CSS Long Term Control Plan Update

Evaluation Criteria

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City of Alexandria
Department of Transportation and Environmental Services

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Table of Contents

Executive Summary **1-1**

Section 1 Introduction **1-1**

Section 2 Evaluation Criteria **2-1**

2.1 Cost 2-2
2.2 CSO Reduction (CSO Volume) 2-2
2.3 Effectiveness 2-3
2.4 Implementation Effort 2-3
2.5 Impact to the Community 2-4
2.6 Expandability 2-5
2.7 Net Environmental Benefit 2-5
2.8 Nutrient Credits for Chesapeake Bay TMDL 2-7
2.9 Permitting Issues 2-7
2.10 Required Maintenance 2-8

Section 3 Evalution Criteria Analysis **3-1**

3.1 Evaluation Criteria Rating System 3-1
3.2 Evaluation Criterion Weightings 3-2
3.3 Evaluation Criteria Matrix 3-2

List of Tables

Table ES-1 Evaluation Criteria Weightings 1-1
Table 2-1 Costs Ratings 2-2
Table 2-2 CSO Reduction Ratings 2-2
Table 2-3 Effectiveness Ratings 2-3
Table 2-4 Implementation Effort Ratings 2-4
Table 2-5 Impact to the Community 2-4
Table 2-6 Expandability Ratings 2-5
Table 2-7 Net Environmental Benefit Ratings 2-6
Table 2-8 Nutrient Credits for Chesapeake Bay TMDL Ratings 2-7
Table 2-9 Permitting Issues Ratings 2-7
Table 2-10 Required Maintenance Ratings 2-8
Table 3-1 Evaluation Criteria Rating System 3-1

DRAFT

Table of Contents

Table 3-2 Evaluation Criteria Weighting Values 3-2
Table 3-3 CSO Control Alternative Evaluation Matrix - Example 3-3

List of Appendices

Appendix A: CSO Control Alternatives Analysis Rating System

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Executive Summary

The evaluation criteria have been developed and will be used to rate each of the CSO control alternatives during the alternatives analysis portion of the Long Term Control Plan Update (LTCPU). The evaluation criteria were developed and tailored to meet the requirements of the Hunting Creek Total Maximum Daily Load (TMDL) requirements while providing a solution unique to the needs of the City of Alexandria. Using a process that has been used for many other long term control plans around the country, the criteria will be used to score each alternative based on a rating of very high, high, medium, low, minimal, or none (if applicable). The evaluation criteria are listed in Table ES-1 below and are described in detail in Section 2.

The criteria presented in Table ES-1 will be assigned a weighting that will be applied to each rating to determine an overall weighted rating for each alternative as described in Section 3. The alternatives will then be ranked based on the highest weighted rating. Upon completion of the alternatives evaluation a select number of alternatives, based on their ranking, will be selected for further development.

Table ES-1
Evaluation Criteria Weightings

Evaluation Criteria
Cost
CSO Reduction
Effectiveness
Implementation Effort
Impact to the Community
Expandability
Net Environmental Benefit
Nutrient Credits for the Chesapeake Bay TMDL
Permitting Issues
Required Maintenance

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Section 1 Introduction

To evaluate and select an appropriate alternative for the City's Long Term Control Plan Update (LTCPU), an approach for evaluating potential alternatives in a consistent and transparent manner has been developed. The criteria, and associated weightings, have been developed to reflect the permit requirement to develop a LTCPU, meet Water Quality Standards (WQS), and align with the City's strategic goals. Select goals from the City's Strategic Plan (June 2010) include the following:

- Goal 2: Alexandria respects, protects and enhances the health of its citizens and the quality of its natural environment;
- Goal 3: A multimodal transportation network that supports sustainable land use and provides internal mobility and regional connectivity for Alexandrians; and
- Goal 5: Alexandria is financially sustainable, efficient, community oriented and values its employees.

