Multnomah County NPDES MS4 Phase I Permit
Stormwater Management Program

Total Maximum Daily Load and 303(d) List Pollutant Reduction Analyses

Submitted to:
Oregon Department of Environmental Quality
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of the National Pollutant Discharge Elimination System
(NPDES) Permit Number 103004, File Number 120542

Submitted by:
Water Quality Program
Department of Community Services
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Introduction

In accordance with Multnomah County's National Pollutant Discharge Elimination System Municipal Separate Storm Sewer System Phase I permit (NPDES permit), issued December 30, 2010, the County is required to submit an Annual Report each November. The November 2014 submission includes three additional reports related to the 303(d) list of pollutants and the Total Maximum Daily Loads (TMDL):

1) An evaluation of pollutants on the current 303(d) listed pollutants
2) A TMDL Pollutant Load Reduction Evaluation.
3) A Waste Load Allocation Attainment Assessment

These reports relate the effectiveness of stormwater best management practices (BMPs) implemented by the County to estimates of pollutants and pollutant removal.

Permit area

Multnomah County's NDPES permit area is unlike most municipal jurisdictions in that geographically, it is comprised of several distinct areas rather than a single large area defined by a municipal boundary. The County permit areas include pockets of urban and rural areas within the City of Portland Urban Services Boundary and the City of Fairview. The County also owns and maintains five Willamette River bridges and approximately 28 miles of arterial roadway within the cities of Fairview, Wood Village and Troutdale. Maps are included in Appendix A of this document. Detailed descriptions of permit areas are included in the following sections.

Summary of pollutants and TDMLs

Oregon Department of Environmental Quality (DEQ) established TMDLs for the Columbia Slough (1998), Tualatin River (2001), Sandy River (2005) and the Lower Willamette River (2006), for a variety of pollutants which caused impairment of beneficial uses in local waterbodies. The pollutants include bacteria, metals (lead, mercury), industrial toxins (PCB, 2,3,7,8 TCDD), nutrient related impairments (dissolved oxygen, pH, chlorophyll a), and legacy pesticides (DDT, Dieldrin). More details about each of these pollutants and the impaired waterbodies can be found in the County's 2014 TMDL Implementation Plan.

Every two years, DEQ is required to compile and submit a list of impaired waterbodies to the Environmental Protection Agency (EPA). This list of impaired waters is known as the 303(d) list, which refers to a section of the federal Clean Water Act. Often, 303(d) listed pollutants are discovered after the establishment of a TMDL for a watershed. Through the NPDES permit, the County is required to review these pollutants without established TMDL wasteload allocations (WLA) . The pollutants requiring review on the 2010 list of impaired waters (303(d) list) include nutrient related impairments (algae, pH, dissolved oxygen), biological criteria (based on

macroinvertebrates), arsenic, and three pollutants related to the Portland Harbor clean up (chlordane, cyanide, hexachlorobenzene).

1. 303(d) Listed Pollutant Evaluation

The County is required to evaluate whether stormwater from County permit areas contribute to the impairments of water quality on stream segments on the 303(d) list without an established TMDL. In 2012, DEQ published their most recent Integrated Report Assessment and 303(d) list after public comment and input from EPA. The County is required to use the most current 303(d) list, approved within three years of the issuance date of the County NPDES permit (December 30, 2010). The County evaluation consists of the following questions as stated in the permit language:

1. *Evaluate whether there is a reasonable likelihood for stormwater from the MS4 to cause or contribute to the impairment.*
2. *Evaluate whether the BMPs in the existing SWMP are effective in addressing and reducing the 303(d) pollutants.*
3. *Describe changes needed to BMPs, if needed, to reduce the pollutants to the maximum extent practicable.*

The list of 303(d) impaired waters was downloaded from the DEQ 2010 Integrated Report Assessment Database.[1] The list contains forty-five listings of impaired stream segments with portions of their watersheds in the County's NPDES permit area, among which nineteen new stream segments have been added since the 2002 303(d) list and the County's previous 303(d) Pollutant Evaluation, which was submitted with the 2006 Interim Evaluation Report to DEQ.

Nutrient-related impairments

303(d) parameter	*Waterbody*
Aquatic weeds or algae	*Arata Creek/Blue Lake* *Osburn Creek/Fairview Lake*
Dissolved oxygen	*Beaverton Creek* *Bronson Creek* *Fanno Creek* *Johnson Creek* *Rock Creek*
pH	*Arata Creek/ Blue Lake* *Johnson Creek*

[1] http://www.deq.state.or.us/wq/assessment/rpt2010/results303d10.asp

Elevated nutrient concentrations, specifically phosphorus and nitrogen, encourage algae growth. The growth and respiration of attached algae causes diel swings in dissolved oxygen and pH. There are a number of natural processes that add nutrients to the lakes and streams: leaching from soil, degradation of plant material, contribution of animal feces, and decay of fish and aquatic invertebrates (shellfish). Anthropogenic causes of increased nutrients include septic system failure, fertilizer runoff and organic matter in urban stormwater.

County roadways cross Osburn and Arata Creek in the cities of Fairview and Wood Village and discharge stormwater to the streams, which may have elevated nutrients from organic matter. The neighborhood of "Interlachen," which is located between Blue Lake and Fairview Lake, may contribute nutrients from stormwater runoff from residential lawns and pet waste.

The County's Stormwater Management Plan contains several BMPs that address pollutants in runoff that may lead to algal growth and other biological impairment identified in the 2010 303(d) list by DEQ. The County provides residents with stormwater outreach through catch basin markers (PI-6) and through various media, including radio, cable and network television, and internet (PI-1). The County maintains a Nuisance Code Enforcement program to prevent illegal dumping by posting "No Dumping" signage where necessary (PI-8), and by investigating incidents when they do occur (ILL-4). The County also provides bi-weekly (twice a month) street sweeping for urban arterials (OM-3), and semi-annual catch basin cleaning (OM-2), and maintains a manual for road maintenance activities to avoid and minimize erosion and contain pollutants (OM-1). This suite of BMPs was previously evaluated to reduce sediment-bound pollution to the maximum extent practicable, and thus, we conclude that the current BMPs are also effective for nutrient reduction.

Biological impairment

303(d) parameter	*Waterbody*
Biological Criteria	Johnson Creek Osburn Creek Tryon Creek Beaver Creek

Biological assessments provide direct measures of the cumulative response of the biological community to all sources of stress, and measure the condition of the aquatic resource to be protected. Benthic macroinvertebrate data are collected once per year, but the organisms have been living in the stream for a longer period of time and therefore a single macroinvertebrate sample represents long-term stream conditions.

County roadways cross over Johnson, Osburn, and Beaver Creek, and may contribute sediment, metals or other pollutants that may harm organisms in these streams. A small pocket of unincorporated County exists in the Tryon Creek watershed, and runoff from this area may contribute to the degradation of biotic health. However, land use in this pocket is regulated by the City of Portland and the Oregon Department of Agriculture (ODA). No runoff is discharged from the roadways in this pocket.

