King County Auditor's Office
Kymber Waltmunson, King County Auditor
King County

Performance Audit of the Georgetown Combined Sewer Overflow Project

Larry Brubaker
Brooke Leary
Chantal Stevens
David Dean

September 9, 2014

Executive Summary

The Wastewater Treatment Division (WTD) has some best practices in place for managing large capital projects. However, WTD selected its preferred alternative for controlling sewer overflows in the Georgetown area based on insufficient analysis of alternatives. Project costs are expected to increase substantially, and WTD lacks mechanisms to control project cost growth in early project development phases. We recommend that WTD consider alternatives to the projects identified in the Combined Sewer Overflow Control Plan, develop performance measures, and provide additional oversight to control project cost growth and minimize potentially substantial program cost and rate increases.

King County Auditor's Office

Advancing Performance and Accountability

Mission: We promote and improve performance, accountability, and transparency in King County government through objective and independent audits and studies.

Values: **Independence** ~ **Credibility** ~ **Results**

The King County Auditor's Office was created by charter in 1969 as an independent agency within the legislative branch of county government. The office conducts oversight of county government through independent audits, capital projects oversight, and other studies. The results of this work are presented to the Metropolitan King County Council and are communicated to the King County Executive and the public. The King County Auditor's Office performs its work in accordance with Government Auditing Standards.

King County Auditor's Office
Kymber Waltmunson, King County Auditor
King County

Georgetown Combined Sewer Overflow Project

Report Highlights

September 9, 2014

Purpose

The County Council has been concerned about the cost growth of the combined sewer overflow (CSO) program, as planning-level estimates provided to the County Council in the 2012 CSO Control Plan were double previous planning-level estimates. This audit of the Georgetown CSO project focuses on how the Wastewater Treatment Division manages projects in the early development phase when significant cost growth has occurred on CSO projects in the past.

Key Audit Findings

WTD is experienced in managing large capital projects and follows some best practices. However, WTD selected wet weather treatment as the final alternative for controlling sewer overflows in the Georgetown area based on imprecise cost estimates and insufficient analysis of other alternatives. Early indications are that costs are likely to grow substantially for the Georgetown project. Further, the alternative WTD selected for the Georgetown project presents inherent risks that could add substantially to project costs. These issues raise significant questions about whether WTD selected a cost-effective alternative.

WTD's planning-level cost estimation process needs improvement and King County faces potentially significant increases on projects in its CSO program, including the Georgetown project. For instance, project costs on four ongoing CSO projects have grown by 47 to 533 percent since WTD provided planning-level cost estimates to decision-makers. If final costs for projects in the 2012 CSO Control Plan exceed planning-level estimates by the same margin, the total cost of the program could be approximately $2.6 billion, substantially higher than the $711 million program cost presented in the 2012 CSO Control Plan.

Projects specified in King County's CSO consent decree with the Department of Justice were selected based on less analysis than is typical for projects of this magnitude. However, it may be possible to modify the terms of the consent decree to increase project benefits and reduce project costs.

What We Recommend

To help ensure cost-effective action on the part of WTD, we recommend that WTD conduct additional analysis of alternatives for controlling sewer overflows and create performance measures and other mechanisms for better controlling project cost growth during early project development phases.

Table of Contents

1. WTD Decision-Making Practices 1

2. Alternatives Analysis for the Georgetown Project 9

3. Consent Decree 16

Appendices

Appendix 1 19

Executive Response 21

Statement of Compliance, Scope, Objective & Methodology 25

List of Recommendations & Implementation Schedule 26

1. WTD Decision-Making Practices

Section Summary

The Wastewater Treatment Division (WTD) follows some best practices in capital project management and decision-making, but could improve in key areas. WTD has some strong processes and practices to involve upper management in key project decisions, form integrated project teams, and incorporate lessons learned into the decision-making process. However, planning-level cost estimates used to inform decision-makers are less accurate than expected according to accepted cost estimation standards, and the structure of early project phases at WTD may create an environment that would allow project scope and costs to increase. WTD should improve its metrics, monitor the agency's final costs for projects relative to cost estimates used for County Council decision-making, and continue efforts to improve its early cost estimates.

WTD follows some best practices in capital project management and decision-making

WTD is experienced in managing large capital projects and follows some key best practices in capital project decision-making and management, including:[1]

- use of executive review committees and involvement of upper management in key decisions
- formation of integrated project teams
- consideration of lessons learned
- thorough process for assessment of potential project risks

Involvement of upper management: WTD uses executive review committees and involves upper management in key project decisions. For instance, the Capital Systems Team (CST) provides a forum for WTD management to monitor and control scope, schedule, and budgets on capital projects and to provide management approval at gate reviews.[2] Project teams provide the CST, which is comprised of section and unit managers throughout WTD, with decision packages at key project milestones and can require project teams to justify changes to a project's scope, schedule, or budget.

Notably, the CST does not provide oversight during the planning phase, in which WTD may assess and compare project alternatives. Since CST authority does not begin until a project receives a budget appropriation, the CST begins project oversight after WTD has already committed substantial resources and made major decisions. We further discuss the project

[1]GAO/AIMD-99-32, *"Executive Guide: Leading Practices in Capital Decision-Making,"* December 1998 (Washington D.C.).
[2]All WTD projects undergo formal review at four established check-in points, termed "gates," to ensure approved project objectives are met or that new/modified objectives are justified and documented.

alternative selection process in Section 2 of this report. According to WTD, planning-level decisions have their own gate process and go through the division and department director for review and approval prior to submittal to the County Council. In addition to the CST, WTD has a separate Management Oversight Team (MOT) that provides oversight and guidance specifically to CSO project managers.

Integrated project teams: WTD uses multidisciplinary teams to manage projects. For instance, according to WTD, the Georgetown project team includes members with expertise in engineering, modeling, project controls, permitting, infrastructure coordination, sustainability, and equity and social justice. WTD has also taken steps to develop project management teams with the right skills. For example, the Georgetown project has two project managers who WTD management selected through a competitive internal process. Since site selection is a key component of the project, WTD management selected one project manager with experience in this area along with a second project manager to focus on management of overall project scope, schedule, and budget.

Lessons learned: WTD has taken steps to establish processes to evaluate project results and incorporate lessons learned into decision-making. Under the new process, project managers are required to complete a form documenting lessons learned at the end of each project gate. WTD stated it keeps a log of lessons learned for future reference and internal project management tools prompt project managers to consider prior lessons learned at key points in a project. According to WTD, completing the Georgetown project in 2022 will allow the division to apply key lessons learned from the construction of a wet weather treatment facility to another second, larger wet weather treatment facility project that is scheduled to enter project development in 2023.[3]

In addition to capturing internal lessons learned, WTD is seeking out information and lessons learned from external entities with relevant experience. For the Georgetown project, WTD project team members toured completed wet weather treatment facilities and talked with officials in the Cities of Salem, Ore. and Tacoma, Wash. Project team members have also talked with officials familiar with the construction and operation of the wet weather treatment facility in the City of Bremerton, Wash.

[3]The Hanford, Lander, King Street, Kingdome project (HLKK) involves constructing a 151 million gallon per day wet weather treatment facility.

1. WTD Decision-Making Practices

Risk assessment: WTD has a robust risk assessment process in place. For example, WTD conducted a daylong workshop to develop a risk register for the Georgetown project, during which the project team was broken into subject areas to brainstorm potential risks and mitigations. Both the team and project management then further refined these lists, which WTD revisits on a regular basis. WTD stated that it begins considering potential risk early on in projects in order to assist in project decision-making and preliminary design work.

