Port of Portland Stormwater Retrofit Strategy

1 RETROFIT STRATEGY INTRODUCTION

The Port of Portland (Port) is a regional government agency authorized by the State of Oregon. The Port owns facilities residing within Clackamas, Multnomah, and Washington counties in Oregon. The Port operates marine, airport, and industrial facilities under the direction of commissioners appointed by the Oregon Governor and confirmed by the legislature. The mission of the Port of Portland is to enhance the region's economy and quality of life by providing efficient cargo and air passenger access to national and global markets.

The Port is a co-permittee with the City of Portland (City) on Municipal Separate Storm Sewer System (MS4) permit issued by the Oregon Department of Environmental Quality (DEQ) in 2011. The MS4 permit is applicable to both City and Port owned separate storm sewer systems within the City Urban Services Boundary (USB). This document is specific to the Port's co-permittee responsibilities. The Port is responsible for implementing the requirements of the MS4 permit for Port-owned storm systems on Port-owned property within the City USB.

In accordance with Port MS4 permit area responsibilities, the Port is developing a stormwater quality Retrofit Strategy which will be the basis for an overall Retrofit Plan. This Retrofit Strategy is intended to provide the overarching objectives for identifying developed areas identified as impacting water quality and that are currently underserved or lacking stormwater quality controls, addressing the identified areas with appropriate retrofit control measures to make progress toward applicable total maximum daily load (TMDL) wasteload allocations (WLAs) benchmarks.

The Port is currently engaged in a stormwater master planning project, which will result in a list of potential capital improvement projects that target water quality improvements. The Port has also developed a Stormwater Design Standards Manual that meets MS4 permit requirements[1] and contains detailed criteria and stormwater best management practice (BMP) selection information to address potential water quality impacts associated with new development and redevelopment. The approach being used to identify and prioritize capital improvements for the Stormwater Master Plan will be documented in the Stormwater Retrofit Plan and is based on the basic strategy and rationale presented below. A summary of the key steps in developing the Retrofit Strategy and Plan is provided in **Attachment A**.

[1] Implementation of the Port's Storm Water Design Standards began on January 1, 2014, consistent with MS4 permit requirements.

2 BASIC STRATEGY OBJECTIVES AND RATIONALE

The primary objective of the Retrofit Strategy is to implement or enhance stormwater quality controls in areas identified as impacting water quality that are underserved by BMPs. The Port is conducting extensive water quality modeling on property within the USB to help identify the underserved areas. The Port will not only target structural treatment BMPs for the retrofit strategy, but also remove or disconnect impervious areas from discharging directly to storm sewers or streams where feasible. To maximize the Port's effectiveness in implementing the retrofit strategy, the Port will seek to combine retrofits with other capital improvement projects if possible.

3 MS4 POLLUTANTS

The Retrofit Strategy includes water quality BMPs which address the pollutants of concern in the applicable TMDLs. The Port has property within the City of Portland USB from which stormwater runoff discharges to the receiving waters covered by the 1998 Columbia Slough TMDL and the 2006 Willamette Basin TMDL (**Table 1**).

Table 1: Pollutants listed in applicable TMDL documents

Pollutant	1998 Columbia Slough TMDL	2006 Willamette Basin TMDL
Chlorophyll-a	x	
DDT/DDE	x	
Dieldrin	x	
Dissolved Oxygen	x	
Dioxin	x	
E. coli	x	x
Lead	x	
Mercury		x*
Orthophosphate	x	
PCBs	x	
Temperature		x*
TSS	x	

x-Included in TMDL
x*-Addressed in TMDL, but no WLA established for stormwater

4 IDENTIFICATION OF CANDIDATE RETROFIT AREAS

The Port will identify the candidate areas to retrofit through evaluating which areas have land uses with high potential of impacting water quality and are underserved by stormwater quality treatment. Water quality modeling of Port property is the first step to help determine the existing level of treatment. The results of the modeling will be analyzed along with available water quality monitoring data to assist with candidate area identification and selection. The modeled pollutant loads will be compared with the Port-wide TMDL WLAs. If any of the WLAs or the pollutant load reduction benchmarks are not being met, areas expected to contribute those pollutants will receive a higher priority. The Port anticipates that areas with high amounts of imperviousness and areas with land uses and activities that have the potential to generate TMDL pollutants will be targeted first.

