King County Auditor's Office
Capital Projects Oversight Program
Kymber Waltmunson, King County Auditor
King County

Georgetown Combined Sewer Overflow Project: Schedule Constrained by Permits, Regulatory Requirements

Jane Vandenberg

January 17, 2017

Executive Summary

While the Wastewater Treatment Division is using many project management best practices to deliver the Georgetown Combined Sewer Overflow project, there are some risks that are not fully mitigated. The most significant risks could impact the schedule and budget. Schedule risks include permit delays that may impact an important deadline. Total project costs could be greater than current estimates due to a very competitive bidding climate and other cost uncertainties.

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Report Highlights
January 17, 2017

Project Status

In general, the Wastewater Treatment Division (WTD) is using many project management best practices to deliver the Georgetown Combined Sewer Overflow project (Georgetown). However, there are continued challenges related to permitting and a very competitive bidding climate. The Georgetown project includes construction of a wet weather treatment station, conveyance pipe, and an outfall structure to control combined sewer overflows in the Brandon and Michigan drainage basins. These basins fall in the Georgetown and lower Duwamish neighborhoods.

Most Significant Risks

WTD has not fully mitigated some project risks, particularly those risks driven by outside forces such as permits and easements. WTD has a comprehensive risk management plan that scores risks according to the probability of occurrence and the severity of impact. We are closely monitoring these risks:

- permits on critical path
- cost estimate allowances and adequacy of project contingency
- geotechnical/poor soils and historical artifact discovery

▽ Schedule

Constrained: WTD may be at risk of not meeting the consent decree milestone deadline of December 31, 2017. The current project schedule meets the consent decree milestone, but there are several critical permits that must be in place to move forward with procurement of the treatment station contract.

▽ Budget

At Risk: While the current budget estimate is within the range of previous estimates, WTD may not have enough contingency to cover risks and cost uncertainties. WTD's baseline cost estimate range is $192 million to $312 million[1] including design, acquisition, permitting, and construction costs.

● Scope

Verified: Independent reviews confirmed that a wet weather treatment station (WWTS) was a good approach, but the reviews occurred too late to allow any substantive change in approach without a renegotiation of the consent decree.

[1] In September 2016 dollars.

● = No Current Concerns ▽ = Attention Needed ⬢ = Corrective Action Needed

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King County

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Alternative Formats Available Upon Request

1. Project Schedule

Section Summary

The Wastewater Treatment Division (WTD) has completed a baseline schedule for the Georgetown project that, while aligned with the United States Environmental Protection Agency consent decree obligations, provides limited flexibility to accommodate delays. There are risks to the project schedule related to permitting, easements, and some geotechnical investigations. This could lead to increased costs if WTD does not meet milestones.[2]

WTD's schedule meets the consent decree deadline but with limited flexibility

WTD may not meet the schedule if key permit approval dates are not met. The November 28, 2016 schedule shows WTD meeting its December 31, 2017 consent decree milestone for issuance of a 'Notice to Proceed'(NTP) on the wet weather treatment station contract, but there are several permits that must be in place to move forward with procurement for the wastewater treatment station contract in June 2017. If there is a delay in any one of these processes, meeting the consent decree milestone deadline may be at risk.

Some of the key permits and agreements needed to move forward with demolition work and construction of the wet weather treatment station include:

