



Introduction

This memorandum documents the initial stormwater retrofit strategy for surfacewater quality and quantity treatment for the Oak Lodge Sanitary District (OLSD or “District”). For this, the District is constrained in its ability to manage this treatment as it is responsible for the area’s surfacewater management, but does not own or control the area’s surfacewater conveyance infrastructure. This infrastructure is owned, controlled and primarily maintained by Clackamas County which is a separate entity. This Retrofit Strategy Memorandum fulfills the requirements of the District’s National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Permit #108016 on March 15, 2012.

The District’s area is mostly already built out. In this District, new development is now required to manage stormwater on-site. Older, existing developments were likely constructed before this stormwater management was required or contemporary criteria established. These are the sites in which retrofits can produce water quality improvements. Retrofits include new installations or upgrades to existing developed sites using Best Management Practices (BMPs) where there is a lack of adequate stormwater treatment. Stormwater retrofits may include, among others, the correction of prior design or performance deficiencies, flood mitigation, reducing impervious areas, improving recharge and infiltration performance, addressing pollutants of concern, demonstrating new technologies, and supporting stream restoration activities.

Summary of Permit Requirements

The NPDES MS4 permits for Phase I communities require development of a stormwater retrofit strategy. Schedule A.6 of the District’s MS4 permit describes the following required elements of the stormwater retrofit strategy development for this permit term:

- Develop and submit a stormwater retrofit statement and summary, including strategy, objectives, rationale and wasteload allocation (WLA) reductions, and
- Identify current stormwater retrofit control measures, and
- Create an estimate of annual program resources directed towards stormwater retrofits, and
- Identify developed areas or land uses affecting water quality that are high priority retrofit areas, and
- Identify new storm water control measures, and retrofit structural control measures, and
- Identify and describe stormwater quality improvement project(s) which reduced applicable total maximum daily load (TMDL) pollutant parameters.

This retrofit strategy memorandum includes the following information:

- Summary of initial stormwater retrofit strategies for stormwater management and water quality treatment.
- Definition of stormwater quality retrofit objectives and rationale

- Summary of current stormwater retrofit activities and annual costs
- Identification of high-priority areas and/or land uses needing water quality retrofit
- Preferred stormwater retrofit approaches, including both programmatic measures and structural controls

RETROFIT STRATEGY

Purpose

The strategy's purpose is to document the District's stormwater retrofit approach for reducing water quality impacts from existing developed areas within the District's area that drain to the municipal stormwater system. This strategy applies to developed areas identified by the District as affecting water quality, are underserved or lacking stormwater management controls. The strategy is based on the District's existing storm water quality retrofit objectives and a comprehensive evaluation of a range of stormwater quality retrofit control measures as identified for the District through the District's Storm Water Management Plan (SWMP) and Capital Improvement Project (CIP) planning processes which were both developed with a public committee processes.

The strategy's objectives incorporate progress towards applicable TMDL WLA since OLSA's regulation implementation. According to the Oregon DEQ, the District's WLAs for the Willamette TMDL require reducing bacteria by at least 80% and mercury by 27%. Ninety-one percent of the thermal load is from non-point sources (i.e. lack of effective shade) and the surrogate measurement of heat load reduction is percent effective shade.¹ Lastly, public comment and consideration is provided for as described further in this document.

As determined in the District's SWMP, the retrofit strategy is to perform the following:

- A. Reduce damage to public and private property and hazards to public safety during floods; and
- B. Improve water quality by reducing discharge of pollutants into surface waters; and
- C. Protect and enhance aquatic habitat along the creeks and wetlands within the District.

Capital projects are a key element of the District's retrofit strategy. The SWMP and CIP planning process determined that capital projects are the most effective solution for addressing the existing water quality condition. These CIPs are installed in conjunction with other ongoing program activities that aim to protect and improve water quality including stormwater development standards (for both greenfield and redevelopment), illicit discharge detection and elimination, spill response, system maintenance (shared with Clackamas County), pollution prevention, source controls, and public education.