With these goals in mind, this document establishes the initial criteria that will be used to evaluate each alternative as well as the method in which the evaluation will be performed. Further refinement and modifications of the criteria is expected as the City further develops the LTCPU and gets input from the public.

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Section 2 Evaluation Criteria

The items below will be used as the criteria to evaluate each of the potential CSO control alternative to determine which ones should be selected for further, more extensive development. Below is a list of the criteria that will be used:

- Cost
- CSO Reduction (CSO Volume)
- Effectiveness
- Implementation Effort
- Impact to the Community
- Expandability
- Net Environmental Benefit
- Nutrient Credits for the Chesapeake Bay TMDL
- Permitting Issues
- Required Maintenance

To evaluate each CSO control alternative and identify the best option, a scoring system is applied to each criterion. The terms that define a high, medium, or low performance for each criterion are defined in the following sections and shown in Appendix A.

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2.1 Cost

The cost category of the evaluation criteria measures the relative cost of each CSO control alternative. The cost of specific projects involved in each alternative are projected and totaled as the alternatives' estimated total cost. Each CSO control alternative's total cost is assigned a rating of high, medium, or low. Numeric value for the cost range identified in Table 2-1 may be added once the ranges of costs are established for the alternatives.

Table 2-1
Costs Ratings

Cost Rating	Cost Range
Very High	Lowest Cost
High	Low Cost
Medium	Moderate Cost
Low	High Cost
Lowest	Highest Cost

The cost rating corresponds to the cost category of the evaluation criteria in Appendix A. Lower costs rank as more favorable; resulting in higher scoring for the cost category. The higher priced alternative will receive fewer points in the cost category.

2.2 CSO Reduction (CSO Volume)

VPDES permit No. VA0087068 addresses the City of Alexandria's CSOs. While the permit does not explicitly require a reduction in volume of CSO, it does require a reduction in the mass of bacteria discharged on an annual basis. One of the most effective ways to reduce the bacteria load to the receiving waters is to limit the volume of CSO. In some instances there may be a reduction in the bacteria load without a reduction in CSO volume (i.e. disinfection).

Table 2-2
CSO Reduction Ratings

CSO Reduction Rating	Description
Very High	>95% reduction
High	Reduction 75-95%
Medium	Reduction 50-74%
Low	Reduction 25-49%
Minimal	<25% reduction
None	No volume reduction

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2.3 Effectiveness

The effectiveness criterion is a rating of how well an alternative meets the Hunting Creek TMDL requirements. The reduction in bacteria loading is estimated for each alternative is considered. The CSO control alternatives estimated to meet or exceed required reduction of TMDL receive the highest ratings. Alternatives that do not comply with the TMDL reduction policy will receive lower ratings.

Table 2-3
Effectiveness Ratings

Effectiveness Rating	Description
Very High	Removal of all bacteria from Hunting Creek
High	High bacteria reduction
Medium	Moderate bacteria reduction
Low	Low bacteria reduction
Minimal	Minimal bacteria reduction
None	No bacteria reduction

2.4 Implementation Effort

The implementation criterion is the feasibility and effectiveness with which all the projects in a CSO control alternative can be successfully completed. Implementation factors are presented in the form of questions:

- Are construction projects low in complexity or have commonly implemented technology?
- Is land available in the proposed project areas?
- Are there adequate amount of resources, labor, and expertise to complete projects?
- Can the proposed project(s) be reasonably constructed in the highly urban environment of Old Town Alexandria?
- Is it likely the LTCP deadlines will be met?

An alternative that satisfies all five of the questions will receive a very high level of performance rating. If an alternative satisfies three of the questions, the alternative receives a medium performance rating, and so on.

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Table 2-4
Implementation Effort Ratings

Implementation Effort Rating	Description
Very High	"Yes" to 5 questions
High	"Yes" to 4 questions
Medium	"Yes" to 3 questions
Low	"Yes" to 2 questions
Minimal (or none)	"Yes" to 1 questions
None	"Yes" to 0 questions

2.5 Impact to the Community

The CSO control alternatives consist of projects that will impact the businesses and citizens of the City of Alexandria during implementation. Alternatives that result in improved business and quality of life with minimal negative impact during implementation receive the highest rating. The alternatives that have moderate or excessive negative impacts (i.e. disruption) during implementation (i.e. construction) to the community and business operations receive medium or low ratings respectively.