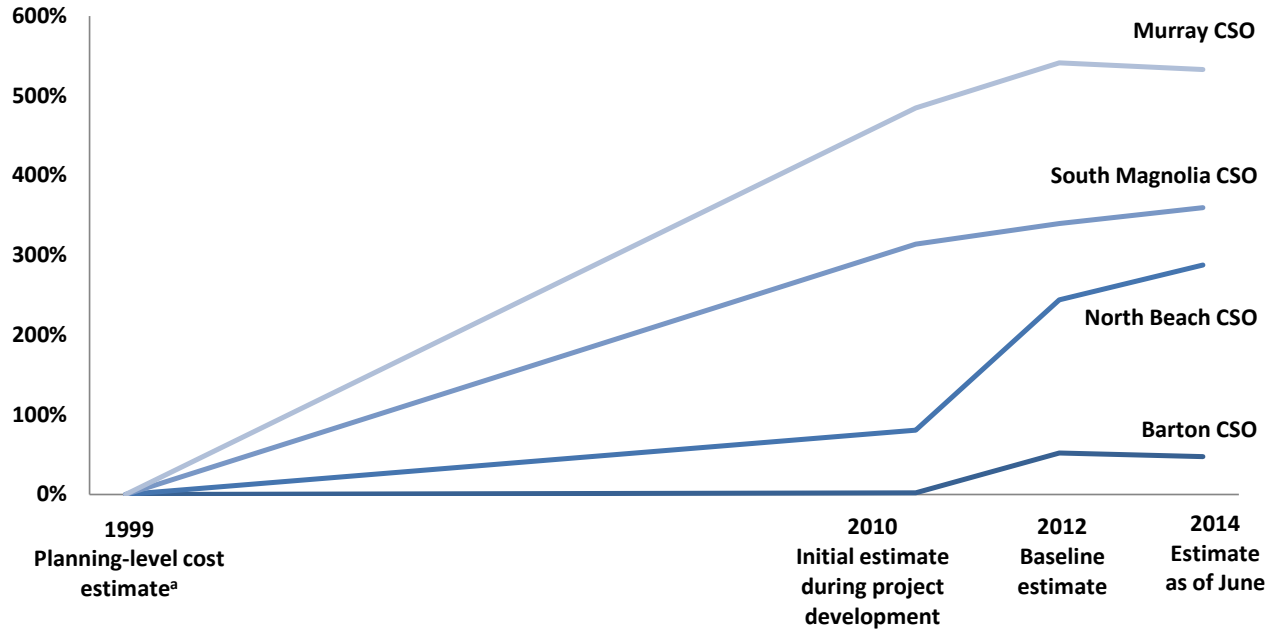
Planning-level cost estimates used to inform decision-making are more inaccurate than expected

Despite application of some best practices, cost estimates developed by WTD during the planning phase of capital projects are more imprecise than expected according to county cost estimation standards. For projects such as those described in the 2012 CSO Control Plan—which includes the Georgetown project—WTD develops planning-level, Class 5 estimates. Class 5 estimates have the widest possible range of uncertainty provided for under cost estimation guidelines: from -50 percent to +100 percent.[4] However, the estimates that WTD provides to the County Council to inform decision-making, can be even less accurate than the stated range. For example, implementation costs on three of the four CSO projects commonly referred to as the Beach Projects (Magnolia, North Beach, Barton, and Murray) exceeded planning-level estimates provided in 1999 by significantly more than 100 percent (Exhibit A). As of 2014, the South Magnolia project had exceeded its planning-level cost estimate of $10.5 million by more than 300 percent, and the Murray project had exceeded its planning-level cost estimate of $7.9 million by more than 500 percent.[5] Construction of both of these projects is ongoing.

[4]Estimate ranges developed by the Association for the Advancement of Cost Estimation (AACE). WTD has officially adopted AACE guidelines on cost estimation.
[5]WTD developed planning-level cost estimates in the 1994-1996 period. WTD published initial cost estimates in the 1999 Regional Wastewater Services Plan and adjusted them to 1999 dollars.

1. WTD Decision-Making Practices

Exhibit A: Planning-level cost estimates for most WTD beach projects have exceeded expected range.



All costs presented are in 2014 dollars.

[a]From the 1999 Regional Wastewater Services Plan
Source: King County Auditor's Office analysis of WTD data

WTD stated that it has historically made planning-level cost estimates based on a limited amount of project-specific information, which may limit the usefulness of these estimates to decision-makers. In some cases, key information was excluded from initial planning-level cost estimates. For instance, on the Georgetown project, information on costs of environmental mitigation, removal and remediation of hazardous materials or contaminated soils and sediment, demolition of existing structures, and the required 1% for public art were not included in the initial planning-level cost estimate. WTD stated that internal confusion over how to interpret the division's contingency policy and specific uncertainty over where WTD would site the Georgetown project led project managers to exclude this information from initial cost estimates.[6]

WTD also is not transparent about how cost estimates for some projects change over time in relation to initial planning-level cost estimates. Without reliable, consistent, and clear information on project costs, it is difficult for decision-makers—including WTD management and County Council—to understand the implications of project choices.

[6]WTD adds project contingency to a project to reflect the uncertainty about the future and as a buffer against the risk of underfunding a project. Contingency provides an element of flexibility in reacting to changing circumstances on a project.

1. WTD Decision-Making Practices

WTD has begun to take steps to improve its planning-level estimates for future projects. WTD stated that it changed its contingency policy for selected projects in 2013 to ensure that costs are more fully accounted for and applied the new policy to all projects starting in 2014. However, WTD has focused its efforts to improve cost estimation primarily on projects that have moved out of the planning phase. WTD has only recently begun to examine its process of cost estimation for project budgeting during the planning phase of projects. WTD stated it has hired a consultant to assess these areas and plans to include proposed updates to the process in the 2017 update to its Regional Wastewater Services Plan.

WTD plans to apply changes to its cost estimation practices for all future projects as well as to revised cost estimates for seven of the nine CSO control projects from WTD's 2012 CSO Control Plan in its 2017 update to the plan. WTD will not update cost estimates for two of the projects, Georgetown and Hanford at Rainier, because the projects have already been handed over to the project planning and delivery teams at WTD. WTD stated that it is likely that cost estimates for the seven projects will increase substantially. These revised estimates will still be subject to the -50 percent to +100 percent range of uncertainty. We discuss this in detail in the context of the Georgetown project below.

Recommendation 1

The Wastewater Treatment Division (WTD) should develop metrics and monitor information on the agency's final costs for projects relative to cost estimates used for County Council decision-making. WTD should work in conjunction with the County Council to determine a regular schedule for reporting on this information, such as including information on project costs in relation to planning-level cost estimates in funding requests.

