5,383
Nominal Diameter (in.)	10.00	10.00
Actual ID (in.)	8.96	8.96
HW Coefficient	120	120
Start Elev. (ft.)	571	571
End Elev. (ft.)	751	751
Static Head (ft.)	180	180
Total Dynamic Head (ft.)	238	238
Velocity (fps)	4.59	4.59

The access port at the new WWPS helps facilitate maintenance access; however, some common inspection and maintenance technologies are not able to extend the full length of the FM. The redundant FM provides a backup flow path, which reduces the need for future access to the stream valley and minimizes maintenance shutdowns. The redundant FM is installed via HDD and open cut and uses the same launch and receiving pits as the primary FM. All other assumptions are identical to Alternative 16.

Table 4-33 Alternative 17 Screening Summary

No.	Pros	Cons
1	Access port for limited maintenance.	Alignment remains in stream valley.
2	100 year PEL.	Additional gravity sewer required.
3	Lowest total dynamic head.	
4	Reduced environmental impacts.	
5	Full redundancy.	

4.1.18 Alternative 18: New FM, Existing Alignment + Marlboro, HDD, WWPS Access, No Redundancy

This alternative is identical to Alternative 14 except no access ports are installed along the alignment. An access port is still installed at the WWPS. Figure 4-18 shows the alignment and Table 4-34 summarizes the parameters for this alternative.

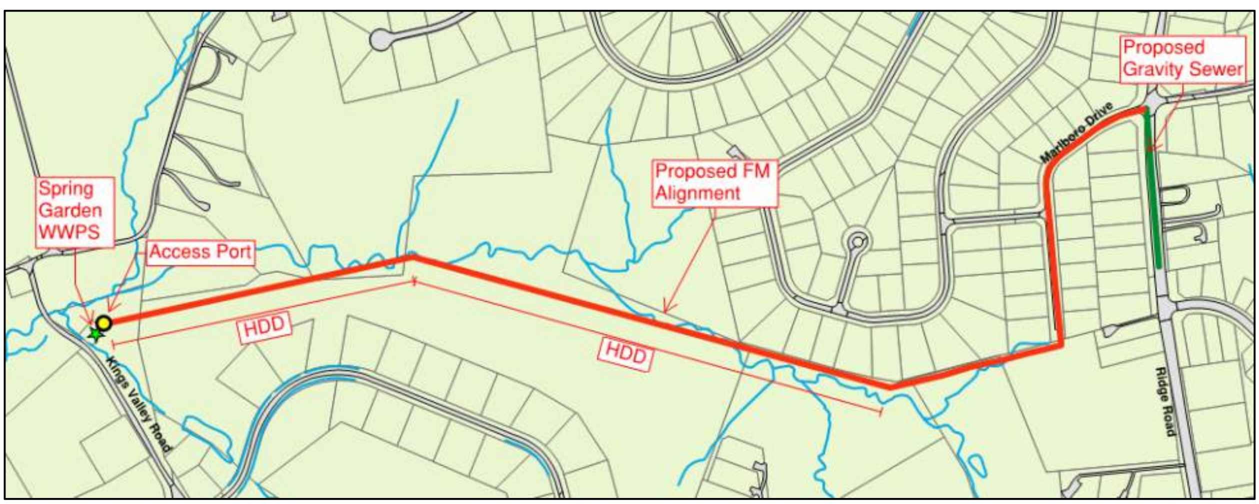

Figure 4-18 Alternative 18 Alignment

Table 4-34 Alternative 18 Parameter Summary

Parameter	Value
Material	HDPE DR11
Length (ft)	5,383
Nominal Diameter (in)	10.00
Actual ID (in)	8.96
HW Coefficient	120

Parameter	Value
Start Elev. (ft)	571
End Elev. (ft)	751
Static Head (ft)	180
Total Dynamic Head (ft)	238
Velocity (fps)	4.59

The access port at the new WWPS helps facilitate maintenance access; however, some common inspection and maintenance technologies are not able to extend the full length of the FM. All other assumptions are identical to Alternative 14.

Table 4-35 Alternative 18 Screening Summary

No.	Pros	Cons
1	Access port for limited maintenance.	Alignment remains in stream valley.
2	100 year PEL.	Additional gravity sewer required.
3	Lowest total dynamic head.	
4	Reduced environmental impacts.	

4.1.19 Alternative 19: New FM, Existing Alignment + Marlboro, HDD, WWPS + 2,500-Foot Access, No Redundancy

This alternative is identical to Alternative 14 except that the spacing for the access ports installed along the FM alignment is apprixmately every 2,500 feet. An access port is still installed at the WWPS. Figure 4-19 shows the alignment and Table 4-36 summarizes the parameters for this alternative.

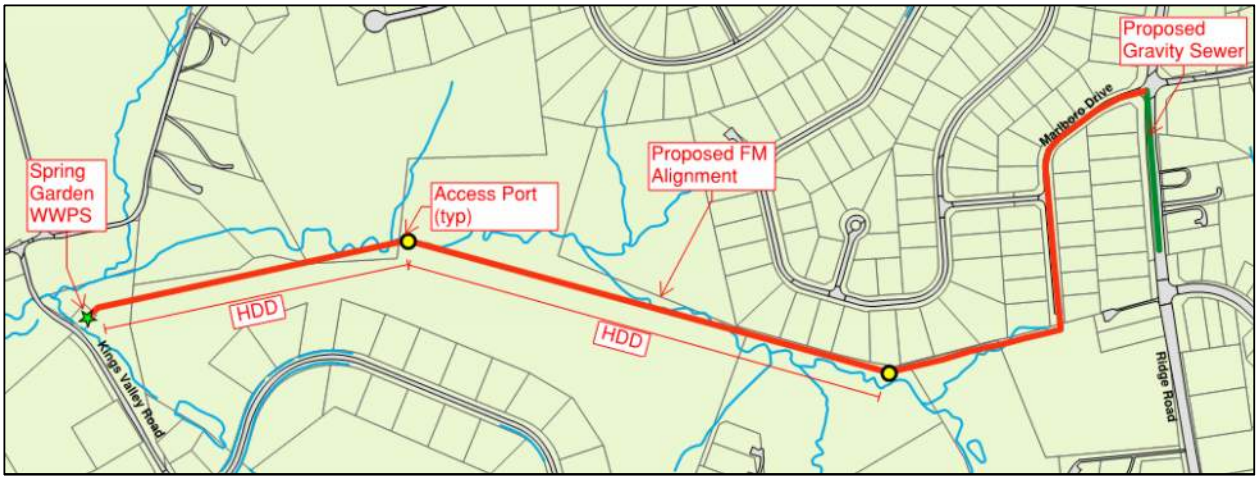

Figure 4-19 Alternative 19 Alignment

Table 4-36 Alternative 19 Parameter Summary

Parameter	Value
Material	HDPE DR11
Length (ft)	5,383
Nominal Diameter (in)	10.00
Actual ID (in)	8.96
HW Coefficient	120
Start Elev. (ft)	571
End Elev. (ft)	751
Static Head (ft)	180
Total Dynamic Head (ft)	238
Velocity (fps)	4.59

All additional assumptions are identical to Alternative 14.

Table 4-37 Alternative 19 Screening Summary

No.	Pros	Cons
1	Access ports for maintenance.	Alignment remains in stream valley.
2	100 year PEL.	Additional gravity sewer required.
3	Lowest total dynamic head.	
4	Reduced environmental impacts.	

4.1.20 Alternative 20: New FM, Kings Valley Road, Open Cut, WWPS + 1,000-Foot Access, No Redundancy

This alternative includes abandoning the existing 8-inch FM, installing a new 10-inch HDPE SDR 11 FM via open cut along Kings Valley Road, installing access ports at the WWPS and approximately every 1,000 feet along the alignment, and performing periodic inspections and cleaning. Additional 10-inch PVC SDR 35 gravity sewer is installed along Ridge Road between the end of the new FM and the existing transition manhole. Figure 4-20 shows the alignment and Table 4-38 summarizes the parameters for this alternative.

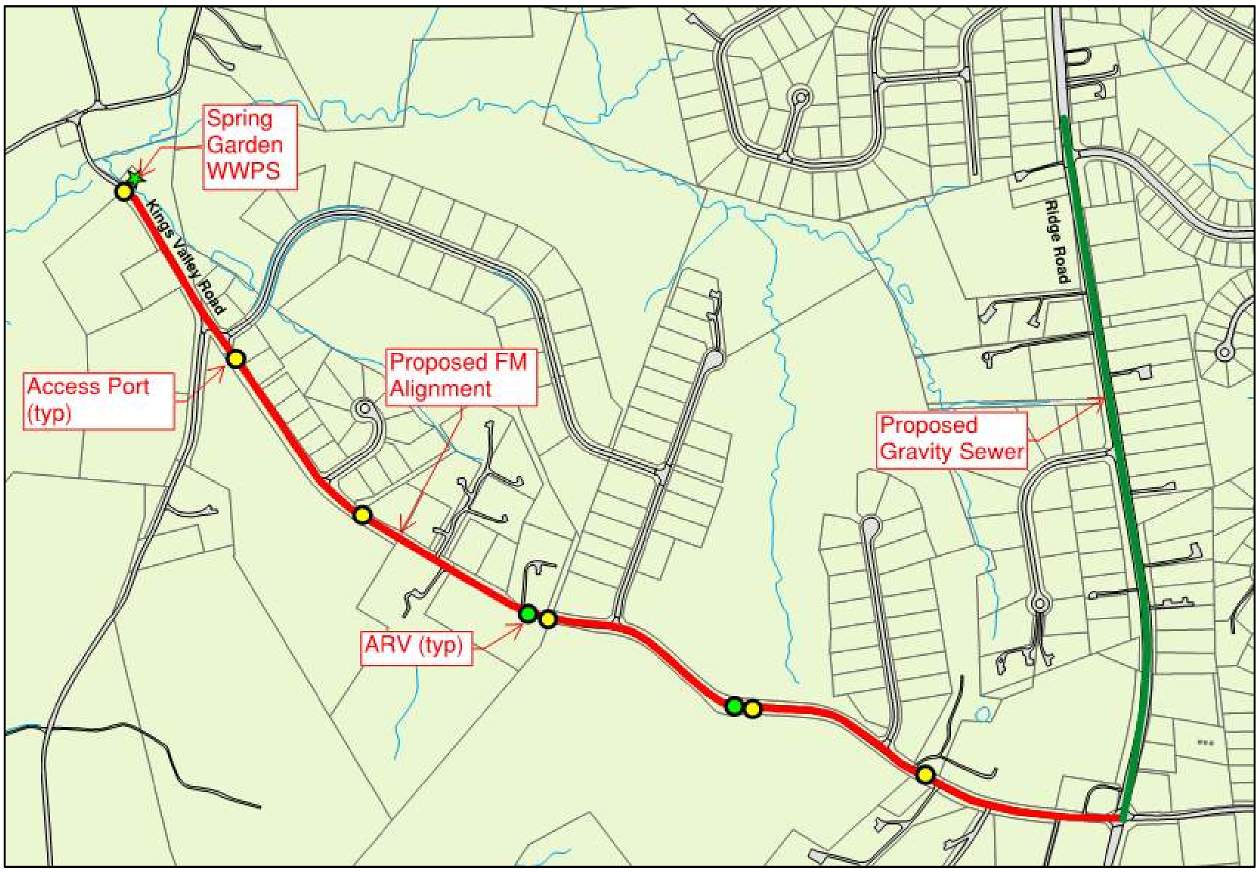

Figure 4-20 Alternative 20 Alignment

Table 4-38 Alternative 20 Parameter Summary

Parameter	Primary FM Value
Material	HDPE DR11
Length (ft)	5,932
Nominal Diameter (in)	10.00
Actual ID (in)	8.96
HW Coefficient	120

Parameter	Primary FM Value
Start Elev. (ft)	571
End Elev. (ft)	796
Static Head (ft)	225
Total Dynamic Head (ft)	287
Velocity (fps)	4.59

Construction costs include open cut installation of 5,932 LF of new FM along Kings Valley Road, open cut installation of 3,150 LF of new gravity sewer along Ridge Road, installation of 1 access port at the WWPS and 5 along the alignment, and installation of 2 ARVs. All new pipes are located within the existing road ROW and under the pavement. The existing FM remains in service during construction, so no bypass pumping is required. After completing the new FM, the existing FM is abandoned and filled with flowable fill. To facilitate the abandonment, one access point to the valley is provided from Red Blaze Drive.

This alternative moves the FM out of the stream valley and into the Kings Valley Road ROW, which eliminates future environmental impacts to the stream valley from FM activities. It also improves access to the FM for maintenance and inspections. All construction occurs from an existing paved road, so no constructed access roads are required. The road along the alignment will require repaving. This alignment increases the FM length and static head requirements. Installation of a new, larger FM provides increased PEL and decreased velocities. The access ports facilitate periodic inspection and maintenance.

Table 4-39 Alternative 20 Screening Summary

No.	Pros	Cons
1	Access ports for maintenance.	Repaving along the full alignment.
2	100 year PEL.	Additional gravity sewer required.
3	Alignment moved out of stream valley.	Highest total dynamic head.
4	Improved maintenance access.	

4.1.21 Alternative 21: New FM, Kings Valley Road, Open Cut, WWPS Access, No Redundancy

This alternative is identical to Alternative 20 except no access ports are installed along the FM alignment. An access port is still installed at the WWPS. Figure 4-21 shows the alignment and Table 4-40 summarizes the parameters for this alternative.

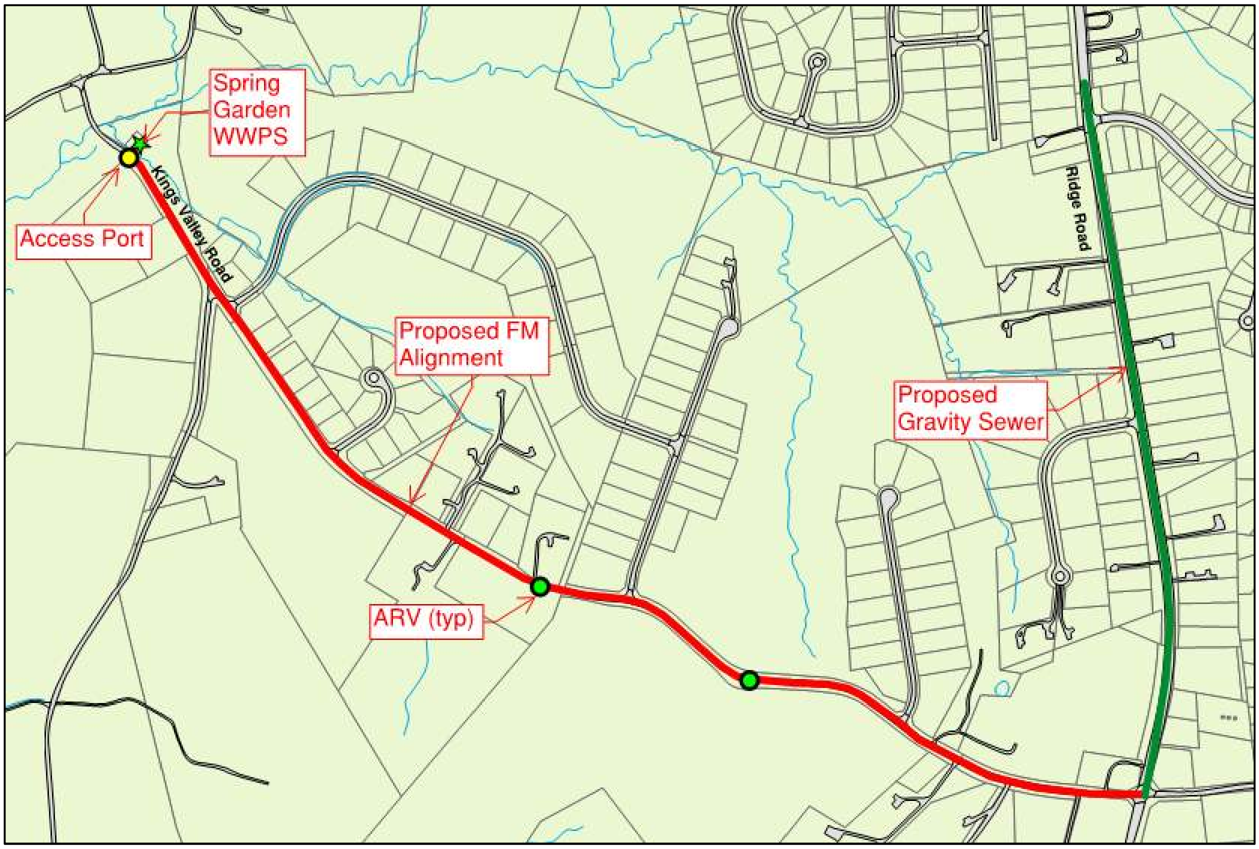

Figure 4-21 Alternative 21 Alignment

Table 4-40 Alternative 21 Parameter Summary

Parameter	Primary FM Value
Material	PVC
Length (ft)	5,932
Nominal Diameter (in)	10.00
Actual ID (in)	8.96
HW Coefficient	120
Start Elev. (ft)	571
End Elev. (ft)	796
Static Head (ft)	225
Total Dynamic Head (ft)	287
Velocity (fps)	4.59

The access port at the new WWPS helps facilitate maintenance access; however, some common inspection and maintenance technologies are not able to extend the full length of the FM. All other assumptions are identical to Alternative 20.

Table 4-41 Alternative 21 Screening Summary

No.	Pros	Cons
1	Access port for limited maintenance.	Repaving along the full alignment.
2	100 year PEL.	Additional gravity sewer required.
3	Alignment moved out of stream valley.	Highest total dynamic head.
4	Improved maintenance access.	

4.1.22 Alternative 22: New FM, Kings Valley Road, Open Cut, WWPS + 2,500-Foot Access, No Redundancy

This alternative is identical to Alternative 20 except that the spacing for the access ports installed along the FM alignment is approximately every 2,500 feet. An access port is still installed at the WWPS. Figure 4-22 shows the alignment and Table 4-42 summarizes the parameters for this alternative.

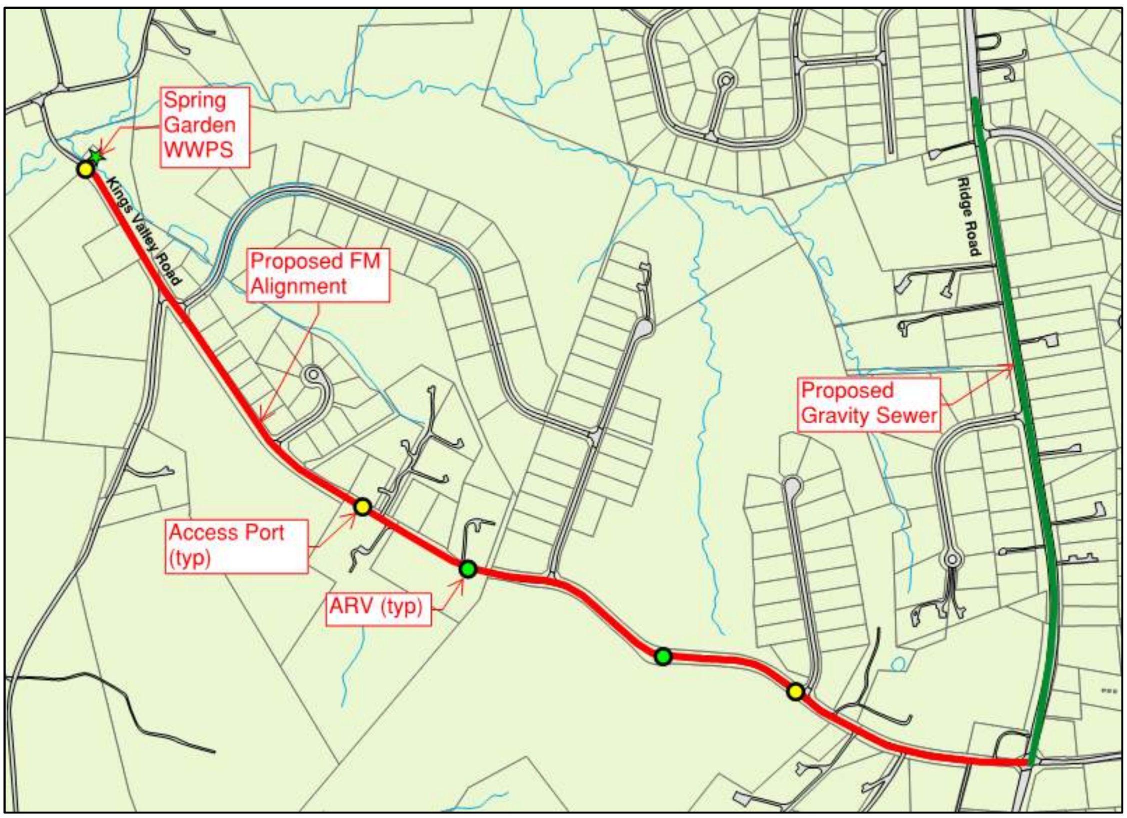

Figure 4-22 Alternative 22 Alignment

Table 4-42 Alternative 22 Parameter Summary

Parameter	Primary FM Value
Material	HDPE DR11
Length (ft)	5,932
Nominal Diameter (in)	10.00
Actual ID (in)	8.56
HW Coefficient	120
Start Elev. (ft)	571
End Elev. (ft)	796
Static Head (ft)	225
Total Dynamic Head (ft)	287
Velocity (fps)	4.59

All additional assumptions are identical to Alternative 20.

Table 4-43 Alternative 22 Screening Summary

No.	Pros	Cons
1	Access ports for maintenance.	Repaving along the full alignment.
2	100 year PEL.	Additional gravity sewer required.
3	Alignment moved out of stream valley.	Highest total dynamic head.
4	Improved maintenance access.	

4.1.23 Alternative 23: New FM, Kingstead Road, Open Cut, WWPS + 1,000-Foot Access, No Redundancy

This alternative includes abandoning the existing 8-inch FM; installing a new 10-inch HDPE SDR 11 FM via open cut along Kings Valley Road, Kingstead Road, Oak Drive, and Ridge Road; installing access ports at the WWPS and approximately every 1,000 feet along the alignment; and performing periodic inspections and cleaning. Additional 10-inch PVC SDR 35 gravity sewer is installed along Ridge Road between the end of the new FM and the existing transition manhole. Figure 4-23 shows the alignment and Table 4-44 summarizes the parameters for this alternative.

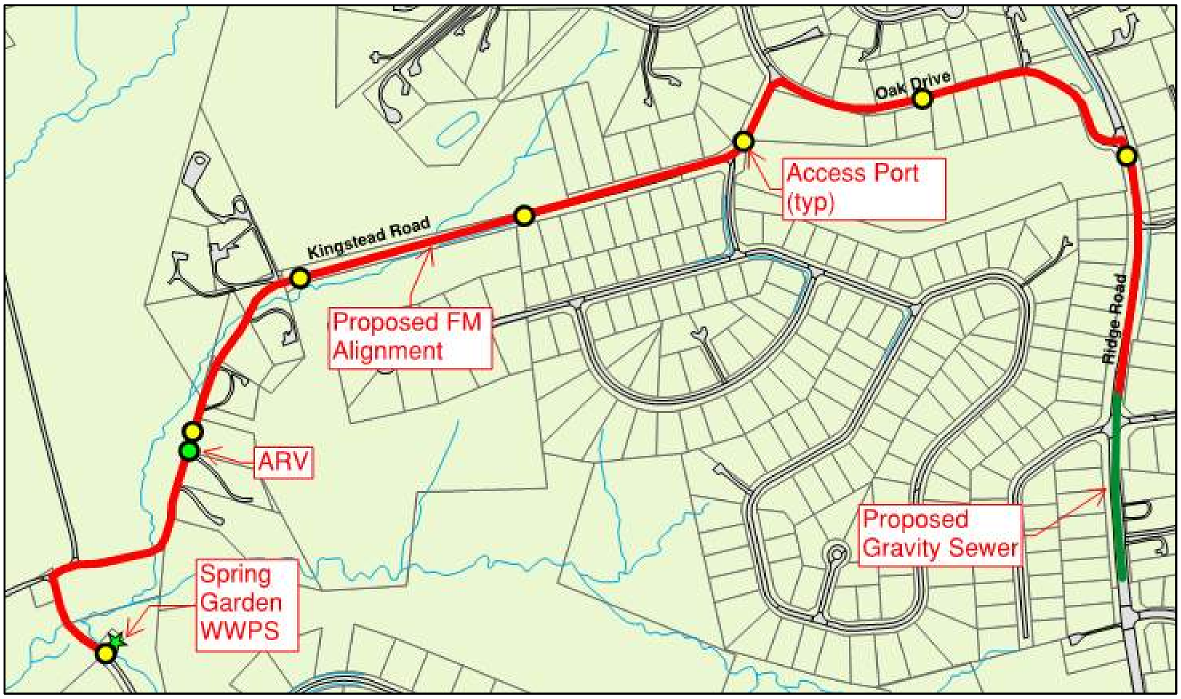

Figure 4-23 Alternative 23 Alignment

Table 4-44 Alternative 23 Parameter Summary

Parameter	Primary FM Value
Material	HDPE DR11
Length (ft)	7,413
Nominal Diameter (in)	10.00
Actual ID (in)	8.56
HW Coefficient	120
Start Elev. (ft)	571
End Elev. (ft)	756
Static Head (ft)	185
Total Dynamic Head (ft)	261
Velocity (fps)	4.59

Construction costs include open cut installation of 7,413 LF of new FM along Kings Valley Road, Kingstead Road, Oak Drive, and Ridge Road; open cut installation of 850 LF of new gravity sewer along Ridge Road; installation of 1 access port at the WWPS and 6 along the alignment; and installation of 1 ARV. All new pipes are located within the existing road ROW and under the pavement. The existing FM remains in service during construction, so no bypass pumping is required. After completion of the new FM, the existing FM is abandoned and filled with flowable fill. To facilitate the abandonment, one access point to the valley is provided at Red Blaze Drive.

This alternative moves the FM out of the stream valley and into a new alignment that follows Kingstead Road, continues along Oak Drive, and terminates at a high point on Ridge Road near the intersection with Marlboro Drive. This eliminates future environmental impacts to the stream valley due to FM activities. It also greatly facilitates access to the FM for maintenance and inspections. All construction occurs from an existing paved road, so no constructed access roads are required. The road along the alignment will require repaving. Where the alignment crosses the unnamed tributary to Little Bennett Creek, it will be incorporated into existing streambed armoring upstream of the culvert. The alignment also crosses two other small drainage swales, but these crossings can be accommodated with open cut. This alignment increases the FM length and static head requirements. Installation of a new, larger FM provides increased PEL and decreased velocities. The access ports facilitate periodic inspection and maintenance.

Table 4-45 Alternative 23 Screening Summary

No.	Pros	Cons
1	Access ports for maintenance.	Repaving along the full alignment.
2	100 year PEL.	Additional gravity sewer required.
3	Alignment moved out of stream valley.	
4	Improved maintenance access.	

4.1.24 Alternative 24: New FM, Kingstead Road, Open Cut, WWPS Access, No Redundancy

This alternative is identical to Alternative 23 except no access ports are installed along the FM alignment. An access port is still installed at the WWPS. Figure 4-24 shows the alignment and Table 4-46 summarizes the parameters for this alternative.

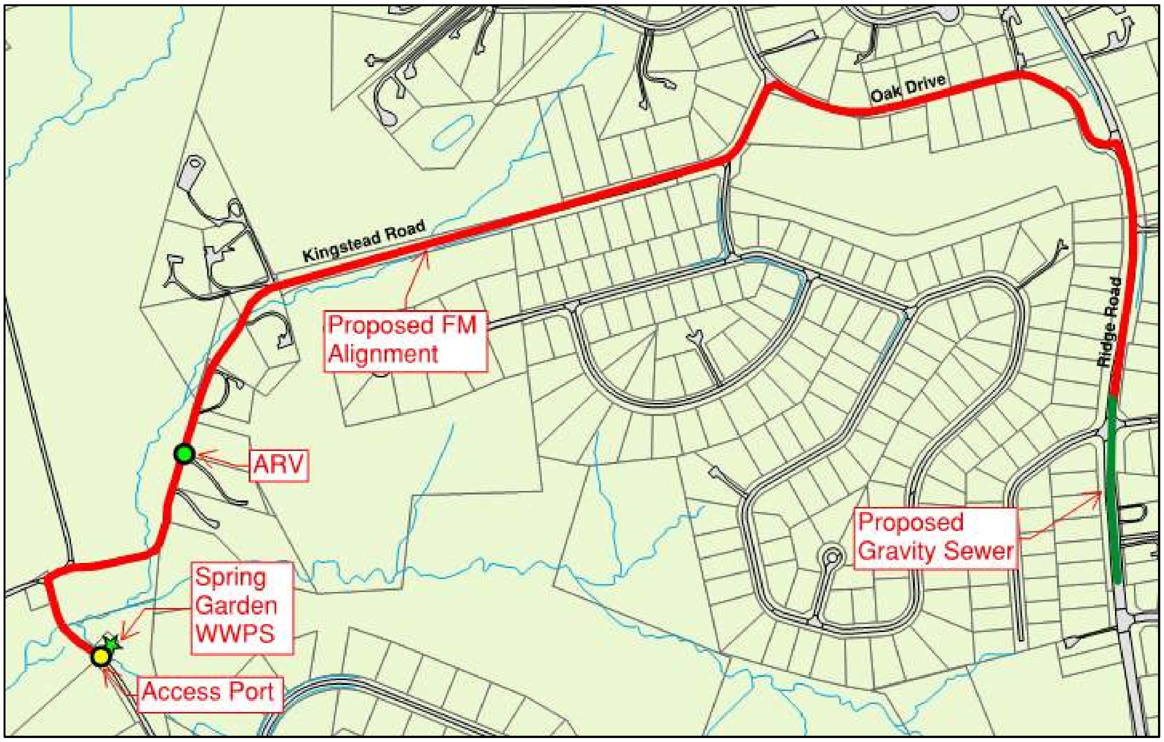

Figure 4-24 Alternative 24 Alignment

Table 4-46 Alternative 24 Parameter Summary

Parameter	Primary FM Value
Material	HDPE DR11
Length (ft)	7,413
Nominal Diameter (in)	10.00
Actual ID (in)	8.56
HW Coefficient	120
Start Elev. (ft)	571
End Elev. (ft)	756
Static Head (ft)	185
Total Dynamic Head (ft)	261
Velocity (fps)	4.59

The access port at the new WWPS helps facilitate maintenance access; however, some common inspection and maintenance technologies are not able to extend the full length of the FM. All other assumptions are identical to Alternative 23.

Table 4-47 Alternative 24 Screening Summary

No.	Pros	Cons
1	Access ports for limited maintenance.	Repaving along the full alignment.
2	100 year PEL.	Additional gravity sewer required.
3	Alignment moved out of stream valley.	
4	Improved maintenance access.	

4.1.25 Alternative 25: New FM, Kingstead Road, Open Cut, WWPS + 2,500-Foot Access, No Redundancy

This alternative is identical to Alternative 23 except that the spacing for the access ports installed along the FM alignment is approximately every 2,500 feet. An access port is still installed at the WWPS. Figure 4-25 shows the alignment and Table 4-48 summarizes the parameters for this alternative.

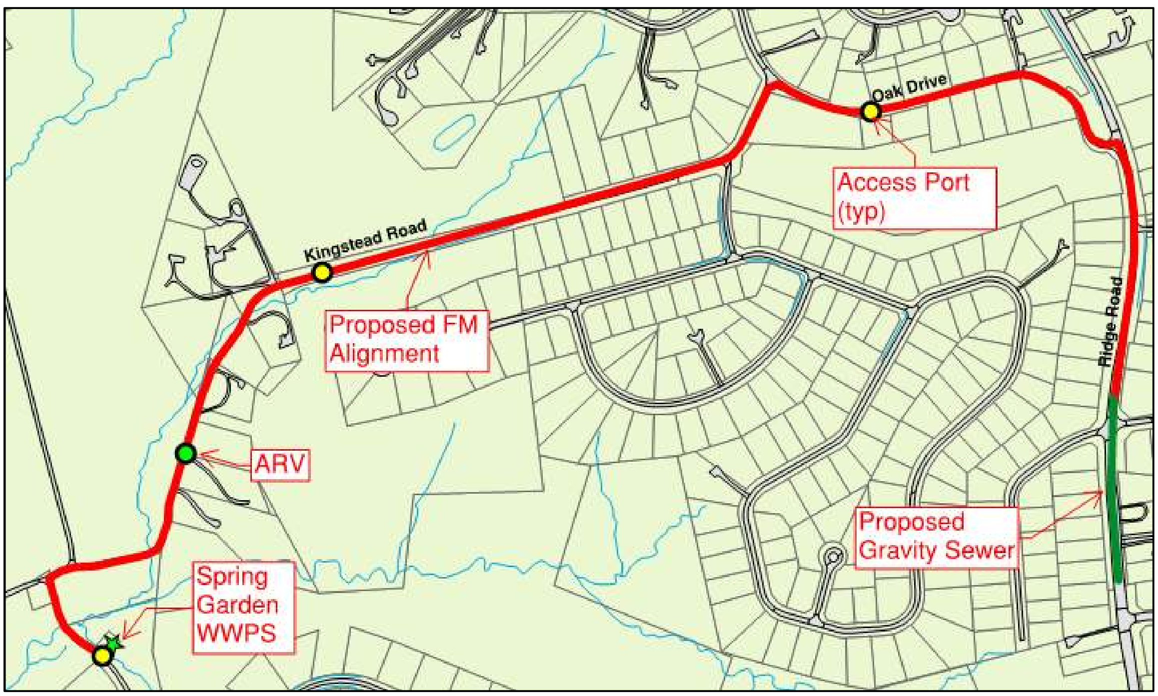

Figure 4-25 Alternative 25 Alignment

Table 4-48 Alternative 25 Parameter Summary

Parameter	Primary FM Value
Material	HDPE DR11
Length (ft)	7,413
Nominal Diameter (in)	10.00
Actual ID (in)	8.56

Parameter	Primary FM Value
HW Coefficient	120
Start Elev. (ft)	571
End Elev. (ft)	756
Static Head (ft)	185
Total Dynamic Head (ft)	261
Velocity (fps)	4.59

All additional assumptions are identical to Alternative 23.

Table 4-49 Alternative 25 Screening Summary

No.	Pros	Cons
1	Access ports for maintenance.	Repaving along the full alignment.
2	100 year PEL.	Additional gravity sewer required.
3	Alignment moved out of stream valley.	
4	Improved maintenance access.	

4.2 Alternative Screening Process

As described in Section 2.1.2, the business case evaluation procedures include an alternative screening process. This process includes an evaluation of each proposed alternative, a technical memorandum summarizing the findings and recommendations, and an alternative screening workshop.

4.3 Alternative Screening Results

Table 4-50 summarizes which alternatives were selected or rejected for further evaluation as determined by the project team as well as the rationale for each decision.

Table 4-50 Selected Alternatives

No.	Name	Recommended	Rationale
1	Do nothing/Status Quo	Yes	Required for baseline comparison.
2	Retrofit existing FM, WWPS + 1,000’ access, no redundancy.	No	Per the results of the separate FM Business Case, all retrofit alternatives were eliminated.
3	Retrofit existing FM, WWPS + 1,000’ access, partial redundancy.	No	Per the results of the separate FM Business Case, all retrofit alternatives were eliminated.
4	Retrofit existing FM, WWPS + 1,000’ access, full redundancy.	No	Per the results of the separate FM Business Case, all retrofit alternatives were eliminated.
5	Retrofit existing FM, WWPS	No	Per the results of the separate FM Business

No.	Name	Recommended	Rationale
	access, full redundancy.		Case, all retrofit alternatives were eliminated.
6	Retrofit existing FM, WWPS access, no redundancy.	No	Per the results of the separate FM Business Case, all retrofit alternatives were eliminated.
7	Retrofit existing FM, WWPS + 2,500' access, no redundancy.	No	Per the results of the separate FM Business Case, all retrofit alternatives were eliminated.
8	New FM, existing alignment + Marlboro, open cut, WWPS + 1,000' access, no redundancy.	Yes	Per the results of the separate FM Business Case, the top alternatives were no redundancy with 1,000', 2,500', or WWPS access.
9	New FM, existing alignment + Marlboro, open cut, WWPS + 1,000' access, partial redundancy.	No	Per the results of the separate FM Business Case, all alternatives with redundancy were eliminated.
10	New FM, existing alignment + Marlboro, open cut, WWPS + 1,000' access, full redundancy.	No	Per the results of the separate FM Business Case, all alternatives with redundancy were eliminated.
11	New FM, existing alignment + Marlboro, open cut, WWPS access, full redundancy.	No	Per the results of the separate FM Business Case, all alternatives with redundancy were eliminated.
12	New FM, existing alignment + Marlboro, open cut, WWPS access, no redundancy.	Yes	Per the results of the separate FM Business Case, the top alternatives were no redundancy with 1,000', 2,500', or WWPS access.
13	New FM, existing alignment + Marlboro, open cut, WWPS + 2,500' access, no redundancy.	Yes	Per the results of the separate FM Business Case, the top alternatives were no redundancy with 1,000', 2,500', or WWPS access.
14	New FM, existing alignment + Marlboro, HDD, WWPS + 1,000' access, no redundancy.	No	Installing access every 1,000 feet negates the advantages of using HDD installation.
15	New FM, existing alignment + Marlboro, HDD, WWPS + 1,000' access, partial redundancy.	No	Per the results of the separate FM Business Case, all alternatives with redundancy were eliminated.
16	New FM, existing alignment + Marlboro, HDD, WWPS + 1,000' access, full redundancy.	No	Per the results of the separate FM Business Case, all alternatives with redundancy were eliminated.
17	New FM, existing alignment + Marlboro, HDD, WWPS access, full redundancy.	No	Per the results of the separate FM Business Case, all alternatives with redundancy were eliminated.
18	New FM, existing alignment + Marlboro, HDD, WWPS	Yes	Per the results of the separate FM Business Case, the top alternatives were no redundancy

No.	Name	Recommended	Rationale
	access, no redundancy.		with 1,000’, 2,500’, or WWPS access.
19	New FM, existing alignment + Marlboro, HDD, WWPS + 2,500’ access, no redundancy.	Yes	Per the results of the separate FM Business Case, the top alternatives were no redundancy with 1,000’, 2,500’, or WWPS access.
20	New FM, Kings Valley Road, open cut, WWPS + 1,000’ access, no redundancy.	Yes	Per the results of the separate FM Business Case, the top alternatives were no redundancy with 1,000’, 2,500’, or WWPS access.
21	New FM, Kings Valley Road, open cut, WWPS access, no redundancy.	Yes	Per the results of the separate FM Business Case, the top alternatives were no redundancy with 1,000’, 2,500’, or WWPS access.
22	New FM, Kings Valley Road, open cut, WWPS + 2,500’ access, no redundancy.	Yes	Per the results of the separate FM Business Case, the top alternatives were no redundancy with 1,000’, 2,500’, or WWPS access.
23	New FM, Kingstead Road, open cut, WWPS + 1,000’ access, no redundancy.	Yes	Per the results of the separate FM Business Case, the top alternatives were no redundancy with 1,000’, 2,500’, or WWPS access.
24	New FM, Kingstead Road, open cut, WWPS access, no redundancy.	Yes	Per the results of the separate FM Business Case, the top alternatives were no redundancy with 1,000’, 2,500’, or WWPS access.
25	New FM, Kingstead Road, open cut, WWPS + 2,500’ access, no redundancy.	Yes	Per the results of the separate FM Business Case, the top alternatives were no redundancy with 1,000’, 2,500’, or WWPS access.

