PROJECT MEMO

TO:	Clark County Buildable Lands Project Advisory Committee	**DATE:**	May 28, 2020
FROM:	Wayne E. Carlson, FAICP Nicole Stickney, AICP Tri-Cities - (509) 380-5883	**PROJECT NO.:** **PROJECT NAME:**	2190628.30 Clark County Buildable Lands Program
SUBJECT:	VBLM Infrastructure Deductions and Stormwater Facilities Analysis		

EXECUTIVE SUMMARY

AHBL has compared the predicted and actual land area consumed for infrastructure resulting from platting within the Urban Growth Areas[1] (UGAs) in Clark County. This investigation supports the work of the Clark County Buildable Lands Project Advisory Committee, and was coordinated with ECONorthwest and Clark County staff, in addressing the new guidelines issued in 2018 by the State for the Buildable Lands Program. We performed this work in order to answer the following issue, which was one of many issues identified in the "Clark County Buildable Lands Issue Summary" memo:

> *Consider whether refinements are needed to the County's current assumptions for the amount of land that will be dedicated to streets, stormwater facilities, etc. to better align with observed development and/or changing regulations.*

In this memo, we review the assumptions used in Clark County's vacant buildable lands model (VBLM) related to infrastructure deductions, with a particular focus on stormwater facility land area requirements. Our examination assesses how land dedicated to infrastructure generally and stormwater specifically has changed over the years based on observed plat data. In addition, we assess how the County has adjusted assumptions for infrastructure needs contained within the model over time. Further, we explore the regulatory framework affecting stormwater facility sizing requirements (see Attachment A).

The driver for this analysis is to understand whether and to what degree changing stormwater regulations have affected land needed for stormwater management, and to provide an analysis of the infrastructure set-aside assumptions in the VBLM. A major shift occurred after stormwater facility regulations were changed as a result of the adoption of the 2005 Ecology manual (or equivalent manuals).

Generally speaking, we conclude the requirements for stormwater management have affected infrastructure set-asides for residential plats: as stormwater regulations have become increasingly rigorous (based on more sophisticated models and requirements), the amount of land used to meet the requirements has increased.

Plats in Clark County built in locations which are subject to regulations consistent with (or equivalent to) Ecology's 2005 Stormwater Manual have been built with 34 percent larger stormwater facilities, as compared to plats constructed prior to the 2005 Stormwater Manual adoption. AHBL recommends that the Clark County Buildable Lands Advisory Committee and Clark County Staff considering modernizing the VBLM to reflect this change in infrastructure needs, in order to accurately predict how densities will be achieved as future

[1] When we refer to land included within UGAs in this memo, that is inclusive of land within the incorporated areas for the cities, unless otherwise noted.

development occurs. On average, in the most recent data, jurisdictions with 2005 (or later) stormwater manual requirements averaged 3.81 percent of plat area devoted to stormwater, while those without these requirements averaged 2.21 percent.

While our main focus was stormwater facilities, we also assess the other components of the infrastructure deduction, to compare how the VBLM accounts for infrastructure to support residential platting activity with the recent trends that we observe in built-out plats in the County's UGAs. Our key findings are:

- Roads account for 18.6 percent of the gross land area for platted lands
- Utilities account for 0.5 percent
- While open space areas take up about 10.1 percent of gross land area, when we overlay open space lands with critical lands and remove the overlaps, the figure drops to only 0.82 percent
- Refinements may be needed for off-site infrastructure needs

INTRODUCTION AND STATE GUIDANCE

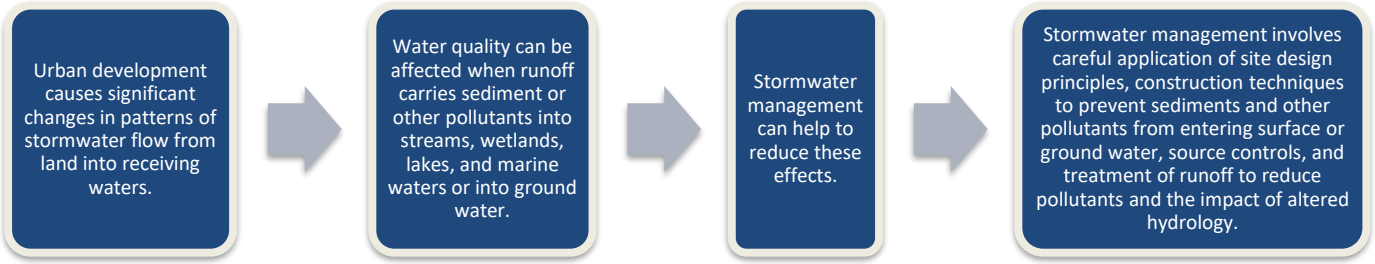
There are many federal and state laws, rules and statutes which form the regulatory framework for the local adoption of development regulations and local policies. As **Figure 1** shows, our analysis considers the relationship between such requirements.

STORMWATER MANAGEMENT

The **Clean Water Act** is a U.S. federal law that regulates the discharge of pollutants into the nation's surface waters, including lakes, rivers, streams, wetlands, and coastal areas. Passed in 1972 and amended in 1977 and 1987, the Clean Water Act was originally known as the Federal Water Pollution Control Act.

The **National Pollutant Discharge Elimination System** (NPDES) permit program addresses water pollution by regulating point sources that discharge pollutants to the waters of the United States. The permit system was created by the Clean Water Act and is a system where the Environmental Protection Action (EPA) authorizes state governments to carry out the program via permitting, administration, and enforcement.

In Washington State, the state Department of Ecology (Ecology) is responsible for NPDES permitting. The following outlines the objectives for stormwater management, in simple terms, as detailed by Ecology:



Certain communities (based on size and physical characteristics) must operate under a NPDES permit. There are a few types of permits statewide; in Clark County, Phase I permits regulate discharges from municipal separate storm stewer systems owned or operated by the state's largest communities by population, and the Western Washington Phase II permits generally cover the small communities.

In order to administer stormwater management programs as NPDES permittees, localities must adopt and implement various techniques, tools, regulations and so forth. The use of stormwater manuals, which provide stormwater permit implementation and management guidance, apply to platting design and configurations and are discussed in detail in this memo.

GROWTH MANAGEMENT AND THE BUILDABLE LANDS PROGRAM

Clark County is included among counties who are required to "fully plan" under the Growth Management Act. Clark County is also included among selected counties that must additionally participate in a program commonly known as the Growth Management Buildable Lands program.

To complete this forward-looking work, Clark County uses a "Vacant Buildable Lands Model" (VBLM) which is discussed in this memo. One component of the VBLM is a deduction of land to account for infrastructure that must be constructed or installed to accommodate growth and development.