Recommendation 2

The Wastewater Treatment Division (WTD) should continue to take steps to improve the quality of its planning-level cost estimates, including:

a) continuing to apply changes to WTD's contingency policy in its cost estimates
b) continuing to work with a consultant to identify and implement methods to improve planning-level cost estimates
c) developing planning-level cost estimation guidelines
d) developing techniques to use historical information to inform estimates of likely costs of projects
e) employing independent validation of early cost estimates

1. WTD Decision-Making Practices

WTD has accountability structures in place, but improvements could enhance control of project scope and budget

WTD has some structures in place to hold project managers and consultants accountable. In accordance with best practices, WTD requires project managers to report to high-level management oversight teams—such as the aforementioned CST and MOT—on matters related to project progress, potential project risks, scope, schedule, and budget. WTD also considers past performance when assigning team members to future projects, which may help motivate employee performance. WTD recently reinstated quarterly meetings between management and project managers to compare planned project cash flow to actual progress. In addition, WTD is specifically requiring the Georgetown project team to provide periodic briefings to WTD's director. Finally, WTD's Change Review Board oversees adherence to scope, schedule, and budget for specific contracts under specific circumstances. WTD has not assessed the efficacy of these structures, however, particularly for changes to scope, schedule, and budget proposed early in projects.

Insufficient performance measures for project managers

While WTD has some high-level accountability structures, the division could improve individual performance measures for project managers. According to WTD, the division assesses project manager performance based on adherence to scope, schedule, and budget. WTD stated that measuring performance on scope, schedule, and budget too stringently could set unreasonable expectations for project managers. However, while some oversight and performance management structures are in place, such as regular reporting on project status that feeds into annual performance evaluations for project managers, specific individual performance measures that focus on controlling scope, schedule, and budget during early project phases are not in place. Specific, individual performance measures, particularly during the period in which the most substantial project cost increases historically take place, may help project managers better understand agency expectations.

Potential incentives for project scope and cost growth

Project consultants may have an incentive to allow project scope and budget to increase. For example, on the Georgetown project, WTD has entered into a phased contract with a consultant.[7] The division expects to amend the contract to continue using the consulting firm for future project phases, including predesign and design. Since the consultant is responsible for developing the construction cost estimate that WTD will use to inform

[7]The consultant contract currently covers compensation for preliminary design phase work and may be amended to add compensation for work in future phases, including final design, construction, and project close out.

design costs for the next phase of the contract, and since WTD budgets for the design fee as a percentage of project construction costs, there may be an incentive for the consultant to maximize the construction cost estimate in order to maximize the firm's fee in the subsequent project phases. For example, if the estimated cost of a project increases from $50 million to $100 million, the budget for the design fee would also double.[8] Phased contracts are an accepted form for consultant agreements; however, best practice includes providing consultants with encouragement to achieve project cost, schedule, and performance goals. Without mechanisms to encourage adherence to scope, schedule, and budget, WTD may spend more on projects than necessary.

WTD's accountability gaps are most significant in early project phases

Gaps in project manager accountability and consultant incentives are typically most significant between project initiation and baseline, which is the phase the Georgetown project is in as of August 2014.[9] The period prior to project baseline is when the cost estimates for the four Beach CSO projects increased the most. Much of the increase in cost estimates during this period is attributable to the imprecision of the planning-level cost estimates. However, the project team and project managers for the Georgetown project have already made project recommendations that may result in higher project costs. For example, during the preliminary design phase Georgetown project managers recommended increasing the size of the site for the project treatment facility from two to four acres.[10] According to WTD, project managers made this recommendation to allow for previously unidentified operational needs, including truck turnaround allowances and space for ancillary buildings. These changes could substantially increase project costs.

Recommendation 3

The Wastewater Treatment Division should further develop performance appraisal criteria for project managers, including more specific criteria applicable to management of scope, schedule, budget, and project quality during preliminary design phase work.

[8]While the budget for the consultant design fee is established as a percentage of construction costs, the actual design fee is negotiated between WTD and its consultants. Nevertheless, a higher budget for design services resulting from a higher construction cost estimate is likely to result in a higher negotiated design fee.
[9]According to the King County Capital Project Management Work Group, project baseline consists of the scope, schedule, and budget set at the conclusion of the preliminary design phase, when the preferred alternative has been selected and design has progressed adequately to make reasonable and informed budget and schedule commitments, at 30 to 40 percent design. Project baseline is used as a basis for reporting and performance measurement.
[10]According to WTD, the CST has not yet formally approved these recommendations.

1. WTD Decision-Making Practices

Recommendation 4	The Wastewater Treatment Division should increase management and monitoring of consultant contracts in order to minimize project scope and cost growth prior to project baseline.
Recommendation 5	The Wastewater Treatment Division should assess the efficacy of oversight structures intended to control project scope, schedule, and budget, including the Capital Systems Team and the Change Review Board. The assessment should include a targeted examination of how effective these bodies are at controlling changes to scope, schedule, and budget proposed during early project phases and WTD should report to County Council on its findings.

2. Alternatives Analysis for the Georgetown Project

Section Summary

WTD's selection of a wet weather treatment facility as the preferred option for the Georgetown project was based on an incomplete analysis of alternatives and has contributed to significant project cost growth. WTD conducted the alternatives analysis for the Georgetown project during the planning phase. Therefore, cost estimates provided to decision-makers were very imprecise.[11] Further, WTD eliminated many alternatives without adequate consideration. Finally, selecting wet weather treatment as the project approach carries inherent risks that may specifically result in substantial cost growth. Together, these issues raise significant concerns that WTD's approach on the Georgetown project may not be cost effective and could significantly contribute to project cost increases. Although the project is still in the early development stage, there is evidence that its costs could grow substantially above planning-level estimates. We recommend that WTD reconsider alternatives and bring one or more additional alternatives forward for development as an alternative to the wet weather treatment facility.

WTD selected its final alternative for Georgetown prematurely based on insufficient analysis

WTD adequately considered four of 15 available alternatives for the Georgetown project, three of which were wet weather treatment options (see Appendix I for more information on wet weather treatment and other alternatives considered for the control of combined sewer overflows).[12] We reviewed the alternatives analysis WTD conducted for the 2012 CSO Control Plan as well as additional information provided by WTD and found that WTD ruled out 11 alternatives prior to its development of preliminary alternatives (Exhibit B). Elimination of these alternatives means that WTD performed no life cycle cost estimates, no analyses of social and environmental costs and benefits of the project, and no risk assessments for these 11 alternatives. Furthermore, WTD selected its preferred alternative during the planning phase, which is in conflict with King County Code. Code states that "evaluation and analysis of potential project alternatives" and the "selection of the preferred alternative" shall occur during the subsequent phase – preliminary design.[13] In general, better information about project alternatives is available and more precise cost estimates are possible during the predesign phase than the planning phase.

[11] As noted above, planning-level cost estimates are very imprecise. Selecting a preferred alternative for a project during the planning phase means that cost estimates will be less precise than if selection of a preferred alternative occurred further along in the design process.

[12] WTD's alternatives analysis for the Georgetown project—which encompasses the Brandon and South Michigan basins—considered options for each basin separately and considered options for the combined basins. With five potential alternatives available for three locations (Brandon basin, South Michigan basin, combined basins) there were 15 different alternatives available to WTD for consideration of how to best control overflows in the Brandon/South Michigan basins.

[13] KCC 4.04.020 and 4.04.245

2. Alternatives Analysis for the Georgetown Project

The options WTD considered were limited in type. Three of the four alternatives WTD considered were wet weather treatment solutions. Therefore, wet weather treatment was a nearly foregone conclusion for the Brandon and Michigan basins prior to the completion of any significant analysis. This is particularly problematic, as alternatives to wet weather treatment often have inherent advantages. For instance, storage and conveyance both bring wastewater to facilities that treat water to a higher standard than wet weather treatment plants, and sewer separation and green stormwater infrastructure both reduce the amount of wastewater in need of treatment.

