This document presents information and reflects the status of planning process on date of the Advisory Group meeting. Some content may no longer be applicable as the planning process has evolved.

Advisory Group Meeting #3: Briefing Document

Introduction

This briefing document provides Advisory Group members with the background information needed to engage in discussions at the October 9th Clean Water Plan Advisory Group Meeting. The purpose for the meeting is to:

- Share King County thinking and receive Advisory Group input on some of the decisions that will shape future investment strategies.
- Hear from the Advisory Group about how the County can systematically evaluate potential water quality investments, including considerations of Community and King County Priorities in the evaluation.

Background and Update on the Planning Process

As a reminder, King County is convening this discussion because it is facing critical decisions that will shape the scope and focus of regional water quality investments and actions for decades to come. The Clean Water Plan represents a community investment that is a major opportunity to contribute to the economic, social, and ecological health of the region.

After reflecting on progress one year into Clean Water Plan development, King County has decided to accelerate the planning process with a goal of presenting the plan to the King County Council at the end of 2021, rather than the previous schedule of 2022.

The County has made this decision to be responsive to the growing need to make tough decisions on water quality, aging infrastructure, and increasing pressures of current and proposed regulatory requirements. King County is confident the shift in the planning process will not impact the quality of the process or the plan. The objective and desired outcomes of the planning process remain the same and the fundamental question the planning process will address is:

What is the most appropriate path to ensure we direct the right public investments to the right actions at the right time for the best water quality outcomes?

Discussion of Decisions

Over the summer, the planning team identified regional trends, specifically trends that impact regional water quality, water resource or ecosystem management efforts, or King County Wastewater Treatment Division (WTD) operations. The trends were provided to the Advisory Group in the briefing document prepared for the second meeting held July 24th, 2019. These trends inform the types of decisions that will need to be made through the Clean Water plan process.

At this phase of the process, the planning team has identified eight preliminary decision areas:

- Treatment Plants
- Pollution Source Control/Product Stewardship
- Stormwater and Combined Sewer Overflows (CSOs)
- Wastewater Conveyance System
- Asset Management, Resiliency, and Redundancy
- Legacy Pollution
- Resource Recovery
- Finance

For the October 9th meeting, the County has explored three of the decision areas, questions, and some of the considerations for each decision to provide real-world examples of the types of decisions that will shape King County's future investment strategies. These decisions are complex.

King County is developing an existing conditions report to support the Clean Water Plan. The report will present the need for the Clean Water Plan and describe relevant conditions in the region. A draft outline for the report is included as Appendix A. As the decisions below are discussed, please share any recommendations on other items to add to the outline or any specific existing condition areas you would like more information on to engage in discussions at Advisory Group meetings in the future

Decision: Treatment Plants - What treatment plant investments should be made?

To answer the above question on treatment plants, the planning process needs to identify the desired level of pollutant removal to target while ensuring capacity to accommodate growth. Here are some of the items that will need to be considered as part of that decision:

- Will construction of additional treatment plant(s) be needed to serve a growing population?
- Will construction of additional treatment plant(s) be needed to treat wastewater to a higher water quality standard?
- What is the cost of pollutant reduction as compared to water quality benefits given the diminishing marginal return on investment with additional pollutant removal? What does that tell us about how to best set priorities for our water quality and ecosystem health investments?
- In addition to water quality, what are the environmental impacts (positive and negative) of wastewater treatment plants?
- How can the County ensure that funding of treatment plant upgrades and siting of any potential new wastewater treatment facilities is equitable?

Decision: Pollution Source Control/Product Stewardship - Are there more efficient or effective methods than wastewater treatment to address pollutants of concern?

To answer the above question on pollution source control and product stewardship, the planning process needs to investigate if limiting harmful chemicals in consumer products and manufacturing can mitigate or reduce the need for additional treatment or enhance the resource value of the end products of wastewater treatment. Here are some of the items that will need to be considered as part of that decision:

- Are existing pollution control programs—for example wastewater industrial pretreatment programs and local hazardous waste programs—sufficient to address harmful chemicals in consumer products?
- Is limiting harmful chemicals in consumer products and manufacturing more cost effective than wastewater treatment?

- Are there differences in personal consumption of consumer products across socio-economic groups that result in inequities in how harmful chemicals in products impact the environment and/or how the removal of pollutants is paid for?

Decision: Stormwater and Combined Sewer Overflows - What approach should be taken to address stormwater and combined sewer overflows in King County's System?

To answer the above question on stormwater and combined sewer overflows (CSOs), the planning process needs to consider if the existing combined sewer overflow control strategy results in the best water quality benefit. While doing this, the team will investigate other combined sewer overflow and/or stormwater management techniques and their water quality benefit. Here are some of the items that will need to be considered as part of that decision:

- Are there other approaches to CSO control and stormwater management that provide better water quality outcomes than the current plans for CSO control?
- Are current approaches to CSO control and stormwater management effective in addressing the current and predicted volumes of stormwater and pollutant loading?