¹ Willamette Basin TMDL Five Year Review: Designated Management Agency Implementation 2008 - 2013 February 2014

Objectives:

The District's retrofit's strategy shares the SWMP goals and objectives and includes:

- Emphasize the use of non-structural methods as a preferred alternative in controlling runoff and pollution at the source.
- Emphasize the value of protection of ecological integrity of rivers, streams, wetlands, lakes, and riparian corridors.
- Integrate both water quantity and quality in addressing the community's needs for surface water management with an emphasis on natural systems as a preferred alternative.
- Provide for public involvement, public information, and public education as tools for improving surface water management through heightened awareness and activity impact on watershed protection, aquatic habitat protection, and riparian habitat protection.
- Comply with local, state, and federal regulations regarding the protection of water quality.
- Provide for surface water management program funding at a level that balances community needs and values.
- Provide for program expenditures and on-going assessment mechanisms, which seek to maximize benefits.

The District accomplishes these objectives through a combination of capital projects, regulatory measures that apply to greenfield and redevelopment sites, financial incentives and voluntary measures, education and demonstration projects.

WLA – Progress Toward Applicable TMDL

In accordance with the District's NPDES Phase I Municipal Separate Storm Sewer System (MS4) permit, issued March 15, 2012, the District is required to evaluate TMDL pollutant load reductions in the District's jurisdiction. A TMDL with established WLAs for urban stormwater has been established for the Willamette River, including the Lower Willamette Subbasin and associated tributaries. Stormwater runoff enters the MS4 and various tributaries (e.g. Boardman Creek, River Forest Creek) prior to discharge directly to the Lower Willamette River. Thus, the District must address the contribution of TMDL pollutant load(s) affiliated with the Willamette River TMDL as a result of urban stormwater runoff within its permit area.

The Willamette River TMDL parameters include elevated in-stream temperature, bacteria (*E. coli*), and mercury concentrations for the Willamette River and tributaries. Temperature is considered to be a non-point source pollutant that is not associated with urban stormwater runoff. Temperature is regulated by the Oregon Department of Environmental Quality (DEQ) and addressed by the District under its Willamette River TMDL Implementation Plan for non-point sources, but not under its NPDES MS4 permit and thus is not a required element of this retrofit strategy. Bacteria are considered to be a

stormwater runoff pollutant. Thus, bacteria are regulated under the District’s MS4 program (and NPDES MS4 permit) as a point source pollutant and is considered in this retrofit strategy. Mercury is also identified as a stormwater runoff pollutant and is considered in this retrofit strategy. Therefore, the District is required to establish TMDL pollutant load estimates and pollutant load reduction benchmarks for bacteria and mercury (though Mercury has since been eliminated as described further in this document).

Bacteria

A common WLA of 78 percent bacteria load reduction was established for both non-point source (agricultural areas) and point source areas (urban areas covered by an industrial stormwater or NPDES MS4 permits) in the Lower Willamette Subbasin under the Willamette River TMDL.

The progress towards meeting OLSD’s bacteria WLA is described in the 2013 Pollutant Load Reduction Benchmarks document submitted to DEQ for compliance with the MS4 permit. From that document, Figure 1 (5-1) indicates that the District was not estimated to meet the WLA for bacteria in the Lower Willamette Subbasin. Since that estimation was completed, the District has tested bacteria levels. The majority of monitoring results have substantiated that bacteria presence is generally higher than the benchmark and WLA. Although more than 53 acres are being treated by structural BMPs, these BMPs (i.e. sedimentation manholes, pollution control manholes) collect and remove little or no bacteria. The quantitative pollutant load projections for the base case (2010) scenario also indicates that the difference between the projected pollutant loadings and the WLA is fairly significant, and significant additional load reduction would be needed beyond the current and projected structural BMP implementation and the non-structural BMP implementation reflected in the range of loading.

