
DRAFT

**Analysis of Stormwater
Mitigation Projected to be
Constructed by 2040 as part of
New and Re-development in
WRIA 9**

February 2014



King County

Department of Natural Resources and Parks
Water and Land Resources Division

Science Section

King Street Center, KSC-NR-0600
201 South Jackson Street, Suite 600
Seattle, WA 98104

Alternate Formats Available
206-477-4807 TTY Relay: 711

DRAFT

**Analysis of Stormwater Mitigation
Projected to be Constructed by 2040
as part of New and Re-development in
WRIA 9**

Submitted by:

Jeff Burkey
King County, Science Section, Water and Land Resources Division
Department of Natural Resources and Parks



King County

Department of
Natural Resources and Parks
Water and Land Resources Division

Acknowledgements

Data used for this assessment was provided by Dr. Marina Alberti, Directory of Urban Ecology Research Laboratory, University of Washington, and Mark Simonson and Peter Caballero from the Puget Sound Regional Council.

Citation

King County. 2014. Analysis of Stormwater Mitigation Projected to be Constructed by 2040 as part of New and Re-development in WRIA 9. Prepared by Jeff Burkey, Science Section, Water and Land Resources Division. Seattle, Washington.

Table of Contents

Executive Summary.....	v
1.0. Introduction.....	1
1.1 Study Area.....	1
1.2 Goals and Objectives.....	2
1.3 New Development and Redevelopment Stormwater Mitigation Requirements	3
1.4 Population Growth	3
2.0. Methods and Data Used.....	6
2.1 Existing Conditions.....	6
2.2 Future Conditions	6
2.3 Comparison of Existing and Future Conditions	7
2.4 Land Ownership	8
2.5 Jurisdictions	8
3.0. Summary of Results	9
3.1 Existing and Future Land and Use Land Cover.....	9
3.2 Jurisdiction	10
3.3 Land Ownership	11
3.4 Estimate of Stormwater Mitigation Built as Part of New and Redevelopment	11
4.0. Discussion.....	15
5.0. Conclusions and Recommendations	17
6.0. References.....	18

Figures

Figure 1 Map of project study area.....	2
Figure 2 Map illustrating Traffic Analysis Zones (TAZ 2010) and jurisdictional boundaries.	A-2
Figure 3 2007 Land use land cover (LULC)	A-3
Figure 4 2040 Land use land cover (LULC)	A-4
Figure 5 Framework for assessing stormwater mitigation built due to land cover change..	A-5
Figure 6 Jurisdiction boundaries.	A-6

Figure 7 Map illustrating land ownership, public and privateA-11

Figure 8 Map illustrating study area that will be developed but not mitigated by 2040 by new or redevelopment and mitigated as part of new or redevelopment for public and private lands.A-12

Figure 9 Fraction of each catchment projected to have development with stormwater mitigation by 2040.A-13

Figure 10 Fraction of each catchment “Undisturbed” in 2007 and not projected to be developed by 2040.A-14

Figure 11 Fraction of each catchment developed by 2007 but not projected to have stormwater mitigation constructed by 2040 as part of new or redevelopment.A-15

Tables

Table 1 Projections of the total resident population for the Growth Management Act Medium Series: 2010 to 2040 (Washington State OFM 2012). 4

Table 2 Population projections for 2035 by jurisdiction based on PSRC VISION 2040 management plan..... 5

Table 3 Summary of Land Use Land Cover categories. 6

Table 4 Hierarchy of disturbance among development categories..... 7

Table 5 Summary of land use land cover in the study area for 2007 and 2040 conditions.... 9

Table 6 Amount of jurisdiction developed..... 10

Table 7 Summary of public and privately owned land..... 11

Table 8 Estimate of stormwater mitigation built by 2040 as part of new and redevelopment 12

Table 9 Summary by jurisdiction of land area projected to be undisturbed, developed but unmitigated, and mitigated by 2040. 13

Table 10 Percent of jurisdiction area projected to be undisturbed, developed but unmitigated, and mitigated by 2040. 14

Table 11 2007 Existing LULC area (acres) by Jurisdiction A-7

Table 12 2007 Existing LULC area (acres) by Jurisdiction (cont'd)..... A-8

Table 13 Future LULC area (acres) by Jurisdiction A-9

Table 14 Future LULC area (acres) by Jurisdiction (cont'd)A-10

Table 15 Summary of retrofit and mitigated areas by catchmentA-16

Appendices

Appendix A. Figures and Tables..... A-1

EXECUTIVE SUMMARY

King County was awarded a Puget Sound Watershed Management Assistance Program Fiscal Year 2009 grant by Region 10 of the U.S. Environmental Protection Agency (U.S. EPA) to develop a stormwater retrofit plan for Water Resources Inventory Area (WRIA) 9 (King County 2010).¹ The primary goal of this grant-funded study is to develop a plan and associated costs to implement stormwater Best Management Practices (BMPs) in developed areas of WRIA 9, that were built primarily without stormwater controls. Another overall goal of the study is to extrapolate stormwater mitigation costs to all of the developed area draining to Puget Sound. This report is one of the interim project reports needed to complete the overall study goals. It documents the methodology and results for estimating how much of the study area is projected to have new stormwater controls as a result of new and re-development based on simulated projections of development associated with estimated population growth by 2040.

Land use and land cover data used in this study were provided by University Washington NSF Biocomplexity II grant and Puget Sound Regional Synthesis Model (PRISM) imagery classifications. Data used to characterize existing conditions (2007) is a composite of observed satellite imagery and simulation outputs. Future conditions (2040) are derived from existing environmental regulations influencing simulated forecast projections into the future.

Current stormwater guidelines (King County 2009 Stormwater Design Manual) allow limited amounts of disturbance without requiring stormwater facilities to mitigate stormwater impacts. Determination of land use requiring stormwater mitigation as a result of new development or retrofitting unchanged conditions is based on defining the 14 categories of land use land cover into two categories, 1) developed with incremental levels of disturbance (agriculture, grasslands, cleared lands, light, medium, and heavy urban) and 2) not developed (mixed forest, coniferous, clear cut, and regenerating forests, wetlands, open water, bare rock, and shorelines).

When projected land uses were projected to change from a lesser level of development to a higher level in the same geographic location, it was assumed mitigation would be required. Based on 2007 land use conditions, there is approximately eight percent more development overall in the future (73% of the study area) than in existing conditions (65% of the study area). This new and redevelopment is estimated to account for 47 percent of the study area. Amortizing this over a 30-year period translates to an annual rate of 1.6 percent mitigation of new and redevelopment and 1.0 percent per year mitigating development without mitigation.

¹ <http://your.kingcounty.gov/dnrp/library/water-and-land/watersheds/green-duwamish/stormwater-retrofit-project/stormwater-retrofit-workplan.pdf>

1.0. INTRODUCTION

King County was awarded a Puget Sound Watershed Management Assistance Program Fiscal Year 2009 grant by Region 10 of the U.S. Environmental Protection Agency (U.S. EPA) to develop a stormwater retrofit plan for Water Resources Inventory Area (WRIA) 9 (King County 2010)². The goal of this grant-funded study was to develop a plan and associated costs to implement stormwater Best Management Practices (BMPs) in developed areas of WRIA 9 built primarily without adequate stormwater controls. Another goal of the study was to extrapolate stormwater mitigation to all of the developed area draining to Puget Sound.

A vast majority of the landscape within King County was developed (King County 2009) under pre-1990 stormwater management regulations shown to be ineffective in protecting receiving waters (Booth et al. 2002). Development that has occurred since the early 1990s has been mitigated to a greater extent than was achieved by earlier regulations. However, these regulations are applied only to new and certain types of redevelopment. Given the level of existing development that has occurred, restoring habitat to sustainable conditions requires retrofitting ineffective and/or missing stormwater infrastructure.

This report describes methods and results used to identify the percent of the project area where stormwater mitigation is projected to be constructed as a result of new development and redevelopment.

1.1 Study Area

The project study area includes drainages starting a short distance downstream of the Howard Hanson Dam on the Green River down to approximately 4.3 miles upstream from the mouth of the Duwamish River in Elliot Bay. In addition, approximately 17 miles of shoreline drainages (39 square miles) directly flowing into the Puget Sound are included—in total, approximately 278 square miles of WRIA 9 are modeled with Hydrologic Simulation Program FORTRAN (HSPF) (Figure 1). Areas not modeled include Vashon Island, the area within the City of Seattle which is comprised of a combined sewer system, and areas upstream of Howard Hanson Dam comprised of forests managed to protect Tacoma Public Utility's water supply.

² <http://your.kingcounty.gov/dnrp/library/water-and-land/watersheds/green-duwamish/stormwater-retrofit-project/stormwater-retrofit-workplan.pdf>

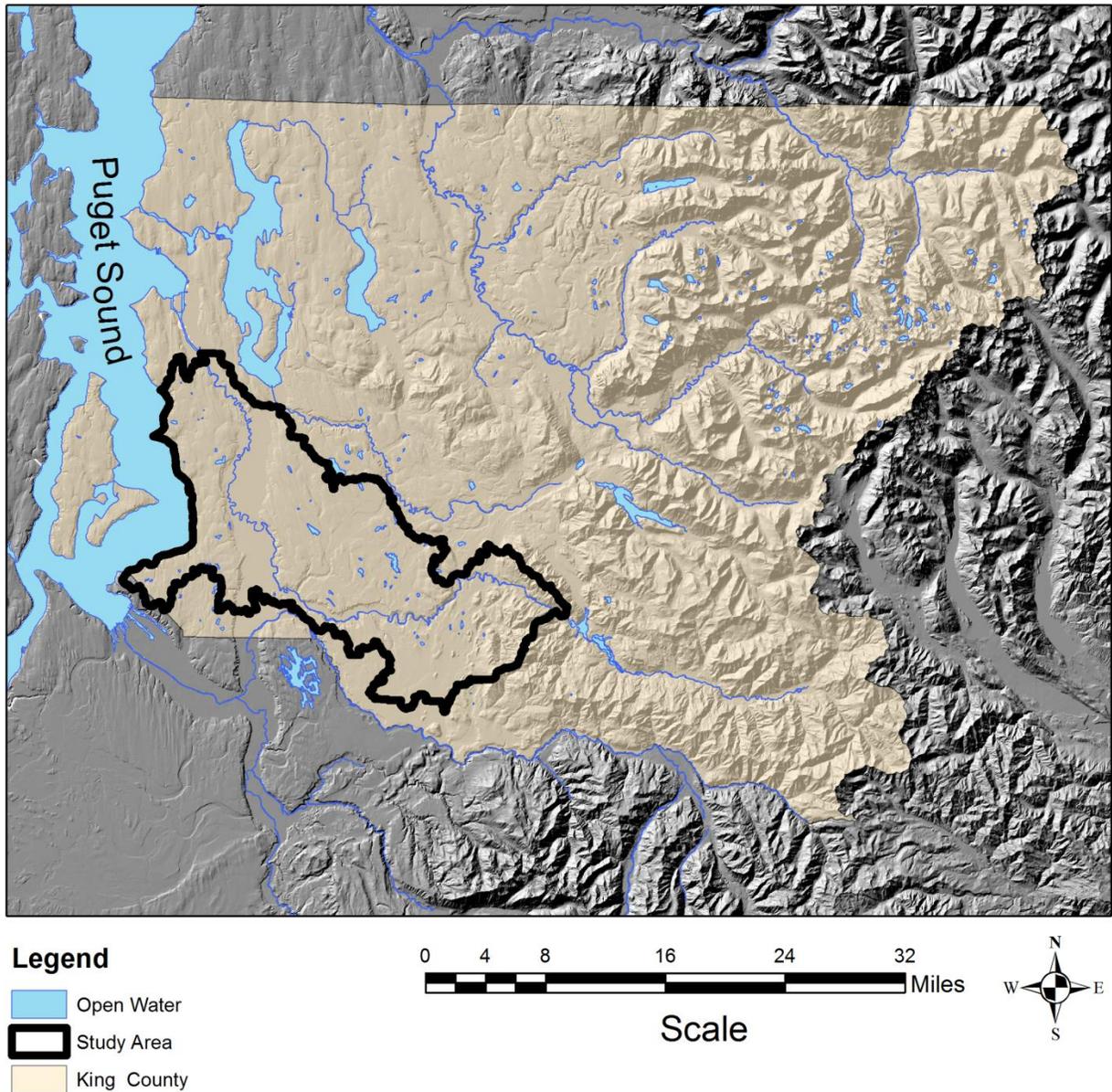


Figure 1 Map of project study area.

1.2 Goals and Objectives

The overall goal of the project is to assess strategies and associated costs to meet defined goals for biological protection and restoration. The objective of this report is to identify the percent of the project area where stormwater mitigation is projected to be constructed by 2040 as a result of new and redevelopment.

1.3 New Development and Redevelopment Stormwater Mitigation Requirements

Stormwater mitigation is required to occur when a project meets any one of multiple criteria. As defined in King County Surface Water Design Manual 2009 (King County 2009) (KCSWDM) Core Requirement #3: Flow Control, new development and redevelopment are required to provide flow control if **any** of these criteria are exceeded:

- More than 2,000 ft² of impervious surfaces are either added (New development) or replaced (Redevelopment).
- More than 35,000 ft² of forested area are converted to non-forested pervious landscapes (e.g. grass lawns) lacking equivalent soils storage functionality as a forested landscape.
- New impervious surfaces added are more than 50% of existing impervious surfaces
- Project site improvements are estimated to increase property value 50% or greater from existing site improvements.

When flow control is required, Low Impact Development (LID) is encouraged. In addition, thresholds instigating water quality mitigation are similar (KCSWDM Core Requirement #8) to above with the exceptions that 5,000 ft² of new or replaced impervious surfaces are pollution generating surfaces—roof tops are **not** considered pollution generating (at this time) and are not considered part of the total impervious area potentially triggering treatment.

1.4 Population Growth

Population growth in the central Puget Sound four county region (King, Snohomish, Pierce, and Kitsap) is expected to grow by 1 million people over the next 30 years (Washington State 2012, Table 1 below). This pressure from population growth will need to be adsorbed either in new and/or redevelopment. Recognizing impacts unmitigated development has on the environment, multiple planning agencies comprised of state and local jurisdictions have established a regional planning organization, Puget Sound Regional Council (PSRC), responsible for balancing future growth in population, economic, and transportation needs with sustaining and restoring a healthy environment.

Table 1 Projections of the total resident population for the Growth Management Act Medium Series: 2010 to 2040 (Washington State OFM 2012).

County	Census	Projections					
	2010	2015	2020	2025	2030	2035	2040
King	1,931,249	2,012,782	2,108,814	2,196,202	2,277,160	2,350,576	2,418,850
Kitsap	251,133	262,032	275,546	289,265	301,642	311,737	320,475
Pierce	795,225	831,944	876,565	923,912	967,601	1,006,614	1,042,341
Snohomish	713,335	750,358	805,015	857,939	908,807	955,281	997,634
County	Projected Percent Growth Relative to 2010 Census						
	2010	2015	2020	2025	2030	2035	2040
King	0%	4%	9%	14%	18%	22%	25%
Kitsap	0%	4%	10%	15%	20%	24%	28%
Pierce	0%	5%	10%	16%	22%	27%	31%
Snohomish	0%	5%	13%	20%	27%	34%	40%

The PSRC goals directing management decisions encapsulate a shared strategy defined as VISION 2040³. Technical analyses supporting this strategy include regional models simulating socio-economic, environmental, and transportation projections from 2010 to 2035 using inputs from GMA and the multiple jurisdictions within the four county regions. Because jurisdictional boundaries generally don't follow watershed drainage boundaries, projections of population growth are based on estimates within Traffic Analysis Zones (TAZ 2010 segmentation) defined by the PSRC and proportioned based on fraction of area within the jurisdictions and study area (Figure 2).

Population distributions are most likely not uniform within a TAZ, thus using unit area averages (i.e., # of people/acre) to reapportion estimated populations that cross jurisdictional and study area boundaries may not correctly add up when comparing to original projections. This is apparent when comparing TAZ generated population estimates exceed original jurisdiction estimates that are entirely located within the study area (Table 2). However, this inaccuracy (over estimates on average 9%) is deemed not to be significant given the uncertainty estimating distributions of population growth 30 years into the future at the scale presented in this study.

It is possible that mixing methodologies estimating population when TAZ areas and jurisdictions span multiple drainage basins and study area boundaries, but consistency in method was considered more important generating future population growth.

³ <http://www.psrc.org/growth/vision2040>

Table 2 Population projections for 2035 by jurisdiction based on PSRC VISION 2040 management plan.