Community and King County Priorities

In Spring 2019, the County began a regional, multi-stakeholder, community-based, intensive public outreach and engagement effort. This effort aimed to break down barriers to involvement and collect input from all kinds of people—including both long-time participants in water quality discussions and new interested and impacted parties. Through all the outreach activities, including the Advisory Group meetings, people told the County their priorities for planning our region's clean water future. The priorities continue to evolve as the County conducts additional outreach, and a list of draft Community and King County Priorities has been included as Appendix B.

At the October 9th meeting, the County would like to discuss with the Advisory Group approaches to incorporate two of the priorities to evaluate potential water quality investments.

Prioritize the best water quality outcomes for our investments: In support of obtaining the best overall water quality and ecosystem health for our Clean Water Plan investments, community members suggest setting priorities based on the most effective solutions for water quality, considering sharing costs across departments and agencies, and emphasizing policies, programs, and projects that provide multiple benefits to the Puget Sound region. In further support of this priority, community members suggested studying the cost and impact of different pollution removal efforts to determine the most effective investment of the public's money. For example, a study could explore the comparative cost and impact of meeting combined sewer overflow control regulations and stormwater runoff pollution reduction. Community input also highlighted the importance of collecting robust, meaningful data to better understand how to measure water quality success.

Ensure benefits and impacts are distributed and experienced equitably: Community members expressed support for helping address historical inequities related to water quality policies, programs, and projects. Due to historical and systemic inequities in decision making and policy, people of color, native, low income, people with disabilities, refugee and immigrant communities do not experience the same quality of life as other residents. This includes exposure to pollution. There is a need for focused effort to redress these disparities because without those efforts, communities will continue to suffer disproportionately from the impacts of environmental pollution and climate change.

Appendices Included in This Brief

The following appendices include relevant additional information about the decision areas and priorities. This section includes the following:

- Appendix A: Existing Conditions Draft Report Outline
- Appendix B: Draft Community & King County Priorities
- Appendix C: King County's Water Quality Benefits Evaluation
- Appendix D: Cost of Wastewater Treatment in Comparison to Pollutant Removal
- Appendix E: Stormwater Runoff Estimates in King County
- Appendix F: Equity and Opportunity in King County
- Appendix G: US Water Alliance Pillars of Water Equity

Appendix A: Clean Water Plan Existing Conditions – Draft Report Outline

Background and Need for the Clean Water Plan

1. Issues facing the region
    a. Population growth
    b. Aging infrastructure
    c. Regulatory landscape
    d. Climate change
    e. Ecosystem health
    f. Social and environmental justice
2. Purpose of the Clean Water Plan
3. Purpose of the Existing Conditions Report

Planning Area

1. King County wastewater treatment service area and receiving waters
2. Environmental setting
    a. Geography, geology, and climate
    b. Habitat and ecosystem
    c. Recreational, commercial, and industrial uses
    d. Community Values
3. Population and demographics
4. Land use
5. Economic conditions
    a. Historical growth
    b. Major industries/employers
    c. Income disparity
6. Governance

King County Existing Conditions

1. Historical context
    a. Regulatory history
    b. Treatment plant history
    c. Conveyance system history
2. Wastewater collection
    a. Sewersheds
    b. Collection system
    c. Combined sewer system
    d. Sanitary sewer system
    e. Pump stations
    f. I/I management
    g. Already planned improvements
3. Wastewater treatment
    a. Wastewater treatment plants
    b. Wastewater flows and loads
    c. Wastewater technology
    d. Already planned improvements
4. Wet weather management
5. Water quality
    a. Existing water quality
    b. Urban Streams
    c. Lake Washington
    d. Duwamish Estuary
    e. Elliott Bay
    f. Lake Union/Ship Canal
    g. Central Basin Puget Sound
    h. Legacy pollution (map of impacted areas)
    i. Source control
    j. Industrial wastewater source control

    k. Hazardous waste program (e.g., pharmaceuticals)
    l. Stormwater source control
    m. Education programs
    n. Product stewardship (e.g., flushable wipes)
    o. Discharge requirements
    p. Already planned improvements
    q. Related planning questions (sidebar to section)
6. Asset Management, resiliency, and redundancy
    a. Aging infrastructure
    b. Asset management program
    c. Data management
    d. Risk management
7. Asset Management, resiliency, and redundancy
8. Operations and staffing
9. Resource recovery
    a. Biosolids
    b. Energy
    c. Recycled Water
    d. Already planned improvements
    e. Related planning questions
10. Financial planning
11. Financial Management Overview
    a. Current Capital Improvement Plan and Operational (O&M) Costs
    b. Existing rate structure
    c. Historical revenues and investment distribution
    d. Current revenues and capital spending
    e. Utility rate affordability

Appendix B: Community & King County Priorities

Through all the outreach activities, we asked people to tell us their priorities for planning our region's clean water future. Here is a list of the priorities we heard, separated into values (what people care about), frequently-cited problems, and suggested solutions. The priorities continue to evolve as the County conducts additional outreach, and the list of draft Community and King County Priorities is current as of October 2, 2019.

