Stormwater Regulations History and Existing Stormwater Infrastructure in the Bear Creek Watershed

October 2017

Department of Natural Resources and Parks
Water and Land Resources Division
Science and Technical Support Section
King Street Center, KSC-NR-0600
201 South Jackson Street, Suite 600
Seattle, WA 98104
206-477-4800 TTY Relay: 711
www.kingcounty.gov/EnvironmentalScience

Alternate Formats Available

Stormwater Regulations History and Existing Stormwater Infrastructure in the Bear Creek Watershed

Prepared for:

King County, Snohomish County, City of Redmond, City of Woodinville, NPDES Permit requirement (Phase I- S5.C.5.c and Phase II- S5.C.4.g), and Washington State Department of Transportation in support of the Bear Creek Watershed-Scale Stormwater Management Plan

Submitted by:

Mark Wilgus, P.E., and David Batts
King County 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

Report graphics provided by Wendy Gable Collins and Andrea Rouleau of King County IT, Department of Natural Resources and Parks.

Citation

King County. 2017. Stormwater Regulations History and Existing Stormwater Infrastructure in the Bear Creek Watershed. Prepared by Mark Wilgus, PE, and David Batts, Water and Land Resources Division. Seattle, Washington.

Table of Contents

Figures

EXECUTIVE SUMMARY

The history of application of stormwater controls and related environmental regulations to development in the Bear Creek Watershed is important to understand as it "sets the table" for understanding the watershed's current water quality conditions.

As early as 1985, King County recognized Bear-Evans Creek drainage basin as a critical flood, drainage and erosion area due to the occurrence of flood damage and stream-bank erosion of public and private property, increased surface water runoff and reduced water quality for stream uses. This recognition resulted in special drainage conditions applied to development in the basin and led to the adoption of the Bear Creek Community Plan (1989) which instituted advanced (for the time) stormwater controls required for new development projects in addition to other land use management requirements. In 1995, regulations implementing the Bear Creek Basin Plan were adopted –these included clearing restrictions and enhanced stream buffers. The 1995 revision and 1998 version of the King County Surface Water Design Manual (SWDM) carried forward these protections with generally more protective revisions. In 2004, the Critical Areas Ordinance was passed which enlarged buffers around streams, wetlands, and steep slopes and advanced limits on clearing of land—notably, however, rural area zoned clearing restrictions where found invalid by the state Court of Appeals in 2008. The default flow control standard applied countywide that appeared in the 2005 SWDM was more protective and thus superseded earlier standards that applied to Bear Creek. Subsequent versions of the SWDM (2009 and 2016) brought further advancements in requirements for implementation of low impact development techniques (aka flow control best management practices (FCBMPs)).

Water Quality Status of the Watershed:

Current concerns for the creek system include elevated temperature, fecal coliforms, low dissolved oxygen, and sub optimal benthic index of biotic integrity (B-IBI) scores. In 2008, EPA approved TMDLs addressing fecal coliform, temperature, and dissolved oxygen in the Bear-Evans watershed. In 2011, Ecology completed a multi-parameter water quality implementation plan (WQIP) that applies to all stream segments and tributaries in the Bear-Evans watershed. The plan was developed to address the seven stream segments in the watershed that were listed as impaired for fecal coliform bacteria and nine stream segments listed as impaired for dissolved oxygen (DO)on the state's 2004 and 2008 303(d) lists, respectively.

Current Stormwater Infrastructure:

To assess the status of the current stormwater control infrastructure in the watershed, an inventory of the basin's stormwater ponds and vaults was compiled that included a determination of which dated version of King County's SWDM each facility was designed under, a tabulation of detention volume provided, and whether water quality treatment was included in the design. The resulting analysis of this data paints a stark picture of treatment and flow control provided to developed surfaces in the basin at the current time relative to that considered necessary to mitigate impacts to levels supportive of restored

beneficial uses. In particular, over ½ of the inventoried facilities were determined to be pre-1990 SWDM facilities that provide no formal water quality treatment and meet flow control standards aimed at controlling peak flows only. Only 3.5% of the inventory was designed per the 2009 SWDM, which requires water quality treatment, duration control of developed flows to forested conditions, and implementation of flow control BMPs such as permeable pavement, bioretention, and dispersion. Partially due to the older, undersized facilities and partially due to developed surfaces with no associated facilities whatsoever, the total detention storage provided in the inventoried ponds and vaults amounts to only 10% of that estimated necessary to mitigate the basin's developed surfaces using the default flow control standard found in the 2009 and 2016 SWDMs.

Improvement Strategy:

Based on the preceding, the opportunity and need to improve stream conditions by retrofitting developed surfaces that have no or inadequate flow control, water quality treatment, and infiltrative BMPs is substantial in Bear Creek Basin. Both flow control facilities and infiltration (BMPs or facilities) can effectively address flow flashiness which has been correlated to measured scores of B-IBI, an acknowledged integrator and indicator of stream health. Infiltrative BMPs, along with planting of shade trees along stream corridors, have the potential to help address elevated summer stream temperatures and reduce transport of pollutant carrying total suspended solids to the stream. In addition, typical water quality treatment facilities such as wet ponds, constructed treatment wetlands, and bioswales can reduce TSS and metal inputs to the stream system.