Exhibit B: WTD considered mainly wet weather treatment alternatives for CSO control in the Brandon and Michigan basins and eliminated other alternatives with minimal or no analysis.

Control Technology	Brandon Basin	Michigan Basin	Combined Basins
Storage	No	No	No
Conveyance	No	No	No
Green Stormwater Infrastructure	No	No	No
Sewer Separation	**Considered**	No	No
Wet Weather Treatment	**Considered**	**Considered**	**Selected**

Source: King County Auditor's Office analysis

Overall, WTD ruled out alternatives for the Georgetown project including storage, conveyance, green stormwater infrastructure (GSI), and sewer separation for reasons, including:

- **Storage:** WTD did not consider storage as a preliminary alternative due to "excessive sizing requirements."[14]
- **Conveyance:** WTD did not consider conveyance as a preliminary alternative due to "excessive sizing requirements."
- **GSI:** According to WTD, volume in basins is too high for GSI to be considered as a stand-alone alternative. WTD did not consider GSI in conjunction with other alternatives that had been ruled out, such as separation, conveyance, or storage.
- **Sewer separation:** According to WTD, the number and complexity of connections to the sewer system make permitting and operating a separated sewer infeasible in the Michigan basin.

[14]WTD stated that it is not possible to build storage facilities or conveyances large enough to mitigate the flows in the Brandon and Michigan basins. We discuss this further later in this section.

In addition, WTD's explanations for why it eliminated potential project alternatives from further consideration in many cases relied on inaccurate assumptions and did not consider evidence that other alternatives may cost less.

Inaccurate assumptions:

- WTD indicated to our office that planning factors had not changed sufficiently to justify reconsidering alternatives that WTD ruled out in 1999. However, the 2012 CSO Control Plan indicated the opposite: that a variety of planning factors had changed sufficiently in both the Brandon and Michigan basins to require reevaluation of the alternative identified in 1999.

- Other jurisdictions have successfully completed storage projects that are significantly larger than what would be required to control overflows in the Brandon and Michigan basins.[15]

- Despite the potential risks WTD has identified related to using GSI, WTD previously conducted a separate analysis of GSI for basins throughout King County and found it to be highly feasible in the Brandon and South Michigan basins, with a high amount of community interest.[16]

Comparable or lower costs for other alternatives:

- The cost estimate of one of the alternatives ruled out in 1999 (sewer separation in the South Michigan basin) was very close to the cost of the alternative selected in 1999 (wet weather treatment).

- Sewer separation was the lowest cost alternative for the Brandon basin according to the analysis conducted by WTD for the 2012 CSO Control Plan.

- WTD documents indicate that its analysis of the costs and benefits of sewer separation did not consider the potential to allow for smaller, less costly CSO projects in downstream basins.

[15]For instance, Atlanta, Georgia's West Area and Intrenchment Creek Tunnel can store up to 177 million gallons of wastewater, Portland, Oregon's storage tunnels can store up to 100 million gallons of wastewater, and the District of Columbia's Anacostia River storage/conveyance tunnel will store up to 157 million gallons of wastewater.
[16]Risks identified by WTD of using GSI in the Brandon/Michigan basins include the large volume of stormwater, a high water table, and contaminated soils.

- The wet weather treatment alternative selected by WTD for the Georgetown project entails some potentially costly risks that are inherent to that alternative. We will discuss these risks in more detail below.

WTD did not fully consider project costs and benefits

Since WTD eliminated 11 of 15 alternatives identified for the Brandon and Michigan basins early in its process, WTD only conducted analysis to consider full project benefits and costs, referred to as triple bottom line analysis, for the four remaining alternatives. The use of triple bottom line analysis is a best practice that allows decision-makers to consider other factors besides project costs and risks before selecting a preferred alternative. These analyses allow the comparison of alternatives from three perspectives: financial, social, and environmental and include consideration of full cost and benefits external to the project.

Of the alternatives it did consider, WTD's triple bottom line analysis assessed a limited spectrum of social and environmental factors, identified a limited set of impacts, and weighted its analysis toward operational and technical factors. In contrast, we found examples of triple bottom line analyses conducted by other jurisdictions that were substantially more robust than analyses conducted by WTD. For example, the triple bottom line analysis performed by the City of Philadelphia, Penn., stands out for its thoroughness and breadth. Its analysis assigned a monetary value to social and environmental benefits and impacts and considered a 40-year time horizon, which provides time for the jurisdiction to realize social and environmental benefits. In contrast, WTD's analytical horizon appears to go through construction (2022) for most criteria.

Using wet weather treatment presents substantial risks that are inherent to this approach

There are inherent risks associated with the alternative WTD selected for the Georgetown project. Many of these risks relate to the fact that the wet weather treatment alternatives WTD considered for the project involve discharging treated industrial and municipal stormwater with sewage into the Duwamish River. Key risks include:

- **Siting an outfall along the Duwamish River is challenging:** The location of the outfall for the Georgetown project is within a highly industrialized area subject to federally mandated clean ups under the Superfund and Resource Conservation and Recovery Act. WTD does not yet have full approval to site an outfall in the Duwamish, and WTD is

likely to face additional permitting and mitigation requirements beyond those of a typical project. In addition, the location of the outfall is within a tribal fishing area with limited periods during the year when construction in the river is allowed. Finally, it is likely that WTD will have to mitigate contaminated soil at whatever site it chooses for the wet weather treatment facility.

- **Water quality standards are subject to change:** Discharges from the new treatment plant will be required to meet water quality standards. These standards require that discharges do not exceed regulatory limits. In addition, the state Department of Ecology is currently in a rulemaking process to update its water quality standards with respect to human health criteria. It is unclear how future changes to water quality standards may affect the project, but it is possible more stringent criteria could increase costs associated with treating discharges.