Protect and restore our rivers, lakes, and Puget Sound

Values:

- Water serves a key role for cultural, spiritual, recreational, ecological, and commercial needs
- Protect water for future generations and make it accessible to all

Frequently-cited problems:

- Stormwater is a major pathway for contaminants to enter waterways
- Point-source pollution (pollution coming from a discrete source such as a pipe) needs to be reduced
- Address legacy contamination, like in the Duwamish River

Suggested Solutions:

- It is important for the Clean Water Plan to address both stormwater and wastewater
- Increase stormwater management, in place of or in addition to reducing other sources of pollution
- Prevent pollution from being produced in the first place
- Consider advanced treatment for potential water quality improvement opportunities, such as reverse osmosis or other processes that take more pollution out of the water
- Explore the role of agricultural runoff management to help reduce the amount of pollution that travels from farms to waterways

Prepare for and prevent climate change

Values:

- The County needs to invest in actions to prepare for and prevent climate change

Frequently-cited problems:

- Climate change will add pressure to ecosystems as habitats change, and there will be uncertainty in predicting outcomes due to future changes
- Sea-level rise could impact existing pipes and treatment facilities
- Wetter winters mean more water enters the sewer system
- Drier summers mean more water will be needed for irrigation
- Infrastructure needs to be updated to be able to adapt to climate change

Suggested solutions:

- The Clean Water Plan should be adaptable to the changing context of climate change
- Recover resources from wastewater, like biosolids, energy, and recycled water
- Encourage water conservation

Avoid sewer system failures

Values:

- Sewer system failures impact people's ability to enjoy local bodies of water, which are important for our quality of life
- King County is responsible for managing the regional sewer system to protect public health and the environment

Frequently-cited problems:

- System failures and sewage spills from treatment plants and pipes have happened
- Aging infrastructure creates a risk of more frequent failures

Suggested solutions:

- Prioritize repair and upgrades for the aging sewer system to prevent sewage spills from treatment plants and pipes
- Prioritize resilience to system failures as a key component in supporting the needs of the growing region

Protect public health

Values:

- Community members want to be able to swim and fish without the risk of getting sick
- Due to the spiritual nature of water, the region's waters should continue to be a source of healing and should contribute to positive health outcomes
- Being near water in people's daily lives contributes to their mental health and overall well-being

Frequently-cited problems:

- Polluted water can make people sick and contaminate fish and shellfish that people eat
- Stormwater is a major pathway for many contaminants to enter waterways

Suggested solutions:

- Prevent fish and shellfish contamination, and reduce peoples' exposure to bacteria and contaminants
- Keep beaches open and accessible for recreation and other purposes
- Pursue new technologies and pollution control upgrades

Support healthy habitats for fish and wildlife

Values:

- A healthy ecosystem should include special consideration for protecting and enhancing critical habitat
- The health of threatened species like orcas and salmon are strong indicators of the health of other species in our water bodies
- Addressing water quality is part of a larger picture of the interconnected land, trees, and humans in the region

Frequently-cited problems:

- Orca and salmon face an even greater threat of extinction due to food and habitat challenges
- These species are also exposed to bacteria and contaminants of emerging concern

- Climate change will add further pressure and uncertainty to ecosystems

Suggested solutions:

- Protection for habitat and species will involve moving beyond a simple focus on water quality improvements
- Protect and enhance critical areas around Puget Sound and waterways, such as the Cedar River

Keep rates affordable in the context of the growing region

Values:

- The Clean Water Plan should consider how much people living in this region and the community overall will be able to afford to pay, in the context of other regional investment needs
- Focus on affordability of wastewater services across populations

Frequently-cited problems:

- The cost of living in King County continues to rise
- Residents who are unable to afford utility bills, in combination with other expenses, continue to be displaced outside of their homes and neighborhoods
- Investments will be funded in the context of a region with growing income disparity and an increasing cost of living
- There is growth in low- and high-income populations and a shrinking middle-income population

Suggested solutions:

- Sewer rates should be set with consideration for how much individuals and families can afford, and options should address the needs of lower-income populations
- Costs might be shared across departments and agencies
- The private sector could be a potential source for financial partnership

Ensure benefits and impacts are experienced equitably

Values:

- We must address historical inequities related to water quality programs, policies, and projects
- The voices of people of color and other underrepresented communities should be valued in water quality decisions

Frequently-cited problems:

- Due to historical and systemic inequities, people of color, native people, low income people, people with disabilities, refugees, and immigrant communities do not experience the same quality of life as other residents, including exposure to pollution
- Without specific attention and focused efforts, underrepresented communities will continue to suffer disproportionately from the impacts of environmental pollution and climate change

Suggested solutions:

- Honor and incorporate the relationship between native people and Puget Sound, rivers, and lakes
- Respect Tribal treaty rights, safeguard access to traditional and cultural food sources, and ensure American Indian and Alaskan Native community's ability to subsistence hunt and fish
- Incorporate equity and social justice goals and address historical discrepancies in costs and benefits associated with pollution
- Focus plan improvements in areas where damages have been the greatest

Communicate with the public about the plan

Values:

- It's important to invest in community engagement. The goal of this engagement should be to help people understand the Clean Water Plan so they can provide feedback and create a stronger Clean Water Plan
- Be transparent and help people participate in the Clean Water Plan process

Frequently-cited problems:

- Past efforts have led to underrepresentation in public processes that did not reach certain populations

Suggested solutions:

- Do early outreach to historically underrepresented communities
- Do meaningful outreach to youth and consider the impacts of water quality decisions on younger generations
- Target communications to the full range of multicultural communities (such as immigrant populations) and generations in the region, and understand how priorities may differ across those communities
- Engage with young leaders who may have a different perspective on sustainability and the right investments for water quality
- Review and replicate effective youth engagement efforts
- Provide the community with tools for conserving water and preventing pollution, such as rain gardens

Maintain an effective wastewater treatment workforce

Values:

- Community members, especially WTD staff, are invested in successful future conditions of the wastewater treatment workforce in the region

Frequently-cited problems:

- The agency faces increasing challenges in employee retention, increasing staff retirement, and succession planning
- Housing affordability in the region impacts wastewater treatment staff, as they may be unable to afford to live in the areas where they work

Suggested solutions:

- Pursue workplace equity and diversification
- Transfer knowledge via apprentice programs

Increase collaboration between agencies and departments

Values:

- The Clean Water Plan should be a coordinated and collaborative effort
- A full range of partnerships and interagency/interjurisdictional collaboration is available and should be leveraged to address the region's complex water quality and ecosystem challenges

Frequently-cited problems:

- There is a risk that the Clean Water Plan would duplicate or be out of sync with existing efforts
- A mix of pollution sources and individual and institutional behaviors impact regional water quality and ecosystem health

- Incidents cannot be fully addressed without an integrated approach

Suggested solutions:

- Coordinate efforts across King County departments such as transportation, land use, and housing
- Consider the private sector as a potential partner for financing projects and implementing sustainable business practices related to water quality
- Integrate water quality considerations into the regulatory and permitting processes for land use development to address impacts of future growth
- Use an interagency approach to manage legacy contamination and improve efficiency
- Look for opportunities to collaborate on green infrastructure, affordable housing, and improving natural and built environments; and explore the use of ecosystem services, certifications (e.g., Salmon Safe Certification), and incentives

Prioritize the best water quality outcomes for our investments

Values:

- Obtain the best overall water quality and ecosystem health for our Clean Water Plan investments
- Provide good stewardship of public dollars

Frequently-cited problems:

- Water quality investments can be costly and can vary substantially in their contribution to water quality improvements

Suggested solutions:

- Set priorities based on the most effective solutions for water quality
- Emphasize policies, programs, and projects that provide multiple benefits to the Puget Sound region
- Consider sharing costs across departments and agencies
- Invest in resource recovery (biosolids, energy, and recycled water) and water conservation
- Prevent pollution at the source instead of treating water (both stormwater and wastewater) after it is polluted
- Study the cost and impact of different pollution removal efforts to determine the most effective investment of the public's money—for example, a study could explore the comparative cost and impact of meeting combined sewer overflow (CSO) control regulations and stormwater runoff pollution reduction
- Collect robust, meaningful data to better understand how to move forward and accurately measure water quality success

King County's Water Quality Benefits Evaluation

Identifying how we can make the biggest impact on our region's water quality

King County is developing tools to help determine the most effective ways to leverage our efforts

King County is committed to investing billions of dollars in water quality improvements in the next decade, but how do we strategically prioritize our actions? Specifically, how can we determine the relative benefit of actions that reduce one pollutant over another? And what combination of actions could we expect to be most effective?

To help answer these questions, we need to start by identifying why we want to improve water quality.

We improve water quality TO PROTECT:

The health of humans interacting with the water, through swimming or eating fish and shellfish.

The health of aquatic animals, especially endangered or threatened species such as Chinook salmon and Southern Resident orcas.

Identifying benefits and tradeoffs

The tools developed under this project will provide decision-makers with information about which water quality projects and programs could be most effective in reducing threats to people and aquatic animals.

For example, the table below illustrates how actions can affect water quality differently. Actions could be more effective at reducing one pollutant over another and have different impacts on human and animal health. For example: Option B is most effective at reducing pollutant B and threats to safe fish consumption.