Table 2-5
Impact to the Community

Impact on Business and Public Rating	Description
High	Improved quality of life and minimal negative impact during implementation
Medium	Some negative impact during implementation
Low	Excessive negative impact during implementation

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2.6 Expandability

The expandability criterion describes how well an alternative will adapt to updates and expansion to the sewer and storm water infrastructure in the City of Alexandria. Fluctuations in population and the CSS sewershed area will result in variations in flows in the future. Alternatives must be able to expand in services and capacity with changing city needs. The alternatives will be rated based on if the alternative expandable to meet anticipated environmental or regulatory needs. A CSO control alternative that has multiple methods of expansion receives a high expandability rating. An alternative that has only two methods of expansion has a medium rating. An alternative with only one or no efficient method of expansion receive a low rating.

Table 2-6
Expandability Ratings

Expandability Rating	Description
High	Multiple options and space for expansion
Medium	Few options and space for expansion
Low	Limited options and space for expansion
Minimal	Minimal opportunities for expansion
None	No opportunities for expansion

2.7 Net Environmental Benefit

The net environmental benefit criteria observes how the potential negative environmental impacts of constructing the projects involved in a CSO control alternative compares to the overall environmental benefits the projects provide in the long-term. There are numerous systems available for calculating and comparing net environmental benefit, and some municipalities have created their own system based on their unique assets and values. Using a standardized approach facilitates transparency and, therefore, verification and approval.

Sustainability rating systems for project planning and design provide a comprehensive framework for analyzing net environmental benefit in terms that designers, and now most stakeholders, recognize and understand. The increasing use of the US Green Building Council's Leadership in Energy and Environmental Design (LEED) rating system for buildings has achieved mainstream recognition as the standard for rating and comparing sustainable buildings. LEED and other similar rating systems, such as Green Globes (for buildings), Envision (for all infrastructure), and SITES (for built landscaping), among others, provide a metric for comparing the net environmental benefit of projects (or project alternatives) that have different sustainability features.

The rating system Envision by the Institute for Sustainable Infrastructure is applicable to all types of infrastructure, such as buildings, roads, pipelines, and sewer structures. Based on the variety of

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infrastructure types that will be included in the project alternatives, Envision is the most appropriate rating system for use.

Envision criteria are divided into 5 major categories: Quality of Life, Leadership, Resource Allocation, Natural World, and Climate and Risk. Quality of Life criteria address the project's impact on the health and wellbeing of individuals and the larger social fabric of the community. Leadership criteria address the collaboration among the project team and within the community as well as infrastructure integration and long term planning. Resource Allocation criteria address the quantity, source, and quality of resources used in the project. Natural World criteria focus on the integration of the project into the local environment and impacts to habitats, geology, plants, and water. Finally, Climate and Risk criteria address emissions and infrastructure resilience.

There are three Envision tools for projects: the Envision Checklist, Envision Rating System, and Verification and Award. The Envision Checklist is recommended for evaluation and comparison of the project alternatives. The Envision Checklist is a downloadable self-evaluation spreadsheet with Yes/No questions for evaluating projects.

The Envision Checklist has 55 credits for analysis. Initial review of the project alternatives identified 4 credits that are likely not applicable and 37 credits that will likely score the same for all alternatives. Based on these 41 credits, there is a base score for the alternatives. The remaining 14 credits target the differences among the alternatives and quantify the net environmental benefit. Based on these credits, the following ranking system will be applied.

