

Improvements to the King County Wastewater Treatment Division's Conceptual Planning and Cost Estimating Processes

Technical Working Group Recommendations

December 9, 2016



King County

Department of Natural Resources and Parks
Wastewater Treatment Division

Improvements to the King County Wastewater Treatment Division's Conceptual Planning and Cost Estimating Processes

The Wastewater Treatment Division (WTD) of the Department of Natural Resources and Parks (DNRP) established a cost estimating Technical Working Group, as required by Section 110 Proviso P1 of the 2015/2016 Biennial Budget Ordinance 17941 to review and make technical recommendations to the King County Executive and Council regarding the following:

- Processes to establish and update planning level cost estimates for WTD capital projects, from the time a project is identified through the preliminary design process until the project reaches thirty percent design completion.
- Processes WTD uses to consider, or reconsider, projects as they move from project identification to thirty-percent design and the establishment of a baseline budget.

Council approved the Technical Working Group's work plan with passage of Motion 14384 on June 29, 2015. The full scope of work presented in the approved Work Plan has been completed. The recommendations summarized in this report were developed through an extensive effort by the Technical Working Group. Implementation of the recommendations will result in more accurate and efficient long-term system planning and conceptual cost estimating processes for WTD.

Technical Working Group

WTD established a nine-member Technical Working Group, including representatives from the Council, Executive, Regional Water Quality Committee (RWQC), and Metropolitan Water Pollution Abatement Advisory Committee (MWPAAC). Members were as follows:

- Mike Reed, Council staff representative
- Katy Buck, RWQC staff representative
- Christie True, DNRP, Executive representative
- Sandy Kilroy, WTD Director's Office representative
- Kathy Loland, WTD Project Planning and Delivery Section representative
- Tom Lienesch, WTD Finance Section representative
- Adam Strutynski, Sound Transit, peer public agency representative
- Henry Chen, Seattle Public Utilities, MWPAAC representative
- Andrew Lee, Bellevue Utilities, MWPAAC representative

The Technical Working Group met in November 2015 and January, March, June, August, and December 2016 to review the progress and work products developed by WTD and its consultant.

Consultant Facilitation

WTD contracted with cost estimating consultant Value Management Strategies, Inc. (VMS) to facilitate and support the Technical Working Group. The VMS consultant team best embodied the expertise desired by WTD in the areas of Total Cost Management, Association for the Advancement of Cost Engineering International (AACEI) affiliation, Conceptual Cost Estimating, Trend Analysis, Risk Management, and Long-term System Planning.

WTD, working with VMS, used the following phased approach for improvements that would result in more accurate and efficient long-term system planning and conceptual cost estimating processes:

1. Identification of Areas of Opportunity
 - Strengths, weaknesses, opportunities, and threats – SWOT analysis
 - Organizational analysis
 - Employee and stakeholder interviews and surveys
2. Identification and Testing of Solutions
 - Validate concepts
 - Pilot projects and concept testing
 - Plan, do, check, adjust – PDCA continuous improvement cycle
3. Review and Input from Technical Working Group
 - Discuss concepts and pilot projects
 - Incorporate feedback
 - Intra-agency lessons learned
4. Implementation of Recommendations
 - Employee education and training
 - PDCA refinements
 - Lessons learned

Summary of Work Efforts and Recommendations

As part of the scope of work, VMS facilitated workshops, work sessions, and associated activities for identifying areas of opportunity and potential solutions during 2016. WTD participants in these efforts included key Project Planning and Delivery (PPD) Section employees from the Comprehensive Planning, Engineering, Project Management, and Project Control Units and employees from the Finance Section. Pilot testing was done on more than 70 capital projects, both in planning and implementation.

The following primary areas for improvement to WTD's long-term system planning and conceptual cost estimating practices were identified:

- Cost estimating
- Trend analysis
- Contingency
- Risk management
- Project formulation

For each of these primary areas, WTD, with the assistance of VMS, developed recommendations for review and discussion by the Technical Working Group. The following is a summary of the WTD and VMS efforts, recommendations supported by the Technical Working Group, and status on WTD's implementation of the recommendations for each of the five primary areas.

Cost Estimating

Cost estimating efforts included an in-depth, current-state analysis of WTD's estimating practices, tools, and data sources. Estimating and basis-of-estimate workshops were conducted to better document and communicate estimate assumptions. Proof-of-concept development was undertaken to test the feasibility of cost estimating improvement processes and tools. Conceptual cost estimating and basis-of-estimate work sessions involved primary PPD and estimating stakeholders. VMS provided independent validation of planning level cost estimates and worked with PPD on processes to improve ongoing validation of cost estimates. WTD initiated more than 50 cost estimating pilot project trials to inform the improvement efforts.