5 General Engineering and Technical Analysis

5.1 Existing FM Flow Conditions

As-built records show that the existing FM is constructed of 8-inch Class 50 DIP. Current WSSC specifications require the interior of DIP FM be lined to a minimum dry film thickness of 40 mils. The 8-inch Class 50 DIP has an internal diameter (ID) of 8.51 inches. Accounting for lining thickness, the maximum ID becomes 8.43 inches. For the existing measured flowrate of 0.41 this results in a flow velocity of 1.64 fps. For the projected future flowrate of 1.3 mgd, this results in a flow velocity of 5.19 fps. It is important to note that these values are computed assuming the full theoretical ID is available for flow; however, given the age of the existing FM and the low flow velocities it currently experiences, the ID is likely smaller. To account for this probability, the original Spring Garden WWPS business case further reduced the ID used in hydraulic calculations to a nominal 8 inches. This increases the existing and proposed flow velocities to 1.91 fps and 5.76 fps, respectively. No inspection data is available for the existing FM, so the actual current ID is not known. Given the age and assumed condition of the pipe, all total head requirements are computed assuming a Hazen-Williams (HW) coefficient of 100. Table 5-1 summarizes the total system head and flow velocities in the existing FM for the projected 1.3 mgd flowrate.

Table 5-1 Existing Flow Conditions

Parameter	Nominal 8-inch ID	CL 50 Full 8.43-inch ID
Total Head (ft)	270	243
Velocity (fps)	5.76	5.19

5.2 Proposed Alignments

The alternatives presented are based on three possible alignments:

1. Existing + Marlboro Drive.
2. Kings Valley Road, which is southwest of the existing alignment.
3. Kingstead Road -> Oak Drive -> Ridge Road, which is northeast of the existing alignment.

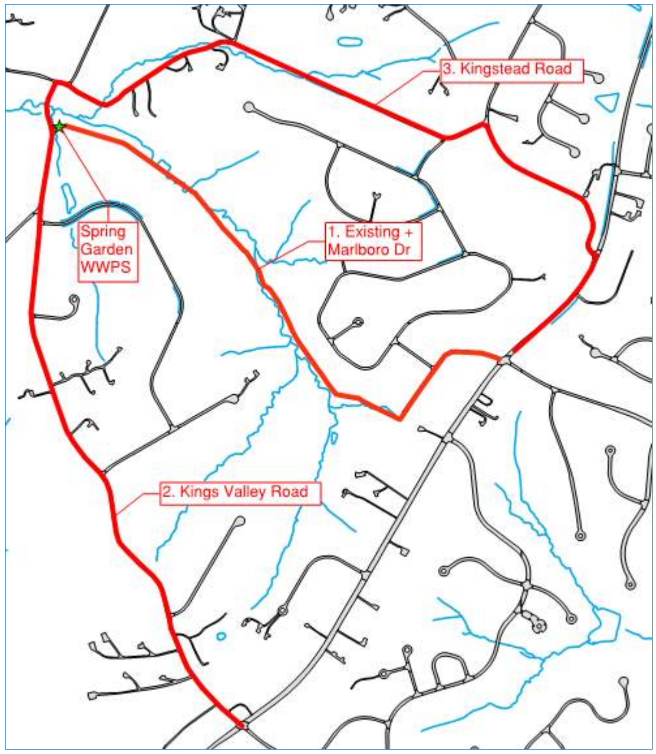

Figure 5-1 Proposed Alignments

The three alignments require different lengths of FM and have different system head requirements. Table 5-2 and Table 5-3 summarize the differences. When computing these values, the FM material was assumed to be either new DIP CL54 or new HDPE DR11. A HW coefficient of 120 was used for all new pipe. Similar computations for the existing FM are included in the previous section. Values are computed for both an 8-inch and 10-inch FM.

Table 5-2 Proposed FM Parameters

Alignment		Length (ft.)	WWPS Elevation (ft.)	Discharge Elevation (ft.)	Static Head (ft.)
1	Existing + Marlboro	5,383	571	751	180
2	Kings Valley Road	5,932	571	794	223
3	Kingstead Road	7,415	571	753	182

Table 5-3 Proposed FM System Requirements

Alignment		Diameter (in)	Material	Velocity (fps)	Total Head (ft)
1	Existing + Marlboro	8	DIP CL 54	5.50	270
		10	HDPE DR 11	4.59	238
2	Kings Valley Road	10	HDPE DR 11	4.59	287
3	Kingstead Road	10	HDPE DR 11	4.59	261

New DIP is only considered as part of the Do Nothing/Status Quo condition, and only 8-inch DIP is considered as that provides flow velocities within the range of WSSC design guidelines. Using 8-inch HDPE DR 11 results in velocities that are higher than the 6.0 fps allowable under WSSC design guidelines; therefore, 8-inch HDPE alternatives are not considered. Table 5-4 summarizes the proposed alignments based on each of the alternatives selected for further evaluation.

Table 5-4 Proposed Alignments Summary

Alternative		FM Length (ft)	Gravity Sewer Length (ft)
1	Do Nothing/Status Quo	5,383	680
8	New FM, Existing Alignment + Marlboro, WWPS + 1,000-Foot Access, No Redundancy	5,383	680
12	New FM, Existing Alignment + Marlboro, WWPS Access, No Redundancy	5,383	680
13	New FM, Existing Alignment + Marlboro, WWPS + 2,500-Foot Access, No Redundancy	5,383	680
18	New FM, Existing Alignment + Marlboro, HDD, WWPS Access, No Redundancy	5,383	680
19	New FM, Existing Alignment + Marlboro, HDD, WWPS + 2,500-Foot Access, No Redundancy	5,383	680
20	New FM, Kings Valley Road, Open Cut, WWPS + 1,000-Foot Access, No Redundancy	5,932	3,150
21	New FM, Kings Valley Road, Open Cut, WWPS Access, No Redundancy	5,932	3,150
22	New FM, Kings Valley Road, Open Cut, WWPS + 2,500-Foot Access, No Redundancy	5,932	3,150
23	New FM, Kingstead Road, Open Cut, WWPS + 1,000-Foot Access, No Redundancy	7,413	850
24	New FM, Kingstead Road, Open Cut, WWPS Access, No Redundancy	7,413	850

Alternative		FM Length (ft)	Gravity Sewer Length (ft)
25	New FM, Kingstead Road, Open Cut, WWPS + 2,500-Foot Access, No Redundancy	7,413	850

5.3 Installation Method

All proposed alternatives included installation via either open cut or HDD. Open cut is generally less costly than HDD; however, it requires full access to the entire alignment. Typically this is not an issue when the alignment is within or near an existing paved road; however, if the alignment is in an undeveloped ROW or environmentally sensitive area (ESA), the environmental impacts and the additional costs associated with the constructed access road can be significant. Constructed access roads typically require a minimum width of 20 feet in addition to the pipe trench itself. HDD can significantly reduce these environmental impacts and constructed access road costs in undeveloped ROW or ESAs. For 8-inch and 10-inch pipe, HDD installations can have up to 3,000 feet between access pits. To install a second pipeline adjacent to an existing one (for replacement or redundancy), a minimum of 5 feet separation (centerline to centerline) is required between the two alignments.

5.4 Stream Valley Access Locations

Any proposed work along the existing FM alignment requires access to the stream valley. Three access points were identified in addition to the existing WWPS.

The first is from between 10944 and 10948 Bellehaven Road and follows a drainage channel. There is an existing gravity sewer along this route. Between the homes there is a 15-foot sanitary sewer easement (centered on the sewer pipe) and an adjacent 15-foot storm drain easement for a total easement width of 30 feet. A 20-foot sanitary sewer easement (centered on the sewer pipe) continues from the back of the house properties until the sewer reaches the trunk gravity sewer in the stream valley.

The second access is from 24330 Red Blaze Drive. There is an existing gravity sewer along this route. A 20-foot wide sewer easement (centered on the pipe) follows this route from the end of Red Blaze Drive until the sewer reaches the trunk gravity sewer in the stream valley.

The third access is from the dead end of Marlboro Drive. From the end of the pavement, it is approximately 50 feet to reach the stream valley over relatively flat terrain. This access follows the existing gravity sewer and FM into the stream valley. There is an existing 30 foot easement following the sewers.

All access paths are assumed to be 16 feet wide and use heavy duty mulch mats (see Appendix E for detail). Table 5-5 summarizes the access points, and Figure 5-2 shows their locations.

Table 5-5 Proposed Access Summary

Access		Length (ft)
1	Bellehaven Boulevard	1,000
2	Red Blaze Drive	700
3	Marlboro Drive	50

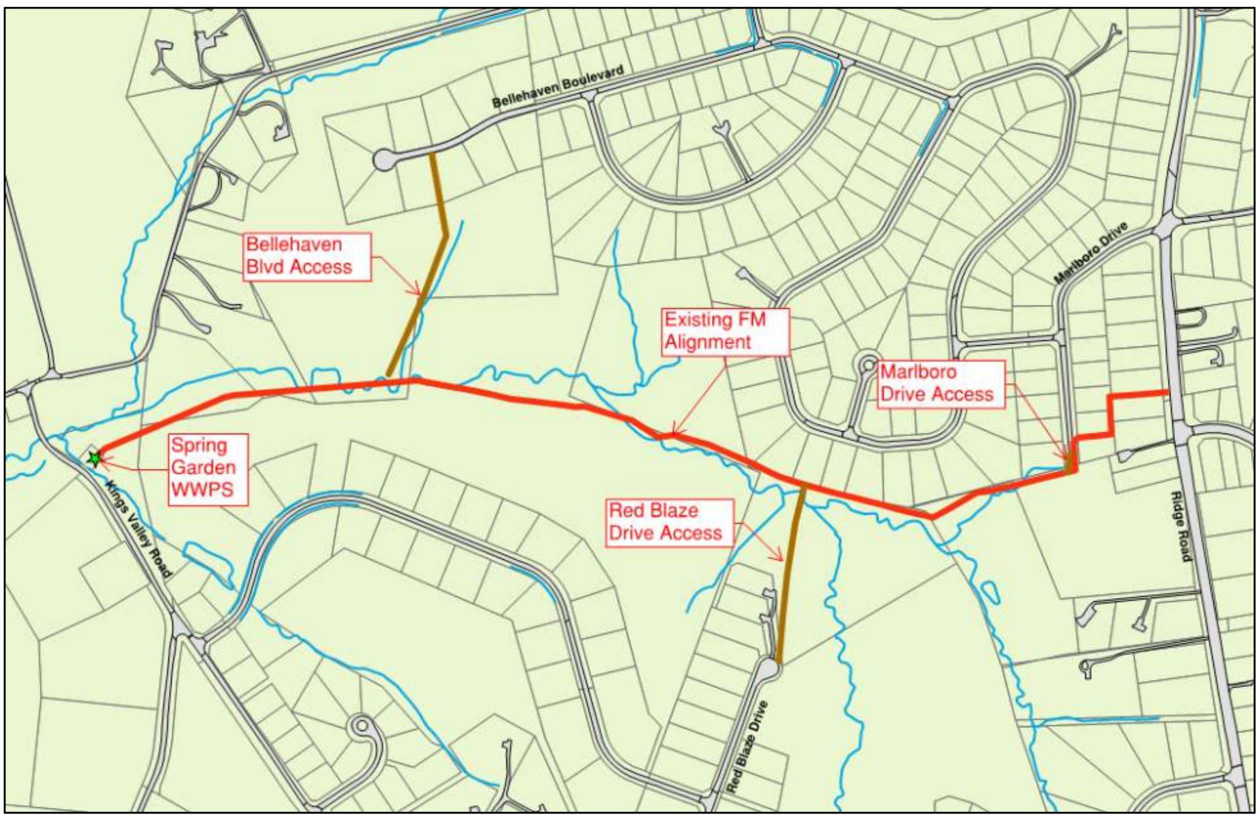

Figure 5-2 Proposed Access Locations

Additional access points were considered from 24508 Ridge Road and from Middleboro Drive, but both were ultimately eliminated. The 24508 Ridge Road access follows an existing easement over navigable terrain, but it uses a driveway shared by three private homes. Marlboro Drive provides access to nearly the same location without the private property impacts. The Middleboro Drive access was rejected due to the narrow width of flat area available for construction access. The available area is wedged between steep slopes and a meandering drainage channel, and it would need to cross the channel multiple times.

5.5 Historical Structures

The Maryland Historical Trust lists one building near the existing WWPS on its list of state historic sites. The building is a two-story wooden house located on the south side of Kings Valley Road, opposite from the existing WWPS. The house was built in the 19th century and is unoccupied. Although it is adjacent to where proposed construction activities may occur, no impacts to the structure are anticipated.

5.6 Geotechnical

Geotechnical information is available from four borings performed in 1975 and 1976 as part of the original FM and WWPS design. Borings 1 and 2 are near the existing WWPS, Boring 5 is near the end of Marlboro Drive, and Boring 6 is just east of Ridge Road. Figure 5-3 shows the boring locations. Full boring results are found in Appendix C. Borings 1, 2, and 5 are located along the existing FM alignment and show disintegrated rock beginning at 11 feet or deeper. It is assumed that these conditions persist throughout the full length of the existing alignment; however, this should be verified by additional borings before starting detailed design. Boring 6, which is not on the existing alignment but is relevant to any new sewers or FMs along Ridge Road, shows disintegrated rock beginning at 7 feet.

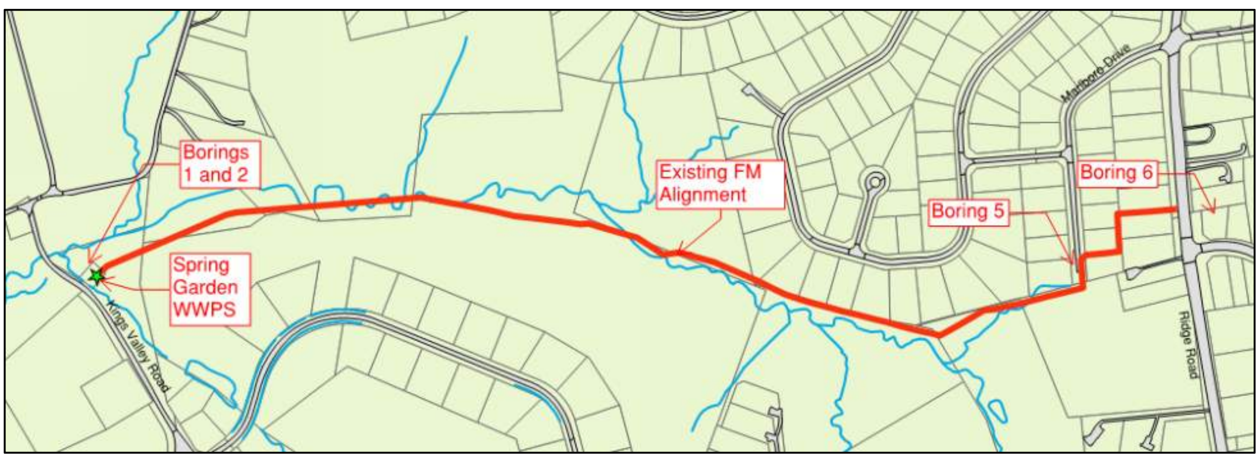

Figure 5-3 Soil Boring Locations

Based on these results, it is assumed that minimal rock excavation will be required along the existing alignment. Therefore, this analysis assumes that 10% of all stream valley excavation will be rock. No boring information is available along Kings Valley Road, Kingstead Road, or Oak Drive; however, the proposed FM is never more than 10 feet deep. Since this is above most of the rock found in the available soil borings, it is again assumed only a minimal 10% rock excavation is required. Based on the shallower rock depth along Ridge Road from Boring 6 and the deeper depth of the gravity sewers, it is assumed that all gravity sewer excavation along Ridge Road will be 50% rock.

5.7 Pumping Requirements

All hydraulic calculations were based on a future flow to the WWPS of 1.3 mgd and an HW coefficient of 120. Table 5-6 summarizes the corresponding pump requirements for each alternative.

Table 5-6 Pumping Requirements

Alternative	Diameter (in)	Material	Velocity (fps)	Static Head (ft)	Total Dynamic Head (ft)
1	8	DIP CL 54	5.50	181	270
8, 12, 13, 18, 19	10	HDPE SDR 11	4.59	181	238
20, 21, 22	10	HDPE SDR 11	4.59	224	287
23, 24, 25	10	HDPE SDR 11	4.59	183	261

5.8 Pipe Splitting

In addition to HDD (used in Alternatives 11 and 15), another trenchless technique, pipe splitting, was also considered. This technique is used for non-brittle pipe such as DI and steel. It involves pulling a splitter head through the existing pipe to cut the pipe along the invert. An expander is then pulled through to open up the split pipe. Finally a new, larger-diameter pipe is pulled into the now-open space.

This method cannot be used on encased pipe and has limited pull lengths. The length of the existing FM and the presence of multiple encased sections would require multiple setups along the length of the FM to complete. This negates much of the advantage of using this trenchless technology over open cut and does not provide the limited access benefits of HDD. For these reasons, it was not pursued further.

5.9 Service Life

Different materials have different service lives. Table 5-7 gives the expected service life for each of the materials used in this analysis. All values were obtained from WSSC's separate FM business case evaluation.

Table 5-7 Service Life

Material	Alternatives	Service Life (years)
DIP CL54	1	50
HDPE SDR 11	8, 12, 13, 18, 19, 20, 21, 22, 23, 24, 25	100

5.10 Maintenance

Eight standard maintenance activities are associated with the FM: Flushing; pigging; inspections for leaks, air pockets, and wall thickness (DIP only); access route maintenance; ARV inspection and exercise; ARV replacement; access port maintenance; and odor control media replacement. The cost of each and scheduled frequency are summarized in Table 5-8.

Table 5-8 Summary of Routine Maintenance

No.	Item	Unit	Unit Cost	Recurrence (years)
1	Flush FM	LS	$1,032	1
2	Pigging	LF	$11.50	5
3	Inspection (leaks, air pockets)	LF	$9.29	10
4	Access route maintenance	SY	$0.10	1
5	ARV inspection/exercise	EA	$240	1
6	ARV replacement	EA	$7,079	20
7	Access port maintenance	EA	$480	1
8	Odor control media replacement	EA	$1,890	2

5.11 Existing Force Main Abandonment

All alternatives that install a new FM but leave the existing FM pipe in place require the existing FM be properly abandoned. WSSC standards require the abandoned FM be filled with flowable fill. Based on contractor input, it was determined that the existing FM can be filled with flowable fill utilizing access from Ridge Road, the existing WWPS, and one intermediate access point. This requires approximately 70 cubic yards of flowable fill to complete. For alternatives that do not already have stream valley access, it is assumed that access for abandonment is constructed from Red Blaze Drive.

5.12 Pumps

All alternatives require two pumps in series to meet the flowrate and total dynamic head requirements and still be within acceptable operating parameters. This analysis modifies the original 2015 Spring Gardens business case evaluation to include updated new pump and motor costs, periodic pump and motor replacement costs, and annual pump and motor electricity costs. Table 5-9 below summarizes the updated costs.

Table 5-9 Pumping Requirements

Alternative	New Pump/Motor Cost[1]	Annual Electricity Cost[2]
1	$127,000	$3,510
8, 12, 13, 18, 19	$127,000	$3,682
20, 21, 22	$160,000	$4,947
23, 24, 25	$160,000	$4,299

1. Pump/motor costs are the total cost for four pumps and motors (two sets of two pumps in series).
2. Annual electricity costs are based on an average annual run time of 621 hours as noted in the 2015 Spring Gardens WWPS business case electrical evaluation.

6 Evaluation

6.1 LCA

6.1.1 LCA Description

An LCA examines the total cost of ownership over the life of the asset(s) associated with the implementation of each of the alternatives selected for analysis. The analysis examines the expected capital, operations and maintenance, and other costs related to each alternative. The analysis also examines any operating benefits associated with the alternatives. The costs are forecast over the life of the asset(s) taking into account factors such as inflation. The future value of the costs (i.e., nominal costs) for each alternative are then discounted to determine the cumulative net present value for each alternative. The cumulative net present value for each alternative is then annuitized and used in the risk analysis in order to compare the cost effectiveness of each alternative.

6.1.2 LCA Assumptions and Inputs

6.1.2.1 General

The following general assumptions are applicable to all alternatives.

- Inflation rate is 3%.
- Discount rate is 4%.
- Cost of electricity is $0.10 kWh.
- Average cost of labor is $33 per hour plus 30% for benefits.
- A construction contingency of 20% is applied to all construction costs.
- Planning, permitting, and design costs:
  - 18% of construction costs for ESA areas.
  - 15% of construction costs for non-ESA areas.
- WSSC design services during construction are 10% of all construction costs.
- WSSC administration costs are 15% of all construction and design oversight costs.
- Tree replanting requirements are 100 container-grown, 2 to 2.5-inch caliper trees per acre in ESAs per Maryland Department of Natural Resources requirements.
- All new FMs are either 8-inch DIP CL54 or 10-inch HDPE SDR 11.
- All new gravity sewers are 10-inch PVC SDR 35.
- All new manholes are 4-foot inside diameter per WSSC standard detail S/1.0.
- All street work includes pavement restoration.
- Operating costs for the existing WWPS during planning, design, and construction are not included in the LCA as they are identical for all alternatives.

6.1.2.2 Alternative 1 Do Nothing/Status Quo

The Alternative 1 analysis period is 4 years for planning, design, and construction plus 50 years for the life of the new FM for a total of 54 years. Construction costs include open cut installation of new 8-inch DIP CL54 FM along the existing alignment. Installation is in the original FM trench, so bypass pumping is required during construction. No access ports or ARVs are installed. Approximately 300 feet of stream is stabilized to prevent future exposures. Access to the valley is from the existing WWPS and from Marlboro Drive.

The following tables summarize the LCA inputs for this alternative based on the assumptions detailed above.

Table 6-1 Alternative 1 Summary of Capital Costs Inputs

	Task	FY 2019	FY 2020	FY 2021	FY 2022	Total
1	Planning, Design, and Supervision					
	Planning, Permitting, Design	($296,607)	($395,476)	($98,869)	$0	($790,952)
	Design Services During Construction	$0	$0	($109,854)	($329,563)	($439,417)
2	Land	$0	($27,216)	$0	$0	($27,216)
3	Site Improvements and Utilities	$0	$0	$0	$0	$0
4	Construction	$0	$0	($1,098,545)	($3,295,634)	($4,394,178)
5	Other (WSSC Administration)	($44,491)	($59,321)	($196,090)	($543,780)	($843,682)
6	**Total**	**($341,098)**	**($482,013)**	**($1,503,358)**	**($4,168,977)**	**($6,495,445)**

1. See Appendix D for additional construction cost details

Table 6-2 Alternative 1 Summary of Recurring Cost and Benefit Inputs

No.	Item	Cost	Begin FY	End FY	Frequency
1	Flush FM	($1,032)	2023	2072	1
2	Pigging	$0			
3	Inspection (wall thickness, leaks, air pockets)	$0			
4	Access route maintenance	$0			
5	ARV inspection/exercise	$0			
6	ARV replacement	$0			
7	Access port maintenance	$0			
8	Electricity Consumption - Pump/Motors	($3,510)	2023	2072	1
9	Pump/Motor Replacement	($127,000)	2062	2072	40
10	Odor control media replacement	($1,890)	2024	2072	2
11	Pump/Motor salvage value	$95,250	2072	2072	1

6.1.2.3 Alternative 8 New FM, Existing Alignment + Marlboro, Open Cut, WWPS + 1,000-Foot Access, No Redundancy

The Alternative 8 analysis period is 5 years for planning, design, and construction plus 100 years for the life of the new FM for a total of 105 years. Construction costs include open cut installation of 4,200 LF of new FM parallel to the existing alignment in the stream valley, open cut installation of 1,183 LF of new FM along Marlboro Drive, open cut installation of 680 LF of new gravity sewer along Ridge Road, installation of one access port at the WWPS and 4 more access ports along the alignment. Approximately 300 feet of stream is stabilized to prevent future exposures. Access to the valley is from the existing WWPS and from Marlboro Drive. The existing FM remains in service during construction, so no bypass pumping is required. After completion of the new FM, the existing FM is abandoned. Since the new FM is not an in-trench replacement of the existing one, the existing easement is widened by 10 feet to accommodate the new FM pipe.

The following tables summarize the LCA inputs for this alternative based on the assumptions detailed above.

Table 6-3 Alternative 8 Summary of Capital Costs Inputs

Task		FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	Total
1	Planning, Design, and Supervision						
	Planning, Permitting, Design	($266,396)	($355,194)	($88,799)	$0	$0	($710,389)
	Design Services During Construction	$0	$0	($65,777)	($263,107)	($65,777)	($394,661)
2	Land	$0	($54,432)	$0	$0	$0	($54,432)
3	Site Improvements and Utilities	$0	$0	$0	$0	$0	$0
4	Construction	$0	$0	($657,767)	($2,631,069)	($657,767)	($3,946,603)
5	Other (WSSC Administration)	($39,959)	($53,279)	($121,851)	($434,126)	($108,532)	($757,747)
6	**Total**	**($306,355)**	**($462,905)**	**($934,194)**	**($3,328,302)**	**($832,076)**	**($5,863,832)**

Table 6-4 Alternative 8 Summary of Recurring Cost and Benefit Inputs

No.	Item	Cost	Begin FY	End FY	Frequency
1	Flush FM	($1,032)	2024	2123	1
2	Pigging	($61,905)	2028	2123	5
3	Inspection (leaks, air pockets)	($50,008)	2033	2123	10
4	Access route maintenance	($1,914)	2024	2123	1
5	ARV inspection/exercise	($960)	2024	2123	1
6	ARV replacement	($7,079)	2043	2123	20
7	Access port maintenance	($2,400)	2024	2123	1
8	Electricity Consumption - Pump/Motors	($3,682)	2024	2123	1
9	Pump/Motor Replacement	($127,000)	2063	2123	40
10	Odor control media replacement	($1,890)	2025	2123	2
11	Pump/Motor salvage value	$63,500	2123	2123	1

6.1.2.4 Alternative 12 New FM, Existing Alignment + Marlboro, Open Cut, WWPS Access, No Redundancy

The assumptions for this alternative are identical to the assumptions for Alternative 8 with the exception that no access ports are constructed along the FM alignment. One access port is still constructed at the WWPS.

The following tables summarize the LCA inputs for this alternative based on the assumptions detailed above.

Table 6-5 Alternative 12 Summary of Capital Costs Inputs

	Task	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	Total
1	Planning, Design, and Supervision						
	Planning, Permitting, Design	($250,034)	($333,378)	($83,345)	$0	$0	($666,757)
	Design Services During Construction	$0	$0	($61,737)	($246,947)	($61,737)	($370,421)
2	Land	$0	($54,432)	$0	$0	$0	($54,432)
3	Site Improvements and Utilities	$0	$0	$0	$0	$0	$0
4	Construction	$0	$0	($617,367)	($2,469,469)	($617,367)	($3,704,203)
5	Other (WSSC Administration)	($37,505)	($50,007)	($114,367)	($407,462)	($101,866)	($711,207)
6	**Total**	**($287,539)**	**($437,817)**	**($876,816)**	**($3,123,878)**	**($780,970)**	**($5,507,020)**

Table 6-6 Alternative 12 Summary of Recurring Cost and Benefit Inputs

No.	Item	Cost	Begin FY	End FY	Frequency
1	Flush FM	($1,032)	2024	2123	1
2	Pigging	($61,905)	2028	2123	5
3	Inspection (leaks, air pockets)	($50,008)	2033	2123	10
4	Access route maintenance	($1,914)	2024	2123	1
5	ARV inspection/exercise	($960)	2024	2123	1
6	ARV replacement	($7,079)	2043	2123	20
7	Access port maintenance	($480)	2024	2123	1
8	Electricity Consumption - Pump/Motors	($3,682)	2024	2123	1
9	Pump/Motor Replacement	($127,000)	2063	2123	40
10	Odor control media replacement	($1,890)	2025	2123	2
11	Pump/Motor salvage value	$63,500	2123	2123	1

6.1.2.5 Alternative 13 New FM, Existing Alignment + Marlboro, Open Cut, WWPS + 2,500-Foot Access, No Redundancy

The assumptions for this alternative are identical to the assumptions for Alternative 8 with the exception that only two access ports are constructed along the FM alignment. One access port is still constructed at the WWPS.

The following tables summarize the LCA inputs for this alternative based on the assumptions detailed above.

Table 6-7 Alternative 13 Summary of Capital Costs Inputs

	Task	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	Total
1	Planning, Design, and Supervision						
	Planning, Permitting, Design	($258,215)	($344,286)	($86,072)	$0	$0	($688,573)
	Design Services During Construction	$0	$0	($63,757)	($255,027)	($63,757)	($382,541)
2	Land	$0	($54,432)	$0	$0	$0	($54,432)
3	Site Improvements and Utilities	$0	$0	$0	$0	$0	$0
4	Construction	$0	$0	($637,567)	($2,550,269)	($637,567)	($3,825,403)
5	Other (WSSC Administration)	($38,732)	($51,643)	($118,109)	($420,794)	($105,199)	($734,477)
6	**Total**	**($296,947)**	**($450,361)**	**($905,505)**	**($3,226,090)**	**($806,523)**	**($5,685,426)**

Table 6-8 Alternative 13 Summary of Recurring Cost and Benefit Inputs

No.	Item	Cost	Begin FY	End FY	Frequency
1	Flush FM	($1,032)	2024	2123	1
2	Pigging	($61,905)	2028	2123	5
3	Inspection (leaks, air pockets)	($50,008)	2033	2123	10
4	Access route maintenance	($1,914)	2024	2123	1
5	ARV inspection/exercise	($960)	2024	2123	1
6	ARV replacement	($7,079)	2043	2123	20
7	Access port maintenance	($1,440)	2024	2123	1
8	Electricity Consumption - Pump/Motors	($3,682)	2024	2123	1
9	Pump/Motor Replacement	($127,000)	2063	2123	40
10	Odor control media replacement	($1,890)	2025	2123	2
11	Pump/Motor salvage value	$63,500	2123	2123	1

6.1.2.6 Alternative 18 New FM, Existing Alignment + Marlboro, HDD, WWPS Access, No Redundancy

The Alternative 18 analysis period is 4 years for planning, design, and construction plus 100 years for the life of the new FM for a total of 104 years. Construction costs include HDD installation of 3,300 LF of new FM in the stream valley, open cut installation of 900 LF of new FM in the valley, open cut installation of 1,183 LF of new FM along Marlboro Drive, open cut installation of 680 LF of new gravity sewer along Ridge Road, and installation of one access port at the WWPS. Access is provided from Bellehaven Boulevard, Marlboro Drive, and the WWPS to the existing alignment.

For HDD operations, an entry pit is located at approximately station 21+00 (see existing FM profile in Appendix D). All HDPE pipe is fused at this location then pulled toward either the existing WWPS or Marlboro Drive. Because HDD is installed in straight lines, it cannot follow the existing easement. New easements are therefore required.

Approximately 300 feet of stream is stabilized to prevent future exposures. The existing FM remains in service during construction, so no bypass pumping is required. After completion of the new FM, the existing FM is abandoned.

The following tables summarize the LCA inputs for this alternative based on the assumptions detailed above.

Table 6-9 Alternative 18 Summary of Capital Costs Inputs

	Task	FY 2019	FY 2020	FY 2021	FY 2022	Total
1	Planning, Design, and Supervision					
	Planning, Permitting, Design	($277,324)	($369,765)	$0	$0	($647,089)
	Design Services During Construction	$0	$0	($143,798)	($287,595)	($431,393)
2	Land	$0	($97,200)	$0	$0	($97,200)
3	Site Improvements and Utilities	$0	$0	$0	$0	$0
4	Construction	$0	$0	($1,437,977)	($2,875,954)	($4,313,930)
5	Other (WSSC Administration)	($41,599)	($55,465)	($237,266)	($474,532)	($808,862)
6	**Total**	**($318,923)**	**($522,430)**	**($1,819,041)**	**($3,638,081)**	**($6,298,474)**

Table 6-10 Alternative 18 Summary of Recurring Cost and Benefit Inputs

No.	Item	Cost	Begin FY	End FY	Frequency
1	Flush FM	($1,032)	2023	2122	1
2	Pigging	($61,905)	2027	2122	5
3	Inspection (leaks, air pockets)	($50,008)	2032	2122	10
4	Access route maintenance	($1,914)	2023	2122	1
5	ARV inspection/exercise	($960)	2023	2122	1
6	ARV replacement	($7,079)	2042	2122	20
7	Access port maintenance	($480)	2023	2122	1
8	Electricity Consumption - Pump/Motors	($3,682)	2023	2122	1
9	Pump/Motor Replacement	($127,000)	2062	2122	40
10	Odor control media replacement	($1,890)	2024	2122	2
11	Pump/Motor salvage value	$63,500	2122	2122	1

6.1.2.7 Alternative 19 New FM, Existing Alignment + Marlboro, HDD, WWPS + 2,500-Foot Access, No Redundancy

The assumptions for this alternative are identical to the assumptions for Alternative 18 with the exception that two additional access ports are constructed along the alignment. The two additional access ports are constructed at the pipe assembly area and at the end of the second HDD drill shot. The longest distance between access ports does not exceed 2,500 feet.

The following tables summarize the LCA inputs for this alternative based on the assumptions detailed above.

Table 6-11 Alternative 19 Summary of Capital Costs Inputs

	Task	FY 2019	FY 2020	FY 2021	FY 2022	Total
1	Planning, Design, and Supervision					
	Planning, Permitting, Design	($285,116)	($380,154)	$0	$0	($665,270)
	Design Services During Construction	$0	$0	($147,838)	($295,675)	($443,513)
2	Land	$0	($97,200)	$0	$0	($97,200)
3	Site Improvements and Utilities	$0	$0	$0	$0	$0
4	Construction	$0	$0	($1,478,377)	($2,956,754)	($4,435,130)
5	Other (WSSC Administration)	($42,767)	($57,023)	($243,932)	($487,864)	($831,586)
6	**Total**	**($327,883)**	**($534,377)**	**($1,870,147)**	**($3,740,293)**	**($6,472,699)**

Table 6-12 Alternative 19 Summary of Recurring Cost and Benefit Inputs

No.	Item	Cost	Begin FY	End FY	Frequency
1	Flush FM	($1,032)	2023	2122	1
2	Pigging	($61,905)	2027	2122	5
3	Inspection (leaks, air pockets)	($50,008)	2032	2122	10
4	Access route maintenance	($1,914)	2023	2122	1
5	ARV inspection/exercise	($960)	2023	2122	1
6	ARV replacement	($7,079)	2042	2122	20
7	Access port maintenance	($1,440)	2023	2122	1
8	Electricity Consumption - Pump/Motors	($3,682)	2023	2122	1
9	Pump/Motor Replacement	($127,000)	2062	2122	40
10	Odor control media replacement	($1,890)	2024	2122	2
11	Pump/Motor salvage value	$63,500	2122	2122	1

6.1.2.8 Alternative 20 New FM, Kings Valley Road, Open Cut, WWPS + 1,000-Foot Access, No Redundancy

The Alternative 20 analysis period is 4 years for planning, design, and construction plus 100 years for the life of the new FM for a total of 104 years. Construction costs include open cut installation of 5,932 LF of new FM along Kings Valley Road, open cut installation of 3,150 LF of new gravity sewer along Ridge Road, installation of 1 access port at the WWPS and 5 along the alignment, and installation of 2 ARVs. All new pipes are located within the existing road ROW and under the pavement. The existing FM remains in service during construction, so no bypass pumping is required. After completion of the new FM, the existing FM is abandoned. To facilitate the abandonment, one access point to the valley is provided from Red Blaze Drive.

The following tables summarize the LCA inputs for this alternative based on the assumptions detailed above.

Table 6-13 Alternative 20 Summary of Capital Costs Inputs

Task		FY 2019	FY 2020	FY 2021	FY 2022	Total
1	Planning, Design, and Supervision					
	Planning, Permitting, Design	($333,653)	($333,653)	$0	$0	($667,306)
	Design Services During Construction	$0	$0	($222,436)	($222,436)	($444,872)
2	Land	$0	$0	$0	$0	$0
3	Site Improvements and Utilities	$0	$0	$0	$0	$0
4	Construction	$0	$0	($2,224,355)	($2,224,355)	($4,448,711)
5	Other (WSSC Administration)	($50,048)	($50,048)	($367,019)	($367,019)	($834,134)
6	**Total**	**($383,701)**	**($383,701)**	**($2,813,810)**	**($2,813,810)**	**($6,395,023)**

Table 6-14 Alternative 20 Summary of Recurring Cost and Benefit Inputs

No.	Item	Cost	Begin FY	End FY	Frequency
1	Flush FM	($1,032)	2023	2122	1
2	Pigging	($68,218)	2027	2122	5
3	Inspection (leaks, air pockets)	($55,108)	2032	2122	10
4	Access route maintenance	$0			
5	ARV inspection/exercise	($2,880)	2023	2122	1
6	ARV replacement	($21,237)	2042	2122	20
7	Access port maintenance	($2,880)	2023	2122	1
8	Electricity Consumption - Pump/Motors	($4,947)	2023	2122	1
9	Pump/Motor Replacement	($160,000)	2062	2122	40
10	Odor control media replacement	($1,890)	2024	2122	2
11	Pump/Motor salvage value	$80,000	2122	2122	1

6.1.2.9 Alternative 21 New FM, Kings Valley Road, Open Cut, WWPS Access, No Redundancy

The assumptions for this alternative are identical to the assumptions for Alternative 20 with the exception that no access ports are constructed along the FM alignment. One access port is still constructed at the WWPS.

The following tables summarize the LCA inputs for this alternative based on the assumptions detailed above.

Table 6-15 Alternative 21 Summary of Capital Costs Inputs

	Task	FY 2019	FY 2020	FY 2021	FY 2022	Total
1	Planning, Design, and Supervision					
	Planning, Permitting, Design	($310,883)	($310,883)	$0	$0	($621,766)
	Design Services During Construction	$0	$0	($207,256)	($207,256)	($414,512)
2	Land	$0	$0	$0	$0	$0
3	Site Improvements and Utilities	$0	$0	$0	$0	$0
4	Construction	$0	$0	($2,072,555)	($2,072,555)	($4,145,111)
5	Other (WSSC Administration)	($46,632)	($46,632)	($341,972)	($341,972)	($777,208)
6	**Total**	**($357,515)**	**($357,515)**	**($2,621,783)**	**($2,621,783)**	**($5,958,597)**

Table 6-16 Alternative 21 Summary of Recurring Cost and Benefit Inputs

No.	Item	Cost	Begin FY	End FY	Frequency
1	Flush FM	($1,032)	2023	2122	1
2	Pigging	($68,218)	2027	2122	5
3	Inspection (leaks, air pockets)	($55,108)	2032	2122	10
4	Access route maintenance	$0			
5	ARV inspection/exercise	($2,880)	2023	2122	1
6	ARV replacement	($21,237)	2042	2122	20
7	Access port maintenance	($480)	2023	2122	1
8	Electricity Consumption - Pump/Motors	($4,947)	2023	2122	1
9	Pump/Motor Replacement	($160,000)	2062	2122	40
10	Odor control media replacement	($1,890)	2024	2122	2
11	Pump/Motor salvage value	$80,000	2122	2122	1

6.1.2.10 Alternative 22 New FM, Kings Valley Road, Open Cut, WWPS + 2,500-Foot Access, No Redundancy

The assumptions for this alternative are identical to the assumptions for Alternative 20 with the exception that only two access ports are constructed along the FM alignment. One additional access port is still constructed at the WWPS.

The following tables summarize the LCA inputs for this alternative based on the assumptions detailed above.