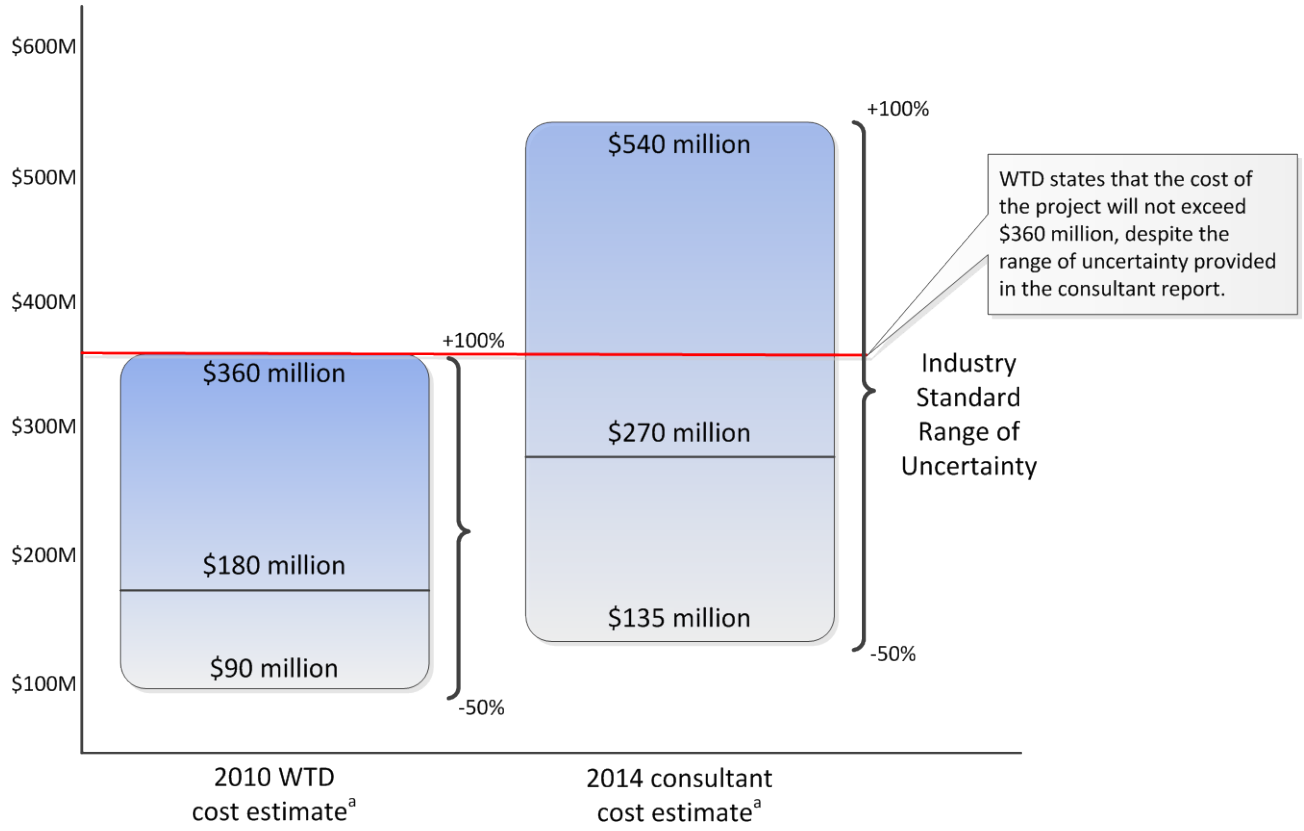
Early indications are that project costs could grow substantially above the planning-level estimate

Projections from WTD's consultant on the Georgetown project indicate that project costs may be substantially more than the number WTD presented to the County Council in the 2012 CSO Control Plan. In a March 2014 report to WTD, the division's consultant for the Georgetown project indicated that WTD excluded a variety of items from the planning-level estimate and did not adequately capture risks in the estimate. As a result, the planning-level estimate could increase by as much as 50 percent.[17] Reasons for the potential increase include adding items not originally included in WTD's planning-level estimate, increasing the site from two to four acres, and costs associated with the unique risks of a wet weather treatment facility described above. Despite this potential 50 percent increase in the estimated cost of the project, the current estimate is still considered a planning-level estimate that is still subject to the same range of uncertainty (-50 percent to +100 percent) as the previous planning-level estimate. This means that the new possible range of costs for the project would go from $135 million on the low end of the range to $540 million on the upper end of the range (Exhibit C). It is of particular concern that potential costs have increased so significantly because the project is currently only between two and five percent design.

[17]All costs discussed in this section are presented in 2014 dollars inflated to the midpoint of construction.

2. Alternatives Analysis for the Georgetown Project

Exhibit C: Georgetown project cost estimate has increased substantially.



[a]All costs presented are in 2014 dollars inflated to the midpoint of construction.

Source: WTD cost estimate as of 2010 and 2014 consultant update to cost estimate.

WTD agreed to reconsider project alternatives if costs increase substantially

Our 2012 CSO audit noted the substantial increase in the cost estimates of the aforementioned WTD Beach Projects, and questioned whether the selected alternative continued to be cost effective in light of these increases in estimated costs. The audit recommended, and WTD concurred, that the division should reconsider alternatives if costs of CSO projects increase substantially during the preliminary design phase.

During the 2013 follow-up to the 2012 CSO audit, WTD indicated that it would revisit alternatives if estimated project costs rose by at least 30 percent during preliminary design. As of September 2014, the risk assessed cost of the Georgetown project—which is currently in the preliminary design phase—may increase by up to 50 percent.

Given the cost growth of the Beach Projects discussed above, and the high probability of cost growth on the Georgetown project, it is likely that rate impacts of the CSO program identified in the 2012 CSO Control Plan were

understated. If the final costs of the nine projects included in the 2012 CSO Control Plan exceed their planning-level estimates by the same margin as the Beach Projects, the total cost of the program could be $2.6 billion and sewer rates could increase by $28 per month. These numbers are substantially higher than the $711 million program cost and $7.61 rate increase presented in the 2012 CSO Control Plan when decision-makers were contemplating options to control combined sewer overflows in King County. According to WTD, the 2012 planning-level estimates are more precise than planning-level estimates in previous plans and should fall within the -50 to +100 percent range of uncertainty attributed to the 2012 estimates. WTD stated that the upper limit of completing the projects in the 2012 CSO Control Plan should be no more than $1.4 billion.

Recommendation 6

The Wastewater Treatment Division (WTD) should analyze alternatives to the selected wet weather treatment option for the Georgetown project and bring one or more alternatives forward for further development, thus allowing WTD to decide which alternative to pursue after it achieves greater certainty about the final life cycle costs of more than one alternative.

Recommendation 7

The Wastewater Treatment Division should revisit the alternatives selected for the other eight combined sewer overflow (CSO) control projects in the 2012 CSO Control Plan and, for each project, should develop one or more alternatives to a sufficient level of cost certainty before selecting which alternative to construct.

3. Consent Decree

Section Summary

The nature of King County's consent decree complicates WTD's ability to make changes to the projects it is pursuing in order to control CSOs, but opportunities exist for modification. Since King County entered into an implement-only consent decree, WTD and the county are restricted to completing the projects that the decree specifies, unless changes are negotiated and approved by federal court. This makes it difficult, but not impossible, for WTD to revisit alternatives that it ruled out in its 2012 analysis. Other jurisdictions provide examples of the potential for consent decree modification.

Opportunities exist for modification of consent decrees

King County's CSO consent decree stipulates when and how the County can modify the agreement.[18] Since the consent decree specifies the method by which King County will mitigate its overflows, King County would have to modify its consent decree in order to select a different alternative to control its overflows.[19] The consent decree stipulates when and how the County can modify the agreement and allows for revision of the design criteria, sequencing of projects, and proposal of additional water quality improvement projects. Other significant modifications require a renegotiation of the consent decree. In order to modify the consent decree, WTD would have to make an application to the U.S. Environmental Protection Agency (EPA) and Washington State Department of Ecology (Ecology) and demonstrate what the county is asking for and why. Until EPA and the U.S. Department of Justice (DOJ) accept a modification, and a federal court approves it, the County would be obligated to continue to meet milestones and dates listed in the consent decree.

Other jurisdictions have negotiated provisions that would mitigate some risks faced by WTD

Other jurisdictions have negotiated provisions to their consent decrees to mitigate some of their risks. For instance, Washington D.C. negotiated a provision to extend its deadline for project delays caused by permitting issues beyond its control, and Cincinnati, Ohio negotiated an extension of its consent decree deadline in the event that the city reaches $1.5 billion in spending prior to controlling its CSOs. According to WTD, the County asked

[18]In 2013, King County entered into a consent decree, a legal agreement with the U.S. Department of Justice (DOJ) and the U.S. Environmental Protection Agency (EPA) that ensures the county will complete its CSO control plan by 2030. A consent decree is a legal agreement that settles a complaint. In King County's case, the complaint is that uncontrolled overflows from its combined sewer system violate the federal Clean Water Act. The County has been implementing its long-term program to bring remaining CSO points into compliance with state and federal standards. The consent decree is a written agreement between King County, Ecology, EPA, and the DOJ that outline the planned actions to resolve the complaint. WTD is one of many utilities across the United States that have negotiated consent decrees with EPA.