Previous evaluations of the Stormwater Management Plan (2006; 2008; 2011) have shown that the plan covers a wide range of education measures, road maintenance and land use development practices and that the plan is implemented to the maximum extent practicable. Biological criteria are indicators for pollutants associated largely with existing TMDL parameters, namely metals and polycyclic aromatic hydrocarbons, and pesticides. Therefore, we can conclude that the existing BMPS are effective reducing pollutants associated with these 303(d) listings to the maximum extent practicable.

Arsenic

303(d) parameter	*Waterbody*
Arsenic	Beaverton Creek

Arsenic is a naturally occurring element in soil, and in Oregon, arsenic concentration is naturally elevated in groundwater and surface water. Natural background concentrations of arsenic in surface waters in Oregon range from less than 1 ug/l to 3 ug/l. Groundwater data from the USGS in 1998 show a range from less than 1 ug/l to 2,000 ug/l. High arsenic concentrations were associated with particular associations of rock and alluvial deposits in the Tualatin Basin. In 2011, DEQ incorporated this science into their program and revised the surface water quality standard for the human health criteria to 2.1 ug/l.

Arsenic is commonly adsorbed to or co-precipitated with minerals, clay, and organic carbon. Stormwater management BMPs that reduce erosion also reduces arsenic in stormwater. These include reviewing the Road Maintenance and Operations Manual (OM-1), cleaning catch basins (OM-2), properly disposing of road waste materials (OM-4), requiring erosion and pollution controls for public projects (ILL-3), installing stormwater treatment where practicable (STR-1, STR-2), and specifying native vegetation in right of way projects where applicable (NS-2). Given the previous evaluations of the SWMP to reduce sediment bound pollutants from stormwater, we conclude this set of erosion protection and prevention BMPs are effective to reduce arsenic to the maximum extent practicable.

Parameters associated with the Portland Harbor Clean up

303(d) parameter	*Waterbody*
Chlordane Cyanide Hexachlorobenzene	Willamette River

Parameters associated with the Portland Harbor include two organic pesticides, and cyanide, a chemical compound associated with steel fabrication. Chlordane is an organochlorine insecticide that has been banned by the EPA since 1983, and hexachlorobenzene, an organochlorine fungicide, has been banned since 1966. The listings of these chemicals on the Willamette River are associated with prior industrial practices along the Willamette River, and are not commonly associated with stormwater from urban roadways.

The County does not have jurisdictional authority in or around the Portland Harbor, except for the five Willamette River bridges (Hawthorne, Burnside, Broadway, Morrison, and Sellwood bridges), which are very unlikely sources of these pollutants.

2. Pollutant Load Reduction Evaluation

Background

The TMDL Pollutant load Reduction Evaluation is a requirement specified in NPDES MS4 permit Schedule D.3.c. The permit requires the County to evaluate progress towards reducing TMDL pollutant loads through the use of a pollutant load reduction empirical model, water quality status and trend analysis, and other appropriate qualitative or quantitative evaluation approaches. The report must contain the following components:

i. *The rationale and methodology used to evaluate progress towards reducing TMDL pollutant loads.*
ii. *An estimate of current pollutant loadings without considering BMP implementation, and an estimate of current pollutant loadings considering BMP implementation for each TMDL parameter with an established WLA. The difference between these two is the pollutant load reduction.*
iii. *A comparison of the estimated pollutant loading with and without BMP implementation to the applicable TMDL WLA.*
iv. *A comparison of the estimated pollutant load reduction to the estimated TMDL pollutant load reduction benchmark established for the permit term, if applicable.*
v. *A description of the estimated effectiveness of structural BMPs.*

vi. A description of the estimated effectiveness of non-structural BMPs, if applicable, and the rationale for the selected approach.

vii. A water quality trend analysis, as sufficient data are available, and the relationship to stormwater discharges for receiving waterbodies with the permittee's jurisdictional area with an approved TMDL. If sufficient data to conduct a water quality trend analysis in unavailable for a receiving waterbody, the permittee must describe the data limitations. The collection of sufficient data must be prioritized and reflected as part of the monitoring project/task proposal required in Schedule B.6.d.

viii. A narrative summarizing progress towards the applicable TMDL WLAs and existing TMDL benchmarks, if applicable. If the co-permittee estimates that an existing TMDL benchmark was not achieved during the permit term, the co-permittee must apply their adaptive management process to reassess the SWMP and current BMP implementation in order to address TMDL pollutant load reduction over the next permit term. The results of this reassessment must be submitted with the permit renewal application package described in Schedule B.6; and,

ix. If the co-permittee estimates that TMDL WLAs are achieved with existing BMP implementation, the permittee must provide a statement supporting this conclusion.

TMDLs have been established for the following watersheds in the permit areas for which Multnomah County is listed as a designated management agency. TMDL pollutants for each watershed are described in the following sections. For more detail on pollutant reduction action, please refer to the County's 2014 TMDL Implementation Plan.

Gresham area:	*Portland area:*
Johnson Creek watershed	Tualatin River watershed (Rock Creek and Fanno Creek tributaries)
Columbia Slough watershed (Fairview Creek)	Willamette River
Sandy River watershed (Beaver Creek)	Tryon Creek watershed
	Springbrook Creek

Methodology

Model description

A spreadsheet model to calculate pollutant loads was developed in 2008 for NPDES Phase I co-permittees through the Association of Clean Water Agencies (ACWA). The spreadsheet model utilizes land use conditions and BMP implementation to calculate pollutant loadings for various parameters on a drainage basin basis. A detailed description of the model development, modeling methods and assumptions are described in the 2008 Gresham NPDES Permit renewal submission to DEQ (chapter 4).

The model is a based on the EPA simple method equation to calculate pollutant loads. Different scenarios are input for BMP coverage, including a no-BMP scenario, a future condition, and a comparison with the wasteload allocation for TMDL pollutants. The model uses regional land use runoff concentration data collected between 1990 and 1995 and national BMP effluent concentrations. The data was compiled by a panel of ACWA members ("the ACWA Rangers"), who represent regional jurisdictions including the City of Portland, the City of Gresham, the City of Eugene, the City of Salem, and Clean Water Services. Tables of BMP effluent concentrations used in the model were updated in 2014, based on statistically verified national data and data obtained by Phase I jurisdictions.

It is significant to note that the effectiveness of non-structural and source control BMPs is not included in the model. This is attributed to the lack of quantitative data. Benefits of non-structural BMPs are described qualitatively, however, in the sections below where their use is a significant tool in the watershed.

Pollutant load status of County permit areas

As described in the introduction of this report, the County has an unusual permit area compared to other NPDES municipal jurisdictions. These areas include small pockets of rural residential development, Willamette River Bridges, roadways designated as *local access roads*, and roadways within other municipal jurisdictions. Given the mix of jurisdictional pockets, a straightforward application of the pollutant model is not practicable for some areas.

In many cases County areas do not contribute stormwater runoff because the roadways in unincorporated rural areas have roads built with a rural standard (no curb or gutter), and often without any drainage system. Runoff from the roadway is allowed to sheet flow from the road into vegetated right of way areas. The County's Hydromodification Assessment contains detailed descriptions and maps of these unique jurisdictional areas.

In the sections below, a narrative summarizing the progress towards pollutant reduction and the WLA are given; in some cases these are qualitative descriptions. Adaptive management strategies are given where applicable, as well as reference to water quality trends, if available.