Retrofitting of existing developed surfaces will likely occur in two ways: (1) redevelopment activity (e.g. additions to existing structures/sites or tear downs/rebuilds, etc.) that exceeds thresholds in the 2016 and future SWDMs will require flow control, water quality treatment and FCBMP/LID mitigation of replaced surfaces and any unmitigated existing surfaces added after 2001 through the permitting process, and (2) public, private, or grant funded mitigation of existing, unmitigated or under mitigated developed surfaces that occurs outside of the permitting/development process. It is important to note, however, that current standards allow certain redevelopment project types to be exempted from flow control and water quality treatment mitigation of replaced impervious surfaces if they fall under percent of expansion or relative cost thresholds. Specifically, transportation redevelopment projects are not required to retrofit replaced impervious surfaces if the project adds less than 50% to the existing developed footprint. Similarly, a parcel redevelopment project's replaced impervious surfaces are exempted from mitigation if the valuation of the project's proposed improvements is less than 50% of the assessed value of the existing site improvements. These redevelopment project exemptions could be reconsidered toward the goal of getting more development funded retrofitting that addresses flow control and water quality treatment.

A subset of retrofitting activity outside of that driven by permitting to be considered includes detailed evaluation of the existing public inventory of stormwater ponds for opportunities to expand or optimize their function.

New development in the watershed is required to comply with requirements ensconced in the most current SWDM (2016) which includes advanced controls/requirements addressing flow control, water quality treatment, and flow control BMPs. Opportunities, however, exist to further improve these standards as they apply to BMP implementation, particularly in the urban areas of the watershed.

Per the 2016 SWDM, flow control BMPs are required to be installed to mitigate targeted impervious surfaces (all new and replaced, plus unmitigated existing that was added after January 8, 2001) to the maximum extent feasible on projects located in urban areas. Complementing this approach, the SWDM includes a detailed list of infeasibility and design criteria for subject FCBMPs, and sets minimum levels of implementation that must be achieved regardless of site feasibility issues. These minimum implementation levels are beyond what is required by Ecology and are used to address the very realistic concern in King County that the maximum feasible approach alone may yield little to no FCBMPs given high groundwater, constrained urban sites, and the predominately non-infiltrative till soils found throughout the region. To achieve minimum levels of BMPs on difficult sites, the SWDM includes alternative BMP approaches including preservation of native vegetation and reduced impervious footprints as these do not rely on adequate soils or groundwater clearance, and can be employed on smaller, constrained lots. In addition to these alternative BMPs, the SWDM also includes provisions for developing an in lieu fee program that could be used to achieve the required minimum implementation off-site in situations where onsite implementation is not feasible. The minimum implementation levels in the 2016 SWDM are set to require FCBMPs for impervious areas equal to either 10% or 20% of the site/lot area for lots up to 11,000 square feet and between 11,000 and 22,000 square feet, respectively. Lots over 22,000 square feet require BMPs applied 20-50% of the target impervious surfaces depending on the resulting impervious surface coverage on the site/lot. In densely developed areas with non-infiltrative soils typical to King County, it is likely that the maximum feasible approach may only result in achieving the aforementioned minimums. It follows that in order to avoid incremental degradation in the watershed caused by new development and to reach the goal of restoring a forested flow regime, it is advisable to raise LID/FCBMP standards in contributing urban areas to levels currently required to be implemented only by large, rural projects—namely that targeted developed surfaces are mitigated to a degree that achieves Ecology's Low Impact Development (LID) Performance Standard. Achieving this standard requires significant infiltration of stormwater and compliance is demonstrated either through hydraulic modeling or providing pre-modeled LID BMPs for 100% of targeted surfaces. This raised standard could be combined with an in lieu fee program that allows developers to pay a fee on sites that cannot feasibly achieve the raised standards. Fees would then be used to fund public retrofit of other unmitigated developed surfaces or potentially to purchase development rights, enact reforestation projects, etc. that result in similar stream restoration goals.

Lastly, King County and the contributing urban jurisdictions should investigate the feasibility and potential benefits of an in basin transfer program that would have as its goals to add and encourage further population density in the urban areas while speeding the retrofit of unmitigated developed surfaces at lower cost. This is conceivably achieved

by transferring required restorative mitigation (flow control and water quality treatment) from constrained, higher value urban areas to lower cost rural areas. Participating urban development/redevelopments would be required to match existing conditions on-site and 'transfer' additional required mitigation to potentially larger, basin plan identified priority projects in lower cost areas.

1.0 INTRODUCTION

Given the role of unmanaged stormwater runoff in stream degradation, an understanding of the history of application of stormwater controls and related environmental regulations to development in the Bear Creek Watershed is important as it "sets the table" for understanding the current conditions of water quality in the watershed.

This study tabulated an inventory of existing ponds and vaults in the basin; determined which version of the King County Surface Water Design Manual (SWDM) each facility was designed to; summed the detention storage (current) in the basin provided by those facilities; and predicted the detention storage that would be required based on current requirements. In addition, the study compiled a history of stormwater and other regulatory requirements in the watershed that answers the question, "How did it come to this?" Lastly, the implications are discussed and recommendations made specific to stormwater regulations and retrofit approaches aimed at recovery of the watershed.

2.0 REGULATORY HISTORY OF BEAR CREEK WATERSHED

King County's written drainage history starts in 1919 with drainage requirements for roads (Allen 1919). A more integrated view of environmental protection and/or quality of life first shows up in 1964, when:

> *"Concerned King County citizens prompt government to draft the first Comprehensive Plan to manage growth in unincorporated King County"* (King County 2016).

