King County Auditor's Office
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King County

Utility Rates: Long-Term Forecasts Should Reflect Uncertainty

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October 13, 2015

Executive Summary

The Solid Waste Division (Solid Waste) and the Wastewater Treatment Division (Wastewater) both provide long-term customer rate forecasts in major planning documents, such as strategic plans. While Solid Waste and Wastewater follow many best practices for such forecasts, both agencies underestimated the rate impacts of their plans. Long-term forecasting is inherently uncertain, and Solid Waste and Wastewater should provide a range of rate estimates to reflect this uncertainty. This would give the County Council and ratepayers a better understanding of the range of potential rate impacts of the initiatives being proposed in strategic plans.

King County Auditor's Office

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Utility Rates: Long-Term Forecasts Should Reflect Uncertainty

Report Highlights

October 13, 2015

Why This Audit Is Important

Together, Solid Waste Division (Solid Waste) and Wastewater Treatment Division (Wastewater) raise about $527 million per year through rates paid by customers. The customer rates pay for the operations of and capital improvements to the solid waste and wastewater disposal and treatment systems. Long-term forecasts of customer rates provide guidance to the County Council when considering major capital improvement programs proposed by the agencies, as major capital programs can have a significant impact on future rates. The purpose of this audit was to assess the accuracy of long-term rate forecasts by these agencies and identify the reasons for any inaccuracies.

What We Found

While Solid Waste and Wastewater follow many best practices in their long-term forecasting, past forecasts have underestimated future rate increases. This is particularly true for Wastewater's capacity charge, which is levied on new connections to the wastewater system. The current capacity charge is about 10 times higher than was forecast in the 1999 Regional Wastewater Services Plan Operational Master Plan. There is a great deal of uncertainty associated with long-term rate forecasts, and neither agency presented future rates as a range of possible outcomes in order to reflect this uncertainty.

What We Recommend

We recommend that Solid Waste and Wastewater conduct sensitivity analysis around key assumptions, and present long-term rate forecasts in a range of possible rate outcomes.

We will be conducting a second phase of this audit to review Wastewater's rates model in detail. Wastewater's rates model is very complex, and the second phase of the audit will review the logic and calculations of the model to ensure that its outputs are consistent with county policies. The Auditor's Office performed a similar review of Solid Waste's rates model in the past.

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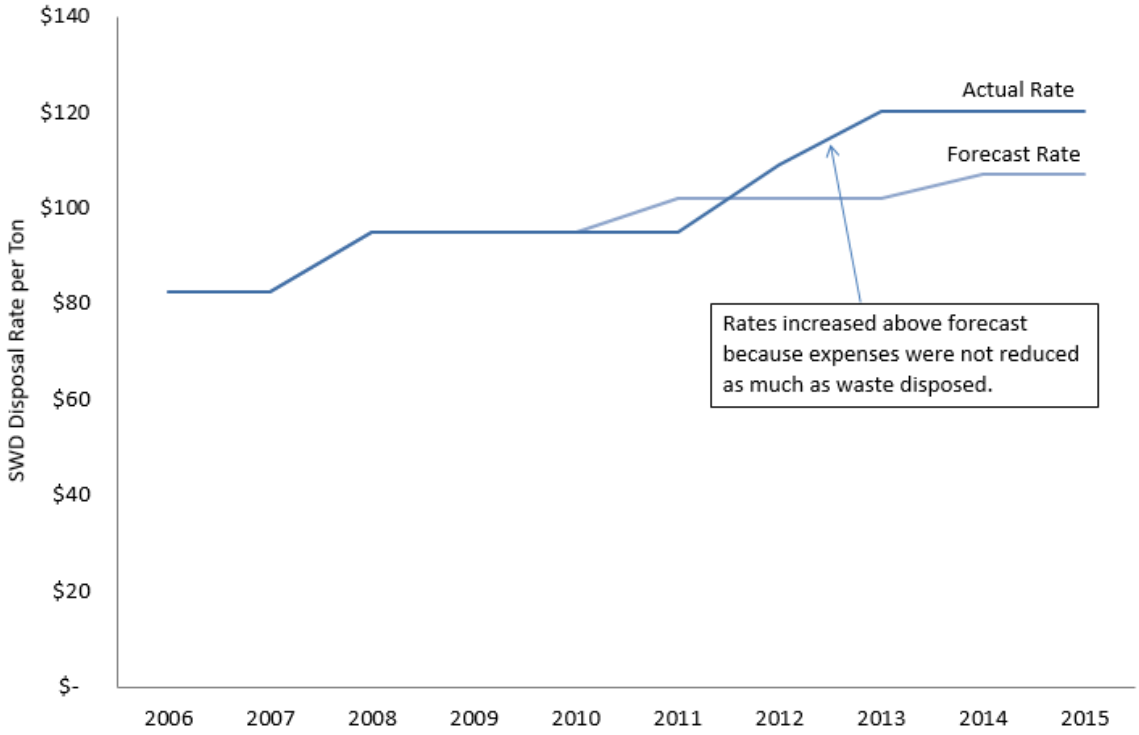
Utility Rates: Long-Term Forecasts Should Reflect Uncertainty