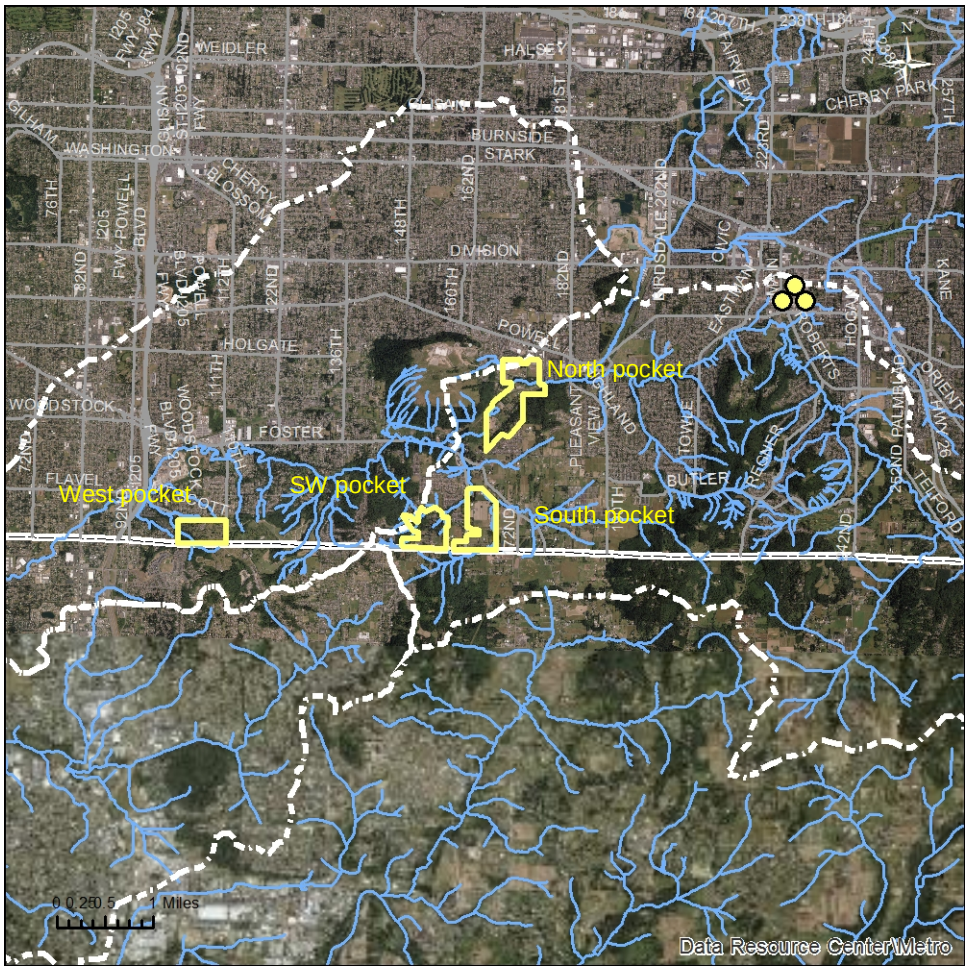
Johnson Creek

Pollutants	*Area*
Bacteria	4 small pockets of rural residential
DDT/Dieldrin (Turbidity surrogate)	3 facilities

The majority of the County's jurisdictional area in the Johnson Creek watershed is in the rural upper watershed east of Gresham. The NPDES jurisdictional area is limited to three pockets of rural residential and agricultural areas adjacent to the City of Portland. These areas were

included in the permit because they are part of the City of Porltand's Urban Services Area, however, these areas are rural in character.

Runoff from each pocket is limited: 1) from the southwest pocket, two road segments to discharge to a forested riparian wetland in a tributary headwater, 2) from the south pocket, a small segment of vegetated ditch from an uncurbed roadway discharges to a tributary, and 3) no direct discharge from the roadways in the northernmost and westernmost pockets.



Three County facilities in the watershed – Gresham Library, East Building, Gresham Probation – currently do not have stormwater treatment. These facilities are included in a stormwater retrofit study by the Department of County Assets for County facilities.

Given the rural land use and limited runoff as described above, the rural pocket areas in the Johnson Creek Watershed were not modeled. When this area becomes urbanized and annexed into Portland, the area would be better suited for analysis with the pollutant load model.

Bacteria and erosion issues are currently regulated by ODA for agricultural activities, and the City of Portland for land use concerns, including construction and septic system inspections and permitting.

Regular ditch maintenance is not needed in these low traffic areas. In rural areas, vegetation is allowed to grow in ditches, and if maintenance is needed, County Road Maintenance crews follow ditch maintenance practices that minimize and avoid erosion. A Ditch Condition Rating program is planned for 2015 using GIS data and a scoring matrix, which will address chronic ditch issues where they may occur. These rural areas are not typical of urban NPDES areas where urban stormwater controls are in place.

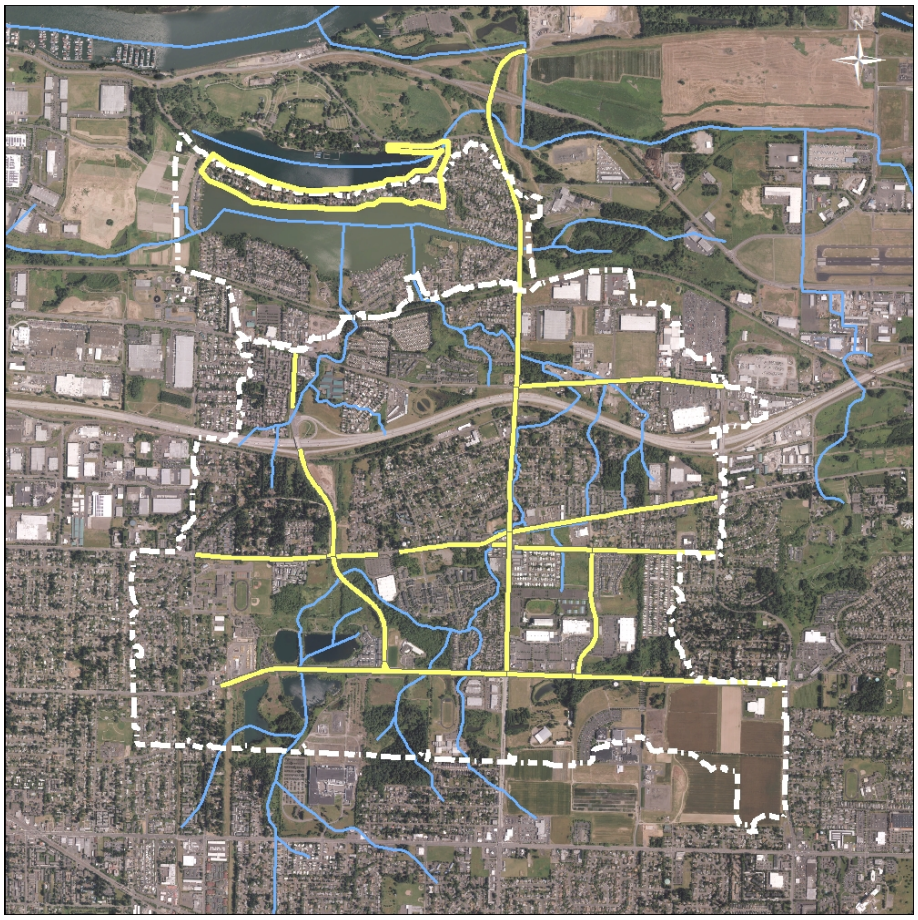
Fairview Creek/Columbia Slough

Pollutants	*Area*
Bacteria Dissolved oxygen DDT/Dieldrin PCB Lead 2,3,7,8 TCDD	Area of residential development Several segments of arterial roadway

Pollutants in Fairview Creek, Fairview Lake and the Columbia Slough are modeled by the cities of Gresham, Fairview and Portland. The segments of County arterials in the Fairview Creek watershed are located in the City of Fairview, and thus have been integrated into the Fairview pollutant load model calculations. For more detail, please refer to the model runs included in the 2008 Permit Renewal, and the forthcoming 2014 Annual Report from the City of Fairview.