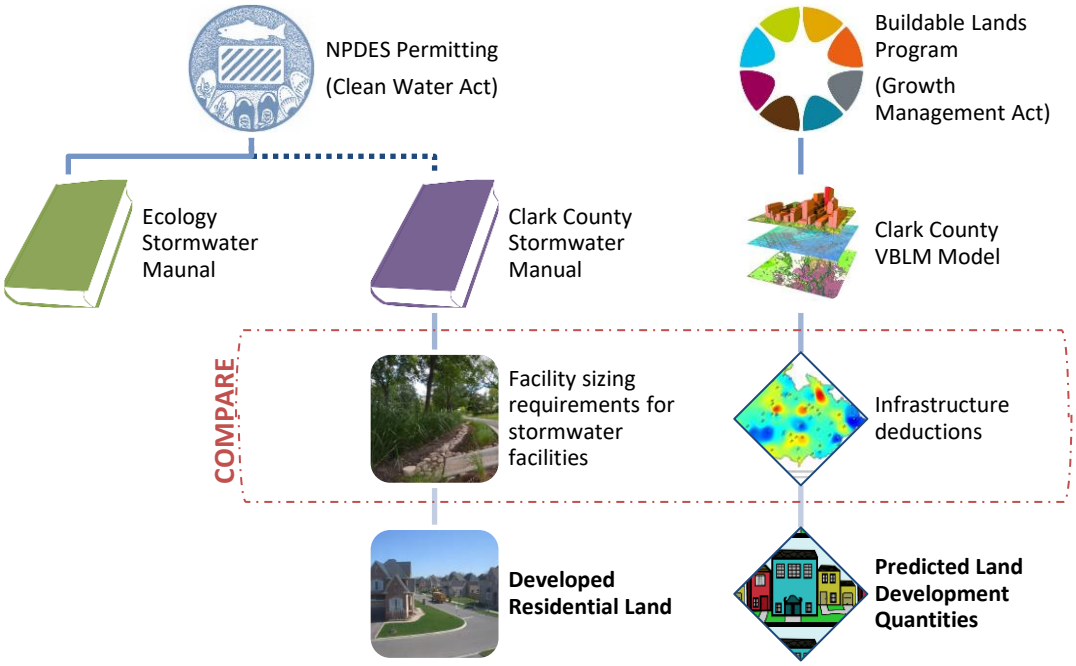


FIGURE 1: THE REGULATORY FRAMEWORK FOR THIS ANALYSIS REGARDING STORMWATER MANAGEMENT

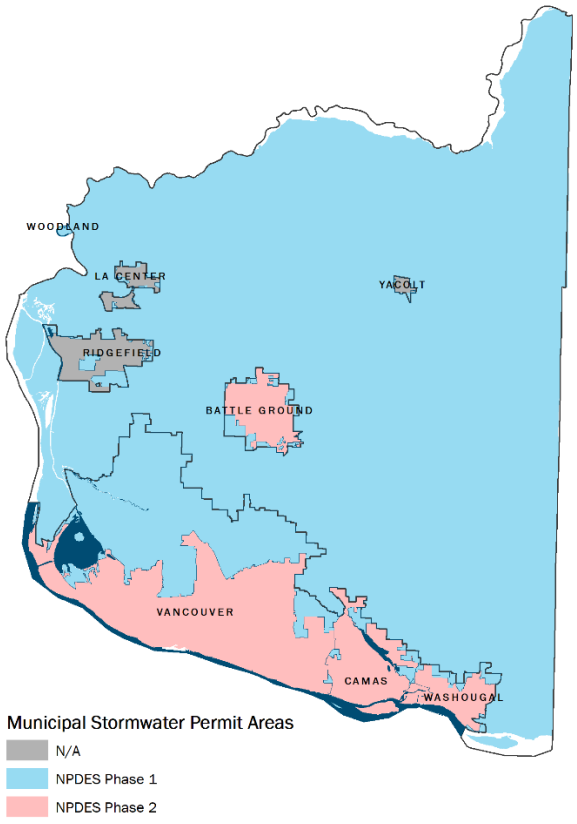
BACKGROUND AND HISTORY OF STORMWATER MANAGEMENT SINCE GMA

The Washington Legislature adopted the Growth Management Act (GMA) in 1990. Thereafter, cities and counties that were required to plan under GMA embarked upon the process of preparing GMA –compliant comprehensive plans and amendments to their development regulations. Concurrently, albeit unrelated with these changes in land use controls, the Washington State Department of Ecology released its *1992 Stormwater Management Manual for the Puget Sound Basin* (1992 Manual). This manual was the first of its kind.

Clark County operates under a NPDES Phase 1 Municipal Stormwater Permit. The County has operated under a NPDES permit since 1999, and the current permit runs from August 1, 2019 through July 31, 2024.

As shown in **Figure 2**, NPDES Phase 2 permittees include the Cities of Vancouver, Battle Ground, Camas and Washougal. The remaining smaller cities of Woodland, Yacolt, La Center and Ridgefield are not covered under a under a municipal stormwater permit. However, it is anticipated that Ridgefield's population will reach the 10,000-resident threshold for eligibility for coverage under the Western Washington Phase II permit by the presumed 2023 reissuance of the permit.

In all cases, lands that are within UGAs but are not within city incorporation limits are permitted through Clark County and therefore are subject to the Phase 1 permit, and the manual adopted by Clark County.



Data Source: Washington Ecology GeoServices, Updated 12/5/2019

N/A	•Woodland •Yacolt
1992 Manual	•LaCenter
2005 Manual	•Ridgefield*
2014 Manual	•Battle Ground •Vancouver
2019 Manual	•Washougal •Camas *(code says "latest edition" is adopted)*

* In 2017, the City of Ridgefield adopted the 2005 Manual for use in facility design, but it did not adopt the manual's thresholds or requirement to use a continuous simulation hydrology model to size stormwater facilities

FIGURE 2: CLARK COUNTY NPDES PERMIT AREAS AND LIST OF STORMWATER MANUALS ADOPTED BY CITIES

Figure 2 also lists Clark County cities and the stormwater manuals that they have adopted and operate under. In some cases, municipal stormwater permittees have the option of either adopting portions of the appropriate Stormwater Manual or portions of a regional manual determined to be equivalent to the Ecology manual. While each locality must adopt a stormwater manual which will implement the NPDES permit that they are operating under, nothing prevents communities from adopting manuals which may result in exceeding minimum requirements they have as an NPDES permittee.

In **Attachment A**, we provide an in-depth look at stormwater regulations and how they have evolved over time, tracking the adoption of updated Stormwater Management Manuals. A brief summary of the key changes and their implications is provided below.

On January 13, 2009, Clark County adopted its own local stormwater manual, which is equivalent to the 2005 Ecology Manual, which resulted in a considerable increase in stormwater facility sizing. (The cities within the County were on separate timelines for their respective adoptions.) Prior to January 13, 2009, stormwater regulations in the County did not include continuous runoff modeling methods or modeling of sites in a forested condition. Other changes to the Ecology Stormwater Management Manual since 2005 include the Low Impact Development (LID) performance standard included within the 2012 Western Washington Phase II NPDES Municipal Stormwater Permit. In general, the 2012/2014 Ecology Manual requires on-site post-construction stormwater management practices for smaller projects as compared to the 2005 manual, and also includes more requirements for managing stormwater than the 2005 Manual. For development sites with good infiltration rates, the size of stormwater facilities will be very similarly sized under the 2012/14 Manual and the 2005 Manual. However, sites with poor infiltration rates will be subject to a more pronounced difference in facility sizing when comparing the two manuals.

The thresholds for post-construction stormwater controls differ between the manuals. The 2012/2014 Manual requires projects with more than 5,000 square feet of new plus replaced impervious surface area to meet all of the minimum requirements. In the 2005 Manual, the project threshold was 5,000 square feet of new impervious surface coverage. The change to include replaced impervious surfaces means more projects trigger post construction stormwater controls.

The biggest impact is that Minimum Requirement #5 "On site Management" has significantly changed. Within the UGA, an applicant may choose standard flow control as long certain on-site flow control BMPs such as dispersion, bioretention, and permeable pavements are considered.

For areas outside the UGA, meeting the LID flow control requirement through the use of a conventional stormwater pond requires larger ponds under the 2012/2014 Manual than would have been required under the 2005 Manual or equivalent manuals because of the need to meet the LID Performance Standard.

VACANT BUILDABLE LANDS MODEL (VBLM)

Clark County's VBLM, first used for a buildable lands report in August 2002, uses methodologies associated with projecting growth and development on vacant and underutilized land classifications[2]. The model was developed to consider environmental constraints and other deductions that are discounted from the vacant and underutilized land supply, coupled with general planning assumptions (such as on- and off-site infrastructure needs[3]), which are used to arrive at a net available land supply. Over the years, refinements and adjustments have been made to the models used for this analysis.

1992 VBLM model

Deductions for infrastructure were established based on the size of the parcel. The infrastructure deduction assumptions were as follows:

[2] Other model(s) for analysis were used as far back as 1996.

[3] Stormwater facilities plus roads, drainage, parks, and other miscellaneous facilities such as pumping stations, power transformers, etc.

Vacant land:
0% deduction for parcels between 5.000 and 20,000 square feet
25% deduction for parcels from 20,000 square feet to one acre
30% deduction for parcels one acre to 2.5 acres
40% deduction for parcels 2.5 acres and larger

Underutilized land:
0% deduction for parcels one acre to 2.5 acres
40% deduction for parcels 2.5 acres or larger

2004 VBLM Model

In the Spring of 2000, a technical advisory committee comprised of local government agencies, *Responsible Growth Forum* members, and *Friends of Clark County* looked at the criteria in the model and the planning assumptions associated with determining capacity. The Board of County Commissioners elected to use the following infrastructure deduction in the 2004 model:

Residential:	38% deduction
Mixed Use /Commercial/Industrial:	25% deduction

Another comprehensive review of the VBLM criteria and assumptions was undertaken in 2006 as part of the growth management plan update. This review compared the 1996 prediction to the 2006 model. This review demonstrated that for the most part the model was a good predictor of what land would develop. However, changes were made to the model based on results of this review.

2007 and 2016 VBLM models

The infrastructure deduction assumptions in the most recent model updates were:

Residential:	
Single/Multi-Family Residential:	27.7% deduction
Mixed Use Residential/Commercial:	25% deduction
Commercial:	
Commercial/Industrial:	25% deduction

The current assumptions are based on **on-site infrastructure** - infrastructure *within* a platted subdivision - all the land outside of the platted lots but within the overall site. The current residential figure was determined by identifying rights of way and tracts with zero assessed value as a percentage of total plat area. The components of the current VBLM on-site infrastructure deduction include:

- Roads
- Stormwater Facilities
- Utilities
- Open Space[4]
- All other unbuildable land contained within tracts[5]

[4] We note that the way Open Space is currently measured incorporates many different types of open space, and alterations to the applied methodology may be necessary moving forward.