POTENTIAL PROJECTS AND PROGRAMS	LOAD REDUCTIONS			THREAT REDUCTIONS				
	Pollutant A	Pollutant B	Pollutant C	Edible fish	Swimming	Shellfish harvesting	Chinook salmon	Orca
Option A	●	○	○	○	●	●	○	○
Option B	○	●	○	●	○	○	◒	◒
Option C	◒	○	●	◒	○	◒	◒	◒

SYMBOLS: ● High reduction ◒ Medium reduction ○ Low reduction

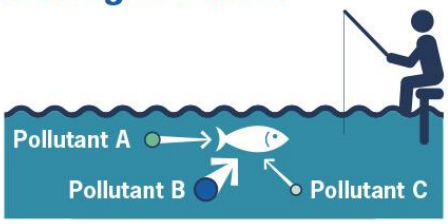
(Continued)

King County
Department of Natural Resources and Parks
Wastewater Treatment Division
Water and Land Resources Division

King County's Water Quality Benefits Evaluation

Steps for developing and using the tools:

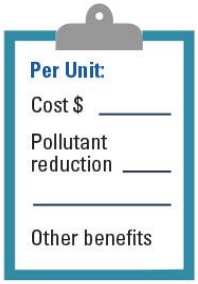
1. Using the latest science and expert input, determine the biggest threats to what we are working to protect.



2. Identify the sources and pathways of these threats and estimate pollutant loads across the landscape.

3. Determine what preventative and corrective actions can be taken to reduce these threats and estimate their effectiveness and cost per unit.

Examples



4. Use the tools to determine the most cost-effective combination of actions across the watershed that provide the greatest reductions in the pollutants causing the biggest threat to what we're working to protect.

King County
Department of Natural Resources and Parks
Wastewater Treatment Division
Water and Land Resources Division

Clean Water Healthy Habitat

Project Timeline

Method Development

Q3 2019 - Q4 2019

Refine project plan and methods to develop effective tools.

Tool Development

Q4 2019 - Q3 2020

Build the tools and get feedback from experts.

Evaluation/Reporting

Q4 2020 - Q2 2021

Use the tools to determine which types of projects and programs are most effective at protecting the health of humans and animals interacting with water.

King County will use the outputs from these tools to identify projects and programs with the greatest water quality benefits.

For more information, please contact:
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KCIT-DCE file: 190820_9730w_wq_bene_eval_fact.ai

Appendix D: Cost of Wastewater Treatment in Comparison to Pollutant Removal

Using wastewater treatment to remove nutrients or trace chemicals will require more complex technologies. National research by the Water Environment Research Foundation and preliminary evaluations by King County indicate constructing and operating these more complex technologies typically has higher costs, consumes more energy, and requires more space. The general consensus among industry professionals is that the unit cost of treatment increases exponentially as the last bit of pollutants are removed. Greater energy consumption is also associated with more complex wastewater treatment technologies and contributes to greenhouse gas emissions.