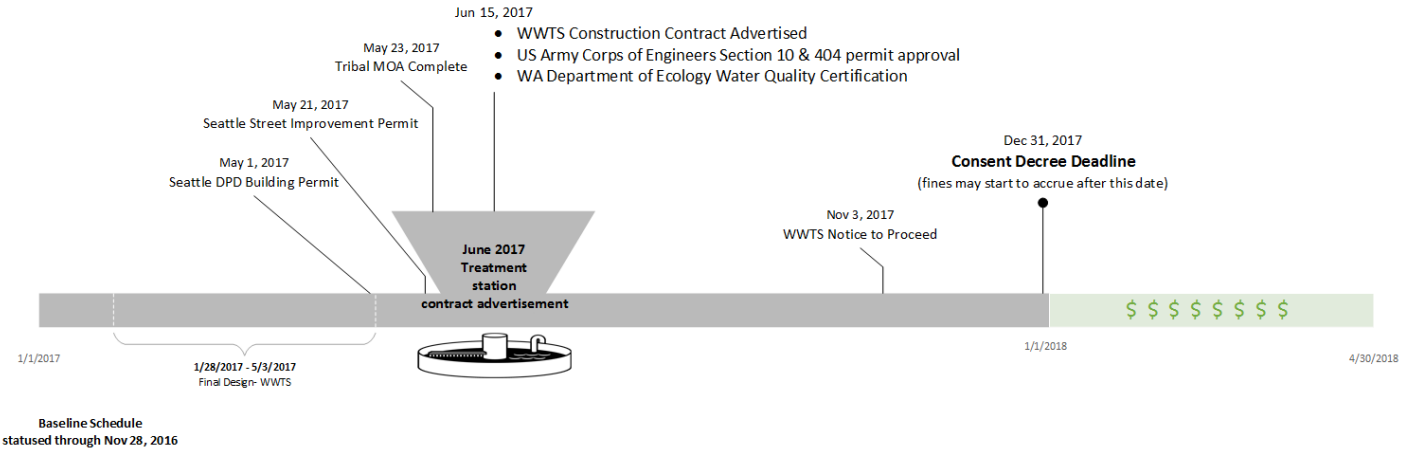
- City of Seattle construction building permit
- US Army Corps of Engineers Section 10 and 404 permit
- A memorandum of agreement (MOA) with the Muckleshoot Tribe

WTD officials state that they are working with the city, state, and federal permit agencies, to ensure timely permitting, and further stated that risks related to permitting are being effectively managed. There is a memorandum of understanding in place with the City of Seattle that commits to issuance of all city permits necessary for construction by May 14, 2017.

[2] In 2013, King County entered into a legal agreement with the US Department of Justice and US Environmental Protection Agency, and the Washington State Department of Ecology that commits to completing the county's entire Combined Sewer Overflow control plan by 2030. The consent decree has project specific interim milestones that must be met unless formal permission or judicial action is taken to revise the decree. (USA & State of Washington v. King County, WA, Consent Decree, Recorded April 16, 2013)

1. Project Schedule

Exhibit A: Permits and other key milestones, including advertisement of the wet weather treatment station, are stacking up from May to mid-June of 2017 and could negatively impact the schedule.



Source: King County Auditor's Office

Even if WTD meets permit approval deadlines, there is no time built into the schedule to allow for conditions of approval that may be required by the permitting agency to be incorporated into the contract documents. WTD has scheduled advertisement of the wet weather treatment station contract for June 15, 2017, the same date as is shown for the permit approval completion milestone. It is not unusual for an issuing agency to include conditions in an approved permit. WTD would need to add any required conditions either by an addendum during the advertisement period or via change order after the contract is awarded. If changes are added by an addendum, there is an increased risk of bid opening delay, which could delay contract execution, resulting in missing the consent decree deadline. If changes are made after a contract is awarded by change order, they are not part of a competitive bid process and can result in a higher cost.

If the consent decree deadline is missed, fines may be imposed by the regulatory agency. The consent decree includes fines that would continue to accrue, starting at $3,000 per day and increasing to $5,000 per day, depending on the length of time the county is out of compliance.[3]

Changing the consent decree deadline could require a formal judicial proceeding. Should a judicial proceeding be necessary, it is difficult to predict the cost or how long it might take.