How accurate have Solid Waste and Wastewater's long-term rate forecasts been?

The long-term forecasts we reviewed from Solid Waste Division (Solid Waste) and Wastewater Treatment Division (Wastewater) underestimated future rates; most notably Wastewater's current capacity charge is about 10 times higher than was forecast in the 1999 Regional Wastewater Services Plan (RWSP) Operational Master Plan. This analysis reviewed the major rates charged by Solid Waste and Wastewater, including Solid Waste's transfer station tonnage fee and Wastewater's monthly customer and capacity charges (the capacity charge is charged to new customers connecting to the system to pay for the capital costs of new capacity). Exhibit A compares Solid Waste's 2006 forecast of its tonnage fee with actual rates, and Exhibits B and C compare Wastewater's 1999 RWSP forecast of its monthly customer and capacity charges with actual rates.

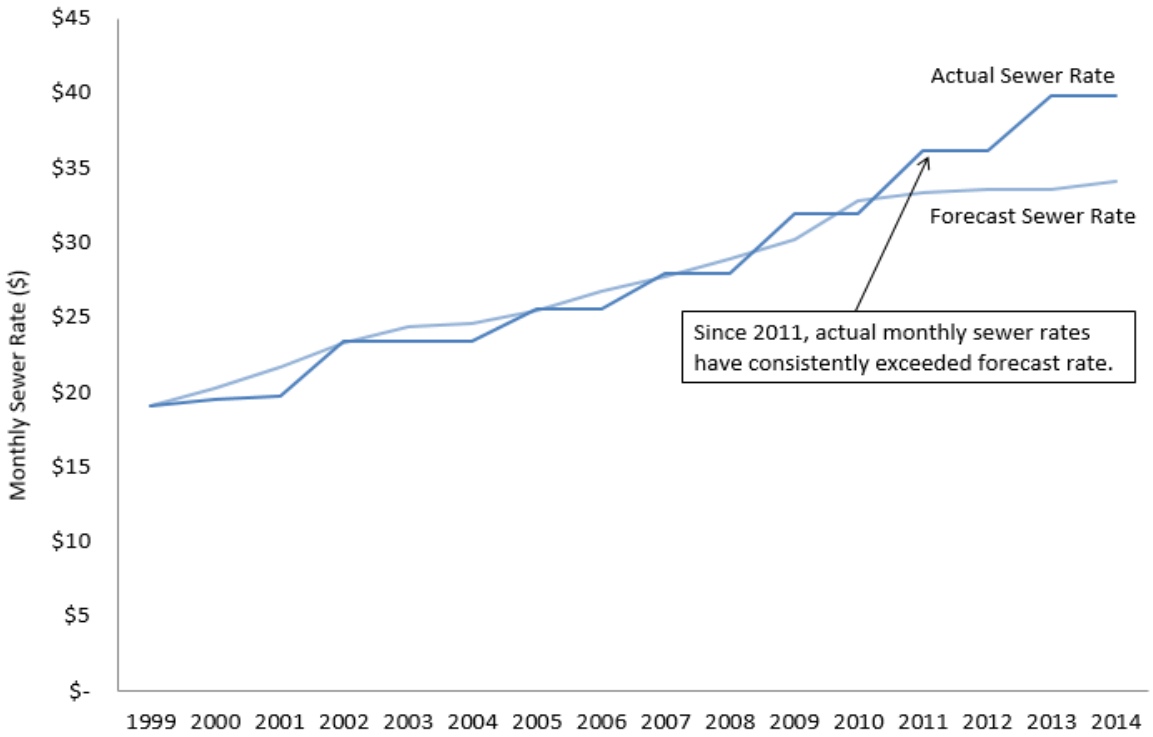
Exhibit A: Solid Waste's 2006 rate forecast accurate in early years; underestimated recent rate increases.