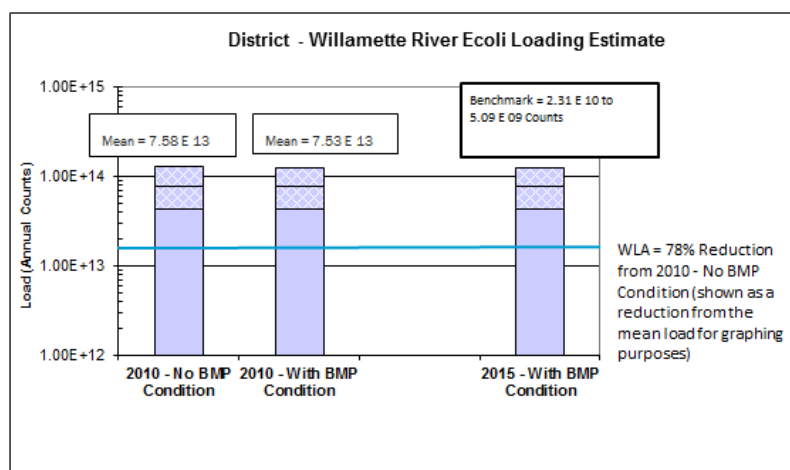


Figure 5-1. District E.Coli pollutant load reduction evaluation

Figure 1: 2013 Pollutant Load Reduction Benchmarks. Source: OLSD: 2013 Pollutant Load Reduction Benchmarks document

Since 2012, four water quality projects have been installed which reduce the discharge of bacteria into receiving waters as identified in Table 2.

This parameter, associated BMPs and OLSD efforts are further described in the document: *Willamette Basin TMDL Implementation Plan May 2014* which was approved by the Oregon DEQ on June 17, 2014.

Mercury

One round of Mercury monitoring was conducted by OLSD. On April 20, 2015, the Oregon DEQ granted approval to eliminate mercury and methyl mercury monitoring during the remainder of the OLSD Permit term. As stated in the NPDES MS4 Permit Evaluation Report and Fact Sheet for the Clackamas County MS4 Group, DEQ established 16 storm events as the minimum number required for mercury and methyl mercury monitoring. OLSD has submitted data satisfying the required minimum samples (2). As Oak Lodge Sanitary District completed the required monitoring and the analytical results were below the plan initiation level, the Oak Lodge Sanitary District contends that the District's stormwater system is a very low risk of Mercury contamination to the environment and the District. This TMDL parameter has progress made toward its reduction with the District's greenfield and redevelopment water quality standards using vegetated water quality facilities, but it is no longer being monitored for OLSD or other co-permittee per an agreement with Oregon DEQ.

Temperature

The District achieves temperature reductions through mitigated tree planting when riparian buffers are encroached upon during greenfield development or redevelopment. Through funding of the North Clackamas Urban Watershed Council's Streamside Stewards Program, the District achieves riparian restoration including tree planting. Trees enhance water quality by providing shade, which lowers stream temperatures, as well as bank stabilization and stormwater retention. Thus, tree replacement requirements maintain and/or improve water quality in local streams. Due to tidal effects, channel morphology, flow characteristics, and other factors the Willamette River along the District boundary is considered a fish transitory area. The District's contribution to the temperature concerns and ability to influence these concerns is extremely limited. Some temperature reduction should be achieved by the District's tree mitigation requirements and the proactive revegetation efforts of the Streamside Stewards program.