Jurisdiction	2035 Projected Population		Fraction of	
	Within Study Area ¹	Jurisdiction	Study Area	Jurisdiction
Algona	1,975	3,476	< 1%	57%
Auburn	60,933	94,302	10%	65%
Black Diamond ²	6,561	9,012	1%	73%
Burien ²	53,098	42,174	8%	126%
Covington ²	18,050	20,551	3%	88%
Des Moines ²	34,890	35,212	5%	99%
Enumclaw	5,145	14,508	1%	35%
Federal Way	70,659	107,057	11%	66%
Kent ²	129,372	109,673	20%	118%
King County	105,940	2,383,978	17%	4%
Maple Valley	10,982	23,564	2%	47%
Normandy Park ²	6,847	6,464	1%	106%
Pierce County	2,106	1,062,729	< 1%	< 1%
Renton	44,129	122,010	7%	36%
SeaTac ²	46,575	43,335	7%	107%
Seattle	7,528	747,128	1%	1%
Tacoma	4,312	299,164	1%	1%
Tukwila ²	29,986	31579	5%	95%
Total	639,088	N/A	100%	--

¹Population estimates are based on area weighted average using TAZ segmentation (<http://www.psrc.org/data/forecasts/2013-forecast-products/>).

²Jurisdictions that nearly entirely fall within the study area.

2.0. METHODS AND DATA USED

This analysis compares current (2007) land use land cover with projected 2040 land use land cover to estimate the amount of new development and redevelopment that would include stormwater mitigation by catchment and by jurisdiction

2.1 Existing Conditions

Existing conditions is characterized using observed and simulated GIS data. Satellite imagery taken in 2007 was classified into 14 categories (Table 3) of land use land cover (University of Washington 2007) for Pierce, King, Snohomish, and Skagit Counties. The categories include three levels of urban intensity; lands cleared for or associated with development, agriculture, and forested lands in different phases of disturbance and growth. For this analysis, these 14 categories are grouped into two classes: developed and not developed. Developed categories are assumed to adversely alter stormwater runoff. 2007 land use land cover for the project area is shown in Figure 3.

Table 3 Summary of Land Use Land Cover categories.

Category	Class
Heavy Urban	Developed
Medium Urban	
Light Urban	
Cleared	
Grass, grasslands	
Agriculture	
Mixed Forest	Not developed (Undisturbed)
Coniferous Forest	
Clearcut Forest	
Regenerating Forest	
Wetlands	
Open Water	
Snow, Bare Rock	
Shorelines	

2.2 Future Conditions

Simulated future conditions (year 2040) for this analysis is based on output from a modeling framework (Alberti 2009) coupling a land cover change model (LCCM) and an urban socio-economic and transportation model (UrbanSim). The modeling scenario used for this study is described as “Business as Usual” and includes existing regulations and land use planning for future projections. Simulation of future conditions span from 2008 to 2040, and output the same 14 categories as described previously in existing conditions.

Future conditions for this study are characterized using simulated 2040 projections, which includes simulated non-residential floor space from UrbanSim. Projected 2040 land use land cover is presented in Figure 4.

2.3 Comparison of Existing and Future Conditions

The six development categories (Table 3) are assigned a simple hierarchy of disturbance starting with agriculture as the lowest level to heavy urban (i.e. commercial and industrial) development. For this analysis, it is assumed that flow controls would be built as part of any new development when the level of disturbance of land use land cover increased by one or more categories between 2007 and 2040. This is based on the assumption that increases in development would exceed the flow control criteria described in section 1.3. Simulation outputs where levels of disturbance were reduced in 2040 to a category not defined as disturbed were assumed to require stormwater mitigation based on existing conditions.

Table 4 Hierarchy of disturbance among development categories

Category	Level of disturbance
Heavy Urban	
Medium Urban	
Light Urban	
Cleared	
Grass, grasslands	
Agriculture	

Because heavy urban is defined as the most disturbed category, any increases in intensity would not be recognized using the approach described above. Instead, the areas with stormwater mitigation due to future new and redevelopment in heavy urban areas were estimated by using simulated floor space increases in the heavy urban (i.e., commercial and industrial) areas. Where floor space increases of 5,000 ft² or greater were projected by 2040, it was assumed that stormwater mitigation would be constructed as part of the redevelopment. Output from UrbanSim produced a number of grid cells with less than 100 ft² floor space in 2007. Since one of the criteria triggering stormwater mitigation is a 50% increase in property value added, simulated floor space in 2040 that was greater than 100 ft² when it was less than 100 ft² in 2007 were also assumed to have stormwater mitigation.

Cleared land is a transitional state of development; therefore it's assumed any lands defined as such in either 2007 or 2040 are assumed to be mitigated.

The conceptual framework for assessing stormwater mitigation built due to land use land cover by 2040 is presented in Figure 5.

2.4 Land Ownership

Land ownership was defined using King County GIS (feature: parcel_address) based on Tax Payer identity and Right-of-Ways. Land owned by a City or County jurisdictions were defined as public, all other properties were defined as private⁴.

2.5 Jurisdictions

Jurisdiction boundaries were defined using King County GIS data (feature: city_3co)

⁴ Port of Seattle properties are defined to behave like private land ownership.

3.0. SUMMARY OF RESULTS

Results are summarized by study area and jurisdictions. Catchment results are summarized in Appendix A.

3.1 Existing and Future Land and Use Land Cover

Overall there is eight percent more of the study area projected to be developed in the future (2040) than there is for existing conditions (2007). In 2007, heavy urban is generally associated with commercial and industrial land use. However, in 2040 heavy urban presumably includes a mix of high density residential, commercial, and industrial land uses. This is illustrated by the large shift in intensity from light and medium urban to heavy urban (Table 5, Figure 3, and Figure 4), and the projections estimating a 29% increase in population⁵ and 69% percent increase in employment by 2040 for the study area (PSRC 2013). Another substantive shift is the projected conversion of agriculture lands to grasslands associated with large acreage residential lots.

Table 5 Summary of land use land cover in the study area for 2007 and 2040 conditions.

LULC Category		2007	2040	2007	2040
		(square miles)		% of Study Area	
Heavy Urban	Developed	39.72	86.51	14%	31%
Medium Urban		62.97	48.20	23%	17%
Light Urban		41.11	31.10	15%	11%
Cleared		0.14	0.42	0%	0%
Grasslands		18.68	35.21	7%	13%
Agriculture		17.63	1.89	6%	1%
Sub total		180.25	203.34	65%	73%
Mixed Forest	Not developed	45.52	25.62	16%	9%
Forest		23.71	19.55	9%	7%
Clearcut Forest		0.35	0.19	0%	0%
Regenerating Forest		22.02	23.18	8%	8%
Wetlands		1.17	1.19	0%	0%
Open Water		5.36	5.26	2%	2%
Bare Rock		0.13	0.17	0%	0%
Shorelines		0.08	0.08	0%	0%
Subtotal		98.33	75.24	35%	27%

⁵ Based on FAZ 2010 boundaries.

3.2 Jurisdiction

There are 18 jurisdictions that either partially or fully reside within the study area (Figure 6). Nearly all jurisdictions are at 80% developed (using the classification previously described) or greater in 2007. However, four of the jurisdictions (Algona, Seattle, Tacoma, and Pierce County) have a very small area that reside in the study area and likely may not be representative of the whole jurisdiction landscape. With these exceptions, two jurisdictions are substantially less developed in 2007 than future forecasts with 17% and 12% more area developed in Black Diamond and King County, respectively. Maple Valley was the only jurisdiction to remain the same with 1% less developed land in the future (Table 6). These results do not reflect the potential maximum amount of development per jurisdiction, simply how much is developed now and as projected in 2040. Individual land use land cover categories by jurisdiction are summarized in Table 11 through Table 14 for current and future conditions in the appendix.

Table 6 Amount of jurisdiction developed.

Jurisdiction	Developed (acres)		Developed (% of Juris.)		Jurisdiction Area (acres)
	2007	2040	2007	2040	
Algona	356	357	99%	99%	361
Auburn	10592	11441	85%	91%	12524
Black Diamond	1659	2441	36%	53%	4610
Burien	5657	5890	90%	94%	6258
Covington	3090	3367	82%	89%	3788
Des Moines	3483	3742	86%	92%	4055
Enumclaw	1833	1888	93%	96%	1976
Federal Way	6782	7246	85%	91%	7944
Kent	19150	20120	88%	93%	21725
King County	40612	50832	45%	57%	89318
Maple Valley	2582	2544	81%	80%	3172
Normandy Park	1267	1454	80%	91%	1591
Pierce County	38	52	17%	24%	219
Renton	5233	5524	85%	90%	6122
SeaTac	5891	5989	90%	91%	6580
Seattle	971	1009	92%	95%	1058
Tacoma	503	492	94%	92%	535
Tukwila	5486	5550	89%	90%	6158
Total	115185	129940	65%	73%	177994

3.3 Land Ownership

The ratio of public versus privately owned lands in the study area were similar among the jurisdictions. Private land ownership ranged from 71% to 79% among the jurisdictions (Table 7), with a few exceptions (i.e. jurisdictions that have very small areas in the study area, Black Diamond, and SeaTac). Black Diamond is presently 90% privately owned—presumably a result of low amounts of development including the expected public road infrastructure. City of SeaTac is mostly owned by Port of Seattle where they operate Sea-Tac International Airport. For this analysis, Port of Seattle is instead similar to privately owned. Overall, three quarters of the study area is defined as privately owned lands and public versus private ownership is assumed to remain constant. A map illustrating the land ownership for the study area can be found in the appendix (Figure 7).

Table 7 Summary of public and privately owned land

Jurisdiction	Private	Public	Total	(% of Jurisdiction)	
	(Acres)			Private	Public
Algona	259	101	360	72%	28%
Auburn	9496	3014	12509	76%	24%
Black Diamond	4136	474	4610	90%	10%
Burien	4707	1536	6242	75%	25%
Covington	2806	982	3788	74%	26%
Des Moines	2970	1066	4036	74%	26%
Enumclaw	1536	434	1970	78%	22%
Federal Way	5810	2107	7917	73%	27%
Kent	15786	5939	21725	73%	27%
King County	68595	20616	89211	77%	23%
Maple Valley	2220	949	3169	70%	30%
Normandy Park	1252	328	1580	79%	21%
Pierce County*	217	1	218	100%	0%
Renton	4443	1673	6116	73%	27%
SeaTac	5310	1270	6580	81%	19%
Seattle	575	471	1046	55%	45%
Tacoma*	526	0	526	100%	0%
Tukwila	4377	1781	6158	71%	29%
Study Area	135021	42742	177763	76%	24%

3.4 Estimate of Stormwater Mitigation Built as Part of New and Redevelopment

The analysis estimates that 47% of the study area will have stormwater mitigation as a result of new and redevelopment by 2040. Another 23% of the study area in 2040 is projected to not need stormwater mitigation because it will remain undeveloped. The

remaining 30% of the study area is not projected to have stormwater mitigation between now and 2040 due to lack of new and redevelopment not exceeding previously defined criteria requiring stormwater control in those areas (Table 8).

Table 8 Estimate of stormwater mitigation built by 2040 as part of new and redevelopment

Projection	Area (sq. mi.)	Percent of Study Area
Mitigated between 2007 and 2040 due to new and redevelopment	130	47%
No stormwater mitigation necessary (i.e., undisturbed)	63	23%
Developed but no stormwater mitigation built by 2040 due to new and redevelopment	85	30%
Total	278	

Table 9 below summarizes by jurisdiction, the amount of stormwater mitigation due to new and redevelopment separated by public and private lands (Figure 8) and amortized based on a 30-year projection. Aside from exceptions reported previously, three of the jurisdictions, Black Diamond, King County, and SeaTac, are forecasted to have below average amounts of mitigation resulting from new and re-development, 42%, 40%, and 41% respectively. Enumclaw is expected to have 70% of its jurisdiction mitigated resulting from new and re-development, well above the other jurisdiction forecasts.

Developed land not projected to be mitigated by 2040 due to falling below triggers and exceptions requiring mitigation to new and redevelopment would be a likely candidate for focusing stormwater mitigation activities. The stormwater mitigation rates were calculated by dividing the total fraction of each by 30 years. Thus to meet projected 2040 development, mitigating unmitigated development ranges from 0.6 to 1.4 percent per year, excluding the previously listed exceptions. Similarly, new and re-development requiring stormwater mitigation ranges from 1.4 to 2.3 percent per year. Averaging over the entire study area, the annual rate to mitigate unmitigated development is 1.0 percent and new and redevelopment mitigation rates of 1.6 percent per year. Focusing on public lands, the annual rate over a 30 year period drops to 0.2 percent of the study area for mitigating unmitigated developed lands and 0.3 percent for new and re-development.

Similar to Table 9 in content, Table 15 summarizes undisturbed, developed but not mitigated, and development with stormwater mitigation by catchment in the study area and is visualized in Figure 9 through Figure 11 in the appendix.

Table 9 Summary by jurisdiction of land area projected to be undisturbed, developed but unmitigated, and mitigated by 2040.

Jurisdiction	Private Lands (acres)			Public Lands (acres)			Jurisdiction Area (acres)			
	Un-disturbed	Developed	Mitigated	Un-disturbed	Developed	Mitigated	Total	Un-disturbed	Developed	Mitigated
Algona	0.2	107.1	151.7	0.2	42	58.6	359.9	0.4	149.1	210.3
Auburn	516.7	3618.2	5360.8	230.4	1285.1	1498.1	12509.3	747.1	4903.3	6858.9
Black Diamond	1771.4	677.4	1687.5	149.5	84.2	240.3	4610.3	1920.9	761.6	1927.8
Burien	141.5	1854	2711.1	127.1	593.7	815	6242.3	268.6	2447.6	3526
Covington	161.1	965	1680	84.6	365.7	531.9	3788.3	245.7	1330.7	2211.9
Des Moines	120.8	1243.7	1605.2	109.9	407.9	548.6	4036.2	230.7	1651.6	2153.9
Enumclaw	35.4	367.9	1132.8	22.4	174.1	237.2	1969.7	57.8	542	1370
Federal Way	260.2	2281.6	3268.7	292.1	772.8	1042	7917.3	552.3	3054.3	4310.7
Kent	669.1	6572.7	8543.8	477.1	2208.5	3253.9	21725.1	1146.2	8781.2	11797.7
King County	21499.5	16394.8	30800.5	11979.9	3569	5067.4	89211.1	33479.4	19964	35868
Maple Valley	218.1	815	1186.9	149.2	344.3	455.2	3168.7	367.3	1159.3	1642.2
Normandy Park	87	394.9	769.9	26	92.8	209.2	1579.8	113	487.8	979.1
Pierce County*	164.1	19.2	33.7	0.7	0	0	217.6	164.8	19.2	33.7
Renton	140.1	1505.2	2798.1	139.7	546.1	986.9	6116.2	279.8	2051.4	3785
SeaTac	328.1	2913	2068.9	51.3	583.2	635.5	6580.1	379.4	3496.2	2704.4
Seattle	5.9	339.9	229.3	26.6	292.8	151.6	1046.2	32.5	632.7	380.9
Tacoma*	16.2	315.7	194.1	0	0.2	0	526.1	16.2	315.8	194.1
Tukwila	275.1	1481.8	2620	64.7	940.7	775.9	6158.3	339.8	2422.5	3395.9
Study Area	26311	41867	66843	13931	12303	16507	177763	40242	54170	83350

* Parcel data used for determining public versus private lands was not readily available for Pierce County, all lands were considered Private

Table 10 Percent of jurisdiction area projected to be undisturbed, developed but unmitigated, and mitigated by 2040.

Jurisdiction	Private Lands (acres)			Public Lands (acres)			Jurisdiction Area (acres)			Annual Rate (%/30yr)		
	Undist	Dev	Mit	Undist	Dev	Mit	Undist	Dev	Mit	Undist	Dev	Mit
Algona	0%	30%	42%	0%	12%	16%	0%	41%	58%	0.0%	1.4%	1.9%
Auburn	4%	29%	43%	2%	10%	12%	6%	39%	55%	0.2%	1.3%	1.8%
Black Diamond	38%	15%	37%	3%	2%	5%	42%	17%	42%	1.4%	0.6%	1.4%
Burien	2%	30%	43%	2%	10%	13%	4%	39%	56%	0.1%	1.3%	1.9%
Covington	4%	25%	44%	2%	10%	14%	6%	35%	58%	0.2%	1.2%	1.9%
Des Moines	3%	31%	40%	3%	10%	14%	6%	41%	53%	0.2%	1.4%	1.8%
Enumclaw	2%	19%	58%	1%	9%	12%	3%	28%	70%	0.1%	0.9%	2.3%
Federal Way	3%	29%	41%	4%	10%	13%	7%	39%	54%	0.2%	1.3%	1.8%
Kent	3%	30%	39%	2%	10%	15%	5%	40%	54%	0.2%	1.3%	1.8%
King County	24%	18%	35%	13%	4%	6%	38%	22%	40%	1.3%	0.7%	1.3%
Maple Valley	7%	26%	37%	5%	11%	14%	12%	37%	52%	0.4%	1.2%	1.7%
Normandy Park	6%	25%	49%	2%	6%	13%	7%	31%	62%	0.2%	1.0%	2.1%
Pierce County*	75%	9%	15%	0%	0%	0%	76%	9%	15%	2.5%	0.3%	0.5%
Renton	2%	25%	46%	2%	9%	16%	5%	34%	62%	0.2%	1.1%	2.1%
SeaTac	5%	44%	31%	1%	9%	10%	6%	53%	41%	0.2%	1.8%	1.4%
Seattle	1%	32%	22%	3%	28%	14%	3%	60%	36%	0.1%	2.0%	1.2%
Tacoma*	3%	60%	37%	0%	0%	0%	3%	60%	37%	0.1%	2.0%	1.2%
Tukwila	4%	24%	43%	1%	15%	13%	6%	39%	55%	0.2%	1.3%	1.8%
Study Area	15%	24%	38%	8%	7%	9%	23%	30%	47%	0.8%	1.0%	1.6%

* Parcel data used for determining public versus private lands was not readily available for Pierce County, all lands were considered Private

4.0. DISCUSSION

The method used for estimating future projections of development that will be mitigated as a result of initiating stormwater guidelines versus mitigating development without mitigation is likely only applicable to the specific data used for this analysis. For example, one of the key assumptions defining future mitigated development is the increase in intensity. Using the stormwater guidelines previously defined in section 1.3, development that is projected to increase one or more categories in intensity is assumed to require stormwater mitigation. Since there is not a quantifiable direct link between the stormwater guidelines and the land use land cover categories defining the landscape, ratios of mitigated development versus unmitigated development could easily reverse when changing this threshold—for example from one category to two.