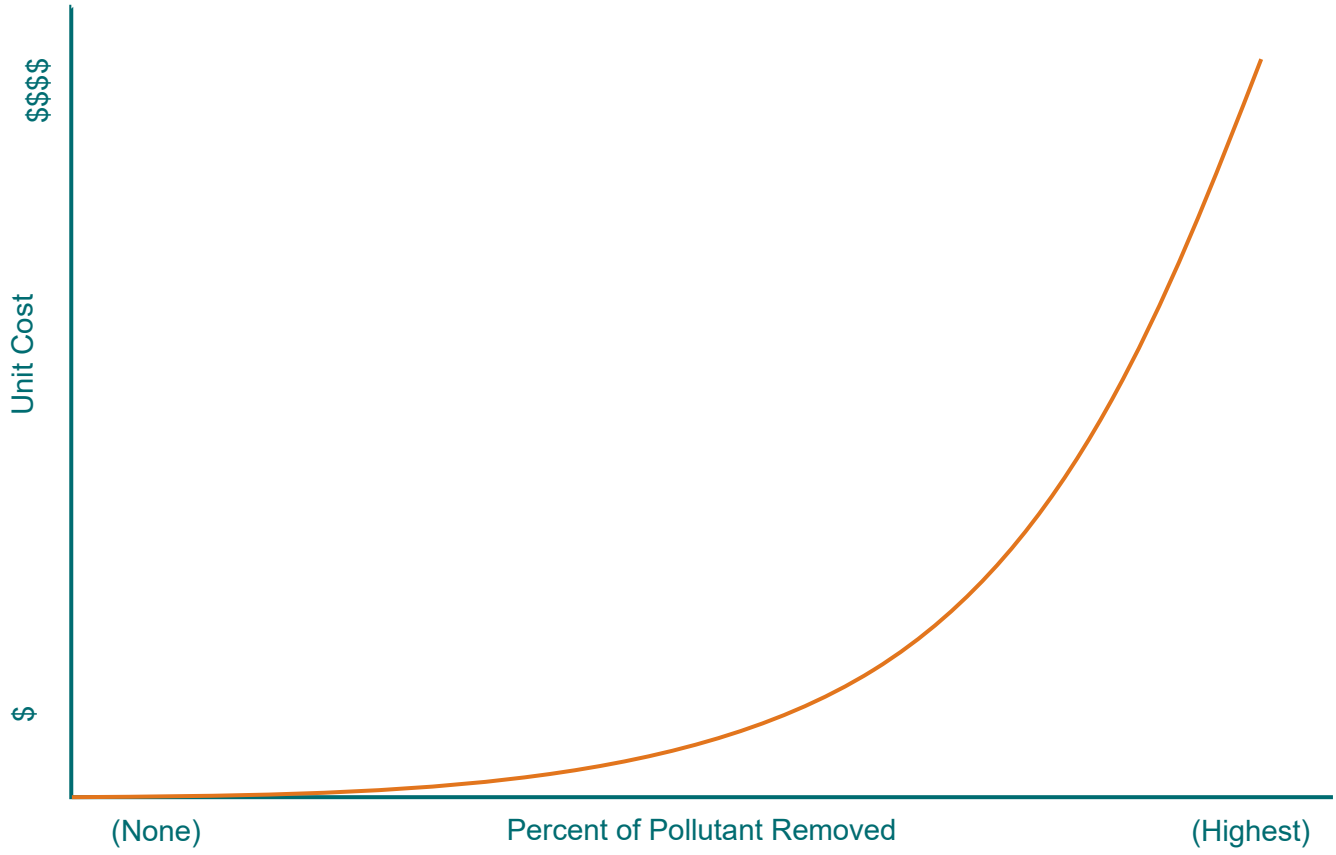


Figure 1. The law of diminishing marginal return: the cost of removing each additional unit of pollutant rises exponentially

Appendix E: Stormwater Runoff in King County

Introduction

In Fall 2018, King County conducted an analysis[1] to estimate the volume of stormwater runoff entering receiving waters (streams, lakes, wetlands, and excluding groundwater) in the county. The goal of this analysis was to quantify how much stormwater runoff to receiving waters is generated from rainfall on the developed landscape within King County under current conditions and to clearly articulate how much of that stormwater might be treated versus untreated.

Background

Stormwater runoff generated from the developed landscape is a ubiquitous problem. For more than a century, development in the Puget Sound region concentrated in the Seattle area and has expanded outward. As the population continues to grow and more land develops, the need to mitigate stormwater impacts increases.

Over the last several decades, resources have been directed to mitigate stormwater impacts from development. In 1990, King County added water quality treatment and substantially improved methodologies for flow control to its stormwater regulations. Water quality treatment is the removal of pollutants from the stormwater that runs off developed land while flow control is the limiting of rate and/or volume of the same stormwater runoff. By the time these mitigations were applied to new development, there were already over 1.5 million people living in King County. This means most of King County has been developed with little or no water quality treatment and flow control. Since 1990, the population has continued to increase nearly 2% each year. Development since 1990 has generally included both water quality treatment and substantially improved flow control, with the requirements for both strengthening over time to minimize new impacts and reduce previous impacts. For the purposes of this summary, the terms “stormwater treatment” and “treated stormwater” will hereafter mean the application of both water quality treatment and flow control to the runoff from developed land.

Annual Stormwater Estimates: King County

On average, King County experiences an estimated 145.7 billion gallons of stormwater runoff each year. It is estimated that 12.4 billion gallons (8.5%) of the county-wide stormwater runoff is currently treated (see below for WTD-specific estimates). Excluding WTD contributions, the total stormwater runoff from developed land is 133.3 billion gallons.

Within the incorporated city areas, stormwater management is performed by the respective local governments. There are 39 cities in the incorporated area with a total geographic area of approximately 430 square miles. This area is generally characterized by urban and suburban development and its associated impacted/disturbed surfaces. A summary of the estimated annual average stormwater volumes is presented in Table 1 below.

[1] The analysis estimating the volume of stormwater runoff from developed land countywide was simplified for this summary. All content in this summary is from “Technical Memo: Updated Estimate of the Annual Average Volume of Treated and Untreated Stormwater Runoff from Developed Lands in King County” by Jeff Burkey, Hydrologist, Science and Technical Support Section, WLR Division prepared on November 28, 2018

Table 1. Annual Average Stormwater Runoff Volume (in Billions of Gallons) from Developed Lands in King County

Area	Treated (% of Area Total)	Untreated (% of Area Total)	Total	% of Overall Total
A. Seattle	13.9 (67%)	6.8 (33%)	20.7	14%
B. Urban Outside Seattle	10.1 (14%)	60.1 (86%)	70.1	48%
C. All Urban (A + B)	24 (26%)	66.9 (74%)	90.8	62%
D. Rural	3.1 (6%)	51.7 (94%)	54.9	38%
All King County (C+ D)	**27.1 (19%)**	**118.6 (81%)**	**145.7**	**100%**

Treated Stormwater Estimates: Treated stormwater county-wide totals average 27.1 billion gallons. Excluding WTD contributions, treated stormwater county-wide totals average 14.7 billion gallons.