Table 2-7
Net Environmental Benefit Ratings

Net Environmental Benefit Rating	Envision Checklist Score
Very High	Base score + >35
High	Base score + 26-35
Medium	Base score + 16-25
Low	Base score + 6-15
Minimal	Base score + 0-5

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2.8 Nutrient Credits for Chesapeake Bay TMDL

It may be possible to implement CSO controls that will capture sanitary flow and storm flow to be treated at the AlexRenew Water Resource Reclamation Facility. By treating stormwater at the treatment plant, the effluent will have a lower nutrient concentration than if the stormwater were allowed to freely flow into the receiving waters. This would allow the City to generate nutrient credits that could be applied to runoff in other areas of the City. Alternatives with that generate significant nutrient credits that can be applied to the Chesapeake Bay TMDL will receive a high rating.

Table 2-8
Nutrient Credits for Chesapeake Bay TMDL Ratings

Nutrient Credits Ratings	Total Nitrogen (lbs/yr)	Total Phosphorous (lbs/yr)	Sediment (lbs/yr)
Very High	> 2,000	> 400	> 40,000
High	1,500 – 1,999	300 – 399	30,000 – 39,999
Medium	1,000 – 1,499	200 – 299	20,000 – 29,999
Low	500 – 999	100 – 199	10,000 – 19,999
Minimal	1 – 499	1 – 99	1 – 9,999
None	0	0	0

2.9 Permitting Issues

Permitting issues are possible in each of the CSO control alternatives and most commonly effect the time and cost of the involved projects. Alternatives with lower risk/ likelihood of permit issues will receive higher ratings and alternatives with higher risk/ likelihood of having permit issues will receive low performance ratings.

Table 2-9
Permitting Issues Ratings

Permitting Issues Rating	Description
Very High	No risk of permitting issues
High	Minimal risk of permitting issues
Medium	Moderate risk of permitting issues
Low	Significant risk of permitting issues

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2.10 Required Maintenance

The required maintenance criterion is a rating of the predicted maintenance a completed project will need over the lifetime of operation. CSO control alternatives that have fewer and less frequent maintenance needs receive higher ratings. The alternatives with frequent and/or expensive maintenance receive medium or low performance ratings.

Table 2-10
Required Maintenance Ratings

Requirement Maintenance Rating	Description
Very High	No required maintenance
High	Few and infrequent maintenance
Medium	Frequent maintenance
Low	Frequent and expensive maintenance

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Section 3 Evalution Criteria Analysis

3.1 Evaluation Criteria Rating System

Each evaluation criterion has varying ratings defined in Section 2. Proposed guidelines for scoring for "High", "Medium", "Low" and "Minimal" ratings are shown in Table 3-1. Intermediate points can be assigned to alternatives where it is deemed necessary. Where the performance is very low or provide no benefit, zero points may be assigned. Note that all points discussed in here are subject to re-evaluation during the LTCPU.

Table 3-1
Evaluation Criteria Rating System

CSO Control Performance Rating	Points
Very High	5
High	4
Medium	3
Low	2
Minimal	1
None	0

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3.2 Evaluation Criterion Weightings

Using a decision making process based on a series of evaluation criteria is commonly used for large infrastructure projects, including the Long Term Control Plans for Lynchburg, Virginia; Indianapolis, Indiana; City of Fort Wayne, Indiana, and South Bend, Indiana; just to name a few. Each evaluation criterion is assigned a weighting that reflects the relative importance of a criteria when considering the City of Alexandria's needs and available resources. Proposed weighting of all criteria are shown below in Table 3-2. Note that all weights discussed in here are subject to re-evaluation during the update.

Table 3-2
Evaluation Criteria Weighting Values

Evaluation Criteria	Weighting
Cost	40%
CSO Reduction	10%
Effectiveness	15%
Implementation	5%
Impact to the Community	10%
Expandability	2.5%
Net Environmental Benefit	5%
Nutrient Credits for the Chesapeake Bay TMDL	5%
Permitting Issues	2.5%
Required Maintenance	5%

Weightings will be multiplied to each alternative's individual criteria and summed to come up with an overall weighted score for each alternative. The overall weighted score will be used to rank the alternatives and determine the final recommended alternatives for further design.