Similarly, including other types of information in the analysis will influence forecasted ratios of mitigation. Forecasted population growth for King County is estimated to increase at a rate ranging from 0.4 to 1.5 percent per year over a 30 year time span (Washington State 2012). Given this projected increase in population, parts of the heavy urban development that is primarily commercial and industrial in 2007 will likely become a mixed use of business and residential. This would suggest a larger ratio of new stormwater mitigation versus mitigating unmitigated land use with stormwater facilities to accommodate population growth in 2040.

Another interesting outcome in projection of future conditions is the conversion of agriculture lands to grasslands. The land cover change model results obtained from the University of Washington project that approximately 90-percent of the agriculture lands in the study area are projected to convert to grasslands and lawns in the future. This conversion assumes an increase in disturbance instigating mitigation. If the reverse were assumed, there would be more mitigation of unmitigated development needs than estimated. However, given the apparent current political desire to maintain and possibly increase agriculture production in King County, this outcome from the simulation projection seems less of a possibility at this time.

Aside from stating the obvious uncertainties in projecting population growth explicitly over time and space, these simulated outputs from landscape modeling are based on current environmental regulations remaining consistent into the future. It is likely that regulations will continue to evolve influencing when/where/how development might occur. Thus depending on the pressures accommodating future development, this could result in either increasing or decreasing mitigation of unmitigated development needs over time.

Identified development in this report that will be mitigated either because of new and re-development or unmitigated does not acknowledge investments in existing stormwater infrastructure. There are significant facilities designed using current or close to current stormwater guidelines (e.g., Sea-Tac International Airport) that should be considered part of the final mitigation. Thus, some parts of the study area are not starting from zero and have an advantage to completion in 2040 either in schedule and/or needed resources. A

complete analysis of stormwater mitigation needs should account for these existing facilities.

5.0. CONCLUSIONS AND RECOMMENDATIONS

The estimated rate of stormwater mitigation resulting from either new or re-development (1.6 percent) pressures is consistent with population growth projections in King County. While this rate is linked to the time span of analysis, the estimated rate of mitigating unmitigated development will be driven by available resources and the public and political will. Thus, the stormwater mitigation rate of unmitigated development is 1.0 percent of the study area and could be higher or lower depending on regional circumstances.

If public lands are prioritized over private, then a mitigation rate at 1 percent would fulfill simulated projections in half the time period (i.e. 16 years). Mitigating unmitigated private lands would need to occur at 0.8 percent per year for 30 years to accomplish simulated projections, with the expectation that new and re-development would occur at 1.3 percent of the study area per year.

Regardless of the estimated rates, three quarters (77 percent) of the study area is forecasted to undergo mitigation. This projection is based on 2040 conditions, which is not characterizing the maximum potential development or its mitigation. The distribution and overall total cost may be substantially different if development intensity and/or rates are significantly different than simulated projections for this study.

The results from this analysis are applicable for scaling when understanding the nuances between the study area and other counties in the lower Puget Sound region. King County is one of the most developed counties in the state, thus leaving less potential for future conversion of undeveloped lands. Other counties in the lower Puget Sound region are projected to have a greater rate of population growth (but less in total) between 2010 and 2040. The projected distribution of how growth will occur is unknown, but will result either in new development progressing towards current GMA boundaries and/or infill with redevelopment in urban centers. If more redevelopment were to occur, then new stormwater mitigation would occur in previously existing areas of unmitigated development resulting in less stormwater needs. If more of the population growth were to progress outwards, then unmitigated existing development projected in 2040 would require more stormwater mitigation needs.

6.0. REFERENCES

- Alberti, Marina. 2009. NSF Biocomplexity II Grant. 2005-2009. Urban Landscape Patterns: Complex Dynamics and Emergent Properties. Dr. Marina Alberti, Principal Investigator
- Booth, D.B., D. Hartley, and R. Jackson. 2002. Forest cover, impervious-surface area, and the mitigation of stormwater impacts. *Journal of the American Water Resources Association* 38:835-845.
- King County. 2009. King County Surface Water Design Manual 2009. <http://www.kingcounty.gov/environment/waterandland/stormwater/documents/surface-water-design-manual.aspx>
- King County. 2009. Report submitted to Puget Sound Partnership 2009. Prepared by Curt Crawford, King County DNRP, Stormwater Services Section.
- King County. 2010. Development of a Stormwater Retrofit Plan for Water Resources Inventory Area (WRIA) 9 and Estimation of Costs for Retrofitting all Developed Land of Puget Sound. EPA Grant application: Puget Sound Watershed Management Assistance Program. Prepared by Jim Simmonds, Water and Lands Resources Division. Seattle, Washington. <http://your.kingcounty.gov/dnrp/library/water-and-land/watersheds/green-duwamish/stormwater-retrofit-project/stormwater-retrofit-workplan.pdf>
- King County. 2013. Development of a Stormwater Retrofit Plan for Water Resources Inventory Area 9: SUS TAIN Model Pilot Study. Prepared by Curtis DeGasperi, Water and Land Resources Division. Seattle, Washington.
- Puget Sound Regional Council. 2013. Personal communication with Peter Caballero and Mark Simonson.
- University of Washington. 2007. Central Puget Sound 2007 Land Cover Classification. Puget Sound Regional Synthesis Model (PRISM). University of Washington.
- Washington State. 2012. Washington state growth management population projections for counties: 2010 to 2040. Prepared by Office of Financial Management. <http://www.ofm.wa.gov/pop/gma/projections12/projections12.asp>

APPENDIX A. FIGURES AND TABLES

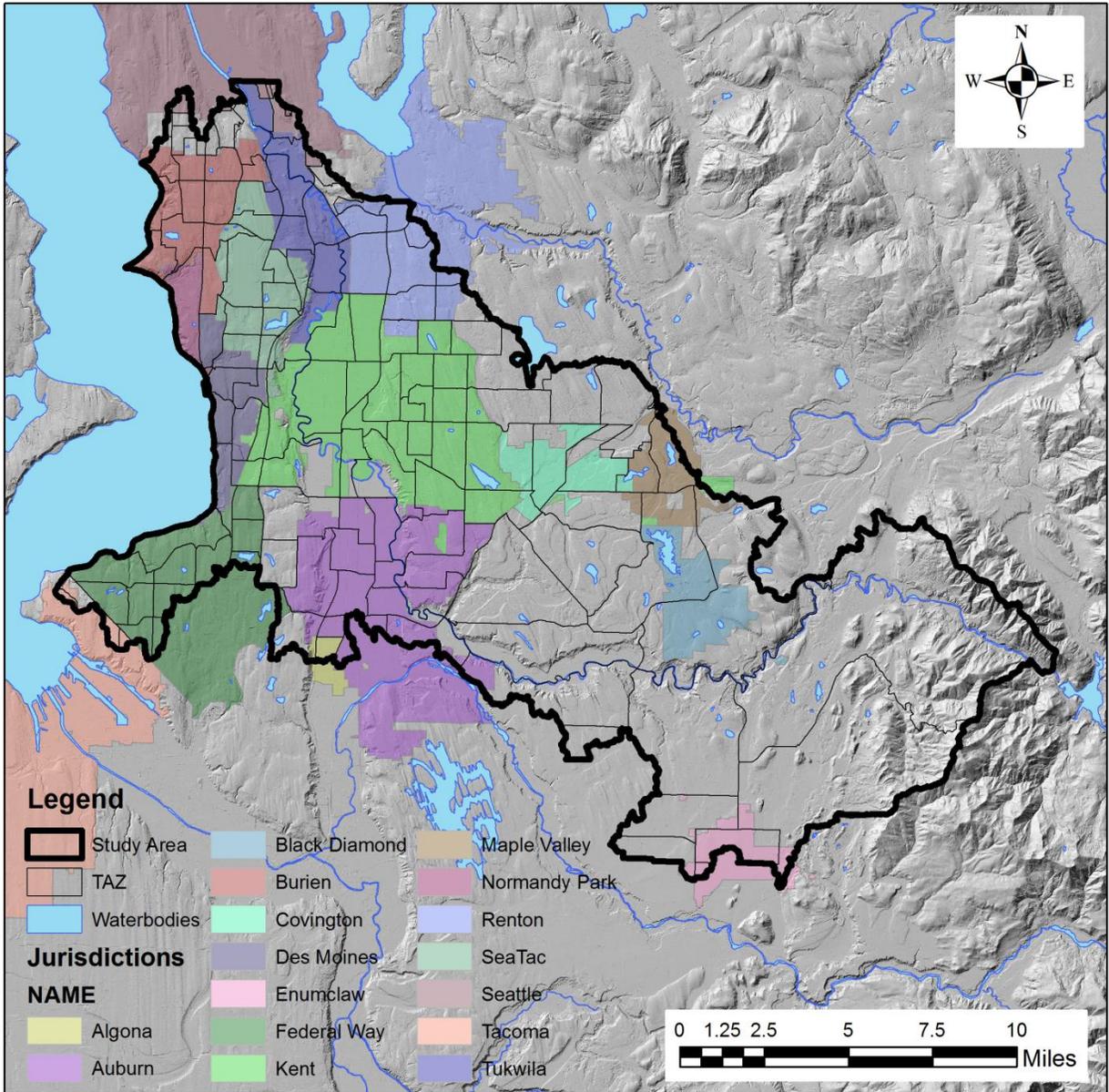


Figure 2 Map illustrating Traffic Analysis Zones (TAZ 2010) and jurisdictional boundaries.

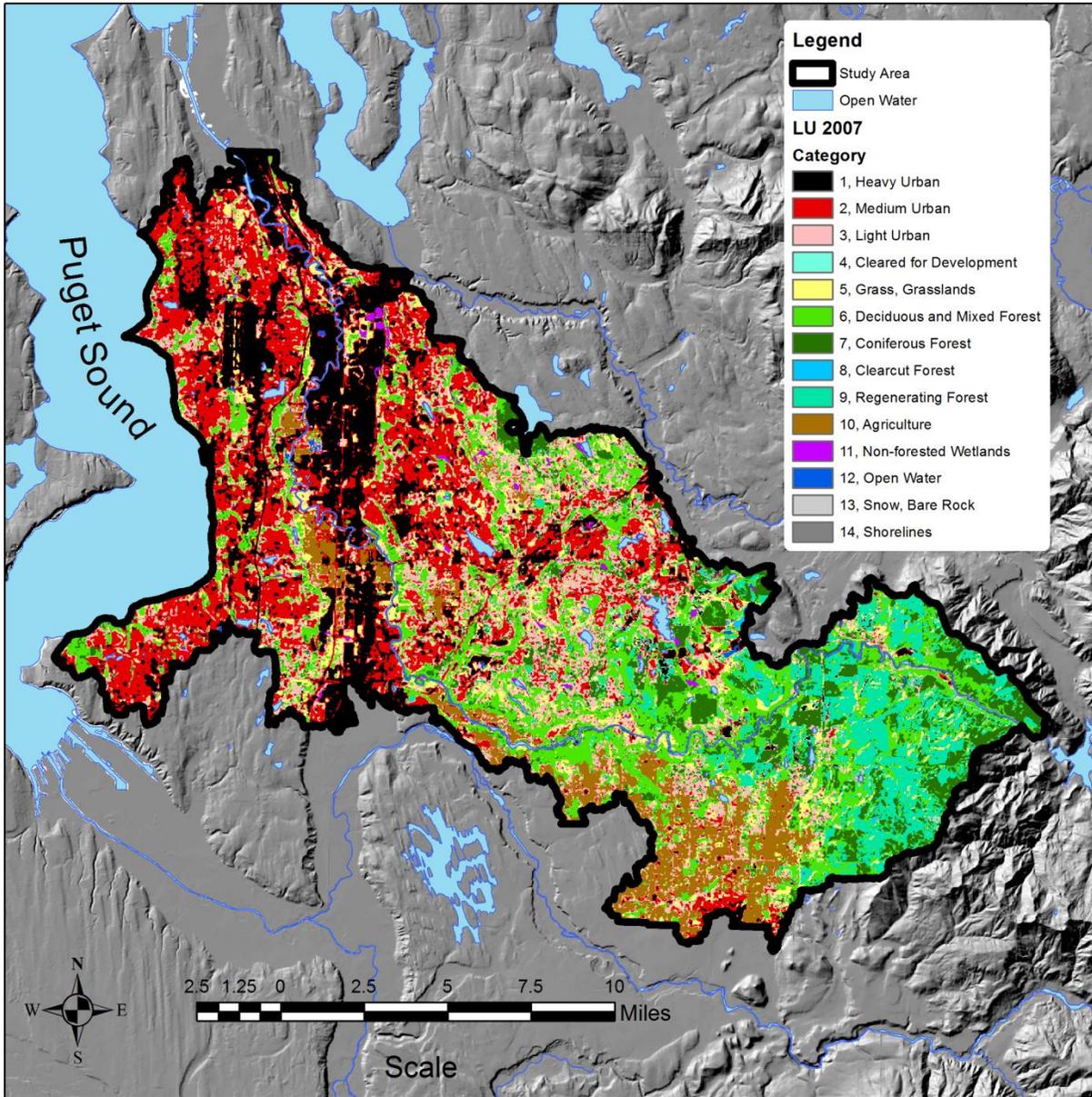


Figure 3 2007 Land use land cover (LULC)

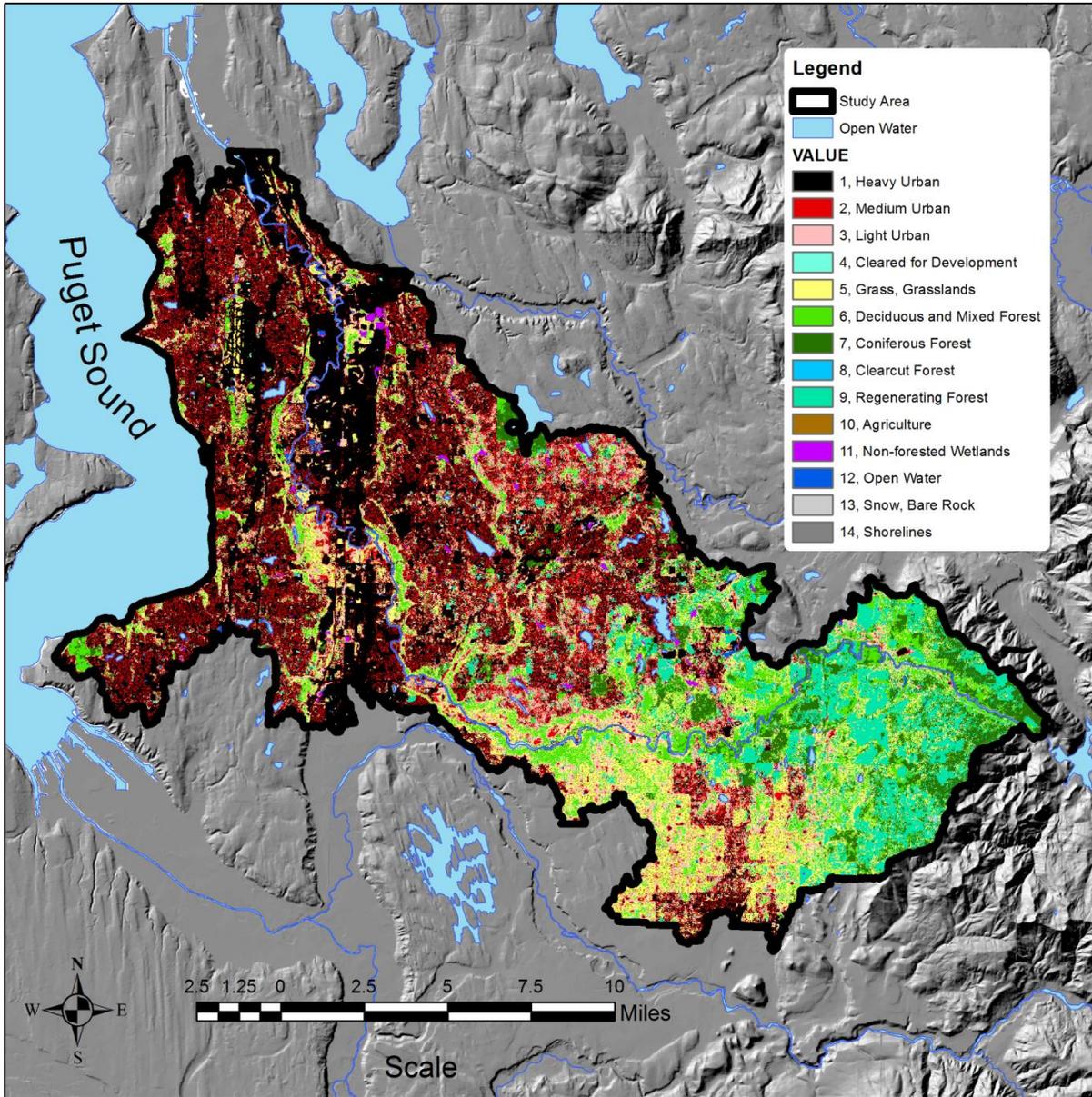


Figure 4 2040 Land use land cover (LULC)

Category		Existing						
		Non-developed	Agriculture	Grasslands	Cleared	Low	Medium	High
Future	Non-developed							
	Agriculture							
	Grasslands							
	Cleared							
	Low							
	Medium							
	High							*

Mitigated as part of new development or redevelopment by 2040
No stormwater facilities built by 2040 due to new or redevelopment
* Mitigated based on commercial and industrial floor space increases => 5,000 ft ² , otherwise no stormwater facilities built by 2040 due to new and redevelopment.
No mitigation necessary

Figure 5 Framework for assessing stormwater mitigation built due to land cover change.