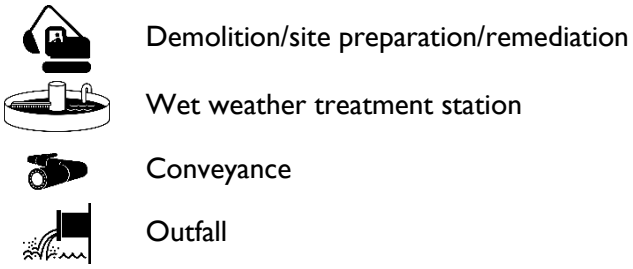
[3] United States of America & State of Washington v. King County, WA, Civil Action No. 2:13-cv-677 April 16, 2013

1. Project Schedule

Construction will be completed in four separate contracts

The Georgetown project includes construction of a wet weather treatment station, effluent conveyance pipes, and an outfall structure to control combined sewer overflows in the Brandon and Michigan drainage basins. These basins include the Georgetown neighborhood and drain into the lower Duwamish Waterway.

Exhibit B: The work will be completed in four separate contracts.



Source: King County Auditor's Office

The demolition, site preparation, and remediation work starts in spring 2017

If issues arise during construction, such as unanticipated utility conflicts, difficult coordination with other contractors, work completed by others, or weather delays, WTD could miss another consent decree deadline and incur fines. WTD completed a draft construction contract sequencing schedule with approximate contract durations based on the 60 percent design drawings.[4]

The first contract will complete the demolition, site preparation, and remediation work that must be done before construction of the wet weather treatment station can begin. Some site remediation work cannot begin until the United States Army Corps of Engineers permit is obtained, which, as of January 2017, is planned for no later than June 15, 2017.

WTD's current draft schedule[5] for the wet weather treatment station contract targets construction starting in late 2017, but work cannot begin until completion of the demolition, site preparation, and remediation contract. Advertisement for the outfall contract is scheduled for November 2017 with a notice to proceed for the outfall work of January 2018. The draft schedules allow time after notice to proceed for required contractor submittals, as well as review by WTD, its consultants, and permitting agencies, so construction may not begin on some contracts until some months after notice to proceed, as shown in Exhibit C.

[4] GWWTS 60-Percent Design Construction Schedule – Basis of Schedule Memorandum, November 5, 2016
[5] Baseline Schedule status through November 28, 2016

1. Project Schedule

Exhibit C: The draft project construction sequencing schedule has the treatment station work completed eleven months before the December 31, 2022 consent decree deadline for a fully operational system.

Contract	Notice to Proceed	Construction Start	Construction Complete
Demolition, site preparation, and remediation	April 2017	April 2017	October 2017
Wet weather treatment station	November 2017	November 2017	January 2022
Outfall	January 2018	August 2018	February 2019
Conveyance	January 2019	June 2019	March 2021

Source: King County Auditor's Office; and WTD GTWWTS 60-Percent Design Construction Schedule Memo, November 5, 2016

Construction will require close coordination among WTD, three project contractors, permitting agencies, and utility companies

The wet weather treatment station, outfall, and conveyance contracts will have some concurrent work and interdependencies. It is likely that there will be three general contractors working on the individual contracts, one completing each project. This means coordination among the contractors will be necessary during construction, particularly at points of connection. There are key milestones that constrain some critical work in the other contracts, as well as work by others to relocate or construct new utilities:

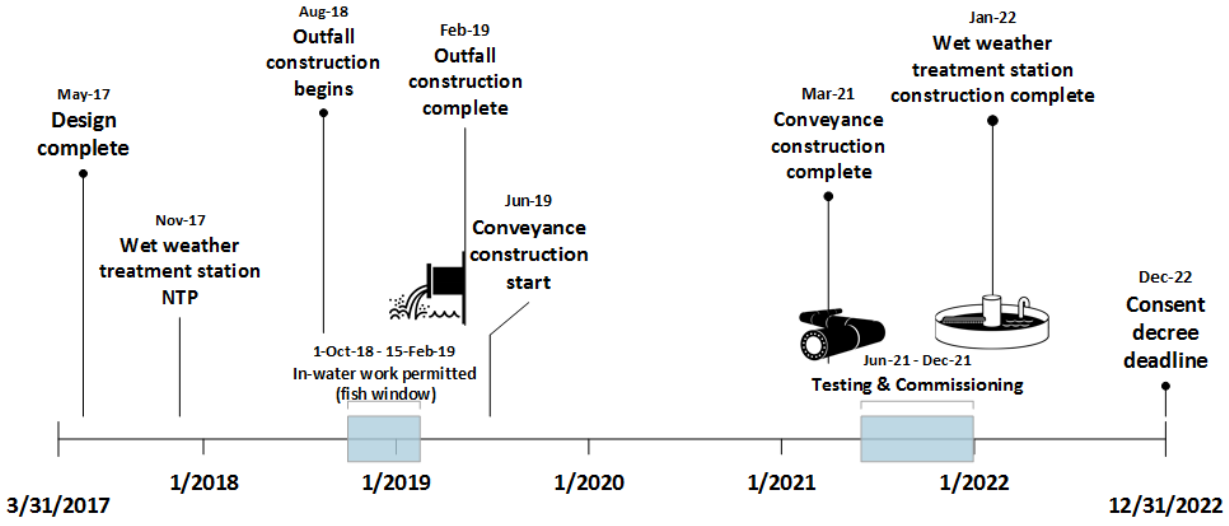
1. There is in-water work to be done as part of the outfall construction. The completion of in-water work is restricted to certain regulatory timeframes, known as fish windows. One established fish window requires in-water work to be completed between October 1 and February 15. There may be additional in-water work restrictions imposed by the MOA currently being negotiated with the Muckleshoot Tribe. The proposed schedule for outfall construction provides seven months for contractor required shoring design, review, and permitting to occur, with substantial completion occurring in February 2019, just as the fish window ends. If there is a delay in any of the permitting reviews through the City of Seattle or other agencies, start of construction on the outfall could slip, causing the in-water work window to close before outfall work is complete.
2. The conveyance contractor needs to connect to a structure being built as part of the outfall contract during the early part of conveyance work. If the work is not well-timed between these two contracts, or if the fish window impacts completion of the outfall work, then schedule delays could occur in the conveyance contract as well.
3. Underground power conduits must be relocated, with some portions of the work done by the contractor and some completed by Seattle City Light.
4. Fire hydrants and piping must be relocated and a reconnection to the waterline completed by the water utility.

5. An underground gas line on East Marginal Way will be relocated by others.
6. There is also work to be done by Seattle City Light at the treatment station site, to provide power to the facility, which must be accommodated in the project schedule. Some Seattle City Light work must be completed a minimum of seven months prior to equipment testing for the treatment station.

If the conveyance work is not completed in time to provide for full testing and operation of the treatment station during the wet weather season, completion of the system could be delayed. The construction completion deadline included in the consent decree for the project is December 31, 2022. This means that all work necessary for the wet weather treatment station to be fully functioning, including testing and commissioning, must be completed by that date.

Coordination efforts among the contractors and close communication with utility agencies that must either relocate or construct new facilities will be essential.

Exhibit D: Work will be completed in separate construction contracts with numerous interdependencies and constraints.



Source: King County Auditor's Office; and WTD GTWWTS 60-Percent Design Construction Schedule Memo, Nov 5, 2016

2. Project Budget

Section Summary

WTD's budget may not have adequate contingency to cover the significant number of identified risks and unknowns. If some of the potential risks occur, total project costs could surpass the $240 million baseline cost estimate.