[19]This is referred to as an "implement-only" consent decree.

for a section similar to that which Cincinnati negotiated, however EPA and Ecology denied the request.

Some jurisdictions have successfully modified their consent decrees
Numerous jurisdictions have modified their consent decrees to decrease costs or increase potential benefits (Exhibit D). For instance, Cincinnati also entered into an implement-only consent decree with EPA and DOJ, but brought a second alternative for one project to 30 percent design in order to evaluate its relative cost-effectiveness. When both project alternatives were at 30 percent design, it was clear that the alternative not specified in the consent decree would be much less expensive to complete. The city then submitted a proposal to EPA and DOJ to modify its consent decree to replace the specified alternative with the more cost-effective alternative. According to officials from Cincinnati, EPA approved this modification in May 2013.

Exhibit D: Several jurisdictions we reviewed or interviewed have modified their consent decrees.

Jurisdiction	Modified	Reason	Consent decree specifies projects
New York City	**Yes**	To include GSI and save $1.4 billion	No
Cincinnati	**Yes**	Identified alternative to a specified project that will save approximately $200 million	**Yes**
Washington, D.C.	**Yes**	To include GSI, add social and environmental benefits, and save money	No
King County	No	N/A	**Yes**
Seattle	No	N/A	No

Source: King County Auditor's Office analysis

King County's consent decree differs from other consent decrees and limits WTD's ability to consider other project options

King County's consent decree is different from many consent decrees entered into by other jurisdictions, in that it is an "implement-only" consent decree. This means that the consent decree incorporates projects approved by EPA and Ecology. County Council was briefed and approved inclusion of these alternatives in the King County 2012 CSO Control Plan. The 2012 plan and the consent decree specify how WTD will complete these projects in order to bring the County into compliance with state and federal standards. For instance, King County's consent decree indicates that the Georgetown project is a CSO treatment and conveyance project that will provide 66 million gallons per day of peak CSO treatment.[20] As a result, if WTD wanted to do any other type of project for these overflows, it would be necessary to

[20]The consent decree refers to the Georgetown project as the "Brandon Street/South Michigan Street" CSO control project. WTD changed the name of the project to the Georgetown Wet Weather Treatment Station project in late 2013.

modify the consent decree. According to WTD, an implement-only consent decree is beneficial to the County because it recognizes the existing CSO control plan, provides King County with certainty regarding regulatory requirements, provides adequate time to reach compliance with EPA and Ecology guidelines, and avoids litigation.

Recommendation 8

In consultation with the County Council, the Wastewater Treatment Division should develop a decision-making framework to use in determining the circumstances under which additional information developed on CSO project alternatives is sufficient to warrant renegotiation or modification of the county's consent decree. For example, a framework might set parameters such that if WTD brings another alternative to 15 percent design and that alternative is at least 30 percent less expensive than the wet weather treatment alternative currently planned for the Georgetown project, the County should initiate the process to modify its consent decree.

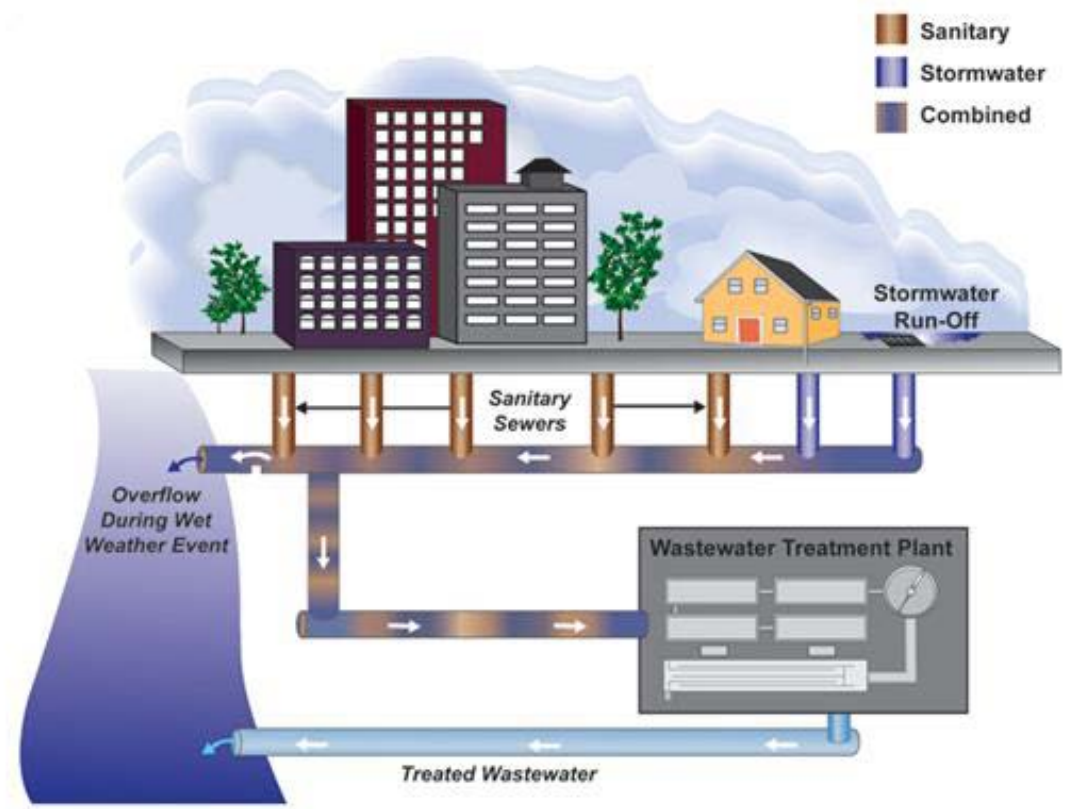
Conclusion

King County faces significant cost increases on projects in its CSO program, including the Georgetown project. If past trends on project costs occur for the CSO program, the total cost of the program could be more than $2.5 billion, and user rates could increase by up to $28 per month. These numbers are substantially higher than the $711 million program cost and $7.61 rate increase presented when decision-makers contemplated options to control combined sewer overflows in King County. WTD acknowledged that its initial project cost estimates are less accurate than expected and agreed that the division should continue to take steps to improve those estimates. In addition, WTD should increase transparency of its cost estimation by maintaining and reporting information on final project costs in comparison to original cost estimates at the planning stage. Without reliable and transparent information on project costs, it is difficult for decision-makers, including WTD management and County Council, to understand the implications of project choices. Furthermore, since WTD's planning-level cost estimates are less accurate than expected, it would be fiscally prudent to develop multiple alternatives to a greater level of cost certainty prior to selecting a final option, for both the Georgetown project and for all other projects in the CSO control program.

Appendix I

Alternatives Available for the Control of Combined Sewer Overflows

Combined sewers carry waste from residential and commercial buildings, but also transport storm runoff in the same pipe to a treatment plant, where it is typically treated and released to a body of water (see below). If there is heavy rain, excess stormwater can push the combined system above its capacity and cause overflows. These discharges contain untreated wastewater, which can carry high levels of bacteria and other pollutants that harm water quality and pose environmental and health risks.



Source: Buffalo Sewer Authority

There are a number of alternatives available for the control of combined sewer overflows, including sewer separation storage, conveyance, green stormwater infrastructure, and wet weather treatment (see below).