The City of Gresham collects samples for E.coli from Fairview Creek near the confluence with Fairview Lake, a man-made impoundment at the head of the Columbia Slough. The data from the past few years shows the concentrations are most often below the single sample standard (except for one exceedance), and the geometric mean is below the 126 org/100ml standard.

According to the City of Gresham Pollutant Load Evaluation, trends in Fairview Creek show that TSS, lead, and other metals are significantly decreasing over time. There is also a significant increasing trend for dissolved oxygen, which indicates overall improvements in stream health.

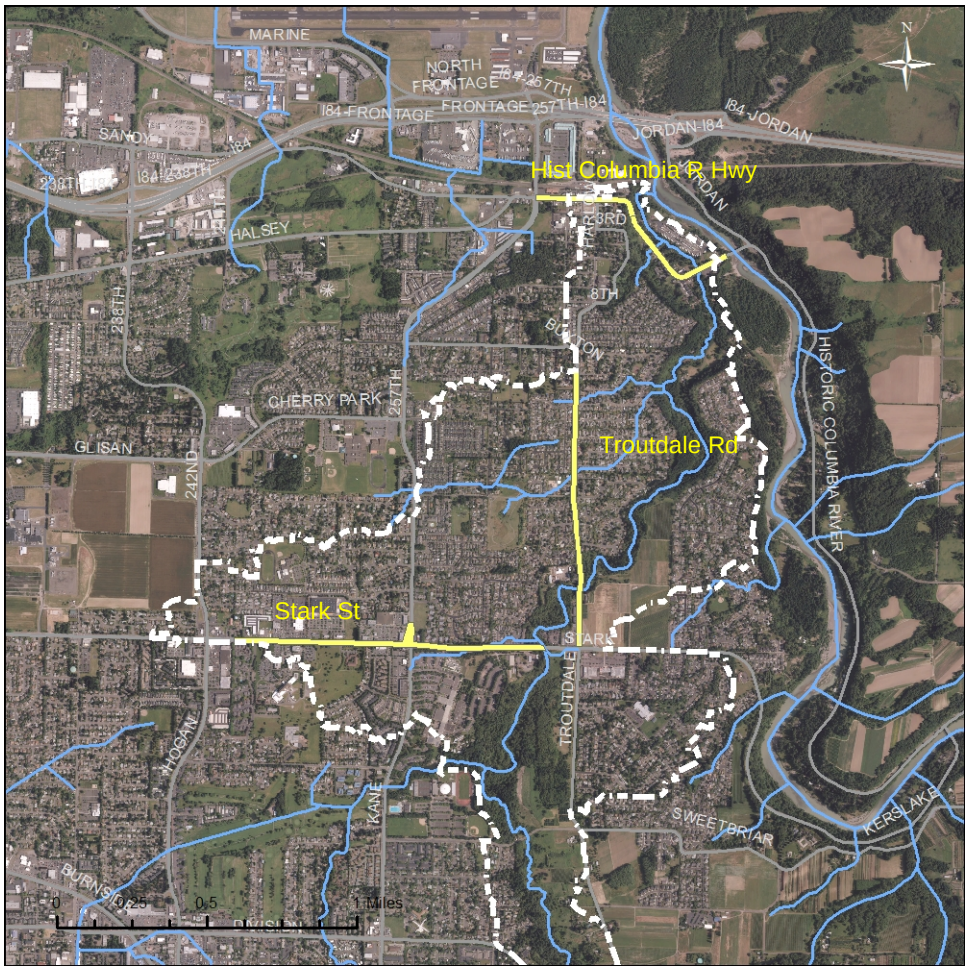


Date	*24hr Rain*	*Fairview Creek mouth E.coli (org/100ml)*
7/29/2013	0.00	200
10/29/2013	0.00	63
1/27/2014	0.00	85
4/29/2014	0.00	63
7/31/2012	0.00	210
10/30/2012	0.57	*1500*
1/29/2013	1.08	140
4/30/2013	0.01	20
8/4/2011	0.00	250
10/25/2011	0.00	190
1/31/2012	0.01	10
4/24/2012	0.00	170
	GeoMean	**114**

Beaver Creek

Pollutants	*Area*
Bacteria	3 segments of urban roadway

In the NPDES permit area, the County owns and maintains three segments of arterial and collector roadways: Historic Columbia River Hwy, Troutdale Rd and Stark St. The City of Troutdale modeled the bacteria load for the portion of the city which contains the County roads in 2011 as a requirement of the City's NPDES MS4 Phase II permit. The Troutdale model results show that while some bacteria reduction may be achieved through flow reduction, it is a long way from achieving the WLA. These roads are cleaned with a street sweeper approximately every two weeks, and catch basins are cleaned twice a year. These non-structural BMPs, however, are not included in the pollutant load modeling.



Instream sampling shows another story, however. E. coli bacteria is analyzed from two sample sites on Beaver Creek, one which captures impacts from agricultural land use (Division/Troutdale), and another in the lower watershed that takes runoff from urban areas of