The Technical Working Group was apprised and updated and then provided input on the cost estimating improvement efforts, tools, techniques, and alignment with AACEI total cost management practices.

Recommendations:

- Incorporate a basis-of-estimate template and guidance document for better communication of cost estimating assumptions, allowances and exclusions. This document will ensure communication to both current and future stakeholders of the estimate scope, limitations and associated cost assumptions. A separate basis-of-estimate document should be part of every cost estimate update.
- Standardize cost estimate format and structure, for use both by internal staff and external consultants, to provide consistency and clear communication of costs.
- Develop future enhancements to WTD's Tabula cost estimating tool, incorporating additional historical data to better inform conceptual conveyance system cost estimates.
- Revise existing cost estimating guidelines to incorporate all implemented improvements to cost estimating processes, tools and techniques.
- Develop additional cost estimating resource capabilities necessary for WTD to fully implement recommendations.
- Provide cost management and estimating education and training on the improvements to estimating processes, tools and techniques.

Status:

- Pilot project trials continue to inform and refine the cost estimating tools and techniques.
- Basis-of-estimate and one-page estimate summary documents are now available for use by all PPD capital project teams, beyond the original pilot project participants.
- Scalable cost estimating tools are under development with WTD's Asset Management Program. Pilot projects will be identified for these smaller asset management work requests.
- Enhancements to WTD's Project Information System Management (PRISM) cost models and project complexity factors were completed.

- Training on the use and application of these estimating tools and techniques is underway for key PPD cost estimating stakeholders.

Trend Analysis

Trend analysis work efforts included an in-depth review of WTD's processes for capturing and communicating changes to scope, cost and schedule over the project lifecycle. Trend analysis workshops were conducted along with proof-of-concept development on how WTD might incorporate existing tracking and reporting processes into an integrated trend analysis program. Work sessions, training to develop and practice trend tracking tools and reporting, and several pilot project trials were conducted.

The Technical Working Group was apprised and updated and then provided input on trend analysis improvement efforts, tools, and techniques that better communicate the impacts of change.

Recommendations:

- Formalize and implement a Trend Analysis Program that incorporates existing WTD tracking and reporting processes to better capture and communicate changes to scope, cost and schedule over the project lifecycle.
- Incorporate the trend tracking template and other trend tools and techniques as informed by the pilot project trials.
- Provide trend analysis education and training to better capture, document and communicate project decisions, costs, schedule and changes over time.

Status:

- Pilot project trials continue to inform and refine the trend analysis and tracking tools and techniques.
- Analysis of WTD's existing tracking and reporting business processes, in conjunction with King County standards and requirements, continue to help form a Trend Analysis Program.

Contingency

A current-state analysis of WTD and King County contingency policies and practices was performed. Workshops and presentations were held based on AACEI total cost management contingency best practices and differentiating between project contingency, allowances for indeterminates (AFI), construction change order allowance and management reserve.

The Technical Working Group was apprised and updated and then provided input on contingency applications that align with AACEI total cost management best practices.

Recommendations:

- Fully align contingency practices and nomenclature to AACEI best practices.
- Provide continued education and training on AACEI total cost management project contingency practices.

Status:

- Updates to existing WTD matrices and PRISM cost models were completed.
- Contingency application and best practice briefings to WTD's Capital Systems Team were conducted.

Risk Management

A current-state analysis of organizational risk management practices was performed. Risk management and scalability workshops were held, resulting in proof-of-concept development for improvement recommendations. Considerable attention was paid to WTD's long-term system planning for conceptual cost estimating risk factors compared to projects with varying degrees of design and engineering. Scalable risk management applications were also developed for smaller projects related to the asset management work request processes. Multiple risk management work sessions were conducted and pilot project trials for scalable risk management approaches were initiated.

The Technical Working Group was apprised and updated and then provided input on risk management applications, tools, techniques, and practices.

Recommendations:

- Incorporate a risk management scalability matrix that addresses project size and complexity, from small asset management work requests to large capital projects through high-risk projects with mandatory phased appropriation.
- Standardize risk management tools and techniques.
- Continue pilot project trials to inform ongoing process improvements and update existing risk management processes, tools, and techniques as lessons learned are incorporated.
- Provide continued education and training on risk management process improvements as implemented.

Status:

- Pilot project trials continue to inform and refine risk management tools and techniques.
- Scalable risk management processes are under development with WTD's Asset Management Program. Pilot projects will be identified for these asset management work requests.