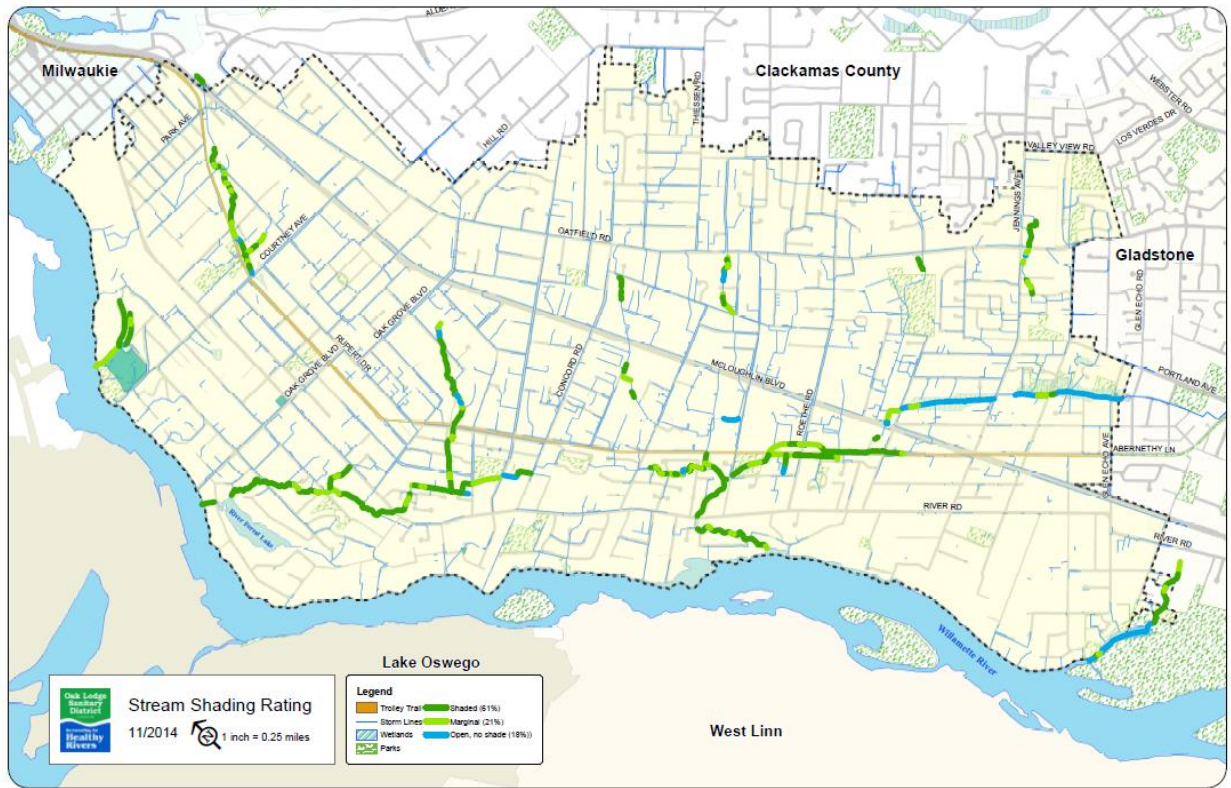


Figure 2: Stream Shading Rating. Source: OLSD

Priority Areas

Existing Conditions

As part of the Hydromodification Assessment, the qualified consultants at Brown and Caldwell used the Geographic Information System (GIS) to conduct a review of existing surface water management conditions within the District. The District provided Brown and Caldwell with GIS map layers including parcels, sensitive areas, land use, impervious surfaces, drainage basin boundaries, and stormwater pipes, channels, and existing treatment facilities. The majority of stormwater facilities have no recorded installation year; however, most of those with a recorded year were installed since 1990. Nearly half the land is impervious, with the majority of land zoned for residential use.

The District’s six watershed basins are located in the Willamette watershed. The largest basin, South Boardman, covers 802 acres. The combined basins contain 54 miles of pipe, 5 miles of open ditches and 6 miles of streams. Compared with peer communities, the District has little subsurface stormwater infrastructure.

OAK LODGE WATERSHED BASINS				
	Basin (acres)	Pipe (miles)	Ditch (miles)	Stream (miles)
South Boardman	802	10	1	1
River Forest	796	16	1	2
Willamette River	589	3	1	0
Kellogg Creek	533	11	1	1
North Boardman	525	11	1	1
Gladstone	321	3	0	1
Total	3,566	54	5	6

Figure 3 OLSD basin areas. Source: OLSD

Lack of development standards prior to implementation of the SWMP and associated regulations contributes to numerous drainage problems. Across all basins, existing surfacewater facilities range from nonexistent to adequate.

Land uses in the District are almost entirely residential (75% single family / 11% multi family). A small portion of the area is classified for light industrial (2%) or commercial use (10%). Parks and open space uses (2%) make up the remaining land use designations.

The Hydromodification Assessment recommends focusing efforts on the Boardman Creek and River Forest Creek basins. This was considered in developing the retrofit strategy which includes capital projects which may include some of the following BMPs:

- flood mitigation and/or
- reducing impervious areas and/or
- improving recharge and infiltration performance and/or addressing pollutants of concern, and/or demonstrating new technologies, and/or
- stream restoration activities.