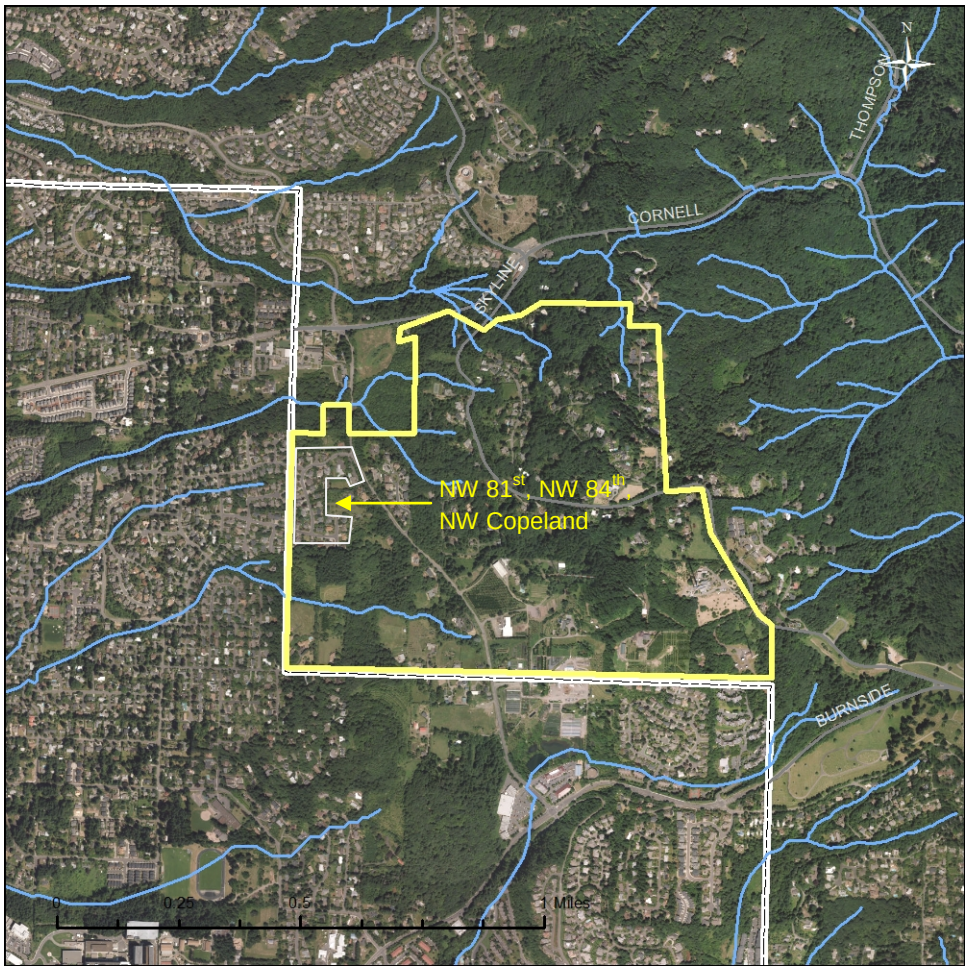
Gresham and Troutdale, in addition to the upper agricultural area. In the table below, it is clear that runoff in the lower watershed is influenced by the agricultural runoff, especially during rain events. E. coli concentrations exceeding the single sample standard (406 org/100ml) are italicized, and the geometric means for the past three years are calculated below. The lower watershed E.coli geometric mean concentrations for this time period is below the geometric mean standard (126 org/100ml), and the upper watershed geometric mean concentrations are slightly above the standard.

Date	*Rain preceding 24 hrs (in)*	*Lower Foot Bridge (lower watershed) E.coli (org/100ml)*	*Division/Troutdale (upper watershed) E.coli (org/100ml)*
4/29/2014	0.00	41	85
1/27/2014	0.00	10	10
10/29/2013	0.00	41	*580*
7/30/2013	0.00	75	180
4/30/2013	0.01	75	230
1/29/2013	1.08	*660*	*480*
10/30/2012	0.57	*960*	*8700*
8/2/2012	0.00	190	*2500*
4/24/2012	0.00	52	130
1/31/2012	0.01	10	*160*
10/25/2011	0.00	10	84
8/8/2011	0.00	20	20
	GeoMean	**57**	**210**

Rock Creek tributaries

Pollutants	*Area*
Bacteria	Area of low density rural development with 3 blocks or residential development

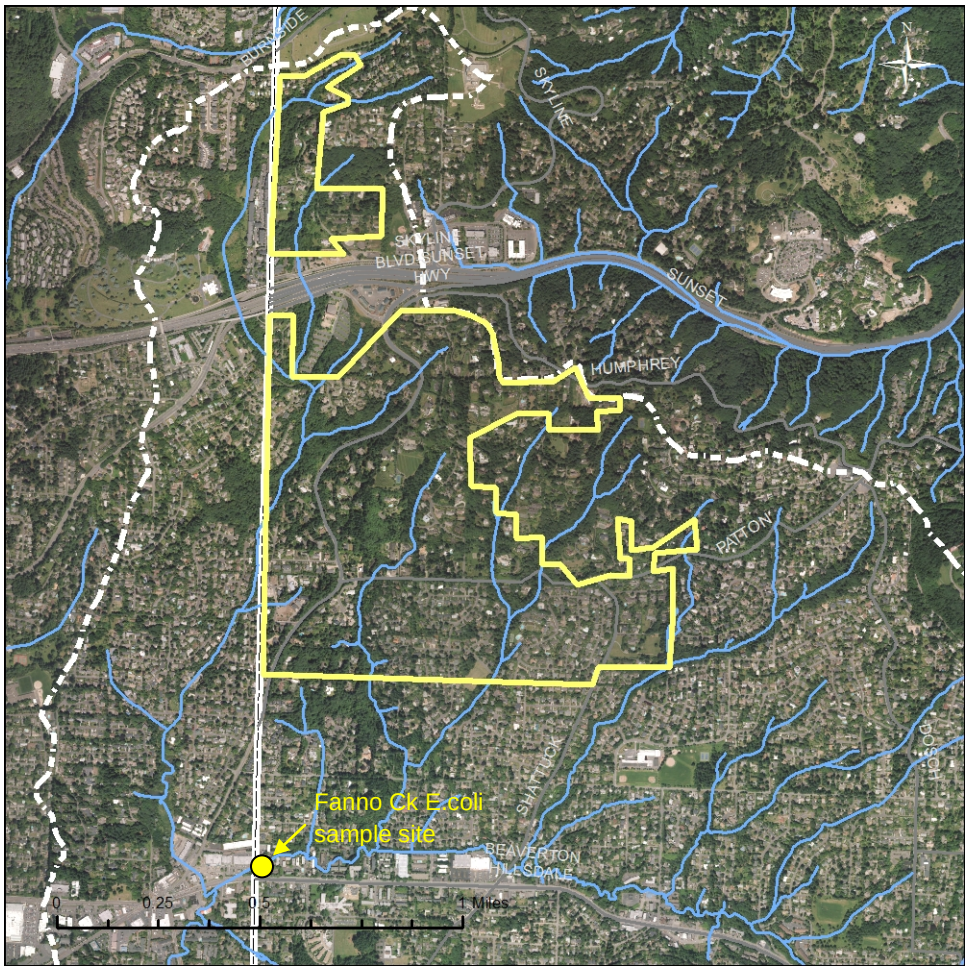
Within the County pocket in the Rock Creek watershed, there are only three residential streets that discharge runoff (NW 81st Pl, NW 84th Pl, NW Copeland St). These streets are part of a larger development established in Washington County. Clean Water Services is responsible for stormwater maintenance through an intergovernmental agreement (IGA), and land use is regulated by the City of Portland, also through an IGA. These roads are classified as local access roads, where Road Fund expenditure on the roads requires special resolution from the County Board. Given the spatial continuity with the Washington County development, it is expected that these few streets would be modeled by Clean Water Services for the Tualatin TMDL.



Fanno Creek

Pollutants	*Area*
Bacteria	Area of residential development

Fanno Creek is a tributary of the Tualatin River with its headwaters in the City of Portland and a pocket of unincorporated County. In previous NPDES reports, this area was not modeled because the County has limited activity regarding stormwater management. Stormwater maintenance responsibility has been transferred to Clean Water Services as part of the Tualatin TMDL. Also, the urban land use authority has been transferred to the City of Portland. Many of the higher traffic collector roads in this area have no curbs or drainage systems, and the curbed residential streets have low traffic. The County relies on non-structural BMPs performed by the Clean Water Services under an intergovernmental agreement to meet the WLA or water quality standards from this area.