Untreated Stormwater Estimates: On average, a total of 118.6 billion gallons of untreated stormwater discharges into open bodies of water. Excluding WTD contributions, untreated stormwater county-wide totals an average of 118 billion gallons.

Annual Stormwater Estimates: WTD Service Area

When stormwater enters into WTD's combined sewer system, there are three possible outcomes:

1. Stormwater and sewage receive secondary treatment at a regional treatment plant,
2. Capacity has been exceeded in part of the system, but receives primary treatment through a CSO wet weather treatment station, or
3. Capacity has been exceeded in part of the system and discharges through outfalls as untreated stormwater and sewage.

Treated Stormwater Estimates[2]: Treated stormwater collected in the WTD service area, including City of Seattle, totals on average 12.4 billion gallons for existing conditions. For future conditions, with all CSO projects completed, the treatment volumes increase four percent to 12.9 billion gallons.

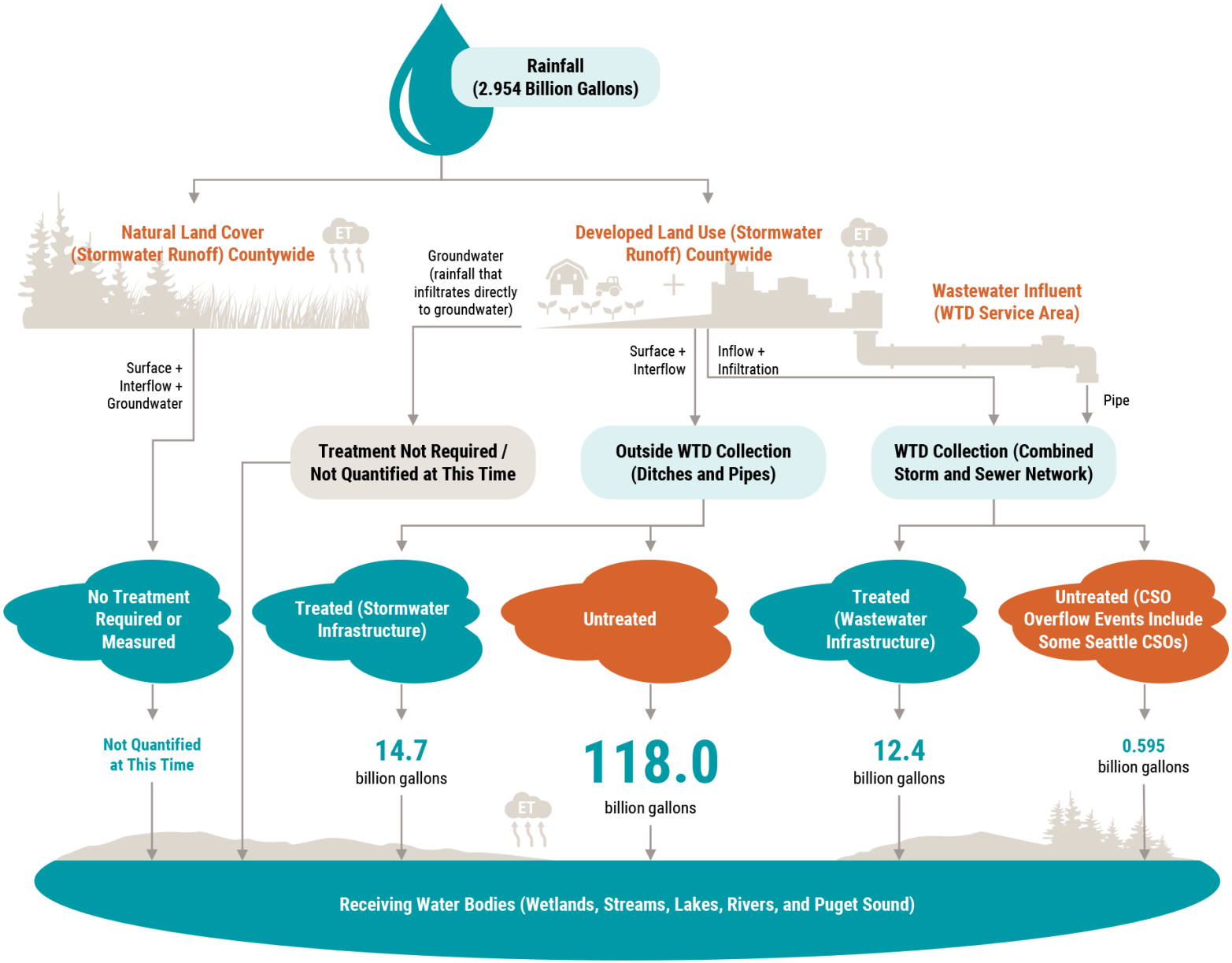
Untreated Stormwater Estimates: For the collection areas within the WTD service area, it is estimated that, on average, a total of 593 million gallons of untreated stormwater (527.6 million gallons from King County CSOs and 65.4 million gallons from City of Seattle CSOs) discharges into open bodies of water. This estimate includes a portion, but not all of City of Seattle's CSO discharges.