The District's surfacewater CIP includes some water quality or quantity BMP. By focusing CIP efforts in priority areas and including BMPs, a retrofit has been achieved and water quality either has been or will have been improved. Examples of these are contained in the Table 1 in this document.

Comprehensive Evaluation of A Range Of Stormwater Quality Retrofit Control Measures And Their Appropriate Use

As described in this memorandum, the District's Surfacewater Management Code contains performance criteria for stormwater facilities that meet the District's standards aimed at minimizing the water quality and quantity impacts associated with new development and redevelopment. Acceptable stormwater facility types include, but are not limited to: planters, eco-roofs, permeable pavements, tree planting, filter strips, ponds, rain gardens, sand filters, swales, and proprietary treatment devices (though vegetated facilities are expressly preferred by the District's code). Once selected, the facility makes a transition from being conceptual in nature to more detailed design. During this selection process, a more detailed analysis of the problems, opportunities, site characteristics, water quality and other issues is conducted. Based upon the analysis, the appropriate retrofit control measure is selected from the range of acceptable facilities

Summary Of Current Stormwater Retrofit Control Measures Being Implemented

Current measures being implemented to achieve the District's retrofit strategy objectives to reduce the water quality impacts associated with existing development and support comprehensive watershed restoration include: capital projects, regulations, incentives, voluntary measures, and public education.

Capital Projects

Capital projects are a key element of the District’s retrofit strategy. The SWMP determined that capital projects are the most effective solution for addressing the existing water quality condition. The District’s SWMP describes that projects within the Surface Water Capital Improvement Program include new regional stormwater treatment facilities, retrofits of existing facilities, installation of roadside facilities, such as “rain gardens”, upgrades of existing storm lines and catchbasins, and natural resource restoration projects.

To prioritize the capital projects, OLSD collects suggestions or ideas for capital projects throughout the year, and then evaluates the projects annually through this process. Most surface water capital projects require multi-year funding in order to design and construct, which requires long term financial planning. The District’s retrofit capital improvement projects are listed in Table 1 of this document.

Regulations

The District’s primary regulatory tool is its surface water management code (code). This code was updated in 2012 to match updated requirements of the MS4 permit. The code addresses regulatory and review requirements related to erosion control, tree removal and mitigation planting, riparian buffers, flow control and treatment requirements. These regulations require submittal of an erosion prevention and sediment control plan containing methods and/or interim facilities to be constructed or used concurrently with land development. Plan submittals are required to provide details of erosion control measures, schedules for construction, and a maintenance schedule for erosion control activities. OLSD has an agreement with Clackamas County Service District (CCSD#1) for administration of the 1200-C permitting program for the areas inside OLSD. OLSD reviews and inspects all “small lot” development of less than one acre in size.

Other control measures or projects are opportunistic from proposed greenfield development or redevelopment. The District’s SWM Code requires water quality treatment and water quantity detention for all new development and redevelopment which generates retrofits on an *ad hoc* basis. The District’s code requires onsite storm quantity detention facilities to be designed to capture and detain runoff to the 2-year, 24-hour post developed runoff rate to a ½ of the 2 year, 24-hour pre-developed discharge rate. This discharge limitation reduces stream channel erosion. Within this, infiltration systems are encouraged. The District’s code also requires all new developments and redevelopments to provide onsite water quality facilities and requires a vegetated treatment but does allow alternative (mechanical) systems if it can provide an equivalent treatment performance, though vegetated facilities are explicitly preferred.

Stormwater User Fees & Systems Development Charges

The District offers a financial incentive for existing and redeveloping properties to reduce impervious area. For each 2,500 square feet of impervious surface removed, the District reduces the customer’s surface water management fee by one equivalent service unit,

currently valued at \$7.25 per month. The District has not implemented a surfacewater system development charge and thus could not use this as an incentive.