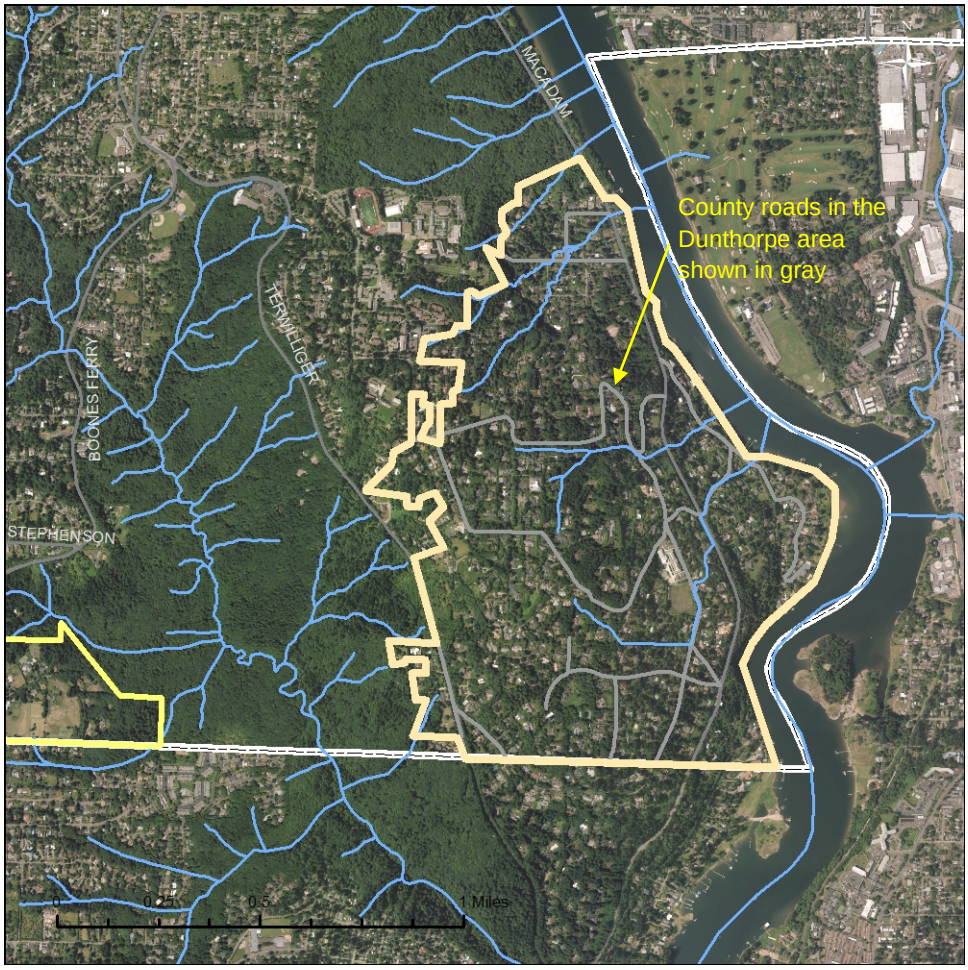
The City of Portland collects E.coli bacteria samples from Fanno Creek near the confluence of tributaries of where the County discharges stormwater. The sample site integrates water from the upstream watershed that includes single and multi-family residential and commercial land uses. Therefore, it may not be representative of the low density residential character of the County pocket. The headwater reaches of the tributaries in the County pocket may run dry during the summer.

Date	*Rainfall preceding 24hours (in)*	*SW 56th Ave (near County line) E.coli (org/100ml)*
2/20/2013	0.10	300
3/18/2013	0.00	140
4/23/2013	0.00	330
5/20/2013	0.00	*470*
6/18/2013	0.00	*510*
7/22/2013	0.00	380
8/20/2013	0.00	*760*
9/23/2013	0.20	*5200*
10/29/13	0.00	370
11/19/13	0.40	*2800*
12/23/13	0.15	*1000*
1/29/14	0.24	*680*
2/20/14	0.18	*960*
3/17/14	0.04	260
4/30/14	0.00	160
5/27/14	0.08	*930*
6/18/14	0.01	*770*
	Geomean	**582**

Willamette River discharge

Pollutants	*Area*
Bacteria	Area of low density residential land use (Dunthorpe) 5 Willamette River bridges (Hawthorne, Broadway, Morrison, Burnside, Sellwood)

The neighborhood of Dunthorpe is a low density residential neighborhood featuring large lots connected to public and private roads, including public roads designated as “local access roads.” Runoff from the narrow public roads in the neighborhood typically sheet flows into the right of way with no curb or gutter, or flows into vegetated ditch segments. Piped drainage is limited in the area. The model assumptions for typical residential (surburban) land use are not particularly applicable given the especially low effective impervious area, lack of urban street features



(curb/gutter/catch basin), and the number of private roads. This neighborhood is also dissimilar to neighborhoods in Johnson Creek where the bacteria wasteload allocation for Lower Willamette tributaries was calculated. For these reasons, this area has not been previously modeled.

In previous reports, the Willamette River Bridges have been deemed by DEQ to have *de minimis* impact of Willamette River water quality. The open grating, discharge of some runoff to the combined sewer system, and the use of stormwater filtration devices on bridge ramps make this a unique area. Because the amount of runoff is small and the stormwater treatment on existing runoff is extensive, this area was not modeled.

Bacteria loads from these areas that discharge directly to the Willamette are expected to meet wasteload allocations or water quality standards given the limited runoff, outreach and non-structural BMPs.

Tryon Creek – Bacteria

The two County roads in this rural pocket area of Tryon Creek watershed do not have drainage systems. This area was not modeled because it does not contain a municipal stormwater system.

Springbrook Creek - Bacteria

The County has determined that it does not have any jurisdiction in the Springbrook Creek watershed upon closer examination of the municipal boundaries and watershed using GIS mapping.

3. Wasteload Allocation Attainment Assessment

Introduction

The Wasteload Allocation Attainment Assessment is an analysis of pollutant load reduction potential of an area to determine if and how a WLA can be met for particular pollutants. This analysis is to determine the attainability of the WLAs, whether WLAs are achievable given estimates of structural BMP performance, and whether the retrofit solutions are practicable in terms of resources and costs. This assessment includes discussion and evaluation of water quality data, if available.

As described in the Pollutant Load Reduction Evaluation in the section above, TMDLs have been established for the following watersheds in the permit areas for which Multnomah County is listed as a designated management agency. Many pockets of unincorporated County that make up the NPDES jurisdictional area are unique and do not lend to modeling given the model assumptions, size and character of area, and other factors described in the previous section of this report.

Gresham area:	*Portland area:*
Johnson Creek watershed	Tualatin River watershed (Rock Creek and Fanno Creek tributaries)
Columbia Slough watershed (Fairview Creek)	Willamette River
Sandy River watershed (Beaver Creek)	Tryon Creek watershed
	Springbrook Creek

Wasteload Allocation Attainment Analysis

Johnson Creek

As described above, the pocket areas of unincorporated County are rural in nature. With limited runoff, these rural pocket areas in the Johnson Creek Watershed were not modeled using the pollutant load model. When this area becomes urbanized and annexed into Portland, the area would be better suited for analysis with the pollutant load model.