Table 6-17 Alternative 22 Summary of Capital Costs Inputs

	Task	FY 2019	FY 2020	FY 2021	FY 2022	Total
1	Planning, Design, and Supervision					
	Planning, Permitting, Design	($319,973)	($319,973)	$0	$0	($639,946)
	Design Services During Construction	$0	$0	($213,316)	($213,316)	($426,632)
2	Land	$0	$0	$0	$0	$0
3	Site Improvements and Utilities	$0	$0	$0	$0	$0
4	Construction	$0	$0	($2,133,155)	($2,133,155)	($4,266,311)
5	Other (WSSC Administration)	($47,996)	($47,996)	($351,971)	($351,971)	($799,934)
6	**Total**	**($367,969)**	**($367,969)**	**($2,698,442)**	**($2,698,442)**	**($6,132,823)**

Table 6-18 Alternative 22 Summary of Recurring Cost and Benefit Inputs

No.	Item	Cost	Begin FY	End FY	Frequency
1	Flush FM	($1,032)	2023	2122	1
2	Pigging	($68,218)	2027	2122	5
3	Inspection (leaks, air pockets)	($55,108)	2032	2122	10
4	Access route maintenance	$0			
5	ARV inspection/exercise	($2,880)	2023	2122	1
6	ARV replacement	($21,237)	2042	2122	20
7	Access port maintenance	($1,440)	2023	2122	1
8	Electricity Consumption - Pump/Motors	($4,947)	2023	2122	1
9	Pump/Motor Replacement	($160,000)	2062	2122	40
10	Odor control media replacement	($1,890)	2024	2122	2
11	Pump/Motor salvage value	$80,000	2122	2122	1

6.1.2.11 Alternative 23 New FM, Kingstead Road, Open Cut, WWPS + 1,000-Foot Access, No Redundancy

The Alternative 23 analysis period is 4 years for planning, design, and construction plus 100 years for the life of the new FM for a total of 104 years. Construction costs include open cut installation of all new FM and gravity sewer pipe, installation of one access port at the WWPS and six along the alignment, and installation of 1 ARV. All new pipes are located within the existing road ROW and under the pavement. The existing FM remains in service during construction, so no bypass pumping is required. After completion of the new FM, the existing FM is abandoned. To facilitate the abandonment, one access point to the valley is provided at Red Blaze Drive.

The following tables summarize the LCA inputs for this alternative based on the assumptions detailed above.

Table 6-19 Alternative 23 Summary of Capital Costs Inputs

	Task	FY 2019	FY 2020	FY 2021	FY 2022	Total
1	Planning, Design, and Supervision					
	Planning, Permitting, Design	($293,942)	($293,942)	$0	$0	($587,884)
	Design Services During Construction	$0	$0	($195,962)	($195,962)	($391,924)
2	Land	$0	$0	$0	$0	$0
3	Site Improvements and Utilities	$0	$0	$0	$0	$0
4	Construction	$0	$0	($1,959,616)	($1,959,616)	($3,919,232)
5	Other (WSSC Administration)	($44,091)	($44,091)	($323,337)	($323,337)	($734,856)
6	**Total**	**($338,033)**	**($338,033)**	**($2,478,915)**	**($2,478,915)**	**($5,633,896)**

Table 6-20 Alternative 23 Summary of Recurring Cost and Benefit Inputs

No.	Item	Cost	Begin FY	End FY	Frequency
1	Flush FM	($1,032)	2023	2122	1
2	Pigging	($85,250)	2027	2122	5
3	Inspection (leaks, air pockets)	($68,867)	2032	2122	10
4	Access route maintenance	$0			
5	ARV inspection/exercise	($1,920)	2023	2122	1
6	ARV replacement	($14,158)	2042	2122	20
7	Access port maintenance	($3,360)	2023	2122	1
8	Electricity Consumption - Pump/Motors	($4,299)	2023	2122	1
9	Pump/Motor Replacement	($160,000)	2062	2122	40
10	Odor control media replacement	($1,890)	2024	2122	2
11	Pump/Motor salvage value	$80,000	2122	2122	1

6.1.2.12 Alternative 24 New FM, Kingstead Road, Open Cut, WWPS Access, No Redundancy

The assumptions for this alternative are identical to the assumptions for Alternative 23 with the exception that no access ports are constructed along the FM alignment. One access port is still constructed at the WWPS.

The following tables summarize the LCA inputs for this alternative based on the assumptions detailed above.

Table 6-21 Alternative 24 Summary of Capital Costs Inputs

	Task	FY 2019	FY 2020	FY 2021	FY 2022	Total
1	Planning, Design, and Supervision					
	Planning, Permitting, Design	($266,582)	($266,582)	$0	$0	($533,164)
	Design Services During Construction	$0	$0	($177,722)	($177,722)	($355,444)
2	Land	$0	$0	$0	$0	$0
3	Site Improvements and Utilities	$0	$0	$0	$0	$0
4	Construction	$0	$0	($1,777,216)	($1,777,216)	($3,554,432)
5	Other (WSSC Administration)	($39,987)	($39,987)	($293,241)	($293,241)	($666,456)
6	**Total**	**($306,569)**	**($306,569)**	**($2,248,179)**	**($2,248,179)**	**($5,109,496)**

Table 6-22 Alternative 24 Summary of Recurring Cost and Benefit Inputs

No.	Item	Cost	Begin FY	End FY	Frequency
1	Flush FM	($1,032)	2023	2122	1
2	Pigging	($85,250)	2027	2122	5
3	Inspection (leaks, air pockets)	($68,867)	2032	2122	10
4	Access route maintenance	$0			
5	ARV inspection/exercise	($1,920)	2023	2122	1
6	ARV replacement	($14,158)	2042	2122	20
7	Access port maintenance	($480)	2023	2122	1
8	Electricity Consumption - Pump/Motors	($4,299)	2023	2122	1
9	Pump/Motor Replacement	($160,000)	2062	2122	40
10	Odor control media replacement	($1,890)	2024	2122	2
11	Pump/Motor salvage value	$80,000	2122	2122	1

6.1.2.13 Alternative 25 New FM, Kingstead Road, Open Cut, WWPS + 2,500-Foot Access, No Redundancy

The assumptions for this alternative are identical to the assumptions for Alternative 23 with the exception that only two access ports are constructed along the FM alignment. One additional access port is still constructed at the WWPS.

The following tables summarize the LCA inputs for this alternative based on the assumptions detailed above.

Table 6-23 Alternative 25 Summary of Capital Costs Inputs

	Task	FY 2019	FY 2020	FY 2021	FY 2022	Total
1	Planning, Design, and Supervision					
	Planning, Permitting, Design	($275,762)	($275,762)	$0	$0	($551,524)
	Design Services During Construction	$0	$0	($183,842)	($183,842)	($367,684)
2	Land	$0	$0	$0	$0	$0
3	Site Improvements and Utilities	$0	$0	$0	$0	$0
4	Construction	$0	$0	($1,838,416)	($1,838,416)	($3,676,832)
5	Other (WSSC Administration)	($41,364)	($41,364)	($303,339)	($303,339)	($689,406)
6	**Total**	**($317,126)**	**($317,126)**	**($2,325,597)**	**($2,325,597)**	**($5,285,446)**

Table 6-24 Alternative 25 Summary of Recurring Cost and Benefit Inputs

No.	Item	Cost	Begin FY	End FY	Frequency
1	Flush FM	($1,032)	2023	2122	1
2	Pigging	($85,250)	2027	2122	5
3	Inspection (leaks, air pockets)	($68,867)	2032	2122	10
4	Access route maintenance	$0			
5	ARV inspection/exercise	($1,920)	2023	2122	1
6	ARV replacement	($14,158)	2042	2122	20
7	Access port maintenance	($1,440)	2023	2122	1
8	Electricity Consumption - Pump/Motors	($4,299)	2023	2122	1
9	Pump/Motor Replacement	($160,000)	2062	2122	40
10	Odor control media replacement	($1,890)	2024	2122	2
11	Pump/Motor salvage value	$80,000	2122	2122	1

6.1.3 LCA Results

Based on the nature of the Spring Gardens Force Main business case evaluation, it was determined that an LCA is necessary to evaluate the alternatives. The LCA examines the total cost of ownership over the life of the asset(s) associated with implementing each of the alternatives selected for analysis. The analysis examines the expected capital, operations and maintenance (O&M), and other costs related to each alternative. The analysis also examines any financial operating benefits associated with the alternatives. The costs are forecast over the life of the asset(s), taking into account factors such as inflation. The future value of the costs (i.e., nominal costs) for each alternative are then discounted to determine the cumulative net present value for each alternative. For the LCA, a higher cumulative net present value (i.e., lower costs) is the preferred result. The cumulative net present value for each alternative is then annuitized and compared to the annuitized cost for Alternative 1 – Do Nothing/Status Quo in order to determine the marginal annuitized cost.

Alternative 12 – New FM, Existing Alignment + Marlboro, Open Cut, WWPS Access, No Redundancy is the highest ranked alternative in terms of annuitized cost. The second ranked alternative based on the annuitized cost is Alternative 24 – New FM, Kingstead Road, Open Cut, WWPS Access, No Redundancy. The margin of difference between the annuitized cost of the top two ranked alternatives is 0.9%. This means that the second ranked alternative is 0.9% more expensive than the top ranked alternative on an annuitized basis. The difference between the top ranked alternative and the bottom ranked alternative in terms of annuitized cost is 18.5%. This shows that the 12 alternatives are grouped fairly close in terms of annuitized cost, as the difference between the highest ranked and lowest ranked alternatives is less than 20.0%.

Table 6-25 summarizes the LCA results.

Table 6-25 Summary of LCA Results

#	Alternative	Analysis Period	Future Value (Nominal)	Cumulative Net Present Value	Annuitized Cost	Marginal Annuitized Cost	Rank
1	Do Nothing/Status Quo	55	($7,797,204)	($6,548,138)	($296,180)	$0	4
8	New FM, Existing Alignment + Marlboro, Open Cut, WWPS + 1,000’ Access, No Redundancy	106	($26,047,858)	($7,481,124)	($304,002)	($7,822)	6
12	New FM, Existing Alignment + Marlboro, Open Cut, WWPS Access, No Redundancy	106	($24,283,845)	($7,017,810)	($285,175)	$11,005	1
13	New FM, Existing Alignment + Marlboro, Open Cut, WWPS + 2,500’ Access, No Redundancy	106	($25,165,851)	($7,249,467)	($294,588)	$1,592	3
18	New FM, Existing Alignment + Marlboro, HDD, WWPS Access, No Redundancy	105	($24,565,727)	($7,817,818)	($317,886)	($21,706)	9
19	New FM, Existing Alignment + Marlboro, HDD, WWPS + 2,500’ Access, No Redundancy	105	($25,421,624)	($8,046,426)	($327,182)	($31,001)	11
20	New FM, Kings Valley Road, Open Cut, WWPS + 1,000’ Access, No Redundancy	105	($28,773,986)	($8,313,352)	($338,035)	($41,855)	12
21	New FM, Kings Valley Road, Open Cut, WWPS Access, No Redundancy	105	($26,635,482)	($7,740,356)	($314,736)	($18,556)	7
22	New FM, Kings Valley Road, Open Cut, WWPS + 2,500’ Access, No Redundancy	105	($27,490,510)	($7,969,219)	($324,042)	($27,862)	10
23	New FM, Kingstead Road, Open Cut, WWPS + 1,000’ Access, No Redundancy	105	($29,930,596)	($7,761,350)	($315,590)	($19,410)	8
24	New FM, Kingstead Road, Open Cut, WWPS Access, No Redundancy	105	($27,363,644)	($7,073,083)	($287,604)	$8,577	2
25	New FM, Kingstead Road, Open Cut, WWPS + 2,500’ Access, No Redundancy	105	($28,220,543)	($7,303,625)	($296,978)	($798)	5

6.2 RRA

6.2.1 RRA Description

An RRA examines the risk outcomes associated with implementing each of the alternatives selected for analysis. The analysis examines the potential failure event(s) and the consequence of failure (COF), probability of failure (POF), and mitigation factor (MF) associated with the failure event(s). The COF, POF, and MF are multiplied by each other for each alternative to determine the risk associated with the failure event(s). The risk outcomes for each alternative are then compared to the baseline risk outcome, which in this instance is equivalent to the risk related to Alternative 1, in order to determine the risk reduction afforded by each alternative. Finally, the annual risk reduction is compared to the annuitized cost of each alternative, as determined in the LCA, in order to compare the cost effectiveness of each alternative on a risk reduced per dollar spent basis.

6.2.2 RRA Assumptions and Inputs

6.2.2.1 RRA Assumptions and Inputs

The failure event is when the FM pipeline ruptures resulting in a sanitary sewer overflow (SSO).

6.2.2.2 General

The following general COF assumptions are applicable to all alternatives.

- An SSO is assumed to release 20% of the average daily flow (ADF). Model results from the report *Damascus Basin Wet Weather Capacity Reevaluation*, dated September 13, 2010, indicate the ADF is 0.09 mgd. 20% of this is 0.018 mgd or 18,000 gallons per day.
- Each repair replaces 20 feet of FM.
- Initial repair completed on an emergency basis within one day of discovery and includes 200 feet of CCTV inspection immediately upstream and downstream (400 feet total) of the repair.
- After repair, FM is put on bypass for further inspection:
    - Bypass pumping requires 1 day for setup and can fuse 900 feet of bypass piping per day.
    - FM inspection includes leak and air pocket detection for all pipe materials and wall thickness for DIP only.
- SSO fines per day are based on the values set in the EPA Consent Decree:
    - $125 – less than 100 gallons.
    - $750 – 100 to 2,499 gallons.
    - $1,250 – 2,500 to 9,999 gallons.
    - $4,700 – 10,000 to 99,999 gallons.

  - $10,000 – 100,000 to 999,999 gallons.
  - $15,000 – 1 million gallons or greater.
- SSO cleanup costs are $1/gallon.
- Total SSO volume is based on the length of time before it is repaired.
  - ESA areas – 3 days
  - Non-ESA areas – 1 day
- No adjacent WSSC or non-WSSC assets are damaged by a pipeline failure and subsequent repair.
- The only community impacts are odor and noise.
- There are no injuries.
- Public health impacts are minor.
- Media coverage is neutral and lasts for 1 week in ESA areas and 3 months in non-ESA areas.
- Duration of environmental impacts to the stream is more than one week. Magnitude of impact is based on the percent of the FM in an ESA. Non-ESA impacts are minor, and ESA impacts are major.
- Impact on fauna is minor, and there are no endangered species in the area.
- WSSC legal costs are minor for all alignments.
- POFs are calculated as 1 divided by the service life.
- The total MF for each alternative is computed as the product of each contributing MF. The following MFs are considered:
  - Emergency response plan – 20% mitigation (0.80 MF).
  - Access port at the WWPS – 25% mitigation (0.75 MF).
  - Access every 1,000 feet along the FM – 15% mitigation (0.85 MF).
  - Access every 2,500 feet along the FM – 10% mitigation (0.90 MF).

6.2.2.3 Alternative 1 Do Nothing

A failure in the FM results in an SSO either within the stream valley or between the houses near existing transition manhole 15051110. For this evaluation, the failure is assumed to occur within the stream valley since the cost of access exceeds the costs associated with private property impacts. Repair requires constructed access, installation of approximately 20 feet of new 8-inch DIP CL54 FM, and site restoration. The constructed access is assumed to be 1,300 feet long, which is the average distance to the midpoint between any two adjacent proposed accesses.

The following table summarizes the COF inputs for this failure event for this alternative based on the assumptions detailed above.

Table 6-26 Summary of COF Inputs for Alternative 1

No.	Item	Cost	RRA Tool Generated Value?	Parameters
1	Damage to failed WSSC assets	($657,000)	N/A	
2	Damage to adjacent WSSC assets	-	-	
3	Damage to non-WSSC assets	-	-	
4	Loss of WSSC asset contents	-	-	
5	Value of lost WSSC service	-	-	
6	Value of lost non-WSSC services	-	-	
7	Cleanup costs	($54,000)	No	54,000 gallons
8	General impacts on the community - level of service loss	($670)	Yes	Odor: residential, 2 people, 1 week Noise: residential, 13 people, 3 days
9	Total cost of injuries	-	-	
10	Public health impacts	($5,000)	Yes	Minor, 10 people
11	Loss of WSSC public image	($5,000)	Yes	Neutral coverage, 1 week
12	Long term impact on the environment	($1,200,000)	Yes	River/creek, more than 1 week, major
13	Impact on fauna	($100,000)	Yes	Minor, no endangered species
14	WSSC legal costs	($50,000)	Yes	Minor
15	Fines levied on WSSC	($14,100)	No	$4,700/day per EPA Consent Decree
	Total	($2,085,770)		

The base POF for these alternatives is 1/50 or 2%. Alternative 1 has an emergency response plan. This results in a total MF of 0.8.

6.2.2.4 Alternatives 8, 12, 13, 18 and 19 Assumptions

A failure of the FM results in an SSO either within the stream valley or along Marlboro Drive. For this evaluation, the failure is assumed to occur within the stream valley since the access cost exceeds the costs associated with private property impacts. Repair requires constructed access, installation of approximately 20 feet of new 10-inch HDPE DR11 pipe, and site restoration. The constructed access is assumed to be 1,300 feet long, which is the average distance to the midpoint between any two adjacent proposed accesses.

The following table summarizes the COF inputs for these alternatives based on the assumptions detailed above.

Table 6-27 Summary of COF Inputs for Alternative 8, 12, 13, 18 and 19

No.	Item	Cost	RRA Tool Generated Value?	Parameters
1	Damage to failed WSSC assets	($500,000)	N/A	
2	Damage to adjacent WSSC assets	-	-	
3	Damage to non-WSSC assets	-	-	
4	Loss of WSSC asset contents	-	-	
5	Value of lost WSSC service	-	-	
6	Value of lost non-WSSC services	-	-	
7	Cleanup costs	($54,000)	No	54,000 gallons
8	General impacts on the community - level of service loss	($1,080)	Yes	Odor: residential, 3 people, 1 week Noise: residential, 22 people, 3 days
9	Total cost of injuries	-	-	
10	Public health impacts	($5,000)	Yes	Minor, 10 people
11	Loss of WSSC public image	($5,000)	Yes	Neutral coverage, 1 week
12	Long term impact on the environment	($1,200,000)	Yes	River/creek, more than 1 week, major
13	Impact on fauna	($100,000)	Yes	Minor, no endangered species
14	WSSC legal costs	($50,000)	Yes	Minor
15	Fines levied on WSSC	($14,100)	No	$4,700/day per EPA Consent Decree
	Total	($1,929,180)		

The base POF for these alternatives is 1/100 or 1%; however, HDPE has a higher POF in the first 5 years because of the possibility that the pipe bedding may not have been properly constructed. The POF for the first 5 years is increased to 2% to account for this. An average POF is calculated over the 100-year life of the pipe, resulting in a final POF of 1.05%. Alternative 8 has an emergency response plan, an access port at the WWPS, and access ports every 1,000 feet. This results in a total MF of 0.51. Alternatives 12 and 18 have emergency response plans and an access ports at the WWPS, but no access ports along the alignment. This results in a total MF of 0.60. Alternatives 13 and 19 have emergency response plans and an access ports at the WWPS, and access ports every 2,500 feet. This results in a total MF of 0.54.

6.2.2.5 Alternatives 20, 21 and 22 Assumptions

A failure in the existing FM results in an SSO along Kings Valley Road. Repair requires installation of approximately 20 feet of new 10-inch HDPE DR11 pipe and site restoration.

The following table summarizes the COF inputs for these alternatives based on the assumptions detailed above.

Table 6-28 Summary of COF Inputs for Alternatives 20, 21and 22

No.	Item	Cost	RRA Tool Generated Value?	Parameters
1	Damage to failed WSSC assets	($294,200)	N/A	
2	Damage to adjacent WSSC assets	-	-	
3	Damage to non-WSSC assets	-	-	
4	Loss of WSSC asset contents	-	-	
5	Value of lost WSSC service	-	-	
6	Value of lost non-WSSC services	-	-	
7	Cleanup costs	($18,000)	No	18,000 gallons
8	General impacts on the community - level of service loss	($1,600)	Yes	Odor: residential, 10 people, 3 days Noise: residential, 100 people, 1 day
9	Total cost of injuries	-	-	
10	Public health impacts	($50,000)	Yes	Minor, 100 people
11	Loss of WSSC public image	($20,000)	Yes	Neutral coverage, 3 months
12	Long term impact on the environment	($400,000)	Yes	River/creek, more than 1 week, minor
13	Impact on fauna	($100,000)	Yes	Minor, no endangered species
14	WSSC legal costs	($50,000)	Yes	Minor
15	Fines levied on WSSC	($4,700)	No	$4,700/day per EPA Consent Decree
	Total	($938,500)		

The base POF for these alternatives is 1/100 or 1%; however, HDPE has a higher POF in the first 5 years because of the possibility that the pipe bedding may not have been properly constructed. The POF for the first 5 years is increased to 2% to account for this. An average POF is calculated over the 100-year life of the pipe, resulting in a final POF of 1.05%. Alternative 20 has an emergency response plan, an access port at the WWPS, and access ports every 1,000 feet. This results in a total MF of 0.51. Alternative 21 has an emergency response plan and an access port at the WWPS, but no access ports along the alignment. This results in a total MF of 0.60. Alternative 21 has an emergency response plan, an access port at the WWPS, and access ports every 2,500 feet. This results in a total MF of 0.54.

6.2.2.6 Alternatives 23, 24 and 25 Assumptions

A failure in the existing FM results in an SSO along Kingstead Road, Oak Drive, or Ridge Road. Repair requires installation of approximately 20 feet of new 10-inch HDPE DR11 pipe and site restoration.

The following table summarizes the COF inputs for this alternative based on the assumptions detailed above.

Table 6-29 Summary of COF Inputs for Alternatives 23, 24 and 25

No.	Item	Cost	RRA Tool Generated Value?	Parameters
1	Damage to failed WSSC assets	($399,700)	N/A	
2	Damage to adjacent WSSC assets	-	-	
3	Damage to non-WSSC assets	-	-	
4	Loss of WSSC asset contents	-	-	
5	Value of lost WSSC service	-	-	
6	Value of lost non-WSSC services	-	-	
7	Cleanup costs	($18,000)	No	18,000 gallons
8	General impacts on the community - level of service loss	($1,600)	Yes	Odor: residential, 10 people, 3 days Noise: residential, 100 people, 1 day
9	Total cost of injuries	-	-	
10	Public health impacts	($50,000)	Yes	Minor, 100 people
11	Loss of WSSC public image	($20,000)	Yes	Neutral coverage, 3 months
12	Long term impact on the environment	($400,000)	Yes	River/creek, more than 1 week, minor
13	Impact on fauna	($100,000)	Yes	Minor, no endangered species
14	WSSC legal costs	($50,000)	Yes	Minor
15	Fines levied on WSSC	($4,700)	No	$4,700/day per EPA Consent Decree
	Total	($1,044,000)		

The base POF for both alternatives is 1/100 or 1%; however, HDPE has a higher POF in the first 5 years due to the possibility that the pipe bedding may not have been properly constructed. The POF for the first 5 years is increased to 2% to account for this. An average POF is calculated over the 100-year life of the pipe, resulting in a final POF of 1.05%. Alternative 23 has an emergency response plan, an access port at the WWPS, and access ports every 1,000 feet. This results in a total MF of 0.51. Alternative 24 has an emergency response plan and an access port at the WWPS, but no access ports along the alignment. This results in a total MF of 0.60. Alternative 25 has an emergency response plan, an access port at the WWPS, and access ports every 2,500 feet. This results in a total MF of 0.54.

6.2.2.7 FE Summary

The following table summarizes the COF, POF, and MF inputs for this failure event for each alternative based on the assumptions detailed in the previous sections. The total annual risk associated with each alternative is the product of the COF, POF, and MF.

Table 6-30 FE Event Summary

#	Alternative	COF	POF	Mitigation Type	MF	Annual Risk
1	Do Nothing/Status Quo	$2,085,770	2.00%	Emergency Response Plan	80.00%	$33,372
8	New FM, Existing Alignment + Marlboro, Open Cut, WWPS + 1,000’ Access, No Redundancy	$1,929,180	1.05%	Emergency Response Plan; WWPS Access; 1,000’ Access	51.00%	$10,331
12	New FM, Existing Alignment + Marlboro, Open Cut, WWPS Access, No Redundancy	$1,929,180	1.05%	Emergency Response Plan; WWPS Access	60.00%	$12,154
13	New FM, Existing Alignment + Marlboro, Open Cut, WWPS + 2,500’ Access, No Redundancy	$1,929,180	1.05%	Emergency Response Plan; WWPS Access; 2,500’ Access	54.00%	$10,938
18	New FM, Existing Alignment + Marlboro, HDD, WWPS Access, No Redundancy	$1,929,180	1.05%	Emergency Response Plan; WWPS Access	60.00%	$12,154
19	New FM, Existing Alignment + Marlboro, HDD, WWPS + 2,500’ Access, No Redundancy	$1,929,180	1.05%	Emergency Response Plan; WWPS Access; 2,500’ Access	54.00%	$10,938
20	New FM, Kings Valley Road, Open Cut, WWPS + 1,000’ Access, No Redundancy	$938,500	1.05%	Emergency Response Plan; WWPS Access; 1,000’ Access	51.00%	$5,026
21	New FM, Kings Valley Road, Open Cut, WWPS Access, No Redundancy	$938,500	1.05%	Emergency Response Plan; WWPS Access	60.00%	$5,913
22	New FM, Kings Valley Road, Open Cut, WWPS + 2,500’ Access, No Redundancy	$938,500	1.05%	Emergency Response Plan; WWPS Access; 2,500’ Access	54.00%	$5,321
23	New FM, Kingstead Road, Open Cut, WWPS + 1,000’ Access, No Redundancy	$1,044,000	1.05%	Emergency Response Plan; WWPS Access; 1,000’ Access	51.00%	$5,591
24	New FM, Kingstead Road, Open Cut, WWPS Access, No Redundancy	$1,044,000	1.05%	Emergency Response Plan; WWPS Access	60.00%	$6,577
25	New FM, Kingstead Road, Open Cut, WWPS + 2,500’ Access, No Redundancy	$1,044,000	1.05%	Emergency Response Plan; WWPS Access; 2,500’ Access	54.00%	$5,919

6.2.3 RRA Results

Table 6-31 below summarizes the RRA results for each alternative. The highest ranked alternative in terms of the cost effectiveness factor is Alternative 24 – New FM, Kingstead Road, Open Cut, WWPS Access, No Redundancy. The second ranked alternative is Alternative 12 – New FM, Existing Alignment + Marlboro, Open Cut, WWPS Access, No Redundancy. Both of these alternatives have a negative cost effectiveness factor because of their annuitized costs being lower than the baseline alternative, which leads to positive marginal annuitized costs. Therefore, the method for comparing these alternatives is based on the absolute values of their marginal annuitized costs and annual risk reduction. The sum of these values is $35,372 for Alternative 24 and $32,224 for Alternative 12. Based on these figures, the margin of difference between the two top ranked alternatives is 8.9%. This means that the second ranked alternative is 8.9% less cost effective than the top ranked alternative.

Table 6-31 summarizes the RRA results.

Table 6-31 RRA Results Summary

#	Alternative	Marginal Annuitized Cost	Total Annual Risk	Annual Risk Reduction	Cost Effectiveness Factor	Rank
		A	B	C	D = (C ÷ A)	
1	Do Nothing/Status Quo	$0	$33,372	$0	0.000	9
8	New FM, Existing Alignment + Marlboro, Open Cut, WWPS + 1,000' Access, No Redundancy	($7,822)	$10,331	($23,042)	2.95	5
12	New FM, Existing Alignment + Marlboro, Open Cut, WWPS Access, No Redundancy	$11,005	$12,154	($21,218)	(1.93)	2
13	New FM, Existing Alignment + Marlboro, Open Cut, WWPS + 2,500' Access, No Redundancy	$1,592	$10,938	($22,434)	(14.09)	3
18	New FM, Existing Alignment + Marlboro, HDD, WWPS Access, No Redundancy	($21,706)	$12,154	($21,218)	0.98	10
19	New FM, Existing Alignment + Marlboro, HDD, WWPS + 2,500' Access, No Redundancy	($31,001)	$10,938	($22,434)	0.72	11
20	New FM, Kings Valley Road, Open Cut, WWPS + 1,000' Access, No Redundancy	($41,855)	$5,026	($28,347)	0.68	12
21	New FM, Kings Valley Road, Open Cut, WWPS Access, No Redundancy	($18,556)	$5,913	($27,460)	1.48	6
22	New FM, Kings Valley Road, Open Cut, WWPS + 2,500' Access, No Redundancy	($27,862)	$5,321	($28,051)	1.01	8
23	New FM, Kingstead Road, Open Cut, WWPS + 1,000' Access, No Redundancy	($19,410)	$5,591	($27,782)	1.43	7
24	New FM, Kingstead Road, Open Cut, WWPS Access, No Redundancy	$8,577	$6,577	($26,795)	(3.12)	1
25	New FM, Kingstead Road, Open Cut, WWPS + 2,500' Access, No Redundancy	($798)	$5,919	($27,453)	34.42	4

6.3 Sensitivity Analysis

6.3.1 Description

The business case analysis is based on a number of assumptions, so a sensitivity analysis is performed to ensure that the optimal alternative is recommended. Different scenarios were evaluated and are summarized in the following sections.

The following areas of uncertainty were identified and analyzed. Each of these parameters was subjected to a sensitivity analysis, detailed below.

- Inflation rates
- Discount rates

6.3.2 Inflation and Discount Rates Sensitivity Analysis

The inflation rate represents the rate at which the costs for goods and services are increasing year after year, and the discount rate represents the rate at which WSSC can borrow money. These rates are difficult to predict over the full length of the analysis period. The primary analysis is conducted with an inflation rate of 3% and a discount rate of 4%. For this sensitivity analysis the inflation rate is varied from 0% to 6%, and the discount rate is varied from 1% to 7%. Changing these rates affects both the LCA and RRA tool results.

The results of the LCA are sensitive to changes in the inflation and discount rates. The top ranked alternative in the primary analysis, Alternative 12 – New FM, Existing Alignment + Marlboro, Open Cut, WWPS Access, No Redundancy, is only the top ranked alternative in 7 of the 49 scenarios, which equates to 14.3%. Alternative 24 – New FM, Kingstead Road, Open Cut, WWPS Access, No Redundancy is the top ranked alternative in 21 of the 49 scenarios, or 42.9%. The top ranked alternative in the remaining 21 scenarios is Alternative 1 – Do Nothing/Status Quo.

See Table 6-32 for a summary of the LCA sensitivity analysis results. Each cell contains the top ranked alternative for that combination of discount and inflation rates. The blue outlined cell denotes the primary analysis conditions.

Table 6-32 Inflation and Discount Rate LCA Annuitized Costs Sensitivity Analysis Results

		Discount Rate						
		1.0%	2.0%	3.0%	4.0%	5.0%	6.0%	7.0%
Inflation Rate	0.0%	12	24	24	24	24	24	24
	1.0%	12	12	24	24	24	24	24
	2.0%	12	12	12	24	24	24	24
	3.0%	1	1	1	12	24	24	24
	4.0%	1	1	1	1	1	24	24
	5.0%	1	1	1	1	1	1	24
	6.0%	1	1	1	1	1	1	1

The results of the inflation and discount rate sensitivity analyses show that the results for the RRA are also sensitive to changes in those variables. The top ranked alternative in the primary analysis, Alternative 24 – New FM, Kingstead Road, Open Cut, WWPS Access, No Redundancy, is the top ranked alternative in 26 of the 49 scenarios, which equates to 53.1% of the scenarios. Alternative 12 – New FM, Existing Alignment + Marlboro, Open Cut, WWPS Access, No Redundancy, which is the second ranked alternative in the primary analysis, is the top ranked alternative in 5 of the 49 sensitivity analysis scenarios (10.2%). Alternative 1 – Do Nothing/Status Quo is the top ranked alternative in the remaining 18 scenarios (36.7%). See Table 6-33 for a summary of the RRA sensitivity analysis results. Each cell contains the top ranked alternative for that combination of discount and inflation rates. The blue outlined cell denotes the primary analysis conditions.

Table 6-33 Inflation and Discount Rate RRA Sensitivity Analysis Results

		Discount Rate						
		1.0%	2.0%	3.0%	4.0%	5.0%	6.0%	7.0%
Inflation Rate	0.0%	24	24	24	24	24	24	24
	1.0%	24	24	24	24	24	24	24
	2.0%	12	12	24	24	24	24	24
	3.0%	1	1	12	24	24	24	24
	4.0%	1	1	1	1	12	24	24
	5.0%	1	1	1	1	1	12	24
	6.0%	1	1	1	1	1	1	1

7 Recommended Alternative

Given the results of the primary analysis and that Alternative 24 was the top ranked alternative in over 50.0% of the inflation and discount rate scenarios, Alternative 24 is the preferred alternative.

Table 7-1 Recommended Alternative Preliminary Implementation Schedule

Phase	Task	Time Frame
1	Project development	July 2018 – September 2018
2	Land Acquisition	N/A
3	Design and permitting	October 2018 – March 2020
4	Bidding and procurement	April 2020 – September 2020
5	Construction	October 2020 – March 2022

Table 7-2 Summary of Capital Costs Inputs

Task		FY 2019	FY 2020	FY 2021	FY 2022	Total
1	Planning, Design, and Supervision					
	Planning, Permitting, Design	($266,582)	($266,582)	$0	$0	($533,164)
	Design Services During Construction	$0	$0	($177,722)	($177,722)	($355,444)
2	Land	$0	$0	$0	$0	$0
3	Site Improvements and Utilities	$0	$0	$0	$0	$0
4	Construction	$0	$0	($1,777,216)	($1,777,216)	($3,554,432)
5	Other (WSSC Administration)	($39,987)	($39,987)	($293,241)	($293,241)	($666,456)
6	**Total**	**($306,569)**	**($306,569)**	**($2,248,179)**	**($2,248,179)**	**($5,109,496)**

Step 1:See Appendix D for additional construction cost details.

During the Evaluation Results Workshop, several members of the project team expressed a preference for Alternative 25 due to the increased availability of access ports along the FM compared with Alternative 24. The associated cost increase for Alternative 25 is less than 4% over the cost of the preferred Alternative 24. Given the similarities in costs, it was noted that additional access ports could be considered during detailed design.

Appendix A: Revision History

Revision History

Rev No.	Description of Revision	Revised By	Date
0	Initial submittal.		
1			
2			
3			
4			

Appendix B: List of Acronyms

List of Acronyms

ACRONYM	PHRASE
AMP	Asset Management Program
ASM	Asset Strategy Manager
BCE	Business Case Evaluation
CBA	Cost Benefit Analysis
CIP	Capital Improvement Program
COF	Consequence of Failure
ESP	Engineering Support Program
FM	Force Main
LOS PM	Level of Service Performance Measure
LCA	Lifecycle Cost Analysis
MF	Mitigation Factor
NASM	Network Asset Strategy Manager
OAM	Office of Asset Management
PEL	Physical Effective Lifespan
PIF	Project Initiation Form
PNPC	Project Needs Planning Committee
PNVP	Project Needs Validation Process
POF	Probability of Failure
RRA	Risk Reduction Analysis
SASM	System Asset Strategy Manager
TSG	Technical Services Group
WSSC	Washington Suburban Sanitary Commission
WWPS	Wastewater Pump Station

Appendix C: Comment Registry

1 Comment Registry Information

Job No. 23202574P
Task Order 2
Spring Gardens WWPS and FM Business Case Evaluation

Contract No. PM0012A16
Project No. 196544

Project Team Members			
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2 Purpose of the Comment Registry

The purpose of the comment registry is to document questions raised during meetings of the project team that are not answered during the meeting. The registry is designed to document the person that raised the question, when the question was raised, the question raised, the response to the question, and the person who provided the subsequent response. In a similar fashion, the comment registry also serves to document the comments received from the project team on the draft business case evaluation report. Comments presented in brackets [ ] reflect paraphrasing of verbal comments reflected in the meeting minutes or the addition of clarifying text.

3 Comment Registry

Comment Number	Reference	Comment Date	Commenter	Comment	Response Date	Responder	Response
1	Alternative Screening Workshop	10/23/2017	WSSC	What are the ROW widths for the proposed road alignments?	10/31/2017	E.B. Houston	KingsValley Road ROW is 70'. Kingstead Road ROW varies from 60' to 80'. Oak Drive ROW is 60'. Ridge Road ROW varies from 50' to 120'.
2	Alternative Screening Workshop	10/23/2017	WSSC	Preferred force main material is HDPE DR 11.	10/31/2017	E.B. Houston	Material will be updated to use HDPE SDR 11. B&V noted that WSSC design guidelines currently only allow use of HDPE for up to 130 psi working + surge pressure. WSSC confirmed the design guidelines are being revised to allow for working + surge up to 200 psi. B&V confirmed that all alternatives being considered meet that criteria.
3	Alternative Screening Workshop	10/23/2017	WSSC	Current WSSC guidelines allow HDPE for open cut only. A variance will be required to use for HDD.	10/31/2017	E.B. Houston	Alternative Screening Memo will be updated to include this requirement.
4	Alternative Screening Workshop	10/23/2017	WSSC	HDPE has a 100 year lifespan. This should be used as the length of analysis period.	10/31/2017	E.B. Houston	All HDPE alternatives will use an analysis period of 100 years.
5	Alternative Screening Workshop	10/23/2017	WSSC	The separate FM business case is being finalized. The results of that analysis will directly affect which proposed alternatives will move forward for detailed analysis.	10/31/2017	E.B. Houston	Results provided by WSSC support eliminating all rehabilitation and redundancy alternatives. B&V to keep full and partial access alternatives.
6	Alternative Screening Workshop	10/23/2017	WSSC	Was pipe bursting considered?	10/31/2017	E.B. Houston	Pipe bursting was considered but was only be relevant to Alternative 6 (originally submitted as Alternative 7). The presence of concrete encasement on the existing force main at all stream crossing further limits the usefulness of this method. It was therefore not included in the presented alternatives. A discussion of this will be added to the Alternative Screening Memo.
7	Alternative Screening Workshop	10/23/2017	WSSC	If the existing force main is abandoned, it must be filled with flowable fill.	10/31/2017	E.B. Houston	Costs associated with filling the force main will be included in the analysis.
8	Alternative Screening Workshop	10/23/2017	WSSC	What is the lifespan for a force main that has been CIPP lined?	10/31/2017	E.B. Houston	50 years per EPA and ASTM F1216.
9	Alt. Screening Memo (10-18-2017): General	10/27/2017	C. Mojica	"Existing force main difficult to properly abandon". Is that statement still true? I thought that Aaron stated that additional entry points were constructed along the force main?	10/31/2017	E.B. Houston	One temporary access point was constructed for recent work but has since been removed. That alignment could be reused for abandonment, but much of the remaining force main will still require additional access. B&V will include all required access in the detailed analysis.
10	Alt. Screening Memo (10-18-2017): Alts 14 & 15 Conceptualization	10/27/2017	C. Mojica	Why are "Construction Costs" not a con in Alternatives [16 and 18 (originally numbered 14 & 15)]? How much more are the construction costs of the other alternatives compared to these 2 alternatives? Maybe that can be quantified more like 20% higher construction costs than alternative 14 & 15 since I appears that these alternatives are used as a benchmark.	10/31/2017	E.B. Houston	Construction cost benchmarks are considered to be the Do Nothing/Status Quo alternative (no construction costs) since all other alternatives will have higher construction costs. These have now been combined into new Alternative 1 (per Comment 36) which does have construction. The "con" will be revised as needed in the updated Alternative Screening memo.