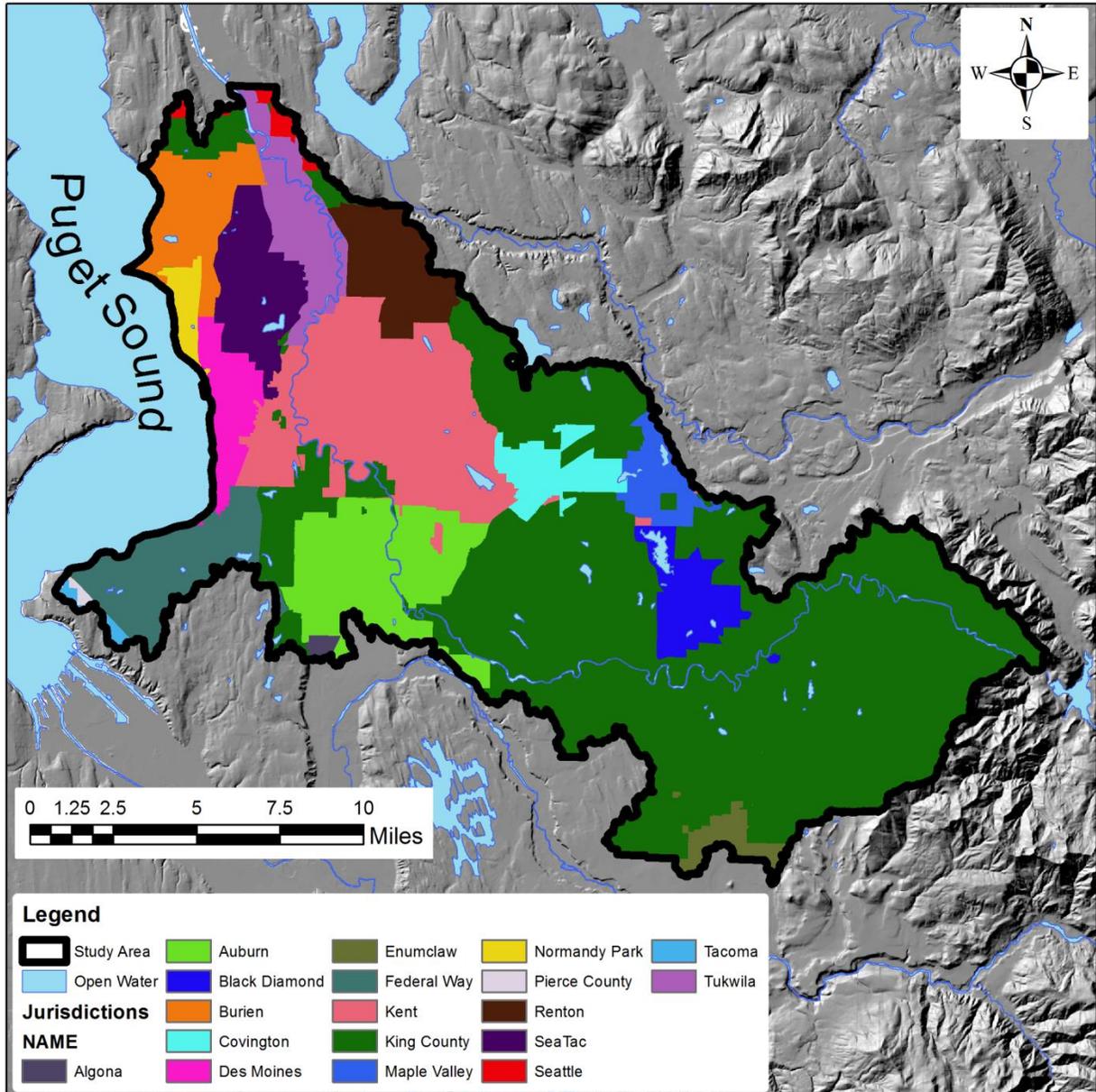


Figure 6 Jurisdiction boundaries.

Table 11 2007 Existing LULC area (acres) by Jurisdiction

Jurisdiction		Algona	Auburn	Black Dia	Burien	Covington	Des Moines	Enumclaw	Kent	Maple Valley
Heavy Urban	Developed	133	3491	240	1207	607	800	252	6675	478
Medium Urban		163	3292	451	3334	1541	2039	689	7886	1280
Light Urban		38	2060	663	893	716	518	229	2822	630
Cleared		0	12	2	0	7	0	0	4	28
Grasslands		18	1007	291	222	189	121	127	1162	139
Agriculture		3	730	12	2	30	4	535	601	26
Subtotal		356	10592	1659	5657	3090	3483	1833	19150	2582
Mixed Forest	Not Developed	3	1424	1047	425	456	509	124	1668	157
Forest		0	283	1161	95	131	28	9	252	166
Clearcut Forest		0	0	3	0	0	0	0	0	0
Regen Forest		0	74	279	5	41	3	8	98	122
Wetlands		0	37	67	4	17	2	0	103	0
Open Water		2	114	394	60	45	16	2	455	145
Bare Rock		0	0	0	0	8	0	0	0	0
Shorelines		0	0	0	12	0	14	0	0	0
Subtotal		5	1932	2951	601	698	572	142	2575	590
Total		361	12524	4610	6258	3788	4055	1976	21725	3172

Table 12 2007 Existing LULC area (acres) by Jurisdiction (cont'd)

Jurisdiction		Normandy Park	Pierce	Renton	SeaTac	Seattle	Tukwila	Federal Way	Tacoma	King
Heavy Urban	Developed	78	4	1969	2642	437	2811	1015	211	2318
Medium Urban		677	9	2099	2350	398	1701	4479	226	7620
Light Urban		470	23	795	594	90	644	1067	49	13981
Cleared		0	0	5	0	0	0	8	0	24
Grasslands		41	3	363	289	46	286	211	17	7414
Agriculture		0	0	3	17	0	44	3	0	9254
Subtotal		1267	38	5233	5891	971	5486	6782	503	40612
Mixed Forest	Not Developed	271	159	610	454	83	271	785	25	20620
Forest		29	22	60	60	1	18	208	1	12627
Clearcut Forest		0	0	0	0	0	0	0	0	217
Regen Forest		1	1	20	9	0	0	19	2	13388
Wetlands		0	0	180	9	0	8	12	0	313
Open Water		9	0	19	153	1	376	134	4	1473
Bare Rock		0	0	0	4	0	0	0	0	69
Shorelines		15	0	0	0	0	0	3	0	1
Subtotal		324	181	888	689	86	672	1162	32	48706
Total		1591	219	6122	6580	1058	6158	7944	535	89318

Table 13 Future LULC area (acres) by Jurisdiction

Jurisdiction		Algona	Auburn	Black Diamond	Burien	Covington	Des Moines	Enumclaw	Kent	Maple Valley
Heavy Urban	Developed	227	6275	691	3419	1721	2162	877	12320	1309
Medium Urban		90	2500	529	1708	1009	1044	475	4650	727
Light Urban		19	1416	521	503	417	358	248	1888	378
Cleared		1	64	1	1	31	5	5	42	7
Grasslands		20	1170	700	259	189	172	269	1217	123
Agriculture		0	16	0	0	0	0	13	4	0
Subtotal		357	11441	2441	5890	3367	3742	1888	20120	2544
Mixed Forest	Undeveloped	2	654	471	234	171	249	55	752	154
Forest		0	110	754	47	108	22	14	125	232
Clearcut Forest		0	0	3	0	0	0	0	0	2
Regen Forest		0	163	489	13	68	10	17	168	103
Wetlands		0	38	69	5	17	2	0	105	0
Open Water		2	116	384	58	43	16	3	454	137
Bare Rock		0	2	0	0	14	0	0	0	0
Shorelines		0	0	0	12	0	14	0	0	0
Subtotal		4	1083	2169	368	421	313	88	1605	628
Total		361	12524	4610	6258	3788	4055	1976	21725	3172

Table 14 Future LULC area (acres) by Jurisdiction (cont'd)

Jurisdiction		Normandy Park	Pierce County	Renton	SeaTac	Seattle	Tukwila	Federal Way	Tacoma	King County
Heavy Urban	Developed	688	13	3344	3935	681	3879	4059	356	9326
Medium Urban		506	14	1165	1195	175	892	2239	101	11783
Light Urban		179	15	624	429	77	481	604	24	11694
Cleared		0	0	16	19	0	15	24	0	40
Grasslands		2	0	34	21	0	2	35	3	13683
Agriculture		81	10	376	412	76	283	320	11	16817
Subtotal		1456	52	5558	6010	1009	5552	7282	495	63343
Mixed Forest	Undeveloped	102	138	331	373	36	203	391	34	12029
Forest		8	26	34	33	11	19	126	1	10818
Clearcut Forest		0	3	0	0	0	0	0	0	113
Regen Forest		0	0	0	0	0	0	0	0	1172
Wetlands		0	0	179	9	0	8	13	0	315
Open Water		10	0	20	150	1	376	130	4	1443
Bare Rock		0	0	0	5	0	0	0	0	85
Shorelines		15	0	0	0	0	0	3	0	1
Subtotal		134	167	564	570	48	607	663	39	25975
Total		1591	219	6122	6580	1058	6158	7944	535	89318

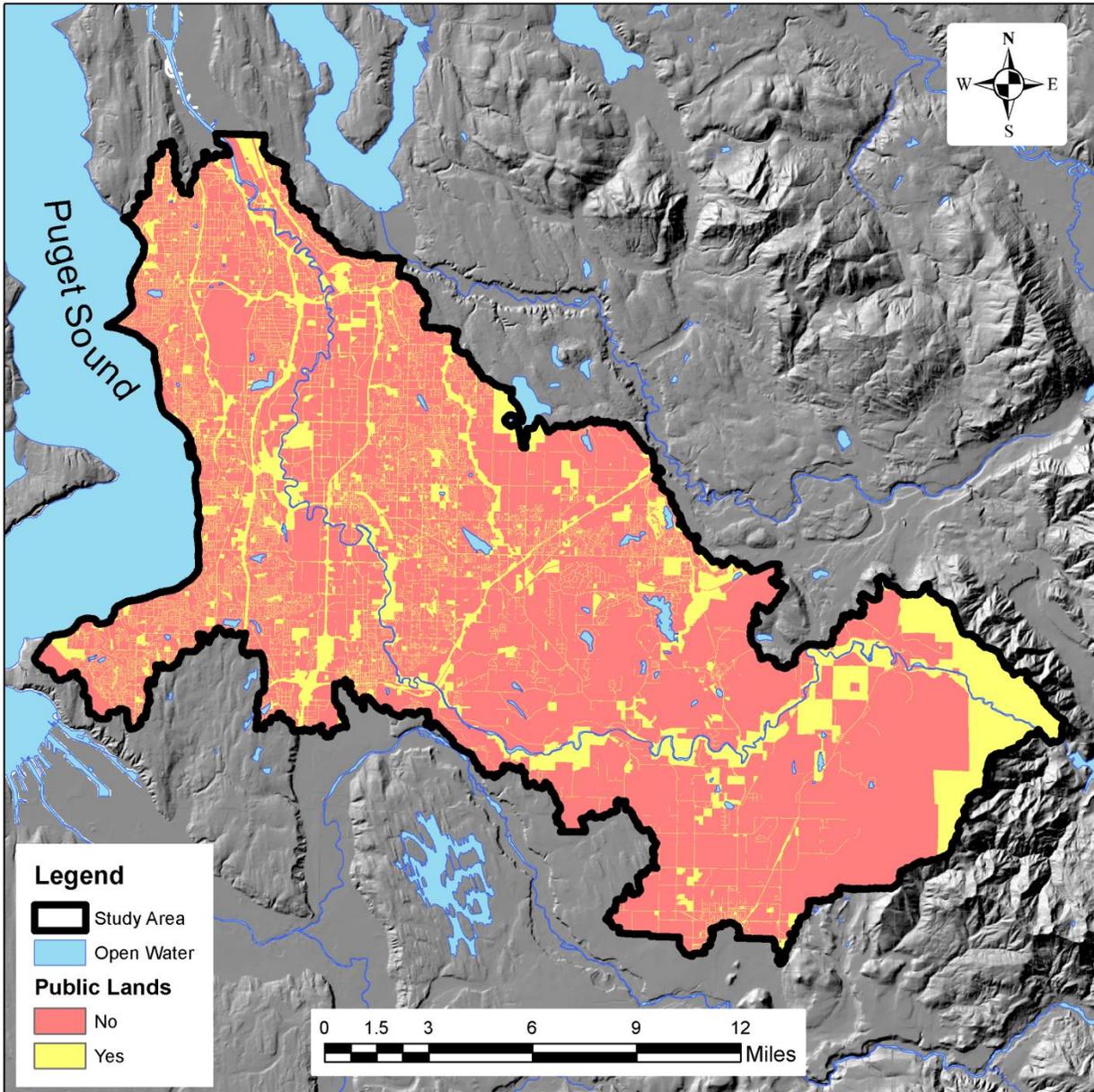


Figure 7 Map illustrating land ownership, public and private

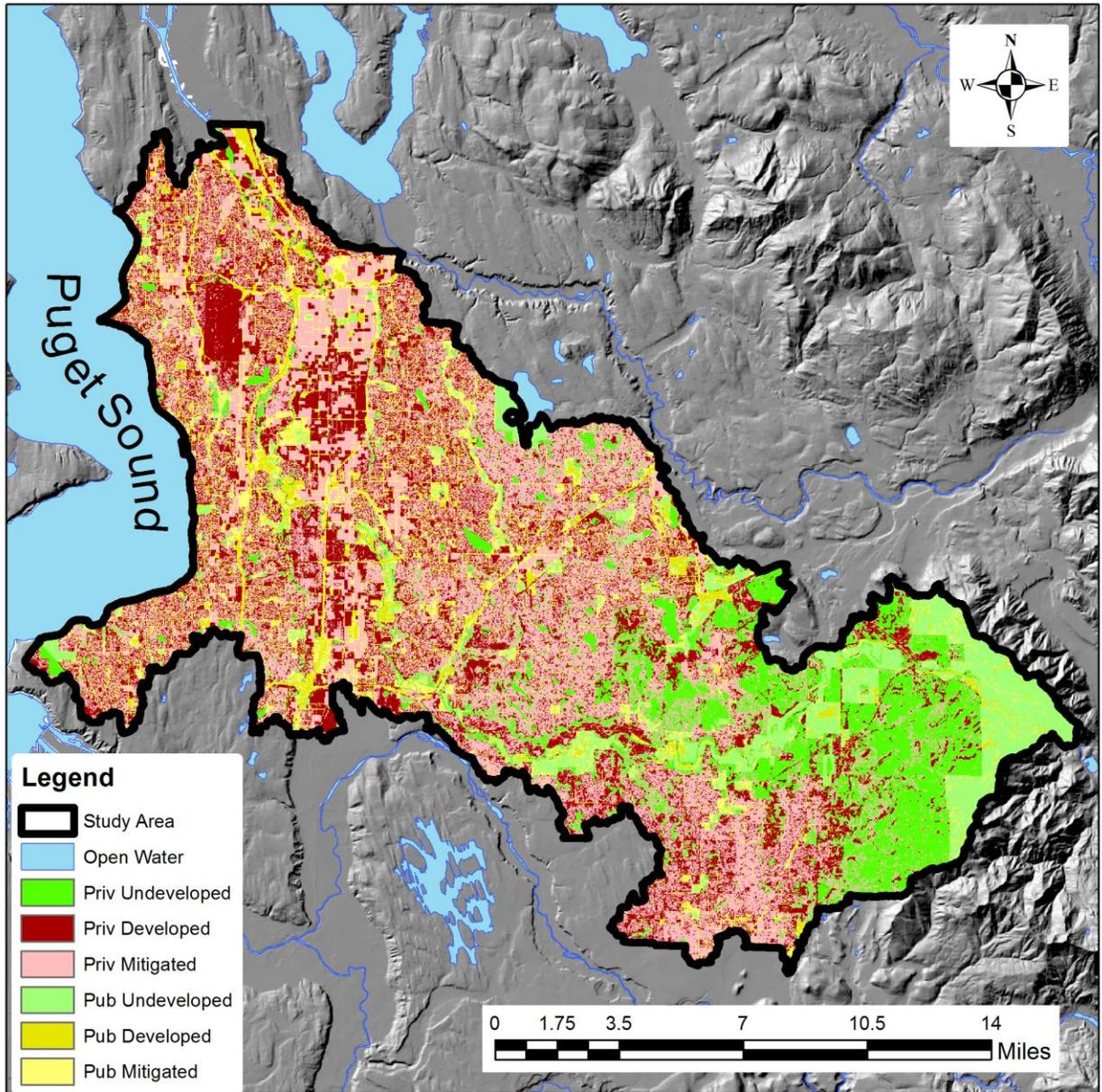


Figure 8 Map illustrating study area that will be developed but not mitigated by 2040 by new or redevelopment and mitigated as part of new or redevelopment for public and private lands.