3.3 Evaluation Criteria Matrix

To determine which CSO control alternative is the best option the alternatives are scored in every criterion. Then weightings are applied and the totals according to the weight are calculated. The alternatives are then assigned a rank that reflects the performance relative to the other alternatives assessed. The ranking of "1" is the best alternative for CSO control and the others following in ascending order of performance. An example of the scoring and ranking of the CSO control alternatives are shown below in Table 3-3.

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Table 3-3
CSO Control Alternative Evaluation Matrix - Example

Evaluation Criteria	Cost	CSO Reduction	Effectiveness	Implementation Effort	Impact to the Community	Expandability	Net Environmental Benefit	Nutrient Credits; Bay TMDL	Permitting Issues	Required Maintenance	Weighted Totals	Ranking
Weighting	40.0%	10.0%	15.0%	5.0%	10.0%	2.5%	5.0%	5.0%	2.5%	5.0%	100%	
Alt.1	1	3	1	5	1	1	1	1	1	1	1.40	9
Alt.2	3	3	3	1	5	3	5	3	1	3	3.15	1
Alt.3	5	1	3	3	3	1	1	0	1	1	3.15	2
Alt.4	1	1	1	1	5	1	5	3	3	5	1.95	5
Alt.5	1	0	1	1	3	3	1	5	3	3	1.50	8
Alt.6	3	1	1	3	1	3	1	1	1	1	1.95	4
Alt.7	1	5	5	1	1	3	3	1	1	1	2.15	3
Alt.8	1	3	2	2	3	1	5	1	1	3	1.90	6
Alt.9	1	1	3	1	3	3	1	3	3	1	1.70	7
Alt.10	1	3	1	1	1	1	0	3	1	3	1.35	10

Appendix A

CSO Control Alternatives Analysis Rating System

Evaluation Criteria	Example Rating Score Qualifications					
	Very High (5 points)	High (4 points)	Medium (3 points)	Low (2 points)	Minimal (1 point)	None (0 points or N/A)
Cost	Lowest Cost	Low Cost	Moderate Cost	High Cost	Highest Cost	N/A
CSO Reduction (Volume)	>95% reduction	Reduction 75-95%	Reduction 50-74%	Reduction 25-49%	<25% reduction	No reduction
Effectiveness	Removal of all bacteria from Hunting Creek	High bacteria reduction	Moderate bacteria reduction	Low bacteria reduction	Minimal bacteria reduction	No reduction
Implementation Effort	"Yes" to 5 questions	"Yes" to 4 questions	"Yes" to 3 questions	"Yes" to 2 questions	"Yes" to 1 or 0 questions	"Yes" to 0
Impact to the Community	Improved quality of live and minimal negative impact during implementation		Some negative impact during implementation	Excessive negative impact during implementation		N/A
Expandability	Multiple options and space for expansion		Few options and space for expansion	Limited options and space for expansion	No opportunities for expansion	N/A
Net Environmental Benefit	Base score + >35	Base score + 26-35	Base score + 16-25	Base score + 6-15	Base score + 0-5	N/A
Nutrient Credits for the Chesapeake Bay TMDL	Nitrogen: >2,000 Phosphorous: >400 Sediment: >40,000	Nitrogen: 1,500 - 1,999 Phosphorous: 300 - 399 Sediment: 30,000 - 39,999	Nitrogen: 1,000 - 1,499 Phosphorous: 200 - 299 Sediment: 20,000 - 29,999	Nitrogen: 500 - 999 Phosphorous: 100 - 199 Sediment: 10,000 - 19,999	Nitrogen: 0 - 499 Phosphorous: 0 - 99 Sediment: 0 - 9,999	No opportunity for credits
Permitting Issues	No risk of permitting issues	Minimal risk of permitting issues	Moderate risk of permitting issues	Significant risk of permitting issues		N/A
Required Maintenance	No required maintenance	Few and infrequent maintenance	Frequent maintenance	Frequent and expensive maintenance		N/A

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