Appendix I (continued)

Sewer separation
Sewer separation consists of diverting stormwater flows from the existing combined sewer system to a storm drain system. Sewer separation provides the ability to treat sanitary sewage at a treatment plant while stormwater continues to discharge to surface waters.

Storage
Storage facilities include tanks, pipes, and tunnels. Additional volume during heavy rain events can be stored in tanks or tunnels until the system has sufficient capacity to handle stored water.

Conveyance
Flows can be transported via pipeline to existing facilities for treatment. Modifications to the conveyance system can increase the capacity of the system to handle additional volume during rain events.

Wet Weather Treatment
Wet weather facilities are additional treatment plants that operate during rain events to help treat additional volume. Flows are not necessarily treated to at least the same standard as that provided at the main treatment plant.

Green Stormwater Infrastructure (GSI)
GSI refers to a range of measures that utilities can take to infiltrate stormwater locally, prior to entering the sewer system. GSI measures include disconnection of roof downspouts from the sewer system, rain gardens, permeable pavement, and green roofs.

Executive Response

King County

Dow Constantine
King County Executive
401 Fifth Avenue, Suite 800
Seattle, WA 98104-1818
206-263-9600 Fax 206-296-0194
TTY Relay: 711
www.kingcounty.gov

KING COUNTY AUDITOR
SEP 02 2014
RECEIVED

September 2, 2014

Kymber Waltmunson
King County Auditor
Room 1033
COURTHOUSE

Dear Ms. Waltmunson:

Thank you for the opportunity to review and comment on the proposed final report on the Department of Natural Resources and Parks (DNRP), Wastewater Treatment Division (WTD) Georgetown Wet Weather Treatment Station Combined Sewer Overflow Project (Georgetown CSO Project) Performance Audit.

I share your office's concern regarding the cost estimates for the project. As you know, Christie True, DNRP Director, has placed the project on hold and directed WTD to undertake a thorough project review to address issues related to cost that the audit raises. I support this review to ensure the project represents the most cost-effective approach to protecting water quality in our region. The process will include a thorough evaluation of alternatives and a cost reduction plan. I have asked to be kept informed about the results of the review.

The WTD has a strong culture of continuous improvement, and I am pleased that the audit report determined that "WTD is experienced in managing large capital projects and follows some key best practices in capital project decision-making and management, including:

- Use of executive review committees and involvement of senior management in key decisions,
- Formation of integrated project teams,
- Consideration of lessons learned, and
- Thorough processes for assessment of potential project risks.

I appreciate that the observations and recommendations in the audit acknowledged the technical complexities of the Georgetown CSO Project and the challenges associated with designing and building a treatment and conveyance facility under a Consent Decree schedule.

King County is an Equal Opportunity/Affirmative Action Employer and complies with the Americans with Disabilitites Act

Kymber Waltmunson
September 2, 2014
Page 2

Although we agree with the audit recommendations, we disagree with much of the technical analysis and data presentations in the report. We have already shared this with you and are willing to discuss it further should you or the Council have additional questions.

Nonetheless, many of the audit recommendations build on work that WTD is already undertaking. The audit's recommendations will assist WTD in further improving long-range planning and project management processes. For example, WTD began work to improve project estimates in 2010. WTD tested the new processes in 2012, and implemented them on certain projects this year. These improved estimating processes will be fully implemented in 2015. In addition, WTD has committed to continually reviewing and improving its estimating procedures to provide greater accuracy and certainty.

I also strongly support standardization and improvements in project management classifications and performance criteria for project managers. WTD is actively involved in a county-wide effort through the Capital Project Management Work Group that includes reviewing performance measures and metrics for project managers and projects. WTD is currently developing specific performance criteria for project managers and planners that will be implemented beginning this year.

I am committed to ensuring that the current review of Georgetown CSO Project will not only help ensure a more cost-effective project, but will also provide information that will benefit future CSO projects.

Thank you for your review of WTD's Georgetown CSO Project and your office's recommendations. If you have any questions regarding our audit responses, contact Pam Elardo, Wastewater Treatment Division Director, at 206-684-1236 or pam.elardo@kingcounty.gov.

Sincerely,

Dow Constantine
King County Executive

Enclosure

cc: Fred Jarrett, Deputy County Executive, King County Executive's Office (KCEO)
Rhonda Berry, Chief of Operations, KCEO
Christie True, Director, Department of Natural Resources and Parks (DNRP)
Pam Elardo, P.E., Director, Wastewater Treatment Division, DNRP

Georgetown Wet Weather Treatment Station Project (Georgetown CSO Project) Audit Report
Audit Recommendations, Executive Response, Staff Assigned to Respond with Response Deliverable(s)

No	Recommendation	Agency Position	Schedule for Implementation	Comments
1	WTD should develop metrics and monitor information on the agency's final costs for projects relative to cost estimates used for County Council decision-making. WTD should continue to work in conjunction with the County Council to determine a regular schedule for reporting on this information, such as including information on project costs in relation to initial cost estimates in funding requests.	Concur	**Estimated completion: Q4 2014**	WTD began developing improvements to metrics in 2010 and implemented these improvements in 2012. These metrics compare the selected alternative's planning level cost estimate, project cost at 30% design and final project cost.
2	WTD should continue to take steps to improve the quality of its planning-level cost estimates, including: a) continuing to apply changes to WTD's contingency policy in its cost estimates; b) continuing to work with a consultant to identify and implement methods to improve planning-level cost estimates; c) developing planning-level cost estimation guidelines; d) developing techniques to use historical information to inform estimates of likely costs of projects; and, e) employing independent validation of early cost estimates	Concur	**Estimated completion: Q4 2015**	These processes are underway. Improvements to WTD planning-level cost estimates were initiated in 2010. Testing the procedures began in 2012, and WTD will fully implement these improvements by 2015. WTD will also work to make regular improvements based on an ongoing evaluation process.
3	WTD should further develop its performance appraisal criteria for project managers including more specific criteria applicable to management of scope, schedule, budget, and project quality during preliminary design phase work.	Concur	**Estimated completion: Q4 2014**	This process is under way in consultation with human resources. Criteria will be developed and finalized in 2014.
4	WTD should increase management and monitoring of consultant contracts in order to minimize project scope and cost growth prior to project baseline.	Concur	**Estimated completion: Q3 2014**	Current WTD processes for management and monitoring of consultant contracts for cost and scope growth are under review to develop improvements.
5	WTD should assess the efficacy of oversight structures intended to control project scope, schedule, and budget, including the Capital Systems Team and the Change Review Board. The assessment should include a targeted examination of how effective these bodies are at controlling changes to scope, schedule and budget proposed during the early project phases and WTD should report to Council on its findings.	Concur	**Estimated completion: Q2 2015**	A procurement process will be initiated this year to work with an independent consultant to review current management oversight committees and make recommendations for improvements.
6	WTD should reanalyze alternatives to the selected wet weather treatment option for the	Concur		

Page 1 of 2

Georgetown Wet Weather Treatment Station Project (Georgetown CSO Project) Audit Report
Audit Recommendations, Executive Response, Staff Assigned to Respond with Response Deliverable(s)