Baseline cost estimate completed in January 2016

WTD baseline cost estimate completed in January 2016 is $240 million,[6] **with a range of $192 million to $312 million. This falls within the range of earlier planning level estimates, but does not include additional contingency recommended by independent reviews.** This estimate was independently validated by an expert review panel. The panel recommended some additional contingency to reflect the competitive local bidding climate, as well as additional allowances for cost uncertainties as described in more detail below. WTD has not added additional contingency to account for this risk. WTD's risk management plan evaluated the identified risks and assigned a probability of the risk occurring and the potential cost impact. This evaluation then compared the cost risks with the total project contingency. WTD believes its estimate has adequate contingency to cover the potential cost increases. However, some recently identified cost risks were not included in this analysis. WTD recently completed the Class 2 design estimate based on 60 percent design.[7] The likely project cost in this new estimate ranges from $204 million to $288 million.[8] The confidence level of the 60 percent estimate is greater than at baseline. The project design is well defined, no major changes in scope are anticipated, and the estimate method uses a detailed approach to quantify most items of work.

Exhibit E: The most recent cost estimate is consistent with baseline estimate. At 60 percent design, the 'level of confidence' in the estimate accuracy is increased.[9]

	WTD LTCP[10] (1999) Class 5	Carollo[11] (2014) Class 4	WTD/CH2M Baseline (Jan 2016) Class 3	WTD/CH2M 60% Design (Sept 2016) Class 2
Accuracy range	-50%/+100%	-30%/+50%	-20%/+30%	-15%/+20%
High end of range	$ 329,000,000	$ 349,000,000	$ 312,000,000	$ 288,000,000
Most probable	$ 164,000,000	$ 232,000,000	$ 240,000,000	$ 240,000,000
Low end of range	$ 82,000,000	$ 162,000,000	$ 192,000 000	$ 204,000,000

Source: WTD Georgetown Wet Weather Treatment Station 60% Cost Estimate PowerPoint, November 15, 2016

[6] September 2016 dollars. Class 3 estimate based on design drawings of approximately 30% completion, with a range of -20% to + 30% estimate accuracy
[7] CH2M/P&M, November 8, 2016 Opinion of Probable Cost, 60% Design Class 2 estimate
[8] September 2016 dollars, Class 2 estimate based on 60% design drawings, with a range of -15% to +20% estimate accuracy
[9] All costs in September 2016 dollars
[10] Long Term Control Plan, November 1999 Regional Water Services Plan (RWSP) approved by King County Council. RWSP included the county's CSO Control plan.
[11] Carollo Engineers, (October 2014) Brandon/S Michigan CSO Basin Alternatives Analysis and Cost Control

2. Project Budget

Cost risks include the current bidding climate and labor market conditions, among others

WTD has partially addressed the greatest cost uncertainty identified: a potential construction cost increase ranging from 7 to 12 percent ($9.7 to $16.6 million) due to a very competitive bidding climate at time of procurement. The Puget Sound regional economy is very robust and the labor market for construction workers is very competitive. The most current cost estimate may not have adequate contingency to cover higher bids due to market conditions. WTD is working with the Finance and Business Operations Division to mitigate some of this risk, and recently held a project open house to share information about the upcoming project with the construction industry.

Ongoing monitoring of the construction bidding climate and outreach to potential bidders will continue to be important in the months leading up to procurement dates.

Risk register identifies additional cost risks that cannot be fully mitigated

There are additional cost risks that, if realized, could result in costs increasing over the approved budget. WTD included many of these risks in the project risk register and identified mitigation measures to address some but not all risks. The risk register scores risks based on probability and cost or schedule impact. Some of the risks of greatest cost impact include:

- **Disposing of excess soil**. The estimate includes an assumption on the disposition of excess soils in areas of excavation. Construction of the treatment station will require disposal of approximately 120,000 tons of soil. The 60 percent cost estimate assumes as much as 86,000 tons of this material can be disposed of locally with no tipping fee. If the material cannot be disposed of as assumed, the costs for disposal could be greater than $5 million. WTD is evaluating alternative soil disposal options that may be less costly. The risk register assigns a probability to this risk and has included $625,000 in the project contingency.
- **Requirement to buy American steel.** WTD recently identified an additional cost risk related to materials. The project is partially funded with State Revolving Fund loans that include a 'buy America' clause. This requires use of American iron and steel. WTD states the cost of this risk have not yet been fully identified, but may be as much as several million dollars.
- **Uncertainty regarding level of street improvements required by Seattle Department of Transportation (SDOT) as condition of permit approval.** WTD included an allowance in the baseline estimate for right-of-way improvements. WTD states this allowance will be adequate for all restoration work within the

right-of-way. Recent discussions with SDOT indicate it may require additional improvements that were not included in the most recent cost estimate. This additional street improvement requirement could have an impact (not yet quantified) on project cost, which could draw from project contingency. WTD is working with SDOT to achieve a workable solution that will not require significant redesign, but a formal decision by SDOT is still pending.

- **Construction work across the Union Pacific Railroad facilities.** There are two crossings of Union Pacific Railroad tracks, one within WSDOT property and one within City of Seattle right-of-way. Both areas are covered by franchise agreements between the respective agencies and the railroad. While the agencies are the ultimate issuer of any permanent easement or franchise of the WTD conveyance pipe, Union Pacific still provides review and possible conditions for crossing of its tracks. Early discussions with Union Pacific indicate it will not support an 'open-cut' construction for installing the conveyance pipe and may require tunneling or boring under its tracks. This was not identified as a potential cost, because the tracks appeared to be inactive. Negotiations are continuing, but agreement has not yet been reached. If boring or tunneling is required, there will be cost and schedule impacts associated with the redesign and the new construction method. This risk has not yet been mitigated.

2. Project Budget

Exhibit F: WTD analyzed risks according to probability and cost to verify adequacy of project contingency. New risks have been identified since the cost risk analysis was completed; the potential cost of some risks may not be fully considered.

Risk	WTD Expected Value[12]	Potential Cost (Low End of Range)	Potential Cost (High End of Range)	Current Trend
Market conditions/bid climate	$ 4,380,000	$ 9,730,000	$ 16,680,000	No change
Geotechnical/ underground obstructions/ archeological discovery	$ 4,750,000	$ 4,750,000	$ 4,750,000	Reducing
Complex business relocations	$ 1,750,000	$ 1,750,000	$ 1,750,000	No change
United Pacific Railroad	$ 875,000	$ 875,000	$ 875,000	Increasing
Excess soil disposal	$ 625,000	$ 5,000,000	$5,000,000	No change
American steel/iron costs	Not included	$ 1,000,000	$ 2,000,000	Newly identified risk
Seattle Department of Transportation restoration requirements	Not included	undetermined	undetermined	Newly identified risk, reducing
Total	**$ 12,380,000**	**$23,105,000**	**$31,055,000**	

Source: WTD Georgetown Risk Register (11/28/16) and 60% Cost Est. Presentation (11/15/16); Jacobs OPPC Review Memo, (11/11/16)

Recommendation 1 The Wastewater Treatment Division should update its risk based analysis of the adequacy of contingency to include 'Buy American Steel,' Seattle Department of Transportation improvements, and other recently identified cost risks.

[12] WTD Georgetown Wet Weather Treatment Station 60% Cost Estimate PowerPoint, November 15, 2016. Exhibit F does not include all cost items included in the most current risk register, only those risks identified in WTD's November 2016 risk trend analysis slide and some recently identified risks that were not evaluated as part of the 60% project contingency analysis. WTD calculates the 'likely' cost of a risk based on probability of occurrence. For example: the 'Excess soil disposal' risk was assumed to have a 12.5 % probability of occurring. $5 million x 12.5% = $625,000.

3. Project Scope

Section Summary

Independent reviews confirmed that a wet weather treatment station was a good approach, but the reviews occurred too late to allow any substantive change in scope and still meet an interim consent decree milestone. WTD completed multiple independent reviews of the Georgetown project's selected alternative, and enlisted the services of an Expert Review Panel to meet the requirements of a budget proviso. Experts made recommendations for additional project optimization and risk identification and mitigation.