[5] The current assumption was established based on tracts assigned as having zero value by the tax assessor as a percentage of tract area.

Off-site infrastructure refers to land *outside* of a platted subdivision that is used for future planned capital facilities, future school sites, transportation corridors, parks, and other facilities that would not be used for residential capacity. The 2016 model did not include a specific deduction for off-site infrastructure; however, the VBLM does identify all publicly owned land and exclude it from consideration as buildable land. This accounts for the vast majority of park and school lands. To the extent that the inventory of publicly owned land may not account for any planned capital facility, it could be considered off-site infrastructure, but is not currently accounted for in the model.

While the County does not have a specific model deduction for tree retention or recreation areas, these are currently included in the open space portion of the deduction. addition, there is a separate method for deducting a portion of "constrained lands" which are encumbered by critical area environmental regulations.

Of the 27.7 percent infrastructure deduction, it is not clear what portion is associated with post-construction stormwater controls for single/multi-family residential uses. Since the current 27.7 percent assumption is based on a county-wide long-run historical average, it blends plat data from a range of regulatory environments.

The Treatment of Critical Areas (Constrained Lands) in the Model

To reflect the regulations in place under the GMA meant for environmental protection (to preserve the natural environment, wildlife habitats, and sources of fresh drinking water) and meant for public safety (regulations which effectively limit development in areas prone to natural hazards like floods and landslides), the model gives special consideration to land that has the following environmental constrained or critical layers:

- 100-year floodplain (or flood fringe)
- Wetlands inventory (NWI, high quality, permitted, modeled) with 100-foot buffer
- Slopes:
  1. Greater than 15 percent; or
  2. Greater than 25 percent plus a 100-foot buffer within Vancouver
- Landslide areas with active or historically unstable slopes
- Designated shorelines
- Hydric soils plus a 50-foot buffer
- Habitat areas plus a 100-foot buffer
- Species areas plus 300-foot buffer
- Riparian stream buffers (by stream type) – varies by jurisdiction:

Stream Type	Clark County stream buffer distance	Vancouver stream buffer distance
S	250 feet	175 feet
F	200 feet	175 feet
N or Np	100 feet	150 feet
Ns	75 feet	125 feet

The VBLM identifies critical lands (constrained lands) as defined above, and does not deduct 100 percent of the land from the inventory of buildable lands because: (1) the model overestimates the amount of land identified as critical (the critical layer is a tool used to flag potential critical lands so that an on-site assessment can be performed in conjunction with the development process); (2) land identified as critical can have density transferred to non-critical land within a development site; and (3) on-site and off-site mitigation allows for

development on lands identified as critical. The current assumption is that 50 percent of critical lands will develop.

HOW ADDRESSED IN OTHER BUILDABLE LANDS COUNTIES

Pierce County – In Pierce County's 2014 Buildable Lands Inventory (BLI), each jurisdiction reports their plat activity and includes the acreage/percentage of land that was devoted to roads, stormwater, critical areas, etc. to the working group. An average of that is taken then from the previous time period (i.e. for the 2014 BLI, the data are from 2006-2012). Each jurisdiction can adjust this assumption for their respective land capacity analysis. In summary, the average amount of land devoted to infrastructure serves to start the discussion, and some communities choose to adjust it.

Snohomish County – We consulted the 2012 Buildable Lands Report for Snohomish County. Like Clark County, Snohomish County is working on updating their methodology and approaches and will produce an updated report in 2021. It appears Snohomish County simply determined a factor that expressed the ratio of gross buildable residential land to net buildable residential land, to account for roads, wetlands, Native Growth Protection Areas, recreational areas and detention ponds. Each locality had a unique factor that was then applied to future land in their model. Interestingly, a 5% reduction was then applied to account for:

> *"the uncertainty of land availability for development due to: new stormwater regulations requiring larger detention ponds (especially in the unincorporated UGAs), potential need for regional or local stormwater facilities, potential need for transmission line, utility, or road or rail rights-of-way, potential need of land for public 2012 Buildable Lands Report for Snohomish County Page 28 or institutional uses like police/fire stations, churches, water supply storage facilities, wastewater treatment and pump stations, landfills and transfer stations, cemeteries, libraries, daycares, small parks or open space, municipal offices, and other uses where we do not today have a specific map coverage to use."*

The County further observed:

> *"This 5 percent reduction factor was used to take into account the potential impact of larger stormwater detention requirements on achieved densities in unincorporated UGAs due to the adoption by the county of the 2005 Department of Ecology stormwater manual."*

Finally, in their report the County noted that in order to inform future reports, this factor will be monitored over time.

Thurston County – Thurston County uses different deductions to model long plat subdivisions for individual jurisdictions. The following table is reproduced from the *Population and Employment Land Supply Assumptions* final report for Thurston County (Thurston Regional Planning Council, April 2019). The table shows the variation that is used for different localities. Generally, 5 to 10 percent of land is deducted for stormwater facilities, but and there are assigned values for open space or tree tracts, roads and rights-of-way, and areas for stormwater facilities are added together.

Table 5: Assumptions for Deductions for Long Plat Subdivisions

Jurisdiction	Open Space/Tree Tract, (whatever is greater)	Storm-water Facility	Roads & Rights-of-Way	Total (whatever is greater)
Lacey	10% or 10% plus critical*	10%	20%	40% or 40% plus critical*
Tumwater	10% or 5% plus critical*	10%	20%	40% or 35% plus critical*
Olympia	5% or critical*	10%	25%	40% or 35% plus critical*
Yelm	5% or critical*	5%	22%	32% or 27% plus critical*
Bucoda	-	-	-	40% or 40% plus critical*
Rainier	-	-	-	40% or 40% plus critical*
Tenino	-	-	-	35% or 35% plus critical*
Unincorporated Growth Areas	5% or 2.5% plus critical*	10%	22%	37% or 34.5% plus critical*

* Critical areas and critical area buffers as estimated in the GIS.

Note: part or all the open space or tree tract requirement may be met in critical area buffers, or partial density can be applied, depending on the jurisdiction.

INVESTIGATION AND METHODOLOGY

We were tasked to examine the 27.7 percent infrastructure deduction that is currently applied to vacant and underutilized residential lands and the components – primarily post construction stormwater controls – that have changed since the VBLM was established. We have prepared the remainder of this memo to examine this topic in substantial detail.

Clark County staff provided a GIS dataset that included all residential plats (long plats) from 2002-2019 and identified the type of land within the plats according to the following categories, called "plat property types." The general categories were Housing, Open Space, Critical Land, Infrastructure, Stormwater Facility, or "unknown," and each category contained several sub-types to further describe the type of property. This dataset was generated based on the assessor's data and was refined by County staff to identify and correct irregularities in the data.

We further adapted the data to correct any issues, to prevent double-counting, and to reclassify very large areas that had been identified as stormwater facilities but should instead have been labeled as wetlands, to be considered wetlands.[6]

In order to effectively assess the resulting "on-the-ground" impacts of the changes to stormwater regulations outlined in Appendix A, we sorted the plat data into two sets: "Pre-2005 manual adoption" years (2002-2007)[7], and "Post 2005 manual adoption" years (2017-2019). This approach to organizing the data is needed because

[6] We identified and corrected 127 records where parcels over 3 acres in size had been identified as stormwater facilities, but were located in where hydric soils, wetlands, and/or buffer existed.

[7] As noted in Attachment A, Clark County adopted its 2005 equivalent manual in early 2009.

there is a lag between the date when plats are entitled (and vested to development regulations) via the preliminary plat process, and the time when final platting occurs. The typical maximum timeframe legally permitted between preliminary plat authorization and recording of a final plat is five years[8]. We are considering and accounting for these factors by using the two distinctive time periods.

An added benefit of looking at these established time frames is that we effectively eliminate the time period when the great recession affected platting activity (according to the U.S. National Bureau of Economic Research the great recession spanned December 2007 through June 2009). The recession likely affected platting activity throughout the County, producing data that would be difficult to interpret and normalize (for example, preliminary plats in locations with certain barriers to development, such as poor soils, could have failed to finalize). County staff also observed that there were an unusually high number of replats during the recession and for several years afterwards as failed developments were re-platted. These replats may have included only the buildable lots and not affected areas designated for streets, stormwater, etc., making them unsuitable for purposes of this analysis. **Figure 3** is a bar chart that shows the *county-wide volume* of residential platting activity (final plats, in acres) over time. The historical economic impacts on platting activity are clear.