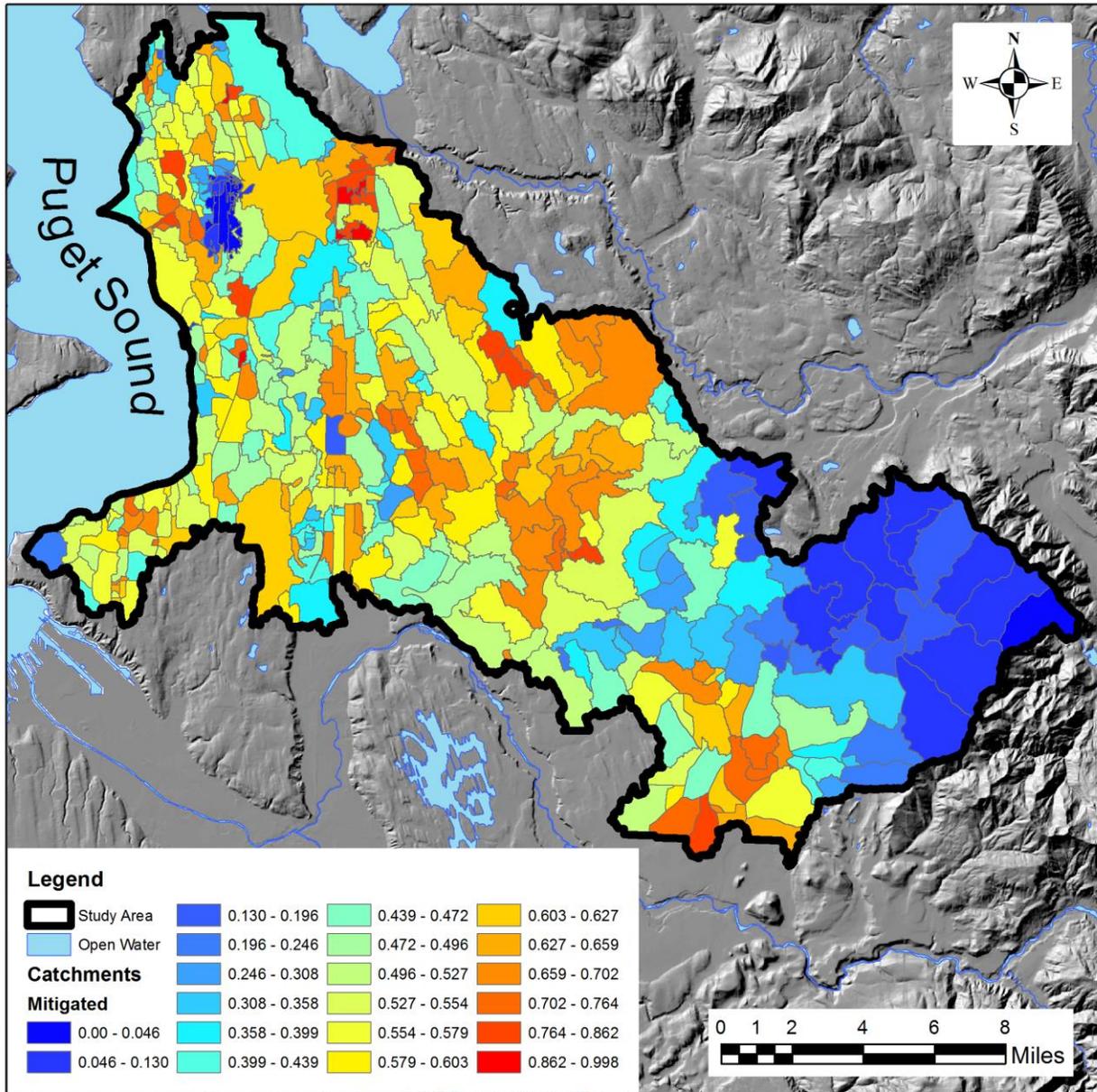


Figure 9 Fraction of each catchment projected to have development with stormwater mitigation by 2040.

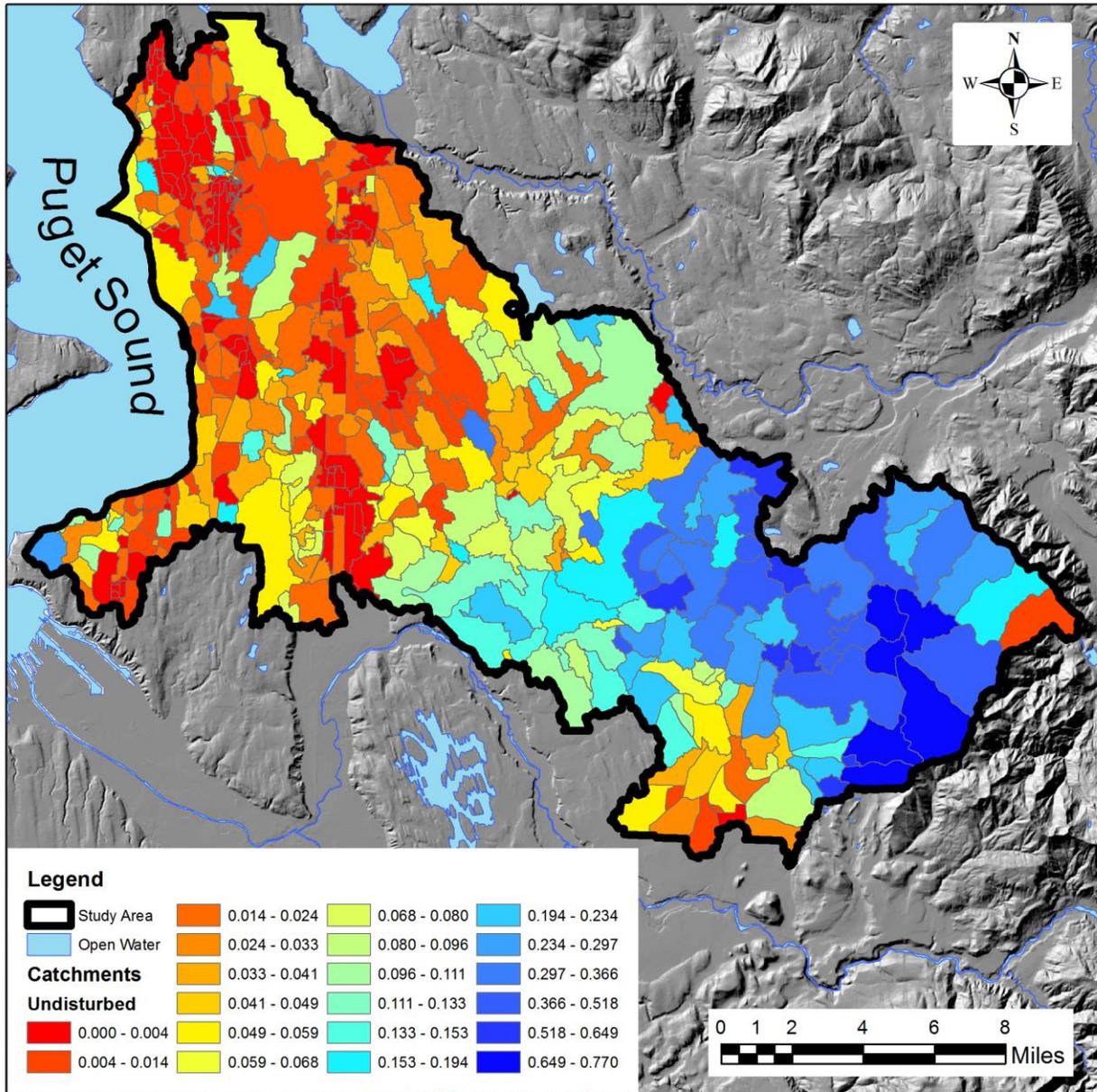


Figure 10 Fraction of each catchment "Undisturbed" in 2007 and not projected to be developed by 2040.

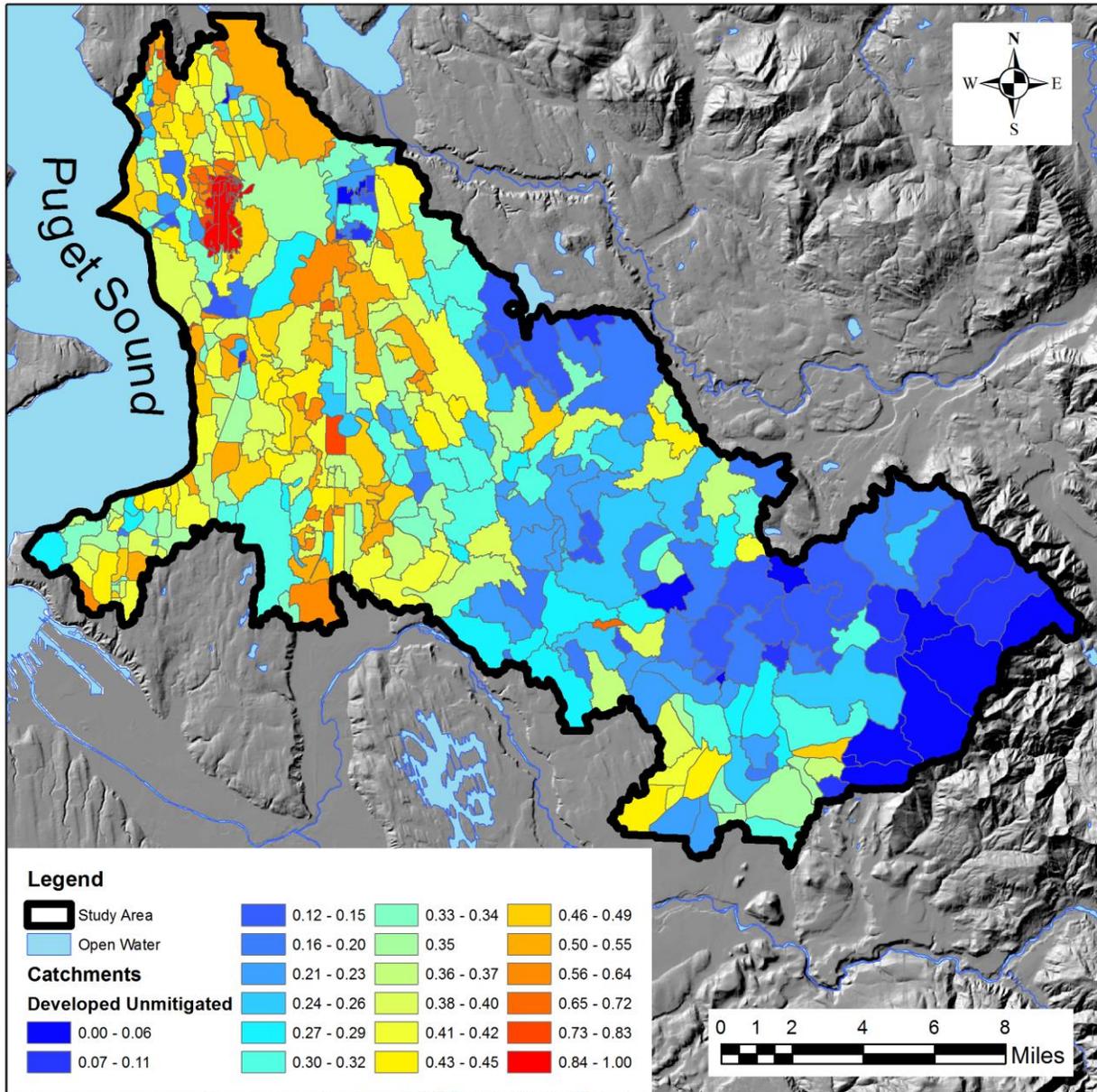


Figure 11 Fraction of each catchment developed by 2007 but not projected to have stormwater mitigation constructed by 2040 as part of new or redevelopment.

Table 15 Summary of undeveloped, developed without mitigation, and developed with mitigation areas by catchment

Catchment	Private Lands (acres)			Public Lands (acres)			Area (acres)			Fraction	
	Undev.	Dev	Mitigated	Undev.	Dev	Mitigated	Total	Total Dev	Total Mitigated	Total Dev	Total Mitigated
BLA001	19.33	108.98	299.43	15.59	41.3	136.12	620.75	150.28	435.56	24%	70%
BLA010	4.71	38.98	62.1	4.07	13.96	24.03	147.85	52.93	86.13	36%	58%
BLA020	1.06	64.32	106.96	0.44	7.01	21.4	201.19	71.33	128.37	35%	64%
BLA030	2.27	51.74	183.08	0.69	23.27	42.31	303.36	75.01	225.38	25%	74%
BLA040	1.32	24.48	56.74	7.92	12.67	60.32	163.46	37.15	117.06	23%	72%
BLA050	0	40.85	74.36	2.31	7.18	19.07	143.78	48.03	93.44	33%	65%
BLA060	4.7	95.89	140.29	6.33	43.23	58.46	348.91	139.13	198.75	40%	57%
BLA070	0	58.15	160.98	0	62.59	102.53	384.26	120.75	263.51	31%	69%
BLA080	3.26	187.49	354.42	0.44	51.91	90.39	687.91	239.4	444.81	35%	65%
BLA090	16.58	121.87	202.19	9.01	122.22	82.05	553.91	244.09	284.24	44%	51%
BLA100	0	127.54	139.47	0.67	26.2	12.55	306.43	153.73	152.02	50%	50%
BLA110	24.02	333.22	304	59.99	99.43	272.68	1093.34	432.65	576.67	40%	53%
BLA120	4.13	93.74	72.65	0.21	8.25	6.19	185.18	101.99	78.84	55%	43%
BLA130	0	215.69	186.78	0	17.86	14.02	434.35	233.55	200.8	54%	46%
BLA140	0	44.62	21.2	0	7.45	4.07	77.33	52.07	25.26	67%	33%
BLA150	0	49.65	89.16	0	1.68	9.05	149.54	51.33	98.21	34%	66%
BLA160	8.77	636.48	399.02	6.08	95.46	73.22	1219.03	731.94	472.24	60%	39%
BLA170	2.74	36.12	30.14	0.23	19.1	13.32	101.65	55.22	43.46	54%	43%
BLA180	0.65	20.31	27.27	0.21	2.76	5.97	57.18	23.08	33.24	40%	58%
BLA190	0.46	27.03	17.74	0.23	9.86	7.18	62.49	36.89	24.92	59%	40%
BLA200	1.08	163.16	295.28	1.49	41.91	80.19	583.12	205.07	375.47	35%	64%
BLA210	0.19	50.92	52.43	0	17.31	19.62	140.47	68.23	72.05	49%	51%
BLA220	8.06	63.93	104.18	2.2	13.4	22.96	214.73	77.34	127.14	36%	59%
BLA230	9.1	231.27	217.08	2.21	61.81	66.11	587.58	293.08	283.18	50%	48%
BLA240	6.69	84.27	124.83	9.98	26.03	53.71	305.5	110.29	178.53	36%	58%
BLA250	16.08	146.62	226.83	1.11	33.08	44.06	467.77	179.7	270.88	38%	58%
BLA260	32.93	578.12	462.16	3.8	108.09	126.43	1311.53	686.21	588.59	52%	45%
BLA270	31.77	226.73	279.99	14.96	56.83	92.5	702.79	283.56	372.49	40%	53%
BLA280	0	2.27	22.05	0	0.14	10.37	34.83	2.41	32.42	7%	93%
BLA290	6.77	76.47	114.42	0.46	16.75	22.48	237.36	93.23	136.9	39%	58%
BLA300	0.21	8.16	65.19	1.54	9.94	10.86	95.89	18.1	76.05	19%	79%
BLA310	0.27	46.51	21.8	1.15	2.61	8.93	81.26	49.12	30.72	60%	38%
BLA320	3.6	24.5	53	19.03	17.59	15.39	133.1	42.08	68.4	32%	51%
BLA330	7.06	35.3	110.99	1.66	12.32	28.9	196.23	47.63	139.89	24%	71%
BLA340	0	0.26	107.7	0	2.36	17.81	128.14	2.62	125.51	2%	98%
BLA350	56.53	71.36	140.23	1.1	20.99	21.3	311.52	92.36	161.53	30%	52%
BLA360	23	280.06	285.91	2.44	70.86	71.12	733.39	350.92	357.03	48%	49%