Source: King County Auditor's Office analysis

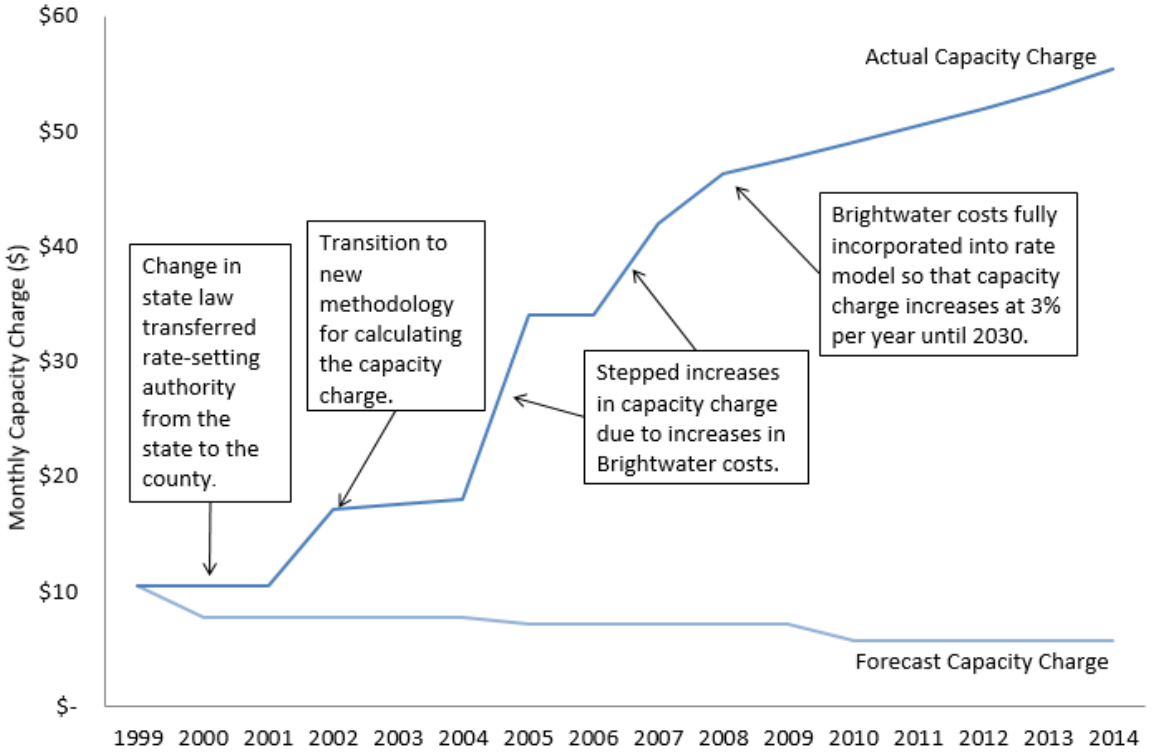
Utility Rates: Long-Term Forecasts Should Reflect Uncertainty

Exhibit B: Wastewater's 1999 customer charge forecast accurate in early years; underestimated recent rate increases.



Source: King County Auditor's Office analysis

Exhibit C: Wastewater's 1999 capacity charge forecast substantially underestimated future capacity charges.



Source: King County Auditor's Office analysis

A major reason for Wastewater's substantial underestimation of the capacity charge was a change in state law that removed constraints on how the charge was calculated. The state law change allowed the County to revise the capacity charge to match a county policy that new customers should pay for the increase in capacity needed to serve them. The revision in the methodology resulted in a higher proportion of capital costs allocated to the capacity charge. The methodology change, combined with higher than projected capital costs for growth-related projects (e.g., the new Brightwater wastewater treatment facility), resulted in the substantial increase in the current capacity charge above the 1999 forecast.