Voluntary Retrofits

Voluntary stormwater retrofits of privately owned, developed properties are encouraged by the District through various means including informational, technical assistance, and partnerships with local watershed councils, other non-profits, and other public agencies. For example, the District is currently partnering with the North Clackamas Urban Watershed Council in its Streamside Stewards Program to contact residents and business owners of developed residential, commercial and industrial properties to generate interest in voluntary riparian restoration. This program implements a BMP of riparian restoration. This is a program that gives direct field services to streamside landowners to help them remove invasive species and plant native trees and shrubs in the riparian zones of the creeks of the District. The priority basin is the Boardman Creek basin, but landowners along all creeks are invited to participate.

The District also capitalizes on opportunities ad hoc such as the BB-02 McLoughlin Corridor SWF Retrofit project further described in this document.

Education And Demonstration Projects

Both public (capital) projects and voluntary stormwater retrofits present opportunities to educate the public about water quality issues and demonstrate functional and attractive best management practices that improve water quality in the District's creeks and rivers. Demonstration projects are included in the CIP list such as the Jennings Avenue Sidewalk Green Infrastructure Demonstration. There will also be demonstration projects included in the Boardman Watershed Complex project SB-17.

Current Estimate of Annual Program Resources Directed Towards Stormwater Retrofits

The following table describes the District’s expended amounts on retrofit CIPs.

Table 1: Retrofit CIP

OLSD Capital Improvement Project Name	Funds Spent To Date	FY 2015/2016 funding	TMDL Parameter	Total Project Budget	Timeline
<i>Boardman Watershed Initiative: Phase 2 (Walta Vista and River Road Culvert Replacement) SB-08</i>	\$211,951.87	\$0	Temp.	\$ 3,673,000	On hold: 2017 recommence
<i>Boardman Watershed Initiative: Boardman Wetland Complex (Boardman Ave to Jennings Ave) SB-17</i>	\$232,229.89	\$1,500,000	Temp. bacteria, heavy metals (including mercury)	\$ 4,890,000	Ongoing – 2017 completion
<i>Boardman Watershed Initiative: Naef Road Culvert Replacement and Channel Restoration SB-16</i>	\$144,491.02	\$0	Temp.	\$ 954,333	On hold: 2017 recommence
<i>McLoughlin Blvd Corridor Stormwater Retrofits BB-03</i>	0	\$40,000	Temp.	\$ 240,000	On hold: 2016 recommence
<i>New Urban High School Stormwater Retrofit: CS-02</i>	\$13,500	\$150,000	Temp.; bacteria, heavy metals (including mercury)	\$ 170,000	On hold: 2016 recommence
<i>McLoughlin Boulevard Corridor Regional Stormwater Facility: BB-02</i>	\$29,350.00	\$0	Temp.; bacteria, heavy metals (including mercury)	<i>Unknown</i>	On hold: 2016 recommence
<i>Courtney Springs Basin: Regional Stormwater Facility and Riparian Restoration; CS -01</i>	0	\$200,000	Temp.; bacteria, heavy metals (including mercury)	\$ 2,062,942	On hold: 2016 recommence

Storm Water Quality Improvement Project, Initiated, Constructed or Implemented

BB-02 McLoughlin Corridor SWF Retrofits: OLSD and EPA installed a CONTECH water quality treatment manhole on a stormline that had no water quality treatment. The upstream catchment now treated is approximately 20 acres.

CS-01: Courtney Springs Regional Water Quality Facility: The Courtney Springs basin was largely developed in the 1960's and 1970's with virtually water quality treatment consideration. A public project in 2013 constructed a regional stormwater facility near the downstream end of the basin that provides treatment for approximately 5 acres of currently developed and untreated impervious area. The facility was designed to meet the District's current water quality requirements.

RF-31: Kellogg Avenue Pervious Sidewalk and Bioswale: Clackamas County and OLSD partnered in 2013 to remove impervious pavement on Kellogg Avenue, and construct a new pervious pavement sidewalk and bioswale for water quality treatment. It is the first demonstration project in the area to utilize pervious pavement as a water quality improvement. This project provides treatment for approximately 0.5 acres of previously developed and untreated impervious area.

Identification Of Developed Areas Or Land Uses Impacting Water Quality That Are High Priority Retrofit Areas

In the 2011 Surface Water Management Strategic Plan, OLSD identified the Boardman Basin as its highest priority area. Boardman Creek is the largest basin within the District boundaries. Lack of development standards prior to implementation of the SWM program has led to numerous surfacewater problems. These problems manifest as chronic flooding events at repeated locations along Boardman Creek.