Then, as stated by the County;

> *"Twenty years later [1985], as rapid growth threatens forests, farmlands and open spaces, and the costs of housing, energy, and police and fire protection soar, the plan is updated. Preserving King County's natural beauty, as well as ensuring affordable housing and diverse living environments, remains fundamental considerations in plans for managing future growth."* (*ibid*)

At the same time, specifically addressing stream hydrology, the County recognized Bear Creek Basin as uniquely deserving of special environmental preservation, as evidenced by a Surface Water Management Division Special Information Bulletin, which states:

> "This bulletin announces the designation of the Bear-Evans Creek drainage basin as a critical flood, drainage and erosion area as provided by King County Code, Section 20.50.055 of the Surface Water Runoff Policy." (King County 1985).
>
> and gives ***Reason for Decision*** as:
>
> "Analysis of existing flooding, drainage and erosion conditions in the Bear-Evans Creek drainage basin shows that the basin qualifies for designation as a critical area under existing King County Code. Flood damage and stream-bank erosion of public and private property, increased surface water runoff and reduced water quality for stream uses have occurred in the basin. Measures are needed to keep these hazards from increasing." (*ibid*)

The additional focus on Bear Creek (Bear-Evans) and other watersheds at the time called for special protections beyond those required for the rest of the County.

In 1989, the Bear Creek Community Plan was adopted which resulted in drainage requirements specific to the Bear Creek Basin including advanced drainage controls applied to development projects that required onsite detention facilities to control post development 2 and 10 year peak flows to corresponding predevelopment levels . For master plan developments and in "Stream Protection Standard" subcatchments, facilities were to be designed to either match development flow durations to their predeveloped levels for all flows greater than ½ of the 2 year event and less than the 50 year event; or to use a peak matching method requiring post development 2 year runoff to be released at a maximum of ½ of the predeveloped 2 year rate, the post developed 10 year at the predeveloped 2 year rate and the post-developed 100 year at the predeveloped 10 year

rate. In 1992, the Bear Creek Basin Plan was adopted as a functional plan and in 1995, regulations implementing and amending the Bear Creek Basin Plan were adopted via King County ordinance. It included requirements for clearing restrictions, enhanced buffers, and advanced flow control consistent with requirements stemming from the Bear Creek Community Plan. Until adoption of the 2005 KCSWDM, which instituted as the countywide default a flow control standard that required projects to match developed discharge durations to historic (forested) predeveloped durations, flow control standards applied in Bear Creek Basin were more stringent than those applied broadly to development in King County. Countywide stormwater standards continued to become more protective in the 2009 KCSWDM, which required on-site flow control best management practices (BMPs) (aka low impact development BMPs) such as rain gardens, bioretention, permeable pavements, small scale infiltration, etc. to mitigate stormwater impacts close to the source of the impact. Under the 2009 KCSWDM, FCBMPs were required to be implemented at levels deemed practicable based on the size of the development site and projected developed impervious surface footprint. Consistent with King County's NPDES Permit requirement to at minimum achieve equivalency with Washington State Ecology's updated stormwater standards, the 2016 KCSWDM, adopted April 26, 2016, further strengthened on-site low impact development regulations. The updated standards require implementation of on-site LID BMPs to the maximum extent feasible or for large, rural projects, to levels necessary to achieve a new flow control standard (LID Performance Standard) considered necessary to support healthy levels of aquatic biota. The LID Performance Standard requires that stormwater discharges from targeted developed surfaces match developed discharge durations to pre-developed durations for the range of pre-developed discharge rates from 8% of the 2-year peak flow to 50% of the 2-year peak flow. Historic site conditions, typically forested, are assumed for the predeveloped condition.

Despite a history of heightened attention to Bear Creek watershed, past and current regulations (Figure 1) and resulting infrastructure have been insufficient to prevent degradation of the watershed. Based on monitoring in the stream system, temperature, bacteria (fecal coliforms), dissolved oxygen, and sub optimal BIBI are all acknowledged concerns.

In 2008, EPA approved TMDLs addressing fecal coliform, temperature, and dissolved oxygen in the Bear-Evans watershed. In 2011, Ecology completed a multi-parameter water quality implementation plan (WQIP) that applies to all stream segments and tributaries in the Bear-Evans watershed. The plan was developed to address the seven stream segments in the watershed that were listed as impaired for fecal coliform bacteria and nine stream segments listed as impaired for dissolved oxygen (DO)on the state's 2004 and 2008 303(d) lists, respectively. Recommended strategies from the WQIP include, but are not limited to, addressing excess bacteria and nutrient loads to the streams via public outreach, elimination of illicit discharges, and investigation and repair of sewer leaks and failing onsite septic systems; protecting cool groundwater and enhancing summer base flows through infiltration of stormwater using LID BMPs; increasing shade and improving riparian areas; and ongoing monitoring.

This watershed's degradation can be partially explained by understanding that substantial development occurred before protection and mitigation requirements were in place, that knowledge of what is required for protection and mitigation has evolved over the course of development in the basin, and that resulting regulatory updates inherently lagged these advancements in knowledge (see Figure 2).