DRAFT - Analysis of Stormwater Mitigation Projected to be Constructed by 2040 as part of New and Re-development for WRIA 9 Stormwater Retrofit Planning

Catchment	Private Lands (acres)			Public Lands (acres)			Area (acres)			Fraction	
	Undev.	Dev	Mitigated	Undev.	Dev	Mitigated	Total	Total Dev	Total Mitigated	Total Dev	Total Mitigated
BLA370	2.52	43.04	24.16	3.18	19.47	15.06	107.42	62.5	39.21	58%	37%
BLA380	12.66	137.21	131.58	31.54	49.59	85.92	448.5	186.81	217.5	42%	48%
BLA390	14.99	306.18	390.72	1.54	99.51	99.82	912.75	405.69	490.53	44%	54%
BLA400	0	10.15	113.96	0	0.95	13.66	138.72	11.1	127.63	8%	92%
BLA410	2.17	8.84	84.96	0.75	5.14	20.25	122.11	13.98	105.21	11%	86%
BLA420	0.23	48.34	165.02	27.33	51.53	43.9	336.35	99.87	208.92	30%	62%
BLA430	1.62	5.34	24.7	0	1.66	4.58	37.9	7.01	29.28	18%	77%
BLA440	6.31	1.15	32.99	11.28	3.66	24.06	79.46	4.81	57.05	6%	72%
BLA450	0	0.06	35.23	0	0	6.39	41.69	0.06	41.63	0%	100%
BLA460	0.06	0.05	10.12	0	0	0.11	10.35	0.05	10.24	0%	99%
BLA470	2.16	23.64	113.09	0	18.32	53.87	211.08	41.96	166.95	20%	79%
BLA480	1.57	10.95	41.71	0	7.57	41.54	103.34	18.52	83.25	18%	81%
BLA490	0	91.13	202.97	0	35.47	58.31	387.88	126.6	261.28	33%	67%
BLA500	0.23	24.26	75.31	0	0.44	16.82	117.05	24.7	92.13	21%	79%
BLA510	13.09	81.58	188.26	7.19	116.07	186.03	592.21	197.65	374.28	33%	63%
BLA520	0.95	38.76	18.2	0.59	3.04	5.31	66.85	41.8	23.51	63%	35%
BRN001	0.31	0.15	0	4.56	0	0	5.02	0.15	0	3%	0%
BRN002	176.33	159.96	118.07	159.5	20.04	15.09	649	180	133.16	28%	21%
CHR001	16.12	24.83	112.37	11.19	2.96	8.55	176.02	27.79	120.93	16%	69%
CHR002	6.17	8.23	25.98	11.19	2.41	17.08	71.06	10.64	43.06	15%	61%
CHR003	2.86	1.32	2.89	22.04	0	16.13	45.23	1.32	19.02	3%	42%
CHR004	26.62	30.31	60.92	16.29	12.21	61.06	207.4	42.52	121.98	21%	59%
CHR005	16.7	97.11	221.82	20.69	13.89	49.31	419.52	110.99	271.13	26%	65%
CHR006	250.94	233.71	403.38	8.31	24.49	38.77	959.6	258.2	442.15	27%	46%
CHR007	17.76	86.9	314.83	0	3.99	11.46	434.94	90.89	326.29	21%	75%
CRI001	7	64.74	24.24	3.95	5.47	2.2	107.59	70.2	26.44	65%	25%
CRI002	72.78	105.4	141.53	49.25	30.58	95.91	495.45	135.98	237.43	27%	48%
CRI003	386.04	20.89	166.24	12.35	1.54	10.29	597.35	22.43	176.53	4%	30%
CRI004	340.51	123.52	292.56	6.85	8.14	11.8	783.37	131.66	304.36	17%	39%
CRI005	130.23	99.8	96.92	9.64	9.19	19.22	365	108.99	116.14	30%	32%
CRI006	103.88	104.51	83.34	6.92	7.25	10.34	316.24	111.75	93.69	35%	30%
DEM001	7.37	62.62	88.59	5.85	36.71	58.49	259.62	99.33	147.08	38%	57%
DEM002	2.69	52.71	93.23	0	19.32	31.16	199.1	72.03	124.39	36%	62%
DEM003	71.15	38.4	130.46	20.9	10	49.74	320.65	48.4	180.2	15%	56%
DEM004	0.21	20.46	12.92	0.19	7.36	5.56	46.69	27.82	18.48	60%	40%
DEM005	25.1	115.61	85.06	18.3	10.21	51.8	306.08	125.82	136.85	41%	45%
DEM006	9.75	117.88	201.08	4.38	22.6	75.92	431.62	140.48	277.01	33%	64%
DEM007	3.47	45.04	215.65	3.26	20.98	53.89	342.29	66.02	269.53	19%	79%
DEM008	8.5	364.83	347.44	0.01	39.47	75.69	835.94	404.3	423.12	48%	51%
DEM009	0	168.25	12.84	0	5.24	0.6	186.93	173.49	13.44	93%	7%

DRAFT - Analysis of Stormwater Mitigation Projected to be Constructed by 2040 as part of New and Re-development for WRIA 9 Stormwater Retrofit Planning

Catchment	Private Lands (acres)			Public Lands (acres)			Area (acres)			Fraction	
	Undev.	Dev	Mitigated	Undev.	Dev	Mitigated	Total	Total Dev	Total Mitigated	Total Dev	Total Mitigated
DEM010	0	293.06	2.61	0	0	0	295.67	293.06	2.61	99%	1%
DEM011	0	186.74	2.15	0	0	0	188.89	186.74	2.15	99%	1%
DEM012	0	107.35	4.51	0	0	0	111.86	107.35	4.51	96%	4%
DEM111	0	1.14	0	0	0	0	1.14	1.14	0	100%	0%
DEM113	3.69	7.76	4.87	0	0	0	16.32	7.76	4.87	48%	30%
DEM114	0	1.21	0	0	0	0	1.21	1.21	0	100%	0%
DEM115	0	3.98	0.03	0	0	0	4	3.98	0.03	100%	1%
DEM116	0	1.91	0	0	0	0	1.91	1.91	0	100%	0%
DEM117	0	2.72	0	0	0	0	2.72	2.72	0	100%	0%
DEM118	0	6.5	0	0	0.02	0	6.52	6.52	0	100%	0%
DEM119	0	0.47	0.2	0	0	0	0.67	0.47	0.2	70%	30%
DEM120	0	26.51	0	0	0	0	26.51	26.51	0	100%	0%
DEM121	0	0.88	0	0	0	0	0.88	0.88	0	100%	0%
DEM122	0	1.11	0	0	0	0	1.11	1.11	0	100%	0%
DUB001	3.59	25.04	35.92	14.62	17.48	29.69	126.34	42.52	65.61	34%	52%
DUB003	2.39	4.15	5.64	0.87	2.42	4.56	20.03	6.57	10.2	33%	51%
DUB005	1.73	4.87	3.16	0	0.89	1.29	11.94	5.76	4.45	48%	37%
DUB006	14.8	120.97	187.98	46.6	30.62	58.21	459.18	151.59	246.19	33%	54%
DUB007	15.03	45.31	62.2	2.41	5.15	9.89	139.99	50.46	72.09	36%	51%
GRE013	8.78	2.04	0.44	1353.31	67.81	57.49	1489.87	69.84	57.93	5%	4%
GRE023	309.6	59.26	65.66	1234.74	115.87	89.04	1874.17	175.13	154.7	9%	8%
GRE033	499.9	76.11	125.01	875	81.99	83.2	1741.22	158.1	208.21	9%	12%
GRE043	702.16	210.96	193.88	600.64	68.4	143.71	1919.75	279.36	337.59	15%	18%
GRE053	151.47	114.67	50.24	274.2	43.55	11.96	646.08	158.22	62.2	24%	10%
GRE063	365.61	159.08	65.76	520.31	52.58	68.17	1231.5	211.66	133.93	17%	11%
GRE073	752.16	258.25	162.26	429.72	50.33	46.04	1698.76	308.58	208.3	18%	12%
GRE083	645.55	123.35	149.13	725.72	95.84	63.66	1803.24	219.19	212.79	12%	12%
GRE093	330.12	27.53	149.35	0.26	0	1.49	508.76	27.53	150.84	5%	30%
GRE103	573.97	139.61	106.11	513.48	85.48	52.39	1471.05	225.1	158.5	15%	11%
GRE113	141.39	74.83	104.58	326.44	18.04	50.32	715.61	92.87	154.9	13%	22%
GRE119	1074.92	114.69	193.36	1057.11	29.07	105.27	2574.41	143.76	298.63	6%	12%
GRE120	1705.45	65.71	232.61	352.99	21.78	66.02	2444.55	87.49	298.63	4%	12%
GRE121	409.64	44.51	108.44	0	0.15	0.62	563.37	44.66	109.07	8%	19%
GRE122	1112.64	678.05	985.67	31.44	29.86	14	2851.66	707.91	999.66	25%	35%
GRE123	224.07	67.54	88.01	4.76	0.69	0.52	385.59	68.23	88.53	18%	23%
GRE130	824.39	39.82	207.08	0	0	0.03	1071.31	39.82	207.1	4%	19%
GRE131	589.3	63.37	94.03	44.98	23.93	14.09	829.7	87.29	108.12	11%	13%
GRE132	246.75	164.55	105.08	43.33	22.04	11.04	592.79	186.59	116.12	31%	20%
GRE133	79.97	15.76	13.2	79.51	6.56	3.37	198.37	22.32	16.57	11%	8%
GRE143	178.63	24.59	28.95	33.69	1.97	12.79	280.62	26.56	41.74	9%	15%

DRAFT - Analysis of Stormwater Mitigation Projected to be Constructed by 2040 as part of New and Re-development for WRIA 9 Stormwater Retrofit Planning

Catchment	Private Lands (acres)			Public Lands (acres)			Area (acres)			Fraction	
	Undev.	Dev	Mitigated	Undev.	Dev	Mitigated	Total	Total Dev	Total Mitigated	Total Dev	Total Mitigated
GRE153	259.62	159.79	204.69	290.43	42.06	88.31	1044.9	201.85	293	19%	28%
GRE163	315.22	112.59	270.24	223.58	26.7	64.82	1013.15	139.29	335.06	14%	33%
GRE174	180.1	22.79	133.72	222.02	122.09	122.52	803.24	144.88	256.24	18%	32%
GRE184	142.14	184.76	146.83	27.78	31.54	24.07	557.11	216.3	170.89	39%	31%
GRE204	114.68	291.89	339.2	34.83	14.12	24.26	818.98	306.01	363.46	37%	44%
GRE214	30.49	44.55	67.17	120.76	19.44	59.36	341.78	63.99	126.53	19%	37%
GRE224	96.94	159.8	155.27	228.93	46.03	123.83	810.81	205.82	279.11	25%	34%
GRE234	12.39	19.36	13.72	35.16	4.7	7.91	93.23	24.06	21.63	26%	23%
GRE244	231.93	329.31	659.69	17.13	24.34	60.09	1322.49	353.65	719.78	27%	54%
GRE254	147.17	372.12	638.59	158.54	24.06	70.18	1410.66	396.18	708.77	28%	50%
GRE264	128.43	133.17	539.92	1.09	8.3	30.12	841.04	141.48	570.05	17%	68%
GRE274	2.96	7.48	30.86	4.65	2.29	3.11	51.35	9.77	33.97	19%	66%
GRE284	247.66	393.3	773.14	104.03	71.05	95.62	1684.8	464.35	868.76	28%	52%
GRE294	184.93	200.54	531.6	5.66	5.42	13.4	941.56	205.96	545	22%	58%
GRE304	185.47	495.05	660.79	44.74	61.91	96.39	1544.35	556.96	757.18	36%	49%
GRE314	115	356.07	342.35	56.15	124.32	194.38	1188.27	480.39	536.72	40%	45%
GRE325	0.16	189.53	277.97	0	77.34	122.93	667.93	266.87	400.9	40%	60%
GRE335	47.18	183.03	248.83	19.17	45.07	95.15	638.43	228.09	343.99	36%	54%
GRE345	11.52	121.52	105.27	0.56	22.81	24.97	286.66	144.33	130.24	50%	45%
GRE355	29.58	137.01	249.39	3.71	17.63	29.48	466.8	154.64	278.87	33%	60%
GRE365	5.08	55.57	107.22	3.89	13.97	22.36	208.09	69.54	129.58	33%	62%
GRE375	11.94	69.66	46.43	6.1	27.79	31.17	193.08	97.45	77.6	50%	40%
GRE385	20.67	52.04	44.86	58.94	122.66	63.83	363	174.69	108.69	48%	30%
GRE395	3.37	110.95	192.23	1.12	38.4	89.19	435.25	149.35	281.41	34%	65%
GRE405	17.19	33.7	160.78	1.32	7.27	23.71	243.96	40.96	184.49	17%	76%
GRE415	16.44	38.69	141.31	1.74	8.52	18.14	224.85	47.21	159.45	21%	71%
GRE425	19.59	62.74	126.25	5.66	13.24	18.33	245.8	75.98	144.58	31%	59%
GRE435	9.04	1.6	2.63	7.05	14.27	14.21	48.79	15.87	16.83	33%	34%
GRE445	50.86	45.45	69.06	97.2	83.86	85.29	431.71	129.31	154.35	30%	36%
GRE455	11	269.24	285.13	19.89	87.77	84.72	757.75	357.01	369.85	47%	49%
GRE465	3.99	233.83	51.15	0.75	29.39	8.28	327.4	263.23	59.43	80%	18%
GRE475	0.59	100.94	178.62	0.21	49.07	42.24	371.66	150.01	220.86	40%	59%
GRE485	13.1	113.33	80.53	2.3	33.04	9.45	251.75	146.37	89.98	58%	36%
GRE495	5.69	123.81	140.45	3.02	27.52	20.13	320.63	151.33	160.59	47%	50%
GRE505	8.73	52.08	47.37	10.96	42.96	58.52	220.62	95.05	105.89	43%	48%
GRE515	9.47	3.11	4.46	4.51	22.29	11.37	55.22	25.4	15.84	46%	29%
GRE525	14.58	66.42	95.75	9.72	53.85	35.19	275.5	120.27	130.94	44%	48%
GRE535	0.19	12.38	25.94	0.69	51.22	24.54	114.96	63.6	50.48	55%	44%
GRE545	1.57	26.53	57.47	5.81	72.58	62.13	226.08	99.1	119.6	44%	53%
GRE555	1.16	0.33	0.71	7.29	21.21	28.33	59.03	21.54	29.04	36%	49%

DRAFT - Analysis of Stormwater Mitigation Projected to be Constructed by 2040 as part of New and Re-development for WRIA 9 Stormwater Retrofit Planning