Alternatives analysis completed after preliminary scope approved

The timing of alternatives analysis in late 2014 did not allow for any major change in scope if the County were to meet certain consent decree deadlines. The project scope was chosen quite early in the project planning phase. The level of alternatives analysis conducted by WTD on this location prior to submitting the Long Term Control Plan to Washington State Department of Ecology for approval was limited, as discussed in our September 2014 audit report.[13]

An alternatives analysis was completed in October 2014.[14] The analysis considered only the materials provided by WTD and its design consultant, and did not consider any engineering solutions which might have been analyzed in the early project planning phase. WTD could have renegotiated some elements of the consent decree but elected to move forward with the original alternative. The consultant report was reviewed by County Council and Auditor's Office staff and a budget proviso was included as part of the 2015-16 biennial budget (refer to Appendix 1).

Changes to baseline scope have been approved

Some changes to the baseline scope have been approved. As the WTD project team and its consultants conducted the review of 60 percent design documents, they identified the following necessary changes to the baseline project scope:

- modifications to the Brandon regulator station, mechanical, electrical and instrumentation (+$500,000)
- design changes to effluent pipeline (+$200,000)
- modifications to the warranty for some owner procured equipment (+$47,000)

[13] King County Auditor's Office (September 2014), Performance Audit of the Georgetown Combined Sewer Overflow Project
[14] Carollo Engineers (October 2014), Brandon/S Michigan CSO Basin Alternatives Analysis and Cost Control

3. Project Scope

WTD's Combined Sewer Overflow (CSO) control plan includes several large projects that are currently in the project definition and planning phases. One of these projects, the Hanford #2 –Lander St – King St – Kingdome plans to construct a CSO treatment facility. The 2014 audit report included a recommendation that WTD should conduct alternatives analysis in the project definition/planning phase of the remaining large CSO projects to allow for change in project direction well in advance of interim consent decree milestones. This recommendation remains open.

Appendix 1

Budget Proviso Requires Expert Review Panel

This proviso directed the Wastewater Treatment Division (WTD) to engage an 'Expert Review Panel' to complete additional review of the Georgetown project and the Carollo alternatives analysis report.[15] WTD enlisted the services of MWH, an engineering consulting firm, via a negotiated contract to meet this requirement. One of the first tasks of the Expert Review Panel (panel) was to review the Georgetown Wastewater Treatment System project scope and make written findings and recommendations. The panel reviewed the Basis of Design report, preliminary design drawings, and the draft facility plan. It also reviewed the Carollo alternatives analysis report. The focus of its review was grouped into three defined categories:

- project optimization
- cost control
- risk management and mitigation

The panel prepared a technical memorandum which summarized its initial project analysis.[16] While it concluded that there was no less-expensive way to comply with the consent decree than the selected wet weather treatment station alternative, the memorandum included several recommendations for the WTD project team:

- conduct additional project optimization studies to find ways to improve operational efficiency and performance
- use of multiple bid packages, including an early bid package for site ground work to isolate risks associated with geotechnical conditions
- include some adaptability in project design to allow future changes that may be needed due to climate change (with the understanding that the timeframe and extent of impacts of climate change are difficult to predict)
- minimize residual risk after 30 percent design.

The panel also noted that **no high-significance risks should remain after 30 percent design.**

The Project Optimization (value engineering) workshops conducted in January 2016 identified areas of cost savings. The two teams identified many areas of design optimization, with $2 million in potential construction cost savings, and other changes identified that could save an additional $685,000. WTD incorporated changes to the project design based on the recommendations of the teams. The process and recommendations were also reviewed by the panel.

[15] 2015-2016 Biennial Budget Ordinance 17941, Section 110, Proviso P3
[16] CSO Expert Review Panel, Presentation to Regional Water Quality Committee, October 7, 2015