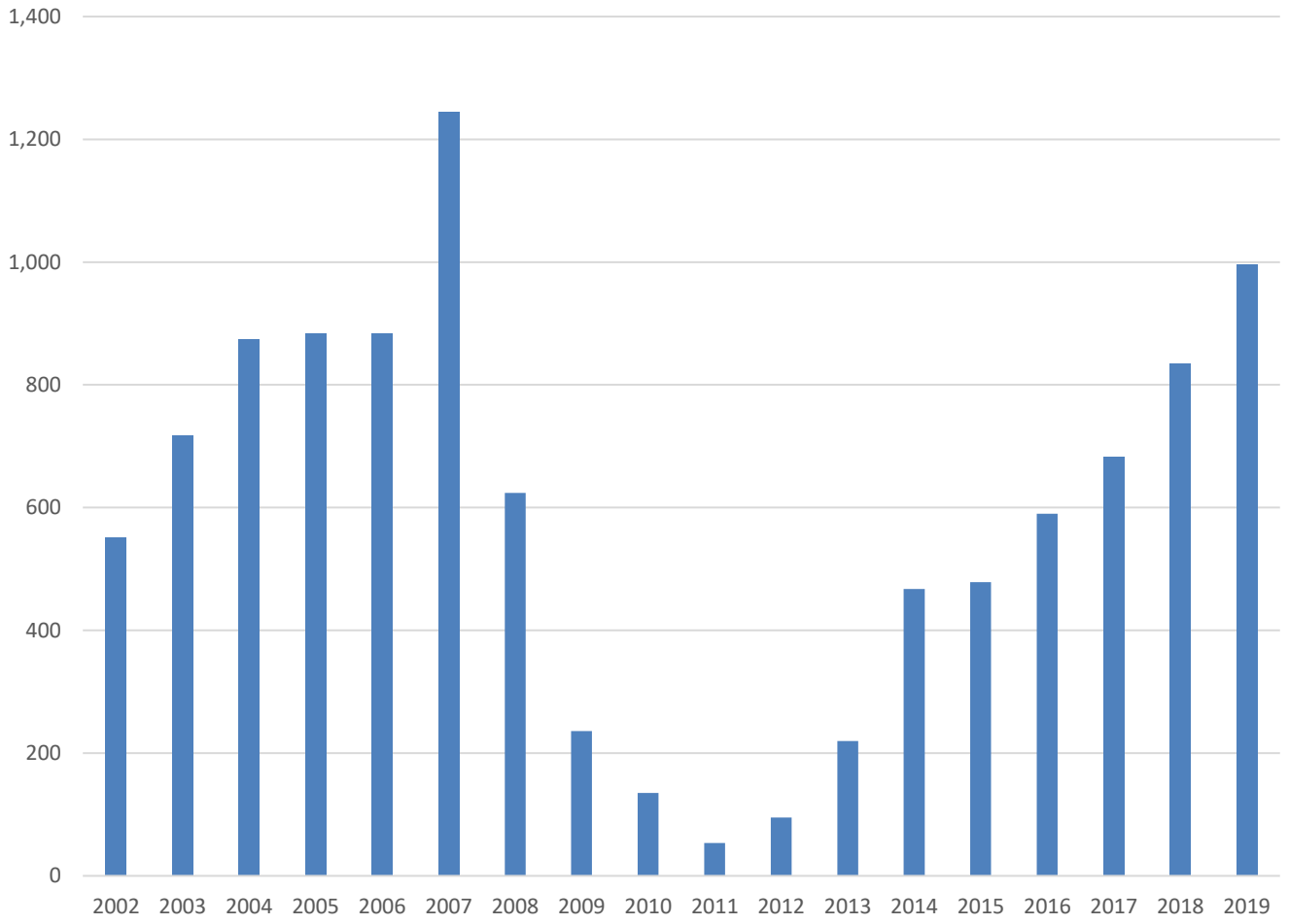


FIGURE 3: CLARK COUNTY RESIDENTIAL PLATTING VOLUME (GROSS LAND AREA, IN ACRES) BY YEAR

[8]The legislature extended the time period to up to 10 years for certain time periods in accordance with amendments to RCW 58.17.140 per EHB 2152 in 2012 and SHB 1074 in 2013

The other spatial feature that we considered in our analysis was jurisdiction (and accordingly the stormwater manual in place in the respective location where the plat developed), for the plats recorded in 2017, 2018, 2019. We split the data into two categories: plats developed in locations where post-2005 equivalent stormwater manuals apply (unincorporated areas within UGAs but outside of city limits and land within Vancouver, Battle Ground, Camas and Washougal), and plats developed in cities where post-2005 equivalent stormwater manuals are not being used (Woodland, La Center, Ridgefield and Yacolt).

Once the data was properly organized, we were able to perform land area calculations using spatial analyst and geometric calculation tools in a GIS program.

FINDINGS

Table 1 shows the calculated gross land area, in acres, that was platted per year in the Clark County UGAs for the timeframes we considered. While Figure 3 depicts county-wide activity, Table 1 is only reflecting plats within UGAs.

While the amount of land platted each year shows variation, this variation is not unexpected nor extreme, and therefore we conclude that the data appears to be sufficient for the analysis and outliers do not need to be considered. Specifically, we find that the amount of lands platted each year during the time periods we explored is rather consistent over time, which affirms that we have enough information to validate our conclusions.

TABLE 1: GROSS LAND AREA PLATTED IN CLARK COUNTY UGAs BY YEAR (2002-2007; 2017-2019)

Year	Gross Land Area (acres)
2002	469.6
2003	590.0
2004	695.2
2005	768.8
2006	804.2
2007	697.3
2017	593.0
2018	758.4
2019	717.6

Figure 4 shows the plats included in the analysis as well as areas that were platted between 2008-2016 where the applicable manual is not determined.

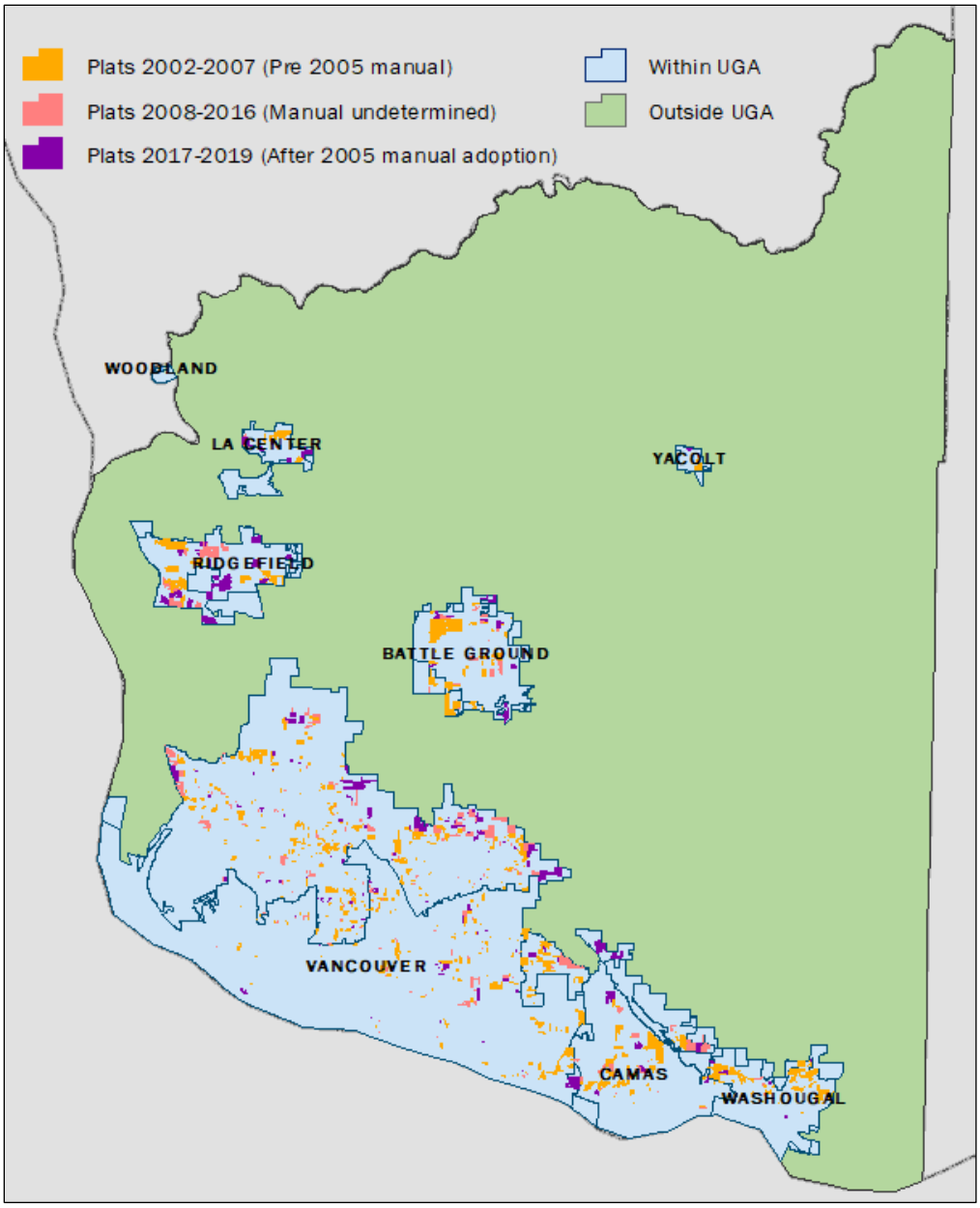


FIGURE 4: MAP OF PLATS IN CLARK COUNTY UGAs (2002-2019)