Comment Number	Reference	Comment Date	Commenter	Comment	Response Date	Responder	Response
11	Alt. Screening Memo (10-18-2017): General	10/27/2017	C. Mojica	Will the changes in the new pipeline design manual impact the pros and cons of these alternatives significantly?	10/31/2017	E.B. Houston	Velocities and total dynamic head are higher for a given diameter because HDPE has thicker walls and a corresponding smaller ID. 1. The original report primarily considered 10" PVC DR 14, which has an internal diameter of 9.514" and velocity of 4.07 fps at 1.3 mgd. 2. 10" HDPE DR 11 has an ID of 8.96" and velocity of 4.59 fps at 1.3 mgd. This results in approximately 15' higher total system head compared to PVC. **3.** Since 10" HDPE meets the revised WSSC design guidelines (see response to Item 2), all alternatives other than Do Nothing/Status Quo will use 10" HDPE SDR 11.
12	Alt. Screening Memo (10-18-2017): Alts 3 – 6 Conceptualization	10/27/2017	C. Mojica	I don't understand how we can use the original force main as an alternative (retrofit) when we do not know the condition of the force main. If any of these retrofit options are chosen to be explored in more detail will inspections be performed? And will the costs of these inspections be beneficial overall? I would recommend to remove all the retrofit alternatives.	10/31/2017	E.B. Houston	The unknown condition will be accounted for either through additional costs in the LCA or additional risk in the RRA. Any required inspection work will be performed prior to detailed design.
13	Alt. Screening Memo (10-18-2017): General	10/27/2017	C. Mojica	Alternatives [16 (originally Alternative 14)] seems to be the best to me.	10/31/2017	E.B. Houston	No comment.
14	Alt. Screening Memo (10-18-2017): General	10/27/2017	M. Bill	Due to the following reasons, I like Alternative [16 (originally Alternative 14)] which is new 10" FM along Kings Valley Road. a. Big plus – it avoids the stream bed. b. It is also shorter than the other non-stream bed option [18 (originally Alternative 15)]. c. It can be all open-cut, which the memo says costs less . d. The TDH is higher, but after considering, all the TDHs are high, so a good selection for the forcemain should not be hindered by worrying about the PS. e. The entire route is along the road, thus easy access and construction, and no special extra roads or pathways are required.	10/31/2017	E.B. Houston	No comment.
15	Alt. Screening Memo (10-18-2017): General	10/27/2017	M. Bill	The consultant should revise with some revised numbers given HDPE DR 11 as described in the 2017 Pipeline Design Manual (link below), and address the fact there is less maintenance (if any) due to there being no pipe joints and high corrosion resistance.	10/31/2017	E.B. Houston	See response to Comments 2 and 11 above.

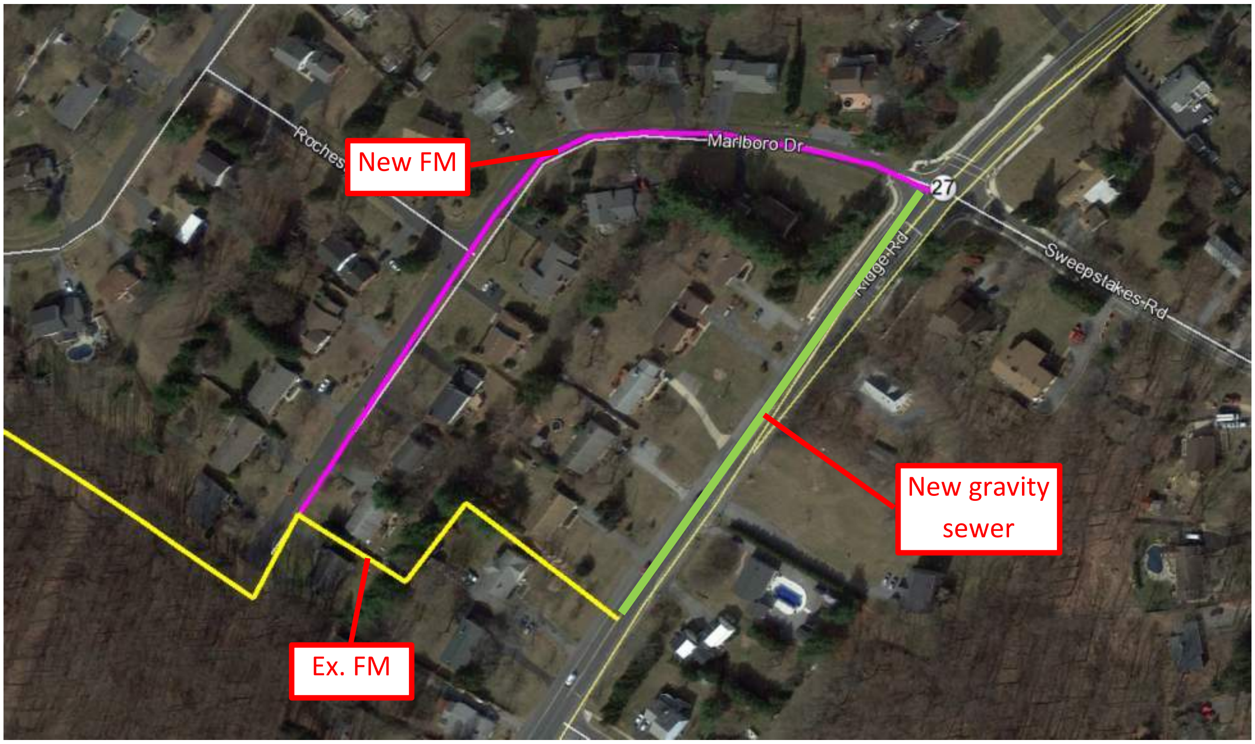
Comment Number	Reference	Comment Date	Commenter	Comment	Response Date	Responder	Response
16	Alt. Screening Memo (10-18-2017): General	10/27/2017	M. Kornhauser	New Pipeline Design Manual 2017- Page S-24.3: [Calls for HDPE DR 11 for 12" and smaller force mains, assuming all pressure conditions are met.]	10/31/2017	E.B. Houston	See response to Comments 2 and 11 above.
17	Alt. Screening Memo (10-18-2017): Alt. 7 Conceptualization	10/27/2017	M. Kornhauser	The new FM in existing alignment, with open cut should account for the access roads into stream valley and the associated clearing of trees, laying down Environmental protection access roads, construction entrances, sediment control devices and re-planting the trees (WSSC practices).	10/31/2017	E.B. Houston	These items will be included as additional construction costs in the LCA.
18	Alt. Screening Memo (10-18-2017): Alt. 7 Conceptualization	10/27/2017	M. Kornhauser	The existing Easement that already contains the gravity sewer and the existing FM will need to be widened and that means to reach out to about 20+ existing land owners (grantors) along the line.	10/31/2017	E.B. Houston	Preference is to keep the FM in the existing easement. If it is determined that this is not possible, the costs and additional time associated with expanding the easement will be included in the LCA analysis.
19	Alt. Screening Memo (10-18-2017): Alt. 7 Conceptualization	10/27/2017	M. Kornhauser	The stream valley restoration should include permanent seeding, permanent tree restoration, permanent stabilization to prevent erosion. In areas with steep slopes it may require erosion checks straw bale dikes or filter logs. Also may require temporary stream protection, temporary stream crossings, temporary tree protections, temporary earth dikes and silt fences.	10/31/2017	E.B. Houston	These items will be included as additional construction costs in the LCA.
20	Alt. Screening Memo (10-18-2017): Alt. 7 Conceptualization	10/27/2017	M. Kornhauser	The environmental aspects of this construction will disturb the natural wildlife, the ex. stream and also residents living near the stream valley.	10/31/2017	E.B. Houston	These items will be included as additional construction costs in the LCA.
21	Alt. Screening Memo (10-18-2017): Alt. 7 Conceptualization	10/27/2017	M. Kornhauser	Problems in Ridge Rd and Marlboro Dr areas: Quick check on google maps revealed that between addresses 24604 Ridge Rd and 24608 Ridge Rd, full grown large evergreen trees are planted on top of the WSSC sewers. There is also a structure that appears to be a shed in 24605 Marlboro Dr. It would be helpful to investigate whether the trace of existing FM is feasible in those particular lots. The MMIS work order history shows leak repairs in those particular residential lots in 1999, 2001, 2003. In 2003 approx. +/-150' of 8"FM was replaced in address 24600 Marlboro Dr. The access, the clearing, the residential part, environmental, legal and construction constrains appear to have a huge impact on this Alternative.	10/31/2017	E.B. Houston	B&V will incorporate a FM alignment along Marlboro Drive into relevant new FM alternatives in place of using the existing easement between homes. See attached figure for the new alignment.
22	Alt. Screening Memo (10-18-2017): Alt. 7 Conceptualization	10/27/2017	M. Kornhauser	Future and maintenance: The current access appears to be very poor due to location of the existing FM. The current FM has no maintenance record, perhaps for this same reason, we should avoid making the same mistake. To maintain the future new FM in a stream valley will continue these challenges. Access roads may need to be created, easement acquired, access ports should be accessible.	10/31/2017	E.B. Houston	Permanently maintained access roads are to be part of this alternative and will be included as additional ongoing maintenance costs in the LCA.

Comment Number	Reference	Comment Date	Commenter	Comment	Response Date	Responder	Response
23	Alt. Screening Memo (10-18-2017): Alt. 8 Conceptualization	10/27/2017	M. Kornhauser	Comments from Alt7 apply to Alt8.	10/31/2017	E.B. Houston	See responses to Comments 17 – 22.
24	Alt. Screening Memo (10-18-2017): Alt. 8 Conceptualization	10/27/2017	M. Kornhauser	Some Test Borings are also available on existing contract 71AS4656D. These were done for the original design.	10/31/2017	E.B. Houston	Request for a higher resolution copy of the cover sheet for 71-4656D has been added to the Data Request Memo. Currently available copy is not legible.
25	Alt. Screening Memo (10-18-2017): Alt. 14 Conceptualization	10/27/2017	M. Kornhauser	We should know how wide is the ROW and investigate the existing water and sewer alignments. No additional ESMT is needed, that should be also included into “Pros”.	10/31/2017	E.B. Houston	Existing Kings Valley Road ROW is 70’. Gravity sewers exist along the northern half of the road. A 10” to 12” water main exists along most of the road. The road also contains an 8” gas line along the full length as well as buried telephone and electric along the northern half. There are occasional storm drains, but no extended storm sewers. The Alternative Screening Memo will be modified to include a discussion on easements and existing utility information.
26	Alt. Screening Memo (10-18-2017): Alt. 14 Conceptualization	10/27/2017	M. Kornhauser	Repaving- with partial HDD the re-paving could be balanced out especially in areas where the paving is newer. Variance to HDD an HDPE was discussed to be added. This alternative is very interesting and could be much faster in construction time compared to the Alt7 or 8.	10/31/2017	E.B. Houston	HDD is considered in the valley primarily to avoid access costs and environmental impacts. These items are not significant concerns for roadway installations. HDD is therefore not considered to be a competitive alternative for the roadway alignments.
27	Alt. Screening Memo (10-18-2017): Alt. 14 Conceptualization	10/27/2017	M. Kornhauser	Need County permit to cut pavement, may need temp. traffic control.	10/31/2017	E.B. Houston	The Alternative Screening Memo will be modified to include this requirement.
28	Alt. Screening Memo (10-18-2017): Alt. 14 Conceptualization	10/27/2017	M. Kornhauser	Pipe exposures not an issue anymore.	10/31/2017	E.B. Houston	The Alternative Screening Memo will be modified to include this as a “Pro.”
29	Alt. Screening Memo (10-18-2017): Alt. 15 Conceptualization	10/27/2017	M. Kornhauser	This alternative should include the HDPE, and partial HDD or even full HDD version.	10/31/2017	E.B. Houston	Material will be changed to HDPE (see response to Comments 2 and 11). See response to Item 26 for HDD.
30	Alt. Screening Memo (10-18-2017): Alt. 15 Conceptualization	10/27/2017	M. Kornhauser	Please do not forget to provide us rough hydraulic calculations with HDPE, that should have a C-value corresponding with approved manufacturer materials.	10/31/2017	E.B. Houston	Calculations will be provided as an appendix to the Alternative Screening Memo.
31	Alt. Screening Memo (10-18-2017): Alt. 15 Conceptualization	10/27/2017	M. Kornhauser	Can this length be reducing by 2,000’? Could there be a shorter possible alignment available via Greensboro Dr – Bellheaven Blvd- Middleboro Dr, and easement through couple of residential properties? Or Perhaps longer gravity.	10/31/2017	E.B. Houston	Such an alignment is possible utilizing existing gravity sewer easements, but the need to impact additional private property was considered highly undesirable. This alignment was therefore not developed further.
32	Alt. Screening Memo (10-18-2017): Alt. 15 Conceptualization	10/27/2017	M. Kornhauser	Maybe 140 or 150 [HW Coefficient] for HDPE DR11.	10/31/2017	E.B. Houston	WSSC DG-07 requires the use of 120 as the basis for development of the system curve.
33	Alt. Screening Memo (10-18-2017): Alt. 15 Conceptualization	10/27/2017	M. Kornhauser	Check what is the allowable total pressure rating of the HDPE that we would accept.	10/31/2017	E.B. Houston	2017 Force Main design guidelines allow for a total (working + surge) pressure of 130 psi.

Comment Number	Reference	Comment Date	Commenter	Comment	Response Date	Responder	Response
34	Alt. Screening Memo (10-18-2017): Alt. 15 Conceptualization	10/27/2017	M. Kornhauser	Need County permit. May need traffic control.	10/31/2017	E.B. Houston	The Alternative Screening Memo will be updated to include the County permit for roadwork. Traffic control will be part of the construction costs.
35	Alt. Screening Memo (10-18-2017): Alt. 15 Conceptualization	10/27/2017	M. Kornhauser	No need restorations, no need cut trees, will need only minimum sediment control. Pipe exposure are unlikely.	10/31/2017	E.B. Houston	The Alternative Screening Memo will be updated to include additional "Pros."
36	Alt. Screening Memo (10-18-2017)	12/7/2017	A. Carpio	Combine the Do Nothing and Status Quo alternatives into one. Since existing FM is at the end of its estimated useful life, assume it is replaced via open cut with new 8" DIP along the same alignment.	12/7/2017	E.B. Houston	Do Nothing and Status Quo alternatives will be combined and updated to include installation of a new 8" DIP FM via open cut.
37	Alt. Screening Memo (10-18-2017)	12/7/2017	A. Carpio	Include a partial access (access only at WWPS) version of all alternatives that currently have full access. Keep the full access version as well.	12/7/2017	E.B. Houston	Partial access variants of Alternatives 7, 11, 14, and 15 (originally 6, 11, 16, and 18 ; renumbered per this comment response) will be added. All alternatives will be renumbered to incorporate this comment and Comment 36. NOTE: All comments after this point will use the updated Alternative numbers.
38	Alt. Screening Memo (10-18-2017)	12/14/2017	A. Carpio	Use the modified alignment along Marlboro Drive for all new FM construction in the valley alternatives except for the Do Nothing/Status Quo alternative.	12/14/2017	E.B. Houston	The Marlboro Drive alignment will be used for Alternatives 6, 10, 11, 15, 16, 17, 18, and 19. See figure provided as part of Comment 21 response.
39	Alternative Screening Workshop	12/26/2017	M. Bill	Different options for pump design to meet the high head requirement may be possible and so should be presented for consideration by a design firm. Maybe this is best during the first 30% of design.	1/19/2018	E.B. Houston	Different pump arrangements were investigated during the 2015 Spring Garden WWPS business case. No other configurations were found to be practical for a WWPS of this size and flowrate.
40	Alternative Screening Workshop	12/26/2017	M. Bill	How feasible is a pump design over 200' of head? A dry pit station will likely be required, which is a more expensive station to build and operate (higher horsepowers). The dry pit station would accommodate pumps in series or larger pumps, whichever best suited, for the project.	1/19/2018	E.B. Houston	The business case assumes 2 dry pit pumps in series to meet the required head conditions.
41	Alternative Screening Workshop	12/26/2017	M. Bill	Is there a good pump selection for the proposed conditions? The flowrate and TDH should be as close to the pump's Best Efficiency Point (BEP) as possible.	1/19/2018	E.B. Houston	Vendors have provided reference pumps that can meet the flow and head conditions while operating within the Preferred Operating Range.
42	Alternative Screening Workshop	12/26/2017	M. Bill	WSSC does not have details yet developed for HDPE force mains, like for clean outs and access. Consultant would have to develop those if required.	1/19/2018	E.B. Houston	All access port costs are based on the reference details provided by WSSC. These details will be modified during detailed design to meet the specific pipe criteria, but this should not significantly change the estimate costs.
43	Evaluation Assumptions Workshop	1/10/2018	WSSC	Since the Do Nothing/Status Quo alternative is constructing a new FM, should it also follow all current design guidelines: access port at WWPS and every 1,000' feet, full maintenance?	1/19/2018	E.B. Houston	In discussions with the WSSC PM and Economic Analyst after the workshop, it was decided that in order to maintain consistency with the separate FM Business Case, access vaults and regular maintenance should not be included as part of this alternative.

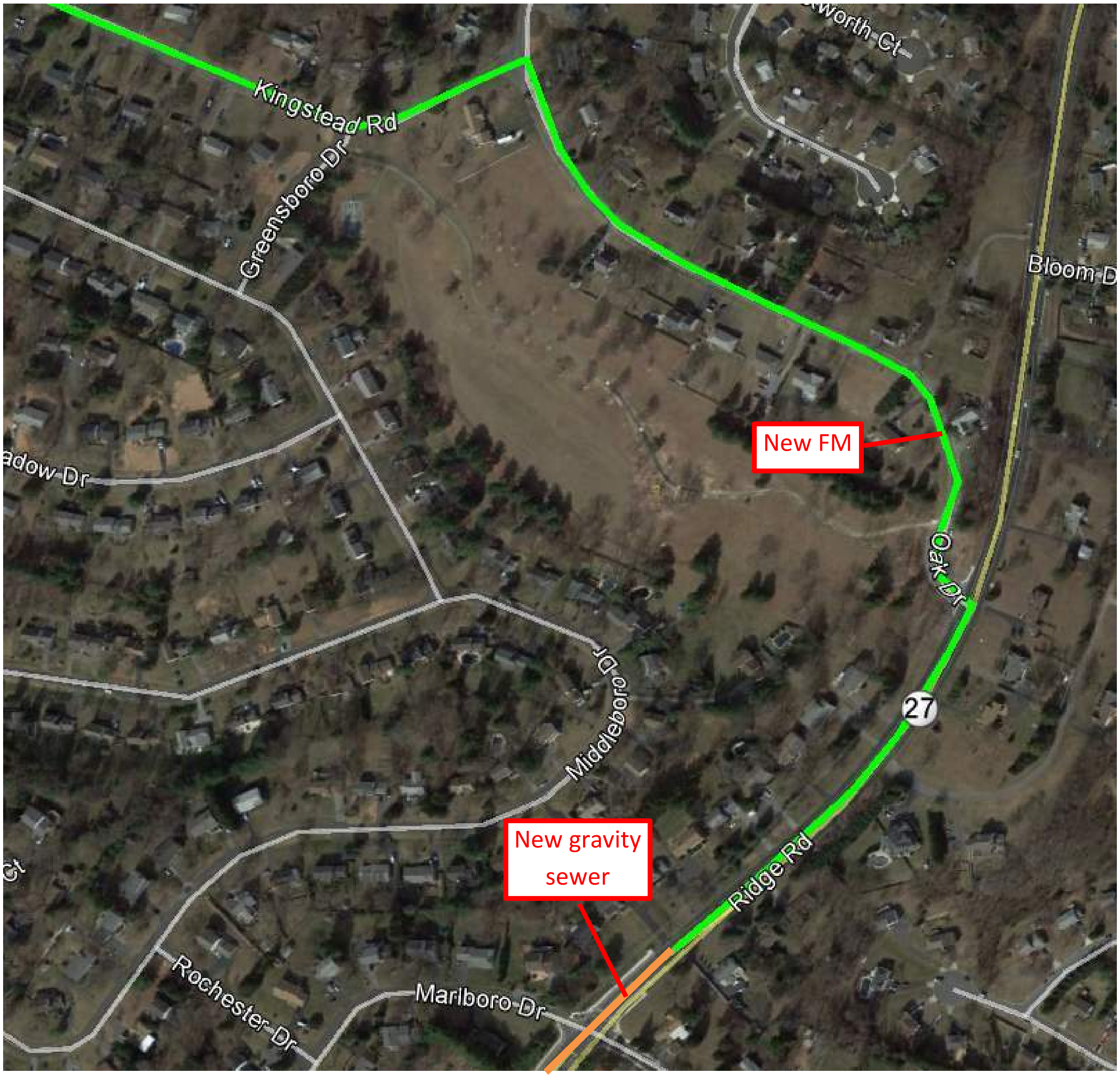
Comment Number	Reference	Comment Date	Commenter	Comment	Response Date	Responder	Response
44	Evaluation Assumptions Workshop	1/10/2018	WSSC	If access vaults and regular maintenance are added to the Do Nothing/Status Quo alternative, the alternative should be split into 2 separate alternatives. The Do Nothing would be a traditional Do Nothing with no new construction or maintenance. The Status Quo would follow all assumptions recommended for the current combined alternative.	1/19/2018	E.B. Houston	Per response to Item 43, it was decided to not include access ports or regular maintenance as part of the Do Nothing/Status Quo alternative. There is therefore no need to separate the Do Nothing from the Status Quo.
45	Evaluation Assumptions Workshop	1/10/2018	WSSC	For HDPE pipe, is pipe wall thickness testing used? And if ARVs are included, is air pocket testing needed?	1/19/2018	E.B. Houston	Provided costs only include leak testing and air pocket testing costs for HDPE pipe. While air pocket testing is not strictly required for pipes with ARVs, the testing is performed at the same time and using the same equipment as the leakage testing. Its inclusion is therefore minimal additional cost.
46	Evaluation Assumptions Workshop	1/10/2018	WSSC	The Risk Reduction tool using the term "Customer" and "People" when talking about impacts. Does "Customer" refer to the number of people or to the number of parcels/accounts?	1/19/2018	E.B. Houston	"Customers" is synonymous with "people." The memo terminology will be updated to make this clear.

Comment 21 Marlboro Drive Alternative Alignment



Comment 21		
No.	**Pros**	**Cons**
1	Alignment entirely within road ROW.	20’ of additional static head.
2	Avoids impacts to private property features (trees, fences, etc.) along the existing sewer easement.	700’ of additional gravity sewer.
3	Removes sharp bends in the FM alignment.	Road repaving required.

Comment 31 Kingstead Road Alternative Alignments



Comment 21 Current Proposed Alignment		
No.	Pros	Cons
1	Completely within road ROW.	7,400' new FM.
2	No additional easements required.	950' new gravity sewer.
3	No deep gravity sewers.	

Comment 21 Greensboro-Bellehaven-Middlebrook Alignment		
No.	**Pros**	**Cons**
1	Reuses existing road and sewer ROWs.	6,600’ new FM.
2	No deep gravity sewers.	1,500’ new gravity sewer.
3		Sewer ROW crosses private yards. Construction will inconvenience the homeowners and require tree removal.
4		Alternate private property crossing all require obtaining new easements and also will likely require tree removal.

Comment 21 Modified Current Proposed Alignment		
No.	Pros	Cons
1	Completely within road ROW.	6,400' new FM.
2	No additional easements required.	2,000' new gravity sewer.
3		20' or more deep gravity sewer required.

Appendix D: Cost Estimates Supporting Documentation

Alt 1 Do Nothing/Status Quo

Item	UC	Unit	Qty	Total	Notes
Mobilization/Demobilization					
Mobilization/Demobilization	$333,000.00	LS	1	$333,000.00	
			Subtotal:	$333,000.00	
Access					
Constructed Access - Heavy duty mulch mat timber access	$126.00	SY	7467	$940,842.00	Valley
Constructed Access - Protection Matting	$91.00	SY	1093	$99,463.00	Between homes
			Subtotal:	$1,040,305.00	
New Construction					
Survey	$3,950.00	AC	7	$27,650.00	50' wide corridor
Super silt fence	$14.50	LF	4200	$60,900.00	
WWPS pump/motor 1	$31,750.00	EA	4	$127,000.00	2 sets, 2 pumps in series
WWPS pump/motor 2 KVR	$40,000.00	EA	0	$0.00	N/A
WWPS pump/motor 3 KSR	$40,000.00	EA	0	$0.00	N/A
New 10" gravity sewer, PVC, 0'-10' depth, Road	$225.00	LF	0	$0.00	N/A
New 10" gravity sewer, PVC, 10'-15' depth, Road	$306.00	LF	680	$208,080.00	N/A
New 10" gravity sewer, PVC, > 15' depth, Road	$390.00	LF	0	$0.00	N/A
New 8" force main, DI CL54, 0'-10' depth, Open Cut, Roac	$240.00	LF	1183	$283,920.00	
New 8" force main, DI CL54, 0'-10' depth, Open Cut, ESA	$212.00	LF	4200	$890,400.00	In-trench replacement
New 10" force main, HDPE, 0'-10' depth, Open Cut, Roac	$208.00	LF	0	$0.00	N/A
New 10" force main, HDPE, 0'-10' depth, Open Cut, ESA	$180.00	LF	0	$0.00	N/A
New 10" force main, HDPE, HDD	$530.00	LF	0	$0.00	N/A
WSSC supervision of HDPE installation	$5.00	LF	0	$0.00	N/A
Corrossion resistant lining (transition manhole)	$400.00	VF	10	$4,000.00	New transition MH
10" Access Port at WWPS	$55,000.00	EA	0	$0.00	N/A
10" Access Port on FM	$46,000.00	EA	0	$0.00	N/A
4" Wastewater ARV	$7,079.00	EA	0	$0.00	N/A
ARV vault (5' diam manhole)	$10,086.00	EA	0	$0.00	N/A
Maintenance of Traffic Initial Setup	$2,370.00	EA	2	$4,740.00	Marlboro Dr, Ridge Road
Additional Duration for Maintenance of Traffic	$1,376.00	ED	21	$28,896.00	100LF/day, 6 wks/vault (2 at a time), 2 days paving
4' diameter manhole (std det S/1.0)	$1,200.00	VF	40	$48,000.00	
Tree Removal (greater than 10" DBH) - per inch diameter D	$70.00	IN	58	$4,060.00	
Existing Force Main Abandonment	$25,000.00	LS	0	$0.00	N/A
XYZ mapping	$900.00	ED	0	$0.00	
Odor control	$21,000.00	EA	1	$21,000.00	Installed at WWPS
4" trash pump	$325.00	EW	0	$0.00	N/A
			Subtotal:	$1,708,646.00	
Stream Stabilization					
Stream bypass pump mobilization	$710.00	EA	1	$710.00	
Stream bypass pump usage	$1,090.00	ED	30	$32,700.00	
Cross vane	$1,900.00	EA	8	$15,200.00	
Imbricated riprap wall	$110.00	LF	100	$11,000.00	
RGC mix	$175.00	CY	300	$52,500.00	
Coir fiber mat	$10.00	SY	300	$3,000.00	
			Subtotal:	$115,110.00	
WWPS Bypass Pumping					
Bypass setup & tear down	$3,200.00	DAY	13	$41,600.00	900 LF/day (interpolated) + 1 for setup, tear down s
Fuel	$3.38	GAL	590	$1,994.20	10 gal/day; 100 LF/ day install
Bypass (weekly)	$1,000.00	WK	9	$9,000.00	Primary pump; 100 LF/ day install
Bypass (weekly)	$1,000.00	WK	9	$9,000.00	Backup pump; 100 LF/ day install
24/7 Pump Watch	$2,250.00	DAY	42	$94,500.00	
Bypass pipe rental 6" HDPE	$4.00	LF-WK	52965	$211,860.00	Backup pump; 100 LF/ day install; 2 pipes required
			Subtotal:	$367,954.20	
			4815		
Site Restoration					
Seeding & Mulching	$2.72	SY	0	$0.00	N/A
Tree - Container Grown, 2-2½ inch Caliper	$310.00	EA	280	$86,800.00	
			Subtotal:	$86,800.00	
Allowances					
Temporary Utility Relocation Allowance	$10,000.00	LS	1	$10,000.00	
			Subtotal:	$10,000.00	
			Subtotal:	$3,661,815.20	
			Contingency (20%):	$732,363.04	
			Total:	$4,394,178.24	
Miscellaneous					
Permanent easement acquisition	$1.08	SF	0	$0.00	N/A
Construction easement acquisition	$0.54	SF	42000	$22,680.00	10' of construction easement along valley
			Subtotal:	$22,680.00	
			Contingency (20%):	$4,536.00	
			Total:	$27,216.00	

Alt 8 New, Ex. Alignment+Marlboro, Open Cut, WWPS+1,000' Access, No Redundancy					
Item	**UC**	**Unit**	**Qty**	**Total**	**Notes**
Mobilization/Demobilization					
Mobilization/Demobilization	$299,000.00	LS	1	$299,000.00	
			Subtotal:	$299,000.00	
Access					
Constructed Access - Heavy duty mulch mat timber access	$126	SY	7467	$940,842.00	Valley
Constructed Access - Protection Matting	$91	SY	0	$0.00	N/A
			Subtotal:	$940,842.00	
New Construction					
Survey	$3,950.00	AC	7	$27,650.00	
Super silt fence	$14.50	LF	4200	$60,900.00	
WWPS pump/motor 1	$31,750.00	EA	4	$127,000.00	2 sets, 2 pumps in series
WWPS pump/motor 2 KVR	$40,000.00	EA	0	$0.00	N/A
WWPS pump/motor 3 KSR	$40,000.00	EA	0	$0.00	N/A
New 10" gravity sewer, PVC, 0'-10' depth, Road	$225.00	LF	0	$0.00	N/A
New 10" gravity sewer, PVC, 10'-15' depth, Road	$306.00	LF	680	$208,080.00	
New 10" gravity sewer, PVC, > 15' depth, Road	$390.00	LF	0	$0.00	N/A
New 8" force main, DI CL54, 0'-10' depth, Open Cut, Roac	$240.00	LF	0	$0.00	N/A
New 8" force main, DI CL54, 0'-10' depth, Open Cut, ESA	$212.00	LF	0	$0.00	N/A
New 10" force main, HDPE, 0'-10' depth, Open Cut, Roac	$208.00	LF	1183	$246,064.00	
New 10" force main, HDPE, 0'-10' depth, Open Cut, ESA	$180.00	LF	4200	$756,000.00	
New 10" force main, HDPE, HDD	$530.00	LF	0	$0.00	N/A
WSSC supervision of HDPE installation	$5.00	LF	5383	$26,915.00	
Corrossion resistant lining (transition manhole)	$400.00	VF	10	$4,000.00	New transition MH
10" Access Port at WWPS	$55,000.00	EA	1	$55,000.00	
10" Access Port on FM	$46,000.00	EA	4	$184,000.00	
4" Wastewater ARV	$7,079.00	EA	1	$7,079.00	At WWPS
ARV vault (5' diam manhole)	$10,086.00	EA	0	$0.00	N/A
Maintenance of Traffic Initial Setup	$2,370.00	EA	2	$4,740.00	Marlboro Dr, Ridge Road
Additional Duration for Maintenance of Traffic	$1,376.00	ED	21	$28,896.00	100LF/day, 6 wks/vault (2 at a time), 2 days paving
4' diameter manhole (std det S/1.0)	$1,200.00	VF	40	$48,000.00	
Tree Removal (greater than 10" DBH) - per inch diameter D	$70.00	IN	58	$4,060.00	
Existing Force Main Abandonment	$25,000.00	LS	1	$25,000.00	
XYZ mapping	$900.00	ED	3	$2,700.00	
Odor control	$21,000.00	EA	1	$21,000.00	Installed at WWPS
4" trash pump	$325.00	EW	0	$0.00	N/A
			Subtotal:	$1,837,084.00	
Stream Stabilization					
Stream bypass pump mobilization	$710.00	EA	1	$710.00	
Stream bypass pump usage	$1,090.00	ED	30	$32,700.00	
Cross vane	$1,900.00	EA	8	$15,200.00	
Imbricated riprap wall	$110.00	LF	100	$11,000.00	
RGC mix	$175.00	CY	300	$52,500.00	
Coir fiber mat	$10.00	SY	300	$3,000.00	
			Subtotal:	$115,110.00	
WWPS Bypass Pumping					
Bypass setup & tear down	$3,200.00	DAY	0	$0.00	N/A
Fuel	$3.38	GAL	0	$0.00	N/A
Bypass (weekly)	$1,000.00	WK	0	$0.00	N/A
Bypass (weekly)	$1,000.00	WK	0	$0.00	N/A
24/7 Pump Watch	$2,250.00	DAY	0	$0.00	N/A
Bypass pipe rental 6" HDPE	$4.00	LF-WK	0	$0.00	N/A
			Subtotal:	$0.00	
Site Restoration					
Seeding & Mulching	$2.72	SY	0	$0.00	
Tree - Container Grown, 2-2½ inch Caliper	$310.00	EA	280	$86,800.00	Valley, assume 30' corridor cleared
			Subtotal:	$86,800.00	
Allowances					
Temporary Utility Relocation Allowance	$10,000.00	LS	1	$10,000.00	
			Subtotal:	$10,000.00	
			Subtotal:	$3,288,836.00	
			Contingency (20%):	$657,767.20	
			Total:	$3,946,603.20	
Miscellaneous					
Permanent easement acquisition	$1.08	SF	42000	$45,360.00	Additional 10' of easement along valley
Construction easement acquisition	$0.54	SF	0	$0.00	
			Subtotal:	$45,360.00	
			Contingency (20%):	$9,072.00	
			Total:	$54,432.00	

Alt 12 New, Ex. Alignment+Marlboro, Open Cut, WWPS Access, No Redundancy					
Item	**UC**	**Unit**	**Qty**	**Total**	**Notes**
Mobilization/Demobilization					
Mobilization/Demobilization	$281,000.00	LS	1	$281,000.00	
			Subtotal:	$281,000.00	
Access					
Constructed Access - Heavy duty mulch mat timber access	$126	SY	7467	$940,842.00	Valley
Constructed Access - Protection Matting	$91	SY	0	$0.00	N/A
			Subtotal:	$940,842.00	
New Construction					
Survey	$3,950.00	AC	7	$27,650.00	
Super silt fence	$14.50	LF	4200	$60,900.00	
WWPS pump/motor 1	$31,750.00	EA	4	$127,000.00	2 sets, 2 pumps in series
WWPS pump/motor 2 KVR	$40,000.00	EA	0	$0.00	N/A
WWPS pump/motor 3 KSR	$40,000.00	EA	0	$0.00	N/A
New 10" gravity sewer, PVC, 0'-10' depth, Road	$225.00	LF	0	$0.00	N/A
New 10" gravity sewer, PVC, 10'-15' depth, Road	$306.00	LF	680	$208,080.00	
New 10" gravity sewer, PVC, > 15' depth, Road	$390.00	LF	0	$0.00	N/A
New 8" force main, DI CL54, 0'-10' depth, Open Cut, Roac	$240.00	LF	0	$0.00	N/A
New 8" force main, DI CL54, 0'-10' depth, Open Cut, ESA	$212.00	LF	0	$0.00	N/A
New 10" force main, HDPE, 0'-10' depth, Open Cut, Roac	$208.00	LF	1183	$246,064.00	
New 10" force main, HDPE, 0'-10' depth, Open Cut, ESA	$180.00	LF	4200	$756,000.00	
New 10" force main, HDPE, HDD	$530.00	LF	0	$0.00	N/A
WSSC supervision of HDPE installation	$5.00	LF	5383	$26,915.00	
Corrossion resistant lining (transition manhole)	$400.00	VF	10	$4,000.00	New transition MH
10" Access Port at WWPS	$55,000.00	EA	1	$55,000.00	
10" Access Port on FM	$46,000.00	EA	0	$0.00	N/A
4" Wastewater ARV	$7,079.00	EA	1	$7,079.00	At WWPS
ARV vault (5' diam manhole)	$10,086.00	EA	0	$0.00	N/A
Maintenance of Traffic Initial Setup	$2,370.00	EA	2	$4,740.00	Marlboro Dr, Ridge Road
Additional Duration for Maintenance of Traffic	$1,376.00	ED	21	$28,896.00	100LF/day, 6 wks/vault (2 at a time), 2 days paving
4' diameter manhole (std det S/1.0)	$1,200.00	VF	40	$48,000.00	
Tree Removal (greater than 10" DBH) - per inch diameter D	$70.00	IN	58	$4,060.00	
Existing Force Main Abandonment	$25,000.00	LS	1	$25,000.00	
XYZ mapping	$900.00	ED	3	$2,700.00	
Odor control	$21,000.00	EA	1	$21,000.00	Installed at WWPS
4" trash pump	$325.00	EW	0	$0.00	N/A
			Subtotal:	$1,653,084.00	
Stream Stabilization					
Stream bypass pump mobilization	$710.00	EA	1	$710.00	
Stream bypass pump usage	$1,090.00	ED	30	$32,700.00	
Cross vane	$1,900.00	EA	8	$15,200.00	
Imbricated riprap wall	$110.00	LF	100	$11,000.00	
RGC mix	$175.00	CY	300	$52,500.00	
Coir fiber mat	$10.00	SY	300	$3,000.00	
			Subtotal:	$115,110.00	
WWPS Bypass Pumping					
Bypass setup & tear down	$3,200.00	DAY	0	$0.00	N/A
Fuel	$3.38	GAL	0	$0.00	N/A
Bypass (weekly)	$1,000.00	WK	0	$0.00	N/A
Bypass (weekly)	$1,000.00	WK	0	$0.00	N/A
24/7 Pump Watch	$2,250.00	DAY	0	$0.00	N/A
Bypass pipe rental 6" HDPE	$4.00	LF-WK	0	$0.00	N/A
			Subtotal:	$0.00	
Site Restoration					
Seeding & Mulching	$2.72	SY	0	$0.00	
Tree - Container Grown, 2-2½ inch Caliper	$310.00	EA	280	$86,800.00	Valley, assume 30' corridor cleared
			Subtotal:	$86,800.00	
Allowances					
Temporary Utility Relocation Allowance	$10,000.00	LS	1	$10,000.00	
			Subtotal:	$10,000.00	
			Subtotal:	$3,086,836.00	
			Contingency (20%):	$617,367.20	
			Total:	$3,704,203.20	
Miscellaneous					
Permanent easement acquisition	$1.08	SF	42000	$45,360.00	Additional 10' of easement along valley
Construction easement acquisition	$0.54	SF	0	$0.00	
			Subtotal:	$45,360.00	
			Contingency (20%):	$9,072.00	
			Total:	$54,432.00	