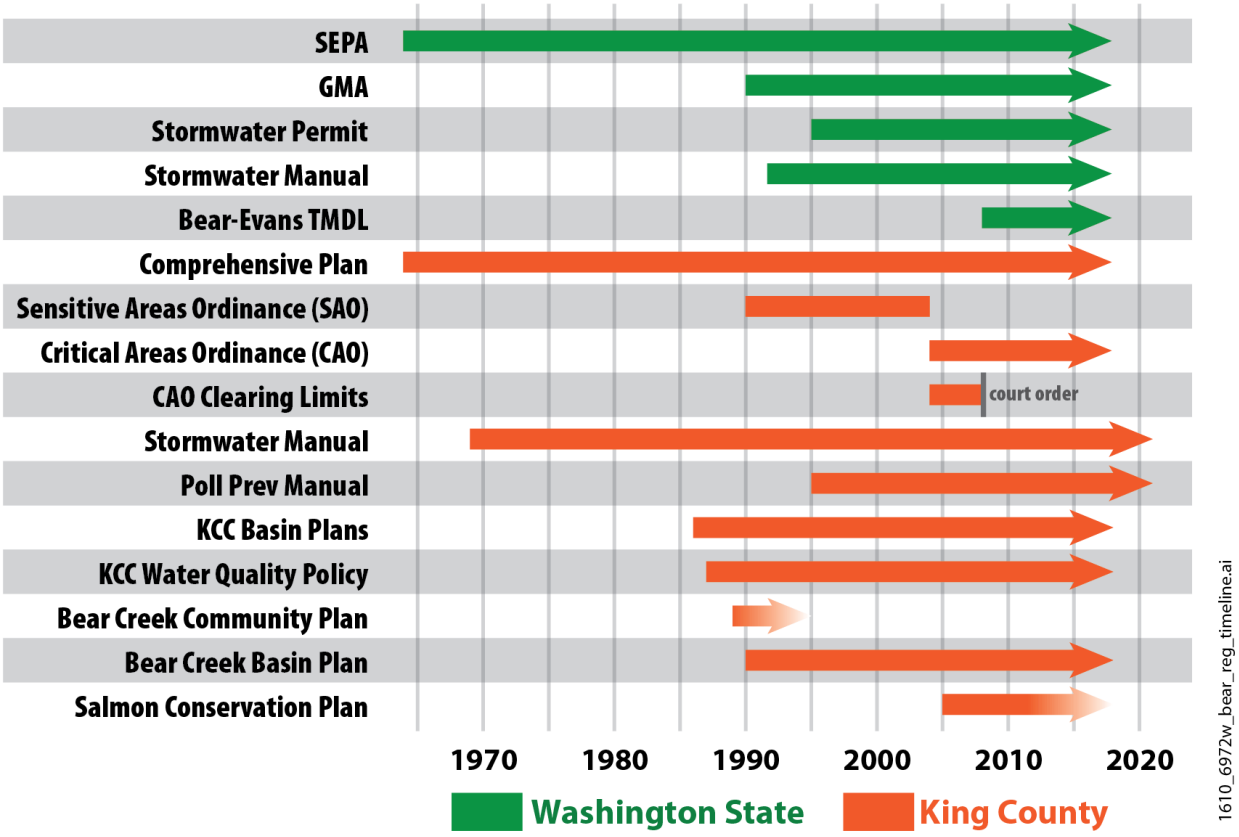
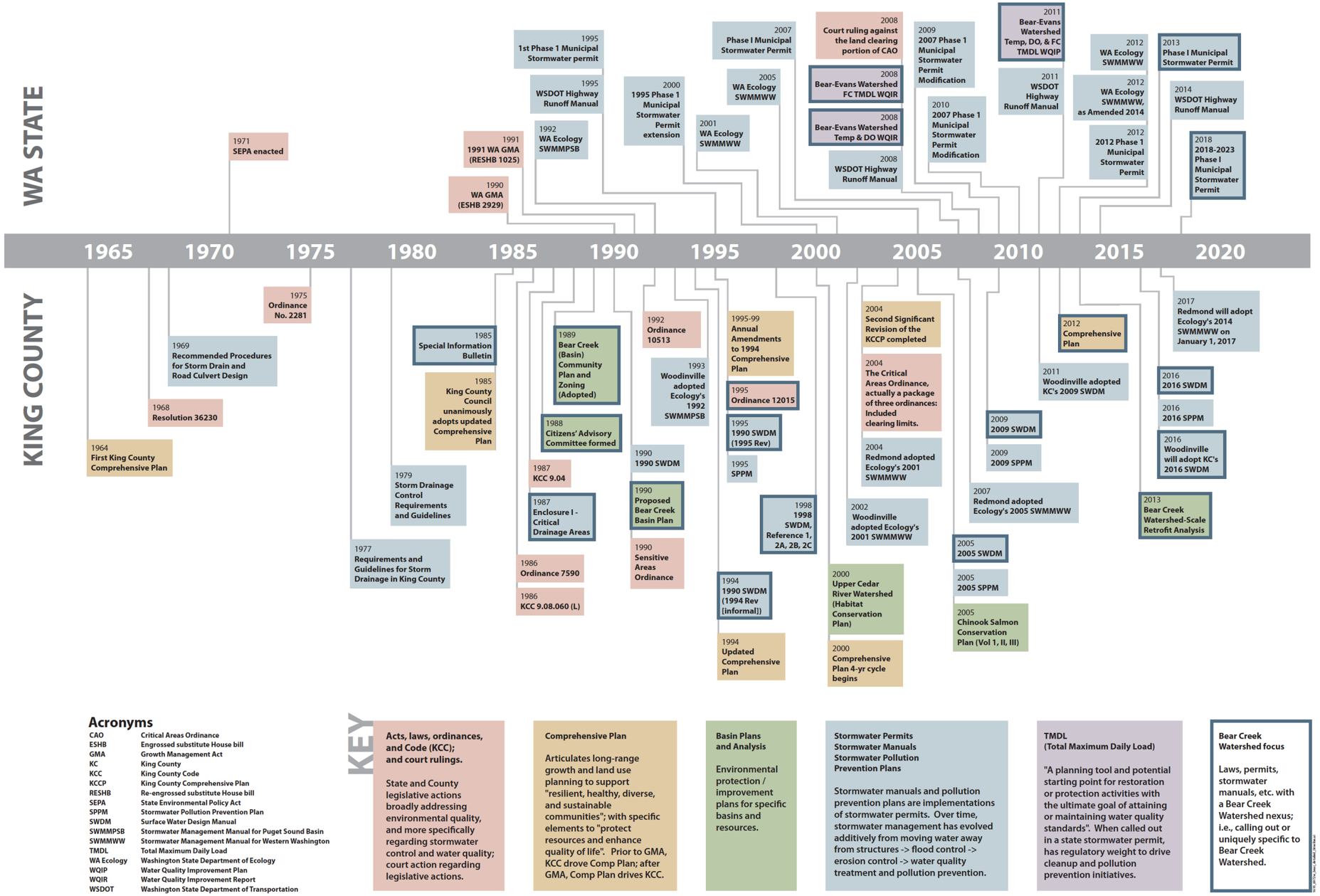