What are the consequences of inaccurate long-term forecasts?

Inaccurate long-term rate forecasts do not provide full information to the County Council and ratepayers about the potential impact of those plans on future rates. Long-term rate forecasts are often a part of strategic planning documents that are the foundation for major capital programs (e.g., Brightwater, combined sewer overflow program for Wastewater, and transfer station upgrades for Solid Waste). Long-term forecasts are inherently uncertain. Both Solid Waste and Wastewater's rate models are capable of performing sensitivity analysis[1] around key assumptions that would allow for presentation of rate projections as a range, rather than a single estimated rate for each year of the forecast. But both Solid Waste and Wastewater presented their forecasts as a single estimated rate for each year. Presenting forecasts in this way is not reflective of the uncertain nature of these forecasts. Both Solid Waste and Wastewater pursued options to expand the capacity of their systems based on inaccurate assumptions about demand for services and, at Wastewater, inaccurate capital costs assumptions. When the recession decreased demand and capital cost increased, the agencies were forced to increase garbage and sewer rates beyond the rates initially predicted. If the forecasts had been presented in a range of potential rates, the County Council and ratepayers would have had a better understanding of the potential rate outcomes of the plans being considered.

To the extent that long-term rate forecasts were inaccurate, what explains the inaccuracies?

Both Solid Waste and Wastewater overestimated the future growth in customer demand, and Wastewater significantly underestimated future capital costs. Both errors resulted in underestimating future rates. Put simply, customer rates are determined by the following calculation:

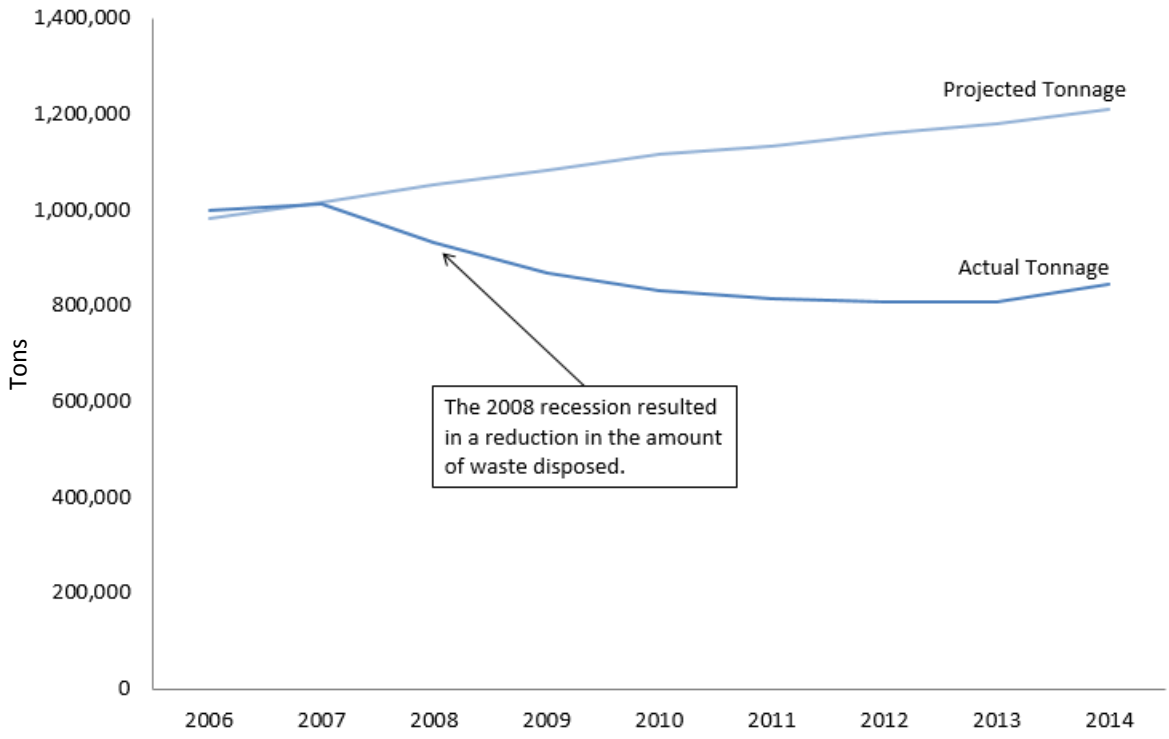
Costs / Units of Service

[1] Sensitivity analysis involves identifying key assumptions that have the most potential to affect the forecast, and testing different values for those assumptions in the model to quantify the impact on rates. For example, if the assumption used in the forecast were that units of service would grow at 2% per year, sensitivity analysis would involve modeling the impact of other assumed growth rates besides 2%.

For Solid Waste, a unit of service is based on the number of tons of solid waste disposed by customers. For Wastewater, a unit of service is based on a measure of the amount of water used by customers known as Residential Customer Equivalents (RCEs). Therefore, the accuracy of Solid Waste and Wastewater's long-term rate forecasts are dependent on underlying projections of both future expenses and customer behavior.

Accuracy of solid waste cost and unit forecasts. The reason Solid Waste's 2006 forecast underestimated future rates is because of the decline in the amount of waste disposed of during the recession. In 2006, Solid Waste overestimated the amount of future tonnage of solid waste (see Exhibit D). The effect of overestimating future units of service is that rates are underestimated, because costs are spread over fewer units of service.

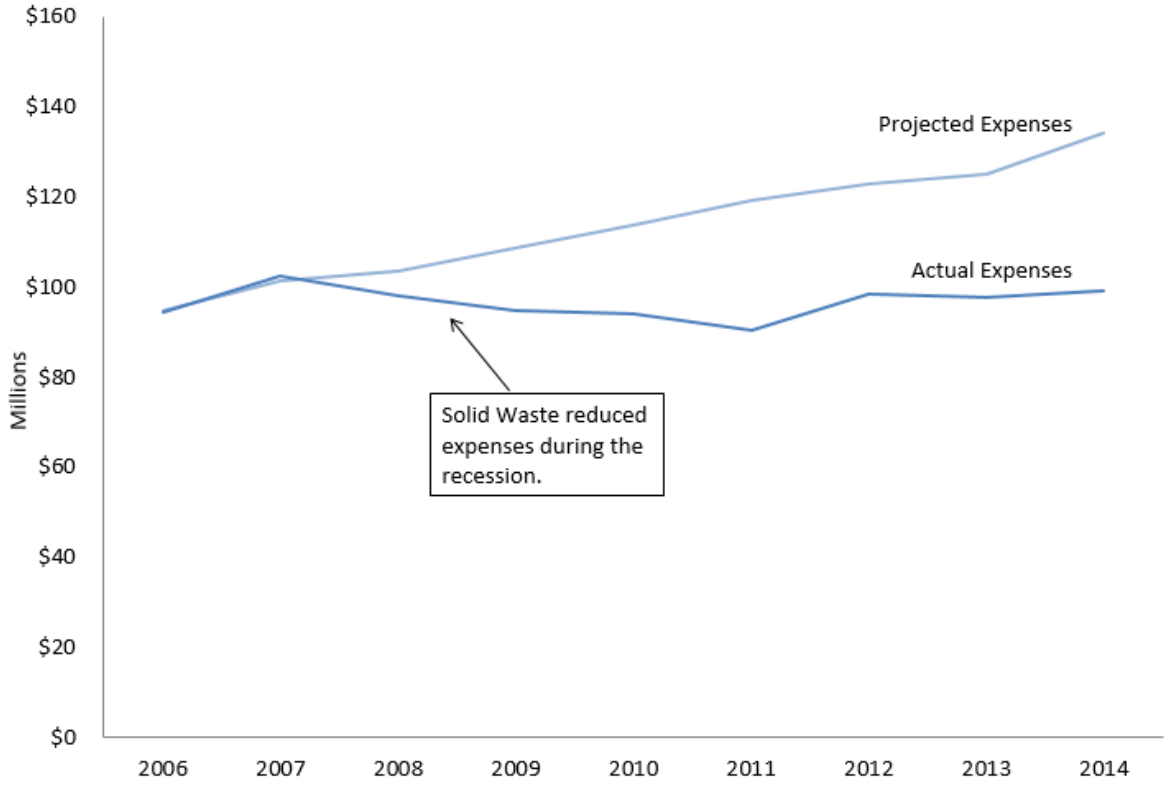
Exhibit D: Tonnage of solid waste fell below 2006 projection during the recession.