Next, **Table 2** shows the amount of land needed for stormwater facilities as a percentage of the total land area of the plat by year for the selected time periods. The data reveal that the percentage of land area used for stormwater facilities in plats recorded between 2002 and 2007 ranged from 2.2 to 3.6 percent on an annual basis, with an overall (weighted) average of 2.85 percent. For the next time period of 2017-2019, the percentage of land area used for stormwater facilities ranged from 1.7 to 2.7 percent of gross land area in the plat on an annual basis and averaged 2.2 percent for cities where the post 2005 stormwater manual adoption has not occurred. In contrast, plats developed in locations where post-2005 equivalent stormwater manuals do apply[9] for the same time period had between 3.1 and 4.4 percent of the gross land area (with an average of 3.81 percent) used for stormwater facilities.

[9] CLARK COUNTY, VANCOUVER, BATTLE GROUND, CAMAS, AND WASHOUGAL

TABLE 2: LAND AREA USED FOR STORMWATER FACILITIES IN CLARK COUNTY UGA PLATS BY YEAR (2002-2007; 2017-2019)

Year	Stormwater facility size as a percentage of the total platted area	
2002	2.4%	
2003	2.2%	
2004	3.5%	**AVERAGE 2002-2007: 2.85%**
2005	2.7%	
2006	3.6%	
2007	2.3%	

	LOCATIONS **WITHOUT** 2005 (OR LATER) STORMWATER MANUAL REQUIREMENTS:	LOCATIONS **WITH** 2005 (OR LATER) STORMWATER MANUAL REQUIREMENTS:	
2017	2.2%	4.4%	**AVERAGE 2017-2019:**
2018	1.7%	3.8%	**2.21% "WITHOUT"**
2019	2.7%	3.1%	**3.81% "WITH"**

In summary, the amount of land consumed to accommodate stormwater facilities following adoption of the 2005 stormwater manual increased between the two time periods by about 34 percent in jurisdictions subject to the new rules.

These results show that the regulatory shift from requiring stormwater facility designs to reflect event-based, existing condition modeling to instead basing the design on a continuous, forested or prairie condition, which occurred during the 2005 manual adoption appears to have resulted in an increased land consumption for the facilities.

ADDITIONAL INFRASTRUCTURE COMPONENTS

While the primary focus of our data analysis was stormwater facilities, we have also observed trends related to other infrastructure set-aside categories, which is worth examination and consideration by the Advisory Committee. When considering infrastructure other than stormwater facilities, we consider *all* the years for which we had platting information available (2002-2019).

Roads – Land within UGAs consumption related to roads inside of the plats has ranged from a low of 12.4 percent in 2010 to a high of 22.0 percent in 2009. However, those two years appear to be outliers (and likely related) as the other years do not vary as much from the average of 18.6 percent. It does not appear that there is any sustained trend, either up or down, for roads.

Utilities – Land within UGAs consumed exclusively for utilities inside of plats ranges from zero to less than 0.5 percent. There is no clear trend of increasing land needs for utilities. We observe that the data - and our analysis - does not account for instances where utilities are located within rights-of-way or within easements on lots.

Consequently, we speculate that the VBLM does not need to fully account for utilities in an infrastructure "set aside." Instead, the need to "reserve" land for utilities use is rather limited, and in reviewing the data it appears that tracts or parcels which are created exclusively for utilities typically are for high-transmission power lines or perhaps underground gas lines, which may or may not occur within "parent" plat parcels.

Figure 5 shows the percentage of the gross land area which was used for roads and utilities in the plats we examined, by year.

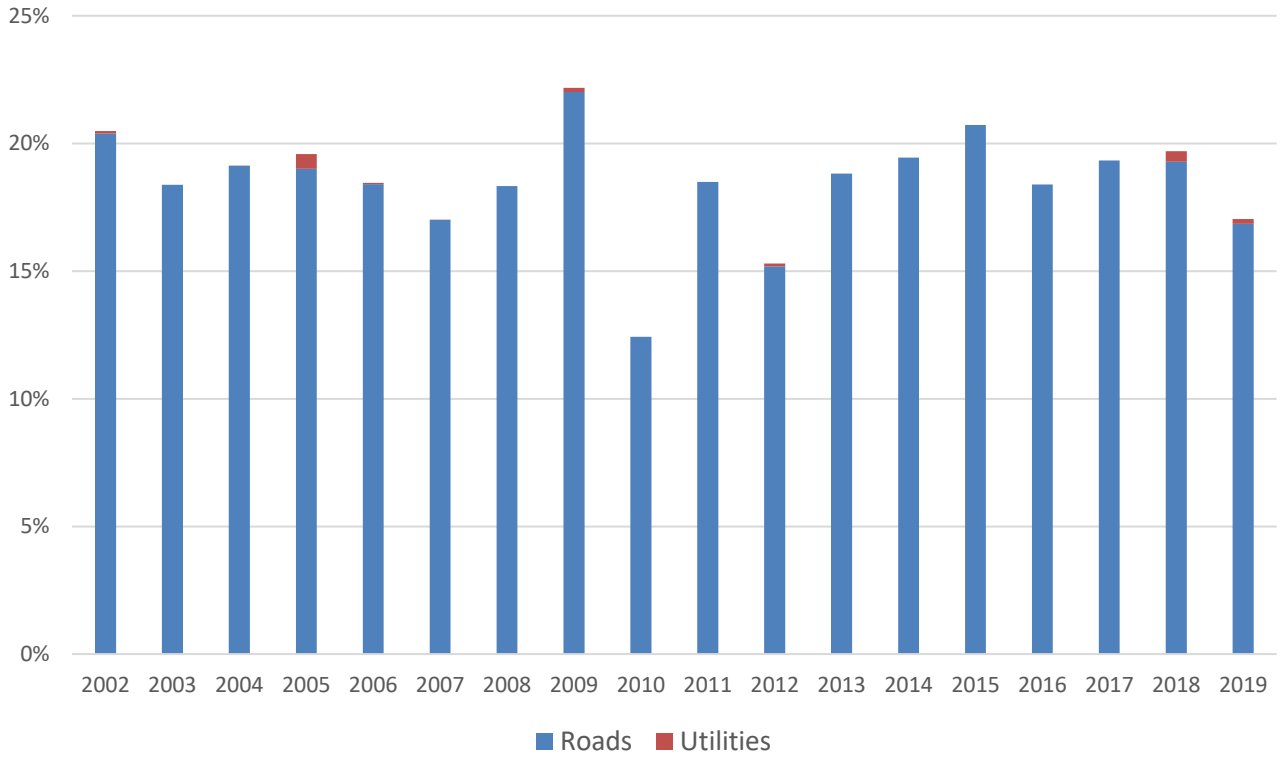


FIGURE 5: PERCENTAGE OF GROSS LAND AREA USED FOR ROADS AND UTILITIES WITHIN PLATS SITUATED IN UGAs (2002-2019)

We emphasize that our data analysis for roads was generally limited to calculating the amount of land needed within plats, representing the internal circulation needs within a platted parent parcel. As such, we recommend that any changes to the VBLM be based on this figure plus an additional allowance for land needed for new or expanded roads outside of plats – typically characterized by minor and major collectors and arterials (which would be a component of an off-site infrastructure figure).

Taken together, this analysis suggests the following assumptions for the components of infrastructure evaluated:

- Stormwater Facilities:
  - Jurisdictions where the 2005 (and later) stormwater manuals are or will soon be applied: 3.81 percent
  - Other jurisdictions: 2.21 percent
- Roads (internal road system only): 18.6 percent
- Utilities: 0.05 percent

These components add up to between 20.86 percent and 22.46 percent and do not include off-site infrastructure needs, as discussed earlier in this memo. We address open space in in **Attachment B** to this memo, as there are many nuances and special situations to consider.