Figure 1. A timeline summarizing regulatory actions taken that were/are applicable to the Bear Creek Watershed.



Note:
Increasing regulation of stormwater, progressing over the last several decades. King County and Washington State Dept. of Ecology are and have been the key regulators affecting stormwater requirements.

Figure 2. A detailed chronology of regulatory actions targeting impacts of stormwater on streams either region wide and/or specific to the Bear Creek Watershed

This page intentionally left blank.

3.0 EXISTING STORMWATER INFRASTRUCTURE

Due to age of development in King County and the significant, progressive advancement of stormwater standards over the last several decades, it is no surprise that where stormwater facilities were required and installed at all, much of the inventory is outdated and therefore undersized and/or lacking in desired functionality. The Bear Creek watershed is no exception. This study tabulated an inventory of existing ponds and vaults in the Bear Creek Basin; determined which version of the King County Surface Water Design Manual (SWDM) each facility was designed to; summed the detention storage (current) in the basin provided by those facilities; and predicted the detention storage that would be required based on current (2016) SWDM requirements. Figure 3, below, graphically presents the percentage of the 173 inventoried ponds and vaults in Bear Creek Study Area by SWDM date. Figure 4 summarizes key differences between the dated versions of the SWDM while Figure 5 shows the graphic spread of the inventoried stormwater ponds and vaults in the study area.

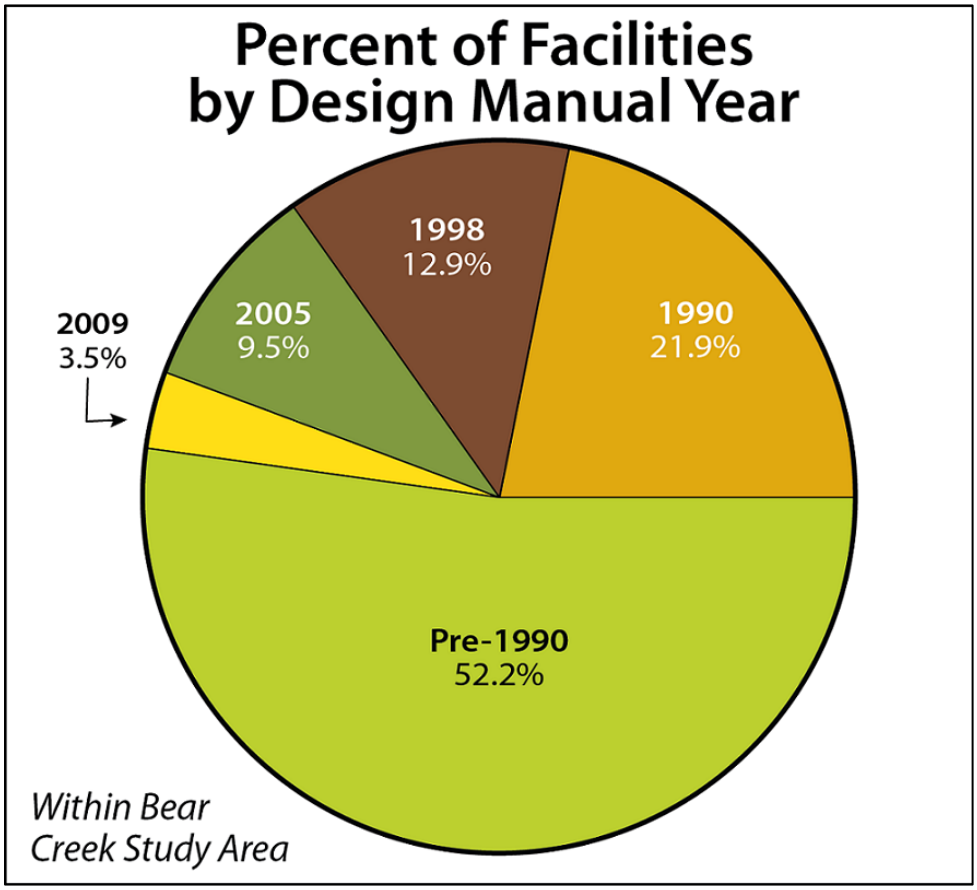


Figure 3. Existing Stormwater Facilities (e.g. ponds and vaults). Percent of Facilities by Design Manual Year