Catchment	Private Lands (acres)			Public Lands (acres)			Area (acres)			Fraction	
	Undev.	Dev	Mitigated	Undev.	Dev	Mitigated	Total	Total Dev	Total Mitigated	Total Dev	Total Mitigated
GRE565	24.4	170.2	113.16	40.32	67.5	104.1	519.68	237.7	217.26	46%	42%
GRE575	121.19	206.67	642.99	11.58	155.35	151.54	1289.33	362.02	794.54	28%	62%
GRE576	111.35	158.81	170.63	1.8	27.94	42.34	512.86	186.75	212.97	36%	42%
GRE585	41.56	688.94	1411.02	25.56	343.32	428.3	2938.7	1032.26	1839.32	35%	63%
GRE596	227.04	1052.75	1055.28	50.17	749.05	415.92	3550.21	1801.8	1471.2	51%	41%
GRE606	5.85	137.45	127.16	0.64	66.22	34.85	372.18	203.67	162.02	55%	44%
GRE615	148.52	575.51	1264.9	22.98	236.73	345.87	2594.52	812.23	1610.78	31%	62%
GRE616	5.44	28.3	53.34	1.69	14.97	22.45	126.18	43.27	75.78	34%	60%
GRE617	1.18	30.27	85.07	0	19.29	21.22	157.03	49.56	106.29	32%	68%
GRE618	0	21.99	44.72	0	48.44	20.55	135.7	70.43	65.28	52%	48%
GRE619	6.15	109.89	118.04	0.21	29.52	36.09	299.89	139.41	154.13	46%	51%
GRE625	18.11	51.92	98.92	2.71	24.47	43.48	239.61	76.39	142.4	32%	59%
GRE626	0.93	12.96	47.94	0	2.94	15.34	80.11	15.9	63.28	20%	79%
GRE627	0	32.54	42.61	0	6.92	7.99	90.06	39.46	50.6	44%	56%
GRE628	0.19	5.17	8.06	0.23	3.65	8.65	25.94	8.82	16.71	34%	64%
GRE629	0	28.76	35.18	0	4.94	8.17	77.05	33.7	43.35	44%	56%
GRE630	0.23	26.33	40.29	0.23	4.43	5.74	77.25	30.76	46.03	40%	60%
GRE635	15.08	427.86	263.64	18.71	145.54	84.96	955.8	573.4	348.6	60%	36%
GRE636	0.14	1.24	28.51	0	0.51	3.9	34.31	1.75	32.41	5%	94%
GRE637	0.21	23.75	60.96	0	8.7	14.66	108.29	32.45	75.63	30%	70%
GRE638	0	34.6	38.8	0	10.01	6.92	90.34	44.62	45.73	49%	51%
GRE639	0	45.45	51.18	0	10.15	11.93	118.72	55.6	63.11	47%	53%
GRE645	6.91	15.64	40.07	3.51	4.91	16.86	87.9	20.55	56.93	23%	65%
GRE655	12.03	106.12	104.81	14.03	122.43	94.51	453.93	228.55	199.32	50%	44%
GRE666	1.48	49.84	16.3	0	14.25	8.98	90.85	64.09	25.28	71%	28%
GRE675	0	9.54	43.4	5.81	39.21	74.8	172.76	48.75	118.2	28%	68%
GRE685	3.69	25.95	14.94	0.68	9.15	5.04	59.46	35.1	19.99	59%	34%
GRE695	11.42	20.62	23.46	6.92	39.95	53.37	155.74	60.57	76.83	39%	49%
GRE705	3.55	37.53	26.97	3.77	10.63	13.54	96	48.17	40.51	50%	42%
GRE715	12.02	48.97	31.49	26.71	32.72	42.3	194.21	81.69	73.79	42%	38%
GRE725	7.83	126.56	162.89	2.57	20.85	34.23	354.94	147.42	197.12	42%	56%
GRE735	2.61	46.1	25.58	0.46	8.63	4.74	88.11	54.72	30.31	62%	34%
GRE745	0	126.27	226.76	0.65	55.47	101.45	510.59	181.74	328.2	36%	64%
GRE755	0	4.53	55.29	0	39.63	35.88	135.34	44.17	91.18	33%	67%
GRE765	0.23	75.01	53.39	0	8.64	11.51	148.78	83.65	64.9	56%	44%
GRE775	2.16	190.52	209.73	0	41.96	57.8	502.16	232.48	267.53	46%	53%
GRE785	6.08	85.96	121.05	0.21	36.11	23.35	272.77	122.08	144.4	45%	53%
GRE795	0	15.17	22.85	0.64	4.4	8.88	51.94	19.57	31.72	38%	61%
GRE805	1.12	118.17	202.69	0.44	18.21	34.86	375.48	136.37	237.55	36%	63%
GRE815	0	39.34	68.43	0	2.34	6.54	116.65	41.68	74.97	36%	64%

DRAFT - Analysis of Stormwater Mitigation Projected to be Constructed by 2040 as part of New and Re-development for WRIA 9 Stormwater Retrofit Planning

Catchment	Private Lands (acres)			Public Lands (acres)			Area (acres)			Fraction	
	Undev.	Dev	Mitigated	Undev.	Dev	Mitigated	Total	Total Dev	Total Mitigated	Total Dev	Total Mitigated
GRE825	14.59	65.14	131	9.37	13.69	32.52	266.32	78.83	163.52	30%	61%
GRE835	1.4	54.45	54.34	0.23	8.31	5.5	124.24	62.77	59.84	51%	48%
GRE845	7.09	29.57	71.31	0.23	8.31	16.19	132.69	37.88	87.49	29%	66%
GRE855	1.08	70.37	118.14	1.52	15.8	44.12	251.03	86.17	162.26	34%	65%
GRE865	21.01	202.79	212.39	9.21	81.38	75.53	602.3	284.16	287.91	47%	48%
GRE875	13.85	94.36	109.81	1.2	19.32	22.19	260.74	113.68	132	44%	51%
GRE885	37.51	185	261.35	1.05	25.09	21.84	531.84	210.09	283.18	40%	53%
GRE895	37.76	81.21	104.23	0.51	22.66	22.63	269	103.88	126.86	39%	47%
GRE905	5.6	45.24	69.57	0.23	10.33	13.97	144.94	55.57	83.54	38%	58%
GRE915	16.77	129.57	162.66	38.77	70.64	102.9	521.32	200.21	265.56	38%	51%
GRE925	25.1	82.52	67.3	22.6	28.13	24.33	249.96	110.65	91.62	44%	37%
GRE935	1.33	70.3	79.39	0	2.95	0.14	154.11	73.25	79.53	48%	52%
HAM010	0.2	27.08	4.38	0.55	26.02	23.13	81.37	53.1	27.52	65%	34%
HAM015	7.44	117.29	202.38	0.44	20.45	30.5	378.49	137.74	232.88	36%	62%
HAM020	0	40.04	87.87	0	19	13.9	160.82	59.05	101.77	37%	63%
HAM030	2.64	48.89	73.09	3.14	37.8	38.74	204.3	86.69	111.83	42%	55%
HAM040	1.52	68.16	87.86	0.23	12.55	15.83	186.14	80.71	103.69	43%	56%
HAM050	1.31	68.31	112.04	0.85	19.68	24.85	227.04	87.99	136.89	39%	60%
IWS001	0	76.64	0.27	0	0.23	0	77.13	76.86	0.27	100%	0%
JOE010	17.91	98.76	153.35	2.71	16.43	35.99	325.15	115.19	189.34	35%	58%
JOE020	20.62	62.21	84.06	0	15.53	19.71	202.13	77.74	103.77	38%	51%
JOE030	10.44	82.68	108.49	1.35	15.02	23.43	241.4	97.7	131.92	40%	55%
JOE040	4.87	141.01	101.37	0	0	0.15	247.4	141.01	101.52	57%	41%
JOE050	0.44	172.91	219.12	3.86	48	72.05	516.37	220.91	291.17	43%	56%
LGR101	0	32.58	2.97	0	6.19	1.62	43.37	38.77	4.6	89%	11%
LKO010	3.39	16.68	27.24	0.44	6.48	7.75	61.97	23.15	34.99	37%	56%
LKO020	10.48	26.79	30.76	0.67	6.2	6.55	81.44	32.99	37.3	41%	46%
LKO030	1.5	4.96	20.1	0.44	1.12	3.95	32.06	6.08	24.04	19%	75%
LKO035	0.23	18.7	35.41	0	2.93	6	63.26	21.62	41.4	34%	65%
LKO040	2.71	64.25	68.48	0	16.21	18.34	169.99	80.46	86.83	47%	51%
LKO050	0	6.95	12.84	0	2.54	6.99	29.32	9.49	19.83	32%	68%
LKO051	0	17.72	29.64	0	2.1	2.89	52.36	19.82	32.53	38%	62%
LKO052	0	1.24	2.11	0	0.4	0.44	4.19	1.64	2.55	39%	61%
LKO053	0	6.91	13.35	0	3.28	5.97	29.51	10.19	19.32	35%	65%
LKO054	0	9.04	10	0	2.77	4.18	25.99	11.81	14.17	45%	55%
LKO055	0	10.75	15.99	0	2.86	5.35	34.95	13.61	21.34	39%	61%
LKO060	4.53	36.94	87.55	0	5.66	20.45	155.12	42.59	108	27%	70%
LKO070	4.21	87.87	111.67	11.74	36.39	61.23	313.1	124.26	172.9	40%	55%
LKO080	1.74	48.89	103.65	0.19	16.37	30.07	200.9	65.25	133.73	32%	67%
LKO090	0.67	3.5	13.42	0.23	0.88	1.19	19.88	4.38	14.61	22%	73%

DRAFT - Analysis of Stormwater Mitigation Projected to be Constructed by 2040 as part of New and Re-development for WRIA 9 Stormwater Retrofit Planning

Catchment	Private Lands (acres)			Public Lands (acres)			Area (acres)			Fraction	
	Undev.	Dev	Mitigated	Undev.	Dev	Mitigated	Total	Total Dev	Total Mitigated	Total Dev	Total Mitigated
LKO099	4.87	98.94	153.73	1.1	47.88	55.62	362.15	146.82	209.36	41%	58%
LKO100	2.6	96.74	159.46	6.87	24.54	53.6	343.8	121.28	213.06	35%	62%
LKO110	21.61	51.33	84.67	0	11.99	13.87	183.47	63.33	98.54	35%	54%
LKO120	1.61	20.29	30.14	3.35	9.14	12.45	76.98	29.43	42.59	38%	55%
LKO130	0.85	114.5	77.49	8.31	39.04	47.47	287.66	153.53	124.96	53%	43%
LPS001	3.54	17.08	6.01	10.12	3.75	4.89	45.38	20.82	10.9	46%	24%
LPS002	3.39	13.68	14.88	20.16	4.7	22.05	78.85	18.37	36.93	23%	47%
LPS003	0.03	4.2	2.88	4.37	18.82	2.02	32.31	23.02	4.9	71%	15%
LPS004	7.3	46.06	62.75	24.32	23.87	45.49	209.79	69.93	108.23	33%	52%
LPS005	40.15	251.73	229.21	7.19	57.92	48.54	634.73	309.65	277.74	49%	44%
LPS006	18.41	120.87	208.64	2.71	47.52	59.51	457.67	168.39	268.15	37%	59%
LPS007	1.49	51.38	46.97	0.83	14.08	15.43	130.19	65.47	62.4	50%	48%
LPS008	26.11	184.66	253.68	2.65	73.51	79.89	620.5	258.17	333.58	42%	54%
LPS009	0.66	47.92	56.15	0.34	13.56	19.51	138.15	61.48	75.66	45%	55%
LPS010	0.19	22.05	33.17	0.04	4.7	5.42	65.56	26.75	38.59	41%	59%
LPS011	1.24	26.56	33.74	0	4.27	3.57	69.39	30.83	37.31	44%	54%
LPS012	0	0.17	0.1	0	0	0	0.27	0.17	0.1	63%	37%
LPS013	0.95	26.52	64.84	0.23	3.19	12.15	107.88	29.71	76.99	28%	71%
LPS014	0	7.19	2.21	0	2.53	0.38	12.31	9.72	2.59	79%	21%
LPS016	0.22	15.38	2.12	3.76	13.01	1.26	35.75	28.39	3.39	79%	9%
LPS017	10.47	68.24	68.76	2.59	17.67	16.69	184.43	85.91	85.45	47%	46%
LPS019	24.69	175.07	211.87	8.88	39.59	64.51	524.62	214.66	276.38	41%	53%
LPS020	2.26	96.36	129.37	0.14	20.84	27.92	276.89	117.2	157.29	42%	57%
LPS100	3.89	81.95	102.19	1.1	16.2	24.61	229.94	98.16	126.8	43%	55%
LPS101	63.06	365.25	527.42	16.01	94.13	156.57	1222.45	459.38	683.99	38%	56%
LPS116	40.39	53.9	85.3	11.83	17.88	23.91	233.2	71.78	109.21	31%	47%
MAS010	1.87	77.46	88.06	0.17	33.25	22.34	223.15	110.71	110.39	50%	49%
MAS020	0.23	15.28	31.02	0.11	3.75	7.87	58.26	19.03	38.88	33%	67%
MAS030	4.62	72.74	100.09	0.74	18.27	31.3	227.75	91.01	131.38	40%	58%
MAS040	4.42	95.8	79.32	1.12	17.32	17.59	215.58	113.12	96.91	52%	45%
MAS050	0.09	17.5	55.09	0	6.52	23.14	102.34	24.02	78.23	23%	76%
MAS060	0	49.59	35.8	0.23	11.43	10.76	107.8	61.02	46.55	57%	43%
MAS070	0	2.18	35.36	0	1.09	10.55	49.18	3.27	45.91	7%	93%
MAS080	1.95	22.97	35.22	3.69	9.95	21.8	95.58	32.92	57.01	34%	60%
MAS090	0.21	27.98	33.99	3.08	19.97	33.53	118.76	47.96	67.52	40%	57%
MAS100	1.73	80.92	125.05	0	22.51	40.59	270.8	103.44	165.64	38%	61%
MCS010	4.72	97.83	82.84	54.45	53.06	26.78	319.68	150.89	109.62	47%	34%
MCS020	3.1	66.66	106.56	5.12	26.96	46.79	255.19	93.62	153.35	37%	60%
MCS030	0.64	52.84	92.36	0.44	40	99.01	285.29	92.85	191.37	33%	67%
MCS040	6.8	68.88	108.66	2.77	19.46	36.61	243.19	88.34	145.27	36%	60%

DRAFT - Analysis of Stormwater Mitigation Projected to be Constructed by 2040 as part of New and Re-development for WRIA 9 Stormwater Retrofit Planning

Catchment	Private Lands (acres)			Public Lands (acres)			Area (acres)			Fraction	
	Undev.	Dev	Mitigated	Undev.	Dev	Mitigated	Total	Total Dev	Total Mitigated	Total Dev	Total Mitigated
MCS050	19.93	97.76	182.99	11.48	80.56	111.89	504.62	178.32	294.88	35%	58%
MCS060	5.56	151.94	158.15	0.75	56.94	46.3	419.63	208.87	204.45	50%	49%
MIL001	9.28	45.61	90	1.81	8.64	12.38	167.72	54.25	102.37	32%	61%
MIL002	5.98	34.76	105.62	5.92	7.82	26.29	186.38	42.58	131.91	23%	71%
MIL003	4.44	72.66	82.82	1.28	20.05	21.26	202.51	92.71	104.08	46%	51%
MIL004	0.37	59.14	81.32	0	16.5	19.28	176.62	75.65	100.61	43%	57%
MIL005	43.84	71.88	89.98	0	26.79	32.39	264.87	98.67	122.37	37%	46%
MIL006	1.21	89.98	132.22	0.23	55.09	63.08	341.8	145.07	195.3	42%	57%
MIL007	0	44.74	204.49	0.23	22.39	72.47	344.32	67.13	276.96	19%	80%
MIL008	0	6.34	6.43	0.46	2.2	3.56	18.99	8.54	9.99	45%	53%
MIL009	0	15.29	19.28	0	1.88	3.59	40.04	17.17	22.87	43%	57%
MIL010	0	43.41	9.81	0	1.52	2.1	56.83	44.92	11.91	79%	21%
MIL011	0.69	59.53	41.31	0	2.32	1.95	105.79	61.84	43.26	58%	41%
MIL012	0.67	47.54	26.54	0	0.19	0	74.94	47.73	26.54	64%	35%
MIL013	0	14.73	5.71	0	11.23	6.98	38.65	25.96	12.69	67%	33%
MIL014	4.89	70.9	33.77	0	10.01	4.18	123.75	80.91	37.95	65%	31%
MIL015	4.02	11.62	12.64	0	4.37	0.85	33.5	15.99	13.49	48%	40%
MIL016	9.78	26.66	8.79	0.04	7.63	6.84	59.74	34.3	15.63	57%	26%
MIL017	1.22	5.48	1.33	0	12.15	1.94	22.12	17.62	3.27	80%	15%
MIL018	1.68	49.91	18.21	0.38	12.14	6.13	88.44	62.05	24.34	70%	28%
MIL019	2.81	27.65	41.29	0	4.85	2.98	79.58	32.5	44.27	41%	56%
MIL020	22.58	86.16	116.19	0.48	22.58	20.9	268.89	108.74	137.09	40%	51%
MIL021	0.31	28.95	55	0	7.03	9.4	100.69	35.98	64.4	36%	64%
MIL022	0.23	23.67	24.93	0.23	8.33	13.8	71.19	32	38.73	45%	54%
MIL023	0.67	82.82	144.23	0.21	11.94	20.67	260.53	94.76	164.9	36%	63%
MIL024	0	97.42	130.74	0	41.13	55.72	325.01	138.55	186.46	43%	57%
MIL025	0.9	98.93	117.51	0	20.94	19.16	257.44	119.88	136.66	47%	53%
MIL026	0	57.53	82.48	0	16.13	19.28	175.43	73.66	101.77	42%	58%
MIL027	0.23	82.74	102.21	0	40.5	40.31	265.98	123.24	142.52	46%	54%
MIL028	3.31	89.71	115.35	3.17	23.47	37.11	272.11	113.18	152.46	42%	56%
MIL029	1.59	7.05	17.82	0	1.58	3.03	31.07	8.64	20.84	28%	67%
MIL030	0	5.43	21.01	0	4.5	7.88	38.82	9.94	28.89	26%	74%
MIL031	2.67	12.45	75.73	1.07	0.97	12.86	105.76	13.42	88.6	13%	84%
MIL032	1.73	56.07	122.06	0	11.26	35.09	226.22	67.34	157.15	30%	69%
MIL033	3.47	19.17	85.19	7.14	18.81	32.9	166.68	37.97	118.09	23%	71%
MIL034	0	0.49	0	0	6.04	2.55	9.08	6.53	2.55	72%	28%
MIL109	0	47.1	2.24	0	0	0	49.34	47.1	2.24	95%	5%
MIL120	0	22.32	4.5	0	0	0	26.82	22.32	4.5	83%	17%
MIL130	0.44	79.29	105.59	5.07	47.99	44.71	283.09	127.28	150.3	45%	53%
MIL200	0	0.22	0	0	0	0	0.22	0.22	0	100%	0%