The Port will then assess applicable retrofit measures to create a potential list of projects to address pollutants in the candidate retrofit areas. Potential BMPs and other measures are described in the following section.

5 POTENTIAL RETROFIT MEASURES

The Port will consider the following retrofit measures as stormwater quality treatment options to address candidate retrofit areas:

- Implement the BMPs described within the applicable stormwater manual (e.g., Port's Stormwater Design Standards Manual (DSM) or City's Stormwater Management Manual (SWMM))
- Retrofit existing BMPs to provide greater treatment capabilities and/or capacity
- Reduce the impervious area and/or connectivity of impervious areas

The Port will evaluate land use and site activities of the candidate retrofit areas in order to select the appropriate retrofit measure(s). The retrofit measures may be implemented through a:

- Distributed approach that manages the stormwater runoff locally onsite,
- Regional control approach that manages stormwater runoff from a larger tributary area on Port property, or
- Combination of retrofit measures.

5.1 Discussion of Retrofit Measures

Reduce the impervious area and/or connectivity of impervious areas: Removing pavement or other impervious surfaces or reducing the connectivity between impervious surfaces and storm sewers is expected to result in a reduction in the volume of runoff discharged to receiving waters. The mechanisms for improving water quality are greater potential for infiltration, reduction of stormwater runoff peak flows, and reduction in the sources of potential pollutants (which tend to accumulate on impervious surfaces).

Implement Port DSM BMPs or City SWMM BMPs[2]: The following provides discussion of primary treatment mechanisms. Refer to **Table 2** for the list of BMPs and summary of treatment capabilities.

- Infiltration BMPs: Infiltration refers to the downward movement of rainfall and surface runoff into existing native soils and the groundwater table via percolation through soil pore spaces. Infiltration can provide multiple water quality and quantity control benefits, including pollutant removal, volume reduction, peak flow control, and flow duration control. From a water quality perspective, infiltration BMPs take advantage of filtration and adsorption of pollutants to soil particles, as well as biological activity within the soils to immobilize or degrade pollutants as water passes through the soil profile.
- Detention/Retention BMPs: Detention refers to the temporary storage of stormwater, with release of the stormwater to surface waters at a specific design rate over a period of time, generally ranging from hours to days after the end of the rainfall event. Detention BMPs can be used to

[2] Port DSM BMPs would apply for Port projects at Portland International Airport (PDX) and tenant projects within the airfield perimeter fence. City SWMM BMPs would apply at all other Port facilities within the City's USB.

provide pollutant removal through settling of suspended solids, peak flow control, and flow duration control. Retention BMPs refer to BMPs that have a permanent or seasonal wet pool as part of their design to promote sedimentation, biological treatment processes, and evapotranspiration.

- Filtration/Biofiltration BMPs: Filtration refers to the physical and chemical removal of pollutants as stormwater percolates through an engineered media. Filtration provides water quality benefits by removing pollutants, and can provide some peak flow control benefits for smaller storms by attenuating flows. In comparison to filtration BMPs, biofiltration BMPs incorporate vegetation and engineered soil media which supports plants. These BMPs may provide additional pollutant removal mechanisms and improved long-term hydraulic performance beyond those available in unvegetated filtration BMPs. However, biofiltration BMPs require more space and cannot be installed below ground.
- Harvesting/Reuse: Cisterns are the most common BMP for rainwater harvesting and are typically larger than rain barrels, ranging in size from 100 gallons to over 10,000 gallons. The size of the cistern needed and the volume reduction capacity for a project depends largely on the size of the rooftop drainage area, the demand for non-potable water use, and the space available. Rainwater can be used for both indoor non-potable uses and for outdoor irrigation. Cisterns can be either installed above or below ground or on rooftops. The primary benefit provided by cisterns is volume and peak flow reduction.
- Gravity Separation: Gravity separation BMPs are designed to remove pollutants that separate from water due to differences in density, including oil and sediment. This mechanism is used within oil/water separator tanks.
- Hydrodynamic Separation: Hydrodynamic separation uses centrifugal forces generated from forcing the flow into a circular motion. This mechanism is used within proprietary devices designed to provide pretreatment for other water quality treatment BMPs.
- Retrofit existing BMPs: Existing BMPs may already be present in candidate retrofit areas. Retrofitting an existing BMP to provide greater treatment capabilities and/or capacity may be in the form of adding pretreatment upstream of the existing BMP or through modifying the BMP itself, such as its outlet structure to increase hydraulic residence times or installing engineered media to target specific pollutants.