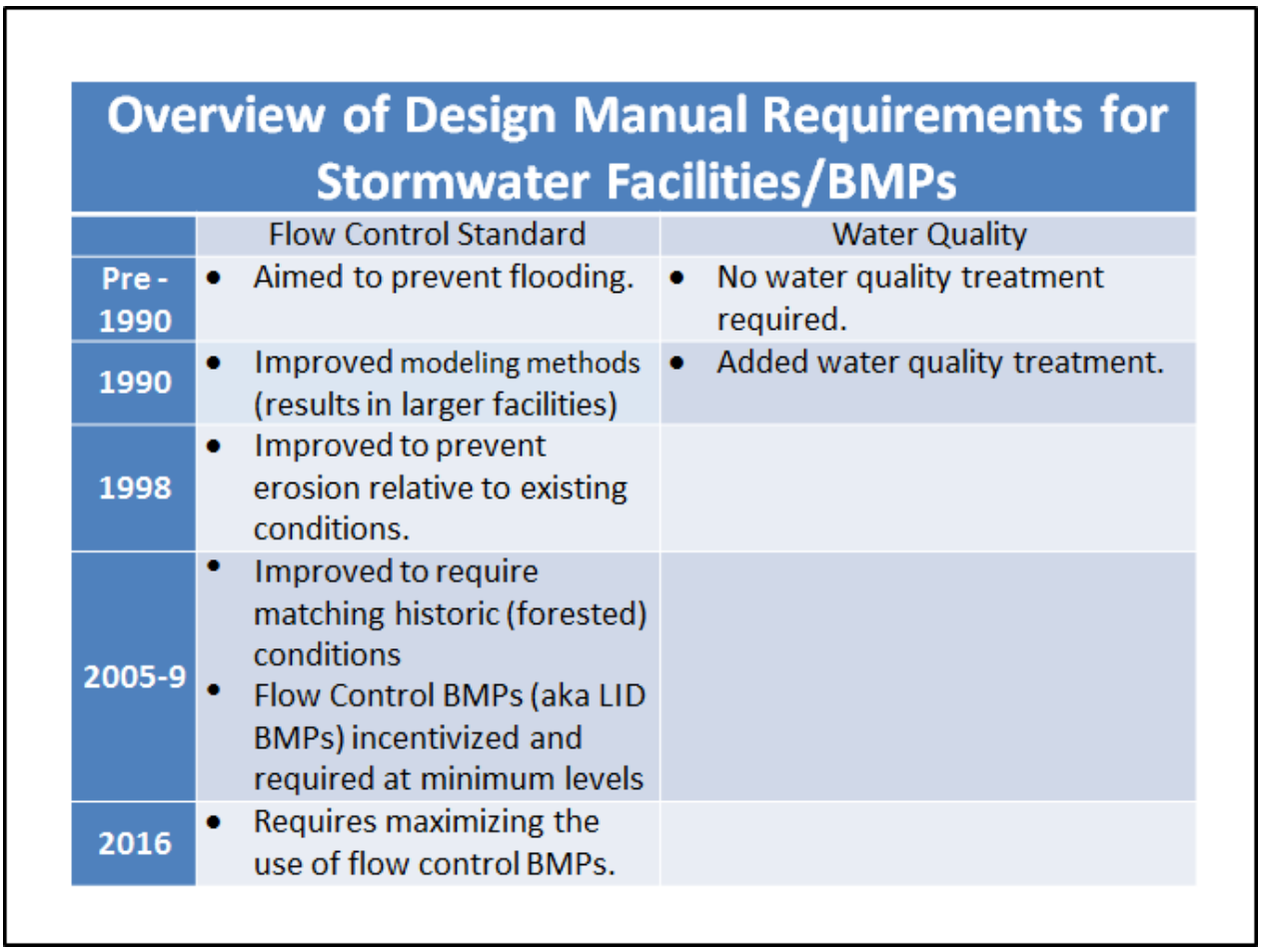


Figure 4. Overview of Design Manual Requirements for Stormwater Facilities/BMPs

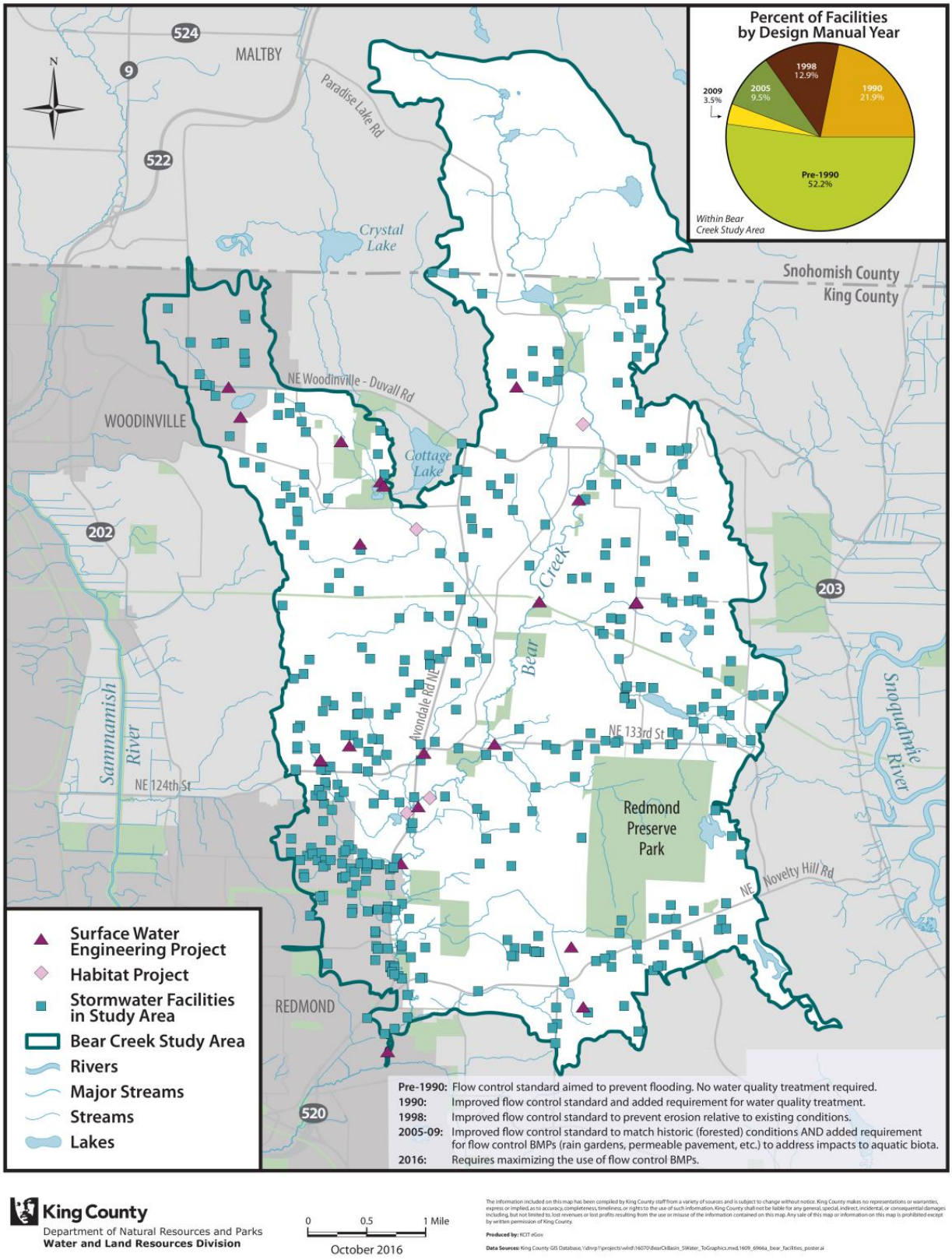


Figure 5. Existing Stormwater Facilities, and Surface Water Engineering and Habitat Restoration Projects in the Bear Creek Watershed Study Area

Key takeaways from this study effort include:

A preponderance of the existing inventory was built to older standards.

Approximately 179 acre-feet of detention storage is provided within the basin's existing detention ponds and vaults. This compares to the 1,598 acre-feet estimated needed to meet King County's current default flow control standard (e.g. Conservation flow control—Level 2-historic(forested) conditions)—e.g. approximately 10%.

Given that 52% of the existing pond facilities and vaults inventoried were developed prior to 1990 SWDM standards where formal water quality treatment was first required, a significant deficit in water quality treatment of developed surfaces in the basin is suggested.

Only 3.5% of the inventoried facilities were built to 2009 SWDM standards under which FC BMPs were first required to be implemented to practicable levels and incentivized using modeling credits. This highlights a substantial lack of FCBMPs in the basin. These LID/FCBMPs are considered critically needed to address flashiness in Bear Creek and its tributaries, to cool receiving waters via infiltration of stormwater from developed surfaces, and to re-charge groundwater.

4.0 IMPLICATIONS

Based on the findings detailed in Section 3 of this report, the opportunity to retrofit developed surfaces that have no or inadequate flow control, water quality treatment, and infiltrative BMPs is large in Bear Creek Basin. Such retrofits can have a potentially significant beneficial impact to affect change in the creek where temperature, fecals, dissolved oxygen, and sub optimal BIBI are all acknowledged concerns. Flow flashiness can be effectively addressed by both infiltration and