Alt 13 New, Ex. Alignment+Marlboro, Open Cut, WWPS+2,500' Access, No Redundancy					
Item	**UC**	**Unit**	**Qty**	**Total**	**Notes**
Mobilization/Demobilization					
Mobilization/Demobilization	$290,000.00	LS	1	$290,000.00	
			Subtotal:	$290,000.00	
Access					
Constructed Access - Heavy duty mulch mat timber access	$126	SY	7467	$940,842.00	Valley
Constructed Access - Protection Matting	$91	SY	0	$0.00	N/A
			Subtotal:	$940,842.00	
New Construction					
Survey	$3,950.00	AC	7	$27,650.00	
Super silt fence	$14.50	LF	4200	$60,900.00	
WWPS pump/motor 1	$31,750.00	EA	4	$127,000.00	2 sets, 2 pumps in series
WWPS pump/motor 2 KVR	$40,000.00	EA	0	$0.00	N/A
WWPS pump/motor 3 KSR	$40,000.00	EA	0	$0.00	N/A
New 10" gravity sewer, PVC, 0'-10' depth, Road	$225.00	LF	0	$0.00	N/A
New 10" gravity sewer, PVC, 10'-15' depth, Road	$306.00	LF	680	$208,080.00	
New 10" gravity sewer, PVC, > 15' depth, Road	$390.00	LF	0	$0.00	N/A
New 8" force main, DI CL54, 0'-10' depth, Open Cut, Roac	$240.00	LF	0	$0.00	N/A
New 8" force main, DI CL54, 0'-10' depth, Open Cut, ESA	$212.00	LF	0	$0.00	N/A
New 10" force main, HDPE, 0'-10' depth, Open Cut, Roac	$208.00	LF	1183	$246,064.00	
New 10" force main, HDPE, 0'-10' depth, Open Cut, ESA	$180.00	LF	4200	$756,000.00	
New 10" force main, HDPE, HDD	$530.00	LF	0	$0.00	N/A
WSSC supervision of HDPE installation	$5.00	LF	5383	$26,915.00	
Corrossion resistant lining (transition manhole)	$400.00	VF	10	$4,000.00	New transition MH
10" Access Port at WWPS	$55,000.00	EA	1	$55,000.00	
10" Access Port on FM	$46,000.00	EA	2	$92,000.00	
4" Wastewater ARV	$7,079.00	EA	1	$7,079.00	At WWPS
ARV vault (5' diam manhole)	$10,086.00	EA	0	$0.00	N/A
Maintenance of Traffic Initial Setup	$2,370.00	EA	2	$4,740.00	Marlboro Dr, Ridge Road
Additional Duration for Maintenance of Traffic	$1,376.00	ED	21	$28,896.00	100LF/day, 6 wks/vault (2 at a time), 2 days paving
4' diameter manhole (std det S/1.0)	$1,200.00	VF	40	$48,000.00	
Tree Removal (greater than 10" DBH) - per inch diameter D	$70.00	IN	58	$4,060.00	
Existing Force Main Abandonment	$25,000.00	LS	1	$25,000.00	
XYZ mapping	$900.00	ED	3	$2,700.00	
Odor control	$21,000.00	EA	1	$21,000.00	Installed at WWPS
4" trash pump	$325.00	EW	0	$0.00	N/A
			Subtotal:	$1,745,084.00	
Stream Stabilization					
Stream bypass pump mobilization	$710.00	EA	1	$710.00	
Stream bypass pump usage	$1,090.00	ED	30	$32,700.00	
Cross vane	$1,900.00	EA	8	$15,200.00	
Imbricated riprap wall	$110.00	LF	100	$11,000.00	
RGC mix	$175.00	CY	300	$52,500.00	
Coir fiber mat	$10.00	SY	300	$3,000.00	
			Subtotal:	$115,110.00	
WWPS Bypass Pumping					
Bypass setup & tear down	$3,200.00	DAY	0	$0.00	N/A
Fuel	$3.38	GAL	0	$0.00	N/A
Bypass (weekly)	$1,000.00	WK	0	$0.00	N/A
Bypass (weekly)	$1,000.00	WK	0	$0.00	N/A
24/7 Pump Watch	$2,250.00	DAY	0	$0.00	N/A
Bypass pipe rental 6" HDPE	$4.00	LF-WK	0	$0.00	N/A
			Subtotal:	$0.00	
Site Restoration					
Seeding & Mulching	$2.72	SY	0	$0.00	
Tree - Container Grown, 2-2½ inch Caliper	$310.00	EA	280	$86,800.00	Valley, assume 30' corridor cleared
			Subtotal:	$86,800.00	
Allowances					
Temporary Utility Relocation Allowance	$10,000.00	LS	1	$10,000.00	
			Subtotal:	$10,000.00	
			Subtotal:	$3,187,836.00	
			Contingency (20%):	$637,567.20	
			Total:	$3,825,403.20	
Miscellaneous					
Permanent easement acquisition	$1.08	SF	42000	$45,360.00	Additional 10' of easement along valley
Construction easement acquisition	$0.54	SF	0	$0.00	
			Subtotal:	$45,360.00	
			Contingency (20%):	$9,072.00	
			Total:	$54,432.00	

Alt 18 New, Ex. Alignment+Marlboro, HDD, WWPS Access, No Redundancy					
Item	**UC**	**Unit**	**Qty**	**Total**	**Notes**
Mobilization/Demobilization					
Mobilization/Demobilization	$327,000.00	LS	1	$327,000.00	
			Subtotal:	$327,000.00	
Access					
Constructed Access - Heavy duty mulch mat timber access	$126	SY	1600	$201,600.00	ESA open cut portion
Constructed Access - Protection Matting	$91	SY	1778	$161,798.00	Bellehaven, access for pipe pulling pit
			Subtotal:	$363,398.00	
New Construction					
Survey	$3,950.00	AC	2.2	$8,690.00	
Super silt fence	$14.50	LF	1000	$14,500.00	
WWPS pump/motor 1	$31,750.00	EA	4	$127,000.00	2 sets, 2 pumps in series
WWPS pump/motor 2 KVR	$40,000.00	EA	0	$0.00	N/A
WWPS pump/motor 3 KSR	$40,000.00	EA	0	$0.00	N/A
New 10" gravity sewer, PVC, 0'-10' depth, Road	$225.00	LF	0	$0.00	N/A
New 10" gravity sewer, PVC, 10'-15' depth, Road	$306.00	LF	680	$208,080.00	
New 10" gravity sewer, PVC, > 15' depth, Road	$390.00	LF	0	$0.00	N/A
New 8" force main, DI CL54, 0'-10' depth, Open Cut, Road	$240.00	LF	0	$0.00	N/A
New 8" force main, DI CL54, 0'-10' depth, Open Cut, ESA	$212.00	LF	0	$0.00	N/A
New 10" force main, HDPE, 0'-10' depth, Open Cut, Road	$208.00	LF	1183	$246,064.00	
New 10" force main, HDPE, 0'-10' depth, Open Cut, ESA	$180.00	LF	900	$162,000.00	
New 10" force main, HDPE, HDD	$530.00	LF	3300	$1,749,000.00	
WSSC supervision of HDPE installation	$5.00	LF	5383	$26,915.00	
Corrossion resistant lining (transition manhole)	$400.00	VF	10	$4,000.00	New transition MH
10" Access Port at WWPS	$55,000.00	EA	1	$55,000.00	
10" Access Port on FM	$46,000.00	EA	0	$0.00	N/A
4" Wastewater ARV	$7,079.00	EA	1	$7,079.00	At WWPS
ARV vault (5' diam manhole)	$10,086.00	EA	0	$0.00	N/A
Maintenance of Traffic Initial Setup	$2,370.00	EA	2	$4,740.00	Marlboro Dr, Ridge Road
Additional Duration for Maintenance of Traffic	$1,376.00	ED	21	$28,896.00	100LF/day, 6 wks/vault (2 at a time), 2 days paving
4' diameter manhole (std det S/1.0)	$1,200.00	VF	40	$48,000.00	
Tree Removal (greater than 10" DBH) - per inch diameter D	$70.00	IN	20	$1,400.00	
Existing Force Main Abandonment	$25,000.00	LS	1	$25,000.00	
XYZ mapping	$900.00	ED	3	$2,700.00	
Odor control	$21,000.00	EA	1	$21,000.00	Installed at WWPS
4" trash pump	$325.00	EW	0	$0.00	N/A
			Subtotal:	$2,740,064.00	
Stream Stabilization					
Stream bypass pump mobilization	$710.00	EA	1	$710.00	
Stream bypass pump usage	$1,090.00	ED	30	$32,700.00	
Cross vane	$1,900.00	EA	8	$15,200.00	
Imbricated riprap wall	$110.00	LF	100	$11,000.00	
RGC mix	$175.00	CY	300	$52,500.00	
Coir fiber mat	$10.00	SY	300	$3,000.00	
			Subtotal:	$115,110.00	
WWPS Bypass Pumping					
Bypass setup & tear down	$3,200.00	DAY	0	$0.00	N/A
Fuel	$3.38	GAL	0	$0.00	N/A
Bypass (weekly)	$1,000.00	WK	0	$0.00	N/A
Bypass (weekly)	$1,000.00	WK	0	$0.00	N/A
24/7 Pump Watch	$2,250.00	DAY	0	$0.00	N/A
Bypass pipe rental 6" HDPE	$4.00	LF-WK	0	$0.00	N/A
			Subtotal:	$0.00	
Site Restoration					
Seeding & Mulching	$2.72	SY	0	$0.00	N/A
Tree - Container Grown, 2-2½ inch Caliper	$310.00	EA	127	$39,370.00	
			Subtotal:	$39,370.00	
Allowances					
Temporary Utility Relocation Allowance	$10,000.00	LS	1	$10,000.00	
			Subtotal:	$10,000.00	
			Subtotal:	$3,594,942.00	
			Contingency (20%):	$718,988.40	
			Total:	$4,313,930.40	
Miscellaneous					
Permanent easement acquisition	$1.08	SF	75000	$81,000.00	20' along HDD; 10' along open cut
Construction easement acquisition	$0.54	SF	0	$0.00	
			Subtotal:	$81,000.00	
			Contingency (20%):	$16,200.00	
			Total:	$97,200.00	

Alt 19 New, Ex. Alignment+Marlboro, HDD, WWPS+2,500' Access, No Redundancy					
Item	**UC**	**Unit**	**Qty**	**Total**	**Notes**
Mobilization/Demobilization					
Mobilization/Demobilization	$336,000.00	LS	1	$336,000.00	
			Subtotal:	$336,000.00	
Access					
Constructed Access - Heavy duty mulch mat timber access	$126	SY	1600	$201,600.00	ESA open cut portion
Constructed Access - Protection Matting	$91	SY	1778	$161,798.00	Bellehaven, access for pipe pulling pit
			Subtotal:	$363,398.00	
New Construction					
Survey	$3,950.00	AC	2.2	$8,690.00	
Super silt fence	$14.50	LF	1000	$14,500.00	
WWPS pump/motor 1	$31,750.00	EA	4	$127,000.00	2 sets, 2 pumps in series
WWPS pump/motor 2 KVR	$40,000.00	EA	0	$0.00	N/A
WWPS pump/motor 3 KSR	$40,000.00	EA	0	$0.00	N/A
New 10" gravity sewer, PVC, 0'-10' depth, Road	$225.00	LF	0	$0.00	N/A
New 10" gravity sewer, PVC, 10'-15' depth, Road	$306.00	LF	680	$208,080.00	
New 10" gravity sewer, PVC, > 15' depth, Road	$390.00	LF	0	$0.00	N/A
New 8" force main, DI CL54, 0'-10' depth, Open Cut, Road	$240.00	LF	0	$0.00	N/A
New 8" force main, DI CL54, 0'-10' depth, Open Cut, ESA	$212.00	LF	0	$0.00	N/A
New 10" force main, HDPE, 0'-10' depth, Open Cut, Road	$208.00	LF	1183	$246,064.00	
New 10" force main, HDPE, 0'-10' depth, Open Cut, ESA	$180.00	LF	900	$162,000.00	
New 10" force main, HDPE, HDD	$530.00	LF	3300	$1,749,000.00	
WSSC supervision of HDPE installation	$5.00	LF	5383	$26,915.00	
Corrossion resistant lining (transition manhole)	$400.00	VF	10	$4,000.00	New transition MH
10" Access Port at WWPS	$55,000.00	EA	1	$55,000.00	
10" Access Port on FM	$46,000.00	EA	2	$92,000.00	Pipe pulling pit, end of HDD, end of Marlboro Dr
4" Wastewater ARV	$7,079.00	EA	1	$7,079.00	At WWPS
ARV vault (5' diam manhole)	$10,086.00	EA	0	$0.00	N/A
Maintenance of Traffic Initial Setup	$2,370.00	EA	2	$4,740.00	Marlboro Dr, Ridge Road
Additional Duration for Maintenance of Traffic	$1,376.00	ED	21	$28,896.00	100LF/day, 6 wks/vault (2 at a time), 2 days paving
4' diameter manhole (std det S/1.0)	$1,200.00	VF	40	$48,000.00	
Tree Removal (greater than 10" DBH) - per inch diameter D	$70.00	IN	20	$1,400.00	
Existing Force Main Abandonment	$25,000.00	LS	1	$25,000.00	
XYZ mapping	$900.00	ED	3	$2,700.00	
Odor control	$21,000.00	EA	1	$21,000.00	Installed at WWPS
4" trash pump	$325.00	EW	0	$0.00	N/A
			Subtotal:	$2,832,064.00	
Stream Stabilization					
Stream bypass pump mobilization	$710.00	EA	1	$710.00	
Stream bypass pump usage	$1,090.00	ED	30	$32,700.00	
Cross vane	$1,900.00	EA	8	$15,200.00	
Imbricated riprap wall	$110.00	LF	100	$11,000.00	
RGC mix	$175.00	CY	300	$52,500.00	
Coir fiber mat	$10.00	SY	300	$3,000.00	
			Subtotal:	$115,110.00	
WWPS Bypass Pumping					
Bypass setup & tear down	$3,200.00	DAY	0	$0.00	N/A
Fuel	$3.38	GAL	0	$0.00	N/A
Bypass (weekly)	$1,000.00	WK	0	$0.00	N/A
Bypass (weekly)	$1,000.00	WK	0	$0.00	N/A
24/7 Pump Watch	$2,250.00	DAY	0	$0.00	N/A
Bypass pipe rental 6" HDPE	$4.00	LF-WK	0	$0.00	N/A
			Subtotal:	$0.00	
Site Restoration					
Seeding & Mulching	$2.72	SY	0	$0.00	N/A
Tree - Container Grown, 2-2½ inch Caliper	$310.00	EA	127	$39,370.00	
			Subtotal:	$39,370.00	
Allowances					
Temporary Utility Relocation Allowance	$10,000.00	LS	1	$10,000.00	
			Subtotal:	$10,000.00	
			Subtotal:	$3,695,942.00	
			Contingency (20%):	$739,188.40	
			Total:	$4,435,130.40	
Miscellaneous					
Permanent easement acquisition	$1.08	SF	75000	$81,000.00	20' along HDD; 10' along open cut
Construction easement acquisition	$0.54	SF	0	$0.00	
			Subtotal:	$81,000.00	
			Contingency (20%):	$16,200.00	
			Total:	$97,200.00	

Alt 20 Kings Valley Road, Open Cut, WWPS+1,000' Access, No Redundancy					
Item	**UC**	**Unit**	**Qty**	**Total**	**Notes**
Mobilization/Demobilization					
Mobilization/Demobilization	$337,000.00	LS	1	$337,000.00	
			Subtotal:	$337,000.00	
Access					
Constructed Access - Heavy duty mulch mat timber access	$126	SY	0	$0.00	N/A
Constructed Access - Protection Matting	$91	SY	1244	$113,204.00	Red Blaze Dr, for FM abandonment
			Subtotal:	$113,204.00	
New Construction					
Survey	$3,950.00	AC	11.0	$43,450.00	
Super silt fence	$14.50	LF	0	$0.00	N/A
WWPS pump/motor 1	$31,750.00	EA	0	$0.00	N/A
WWPS pump/motor 2 KVR	$40,000.00	EA	4	$160,000.00	2 sets, 2 pumps in series
WWPS pump/motor 3 KSR	$40,000.00	EA	0	$0.00	N/A
New 10" gravity sewer, PVC, 0'-10' depth, Road	$225.00	LF	0	$0.00	N/A
New 10" gravity sewer, PVC, 10'-15' depth, Road	$306.00	LF	3150	$963,900.00	
New 10" gravity sewer, PVC, > 15' depth, Road	$390.00	LF	0	$0.00	N/A
New 8" force main, DI CL54, 0'-10' depth, Open Cut, Roac	$240.00	LF	0	$0.00	N/A
New 8" force main, DI CL54, 0'-10' depth, Open Cut, ESA	$212.00	LF	0	$0.00	N/A
New 10" force main, HDPE, 0'-10' depth, Open Cut, Roac	$208.00	LF	5932	$1,233,856.00	
New 10" force main, HDPE, 0'-10' depth, Open Cut, ESA	$180.00	LF	0	$0.00	N/A
New 10" force main, HDPE, HDD	$530.00	LF	0	$0.00	N/A
WSSC supervision of HDPE installation	$5.00	LF	5932	$29,660.00	
Corrossion resistant lining (transition manhole)	$400.00	VF	7	$2,800.00	New transition MH
10" Access Port at WWPS	$55,000.00	EA	1	$55,000.00	
10" Access Port on FM	$46,000.00	EA	5	$230,000.00	
4" Wastewater ARV	$7,079.00	EA	3	$21,237.00	2 along alignment, 1 at WWPS
ARV vault (5' diam manhole)	$10,086.00	EA	2	$20,172.00	2 along alignment
Maintenance of Traffic Initial Setup	$2,370.00	EA	2	$4,740.00	King Valley Road, Ridge Road
Additional Duration for Maintenance of Traffic	$1,376.00	ED	190	$261,440.00	100LF/day, 6 wks/vault (2 at a time), 2 days paving
4' diameter manhole (std det S/1.0)	$1,200.00	VF	120	$144,000.00	
Tree Removal (greater than 10" DBH) - per inch diameter D	$70.00	IN	5	$350.00	Red Blaze access
Existing Force Main Abandonment	$25,000.00	LS	1	$25,000.00	
XYZ mapping	$900.00	ED	3	$2,700.00	
Odor control	$21,000.00	EA	1	$21,000.00	Installed at WWPS
4" trash pump	$325.00	EW	0	$0.00	N/A
			Subtotal:	$3,219,305.00	
Stream Stabilization					
Stream bypass pump mobilization	$710.00	EA	0	$0.00	N/A
Stream bypass pump usage	$1,090.00	ED	0	$0.00	N/A
Cross vane	$1,900.00	EA	0	$0.00	N/A
Imbricated riprap wall	$110.00	LF	0	$0.00	N/A
RGC mix	$175.00	CY	0	$0.00	N/A
Coir fiber mat	$10.00	SY	0	$0.00	N/A
			Subtotal:	$0.00	
WWPS Bypass Pumping					
Bypass setup & tear down	$3,200.00	DAY	0	$0.00	N/A
Fuel	$3.38	GAL	0	$0.00	N/A
Bypass (weekly)	$1,000.00	WK	0	$0.00	N/A
Bypass (weekly)	$1,000.00	WK	0	$0.00	N/A
24/7 Pump Watch	$2,250.00	DAY	0	$0.00	N/A
Bypass pipe rental 6" HDPE	$4.00	LF-WK	0	$0.00	N/A
			Subtotal:	$0.00	
Site Restoration					
Seeding & Mulching	$2.72	SY	0	$0.00	N/A
Tree - Container Grown, 2-2½ inch Caliper	$310.00	EA	25	$7,750.00	Red Blaze access
			Subtotal:	$7,750.00	
Allowances					
Temporary Utility Relocation Allowance	$10,000.00	LS	3	$30,000.00	
			Subtotal:	$30,000.00	
			Subtotal:	$3,707,259.00	
			Contingency (20%):	$741,451.80	
			Total:	$4,448,710.80	
Miscellaneous					
Permanent easement acquisition	$1.08	SF	0	$0.00	N/A
Construction easement acquisition	$0.54	SF	0	$0.00	
			Subtotal:	$0.00	
			Contingency (20%):	$0.00	
			Total:	$0.00	

Alt 21 Kings Valley Road, Open Cut, WWPS Access, No Redundancy					
Item	**UC**	**Unit**	**Qty**	**Total**	**Notes**
Mobilization/Demobilization					
Mobilization/Demobilization	$314,000.00	LS	1	$314,000.00	
			Subtotal:	$314,000.00	
Access					
Constructed Access - Heavy duty mulch mat timber access	$126	SY	0	$0.00	N/A
Constructed Access - Protection Matting	$91	SY	1244	$113,204.00	Red Blaze Dr, for FM abandonment
			Subtotal:	$113,204.00	
New Construction					
Survey	$3,950.00	AC	11.0	$43,450.00	
Super silt fence	$14.50	LF	0	$0.00	N/A
WWPS pump/motor 1	$31,750.00	EA	0	$0.00	N/A
WWPS pump/motor 2 KVR	$40,000.00	EA	4	$160,000.00	2 sets, 2 pumps in series
WWPS pump/motor 3 KSR	$40,000.00	EA	0	$0.00	N/A
New 10" gravity sewer, PVC, 0'-10' depth, Road	$225.00	LF	0	$0.00	N/A
New 10" gravity sewer, PVC, 10'-15' depth, Road	$306.00	LF	3150	$963,900.00	
New 10" gravity sewer, PVC, > 15' depth, Road	$390.00	LF	0	$0.00	N/A
New 8" force main, DI CL54, 0'-10' depth, Open Cut, Roac	$240.00	LF	0	$0.00	N/A
New 8" force main, DI CL54, 0'-10' depth, Open Cut, ESA	$212.00	LF	0	$0.00	N/A
New 10" force main, HDPE, 0'-10' depth, Open Cut, Roac	$208.00	LF	5932	$1,233,856.00	
New 10" force main, HDPE, 0'-10' depth, Open Cut, ESA	$180.00	LF	0	$0.00	N/A
New 10" force main, HDPE, HDD	$530.00	LF	0	$0.00	N/A
WSSC supervision of HDPE installation	$5.00	LF	5932	$29,660.00	
Corrossion resistant lining (transition manhole)	$400.00	VF	7	$2,800.00	New transition MH
10" Access Port at WWPS	$55,000.00	EA	1	$55,000.00	
10" Access Port on FM	$46,000.00	EA	0	$0.00	N/A
4" Wastewater ARV	$7,079.00	EA	3	$21,237.00	2 along alignment, 1 at WWPS
ARV vault (5' diam manhole)	$10,086.00	EA	2	$20,172.00	2 along alignment
Maintenance of Traffic Initial Setup	$2,370.00	EA	2	$4,740.00	King Valley Road, Ridge Road
Additional Duration for Maintenance of Traffic	$1,376.00	ED	190	$261,440.00	100LF/day, 6 wks/vault (2 at a time), 2 days paving
4' diameter manhole (std det S/1.0)	$1,200.00	VF	120	$144,000.00	
Tree Removal (greater than 10" DBH) - per inch diameter D	$70.00	IN	5	$350.00	Red Blaze access
Existing Force Main Abandonment	$25,000.00	LS	1	$25,000.00	
XYZ mapping	$900.00	ED	3	$2,700.00	
Odor control	$21,000.00	EA	1	$21,000.00	Installed at WWPS
4" trash pump	$325.00	EW	0	$0.00	N/A
			Subtotal:	$2,989,305.00	
Stream Stabilization					
Stream bypass pump mobilization	$710.00	EA	0	$0.00	N/A
Stream bypass pump usage	$1,090.00	ED	0	$0.00	N/A
Cross vane	$1,900.00	EA	0	$0.00	N/A
Imbricated riprap wall	$110.00	LF	0	$0.00	N/A
RGC mix	$175.00	CY	0	$0.00	N/A
Coir fiber mat	$10.00	SY	0	$0.00	N/A
			Subtotal:	$0.00	
WWPS Bypass Pumping					
Bypass setup & tear down	$3,200.00	DAY	0	$0.00	N/A
Fuel	$3.38	GAL	0	$0.00	N/A
Bypass (weekly)	$1,000.00	WK	0	$0.00	N/A
Bypass (weekly)	$1,000.00	WK	0	$0.00	N/A
24/7 Pump Watch	$2,250.00	DAY	0	$0.00	N/A
Bypass pipe rental 6" HDPE	$4.00	LF-WK	0	$0.00	N/A
			Subtotal:	$0.00	
Site Restoration					
Seeding & Mulching	$2.72	SY	0	$0.00	N/A
Tree - Container Grown, 2-2½ inch Caliper	$310.00	EA	25	$7,750.00	Red Blaze access
			Subtotal:	$7,750.00	
Allowances					
Temporary Utility Relocation Allowance	$10,000.00	LS	3	$30,000.00	
			Subtotal:	$30,000.00	
			Subtotal:	$3,454,259.00	
			Contingency (20%):	$690,851.80	
			Total:	$4,145,110.80	
Miscellaneous					
Permanent easement acquisition	$1.08	SF	0	$0.00	N/A
Construction easement acquisition	$0.54	SF	0	$0.00	
			Subtotal:	$0.00	
			Contingency (20%):	$0.00	
			Total:	$0.00	

Alt 22 Kings Valley Road, Open Cut, WWPS+2,500' Access, No Redundancy					
Item	**UC**	**Unit**	**Qty**	**Total**	**Notes**
Mobilization/Demobilization					
Mobilization/Demobilization	$323,000.00	LS	1	$323,000.00	
			Subtotal:	$323,000.00	
Access					
Constructed Access - Heavy duty mulch mat timber access	$126	SY	0	$0.00	N/A
Constructed Access - Protection Matting	$91	SY	1244	$113,204.00	Red Blaze Dr, for FM abandonment
			Subtotal:	$113,204.00	
New Construction					
Survey	$3,950.00	AC	11.0	$43,450.00	
Super silt fence	$14.50	LF	0	$0.00	N/A
WWPS pump/motor 1	$31,750.00	EA	0	$0.00	N/A
WWPS pump/motor 2 KVR	$40,000.00	EA	4	$160,000.00	2 sets, 2 pumps in series
WWPS pump/motor 3 KSR	$40,000.00	EA	0	$0.00	N/A
New 10" gravity sewer, PVC, 0'-10' depth, Road	$225.00	LF	0	$0.00	N/A
New 10" gravity sewer, PVC, 10'-15' depth, Road	$306.00	LF	3150	$963,900.00	
New 10" gravity sewer, PVC, > 15' depth, Road	$390.00	LF	0	$0.00	N/A
New 8" force main, DI CL54, 0'-10' depth, Open Cut, Roac	$240.00	LF	0	$0.00	N/A
New 8" force main, DI CL54, 0'-10' depth, Open Cut, ESA	$212.00	LF	0	$0.00	N/A
New 10" force main, HDPE, 0'-10' depth, Open Cut, Roac	$208.00	LF	5932	$1,233,856.00	
New 10" force main, HDPE, 0'-10' depth, Open Cut, ESA	$180.00	LF	0	$0.00	N/A
New 10" force main, HDPE, HDD	$530.00	LF	0	$0.00	N/A
WSSC supervision of HDPE installation	$5.00	LF	5932	$29,660.00	
Corrossion resistant lining (transition manhole)	$400.00	VF	7	$2,800.00	New transition MH
10" Access Port at WWPS	$55,000.00	EA	1	$55,000.00	
10" Access Port on FM	$46,000.00	EA	2	$92,000.00	ARV vaults
4" Wastewater ARV	$7,079.00	EA	3	$21,237.00	2 along alignment, 1 at WWPS
ARV vault (5' diam manhole)	$10,086.00	EA	2	$20,172.00	2 along alignment
Maintenance of Traffic Initial Setup	$2,370.00	EA	2	$4,740.00	King Valley Road, Ridge Road
Additional Duration for Maintenance of Traffic	$1,376.00	ED	190	$261,440.00	100LF/day, 6 wks/vault (2 at a time), 2 days paving
4' diameter manhole (std det S/1.0)	$1,200.00	VF	120	$144,000.00	
Tree Removal (greater than 10" DBH) - per inch diameter D	$70.00	IN	5	$350.00	Red Blaze access
Existing Force Main Abandonment	$25,000.00	LS	1	$25,000.00	
XYZ mapping	$900.00	ED	3	$2,700.00	
Odor control	$21,000.00	EA	1	$21,000.00	Installed at WWPS
4" trash pump	$325.00	EW	0	$0.00	N/A
			Subtotal:	$3,081,305.00	
Stream Stabilization					
Stream bypass pump mobilization	$710.00	EA	0	$0.00	N/A
Stream bypass pump usage	$1,090.00	ED	0	$0.00	N/A
Cross vane	$1,900.00	EA	0	$0.00	N/A
Imbricated riprap wall	$110.00	LF	0	$0.00	N/A
RGC mix	$175.00	CY	0	$0.00	N/A
Coir fiber mat	$10.00	SY	0	$0.00	N/A
			Subtotal:	$0.00	
WWPS Bypass Pumping					
Bypass setup & tear down	$3,200.00	DAY	0	$0.00	N/A
Fuel	$3.38	GAL	0	$0.00	N/A
Bypass (weekly)	$1,000.00	WK	0	$0.00	N/A
Bypass (weekly)	$1,000.00	WK	0	$0.00	N/A
24/7 Pump Watch	$2,250.00	DAY	0	$0.00	N/A
Bypass pipe rental 6" HDPE	$4.00	LF-WK	0	$0.00	N/A
			Subtotal:	$0.00	
Site Restoration					
Seeding & Mulching	$2.72	SY	0	$0.00	N/A
Tree - Container Grown, 2-2½ inch Caliper	$310.00	EA	25	$7,750.00	Red Blaze access
			Subtotal:	$7,750.00	
Allowances					
Temporary Utility Relocation Allowance	$10,000.00	LS	3	$30,000.00	
			Subtotal:	$30,000.00	
			Subtotal:	$3,555,259.00	
			Contingency (20%):	$711,051.80	
			Total:	$4,266,310.80	
Miscellaneous					
Permanent easement acquisition	$1.08	SF	0	$0.00	N/A
Construction easement acquisition	$0.54	SF	0	$0.00	
			Subtotal:	$0.00	
			Contingency (20%):	$0.00	
			Total:	$0.00	

Alt 23 Kingstead Road, Open Cut, WWPS+1,000' Access, No Redundancy

Item	UC	Unit	Qty	Total	Notes
Mobilization/Demobilization					
Mobilization/Demobilization	$297,000.00	LS	1	$297,000.00	
			Subtotal:	$297,000.00	
Access					
Constructed Access - Heavy duty mulch mat timber access	$126	SY	0	$0.00	N/A
Constructed Access - Protection Matting	$91	SY	1244	$113,204.00	Red Blaze Dr, for FM abandonment
			Subtotal:	$113,204.00	
New Construction					
Survey	$3,950.00	AC	10.0	$39,500.00	
Super silt fence	$14.50	LF	0	$0.00	N/A
WWPS pump/motor 1	$31,750.00	EA	0	$0.00	N/A
WWPS pump/motor 2 KVR	$40,000.00	EA	0	$0.00	N/A
WWPS pump/motor 3 KSR	$40,000.00	EA	4	$160,000.00	2 sets, 2 pumps in series
New 10" gravity sewer, PVC, 0'-10' depth, Road	$225.00	LF	0	$0.00	N/A
New 10" gravity sewer, PVC, 10'-15' depth, Road	$306.00	LF	850	$260,100.00	
New 10" gravity sewer, PVC, > 15' depth, Road	$390.00	LF	0	$0.00	N/A
New 8" force main, DI CL54, 0'-10' depth, Open Cut, Roac	$240.00	LF	0	$0.00	N/A
New 8" force main, DI CL54, 0'-10' depth, Open Cut, ESA	$212.00	LF	0	$0.00	N/A
New 10" force main, HDPE, 0'-10' depth, Open Cut, Roac	$208.00	LF	7413	$1,541,904.00	
New 10" force main, HDPE, 0'-10' depth, Open Cut, ESA	$180.00	LF	0	$0.00	N/A
New 10" force main, HDPE, HDD	$530.00	LF	0	$0.00	N/A
WSSC supervision of HDPE installation	$5.00	LF	7413	$37,065.00	
Corrossion resistant lining (transition manhole)	$400.00	VF	10	$4,000.00	New transition MH
10" Access Port at WWPS	$55,000.00	EA	1	$55,000.00	
10" Access Port on FM	$46,000.00	EA	6	$276,000.00	
4" Wastewater ARV	$7,079.00	EA	2	$14,158.00	1 along alignment, 1 at WWPS
ARV vault (5' diam manhole)	$10,086.00	EA	1	$10,086.00	1 along alignment
Maintenance of Traffic Initial Setup	$2,370.00	EA	4	$9,480.00	Kings Valley Road, Kingstead Road, Oak Drive, Ridge
Additional Duration for Maintenance of Traffic	$1,376.00	ED	170	$233,920.00	100LF/day, 6 wks/vault (2 at a time), 2 days paving
4' diameter manhole (std det S/1.0)	$1,200.00	VF	100	$120,000.00	
Tree Removal (greater than 10" DBH) - per inch diameter D	$70.00	IN	5	$350.00	Red Blaze access
Existing Force Main Abandonment	$25,000.00	LS	1	$25,000.00	
XYZ mapping	$900.00	ED	4	$3,600.00	
Odor control	$21,000.00	EA	1	$21,000.00	Installed at WWPS
4" trash pump	$325.00	EW	4	$1,300.00	2 weeks for each crossing under Kingstead Rd
			Subtotal:	$2,812,463.00	
Stream Stabilization					
Stream bypass pump mobilization	$710.00	EA	1	$710.00	Tributary under Kings Valley Road
Stream bypass pump usage	$1,090.00	ED	10	$10,900.00	2 weeks
Cross vane	$1,900.00	EA	0	$0.00	
Imbricated riprap wall	$110.00	LF	0	$0.00	
RGC mix	$175.00	CY	20	$3,500.00	
Coir fiber mat	$10.00	SY	50	$500.00	
			Subtotal:	$15,610.00	
WWPS Bypass Pumping					
Bypass setup & tear down	$3,200.00	DAY	0	$0.00	N/A
Fuel	$3.38	GAL	0	$0.00	N/A
Bypass (weekly)	$1,000.00	WK	0	$0.00	N/A
Bypass (weekly)	$1,000.00	WK	0	$0.00	N/A
24/7 Pump Watch	$2,250.00	DAY	0	$0.00	N/A
Bypass pipe rental 6" HDPE	$4.00	LF-WK	0	$0.00	N/A
			Subtotal:	$0.00	
Site Restoration					
Seeding & Mulching	$2.72	SY	0	$0.00	N/A
Tree - Container Grown, 2-2½ inch Caliper	$310.00	EA	25	$7,750.00	Red Blaze access
			Subtotal:	$7,750.00	
Allowances					
Temporary Utility Relocation Allowance	$10,000.00	LS	2	$20,000.00	
			Subtotal:	$20,000.00	
			Subtotal:	$3,266,027.00	
			Contingency (20%):	$653,205.40	
			Total:	$3,919,232.40	
Miscellaneous					
Permanent easement acquisition	$1.08	SF	0	$0.00	N/A
Construction easement acquisition	$0.54	SF	0	$0.00	
			Subtotal:	$0.00	
			Contingency (20%):	$0.00	
			Total:	$0.00	

Alt 24 Kingstead Road, Open Cut, WWPS Access, No Redundancy					
Item	**UC**	**Unit**	**Qty**	**Total**	**Notes**
Mobilization/Demobilization					
Mobilization/Demobilization	$269,000.00	LS	1	$269,000.00	
			Subtotal:	$269,000.00	
Access					
Constructed Access - Heavy duty mulch mat timber access	$126	SY	0	$0.00	N/A
Constructed Access - Protection Matting	$91	SY	1244	$113,204.00	Red Blaze Dr, for FM abandonment
			Subtotal:	$113,204.00	
New Construction					
Survey	$3,950.00	AC	10.0	$39,500.00	
Super silt fence	$14.50	LF	0	$0.00	N/A
WWPS pump/motor 1	$31,750.00	EA	0	$0.00	N/A
WWPS pump/motor 2 KVR	$40,000.00	EA	0	$0.00	N/A
WWPS pump/motor 3 KSR	$40,000.00	EA	4	$160,000.00	2 sets, 2 pumps in series
New 10" gravity sewer, PVC, 0'-10' depth, Road	$225.00	LF	0	$0.00	N/A
New 10" gravity sewer, PVC, 10'-15' depth, Road	$306.00	LF	850	$260,100.00	
New 10" gravity sewer, PVC, > 15' depth, Road	$390.00	LF	0	$0.00	N/A
New 8" force main, DI CL54, 0'-10' depth, Open Cut, Roac	$240.00	LF	0	$0.00	N/A
New 8" force main, DI CL54, 0'-10' depth, Open Cut, ESA	$212.00	LF	0	$0.00	N/A
New 10" force main, HDPE, 0'-10' depth, Open Cut, Roac	$208.00	LF	7413	$1,541,904.00	
New 10" force main, HDPE, 0'-10' depth, Open Cut, ESA	$180.00	LF	0	$0.00	N/A
New 10" force main, HDPE, HDD	$530.00	LF	0	$0.00	N/A
WSSC supervision of HDPE installation	$5.00	LF	7413	$37,065.00	
Corrossion resistant lining (transition manhole)	$400.00	VF	10	$4,000.00	New transition MH
10" Access Port at WWPS	$55,000.00	EA	1	$55,000.00	
10" Access Port on FM	$46,000.00	EA	0	$0.00	N/A
4" Wastewater ARV	$7,079.00	EA	2	$14,158.00	1 along alignment, 1 at WWPS
ARV vault (5' diam manhole)	$10,086.00	EA	1	$10,086.00	1 along alignment
Maintenance of Traffic Initial Setup	$2,370.00	EA	4	$9,480.00	Kings Valley Road, Kingstead Road, Oak Drive, Ridge
Additional Duration for Maintenance of Traffic	$1,376.00	ED	170	$233,920.00	100LF/day, 6 wks/vault (2 at a time), 2 days paving
4' diameter manhole (std det S/1.0)	$1,200.00	VF	100	$120,000.00	
Tree Removal (greater than 10" DBH) - per inch diameter D	$70.00	IN	5	$350.00	Red Blaze access
Existing Force Main Abandonment	$25,000.00	LS	1	$25,000.00	
XYZ mapping	$900.00	ED	4	$3,600.00	
Odor control	$21,000.00	EA	1	$21,000.00	Installed at WWPS
4" trash pump	$325.00	EW	4	$1,300.00	2 weeks for each crossing under Kingstead Rd
			Subtotal:	$2,536,463.00	
Stream Stabilization					
Stream bypass pump mobilization	$710.00	EA	1	$710.00	Tributary under Kings Valley Road
Stream bypass pump usage	$1,090.00	ED	10	$10,900.00	2 weeks
Cross vane	$1,900.00	EA	0	$0.00	
Imbricated riprap wall	$110.00	LF	0	$0.00	
RGC mix	$175.00	CY	20	$3,500.00	
Coir fiber mat	$10.00	SY	50	$500.00	
			Subtotal:	$15,610.00	
WWPS Bypass Pumping					
Bypass setup & tear down	$3,200.00	DAY	0	$0.00	N/A
Fuel	$3.38	GAL	0	$0.00	N/A
Bypass (weekly)	$1,000.00	WK	0	$0.00	N/A
Bypass (weekly)	$1,000.00	WK	0	$0.00	N/A
24/7 Pump Watch	$2,250.00	DAY	0	$0.00	N/A
Bypass pipe rental 6" HDPE	$4.00	LF-WK	0	$0.00	N/A
			Subtotal:	$0.00	
Site Restoration					
Seeding & Mulching	$2.72	SY	0	$0.00	N/A
Tree - Container Grown, 2-2½ inch Caliper	$310.00	EA	25	$7,750.00	Red Blaze access
			Subtotal:	$7,750.00	
Allowances					
Temporary Utility Relocation Allowance	$10,000.00	LS	2	$20,000.00	
			Subtotal:	$20,000.00	
			Subtotal:	$2,962,027.00	
			Contingency (20%):	$592,405.40	
			Total:	$3,554,432.40	
Miscellaneous					
Permanent easement acquisition	$1.08	SF	0	$0.00	N/A
Construction easement acquisition	$0.54	SF	0	$0.00	
			Subtotal:	$0.00	
			Contingency (20%):	$0.00	
			Total:	$0.00	