Cc: Oliver Orjiako, Clark County
Jose Alvarez, Clark County
Bob Pool, Clark County
Becky Hewitt, ECONorthwest

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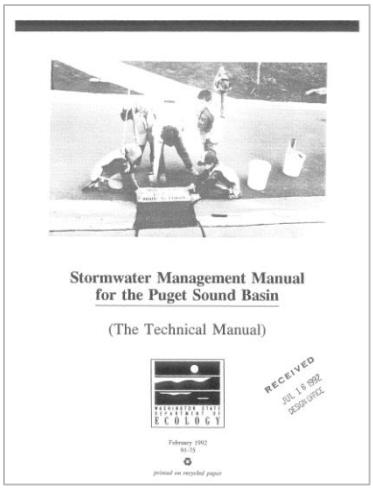
ATTACHMENT A: AN IN-DEPTH LOOK AT STORMWATER MANAGEMENT REGULATIONS IN CLARK COUNTY

In order to investigate the changes in infrastructure needs for stormwater management over the years, we have chronicled and discussed the different stormwater manuals, the basis for their adoption, and their resulting outcomes, in the sections below.

1992 Manual

- 1992 Stormwater Management Manual for the Puget Sound Basin (The Technical Manual)
- Ecology Publication # 91-75
- *Now obsolete*

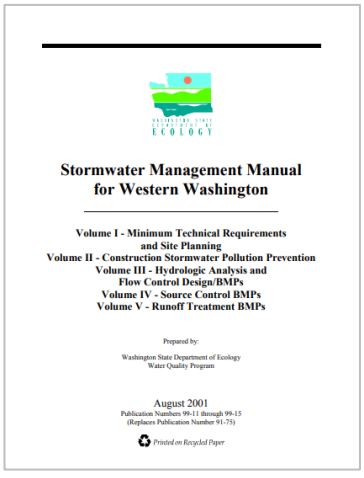


The Ecology stormwater manual was originally developed in response to a Puget Sound Water Quality Management Plan directive. Although the manual was written to apply to the Puget Sound Basin, it was used by localities outside the Basin and eventually became the de facto design manual for most of western Washington. Ecology intended for the manual to define minimum requirements and provide technical guidance for implementing local stormwater management programs. The manual was prepared by Ecology staff, with contributions from advisory committees consisting of local government public works and planning officials, representatives from other state agencies, and other affected parties including industry and tribes.

The 1992 Manual included technical design guidance to aid engineers with the sizing of stormwater flow control and treatment facilities to meet the Plan's objectives. The technical design guidance was based on single event-based models and methods, such as the Soil Conservation Service Unit Hydrograph (SCSUH), Santa Barbara Unit Hydrograph (SBUH), or the Rational Method.

2001 Manual

- 2001 Stormwater Management Manual for Western Washington
- Five volumes, Ecology publication # 99-11, 99-12, 99-13, 99-14 and 99-15
- *Now obsolete*



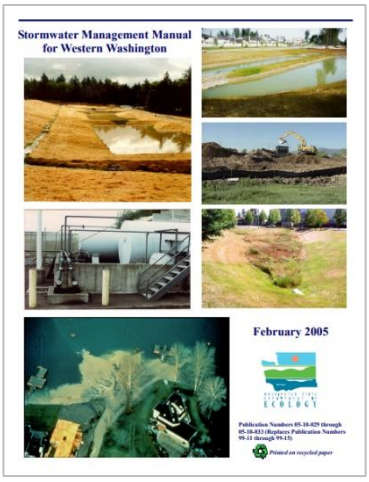
In 2001, Ecology issued a substantial amendment to the 1992 Manual. The intended geographic scope of the manual was expanded to include all of western Washington, including Clark County. New rules that had been recently promulgated under the Clean Water Act and the Safe Drinking Water Act, as well as state regulations under GMA made it necessary to expand the scope of the manual to include regions outside Puget Sound, such as Clark County.

Ecology updated technical guidance based on research which was based on a better understanding of the impacts of stormwater runoff, and technical advances in control measures. That research, and the listing of various runs of salmonids (chinook, sockeye, chum, and steelhead) as threatened or endangered under the salmon species under the Endangered Species Act (ESA), precipitated changes in the way that urban runoff was managed. Other changes included modified thresholds for selection of Best Management Practices (BMPs) to require nearly all projects to apply

appropriate flow control and runoff treatment BMPs, increased flow control requirements to address both peak flows and duration of high flows, and higher levels of enhanced treatment for discharges from industrial, commercial, and multifamily sites, as well as roads.

Consistent with the previous manual, design guidance in the 2001 Manual remained to be based on single event-based models and methods.

2005 Manual



- 2005 Stormwater Management Manual for Western Washington
- Five volumes, Ecology publication # 05-10-029, 05-10-030, 05-10-031, 05-10-032 and 05-10-033
- *The Industrial Stormwater General Permit, Construction Stormwater General Permit, and many city and county codes still continue to reference this manual*
- *Related publication:* Low Impact Development Technical Guidance Manual for Puget Sound (2005) – Puget Sound Action Team / WSU-Extension- Pierce County

Ecology's 2005 update to the Stormwater Management Manual provided significant changes to the practice of stormwater management in Washington. The changes included transitioning from event-based to continuous simulation modeling and a new requirement to model development sites using a pre-developed, forested condition (rather than the existing condition).

Continuous Simulation Modeling

The 2005 Manual transformed the modeling methods associated with the sizing of stormwater flow control and treatment facilities from single event-based methods such as the SCSUH, SBUH, or the Rational Method to a continuous simulation model. Continuous simulation models were deemed by Ecology to have advantages over single event-based methods because of the capability to simulate a wider range of hydrologic responses as compared to the single-event models. Single-event models cannot take into account storm events that may occur just before or just after the single-event (the design storm) that is under consideration. In addition, the continuous simulation models are able to introduce local parameters and actual rainfall data into the model in a manner that better estimates runoff than the SCSUH, SBUH, or Rational methods.

Single-event models often give acceptable estimates of total runoff volumes but tend to overestimate peak flow rates from pervious areas due to the inability to adequately model subsurface flow (a dominant flow regime for pre-development conditions in western Washington basins). One reason SBUH overestimates the peak flow rate for pervious areas is that the actual time of concentration is typically greater than what is assumed. Conversely, continuous simulation models return a longer time of concentration that changes both the peak flow rate (i.e., it would be lower) and the shape of the hydrograph[10] (i.e., peak occurs somewhat later) such that the hydrograph would better reflect actual predeveloped conditions.

Another major weakness of SBUH is that it is used to model a 24-hour storm event, which is not the ideal duration for considering longer-term storms in western Washington; use of a model that considers longer terms (e.g., 3- or 7-day storms) is better suited for western Washington.

[10] Hydrograph: a graph showing the rate of flow versus time past a specific point

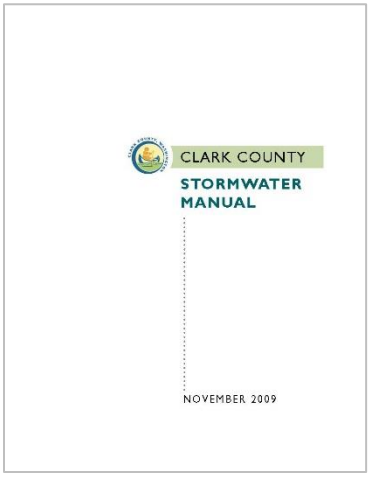
Related to the last concern is the fact that approaches considering a single event, such as SBUH, assume that flow control ponds are empty at the start of the design event. In comparison, continuous runoff models are able to simulate a continuous long-term record of runoff and soil moisture conditions. They simulate situations where ponds are not empty when another rain event begins. Finally, single event models do not allow for estimation and analyses of flow durations nor water level fluctuations. Flow durations are necessary for discharges to streams. Estimates of water level fluctuations are necessary to account for discharges to wetlands and for tracking influent water elevations and bypass quantities, to properly size treatment facilities.

Baseline Existing Condition

Application of the 2005 Manual required new development and redevelopment projects to control the rate where stormwater is released from the site to match historical pre-developed (typically forested) conditions, instead of using existing site condition runoff as a benchmark. The Independent Science Panel reviewed Ecology's manuals and posited that the flow control standard and the requirement to match flows estimated for an historic land cover condition was appropriate for use in all watersheds, regardless of a watershed's current level of development. As a result, the flow control standard resulted in a significant enlargement of flow control facilities as compared to designs based on previous manuals.

The 2005 Manual included a flow control standard that reflected the requirements in the NPDES Phase I Permit. The Phase I Permit required that Phase I permittees, such as Clark County, adopt the ordinances necessary to implement the permit no later than 18 months from the effective date of the permit (August 16, 2008).