detention, and has been statistically correlated to measured scores of the benthic index of biotic integrity (B-IBI), an acknowledged integrator and indicator of stream health. Along with restoration of riparian vegetation to provide shading, summer water temperatures may be reduced by infiltrating runoff from developed surfaces near its source using infiltrative FCBMPs. Reduction of metals, TSS, and other pollutants in the stream from developed surfaces can be addressed by both formal water quality treatment facilities as well as infiltrative FCBMPs.

Retrofitting of existing developed surfaces will likely occur in two ways: (1) redevelopment activity (e.g. additions to existing structures/sites or tear downs/rebuilds, etc.) that exceeds thresholds in the 2016 and future SWDMs will require flow control, water quality treatment and FCBMP/LID mitigation of replaced surfaces and any unmitigated existing surfaces added after 2001 through the permitting process, and (2) public, private, or grant funded mitigation of existing, unmitigated or under mitigated developed surfaces that occurs outside of the permitting/development process. It is important to note, however, that current standards allow certain redevelopment project types to be exempted from flow control and water quality treatment mitigation of replaced impervious surfaces if they fall under percent of expansion or relative cost thresholds. Specifically, transportation redevelopment projects are not required to retrofit replaced impervious surfaces if the project adds less than 50% to the existing developed footprint. Similarly, a parcel redevelopment project's replaced impervious surfaces are exempted from mitigation if the valuation of the project's proposed improvements is less than 50% of the assessed value of the existing site improvements. These redevelopment project exemptions could be reconsidered toward the goal of getting more development funded retrofitting that addresses flow control and water quality treatment.