Alt 25 Kingstead Road, Open Cut, WWPS+2,500' Access, No Redundancy					
Item	**UC**	**Unit**	**Qty**	**Total**	**Notes**
Mobilization/Demobilization					
Mobilization/Demobilization	$279,000.00	LS	1	$279,000.00	
			Subtotal:	$279,000.00	
Access					
Constructed Access - Heavy duty mulch mat timber access	$126	SY	0	$0.00	N/A
Constructed Access - Protection Matting	$91	SY	1244	$113,204.00	Red Blaze Dr, for FM abandonment
			Subtotal:	$113,204.00	
New Construction					
Survey	$3,950.00	AC	10.0	$39,500.00	
Super silt fence	$14.50	LF	0	$0.00	N/A
WWPS pump/motor 1	$31,750.00	EA	0	$0.00	N/A
WWPS pump/motor 2 KVR	$40,000.00	EA	0	$0.00	N/A
WWPS pump/motor 3 KSR	$40,000.00	EA	4	$160,000.00	2 sets, 2 pumps in series
New 10" gravity sewer, PVC, 0'-10' depth, Road	$225.00	LF	0	$0.00	N/A
New 10" gravity sewer, PVC, 10'-15' depth, Road	$306.00	LF	850	$260,100.00	
New 10" gravity sewer, PVC, > 15' depth, Road	$390.00	LF	0	$0.00	N/A
New 8" force main, DI CL54, 0'-10' depth, Open Cut, Roac	$240.00	LF	0	$0.00	N/A
New 8" force main, DI CL54, 0'-10' depth, Open Cut, ESA	$212.00	LF	0	$0.00	N/A
New 10" force main, HDPE, 0'-10' depth, Open Cut, Roac	$208.00	LF	7413	$1,541,904.00	
New 10" force main, HDPE, 0'-10' depth, Open Cut, ESA	$180.00	LF	0	$0.00	N/A
New 10" force main, HDPE, HDD	$530.00	LF	0	$0.00	N/A
WSSC supervision of HDPE installation	$5.00	LF	7413	$37,065.00	
Corrossion resistant lining (transition manhole)	$400.00	VF	10	$4,000.00	New transition MH
10" Access Port at WWPS	$55,000.00	EA	1	$55,000.00	
10" Access Port on FM	$46,000.00	EA	2	$92,000.00	
4" Wastewater ARV	$7,079.00	EA	2	$14,158.00	1 along alignment, 1 at WWPS
ARV vault (5' diam manhole)	$10,086.00	EA	1	$10,086.00	1 along alignment
Maintenance of Traffic Initial Setup	$2,370.00	EA	4	$9,480.00	Kings Valley Road, Kingstead Road, Oak Drive, Ridge
Additional Duration for Maintenance of Traffic	$1,376.00	ED	170	$233,920.00	100LF/day, 6 wks/vault (2 at a time), 2 days paving
4' diameter manhole (std det S/1.0)	$1,200.00	VF	100	$120,000.00	
Tree Removal (greater than 10" DBH) - per inch diameter D	$70.00	IN	5	$350.00	Red Blaze access
Existing Force Main Abandonment	$25,000.00	LS	1	$25,000.00	
XYZ mapping	$900.00	ED	4	$3,600.00	
Odor control	$21,000.00	EA	1	$21,000.00	Installed at WWPS
4" trash pump	$325.00	EW	4	$1,300.00	2 weeks for each crossing under Kingstead Rd
			Subtotal:	$2,628,463.00	
Stream Stabilization					
Stream bypass pump mobilization	$710.00	EA	1	$710.00	Tributary under Kings Valley Road
Stream bypass pump usage	$1,090.00	ED	10	$10,900.00	2 weeks
Cross vane	$1,900.00	EA	0	$0.00	
Imbricated riprap wall	$110.00	LF	0	$0.00	
RGC mix	$175.00	CY	20	$3,500.00	
Coir fiber mat	$10.00	SY	50	$500.00	
			Subtotal:	$15,610.00	
WWPS Bypass Pumping					
Bypass setup & tear down	$3,200.00	DAY	0	$0.00	N/A
Fuel	$3.38	GAL	0	$0.00	N/A
Bypass (weekly)	$1,000.00	WK	0	$0.00	N/A
Bypass (weekly)	$1,000.00	WK	0	$0.00	N/A
24/7 Pump Watch	$2,250.00	DAY	0	$0.00	N/A
Bypass pipe rental 6" HDPE	$4.00	LF-WK	0	$0.00	N/A
			Subtotal:	$0.00	
Site Restoration					
Seeding & Mulching	$2.72	SY	0	$0.00	N/A
Tree - Container Grown, 2-2½ inch Caliper	$310.00	EA	25	$7,750.00	Red Blaze access
			Subtotal:	$7,750.00	
Allowances					
Temporary Utility Relocation Allowance	$10,000.00	LS	2	$20,000.00	
			Subtotal:	$20,000.00	
			Subtotal:	$3,064,027.00	
			Contingency (20%):	$612,805.40	
			Total:	$3,676,832.40	
Miscellaneous					
Permanent easement acquisition	$1.08	SF	0	$0.00	N/A
Construction easement acquisition	$0.54	SF	0	$0.00	
			Subtotal:	$0.00	
			Contingency (20%):	$0.00	
			Total:	$0.00	

Appendix E: Geotechnical Data

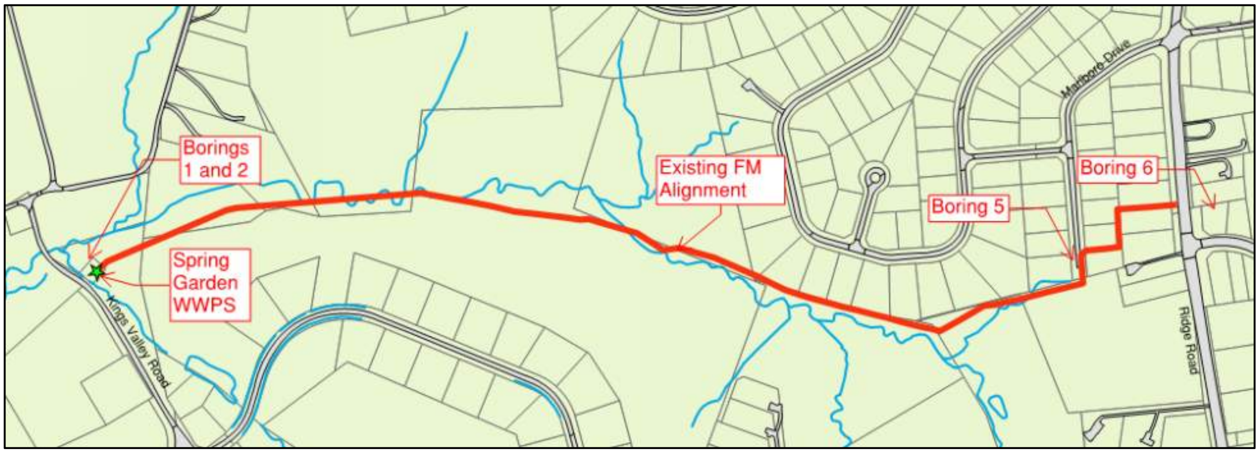


Figure C-1 Soil Boring Locations

BORING #1
GROUND SURFACE ELEVATION = 592.0

3'-0"	SILTY CLAY, TRACE FINE SAND - BROWN AND GRAY	589.0
9'-0"	FINE SANDY SILT, TRACE QUARTZ AND ROCK FRAGMENTS - BROWN	583.0
14'-0"	FINE SANDY SILT BROWN	578.0
19'-0"	FINE SANDY SILT, TRACE QUARTZ - BROWN	573.0
24'-0"	FINE SANDY SILT, TRACE QUARTZ - GRAY	568.0
28'-0"	CLAYEY SILT BROWN & GRAY	564.0
30'-0"	NOTE A	562.0

NOTE A - FINE SANDY SILT W/ QUARTZ & ROCK FRAGMENTS - BROWN

BORING COMPLETED 2-6-75

BORING #2
GROUND SURFACE ELEVATION = 589.0

13'-0"	6" TOP SOIL FINE SANDY SILT, TRACE QUARTZ & ROCK FRAGMENTS GRAY & BROWN	576.0
25'-1"	DISINTEGRATED ROCK GRAY & BROWN	563.9

REFUSAL

BORING COMPLETED 2-7-75

BORING #5
GROUND SURFACE ELEVATION = 705.0

9'-0"	3" BLACK TOP SANDY SILT & ROCK FRAGMENTS - FILL BROWN	696.0
11'-0"	CLAYEY SILT & WOOD FILL - BROWN	694.0
20'-0"	FINE SANDY SILT W/ QUARTZ & ROCK FRAGMENTS - BROWN AND GRAY	685.0

BORING COMPLETED 2-7-75

BORING #6
GROUND SURFACE ELEVATION = 730.0

3'-0"	FINE SANDY SILT - PROBABLE FILL - BROWN	727.0
7'-0"	FIND SANDY SILT WITH QUARTZ & ROCK FRAGMENTS - BROWN	723.0
14'-2"	DISINTEGRATED ROCK GRAY & BROWN	715.8

REFUSAL

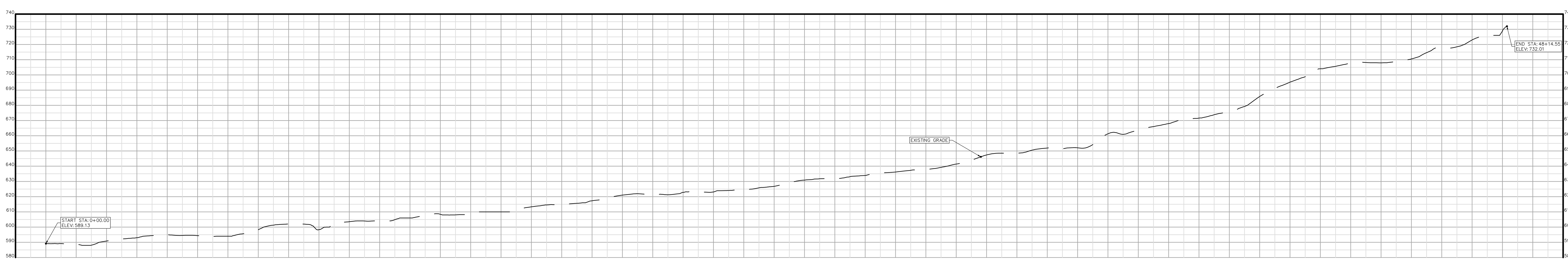
BORING COMPLETED 9-18-74

Appendix F: Force Main Profiles

PLAN VIEW

SCALE: 1"=200'

0 200 400 Feet



PROFILE

HORIZ - 1"=200'
VERT - 1"=40'

AS BUILT DATA	
CONTRACT MANAGER	
CONTRACTOR	
INSPECTOR	
L & G	
DATE STARTED	
DATE COMPLETED	
TYPE PIPE W.	S.
TYPE MANHOLES	
DATE FINALED	
FINALED BY	

DATE	REVISIONS

PIPELINE DESIGN DIVISION

DATE DIVISION MANAGER

WATER INFRASTRUCTURE SECTION

DATE SECTION MANAGER

DRAWN	ADEQUATE SURVEY		
RM	ON PROP. R/W REQ'D		
CHECK	OFF PROP. R/W REQ'D		
	OTHER UTILITIES		

JOB NO. 2320574P

NO

200'S 215 NW 4 OF

ENGINEER:

BLACK & VEATCH Building a world of difference.

PHONE NO. 301-556-4400

PROFESSIONAL CERTIFICATION

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EXPIRATION DATE: ______________

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ADDRESS: 18310 MONTGOMERY VILLAGE AVE, STE 500 GAITHERSBURG, MARYLAND, 20879
PHONE: (301)-556-4400
CONTACT: FADY AFIF

CONTRACT NO. PM0012A16
PROPOSED FORCE MAIN ALIGNMENT
EXISTING FM

FD186253 D175683

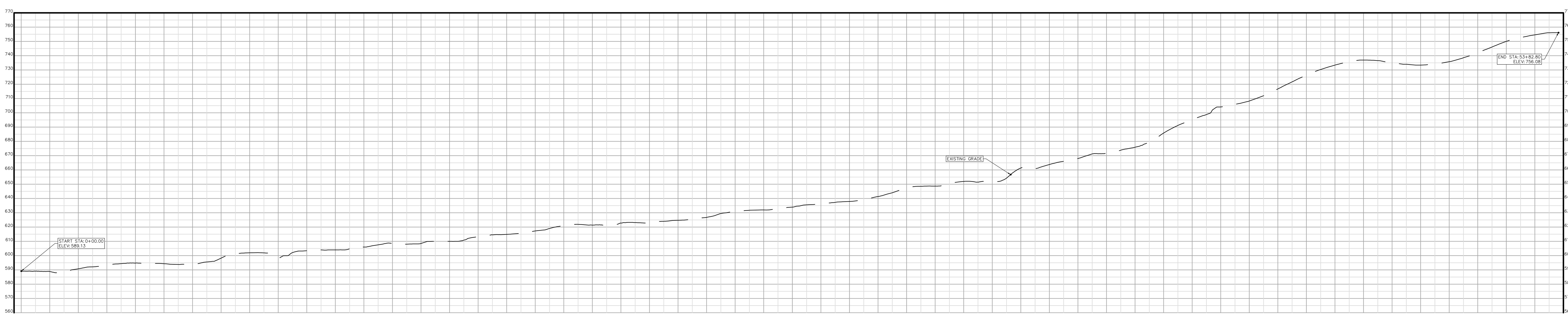
FILE NAME:

VERIFY SCALE - BAR IS ONE INCH ON ORIGINAL DRAWING 0 —— 1". IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

PLAN VIEW

SCALE: 1"=200'

0 200 400 Feet



PROFILE

HORIZ - 1"=200'

VERT - 1"=40'

AS BUILT DATA	
CONTRACT MANAGER	
CONTRACTOR	
INSPECTOR	
L & G	
DATE STARTED	
DATE COMPLETED	
TYPE PIPE W.	S.
TYPE MANHOLES	
DATE FINALED	
FINALED BY	

DATE	REVISIONS

PIPELINE DESIGN DIVISION

DATE — DIVISION MANAGER

WATER INFRASTRUCTURE SECTION

DATE — SECTION MANAGER

DRAWN	ADEQUATE SURVEY		
RM	ON PROP. R/W REQ'D		
CHECK	OFF PROP. R/W REQ'D		
	OTHER UTILITIES		

JOB NO. 2320574P

ENGINEER:

BLACK & VEATCH Building a world of difference.

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PHONE: (301)-556-4400
CONTACT: FADY AFIF

CONTRACT NO. PM0012A16

PROPOSED FORCE MAIN ALIGNMENT

EXISTING FM - MARLBORO DRIVE

200'S 215 NW 4 — NO — OF

D175683

FD186253

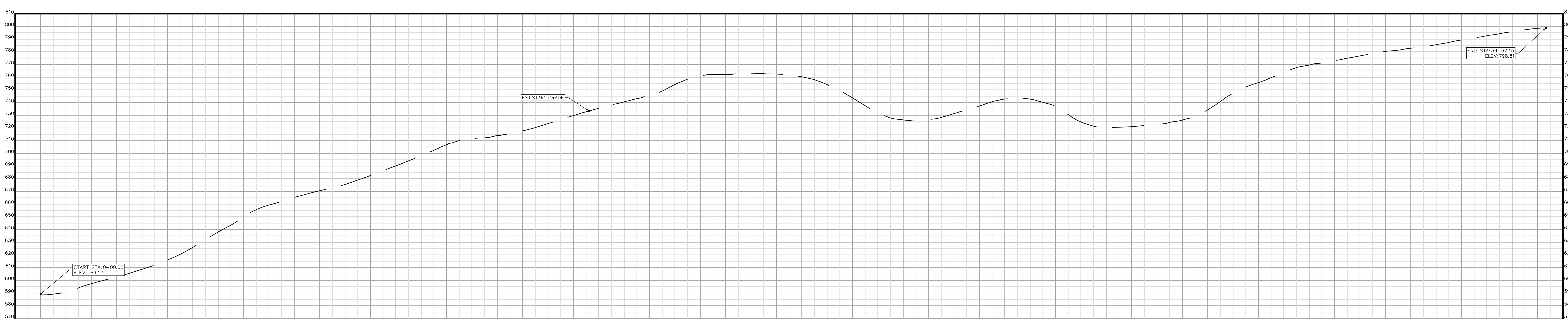
FILE NAME:

VERIFY SCALE - BAR IS ONE INCH ON ORIGINAL DRAWING 0 —— 1". IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

PLAN VIEW

SCALE: 1"=200'

0 250 500 Feet



PROFILE

HORIZ - 1"=250'

VERT - 1"=50'

AS BUILT DATA	
CONTRACT MANAGER	
CONTRACTOR	
INSPECTOR	
L & G	
DATE STARTED	
DATE COMPLETED	
TYPE PIPE W.	S.
TYPE MANHOLES	
DATE FINALED	
FINALED BY	

DATE	REVISIONS

PIPELINE DESIGN DIVISION

DATE DIVISION MANAGER

WATER INFRASTRUCTURE SECTION

DATE SECTION MANAGER

DRAWN	ADEQUATE SURVEY		
RM	ON PROP. R/W REQ'D		
CHECK	OFF PROP. R/W REQ'D		
	OTHER UTILITIES		

JOB NO. 2320574P

200'S 215 NW 4

NO

OF

ENGINEER:

BLACK & VEATCH

Building a world of difference.

PHONE NO. 301-556-4400

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ENGINEER:

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ADDRESS: 18310 MONTGOMERY VILLAGE AVE, STE 500 GAITHERSBURG, MARYLAND, 20879

PHONE: (301)-556-4400

CONTACT : FADY AFIF

CONTRACT NO. PM0012A16

PROPOSED FORCE MAIN ALIGNMENT

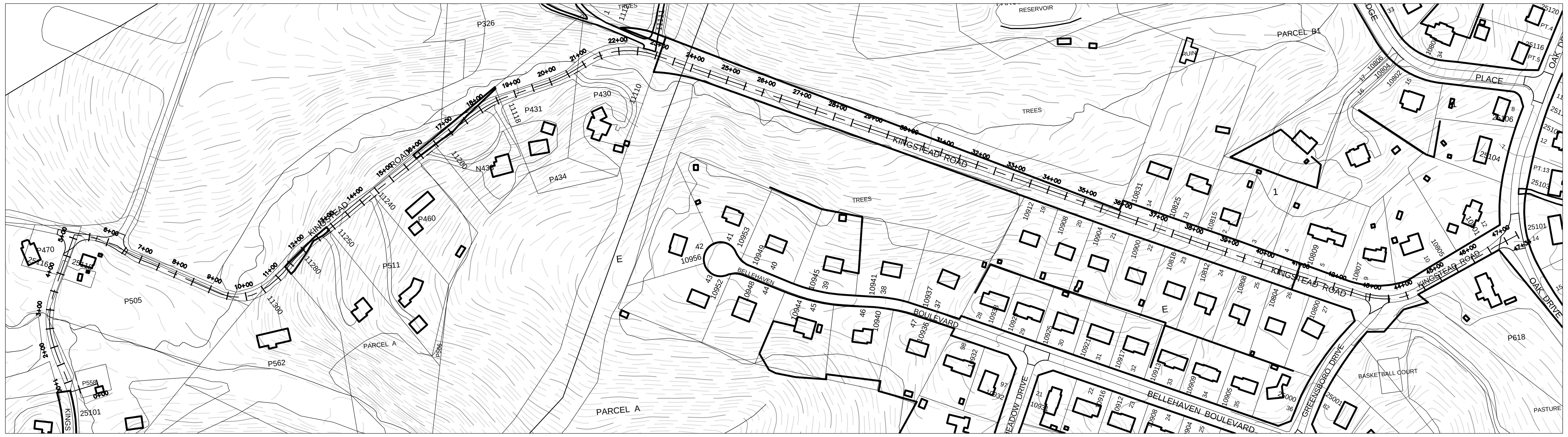
KINGS VALLEY ROAD

D175683

FD186253

FILE NAME:

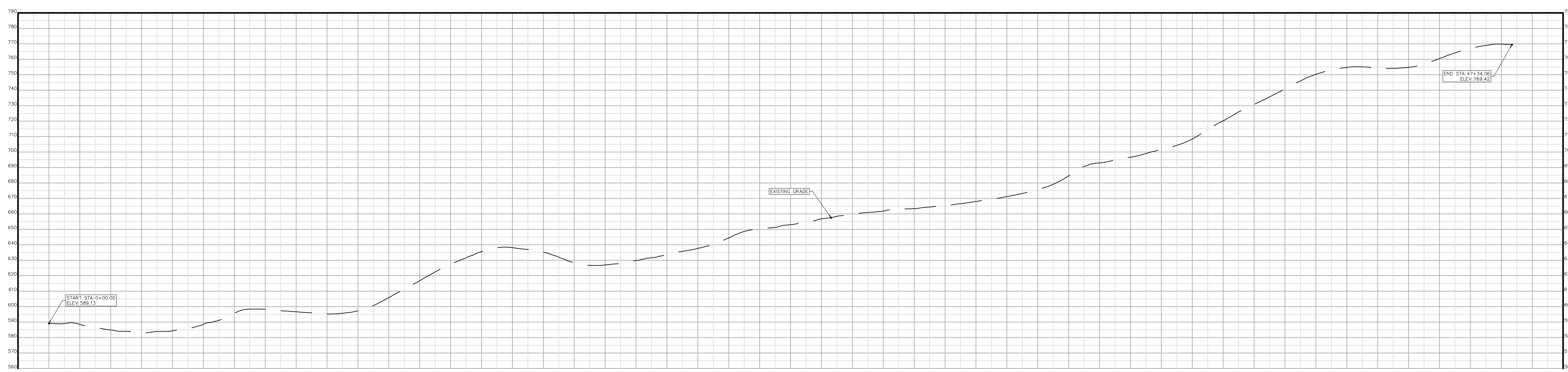
VERIFY SCALE - BAR IS ONE INCH ON ORIGINAL DRAWING 0 —— 1". IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.



PLAN VIEW

SCALE: 1"=200'

0 200 400 Feet



PROFILE

HORIZ - 1"=200'

VERT - 1"=40'

AS BUILT DATA	
CONTRACT MANAGER	
CONTRACTOR	
INSPECTOR	
L & G	
DATE STARTED	
DATE COMPLETED	
TYPE PIPE W.	S.
TYPE MANHOLES	
DATE FINALED	
FINALED BY	

DATE	REVISIONS

PIPELINE DESIGN DIVISION

DATE DIVISION MANAGER

WATER INFRASTRUCTURE SECTION

DATE SECTION MANAGER

DRAWN	ADEQUATE SURVEY	
RM	ON PROP. R/W REQ'D	
CHECK	OFF PROP. R/W REQ'D	
	OTHER UTILITIES	

JOB NO. 2320574P

200'S 215 NW 4 NO OF

ENGINEER:

BLACK & VEATCH Building a world of difference.

PHONE NO. 301-556-4400

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ADDRESS: 18310 MONTGOMERY VILLAGE AVE, STE 500 GAITHERSBURG, MARYLAND, 20879
PHONE: (301)-556-4400
CONTACT: FADY AFIF

CONTRACT NO. PM0012A16

PROPOSED FORCE MAIN ALIGNMENT

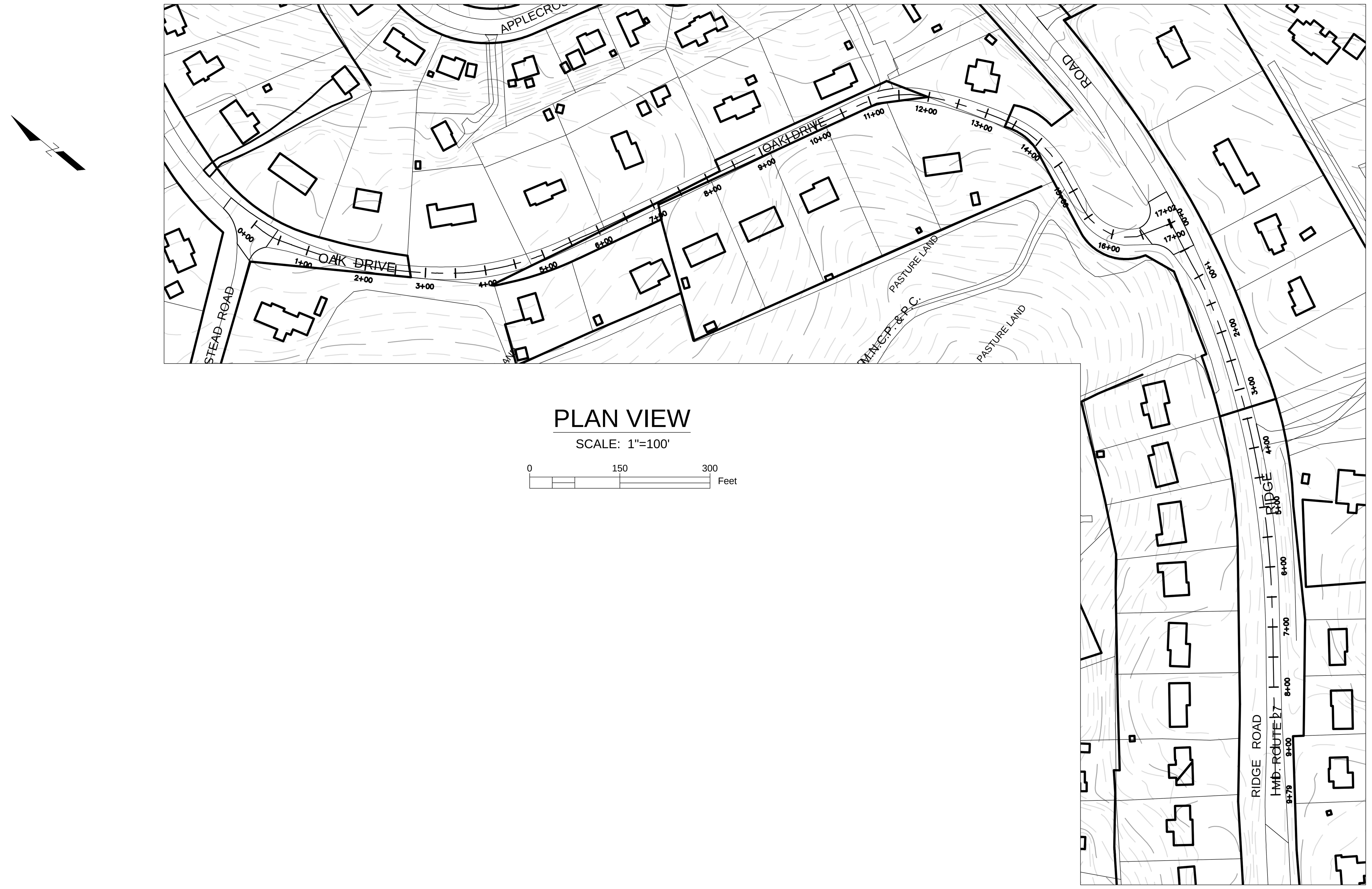
KINGSTEAD ROAD

D175683

FD186253

VERIFY SCALE - BAR IS ONE INCH ON ORIGINAL DRAWING 0 —— 1". IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

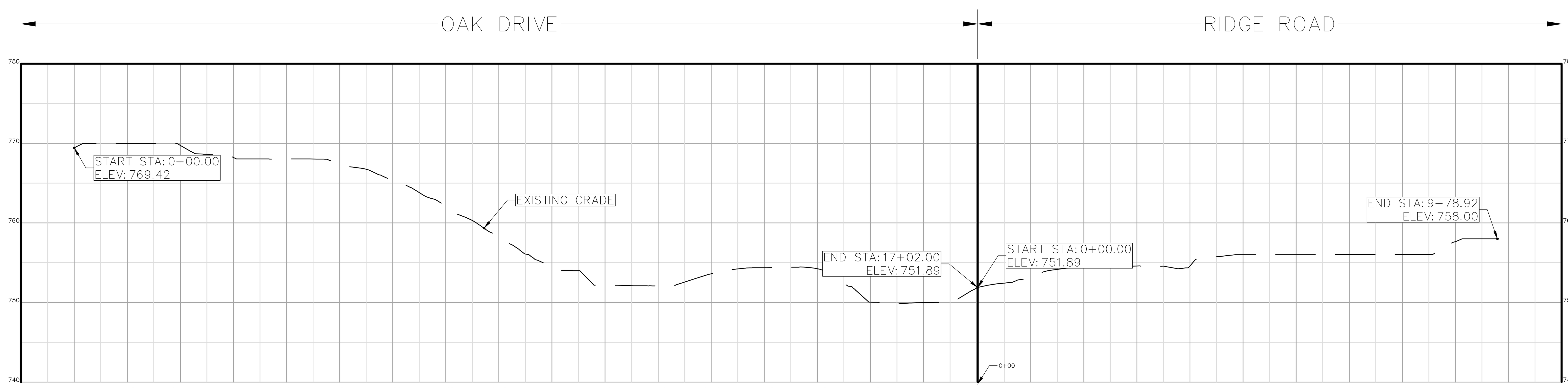
FILE NAME:



PLAN VIEW

SCALE: 1"=100'

0 150 300 Feet



PROFILE

HORIZ - 1"=150'

VERT - 1"=10'

AS BUILT DATA	
CONTRACT MANAGER	
CONTRACTOR	
INSPECTOR	
L & G	
DATE STARTED	
DATE COMPLETED	
TYPE PIPE W. S.	
TYPE MANHOLES	
DATE FINALED	
FINALED BY	

DATE	REVISIONS

PIPELINE DESIGN DIVISION

DATE DIVISION MANAGER

WATER INFRASTRUCTURE SECTION

DATE SECTION MANAGER

DRAWN	ADEQUATE SURVEY		
RM	ON PROP. R/W REQ'D		
CHECK	OFF PROP. R/W REQ'D		
	OTHER UTILITIES		

JOB NO. 2320574P

ENGINEER:

BLACK & VEATCH
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PHONE NO. 301-556-4400

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PHONE: (301)-556-4400
CONTACT: FADY AFIF

CONTRACT NO. PM0012A16

PROPOSED FORCE MAIN ALIGNMENT

OAK DRIVE - RIDGE ROAD

200'S 215 NW 4

NO

OF

FILE NAME:

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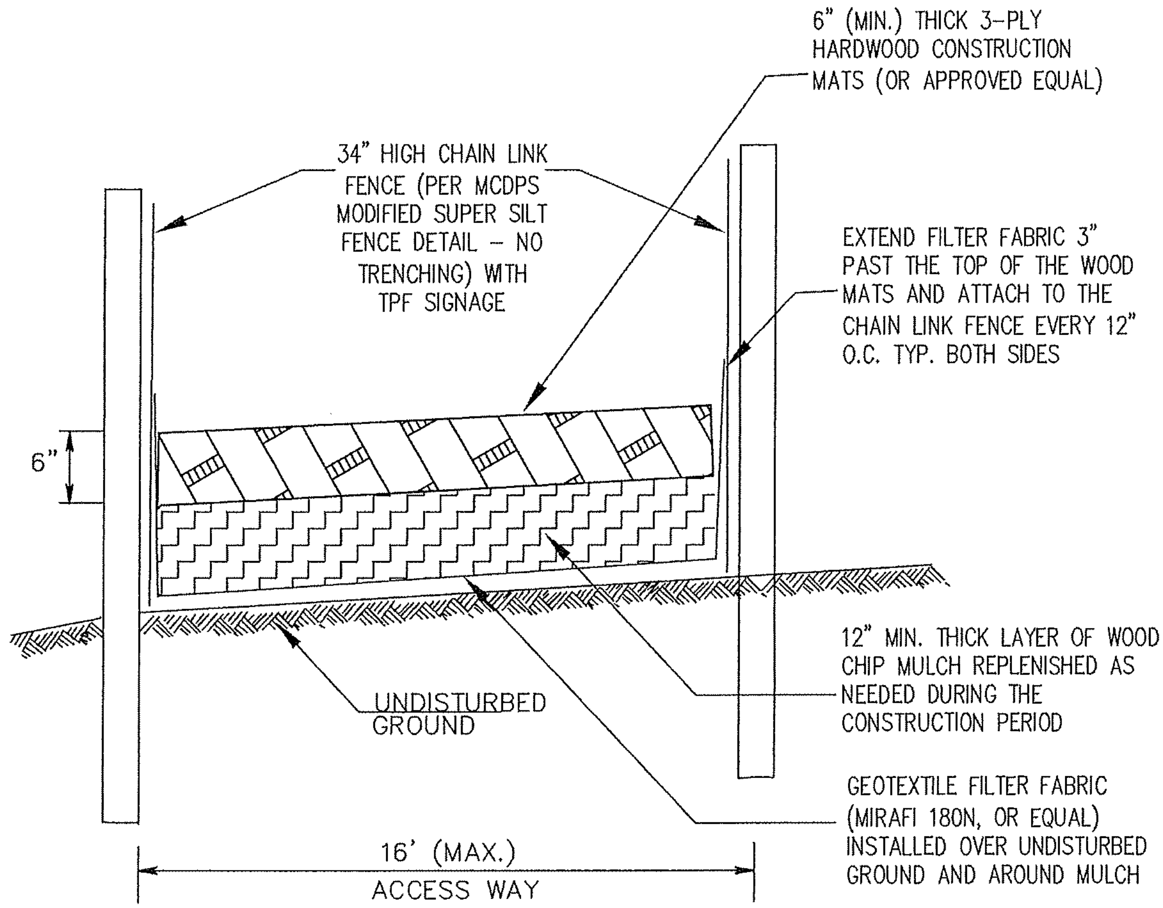
D175683

FD186253

Appendix G: Construction Details



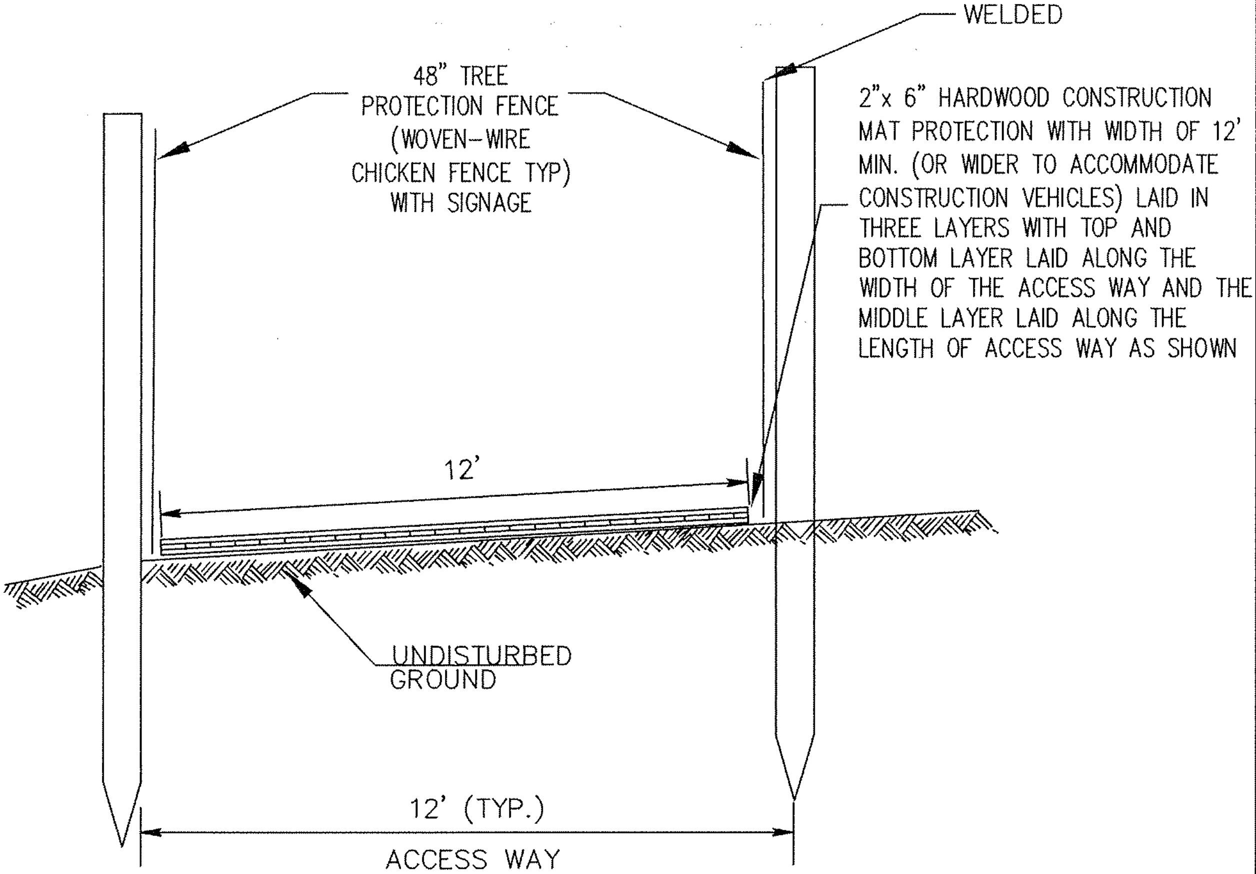
ACCESS WAY
CROSS-SECTION

NOTES:

1. ACCESS ROUTES TO BE FIELD LOCATED WITH M-NCPPC AND MCDPS AT PRE-CONSTRUCTION MEETING.
2. CONTRACTOR SHALL SEQUENCE CONSTRUCTION SUCH THAT NO EQUIPMENT IMPACTS AREA TO BE PROTECTED PRIOR TO MULCH PLACEMENT.
3. FILTER FABRIC SHALL BE A SINGLE PIECE ACROSS WIDTH. OVERLAP FABRIC BY 18" MIN. ALONG LENGTH OF ROUTE.
4. FILTER FABRIC MAY ONLY BE ELIMINATED AT DIRECTION OF M-NCPPC ARBORIST.
5. CONTRACTOR SHALL MAINTAIN MULCH MAT THROUGHOUT CONSTRUCTION PERIOD.
6. MULCH SHALL BE DISPOSED OF OFF-SITE UNLESS OTHERWISE APPROVED BY M-NCPPC. WHERE MULCH IS TO REMAIN, FILTER FABRIC SHALL BE AN APPROVED BIODEGRADABLE TYPE).