No	Recommendation	Agency Position	Schedule for Implementation	Comments
	Georgetown project and bring one or more alternatives forward for further development, thus allowing WTD to decide which alternative to pursue after it achieves greater certainty about the final life cycle costs of more than one alternative.		**Estimated completion: 4Q 2014**	The project is currently on hold to conduct a review and analysis of alternatives .
7	WTD should revisit the alternatives selected for the other eight combined sewer overflow (CSO) projects in the 2012 CSO Control Plan and, for each project, should develop one or more alternatives to a sufficient level of cost certainty before selecting which alternative to construct.	Concur	**Estimated completion:** • **Q3 2015 -15% design detail, estimated cost (Class V estimate); estimated schedule** • **Q4 2016 - Draft 2017 CSO Plan Update** • **Q2 2017 – Council Presentation(s) on Plan Update**	This process is under way as part of the 2017 CSO Plan Update.
8	In consultation with the County Council, WTD should develop a decision-making framework to use in determining the circumstances under which additional information developed on CSO project alternatives is sufficient to warrant renegotiation or modification of the county's consent decree. For example, a framework might set parameters such that if WTD brings another alternative to 15 percent design and that alternative is at least 30 percent less expensive than the wet weather treatment alternative currently planned for the Georgetown project, the County should initiate the process to modify its consent decree.	Concur	**Estimated completion:** **Q3 2015**	Beginning this year, WTD will begin working with the Council to develop a decision-making framework for determining the circumstances under which the County should seek to modify the consent decree. The framework should be completed by 2015.

Page 2 of 2

Statement of Compliance, Scope, Objective & Methodology

Statement of Compliance with Government Auditing Standards

We conducted this performance audit in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Audit Scope and Objectives

This audit evaluates the Wastewater Treatment Division's (WTD) efforts to plan for the construction of a wet weather treatment station in Seattle's Georgetown neighborhood. This facility is one of nine planned projects identified as necessary to control sewer overflows in King County as part of the county's commitments to federal and state regulators to control overflows by 2030.
The objectives for this audit were to:

- Identify how WTD makes major decisions when planning for the construction of major facilities such as the Georgetown Wet Weather Treatment Station.
- Determine the extent to which the division's decision-making policies and practices are in alignment with best practices.
- Identify challenges the division faces in its management of the Georgetown project and how it plans to mitigate those challenges.

Methodology

To achieve the objectives listed above, the King County Auditor's Office interviewed WTD leadership, management and staff, key stakeholders, and management and staff of other municipalities who are engaged in controlling combined sewer overflows. We carried out a detailed evaluation of the alternatives analysis performed to inform the development of the 2012 CSO Control Plan. We reviewed numerous documents from WTD including the 2012 Long-Term CSO Control Plan and Control Plan Update, technical memoranda related to the Georgetown project, additional supporting documentation on Georgetown project alternatives analysis supplied by WTD, policies and procedures related to decision-making, and supporting documentation for the Georgetown project. Municipalities interviewed for this report include City of Bremerton, Wash.; City of Seattle, Wash.; City of Salem, Ore.; City of Cincinnati, Ohio; and Washington D.C. We selected municipalities to interview based on input from WTD and criteria including size of metropolitan area, implementation of wet weather treatment technology, and presence of a consent decree with the U.S. Department of Justice and the Environmental Protection Agency to control combined sewer overflows.

Scope of Work on Internal Controls

We assessed internal controls relevant to the audit objectives. This included review of selected policies, plans, processes, and reports. We did not rely on computer-generated data for this report.

List of Recommendations & Implementation Schedule

Recommendation 1: The Wastewater Treatment Division (WTD) should develop metrics and monitor information on the agency's final costs for projects relative to cost estimates used for County Council decision-making. WTD should work in conjunction with the County Council to determine a regular schedule for reporting on this information, such as including information on project costs in relation to planning-level cost estimates in funding requests.

> **Implementation Date:** Q4 2014
> **Estimate of Impact:** Regular monitoring and reporting of information on project costs over time will increase transparency of information for decision-makers.

Recommendation 2: The Wastewater Treatment Division (WTD) should continue to take steps to improve the quality of its planning-level cost estimates, including:

a) continuing to apply changes to WTD's contingency policy in its cost estimates
b) continuing to work with a consultant to identify and implement methods to improve planning-level cost estimates
c) developing planning-level cost estimation guidelines
d) developing techniques to use historical information to inform estimates of likely costs of projects
e) employing independent validation of early cost estimates

> **Implementation Date:** Q4 2015
> **Estimate of Impact:** Improvements to planning-level cost estimates would improve the quality of information used by decision-makers to select project alternatives and determine departmental and county priorities.

Recommendation 3: The Wastewater Treatment Division should further develop performance appraisal criteria for project managers, including more specific criteria applicable to management of scope, schedule, budget, and project quality during preliminary design phase work.

> **Implementation Date:** Q4 2014
> **Estimate of Impact:** More specific performance appraisal criteria for project managers during early project phases will help ensure control over project scope, schedule, and budget.

Recommendation 4: The Wastewater Treatment Division should increase management and monitoring of consultant contracts in order to minimize project scope and cost growth prior to project baseline.

> **Implementation Date:** Q3 2014
> **Estimate of Impact:** Increased monitoring of consultant contracts will help ensure control over project scope and budget during early project phases.

List of Recommendations & Implementation Schedule (continued)

Recommendation 5: The Wastewater Treatment Division should assess the efficacy of oversight structures intended to control project scope, schedule, and budget, including the Capital Systems Team and the Change Review Board. The assessment should include a targeted examination of how effective these bodies are at controlling changes to scope, schedule, and budget proposed during early project phases and WTD should report to County Council on its findings.

> **Implementation Date:** Q2 2015
> **Estimate of Impact:** An assessment of the efficacy of existing oversight structures within WTD will help identify ways that WTD can improve these oversight mechanisms.

Recommendation 6: The Wastewater Treatment Division (WTD) should analyze alternatives to the selected wet weather treatment option for the Georgetown project and bring one or more alternatives forward for further development, thus allowing WTD to decide which alternative to pursue after it achieves greater certainty about the final life cycle costs of more than one alternative.

> **Implementation Date:** Q4 2014
> **Estimate of Impact:** Further analysis of alternatives for the Georgetown project will help ensure that the County is pursuing a cost-effective alternative.

Recommendation 7: The Wastewater Treatment Division should revisit the alternatives selected for the other eight combined sewer overflow (CSO) control projects in the 2012 CSO Control Plan and, for each project, should develop one or more alternatives to a sufficient level of cost certainty before selecting which alternative to construct.

> **Implementation Date:**
> - Q3 2015 -15% design detail, estimated cost (Class V estimate); estimated schedule
> - Q4 2016 - Draft 2017 CSO Plan Update
> - Q2 2017 – Council Presentation(s) on Plan Update
>
> **Estimate of Impact:** Further analysis of alternatives for the other eight projects in the 2012 CSO Control Plan will help ensure that the County is pursuing cost-effective alternatives for all projects.

Recommendation 8: In consultation with the County Council, the Wastewater Treatment Division should develop a decision-making framework to use in determining the circumstances under which additional information developed on CSO project alternatives is sufficient to warrant renegotiation or modification of the county's consent decree. For example, a framework might set parameters such that if WTD brings another alternative to 15 percent design and that alternative is at least 30 percent less expensive than the wet weather treatment alternative currently planned for the Georgetown project, the County should initiate the process to modify its consent decree.

Implementation Date: Q3 2015
Estimate of Impact: Development of a decision-making framework will assist WTD and the county in objectively determining on a case-by-case basis whether renegotiation or modification of the consent decree is warranted.