Bacteria and erosion/sediment concerns should be placed on the adjacent land uses, regulated by ODA and the City of Portland.

Fairview Creek

Pollutants in Fairview Creek, Fairview Lake and the Columbia Slough are modeled by the cities of Gresham, Fairview and Portland. The County arterials are contained in the areas of Fairview that discharge to Fairview Creek. Thus, County roads are integrated into the Fairview pollutant load model calculations from 2008, and the forthcoming 2014 report from the City of Fairview. These are reported under the Gresham/Fairview NPDES permit.

The County owns several arterial roads within the Fairview Creek watershed in the NPDES permit area. These are identified in the County Stormwater Retrofit Strategy (2014). The cost of stormwater retrofits installed in each of the segments is estimated to be in the range of approximately $4.5 -10.5 million.

Roadway	*Segment*	*Water Quality Cost Range*
W Arata Rd	223rd - 238th Dr	$244,000 - $488,000
NE Glisan St	202nd Ave -Fairview Parkway	$223,300 - $446,700
NE Glisan St	Fairview Pkwy - 238th Dr	$272,000 - $884,000
NE Fairview Pkwy	Sandy Blvd - 1035' South	$58,000 - $188,500
NE Fairview Pkwy	I-84 - Glisan St	$352,200 - $1,144,700
NE 223rd Ave	NE Sandy Blvd - NE Glisan St	$432,300 - $990,300
Wood Village Blvd	NE Halsey - Glisan St	$123,800 - $335,100
NE Halsey	201st Ave - Historic Columbia River Hwy	$1,717,100 - $3,434,200
NE 238th Dr	NE Sandy Blvd - NE Glisan St	$348,500 - $1,132,600
NE 242nd Dr	NE Glisan - 1350' South of Glisan	$75,600 - $245,700
NE Sandy Blvd	Fairview City Limits - 238th Dr	$602,000 - $1,204,000
	Total	*4,448,800 - 10,493,800*

Beaver Creek

The City of Troutdale report on pollutant load reduction (2011) described that BMPs are not very effective for bacteria reduction; however, some reductions can be achieved simply from flow reduction. The report concludes that the WLA is still a long way from being met; however water quality data from Beaver Creek shows bacteria concentrations generally meeting the water quality standard in the urban area. Bacteria loading from the agricultural areas upstream look to be a concern.

The County owns two urban roads within the Beaver Creek watershed in the NPDES permit area. These are identified in the County Stormwater Retrofit Strategy (2014). Stormwater retrofits could be installed in these segments for approximately $1-2 million.

Roadway	*Segment*	*Water quality Cost range*
SE Stark St	SE 257th to Troutdale Rd	$433,200 - $946,400
SE Stark St	East of Troutdale Rd	$252,000 - $504,000
S Troutdale Rd	SE 19th Ave to Stark	$166,900 - $376,700
Historic Columbia River Hwy	SE 257th to Sandy River	$152,100 - $494,300
	TOTAL	*$1,004,200 – 2,321,400*

Rock Creek tributaries

The three small residential streets within the County pocket are part of a larger development in Washington County. The County expects that Clean Water Services will include this small part of the development in a Tualatin watershed pollutant load model. These roads are classified as local access roads, and are not part of the County master road list.

Fanno Creek - Bacteria

The pocket of unincorporated County draining to Fanno creek has a total of 404 acres, of which 345 acres is residential development and 59 acres are open space area. The mean bacteria load generated from this area without BMPs, estimated using the pollutant load model (described in section 2) is 9.9 x 10^{10} MPN/day, which is an order of magnitude lower than the summer design storm WLA of 9.14 x 10^{11} MPN/day. Based on this model result, the bacteria load from this area meets the WLA.

Lower 95% confidence interval (MPN/day)	*Mean (MPN/day)*	*Upper 95% confidence interval (MPN/day)*	*WLA (MPN/day)*
1.5 x 10^{10}	9.9 x 10^{10}	1.8 x 10^{11}	9.14 x 10^{11}

Willamette River (Dunthorpe) – Bacteria

The pocket of unincorporated County known as Dunthorpe, drains directly to the Willamette River. The total area of this pocket is 655 acres, of which 563 acres are low density residential and 92 acres are open space. This neighborhood has uncharacteristically large lots, and has a neighborhood character of more rural nature with un-curbed narrow streets and much forest canopy.

In the Lower Willamette River TMDL, DEQ chose to apply the 78% bacteria load reduction calculated for the Johnson Creek Watershed to all other tributaries in the Lower Willamette Subbasin. This reduction applies on a year round basis.

Despite the nature of the neighborhood and roadways being significantly different from other urban neighborhoods of Johnson Creek, the pollutant load model was used to provide a theoretical estimate of the amount of stormwater treatment needed to reduce mean bacteria loads to the WLA.

The estimated mean bacteria load generated from this pocket is 1.6×10^{11} MPN/day. The model estimates that with rain gardens or pervious pavement treating 30% of the residential area (168 acres), the mean bacteria load can be reduced below the WLA (1.25×10^{11} MPN/day).

Treatment Type	*Treatment Area (ac)(%)*	*Mean Bacteria Load (MPN/day)*
Rain garden or pervious pavement	168 ac (30% of 655 ac)	1.1×10^{11}

The total roadway pavement area in this area is 680,000 ft^2. Thirty percent of the total is 204,000 ft^2. The construction cost to retrofit this area is estimated to be in the range of $204,000 to $404,000, with rain gardens in the lower range and porous pavement in the higher range. This estimate is based on calculations described in the County's Stormwater Retrofit Strategy.

Tryon and Springbrook Creeks

There is no MS4 discharge to these streams from the County NPDES permit areas.