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Table 2: Retrofit Strategy Best Management Practice (BMP) Water Quality Treatment Options

BMP Type	Primary Mechanism	Target Pollutants
Dry Extended Detention Basin	Detention/ Retention	Coarse and fine sediment, oil and grease, particulate-bound pollutants
Retention Basin Wetland Basin Pocket Wetland	Detention/ Retention	Coarse and fine sediment, oil and grease, metals, nutrients, organics, bacteria

Subsurface Flow Wetland	Detention/ Retention	Coarse and fine sediment, oil and grease, metals, nutrients, organics, bacteria
Bioretention	Infiltration	Coarse and fine sediment, oil and grease, metals, nutrients, organics, bacteria
Infiltration Trench	Infiltration	Coarse and fine sediment, oil and grease, metals, nutrients, organics, bacteria
Vegetated Swale	Filtration/ Biofiltration	Coarse and fine sediment, oil and grease, particulate-bound pollutants
Vegetated Filter Strip	Filtration/ Biofiltration/ Infiltration	Coarse and fine sediment, oil and grease, metals, organics
Media Filters	Filtration/ Biofiltration	Coarse and fine sediment, oil and grease, metals, nutrients, organics, bacteria
Infiltration Vault, Tank, Chamber	Infiltration	Coarse and fine sediment, oil and grease, metals, nutrients, organics, bacteria
Detention Vault, Tank, Structural Detention	Detention/ Retention	Coarse sediment, oil and grease
Wet Vault, Tank	Detention/ Retention	Coarse and fine sediment, oil and grease, particulate-bound pollutants
Pervious Pavement	Infiltration/ Detention/ Retention	Coarse and fine sediment, oil and grease, metals, nutrients, organics, bacteria
Planter Box Filters	Filtration/ Biofiltration	Coarse and fine sediment, oil and grease, metals, organics, bacteria
Green Roofs	Detention/ Retention	Not applicable – primarily provides volume and peak flow reduction and pollutant source control
Cisterns	Storage	Not applicable – primarily provides volume and peak flow reduction
Dry Well	Infiltration	Coarse and fine sediment, oil and grease, metals, nutrients, organics, bacteria
Cartridge Filter Vaults	Filtration/ Biofiltration	Coarse and fine sediment, oil and grease, metals, nutrients, organics, bacteria
Oil/Water Separators	Gravity Separation	Coarse sediment, oil and grease
Hydrodynamic Separators	Hydrodynamic Separation	Coarse sediment, oil and grease

6 IDENTIFICATION OF PREFERRED RETROFIT MEASURES

The candidate potential retrofit projects will be evaluated using a set of grading criteria, such as those shown in **Attachment B**, to assist with prioritization and decision-making.Since each of the potential projects identified have the capability of improving water quality in the candidate retrofit areas, the Port will use the selected criteria to help differentiate the projects based on Port priorities, including effectiveness, maintenance requirements, feasibility and water quality.

The selected projects will be incorporated into the Port's Retrofit Plan and capital improvement program (CIP) over the next several MS4 permit cycles. The Retrofit Plan will identify specific near-term retrofit projects and to the extent possible these projects will be implemented with existing planned CIP and development projects. Longer term retrofit projects will be not be specifically identified in the Port's

Retrofit Plan but will be incorporated into the Port's CIP as these opportunities occur. The Port will use the adaptive management process to periodically review the planned projects and reevaluate the ranking priorities to maintain the Retrofit Plan over time.

Attachment A: Key Steps in Port of Portland Retrofit Strategy and Plan Development

Step 1: Develop draft retrofit strategy.

The draft Retrofit Strategy is this current document. This strategy provides the overarching objectives for identifying areas that are currently underserved or lacking stormwater quality controls, addressing the identified areas with appropriate retrofit control measures, and incorporating progress toward applicable TMDL WLA benchmarks.

Step 2: Obtain public comment. Review and incorporate, as appropriate, into finalized strategy.