HEAVY DUTY MULCH MAT DETAIL

NOT TO SCALE



ACCESS WAY
CROSS-SECTION

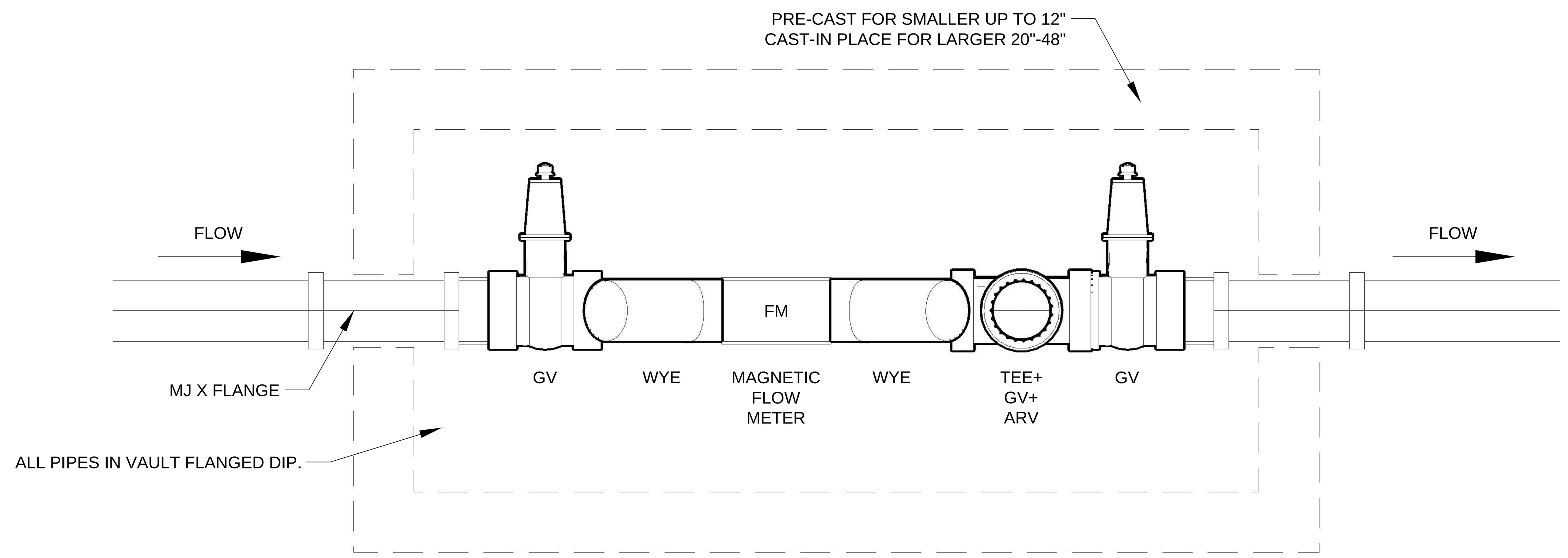
NOTES:

1. ACCESS ROUTES TO BE FIELD LOCATED WITH M-NCPPC AND MCDPS INSPECTORS AT PRE-CONSTRUCTION MEETING.
2. CONTRACTOR SHALL SEQUENCE CONSTRUCTION SUCH THAT NO EQUIPMENT WILL IMPACT AREAS TO BE PROTECTED PRIOR TO MAT PLACEMENT.
3. CONTRACTOR SHALL MAINTAIN PROTECTION MAT THROUGHOUT CONSTRUCTION PERIOD.
4. CONTRACTOR SHALL PROVIDE 2"x6" HARDWOOD BOARDS OF 12' WIDTH(OR WIDER TO ACCOMMODATE CONSTRUCTION VEHICLES) OR APPROVED EQUAL WHICH ARE TO BE LAID OVER DRY TURF SURFACE ALONG THE WIDTH OF THE ACCESS WAY FOR IMPACT PROTECTION AND MINOR WEIGHT DISTRIBUTION.
5. USE OF THIS METHOD IS PERMITTED ONLY WITH APPROVAL OF FIELD INSPECTOR PRIOR TO CONSTRUCTION.

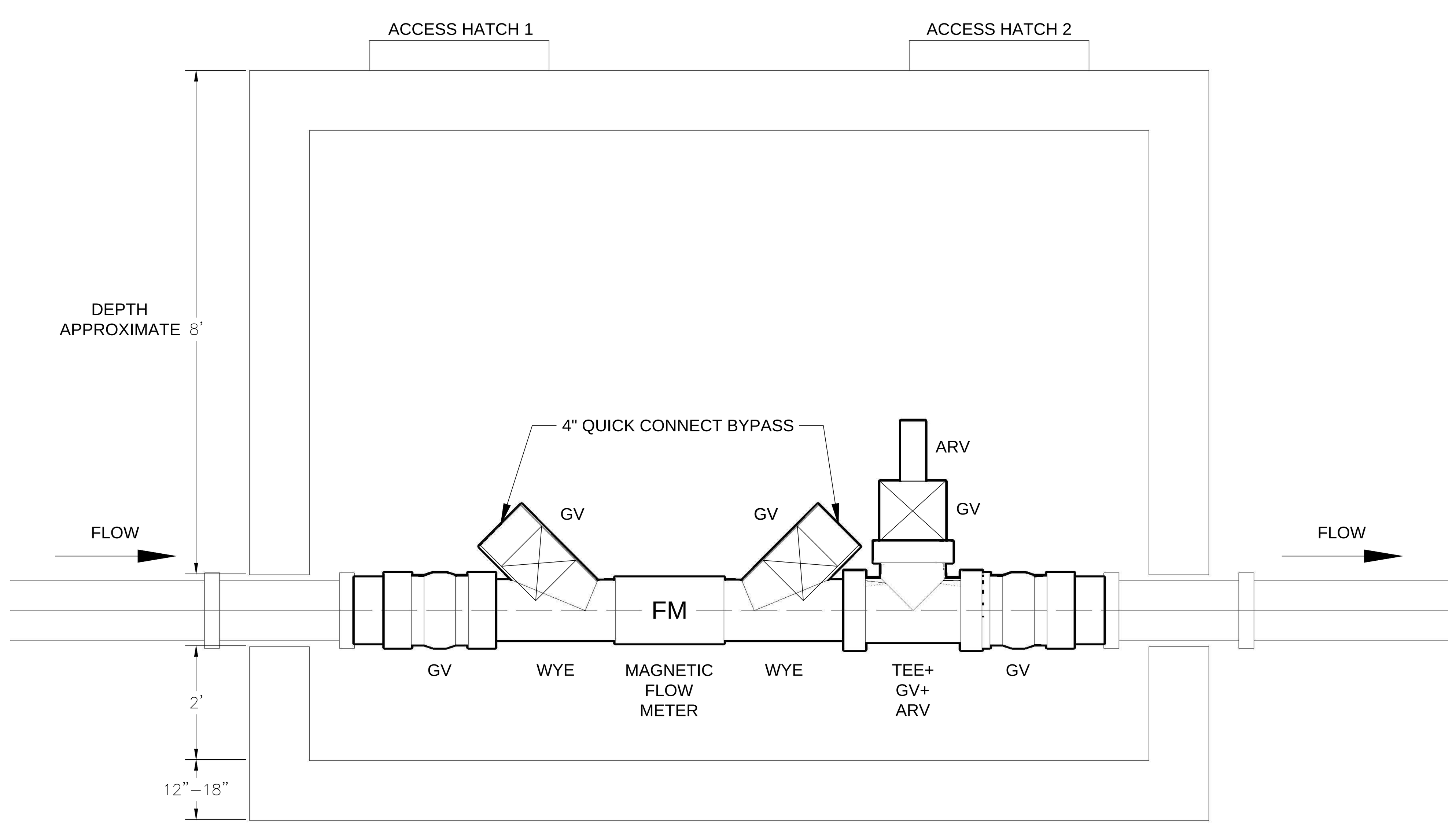
WIDE VEHICLE PROTECTION MAT DETAIL

NOT TO SCALE

ACCESS PORT AT PUMP STATION

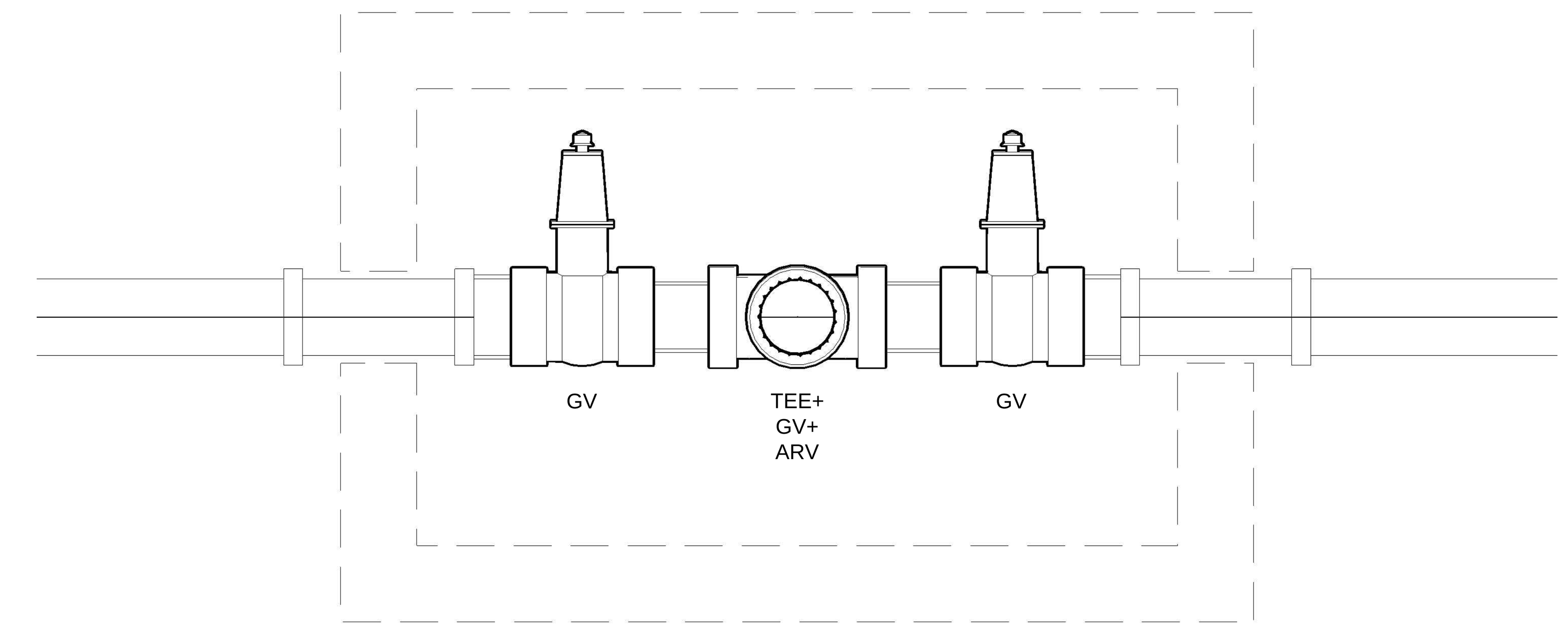


PLAN
4" = 12' LONG x 6' WIDE
6" = 12' LONG x 6' WIDE
8" = 12' LONG x 6' WIDE
12" = 16' LONG x 8' WIDE

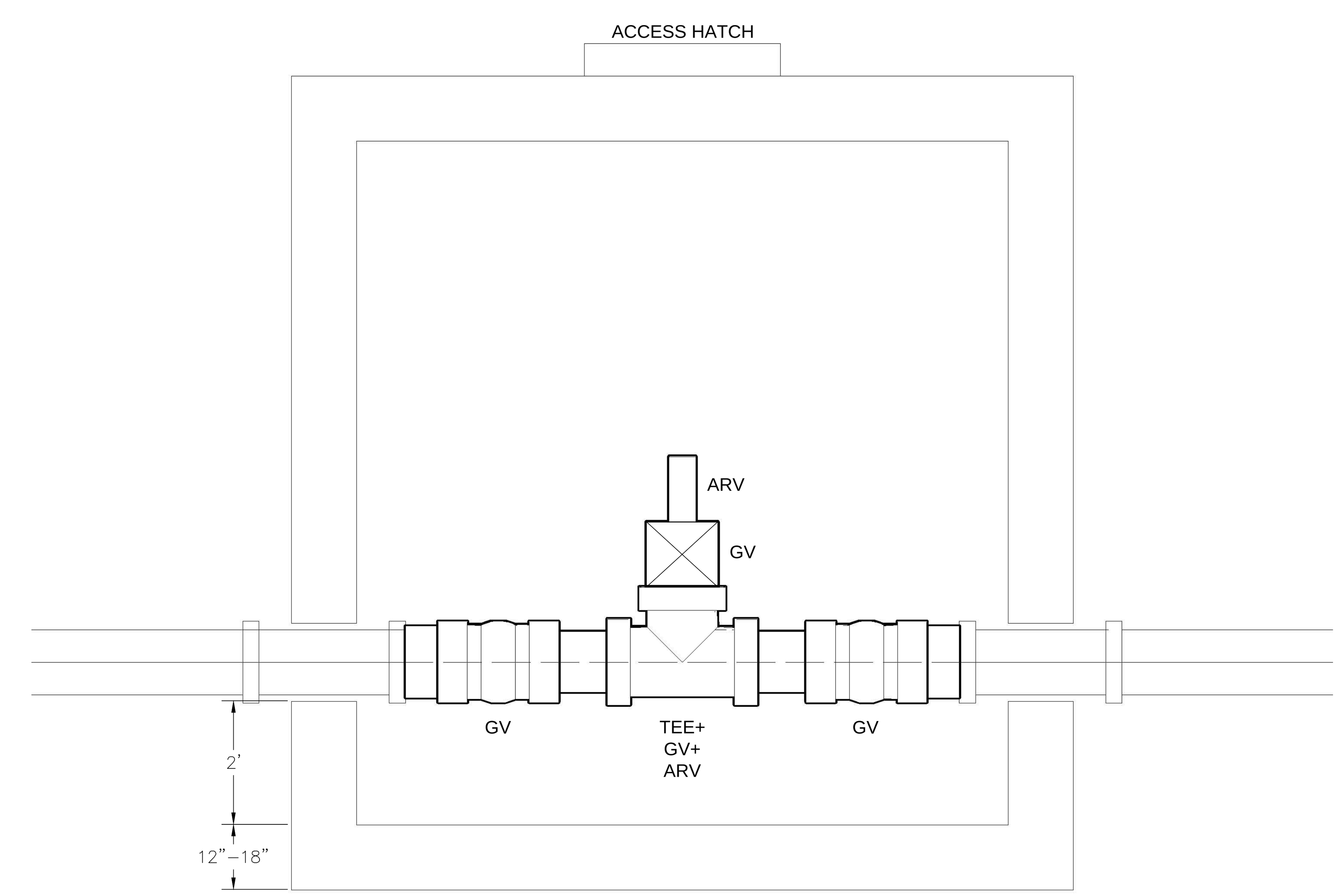


PROFILE

ACCESS PORT ALONG ALIGNMENT



PLAN
4" = 9' LONG x 6' WIDE
6" = 9' LONG x 6' WIDE
8" = 9' LONG x 6' WIDE
12" = 12' LONG x 8' WIDE



PROFILE

AS BUILT DATA	
CONTRACT MANAGER	
CONTRACTOR	
INSPECTOR	
L & G	
DATE STARTED	
DATE COMPLETED	
TYPE PIPE W.	S.
TYPE MANHOLES	
DATE FINALED	
FINALED BY	

DATE	REVISIONS

PIPELINE DESIGN DIVISION

DATE DIVISION MANAGER

WATER INFRASTRUCTURE SECTION

DATE SECTION MANAGER

DRAWN	ADEQUATE SURVEY		
RM	ON PROP. R/W REQ'D		
CHECK	OFF PROP. R/W REQ'D		
	OTHER UTILITIES		

JOB NO. 2320574P

ENGINEER:

BLACK & VEATCH Building a world of difference.

PHONE NO. 301-556-4400

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ADDRESS: 18310 MONTGOMERY VILLAGE AVE, STE 500 GAITHERSBURG, MARYLAND, 20879
PHONE: (301)-556-4400
CONTACT : FADY AFIF

CONTRACT NO. PM0012A16
ACCESS PORT DETAILS

200'S 215 NW 4
NO
OF

D175683
FD186253

FILE NAME:

VERIFY SCALE - BAR IS ONE INCH ON ORIGINAL DRAWING 0 —— 1". IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

Appendix H: Environmental Assessment

WSSC BUSINESS CASE DEVELOPMENT BOA
ENVIRONMENTAL ASSESSMENT OF SPRING GARDEN FORCE MAIN ALIGNMENT ALTERNATIVES

WSSC Where Water Matters

WSSC Contract No. PM0012A16

Job No. 23202574P

Prepared for:

Black & Veatch 18310 Montgomery Village Avenue
Suite 500
Gaithersburg, MD 20879

Prepared by:

PEER Consultants, P.C.
409 12th Street SW, Suite 603
Washington, DC 20024

Engineers • Scientists • Planners

Table of Contents

LIST OF TABLES

LIST OF FIGURES

APPENDICES

LIST OF ACRONYMS

BOA	Basic Ordering Agreement
COMAR	Code of Maryland Annotated Regulation
DNR	Maryland Department of Natural Resources
FEMA	Federal Emergency Management Agency
FIDS	Forest Interior Dwelling Species
IPaC	Information for Planning and Consultation
MNCPPC	Maryland National Capital Park and Planning Commission
NRCS	National Resources Conservation Service
NWI	National Wetland Inventory
RTE	Rare, Threatened or Endangered Species
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture

USFWS	U.S. Fish and Wildlife Service
WSSC	Washington Suburban Sanitary Commission
WMA	Wildlife Management Area
WWPS	Waste water Pumping Station

Introduction

The applicant, WSSC, proposes to construct a new force main from an existing waste water pumping station (WWPS) located on Kings Valley Road, to a higher point in the sewershed, along Route 27 – Ridge Road, in Damascus, MD. As part of the alternative screening for possible alignments, Peer Consultants was asked to review and summarize the environmental impacts of three alignments provided by Black & Veatch (see Figure 1).

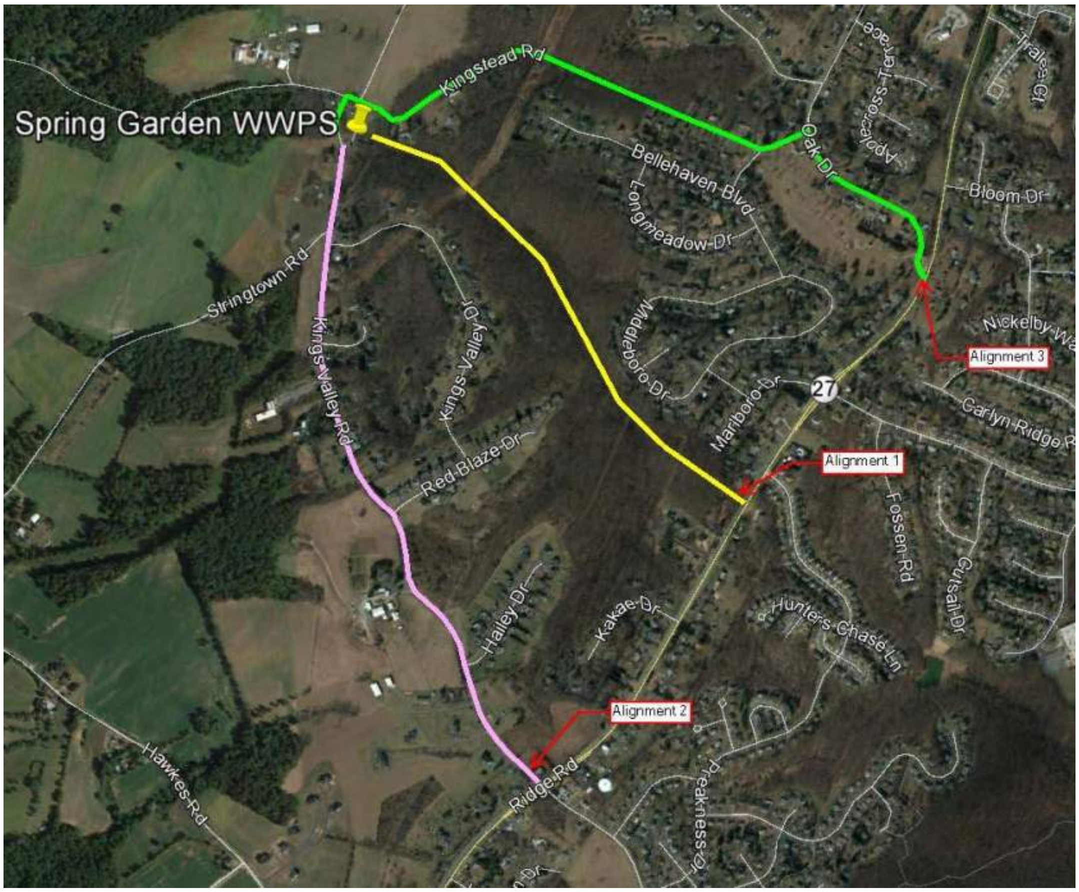

Figure 1 - Spring Garden Force Main Alignments

The three alignments arrive at different points along Route 27, have differing lengths but all have the common starting point of the existing pump station.

Environmental impacts reviewed include: wetlands, streams & FEMA floodplains; Rare, Threatened or Endangered (RTE) Species & Sensitive Species; and forests and prime agricultural lands. A field visit was conducted on October 3, 2017 to review possible alignments and prepare for desktop analysis of potential impacts. A desktop review consisted of reviewing Federal, State and Local online databases for information on possible wetlands, streams, floodplains, Federal RTE species, MD DNR Sensitive Species and forests in the area of the proposed alignments. Maps 1- 6 (Appendix A, attached) show each of the proposed alignments along with significant environmental features relevant to the impact study.

Environmental Data Reviewed

The 500-acre study area is roughly bound by Kings Valley Road on the south and west, Kingstead Road and Oak Drive on the north and Ridge Road (Route 27) on the east. The topography of the area slopes northwest from a high point along Ridge Road to a low point along Kings Valley Road at the WWPS. There is a forested stream valley (see Appendix A, Map 1) containing an unnamed tributary to Little Bennett Creek that is surrounded on three sides by several single family residential subdivisions. During the field visit it was noted that there are several existing manholes in the valley, so there has been previous incursions for utility construction. The project lies within an area of State Water Use Class III, P waters which can affect wetland permit reviews and extent of County regulated stream buffers (see Appendix A, Map 2). No FEMA floodplain is mapped for the project study area.

The study area mentioned above was used to review potential for Federal RTE & MD DNR Sensitive Species impacts of the proposed alignments. The repository for Federal RTE information on the project area is the Chesapeake Bay Program Office of the US Fish and Wildlife Service (USFWS). USFWS has an online information tool for assessing potential impacts to Federally listed RTE and other environmental resources. This tool is called the Information for Planning and Consultation (IPaC) and the report for the proposed project study area is attached to this report as Appendix B. Details provided in the report include no findings of endangered species at the project location, 11 listings of Migratory birds protected under the Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act and findings of National Wetland Inventory (NWI) wetlands in the project area. Impacts to forested areas utilized by the migratory species found may be restricted during breeding times and special conditions applied to construction approvals to meet these restrictions.

A review of relevant State endangered species data provided by MD DNR (see Appendix A, Map 3) shows no Sensitive Species within the study area. However, as shown on Appendix A, Map 4 there are positive indications of Forest Interior Dwelling Species (FIDS) in the project area, particularly for alignment 1. The FIDS finding is consistent with the Federal Migratory Bird finding, as these species often prefer large tracts of older forest land for nesting and breeding.

After reviewing the USDA NRCS Soils Map (see Appendix A, Map 5) for the project study area and the Soil Survey for Montgomery County, we determined that there are no prime agricultural farmland soils in the vicinity of the proposed project. There are however, hydric soils within the stream valley along the route of proposed alignment 1.

Map 6 in Appendix A shows the proposed project alignments in relation to existing Montgomery County Forest Conservation Easements regulated by MNCPPC and MD DNR.

The project area is not in the Patuxent River drainage area, and therefore is not subject to Primary Management Area requirements.

Evaluation of Alignments

Descriptions of each alignment, along with potential environmental impacts and possible permits/approvals needed to complete construction are provided below.

Alignment 1 – Stream Valley (shown in yellow on Figure 1)

This alignment is located within the forested stream valley containing an unnamed tributary to Little Bennett Creek. The forest around the stream varies from 485 feet to more than 1000 feet wide in places. There are no National Wetland Inventory wetland systems mapped within the valley, but the field visit on October 3, 2017, revealed the likelihood that non-tidal wetlands exist in places along the 4500-foot length of the alignment. The alignment traverses a variety of soil types in the valley, but 2 are considered hydric (6A & 54A) and may contain wetlands (see Appendix A, Map 4). A full wetland investigation of the stream valley is warranted to confirm presence of possible resources impacted. A search of protected lands in County land records indicated that there are several forest conservation easements (see Appendix A, Map 5) that may be impacted by sewer construction in the valley. Anticipated impacts in a 40-foot-wide construction corridor (includes access roads and sewer construction) include mature forest removal and temporary impacts to wetlands and streams. Use of directional boring construction will minimize (if not eliminate) impacts to sensitive environmental areas. Based on worst case anticipated impacts, the following permits and approvals are needed: Joint Permit Application (JPA) review by MDE and US Army Corps (for streams and wetlands), Montgomery County Park and Planning Commission (MNCPPC) – Environmental Planning Section (for forest clearing and easement impacts). Note that State review of forest impacts by MD DNR may mitigate applicability of County Forest Conservation and stream buffer requirements. This alignment proposes the highest amount of environmental impacts and requires the most complicated permits due to its construction in a forested stream valley with existing easements, wetlands and streams.

Table 1 summarizes the anticipated impacts for alignment 1.

Table 1 – Alignment 1 Impact Summary

Area of Impact	Impact (SF or LF)	Description of Impact(s)
Environmentally Sensitive Areas	Potential 175,000 sf of perennial stream and wetland buffers (MNCPPC) & riparian forest (MNCPPC & MD DNR)	Impacts to sensitive areas are anticipated with construction in the stream valley including 150'-250' stream buffer for MNCPPC if additional field investigations find presence of non-tidal wetlands and steep slopes within base 150 foot stream buffer
Floodplains	0	No mapped FEMA floodplains exist for this site; therefore, no impacts are anticipated.
Fish and Wildlife Habitats	175,000 sf stream, buffer & riparian forest habitat impact (MNCPPC & MD DNR)	Impacts to fish and wildlife habitats (forests and streams) are anticipated with construction in the stream valley and will be reviewed by MD DNR, MNCPPC, MDE, USACE & USFWS
Wetlands	175,000 sf wetland, buffers & stream impact with a JPA required	Impacts to wetlands are anticipated with construction in the stream valley and will be reviewed by MD DNR, MDE, USACE & USFWS

Area of Impact	Impact (SF or LF)	Description of Impact(s)
Prime Agricultural Lands	0	There are no prime agricultural lands in the project area. Therefore, no impact is anticipated.
Water Reservoirs	0	There are no reservoirs in the vicinity of the site. Therefore, no impact to reservoirs are anticipated.
Overall Environmental Impact	**Potential 175,000 sf wetland, buffer, forest, fish & wildlife habitat impact**	**Under this alternative, no environmental impacts are expected except for potential impacts described above**

Alignment 2 – Kings Valley Road (shown in pink on Map 1)

This alignment is located entirely within the public right of way of Kings Valley Road and is approximately 5800 feet long. Since the road is in a cleared right of way, there will be no impacts to forests, streams or wetlands with this alignment and no environmental permits for their impacts will be needed. Any deviation from the road right of way may lead to forest conservation requirements and approvals from MNCPPC.

Table 2 summarizes the anticipated impacts for alignment 2.

Table 2 – Alignment 2 Impact Summary

Area of Impact	Impact (SF or LF)	Description of Impact(s)
Environmentally Sensitive Areas	0	No impacts to environmentally sensitive areas are anticipated with construction within the public right of way.
Floodplains	0	No mapped FEMA floodplains exist for this site; therefore, no impacts are anticipated.
Fish and Wildlife Habitats	0	No impacts to fish and wildlife habitats (forests and streams) are anticipated with construction public right of way.
Wetlands	0	No impacts to wetlands are anticipated with construction in the public right of way.
Prime Agricultural Lands	0	There are no prime agricultural lands in the project area. Therefore, no impact is anticipated.
Water Reservoirs	0	There are no reservoirs in the vicinity of the site. Therefore, no impact to reservoirs are anticipated.
Overall Environmental Impact	**0**	**Under this alternative, no environmental impacts are expected provided construction is located in the public right of way.**

Alignment 3 – Kingstead Road and Oak Drive (shown in green on Map 1)

This alignment is located entirely within the public right of way of Kingstead Road and Oak Drive and is approximately 6400 feet long. Since the road is in a cleared right of way there will be no impacts to forests. However, there are at least 3 stream crossings (1 concrete and 2 corrugated metal culverts) along this proposed alignment. The first crossing on Kings Valley Road, north of the pump station, will be on the upstream side of a newly replaced concrete culvert. The upstream banks adjacent to the culvert are armored with riprap and directional boring could be used to avoid stream and wetland impacts in this area. The two remaining culverts along Kingstead Road are in poor condition and may need to be replaced if disturbed by proposed sewer line construction. It may be possible to avoid culvert replacement by moving the sewer alignment just off the road, but this may impact regulated streams/wetlands and possibly have some forest impacts. Use of directional boring construction will minimize (if not eliminate) impacts to sensitive environmental areas at the crossing points. A full wetland investigation of the streams and wetlands along this alignment is recommended to confirm presence of possible resources to be impacted. A joint permit application reviewed by MDE and USACE will be needed for stream and wetland impacts. Any deviation from the road right of way may lead to forest conservation requirements and approvals from MNCPPC and/or MD DNR. Note that State review of forest impacts by MD DNR may mitigate applicability of County Forest Conservation requirements.

Table 3 summarizes the anticipated impacts for Alignment 3.

Table 3 – Alignment 3 Impact Summary

Area of Impact	Impact (SF or LF)	Description of Impact(s)
Environmentally Sensitive Areas	0/~3200 to stream buffers (MNCPPC) if location moved off paved areas	No impacts to environmentally sensitive areas are anticipated with construction within the public right of way. Minimal impacts to riparian areas if alignment moved and directional boring not selected.
Floodplains	0	No mapped FEMA floodplains exist for this site; therefore, no impacts are anticipated.
Fish and Wildlife Habitats	0/~3200 to forests (MNCPPC) and streams (JPA) along roadway	No impacts to fish and wildlife habitats (forests and streams) are anticipated with construction public right of way. Minimal impacts to forests/streams areas if alignment moved and directional boring not selected.
Wetlands	0/~3200 to wetlands and buffers (JPA) along roadway	No impacts to wetlands are anticipated with construction in the public right of way. Minimal impacts to wetlands and buffers areas if alignment moved and directional boring not selected.
Prime Agricultural Lands	0	There are no prime agricultural lands in the project area. Therefore, no impact is anticipated.
Water Reservoirs	0	There are no reservoirs in the vicinity of the site. Therefore, no impacts to reservoirs are anticipated.

Area of Impact	Impact (SF or LF)	Description of Impact(s)
Overall Environmental Impact	**Possible 3,200 sf wetland, buffers, stream, forest, impact**	**Under this alternative, no environmental impacts are expected unless construction is moved outside of the public right of way.**

Permits and Regulatory Requirements

MDE and USACE Requirements:

If further field investigation identifies the presence of hydric (wetland) soils, hydrophytic vegetation and wetland hydrology or if the streams along alignments 1 and 3 are found to be jurisdictional, any environmental impacts to these features will require a JPA and Permit Approval before construction can proceed. This permit will require the approval of both the Maryland Department of the Environment and the US
Army Corps of Engineers – Regulatory Branch. Under the current considerations, no impacts to these
features are expected.

Maryland Department of Natural Resources (DNR)

Any forest impacts greater than 1 acre (43,560 square feet) will require preparation of a Forest Stand Delineation and Forest Conservation Plan for review and approval of the Maryland DNR Forest Service. The plan must be prepared by a Code of Maryland (COMAR) Qualified Forest Professional and adhere to the rules and regulations of the Maryland Forest Conservation Technical Manual. These plans will likely be required for alignment 1 due to the route of the alignment through a forested stream valley.

M-NCPPC Requirements:

For Alignments 1 & 3, the potential regulatory impact is related to Montgomery County regulations regarding protection of environmentally sensitive areas, which would add stream buffers for perennial and intermittent streams which may be present along alignments 1 and 3. For Alignment 2, no impacts
to the any regulated streams or wetlands are anticipated. M-NCPPC will likely require a minimum of a 150-foot stream buffer on each side of the stream, and up to a 200 feet wide buffer (each side) depending on the steepness of slopes adjacent to the stream. If the channels are determined to be ephemeral (stormflow only), those channels may be regulated by USACE only and no stream buffer will be required.

Summary and Conclusion

The desktop research and site visits indicated several significant environmental features impacts along alignment 1, and possible impacts along alignment 3 if construction moves outside the paved roadway. No impacts are anticipated along alignment 2 provided the construction limits are contained within the paved roadway and public right of way.

Alignments 1 and 3 have a potential of features being determined to be regulated streams by MDE, USACE, and M-NCPPC, with the potential for a M-NCPPC stream buffer to intersect onto the alignments if the features are determined to be intermittent or perennial streams. While no wetlands are mapped for any of the sites, the presence of wetlands was not ascertainable during the initial site visits by visual assessment of the vegetation and other field conditions. However, since hydric soils were found along alignment 1, there is a likelihood that wetlands are present in these areas. Further field studies are recommended to determine the extent of wetland and stream features along alignments 1 and 3 to allow detailed evaluation of possible impacts. Therefore, if further field investigation finds the presence of wetland soils in or around the alignments, those limits must be identified to optimize the construction site layout. Should the construction limits extend beyond the wetland or stream buffer limits, a permit application with regulatory agency approval will be required.

Impacts to forest resources that total more than 1 acre (likely along alignment 1) detailed forest conservation plans must be prepared and reviewed by the Maryland Department of Natural Resources.

B. CEM Field Delineated Environmental Resources Assessment

Applying Practical Science to Improve Communities

WSSC SPRING GARDEN WASTEWATER PUMPING STATION SITE SELECTION FIELD DELINEATED ENVIRONMENTAL RESOURCES ASSESSMENT

Prepared For:
Washington Suburban Sanitary Commission
14501 Sweitzer Lane
Laurel, MD 20707

Project Engineer:
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Hunt Valley, MD 21031

Prepared By:
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Bel Air, MD 21014

APRIL 2020

Applying Practical Science to Improve Communities

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SECTIONS

TABLES

APPENDIX A – SITE FIGURES

APPENDIX B - FIELD DELINEATED RESOURCE PHOTO LOG

SECTION 1 - INTRODUCTION

CEM was contracted by Mott MacDonald (MM) to perform a field investigation of jurisdictional environmental resources identified within the study area limits of, and areas directly adjacent to, four (4) potential site alternatives for the installation of a Washington Suburban Sanitary Commission (WSSC) wastewater pumping station in Montgomery County, Maryland. The study areas extend along Kings Valley Rd from Kingstead Rd in the north to the intersection of Stringtown Rd and Kings Valley Rd in the south (**Appendix A, Figure 1 - Site Vicinity Map**). **Table 1** below provides a location description and study area size, in square feet and acres, of each site alternative.

Table 1 - Alignment Descriptions			
Site Alternative	**Location**	**SF***	**Acres***
1	West side of Kings Valley Road approximately 500 feet south of Kingstead Road.	190,670	4.38
2	Flag lot located directly adjacent to and west of Alternative Site 1.	120,935	2.78
3	Straddles Kingstead Road, north of Site 4.	178,283	4.09
4	Located along the eastern side of Kings Valley Road from approximately 200 feet south of Kingstead Road to Stringtown Road.	114,920	2.64

**Represents the total size of the study area for each site alternative. The actual area required for the proposed wastewater pumping station will be determined by design factors.*

CEM utilized the following online data sources to create field maps and provide background information prior to the field investigation:

- Montgomery County GIS Open Data Portal
- U.S. Department of Agriculture – Natural Resources Conservation Service Soil Survey for Montgomery County
- US Fish and Wildlife Service National Wetlands Inventory (NWI)
- Maryland Department of Natural Resources (MDNR) geospatial data
- Aerial photographs
- Federal Emergency Management Area (FEMA) Floodplain data (Flood Insurance Rate Map [FIRM] No. 24031C0065D, dated September 29, 2006.

CEM performed a field survey to identify the jurisdictional limits of streams, wetlands, and forest resources within the limits of the four site alternatives. The findings of the field investigation, conducted on April 7, 8, and 20, 2020, are provided in **Sections 2** through **Section 4. Section 5** below provides a summary of resources identified within each site alternative. Figures identifying delineated resources are provided in **Appendix A** and a photo log of the field delineated resources are provided in the **Appendix B**.

The jurisdictional limits of field delineated resources will require verification from the associated resource agency prior to the issuance of any impact authorization.

SECTION 2– FIELD DELINEATED WETLANDS

A field delineation is required to determine the presence and jurisdictional limit of wetland/waters resources. Jurisdictional wetland impacts are authorized by MDE's Wetlands and Waterways Division and the U.S. Army Corps of Engineers (USACE) via the Joint Permit Application (JPA) process. Wetland permitting is typically divided into two categories, minor and major depending on the level of impact. Minor projects generally involve permanent impacts of less than 5,000 square feet of non-tidal wetlands. Minor projects generally do not require mitigation, an alternatives analysis, or public notice by the applicant. Major projects are those with greater than 5,000 square feet of permanent impacts or projects that will impact wetlands within a Use III or Use IV watershed. Major projects require an alternatives analysis, public notice, and mitigation. The delineated wetlands are located within a Use III watershed.

MDE also regulates a wetland buffer, 25 feet in width, surrounding all jurisdictional non-tidal wetlands. The 25-foot buffer is expanded to 100 feet for Wetlands of Special State Concern. There are no Wetlands of Special State Concern within the limits of the study area. The USACE does not regulate non-tidal wetland buffers. Impacts to the 25-foot non-tidal wetland buffer require authorization from MDE via the Joint Permit Application (JPA) process.

Additionally, Montgomery County and the Maryland-National Capital Park and Planning Commission (M-NCPPC) further regulate wetland buffers. The width of these buffers are based upon several variables, including; stream use classification, wetlands of special state concern, adjacent steep slopes, and wetlands with erodible soils. Distances are expressed in feet from the edge of the delineated wetland boundary. CEM determined that the M-NCPPC wetland buffer for all wetlands within the study area is 50 feet because they are classified as Second Order streams and are located within a Use III watershed. M-NCPPC buffers for wetland, springs and seeps are provided in **Table 2a**.

Table 2a - M-NCPPC Buffers for Wetlands, Springs, and Seeps

Stream Use and Order	Wetlands of Special State Concern	Wetlands with Steep Slopes	Wetlands with Erodible Soils	Other Wetlands
Use III, First and Second Order	100’	50-100’	50-100’	**50’**
Use III, Third and Higher Order	100’	25-100’	25-100’	25’
Use IV, First and Second Order	100’	40-100’	40-100’	40’
Use IV, Third and Higher Order	100’	25-100’	25-100’	25’
Use I, First and Second Order	100’	25-100’	25-100’	25’
Use I, Third and Higher Order	100’	25-100’	25-100’	25’

Wetlands were field delineated using the "Routine Method" described in the *1987 US Army Corps of Engineers Wetlands Delineation Manual (Y-87-1) and the 2010 Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain (Regional Supplement)*. The Manual states that three criteria (wetland vegetation, wetland soils, and wetland hydrology) must be present for an area to qualify as a wetland.

A total of 3 wetlands (WET) were delineated within the limits of, or adjacent to, the four site alternatives. Wetland WET-1 is classified as a palustrine broadleaf deciduous forested wetland that is temporarily flooded (PFO1A). WET-1 straddles site alternatives 3 and 4, is located just north of the current WSSC wastewater pumping station along and east of Kings Valley Rd, and adjoins the south bank of WUS-1. WET-1 continues to the east outside of the study area. Wetland WET-1A is classified as a palustrine broadleaf deciduous forested wetland that is temporarily flooded (PFO1A). WET-1A is wholly within site alternative 3, is located south of Kingstead Rd, and adjoins WUS-3 along the eastern and southern edge of the wetland. Wetland WET-2 is classified as a palustrine broadleaf deciduous forested wetland that is temporarily flooded (PFO1A) and is located north and west of site alternative 2.

The total area of wetlands, MDE wetland buffers, and M-NCPPC wetland buffers are provided in **Table 2b - Delineated Wetlands and Associated Wetland Buffers** below. **Figures 2 & 3** in the **Appendix A** provide a visual depiction of delineated wetland resources.

Table 2b - Delineated Wetland Resources and Associated Wetland Buffers

Site	Wetlands		MDE 25 ft. Wetland Buffers		M-NCPPC 50 ft. Wetland Buffers	
	SF	AC	SF	AC	SF	AC
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	11,289	0.26	21,474	0.49	36,890	0.85
4	26,319	0.60	11,944	0.27	18,742	0.43

SECTION 3– FIELD DELINEATED STREAMS

The limit of jurisdiction for streams is identified via a field delineation and extends to the Ordinary High Water Mark (OHWM) on each side of the stream. 33 CFR 328.3(e) defines the OHWM as follows:

> *"that line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas."*

Montgomery County and the M-NCPPC regulate stream buffers based on percent slope and Stream Use Class designation. MDE does not regulate stream buffers. M-NCPPC stream buffers are only applied to perennial and intermittent stream designations. Ephemeral streams are not subject to buffers. CEM determined that the M-NCPPC stream buffer for the streams within the study area was 150 feet as the streams are identified as Use Class III with a surrounding percent slope of 0-15%. Distances are expressed in feet from the delineated OHWM on each stream bank. M-NCPPC stream buffer width are provided in **Table 3a**.