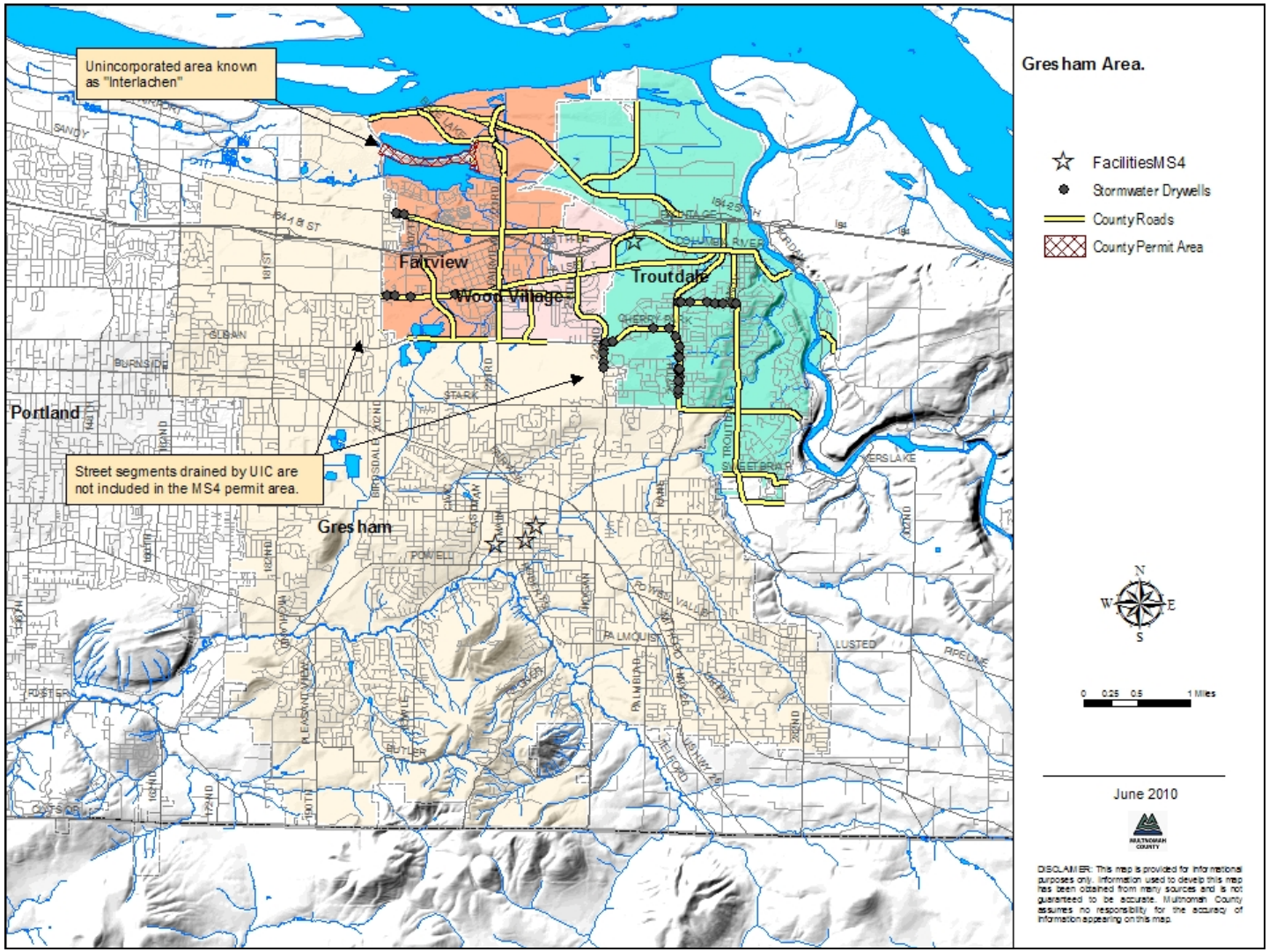
References

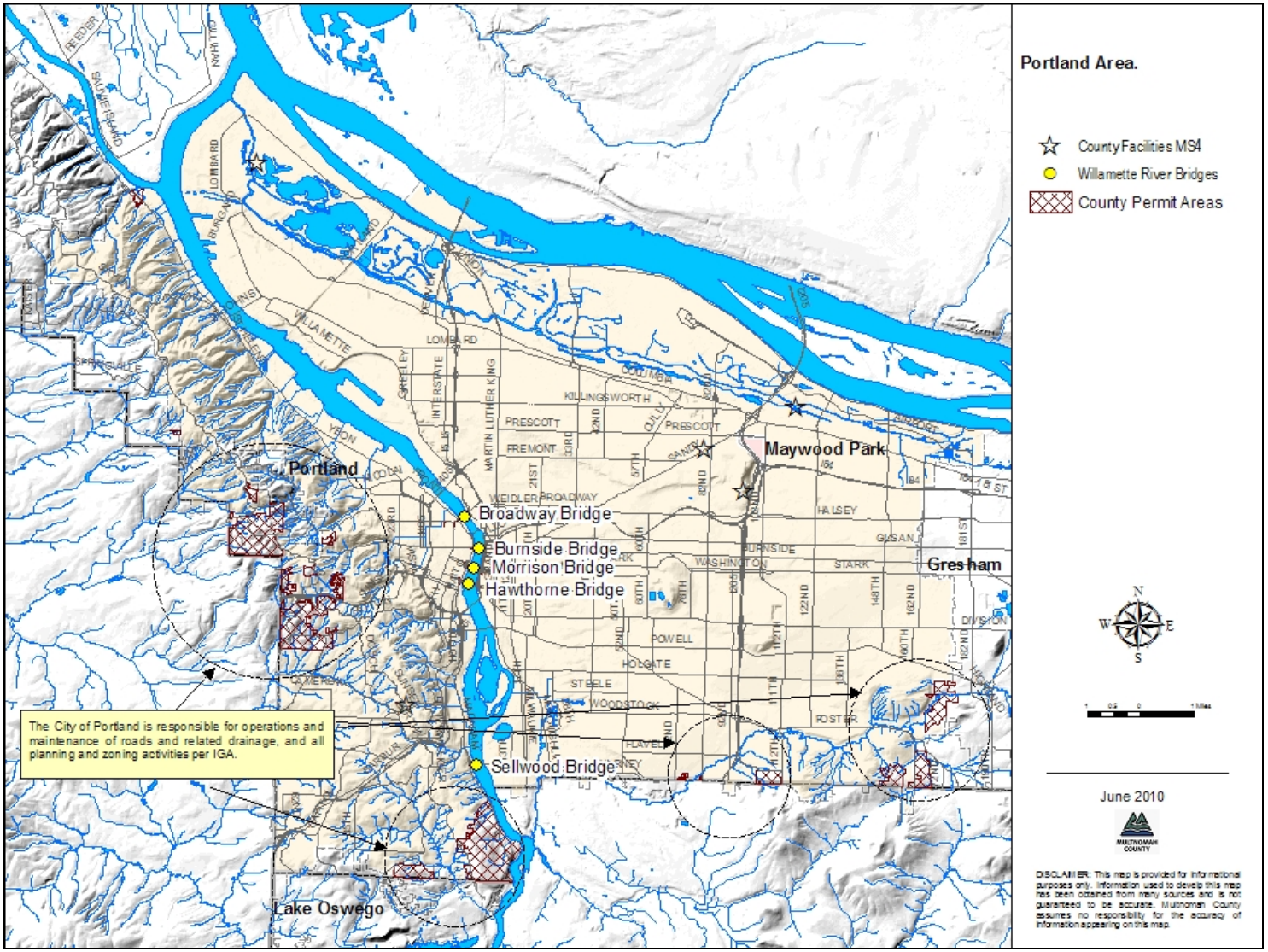
City of Gresham, 2014. Pollutant Load Evaluation 2014. Gresham, Oregon.

City of Portland, 2014. NPDES Annual Report 2012- 2014. Portland, Oregon.

City of Troutdale, 2011. Pollutant load Reduction Benchmarks 2011: Sandy River TMDL. Troutdale, Oregon.

APPENDIX A. Map of Permit Areas




Portland Area.
County Facilities MS4
Willamette River Bridges
County Permit Areas
Portland
Maywood Park
Gresham
Lake Oswego
Broadway Bridge
Burnside Bridge
Morrison Bridge
Hawthorne Bridge
Sellwood Bridge
The City of Portland is responsible for operations and maintenance of roads and related drainage, and all planning and zoning activities per IGA.
June 2010
DISCLAIMER: This map is provided for informational purposes only. Information used to develop this map has been obtained from many sources and is not guaranteed to be accurate. Multnomah County assumes no responsibility for the accuracy of information appearing on this map.