Ecology determined that in order to satisfy maximum extent practicable (MEP) standard found in the Clean Water Act (CWA) and state AKART (All Known And Reasonable Treatment) requirements, permittees were required to adopt their updated flow control requirements no later than 18 months after the effective date of the permit (August 16, 2008), and begin applying those requirements within a reasonable period of time after adoption (30-90 days).



Instead of operating under the Ecology manuals, Clark County creates their own manuals, which are equivalent to Ecology's manuals, and are also approved by Ecology for use and application.

On January 13, 2009, Clark County adopted Ordinance No. 2009-01-01, which was effective on April 13, 2009[11]. The ordinance required the flow duration standard for high flows to be engineered to match the existing conditions on the site rather than historic, pre-development conditions.

Clark County's 2005 SWMMWW equivalent program consisted of:

[11] Repealed 1-7-2016

CLARK COUNTY STORMWATER PROGRAM (2005)	Clark County Stormwater Manual (2009)
	Clark County Stormwater Pollution Control Manual – Best Management Practices for Businesses and Government Agencies (2009)
	Clark County Stormwater Facility Maintenance Manual (2009)
	Clark County Code Chapter 40.35 - Stormwater and Erosion Control
	Clark County Code Chapter 13.26A - Water Quality
	Clark County Code Chapter 40.450 - Wetland Permits
	Clark County's Development and Redevelopment Flow Control Mitigation Program

Following Ecology's appeal of Clark County's adopted flow duration standard, an Agreed Order approved Clark County's alternative flow control program on the condition that Clark County mitigate runoff from new development and redevelopment to the historic, pre-development condition through a capital flow control mitigation program undertaken at alternative sites selected by the County. The Agreed Order was subsequently appealed to the Pollution Control Hearings Board, which ruled that the Agreed Order did not satisfy MEP or AKART because Clark County did not undergo the prerequisite basin planning or similar planning necessary to develop its alternative flow control requirement.

2007 NPDES Municipal Stormwater Permit

In 2007, Ecology reissued a new Phase I Municipal Stormwater Permit (Phase I Permit) for Phase I jurisdictions including Clark County. A variety of parties including Clark County[12] appealed the 2007 Phase I NPDES Permit to the Pollution Control Hearings Board (PCHB) (board). Issues cited in the appeal included:

1. Monitoring
2. Low-Impact Development
3. Existing Development
4. Water Quality Standards Violations
5. Compliance
6. SWPPs for Port-Owned Properties

Among the items at issue, the most consequential question for stormwater design became whether the Phase I Permit failed to meet the required treatment standard of reducing pollutants to the "maximum extent practicable"(MEP) and applying "all known, available and reasonable methods of treatment" (AKART), because the permit does not require more extensive use of Low-Impact Development (LID) techniques. The board found that the permit's reliance on a flow control standard as the primary method to control stormwater runoff from operators of municipal separate storm sewer systems (MS4s) failed to reduce pollutants to the federal MEP

[12] Puget Soundkeeper Alliance; People for Puget Sound; Pierce County Public Works and Utilities Department; City of Tacoma; Port of Seattle; Snohomish County; Clark County; Pacificorp; and Puget Sound Energy v. State of Washington, Department of Ecology, PCHB NOS. 07-021, 07-026, 07-027 07-028, 07-029, 0-030, 07-037

standard, and without greater reliance on LID, does not represent AKART under state Water Pollution Control Act (WPCA).

The Board concluded that in order to reduce pollution in urban stormwater to the maximum extent practicable, and to apply AKART, it would be necessary to aggressively employ LID practices in combination with conventional stormwater management methods. The permit must also require the application of LID, where feasible, and conventional engineered stormwater management techniques to remove pollutants from stormwater to the maximum extent practicable in order to comply with federal law. The Board also noted that there was no conflict between GMA and the state WPCA; it noted the required measures could be integrated and harmonized in the growth management process outlined in the GMA.

The decision, issued by the PCHB in August 2008, directed Ecology to reissue the Phase I Permit to require the aggressive use of LID practices in combination with conventional stormwater management practices, where feasible. However, an issue arose with the PCHB decision; as there was no definition of LID practices, no description of what the aggressive use of LID practices meant, and no definition of "feasibility." In order to interpret the Board decision, Ecology convened a stakeholder group that assisted in a processes which ultimately resulted in the reissuance of the Phase I Permit in 2012, as well as 2012 updates to the Stormwater Management Manual for Western Washington and the Low Impact Development (LID) Technical Guidance Document.

2012/2014 Manual

- 2012 Stormwater Management Manual for Western Washington, Ecology publication # 12-10-030 (included five volumes, plus Errata, using the same publication #)
- 2012 Stormwater Management Manual for Western Washington, as Amended in December 2014 (The 2014 SWMMWW), Ecology publication # 14-10-055 (included five volumes, plus Executive Summary and Errata, using same publication #)

In response to the Pollution Control Hearings Board, Ecology convened two LID Advisory Committees – a technical group and an implementation group – to advise the Department with writing of rules associated with the aggressive use of LID practices in combination with conventional stormwater management practices where feasible.

The groups worked for nearly two years to address the issues identified by the PCHB. The intent was initially to revise and reissue the 2007 Permit. However, the time spent by Ecology and the LID Advisory Committees began to interfere with the timeliness of Ecology preparing and transmitting for public comment the 2012 reissuance of the NPDES Permit. To that end, Ecology entered settlement agreements with the appellants and proceeded with its 2012 permits according to the directives from the PCHB decisions, advice from the LID Advisory Committees, listening sessions, surveys, meetings with experts in selected fields, and extensive public comment.

The 2012 reissuance of the NPDES Municipal Stormwater Permits resulted in Ecology's issuance of the 2012 Manual, together with two other publications affecting stormwater management and design in western Washington written and published by the Puget Sound Partnership (PSP):

- Integrating LID into Local Codes: A Guidebook for Local Governments (2012) Publication #PSP 12-01. This document provided official guidance to local governments for the 2012 NPDES Permit requirement

stipulating that local governments make LID the preferred and commonly used approach for stormwater management by minimizing impervious surface coverage and native vegetation loss.

- Low Impact Development: Technical Guidance Manual for Puget Sound (2012) Publication #PSP 2012-3. This document updated the 2005 manual of the same name. Updated technical guidance was provided for bioretention and permeable pavement. (WSU Extension also contributed to the publication)

This Manual included requirements for low impact development at the site and subdivision scale including a new standard of matching 8 percent of the 2-year flow. The flow duration matching requirement was intended to more closely match the flow duration curve produced by natural conditions. Based on computer modeling matching this portion of the flow duration curve would also result in matching the annual total of interflow and surface runoff produced by a natural land cover situation. The Manual also included design guidance for bioretention/rain gardens, permeable pavements, roof downspout controls, dispersion, and soil quality and depth.

The current manual in Clark County is the *Clark County Stormwater Manual 2015* which became effective on January 8, 2016[13]. *(A September 2016 Errata, effective December 2, 2016 is also in use.)* This manual was deemed by Ecology to be equivalent to their 2014 SWMMWW.

Clark County's 2014 SWMMWW equivalent program consists of:

CLARK COUNTY STORMWATER PROGRAM (2014)	Clark County Stormwater Manual (2015)
	- Clark County Stormwater Manual - Introduction
	- Book 1 - Applicability, BMP Selection and Submittals
	- Book 2 - Best Management Practices Design
	- Book 3 - Source Control
	- Book 4 - Maintenance and Operations
	- Appendix 1-I - Site Plan Short Form
	- Appendix 1-J - Abbreviated Construction SWPPP
	Clark County Code Chapter 40.386 - Stormwater and Erosion Control
	Clark County Code Chapter 13.26A - Water Quality
	Clark County Code Chapter 40.450 - Wetland Permits
	Clark County's Development and Redevelopment Flow Control Mitigation Program

In general, the 2012/2014 Ecology Manual and equivalent documents have lower thresholds and more requirements for managing stormwater than previous manuals. There are many factors that influence the sizing of stormwater facilities with the most notable being soil type and topography. For sites with good infiltration rates, the size of stormwater facilities will be very similarly sized under the 2012/14 Manual and the 2005

[13] Clark County Ordinance No. 2015-11-24, adopted in December 2015.

Manual. For sites with poor infiltration rates, the differences in facility sizing between the two manuals are more pronounced.

The thresholds for post-construction stormwater controls also differ between the manuals. The 2012/2014 Manual requires projects with more than 5,000 square feet of new plus replaced impervious surface area to meet all of the minimum requirements. In the 2005 Manual, the project threshold was 5,000 square feet of new impervious surface coverage. The change to include replaced impervious surfaces means more projects trigger post construction stormwater controls.