The Port will facilitate public comment through publishing the electronic copy of the Retrofit Strategy on the Port's website. The Port will gather the comments and responses to the strategy and incorporate where appropriate into the final strategy.

Step 3: Conduct stormwater hydrologic, hydraulic and water quality analyses of Port facilities within MS4 Urban Services Boundary to identify underserved areas.

The Port is currently evaluating stormwater hydrologic, hydraulic, and water quality for Port facilities that are within the MS4 permit area through the stormwater master planning project. These evaluations include hydrologic and hydraulic modeling along with water quality data review and modeling. The results of the analyses will provide the Port with the necessary information for determining the underserved areas with respect to TMDL WLA benchmarks.

Step 4: Identify candidate retrofit projects and screen with the ranking criteria.

When underserved areas have been identified and characterized, candidate retrofit projects that will provide water quality improvements will be identified. The identified potential retrofit projects will then be screened through the ranking criteria to support prioritization of the projects.

Step 5: Identify preferred retrofit projects and assess feasibility based upon ranking criteria and other factors such as field verification of proposed retrofit locations to identify any site-specific constraints.

The preferred retrofit projects are the projects that are ranked high through the ranking criteria, are associated with near-term CIP or development projects, and then undergo additional field verification screening to identify potential site-specific constraints that impact feasibility. Preferred near-term projects will be identified in the Port's Retrofit Plan. Longer term projects will be reviewed on a periodic basis to evaluate incorporation into the Retrofit Plan in the future.

Step 6: Estimate planning-level costs, schedule for implementation and potential progress toward waste load allocation benchmarks for selected retrofit projects.

The preferred retrofit projects will be further evaluated to provide planning-level costs, schedule, and expected potential progress toward WLA benchmarks.

Step 7: Develop Retrofit Plan according to evaluations and submit to Oregon DEQ by November 1, 2014.

The Port will review the findings throughout the stormwater master planning project to align the Retrofit Plan with other Port planning efforts. The Plan will include the Port's projected timeline for implementation of near-term retrofit measures along with the framework for the retrofit program.

Step 8: Implement Retrofit Plan and apply adaptive management.

The Port will begin to schedule the design and implementation of the prioritized retrofit projects according to the Retrofit Plan, availability of resources, and CIP schedules. The Port will apply adaptive management to assess longer term retrofit opportunities that may arise throughout the implementation of the Retrofit Plan that may increase water quality treatment of stormwater in underserved areas.

Attachment B: Port of Portland Stormwater BMP Retrofit Project Grading Criteria

The following proposed criteria will be considered for each of the identified retrofit projects. The criteria will provide a method to compare the retrofit projects to aid prioritization, decision-making, and implementation of retrofit projects. The Port will assess as needed when updates to retrofit project rankings are needed based on the CIP list, business development needs, or other factors.

Impervious Acres Treated: Retrofit projects will be scored higher for larger number of impervious acres treated.

Volume Reduction: Retrofit projects that have a greater potential to infiltrate per unit area will be scored higher than projects that can only meet the water quality objectives.

Opportunity: Retrofit projects that have time dependent opportunities that may ease project implementation (e.g., synergy with other projects, grant availability, strategic partnerships, or other initiatives) will be scored higher.

Multiple Objectives: Retrofit projects that accomplish additional Port goals (e.g., flood control, airfield safety, community relations, tenant needs, etc.) above and beyond water quality goals will be scored higher.

Ease of Implementation: Site-specific constraints may complicate the implementation of the retrofit project or increase the cost of the project, including factors such as constructability and operational impacts. Retrofit projects with fewer site constraints and other implementation limitations will be scored higher.

Cost per Impervious Acre Treated: Retrofit projects with lower cost per impervious acre treated will be scored higher.

Operations and Maintenance Level of Effort: Retrofit projects with lower annual operations and maintenance costs and level of effort will be scored higher.

Asset Management Enhancement: Potential asset improvements which could be accomplished in combination with the retrofit project (e.g., replacing a deteriorating pipe during installation of a water quality retrofit) will be evaluated. Retrofit projects that provide an opportunity for asset improvement will be scored higher than projects that solely meet the retrofit requirements for water quality.

Sustainability: Retrofit projects that balance economic, environmental, and social objectives will be considered to have more sustainable attributes (based on Appendix P of the Port's Stormwater Design Standards Manual) and will be scored