Project Formulation

A current-state analysis of the processes WTD uses to consider, or reconsider, projects as they move from initial problem to project identification was undertaken. An initial project formulation development team was established to investigate proposed project scope, schedule and budget needs with key internal stakeholders and associated oversight, chartering and prioritization efforts. Understanding that problems and potential needs do not have enough information to be described as formal projects, the recommended Project Formulation Program provides initial investigation of candidate projects to further develop key needs into conceptual projects and better evaluate project requests. Capital Systems Team provided input on Project Formulation development.

The Technical Working Group was apprised and updated and then provided input on project formulation practices.

Recommendations:

- Adopt a Project Formulation Program to develop conceptual needs into recommended projects. The program will benefit WTD through better scope definition and improved understanding of costs and schedule impacts; better inform project development efforts; and allow decision makers to more fully evaluate future stand-alone project funding requests.

Status:

- Project Formulation Program sponsors have been identified, and WTD's Capital Systems Team has been briefed. Development continues.

Coordination Activities

The efforts to improve WTD's long-term system planning and conceptual cost estimating processes were coordinated with several other improvement efforts and stakeholders, including the Expert Review Panel for the combined sewer overflow program, WTD's Continuous Improvement Capital Project Streamlining and Lean initiatives, an independent consultant panel evaluating WTD's Project Oversight Effectiveness, and WTD's Project Control Officer. As implementation progresses, WTD will coordinate with King County's Capital Project Management Work Group to share scalable conceptual cost estimating approaches, guidelines, tools and templates with a broader audience.

Briefings

Stakeholder engagement and subject matter briefings occurred with King County Executive and Council representatives throughout this effort and at key deliverable milestones. Formal presentations were made to the RWQC on December 2, 2015, and March 2 and September 7, 2016; to MWPAAC on February 4, August 4, and August 24, 2016; and to King County Council auditors on July 20, 2016.

Implementation Schedule

WTD will continue implementing these recommendations within the PPD Section capital program. This will involve additional training on improved conceptual planning and cost estimating processes, trend analysis, risk management, project formulation and effectively communicating project cost estimates resulting from these recommendations.

2016

- Technical Working Group recommendations complete by end of 2016.

2017

- Implementation of the recommendations in this report by end of 2017.
- Training of primary PPD capital program planning and cost estimating stakeholders.
- PDCA continuous improvement and incorporation of lessons learned.

2018

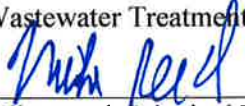
- Enhancements to WTD's Tabula conveyance system cost estimating tool.
- Enhancements to WTD's PRISM project and reporting modules.
- Coordination with King County's Capital Project Management Work Group to share scalable conceptual cost estimating approaches, guidelines, tools and templates.
- PDCA continuous improvement and incorporation of lessons learned.
- Ongoing training of PPD capital program planning and cost estimating stakeholders.


2019 – 2020

- WTD may extend the VMS consultant contract through 2020 for ongoing third-party cost estimate validation and process improvement support as lessons learned are identified.


Technical Working Group Concurrence

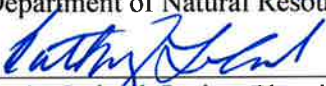
The Technical Working Group established by the Wastewater Treatment Division of the Department of Natural Resources and Parks per Proviso P1 of the 2015/2016 Biennial Budget Ordinance 17941 Motion 14384 hereby concurs with the above technical recommendations. These recommendations will result in more accurate and efficient long-term system planning and conceptual cost estimating processes for the Wastewater Treatment Division.


Mike Reed, Principal Legislative Analyst, King County Council, representing the Regional Water Quality Committee



Katy Buck, Legislative Aide, King County Council, representing the Regional Water Quality Committee

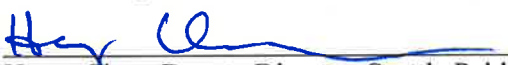

Christie True, Department Director, Department of Natural Resources & Parks

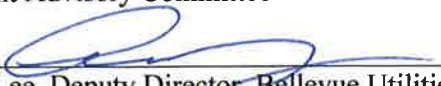

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Tom Lienesch, Economist, Wastewater Treatment Division, Department of Natural Resources & Parks


Adam Strutynski, Director of Scheduling, Estimating, Risk & Value Engineering, Sound Transit


Henry Chen, Deputy Director, Seattle Public Utilities, representing the Metropolitan Water Pollution Abatement Advisory Committee


Andrew Lee, Deputy Director, Bellevue Utilities, representing the Metropolitan Water Pollution Abatement Advisory Committee