Conclusion

Taking into consideration the sensitivity of the assumptions made, the average annual volume of stormwater runoff (treated and untreated) from developed land is estimated to be at least in the 100 billion gallon range; for this analysis, it's assumed to be 145 billion gallons. Less than 20% of that runoff is considered treated. Of that 20%, WTD's combined system accounts for almost half of that treatment. However, even if WTD has constructed all planned CSO projects and treats over 99% of the stormwater collected in the combined system, that still only accounts for 9% of the total stormwater volumes.

[2] Treated stormwater runoff is runoff that is treated either by stormwater facilities or through the King County Wastewater Treatment system.

Figure 2. Flow chart illustrating the simplified universe of rainfall and runoff for this analysis. Note that runoff from natural land cover and rainfall that directly infiltrates to groundwater is not quantified at this time.



** existing conditions, estimates are annual volumes, on average*

Appendix F: Equity and Opportunity[3]: What Does it Mean for King County?

At a glance, King County is a great place to live, learn, work, and play: a robust and innovative economy, stunning natural beauty, a thriving culture and arts scene, and an openness to diversity make King County a vibrant home to over 2 million people. But when you look closer, significant portions of our community are being left behind. People of color generally do not experience the same quality of life as white residents.

Race and Place Predict Whether People Have the Opportunity to Thrive

What do all residents need to reach their full potential? King County has identified the following 14 Determinants of Equity that each of us need to thrive:

[3] Source for data: kingcounty.gov/exec/buildingequity/sources

Appendix G: US Water Alliance: The Pillars of Water Equity

In "An Equitable Water Future: A National Briefing Paper," the US Water Alliance outlined the critical challenges facing the water sector, how they impact vulnerable communities, and the practices and strategies organizations can apply to advance water equity in the US. The following is a summary of the Pillars of Water Equity[4] framework from this report:

Pillar 1: Ensure all people have access to clean, safe, affordable water service

While most people in this country are provided with safe, reliable, affordable, water and wastewater services 24/7, there are millions of people who lack access. Some areas have never had adequate water and wastewater infrastructure, and others struggle with aging systems, unaffordable rates, and poor water quality. Other areas lack access to clean lakes, rivers, and beaches that provide free, healthy public spaces and leisure activities. Vulnerable communities without other recreational options are particularly affected when water bodies and coastlines are threatened.

Creating an equitable water future means providing all people with access to clean, safe water at a price they can afford. To achieve this, collaboration and co-investment by all levels of government, water providers, the private sector, community-based organizations, and others is critical.

Pillar 2: Maximize the community and economic benefits of water infrastructure investment

While nature provides water, it takes pipes, pumps, and people working 24/7 to deliver clean water to homes and businesses, and to remove and treat wastewater. The infrastructure we rely on is aging and in need of renewal. Across the country, utilities are investing billions of dollars to address America's water infrastructure crisis and bring systems to a state of good repair.

As utilities undertake capital projects, they can advance water equity at every stage of the process. The water sector provides solid, living-wage jobs that are excellent steppingstones to the middle class. Tremendous potential exists to leverage water investments for local employment and career pathways, business development and contracting opportunities, educational programs, and neighborhood improvements. Partnering with community-based organizations, nonprofits, labor unions, and philanthropic organizations can maximize these outcomes.

Pillar 3: Foster community resilience in the face of a changing climate

The impacts of a changing climate are often experienced as water challenges. Changing precipitation patterns due to rising temperatures create droughts in some areas and floods in others. Heavy rainfall overburdens stormwater systems, flooding homes and neighborhoods. Extreme storms damage coastal communities and waterfronts. Lower-income communities are often the most vulnerable in the face of a changing climate. They are more likely to live in low-quality housing, lack insurance, and have fewer resources to rebuild and recover.

Climate planning at the utility, city, regional, and state level is key to preparing for the water impacts of climate change. As government agencies develop climate action plans, incorporating equity concerns into planning, funding, and implementation can create more resilient communities.

[4] US Water Alliance, Water Equity Clearinghouse: The Pillars of Water Equity, http://uswateralliance.org/wec/framework (Accessed September 29, 2019)