The biggest impact is that Minimum Requirement #5 "On site Management" has significantly changed. The 2005 Manual required designers to provide LID BMPs to the maximum extent feasible. The requirements of this section were less than a page in the 2005 Manual. The criteria for Minimum Requirement #5 totaled more than five pages long in the 2012/2014 Manual.

Within the UGA, an applicant may choose standard flow control as long certain on-site flow control BMPs such as dispersion, bioretention, and permeable pavements are considered. In most cases, meeting the standard flow control standard by using on-site flow control BMPs is the preferred alternative in UGAs.

For areas outside the UGA, the 2012/2014 Manual requires projects to meet the LID Performance Standard, which involves the proposed project meeting the flow release of a forested condition for the range of eight percent of the 2-year flow to 50 percent of the 2-year peak flow in addition to meeting the flow control standard for duration analysis for eight percent of the 2-year to the 50-year storm. Meeting the LID flow control requirement through the use of a conventional stormwater pond will require larger ponds under the 2012/2014 Manual than would have been required under the 2005 Manual or equivalent manuals.

The size of the area taken up by the onsite BMPs will vary depending upon soils and topography. One rule of thumb is that a bioretention facility size be five percent of the area draining to it. For example, one acre of impervious surface coverage would require a bioretention area of approximately 2,178 square feet (43,560 sf x 0.05 = 2,178 sf). For sites within the UGA, it is not unreasonable to conclude that stormwater facilities will occupy approximately five percent more area under the 2012/2014 Manual.

The water quality requirement changed from requiring projects to provide treatment for 91 percent of a 24-hour, 6-month storm to 91% of the volume of the continuous time series for the site. Our experience is that the sizing of treatment facilities is similar under the 2012/2014 Manual and the 2005 Manual.

As noted above, changes in the methodologies and the resulting design assumptions used between the different models has caused development changes; when larger facilities sizes for stormwater facilities are necessary, the resulting density of development diminishes.

Similarly, the cities in Clark County have various requirements and regulations for Stormwater management. All of the above-discussed regulations for Clark County apply to all unincorporated lands throughout the County, which includes those areas that are within UGAs but not including property located within city limits. Within city limits, city regulations apply.

ATTACHMENT B: AN IN-DEPTH LOOK AT OPEN SPACE AND CLARK COUNTY'S VBLM

This attachment supplements our memo regarding Clark County's Vacant Buildable Lands Model (VBLM) Deductions. In this piece, we focus on open space, which is a bit complicated to fully assess due to varying local code requirements.

For example, one jurisdiction in the county requires a certain percentage of open space/parks dedication as a condition of subdivision approval when critical areas are present within a subdivision. Other jurisdictions have open space requirements that are triggered when a developer opts to use a Planned Unit Development or similar tool (which affords the developer flexibility with various dimensional requirements).

We begin by providing a brief snapshot of the current open space requirements for planned developments in three of the cities. We determined that a close look at Ridgefield and Camas were important following discussions with County staff who indicated that they were aware that Ridgefield had codes requiring a comparatively high amount of open space, and Camas had historically required developers to include 30 percent open space in planned developments:

- **Ridgefield:** In examining the requirements for *Planned Unit Developments* (PUDs) for Ridgefield, we find that their current code (last amended via Ord. No. 1290, § 2 in April 2019) requires a minimum of **twenty-five percent** of the gross site area for common open space. In addition, we understand that Ridgefield requires a PUD any time that there are critical areas involved.
- **Camas:** Currently, developments in *Planned Residential Developments* (PRDs) must set aside "an equivalent amount of **up to twenty percent** of the developed area" for recreational open space (Ord. No. 15-008; March 2015).
- **Vancouver:** In planned developments, **at least ten percent** of the gross area of the site must be devoted to common open space. (Ord. No. M-4179; 2016)

While it is easy to identify that local codes very likely are the primary influence in how much open space is included in plats, it is difficult pinpoint a direct cause and effect. This is because it appears many cities have frequently adjusted and updated their codes numerous times of the study period. Next, we are not certain what portion of plats that we are looking at in the data sets are within planned developments verses not within such categories, and therefore subject to different rules and regulations. Moreover, there is a lag between the time in which a plat entitlement is granted through the preliminary plat process (and vesting occurs) and when the final plat is recorded[14]. **Figure B-1**[15] shows the variation in the share of platted land given to open space over the years for Camas and Ridgefield. Any trend in the data is fairly indistinct, other than it appears that in more recent years the amount of open space has generally dropped since 2007 in the case of Camas, and since 2010 for Ridgefield.

[14] While the typical maximum timeframe legally permitted between preliminary plat authorization and recording of a final plat is five years, the legislature extended the time period to up to 10 years for certain time periods in accordance with amendments to RCW 58.17.140 per EHB 2152 in 2012 and SHB 1074 in 2013.

[15] This is not adjusted for critical area overlays, which is introduced in the next section.

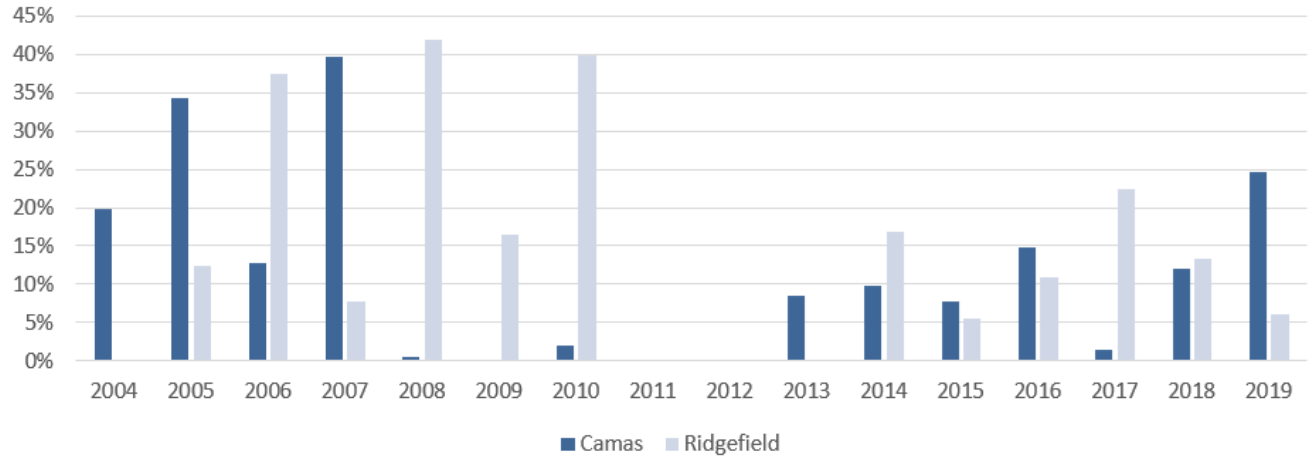


FIGURE B-1: PERCENTAGE OF OPEN SPACE IN CAMAS AND RIDGEFIELD PLATS, BY YEAR

OPEN SPACE AND THE VBLM - FINDINGS

We examined the records for plats recorded in Clark County between 2002 and 2019 to assess the quantity of land area actually included in open space. When organizing the data among jurisdictions, we find that the amount of open space as a percentage of the total platted land area varies greatly. **Table 1** shows that Camas features the highest share of open space in plats, at 18.1 percent, with Ridgefield next at 15.5 percent. For the small cities of Woodland and Yacolt there was no open space within the plats in our sample. For the remaining cities and the composite of all of the UGA areas surrounding cities where plats are permitted through Clark County, the amount of open space ranges from just under five percent to about ten percent. The (weighted) average county-wide among all these locations is 10.1 percent.

However, we also recognize that areas that were in open space were commonly also located in land which is constrained (contains critical areas). When the amount of open space is re-calculated with portions that are overlaid with critical lands are removed, the figures for all jurisdictions drop dramatically, all under one percent. The weighted average is 0.82 percent.

TABLE 1: SHARE OF OPEN SPACE IN PLATS BY JURISDICTION (2002-2019)

JURISDICTION	OPEN SPACE (TOTAL)	OPEN SPACE – WHEN CRITICAL LAND IS REMOVED
Camas	18.1%	0.92%
Ridgefield	15.5%	0.68%
Washougal	9.7%	0.64%
Battleground	6.5%	0.42%
LaCenter	6.0%	0.38%
Vancouver	4.5%	0.87%
UGA areas (not cities)	4.4%	0.97%
Woodland	None	None
Yacolt	None	None

As suggested above, variations in the share of open space lands can be attributed to many factors, and we postulate that the biggest influence is local codes.

SUMMARY

As noted above, the amount of open space observed in Clark County plats (and excluding plats not within a UGA) since the beginning of 2002 has averaged 10.1 percent. However, when excluding constrained land, the figure drops to only 0.82 percent.