The District will focus on high priority problems and opportunities across the Boardman Creek basin, leveraging OLSD surfacewater capital improvement funding and other resources through partnerships with agencies, organizations and individuals sharing an interest in local streams.

Multiple benefits of the Boardman Creek Basin Initiative:

- Address chronic water quality/quantity issues along Boardman Creek.
- Improve fish and wildlife habitat throughout the Boardman basin.
- Restore migratory fish passage.
- Demonstrate progress to justify ratepayers' surfacewater fee investments.
- Leverage OLSD SWM resources through partnerships with agencies, organizations and individuals sharing an interest in local streams.

Within this basin, the Highway 99E / SE McLoughlin Boulevard commercial corridor is the highest priority target for retrofits because the properties have a higher impervious area percentage than the surrounding residential properties, have a higher pollutant potential based on their land use and were largely developed prior to substantial stormwater controls.

Progress toward TMDL WLAs can be made by either adding water quality treatment in untreated areas or by improving the effectiveness of existing treatment facilities to address TMDL parameters. The potential projects identified in this memorandum include both types of retrofit projects. In general, there is greater water quality benefit (and therefore greater progress toward TMDL WLAs) by adding structural controls to untreated areas, compared to modifying existing treatment facilities to increase effectiveness. For this reason, priority areas for water quality retrofits are those areas that are currently without structural BMPs. Commercial and industrial areas are of higher retrofit priority than residential areas because the expected pollutant discharge is higher.

Priority areas for water quality retrofits include the following categories:

- High: Commercial and industrial areas that do not currently have structural BMPs.
- Medium: Residential areas that do not currently have structural BMPs.
- Low: All areas of the District that have an existing structural BMP.

These priority areas have been identified as a means to develop an implementation plan for proposed retrofit projects. However, because most areas of the District are part of the Willamette Basin TMDL coverage, adding or improving water quality treatment in any identified project location is considered progress toward TMDL WLAs.

Consideration of new storm water control measures

The District will continue implementing measures, including planning, capital projects, regulations applicable to re-development, voluntary measures, and education and demonstration, to achieve stormwater retrofit strategy objectives to reduce the water quality impacts associated with existing development and support comprehensive watershed restoration.

A summary of installed facilities containing storm water control measures on private greenfield and redevelopment since 2012 is as follows:

Table 2 Greenfield and Redevelopment Projects incorporating water quality retrofits.

Legend (1): **R** = Redevelopment (retrofit), **G** = Greenfield

Project / Address / Facility	TMDL	Water Quantity?	(1)
2-Parcel Partition 14824 SE Laurie Ave. ○ Vegetated swale on private drive.	Merc. Temp. Bact.	No	G
6-unit Apartment Addition 2013 SE Courtney Ave. ○ Vegetated swale along Trolley Trail.	Merc. Temp. Bact.	No	R
Walgreens 14715 SE McLoughlin Blvd. ○ Underground filter (StormTech SC-740 Chambers)	Temp.	Yes	R
Church Parking Lot 13980 SE Briggs St. ○ Vegetated swale and detention pond.	Merc. Temp. Bact.	Yes	R
Church Addition 5101 SE Thiessen Rd. ○ Detention Pond	Merc.	Yes	R
High School Batting Cage Bldg. 4950 SE Roethe Rd. ○ Vegetated swale	Merc. Temp. Bact.	Yes	R

Public Notice of 2015 Retrofit Analysis Report

OLSD solicited public comment on this annual report in the following manner:

- Public Notice and Solicitation of Comments on the OLSD Website: 2-weeks in June 2015 beginning on June 12, 2015. No comments received.
- OLSD Board Meeting June 10, 2015: Planning and Development Manager's Staff Report mentions availability of report on website for public review and comment.
- North Clackamas Urban Watersheds Council May and June 2015: OLSD's monthly report mentions availability of report on website for Public Review and Comment.
- July/August Newsletter: reminds residents to watch OLSD website for opportunities to review and comment on various reports and program information.

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