Table 3a – M-NCPPC Stream Buffer			
Percent Slope	**Use I/I-P**	**Use III/III-P**	**Use IV/IV-p**
0 to <15 %	100’	**150’**	125’
15 to <25 %	125’	175’	150’
25 % and greater	150’	200’	175’

A total of 5 streams (WUS) were delineated within the limits of, and directly adjacent to, the study area. Three streams were identified as perennial (WUS 1, 2, & 3) and two streams were identified as intermittent (WUS-4 & 5).

Perennial stream WUS-1 meanders along the border between site alternative 3 and 4 and extends beyond the limits of the study area to the east and to the west. Perennial stream WUS-2 is located within site alternative 4 and extends south beyond the limits of the study area. Perennial stream WUS-3 is located along the eastern border of site alternative 3 and flows south until its confluence with WUS-1, along the border of site alternatives 3 and 4. Intermittent stream WUS-4 is located east of site alternative 3, outside the limits of the study area and intermittent stream WUS-5 is located north of site alternative 2. **Table 3b** below depicts the total amount of stream and M-NCPPC stream buffer identified within each of the four site alternatives. **Figures 2 & 3** in **Appendix A** provide a visual depiction of delineated stream resources.

Table 3b - Delineated Stream Resources and Associated M-NCPPC Buffers		
Site	**Linear Feet**	**M-NCPPC Stream Buffer (SF)**
1	0	21,262
2	0	21,383
3	584	116,659
4	671	104,464

SECTION 4 – FIELD DELINEAED FOREST STAND RESOURCES

The jurisdictional limits of forest resources are field verified via the guidelines established in the Maryland Forest Conservation Act (FCA) at *Natural Resources Article Section 5-1601 through 5-1613*. The FCA was signed into Maryland Law in 1991 and was established to minimize the loss of forest resources during land development by making the identification and protection of forests part of the site planning process. Montgomery County Forest Conservation Law (1992 L.M.C., ch. 4 § 1) requires a Forest Conservation Plan for any project requiring the following: submittal of development plan on any size parcel; submittal of special exception on a lot greater than or equal to 40,000 square feet; submittal of mandatory referral on a parcel greater than or equal to 40,000 square feet; obtaining a sediment control permit (5,000 square feet of land disturbance); construction which threatens a champion tree. CEM also measured and located specimen trees. Specimen trees are trees having a diameter at breast height (DBH), 4.5 feet above the ground, of 30 inchers or greater, or trees having 75% or more of the diameter of the current state champion tree.

CEM conducted field delineations of forest stand resources on 4/7/2020 and 4/8/2020. A total of 3 forest stands (FS) and two specimen trees were identified. FS1 is a broadleaf deciduous forest primarily dominated by a tulip poplar (*Liriodendron tulipifera*) and co-dominated by red maple (*Acer rurbum*). FS2 is a broadleaf deciduous forest primarily dominated by red maple and co-dominated by black willow (*Salix nigra*). FS3 is a broadleaf deciduous forest dominated by red maple and co-dominated by common persimmon (*Diospyros virginiana*).

Table 4 - Delineated Forest Resources below provides a breakdown of the total amount of forest resources identified within the limits of each site alternative. **Figure 4** in **Appendix A** provides a visual depiction of the field delineated forest resources.

Table 4 - Delineated Forest Resources				
Site	**Acres of Forest**			
	FS1	**FS2**	**FS3**	**Total**
1	0	0	0	**0**
2	0	0	0	**0**
3	0	0.65	0.06	**0.71**
4	0.42	0.82	0	**1.24**

SECTION 5 – Field Delineated Resource Summary

Table 5 below provides a summary of wetland, stream, buffer, forest, and specimen trees resources delineated within the project study area for each of the four site alternatives. Based on the results of the field investigation, alternative site 2 contains the least amount of potentially jurisdictional resources.

Table 5 - Delineated Resources Summary				
Resource	**Site 1**	**Site 2**	**Site 3**	**Site 4**
Delineated Wetlands (SF)	0	0	11,289	26,319
MDE 25-Ft Wetland Buffer (SF)	0	0	21,474	11,944
M-NCPPC 50-Ft Wetland Buffer (SF)	0	0	36,890	18,742
Delineated Streams (LF)	0	0	584	671
M-NCPPC 150-Ft Stream Buffer (SF)	21,262	21,383	116,659	104,464
Delineated Forest (AC)	0	0	0.71	1.24
Specimen Trees (total)	0	0	0	2

APPENDIX A

FIGURE 1 - Site Vicinity Map
FIGURE 2 – Delineated Wetland Resources with M-NCPPC Buffers
FIGURE 3 – Delineated Wetland Resources with MDE Buffers
FIGURE 4 – Delineated Forest Resources

Path: V:\WSSC 1154\T08 WSSC Spring Garden Site Selection\GIS\Projects\Spring Garden\Spring Garden.aprx

Spatial Reference
Name: NAD 1983 HARN StatePlane Maryland FIPS 1900 Feet

LEGEND

- STUDY AREA
- DNR STREAMS
- COUNTY BOUNDARY

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WSSC WATER
DELIVERING THE ESSENTIAL

MOTT MACDONALD

SCALE: 1:12,000

0 500 1,000 2,000 FEET

WSSC SPRING GARDEN WWPS SITE SELECTION FIGURE 1: SITE VICINITY MAP

MONTGOMERY COUNTY, MD

SHEET # 1 OF 1

DATE: APRIL 2020

DATA SOURCES:
MD iMAP SIX INCH IMAGERY, WORLD STREET BASEMAP (ArcGIS Online), MD DEPARTMENT OF NATURAL RESOURCES GIS DATA

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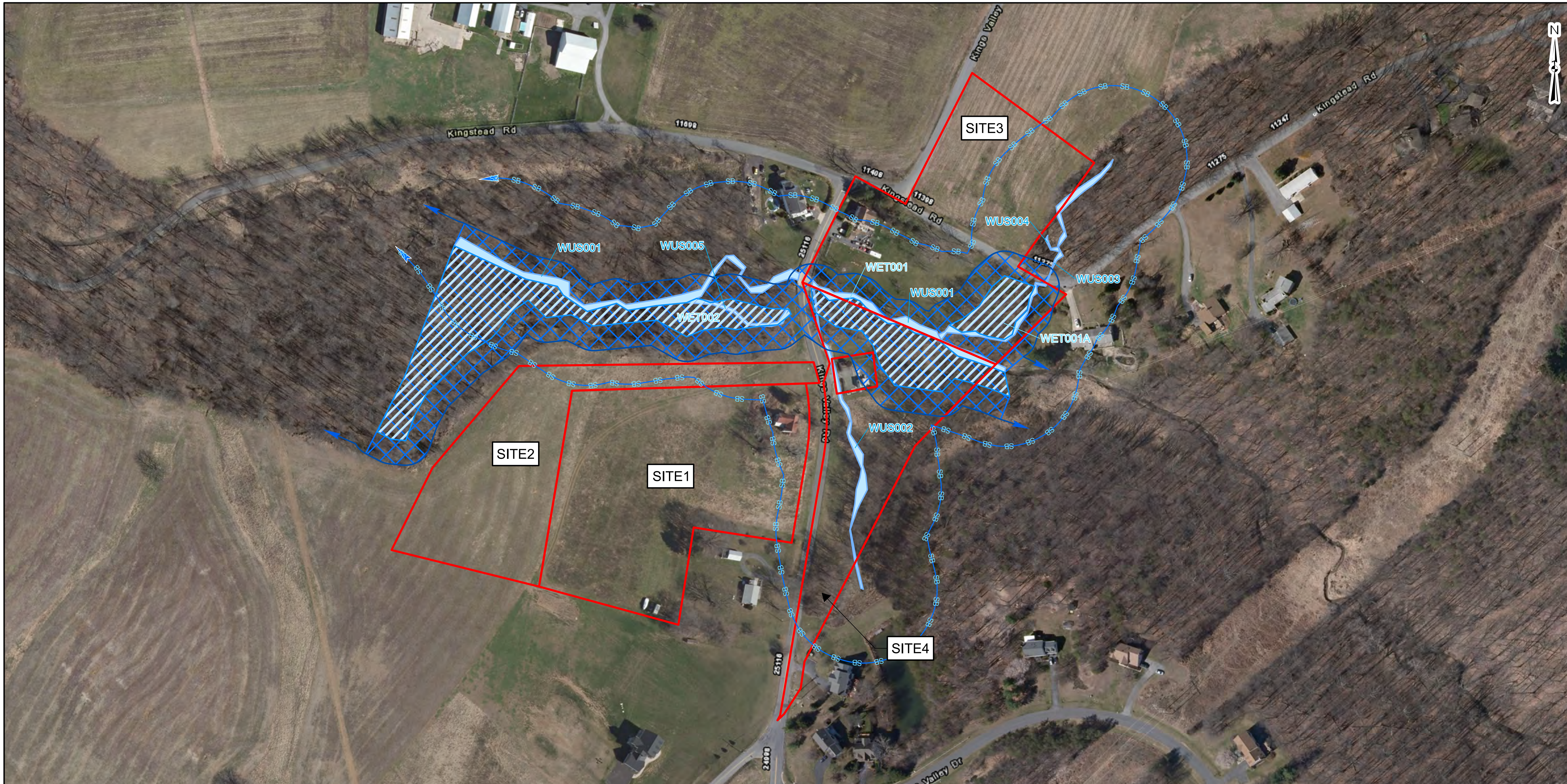

LEGEND
- STUDY AREA
- DELINEATED WETLANDS
- DELINEATED WATERWAY
- M-NCPPC 50-FT WETLAND BUFFER
- M-NCPPC 150-FT STREAM BUFFER

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WSSC WATER
DELIVERING THE ESSENTIAL

MOTT MACDONALD

SCALE: 1:2,400

0 100 200 400 FEET

WSSC SPRING GARDEN WWPS SITE SELECTION
FIGURE 2: WETLAND AND STREAM LOCATION MAP - M-NCPPC

MONTGOMERY COUNTY, MD

SHEET # 1 OF 1

DATE: APRIL 2020

DATA SOURCES:
MD iMAP SIX INCH IMAGERY, MD DEPARTMENT OF NATURAL RESOURCES GIS DATA

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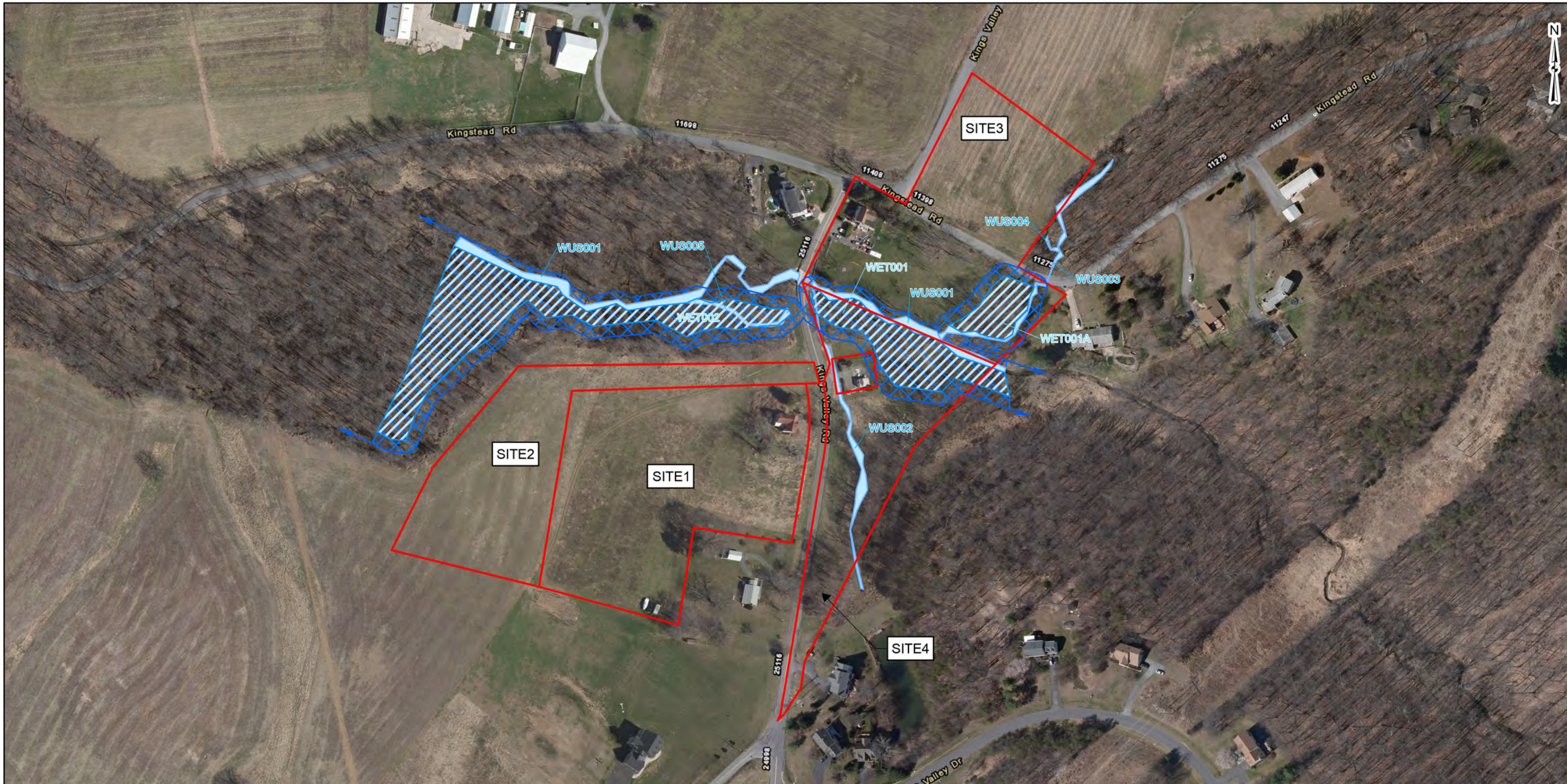

LEGEND
- STUDY AREA
- DELINEATED WETLANDS
- DELINEATED WATERWAY
- MDE 25-FOOT WETLAND BUFFER

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WSSC WATER
DELIVERING THE ESSENTIAL

MOTT MACDONALD

SCALE: 1:2,400

FEET
0 100 200 400

WSSC SPRING GARDEN WWPS SITE SELECTION
FIGURE 3: WETLAND AND STREAM LOCATION MAP - MDE

MONTGOMERY COUNTY, MD

SHEET # 1 OF 1

DATE: APRIL 2020

DATA SOURCES:
MD iMAP SIX INCH IMAGERY, MD DEPARTMENT OF NATURAL RESOURCES GIS DATA

Path: V:\WSSC 1154\T08 WSSC Spring Garden Site Selection\GIS\Projects\Spring Garden\Spring Garden.aprx

Spatial Reference
Name: NAD 1983 HARN StatePlane Maryland FIPS 1900 Feet

LEGEND
- STUDY AREA
- SPECIMEN TREE
- FOREST STAND BOUNDARY
- FOREST STAND

CEM
Applying Practical Science to Improve Communities
42 N. MAIN ST.
BEL AIR, MD 21014

WSSC WATER
DELIVERING THE ESSENTIAL

MOTT MACDONALD

SCALE: 1:2,400

FEET
0 100 200 400

WSSC SPRING GARDEN WWPS SITE SELECTION
FIGURE 4: FOREST LOCATION MAP

MONTGOMERY COUNTY, MD

SHEET # 1 OF 1

DATE: APRIL 2020

DATA SOURCES:
MD iMAP SIX INCH IMAGERY, MD DEPARTMENT OF NATURAL RESOURCES GIS DATA

APPENDIX B

Site Photographs

WATERS OF THE US

WUS-1 downstream, facing west

WUS-1 upstream, facing east

WUS-2 downstream, riprap reinforcement, facing north

WUS-2 upstream, riprap reinforcement, facing south

WUS-2 downstream, facing north

WUS-2 upstream, facing south

WUS-3 downstream, facing south

WUS-3 upstream, facing north

WUS-4 downstream, facing east

WUS-4 upstream, facing west

WETLANDS

WET-1-WET, facing northwest

WET-1-WET, facing east

WET-1A-WET downstream, facing northwest

WET-1/1A-UPL upstream, facing southeast

FOREST STANDS

FS-1, facing northeast

FS-1, facing northwest

FS-2, facing east

FS-2, facing north

FS-3, facing north

Manholes

WSSC Manhole 1, facing south

WSSC Manhole 2, facing south

WSSC Manhole 3, facing north

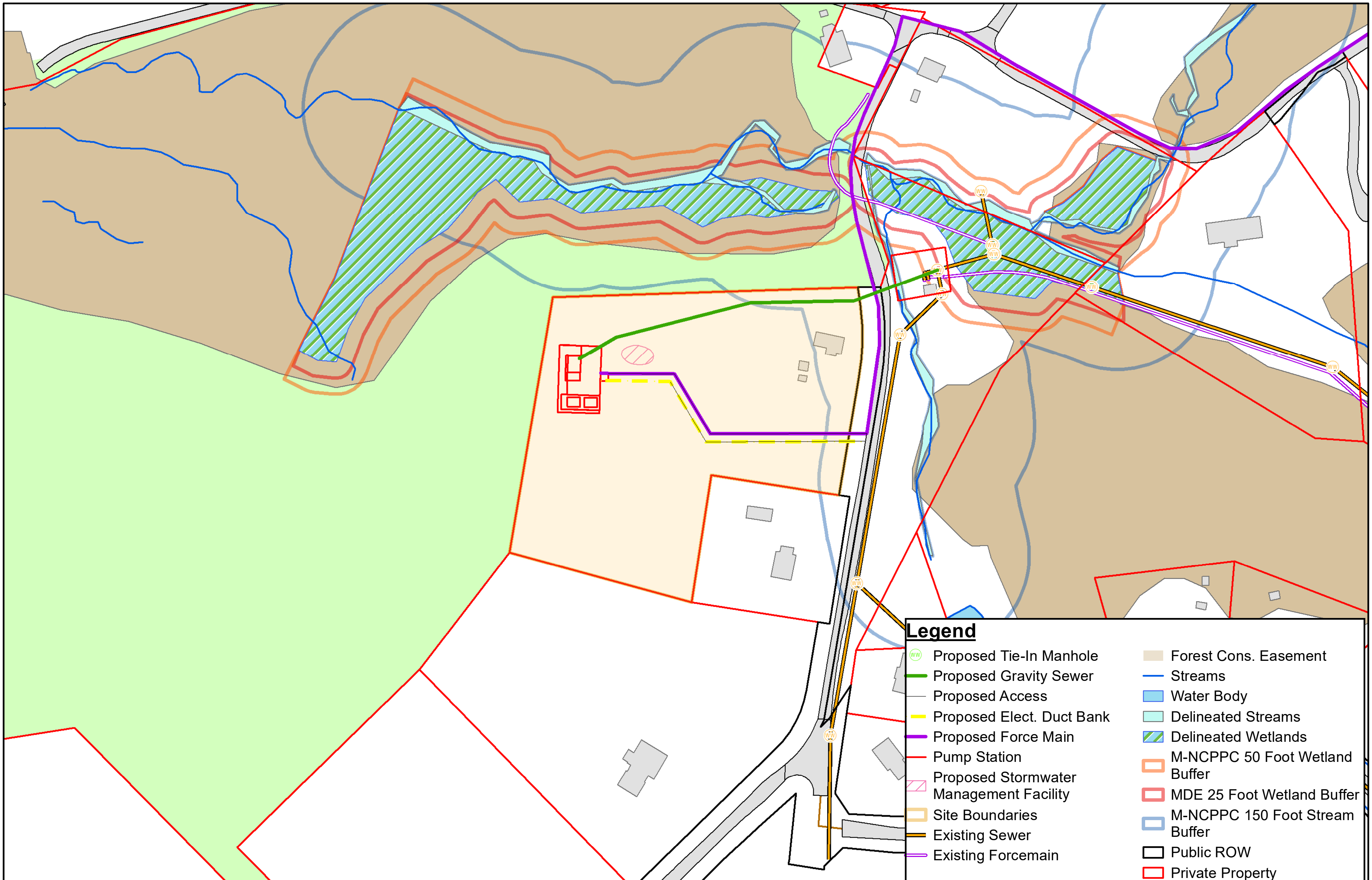
WSSC Manhole 4, facing north

WSSC Manhole 5, facing east

WSSC Manhole 6, facing north

WSSC Manhole 7, facing northeast

C. Site Maps



M M
MOTT MACDONALD

N
W E
S

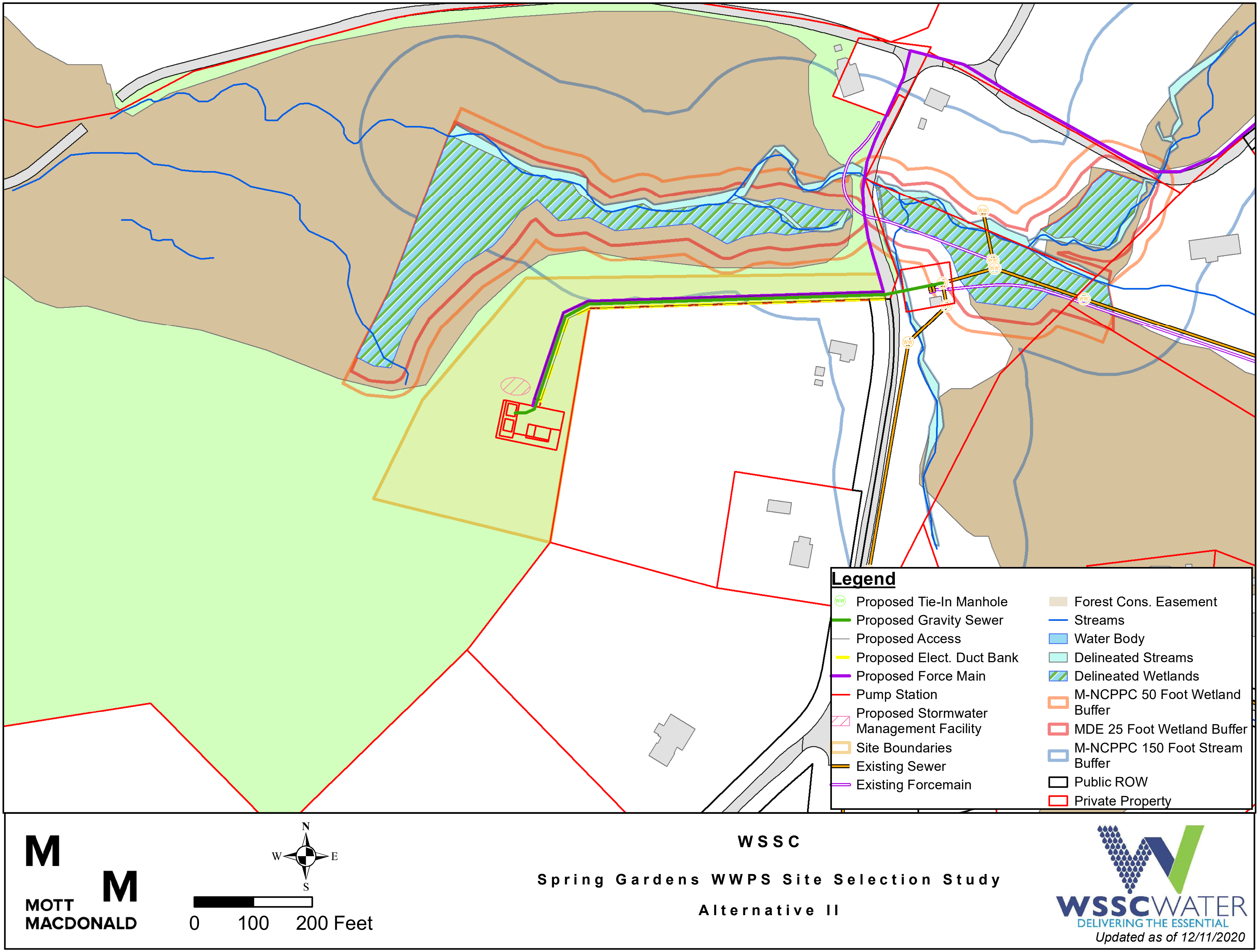
0 100 200 Feet

WSSC

Spring Gardens WWPS Site Selection Study

Alternative I

WSSC WATER
DELIVERING THE ESSENTIAL
Updated as of 12/11/2020



MOTT MACDONALD

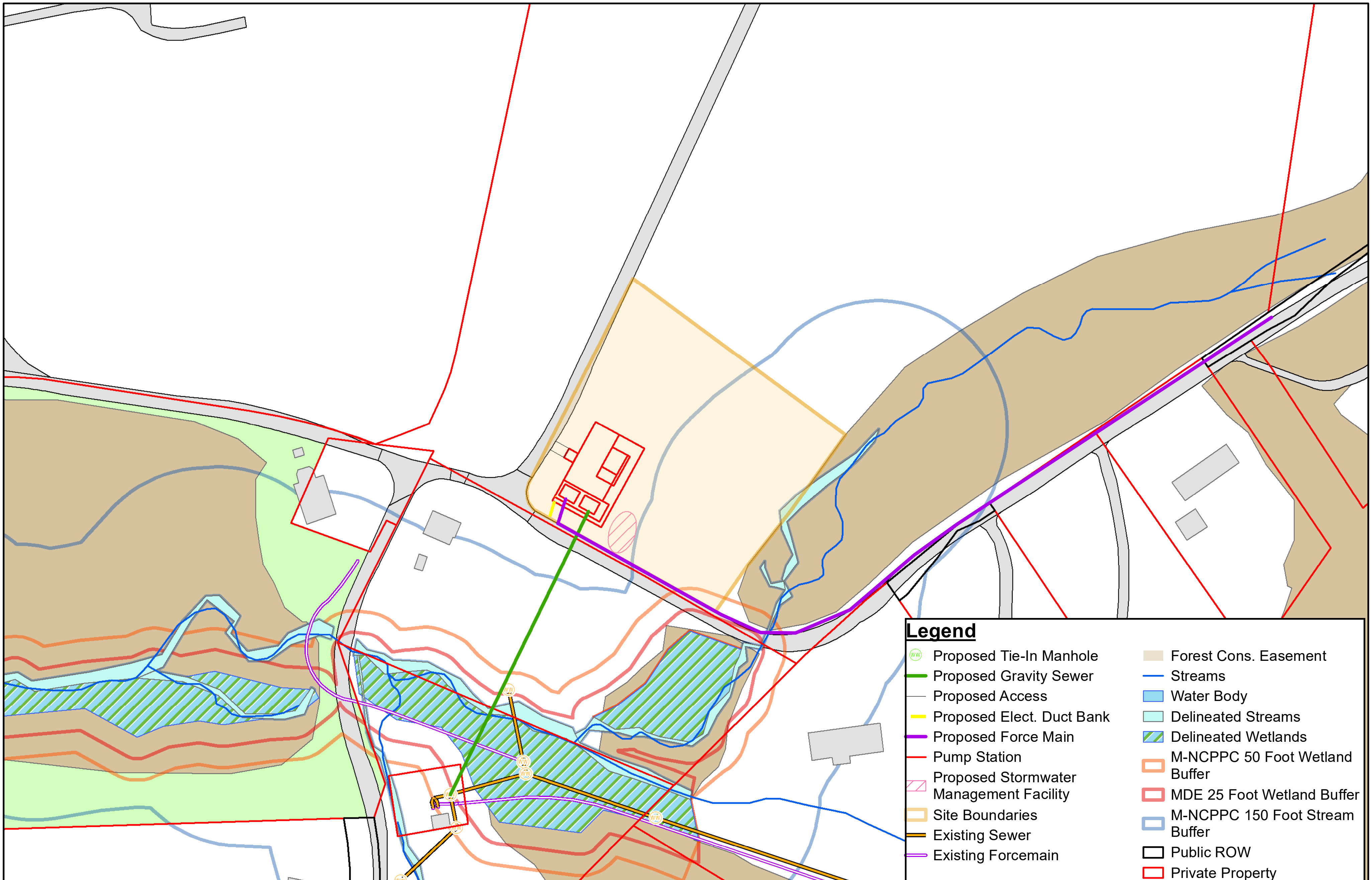
WSSC

Spring Gardens WWPS Site Selection Study

Alternative II

WSSC WATER
DELIVERING THE ESSENTIAL

Updated as of 12/11/2020



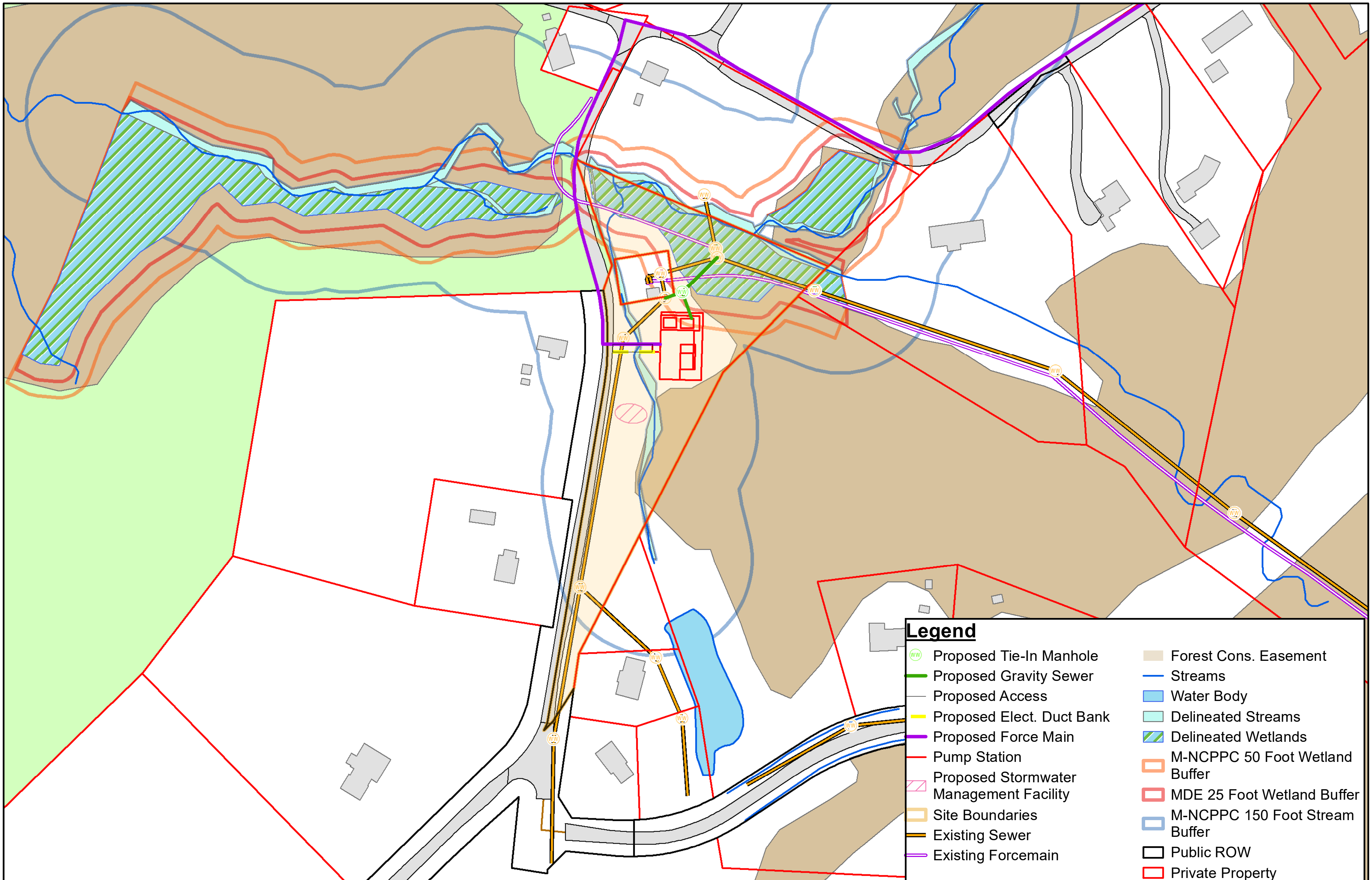
MOTT MACDONALD

WSSC

Spring Gardens WWPS Site Selection Study

Alternative III

WSSC WATER
DELIVERING THE ESSENTIAL
Updated as of 12/11/2020



M M MOTT MACDONALD

N W E S

0 100 200 Feet

WSSC

Spring Gardens WWPS Site Selection Study

Alternative IV

WSSC WATER DELIVERING THE ESSENTIAL

Updated as of 12/11/2020

D. Summary Table

Appendix E: Summary Table

MOTT MACDONALD

Site	Total Length [ft]	Depth of WWPS [ft]	Cost of Extra Depth of WWPS [$]	Construction Cost WWPS [$]	New Gravity Main [ft]	New Force Main [ft]	New Electric Duct Bank [ft]	Open Cut Major Stream Crossing	Jack and Bore Private Property Crossing	Jack and Bore New Gravity Main Length [LF]	New 12' Driveway [SY]
Site 1	2020	24	$ -	$ 2,500,000	680	1,340	470	2	-	-	607
Site 2	2285	24	$ -	$ 2,500,000	940	1,345	700	2	-	-	940
Site 3	400	38	$ 200,000	$ 2,500,000	-	30	30	1	1	370	27
Site 4	975	24	$ -	$ 2,500,000	155	820	75	2	-	-	113

Appendix E: Summary Table

Site	Parallel or New Trench in Roadway [ft]	Parallel or New Trench Private Property [ft]	Trench Depth [ft]	Parallel or New Trench w/ Pavement Restoration [SY]	12" PVC Gravity Linear Cost [$/ft]	8" HDPE Force Main Cost [$/LF]	Electric Duct Bank Cost [$/LF]	Jack and Bore Cost [$/ft]	12' Driveway Cost [$/SY]	Total Cost Main	Total Cost	Total Cost Rounded
Site 1	870	870	11	1,160	$ 180	$ 150	$ 1,200	$ 1,000	$ 54	$323,400	$ 3,482,800	$ 3,500,000
Site 2	630	645	9	840	$ 180	$ 150	$ 1,200	$ 1,000	$ 54	$370,950	$ 3,807,070	$ 3,900,000
Site 3	40	-	17	53	$ 180	$ 150	$ 1,200	$ 1,000	$ 54	$374,500	$ 3,114,820	$ 3,200,000
Site 4	705	745	10	940	$ 180	$ 150	$ 1,200	$ 1,000	$ 54	$150,900	$ 2,797,780	$ 2,800,000

Appendix E: Summary Table

MOTT MACDONALD

Site	Pump Station Construction Duration [years]	Pump Station Construction Duration [wk]	Sewer Main Laydown Rate [LF/wk]	Sewer Main Installation [wk]	Electric Duct Bank Laydown Rate [LF/wk]	Electric Duct Bank Installation [wk]	Roadway Jurisdiction	Crossing Duration [wk]	Duration for Extra Pump Station Depth [wk]	Total Duration [wk]
Site 1	1.5	78.00	190	11	150	3	County	-	-	92
Site 2	1.5	78.00	190	12	150	5	County	-	-	95
Site 3	1.5	78.00	190	2	150	0	County	13	10	103
Site 4	1.5	78.00	190	5	150	1	County	-	-	84

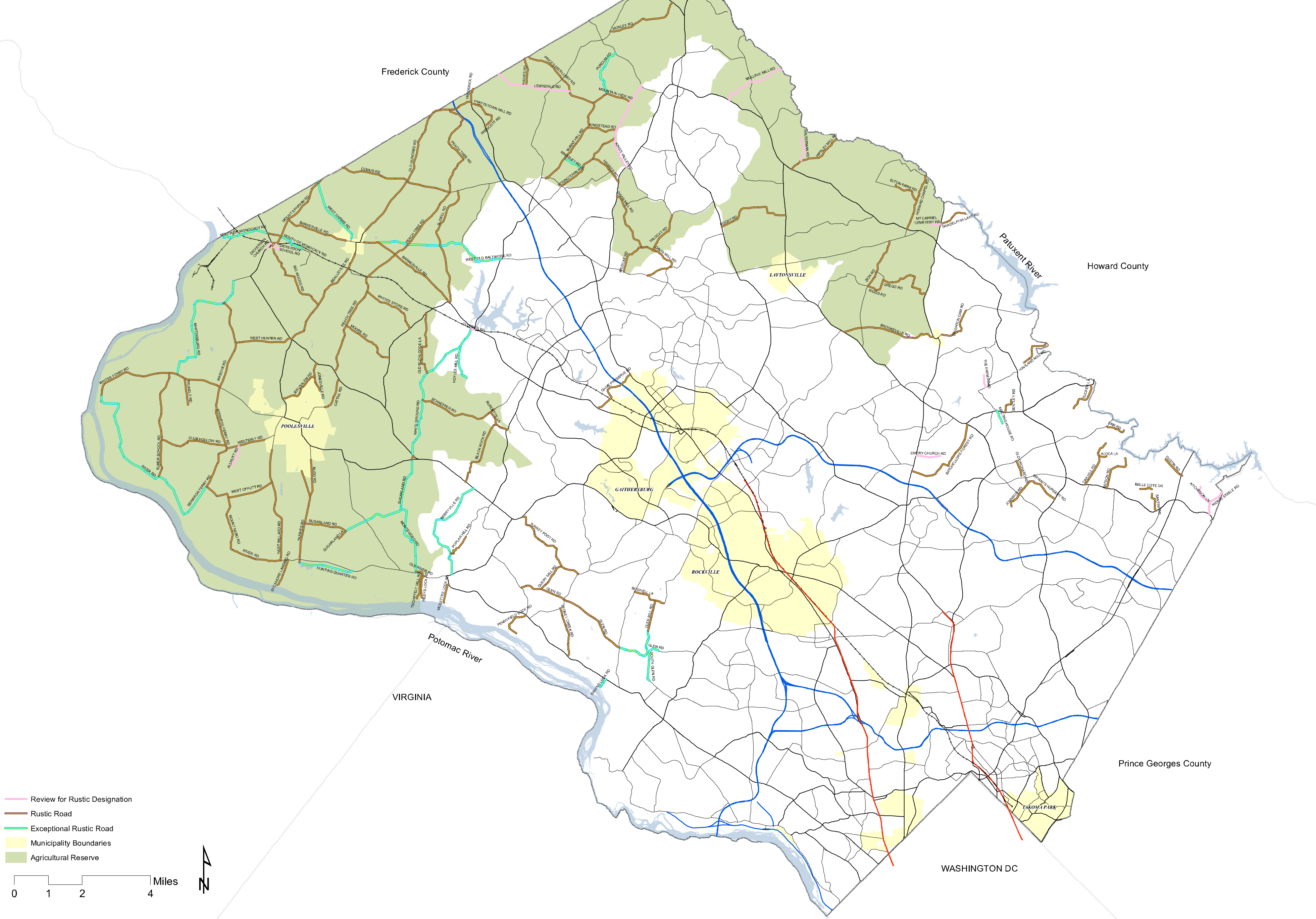
Appendix E: Summary Table

Site	Total Duration [yr]	Easements	Number of Historic Buildings	Rustic Road Crossings
Site 1	1.8	1	1	1
Site 2	1.8	1	0	1
Site 3	2.0	1	0	0
Site 4	1.6	1	0	0

E. Montgomery County Rustic Road Map

RUSTIC ROADS
Montgomery County, Maryland

Draft created for the RRAC October 18, 2015



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