A subset of retrofitting activity outside of that driven by permitting to be considered includes detailed evaluation of the existing public inventory of stormwater ponds for opportunities to expand or optimize their function.

New development in the watershed is required to comply with requirements ensconced in the most current SWDM (2016) which includes advanced controls/requirements addressing flow control, water quality treatment, and flow control BMPs. Opportunities, however, exist to further improve these standards as they apply to BMP implementation, particularly in the urban areas of the watershed.

Per the 2016 SWDM, flow control BMPs are required to be installed to mitigate targeted impervious surfaces (all new and replaced, plus unmitigated existing that was added after

January 8, 2001) to the maximum extent feasible on projects located in urban areas. Complementing this approach, the SWDM includes a detailed list of infeasibility and design criteria for subject FCBMPs, and sets minimum levels of implementation that must be achieved regardless of site feasibility issues. These minimum implementation levels are beyond what is required by Ecology and are used to address the very realistic concern in King County that the maximum feasible approach alone may yield little to no FCBMPs given high groundwater, constrained urban sites, and the predominately non-infiltrative till soils found throughout the region. To achieve minimum levels of BMPs on difficult sites, the SWDM includes alternative BMP approaches including preservation of native vegetation and reduced impervious footprints as these do not rely on adequate soils or groundwater clearance, and can be employed on smaller, constrained lots. In addition to these alternative BMPs, the SWDM also includes provisions for developing an in lieu fee program that could be used to achieve the required minimum implementation off-site in situations where onsite implementation is not feasible. The minimum implementation levels in the 2016 SWDM are set to require FCBMPs for impervious areas equal to either 10% or 20% of the site/lot area for lots up to 11,000 square feet and between 11,000 and 22,000 square feet, respectively. Lots over 22,000 square feet require BMPs applied 20-50% of the target impervious surfaces depending on the resulting impervious surface coverage on the site/lot. In densely developed areas with non-infiltrative soils typical to King County, it is likely that the maximum feasible approach may only result in achieving the aforementioned minimums. It follows that in order to avoid incremental degradation in the watershed caused by new development and to reach the goal of restoring a forested flow regime, it is advisable to raise LID/FCBMP standards in contributing urban areas to levels currently required to be implemented only by large, rural projects-- namely that targeted developed surfaces are mitigated to a degree that achieves Ecology's Low Impact Development (LID) Performance Standard. Achieving this standard requires significant infiltration of stormwater and compliance is demonstrated either through hydraulic modeling or through providing pre-modeled LID BMPs for 100% of targeted surfaces. This raised standard could be combined with an in lieu fee program that allows developers to pay a fee on sites that cannot feasibly achieve the raised standards. Fees would then be used to fund public retrofit of other unmitigated developed surfaces or potentially to purchase development rights, enact reforestation projects, etc. that result in similar stream restoration goals.

Lastly, King County and the contributing urban jurisdictions should investigate the feasibility and potential benefits of an in basin transfer program that would have as its goals to add and encourage further population density in the urban areas while speeding the retrofit of unmitigated developed surfaces at lower cost. This is conceivably achieved by transferring required restorative mitigation (flow control and water quality treatment) from constrained, higher value urban areas to lower cost rural areas. Participating urban development/redevelopments would be required to match existing conditions on-site and 'transfer' additional required mitigation to potentially larger, basin plan identified priority projects in lower cost areas.

5.0 RECOMMENDATIONS

1. In order to speed retrofitting progress and prevent further resource degradation, raise LID standards applied to development in contributing urban areas and on smaller rural sites (less than 5 acres), to levels currently borne only by large, rural projects-- namely that targeted developed surfaces must be mitigated with flow control BMPs sufficient to achieve the LID Performance Standard.
2. Institute an in lieu fee program that allows payment on development sites in the watershed that cannot feasibly achieve the raised LID standards on-site. Use these fees to accomplish stream restoration goals by funding mitigation in the watershed including: retrofit of other unmitigated developed surfaces; purchase of development rights; reforestation projects; riparian buffer acquisition/improvement; instream habitat projects, etc.
3. Evaluate the existing public inventory of stormwater ponds for opportunities to expand or optimize their function.
4. Explore the potential benefits and opportunities of an in-basin transfer program between King County and contributing urban jurisdictions in the watershed with the goal of achieving retrofit targets and/or metrics in the most time and cost efficient manner.
5. Study the implications of and consider modifying exemptions in the SWDM as applied to replaced impervious surfaces on redevelopment projects.

6.0 REFERENCES

Allen, Janes. 1919. Improved Roads By County and Benefit Districts (Donohue Road Law), edited by State of Washington: Frank M. Lamborn, Public Printer, Olympia, WA.

King County. 1985. Special Information Bulletin: Department of Public Works, Surface Water Management Division.

King County. 2016. *King County Comprehensive Plan: History and background*. Office of the Executive 2016 [cited 2016/12/21 2016]. Available from http://www.kingcounty.gov/depts/executive/performance-strategy-budget/regional-planning/king-county-comprehensive-plan/history.aspx.