DRAFT - Analysis of Stormwater Mitigation Projected to be Constructed by 2040 as part of New and Re-development for WRIA 9 Stormwater Retrofit Planning

Catchment	Private Lands (acres)			Public Lands (acres)			Area (acres)			Fraction	
	Undev.	Dev	Mitigated	Undev.	Dev	Mitigated	Total	Total Dev	Total Mitigated	Total Dev	Total Mitigated
MIL201	0	0.87	0	0	0	0	0.87	0.87	0	100%	0%
MIL202	0	0.62	0	0	0	0	0.62	0.62	0	100%	0%
MIL203	0	1.54	0	0	0	0	1.54	1.54	0	100%	0%
MIL204	0	0.76	0	0	0	0	0.76	0.76	0	100%	0%
MIL205	0	1.21	0	0	0	0	1.21	1.21	0	100%	0%
MIL206	0	3.72	0.11	0	3.01	0.43	7.27	6.73	0.54	93%	7%
MIL207	0	0.56	0	0	0	0	0.56	0.56	0	100%	0%
MIL208	0	0.57	0	0	0	0	0.57	0.57	0	100%	0%
MIL209	0	1.7	0	0	0	0	1.7	1.7	0	100%	0%
MIL210	0	1.24	0	0	0	0	1.24	1.24	0	100%	0%
MIL211	0	0.57	0	0	0	0	0.57	0.57	0	100%	0%
MIL212	0	5.04	0	0	0.5	0	5.54	5.54	0	100%	0%
MIL213	0.44	8.81	15.35	0	8.75	3.79	37.14	17.56	19.14	47%	52%
MIL214	0	4.2	0	0	0	0	4.2	4.2	0	100%	0%
MIL215	0	33.49	0.1	0	0	0	33.59	33.49	0.1	100%	0%
MIL216	0	1.76	0.14	0	0.56	0	2.45	2.31	0.14	94%	6%
MIL217	0	42.25	5.11	0	0	0	47.36	42.25	5.11	89%	11%
MIL218	0	15.5	0.67	0	0.01	0.07	16.25	15.51	0.74	95%	5%
MIL219	0	30.38	2.25	0	0	0	32.63	30.38	2.25	93%	7%
MIL220	0	33.29	4.02	0	0.13	0	37.44	33.42	4.02	89%	11%
MIL221	0	2.66	0.29	0	0	0	2.95	2.66	0.29	90%	10%
NEW011	876.38	46.3	231.2	4.89	1.35	3.6	1163.74	47.66	234.81	4%	20%
NEW021	51.82	0.59	28.19	0	0	0	80.59	0.59	28.19	1%	35%
NEW031	53.14	165.17	138.01	1.15	6.22	3.84	367.53	171.39	141.85	47%	39%
NEW041	622.25	26.45	204.83	0	0	0	853.53	26.45	204.83	3%	24%
NEW051	79.63	133.54	147	0	0.33	0.31	360.81	133.87	147.3	37%	41%
NEW061	184.48	29.65	95.48	0	0	0	309.61	29.65	95.48	10%	31%
NEW071	64.15	101.12	122.83	1.12	1.37	4.87	295.45	102.48	127.7	35%	43%
NEW081	335.13	429.75	701.57	5.44	37.38	35.43	1544.69	467.13	737	30%	48%
NEW091	10.85	67	149.91	0	4.66	15.37	247.78	71.66	165.27	29%	67%
NEW101	20.71	120.64	359.33	5.48	89.49	87.47	683.12	210.13	446.8	31%	65%
NEW111	119.87	402.2	731.76	10.5	82.04	69.55	1415.92	484.24	801.31	34%	57%
NEW121	16.09	41.22	165.2	0.67	0.85	3.4	227.44	42.08	168.6	19%	74%
NEW131	12.41	173.61	492.08	0.43	6.42	11.23	696.17	180.03	503.3	26%	72%
NEW141	19.06	113.03	216.08	0	14.9	19.22	382.3	127.94	235.3	33%	62%
NEW151	0	54.81	106.13	0	26.37	42.15	229.46	81.18	148.28	35%	65%
NEW161	0.23	10.3	20.56	0	1.45	3.2	35.73	11.74	23.76	33%	66%
NEW171	4.79	107.37	456.89	1.58	24.04	60.61	655.28	131.41	517.5	20%	79%
NEW181	18.84	132.75	459.62	18.04	25.11	51.41	705.76	157.85	511.03	22%	72%
NEW191	30.58	258.24	262.79	40.97	33.77	43.81	670.16	292.02	306.6	44%	46%

DRAFT - Analysis of Stormwater Mitigation Projected to be Constructed by 2040 as part of New and Re-development for WRIA 9 Stormwater Retrofit Planning

Catchment	Private Lands (acres)			Public Lands (acres)			Area (acres)			Fraction	
	Undev.	Dev	Mitigated	Undev.	Dev	Mitigated	Total	Total Dev	Total Mitigated	Total Dev	Total Mitigated
NEW201	2.07	60.35	88.42	0	2.23	1.07	154.14	62.58	89.49	41%	58%
NEW211	50.99	373.07	484.83	0.54	28.58	7.93	945.95	401.66	492.76	42%	52%
NEW221	19.42	205.8	283.23	0.46	21.97	24.03	554.91	227.77	307.27	41%	55%
NEW231	117.05	291.66	357.01	1.79	11.65	7.62	786.78	303.31	364.63	39%	46%
NEW241	45.56	247.1	486.35	21.04	12.66	51.16	863.87	259.76	537.51	30%	62%
NEW251	23.94	81.84	128.45	0	1.33	0	235.55	83.17	128.45	35%	55%
NEW261	176.09	187.7	494.55	0	3.92	0.91	863.17	191.62	495.45	22%	57%
NEW271	50.74	158.85	508.27	2.55	14.23	25.22	759.86	173.09	533.49	23%	70%
NEW281	69.5	60.6	145.08	24.49	8.77	23.67	332.11	69.37	168.75	21%	51%
NEW291	56.88	18.23	33.85	10.37	0.08	7.27	126.67	18.3	41.11	14%	32%
SAL001	0.16	10.76	7.2	0	3.25	2.8	24.18	14.02	10	58%	41%
SAL002	2.83	20.61	24.66	18.29	13.7	21.39	101.48	34.31	46.05	34%	45%
SAL003	1.95	11.53	29.59	0	2.34	5.89	51.31	13.87	35.48	27%	69%
SAL004	1.56	1.23	3.34	3.75	0.6	4.94	15.42	1.83	8.28	12%	54%
SAL005	1.06	20.48	20.77	0.87	2.3	3.3	48.78	22.78	24.07	47%	49%
SAL006	0.28	47.41	41.4	0	16.2	13.75	119.04	63.61	55.15	53%	46%
SAL007	6.06	14.25	17.17	20.5	4.29	20.82	83.09	18.54	37.99	22%	46%
SAL008	0	16.1	39.05	0	1.65	8.27	65.07	17.75	47.32	27%	73%
SAL009	0	102.29	53.48	6.73	51.1	27.27	240.86	153.38	80.75	64%	34%
SAL010	0.69	12.5	14.11	2.3	7.56	2.98	40.14	20.06	17.09	50%	43%
SAL011	0	10.61	16.43	0	1.07	3.9	32.01	11.68	20.33	36%	64%
SAL012	0	27.04	60.14	0.47	16.08	17.24	120.97	43.12	77.38	36%	64%
SAL013	0	19.15	8.02	0	11.04	6.6	44.8	30.19	14.62	67%	33%
SAL014	0	20.78	7.93	0	7.87	3.7	40.28	28.65	11.63	71%	29%
SAL015	0	11.19	3.51	0	1.93	0.38	17.01	13.12	3.89	77%	23%
SAL016	0	11.9	3.45	1.66	7.48	1.4	25.89	19.38	4.85	75%	19%
SAL017	0	0.07	0.59	0	0.85	0.64	2.15	0.92	1.23	43%	57%
SAL019	0	54.23	34.23	0	23.81	11.77	124.05	78.04	46	63%	37%
SAL020	0	45.04	34.78	3.45	30.01	31.14	144.42	75.05	65.92	52%	46%
SOO012	42.96	278.01	491.94	31.14	61.12	150.6	1055.77	339.13	642.54	32%	61%
SOO022	25.68	311.85	617.49	37.08	98.84	215.48	1306.42	410.69	832.97	31%	64%
SOO032	59.53	82.21	340.87	506.66	43.74	55.65	1088.66	125.95	396.52	12%	36%
SOO042	33.39	116.96	239.4	11.4	43.39	87.71	532.25	160.34	327.11	30%	61%
SOO052	29.85	38.93	235.56	0.26	1.11	6.69	312.4	40.03	242.26	13%	78%
SOO062	37.22	63.18	171.75	46.23	28.3	72.43	419.1	91.48	244.18	22%	58%
SOO072	30.96	52.16	334.08	0.52	2	17.05	436.78	54.16	351.14	12%	80%
SOO082	20.26	76.39	171.79	28.76	30.21	89.52	416.93	106.6	261.31	26%	63%
SOO092	27.57	566.69	745.14	67.27	192.67	306.28	1905.63	759.37	1051.41	40%	55%
SOO102	31.98	197.01	301.01	37.54	66.35	140.81	774.7	263.36	441.82	34%	57%
SOO112	105.69	140.26	635.25	227.2	30.04	71.98	1210.42	170.3	707.23	14%	58%

DRAFT - Analysis of Stormwater Mitigation Projected to be Constructed by 2040 as part of New and Re-development for WRIA 9 Stormwater Retrofit Planning

Catchment	Private Lands (acres)			Public Lands (acres)			Area (acres)			Fraction	
	Undev.	Dev	Mitigated	Undev.	Dev	Mitigated	Total	Total Dev	Total Mitigated	Total Dev	Total Mitigated
SOO122	18.89	33.37	147.92	0	0.42	3.47	204.07	33.79	151.39	17%	74%
SOO132	40	38.32	163.64	0.44	7.11	12.08	261.58	45.43	175.72	17%	67%
SOO142	11.92	206.92	259.97	1.35	75.79	63.19	619.15	282.7	323.16	46%	52%
SOO152	11.85	55.41	136.34	2.62	19.78	42.08	268.08	75.19	178.42	28%	67%
SOO162	1.31	63.22	82.86	0.23	16.86	24.36	188.84	80.08	107.22	42%	57%
SOO172	162.33	93.39	138.47	5.1	23.25	32.63	455.17	116.64	171.1	26%	38%
SOO182	9.47	82.28	130.59	6.26	26.14	57.47	312.21	108.42	188.07	35%	60%
SOO192	5.3	24.83	86.37	1.35	3.41	6.37	127.64	28.25	92.74	22%	73%
SOO202	37.93	81.15	223.73	53.78	17.93	30.99	445.51	99.07	254.72	22%	57%
SOO212	16.3	171.64	241.58	12.02	113.17	105.66	660.37	284.81	347.24	43%	53%
SOO222	70.77	70.56	64.53	22.94	37.93	65.12	331.85	108.49	129.65	33%	39%
SOO232	0.67	38.88	65.39	53.16	53.29	46.29	257.68	92.17	111.68	36%	43%
SOO242	333.18	450.22	1728.65	79.43	136.38	283.08	3010.93	586.59	2011.73	19%	67%
SOO252	112.16	50.53	312.62	4.08	4.09	27.33	510.81	54.61	339.95	11%	67%
SOO262	72.64	86.24	417.07	22.34	21.2	40.35	659.84	107.44	457.42	16%	69%
SOO272	9.49	89.38	222.33	14.98	65.96	78.17	480.31	155.34	300.51	32%	63%
SOO282	51.35	200.11	271.8	12.33	77.71	107.08	720.39	277.82	378.89	39%	53%
SOO292	44.54	238.92	368.15	47.97	144.42	124.14	968.15	383.34	492.3	40%	51%
SOO302	80.2	168.49	448.89	1.34	37.49	54.7	791.1	205.98	503.59	26%	64%
SOO312	14.09	129.65	284.98	11.66	27.2	54.53	522.11	156.85	339.51	30%	65%
SOO322	21.7	63.33	168.5	23.25	14.36	59	350.13	77.68	227.5	22%	65%
SOO332	36.21	155.95	377.59	20.88	83.36	93.29	767.3	239.31	470.89	31%	61%
SOO342	0.08	8.72	18.21	0	1.26	2.65	30.93	9.98	20.86	32%	67%
SOO352	92.46	157.78	525.81	0.2	5.78	21.73	803.76	163.57	547.54	20%	68%
SOO362	293.37	178.32	112.19	0.92	1.8	2.72	589.31	180.12	114.91	31%	19%
SOO372	140.47	138.14	53.06	1.1	5.81	3.79	342.38	143.95	56.85	42%	17%
SOO382	98.87	132.76	283.35	1.6	21.57	46.17	584.3	154.33	329.51	26%	56%
SOO392	676.8	142.24	442.94	6.2	8.31	29.81	1306.3	150.55	472.75	12%	36%
SOO402	444.06	203.87	573.18	31.13	21.87	52.16	1326.27	225.75	625.33	17%	47%
SOO412	566.87	119.63	58.79	106.16	31.51	22.64	905.59	151.14	81.43	17%	9%
SOO422	249.33	155.62	106.98	204.83	206.42	86.59	1009.77	362.04	193.57	36%	19%
SOO432	50.83	23.19	25.44	71.06	13.45	42.53	226.49	36.63	67.96	16%	30%
SOO442	528.78	291.83	492.81	122.22	106.25	163.26	1705.15	398.08	656.07	23%	38%
SOO452	567.61	668.32	1485.4	14.06	59.16	138.46	2933.01	727.48	1623.86	25%	55%
SOO462	49.83	141.95	429.67	13.42	21.49	77.42	733.77	163.44	507.08	22%	69%
SOO472	74.38	209.75	671.1	2.18	29.66	61.64	1048.7	239.4	732.74	23%	70%
SOO482	85.86	29.76	142.62	0	3.81	15	277.05	33.57	157.61	12%	57%
SOO492	14.22	27.67	190.12	0.35	1.69	6.61	240.66	29.36	196.73	12%	82%
SOO502	1.79	12.61	36.38	0.11	1.15	3.36	55.4	13.75	39.75	25%	72%
SOO512	9.24	46.8	161.78	0.23	2.72	7.56	228.33	49.51	169.35	22%	74%

DRAFT - Analysis of Stormwater Mitigation Projected to be Constructed by 2040 as part of New and Re-development for WRIA 9 Stormwater Retrofit Planning

Catchment	Private Lands (acres)			Public Lands (acres)			Area (acres)			Fraction	
	Undev.	Dev	Mitigated	Undev.	Dev	Mitigated	Total	Total Dev	Total Mitigated	Total Dev	Total Mitigated
SOO522	73.39	152.15	463.31	9.61	18.43	68.38	785.28	170.58	531.69	22%	68%
SOO532	57.68	266.4	333.76	18.59	15.5	48.83	740.76	281.9	382.59	38%	52%
SOO542	3.93	175.03	234.28	1.52	45.07	77.43	537.25	220.1	311.71	41%	58%
SOO552	19.61	162.87	203.62	0.23	44.31	56.8	487.44	207.19	260.42	43%	53%
SOO562	42.35	169.05	377.28	7.09	56.83	84.2	736.79	225.88	461.48	31%	63%
SOO572	10.45	145.39	342.7	0.81	30.89	46.87	577.11	176.28	389.58	31%	68%
SOO582	103.71	254.66	563.22	17.8	114.58	146.38	1200.34	369.23	709.61	31%	59%
SOO592	25.46	37.21	70.38	0.41	4.56	10.61	148.63	41.77	80.99	28%	54%
SOO602	16.7	81.96	121.81	24.99	54.31	52.64	352.4	136.27	174.45	39%	50%
Study Area	26311	41867	66843	13931	12303	16507	177763	54170	83350	30%	47%