Source: King County Auditor's Office analysis

During the recession, Solid Waste cut expenses in response to reduced revenues but not enough to avoid rate increases (Exhibit E below).

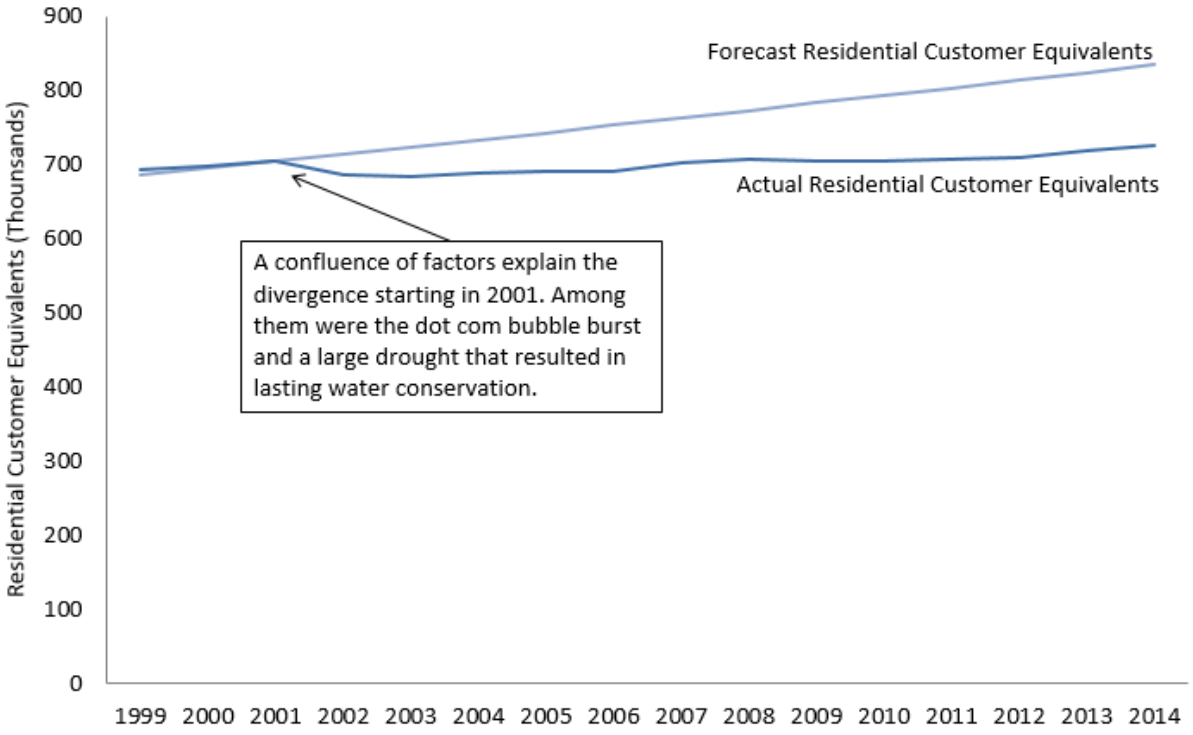
Exhibit E: Solid Waste reduced expenses during the recession.



Source: King County Auditor's Office analysis

Accuracy of wastewater cost and unit forecasts. Similar to Solid Waste, Wastewater also overestimated the number of units of customer service (Exhibit F, below). Growth in Wastewater's units of service fell below projections beginning in the early 2000's, which Wastewater attributes to efforts by customers to conserve water during a drought. Exhibit F also illustrates further moderation of unit growth during the recession. Unlike Solid Waste, the units of service for Wastewater did not significantly decline during the recession, but rather failed to increase as much as forecast. Subsequent forecasts by Wastewater have reflected these changes.

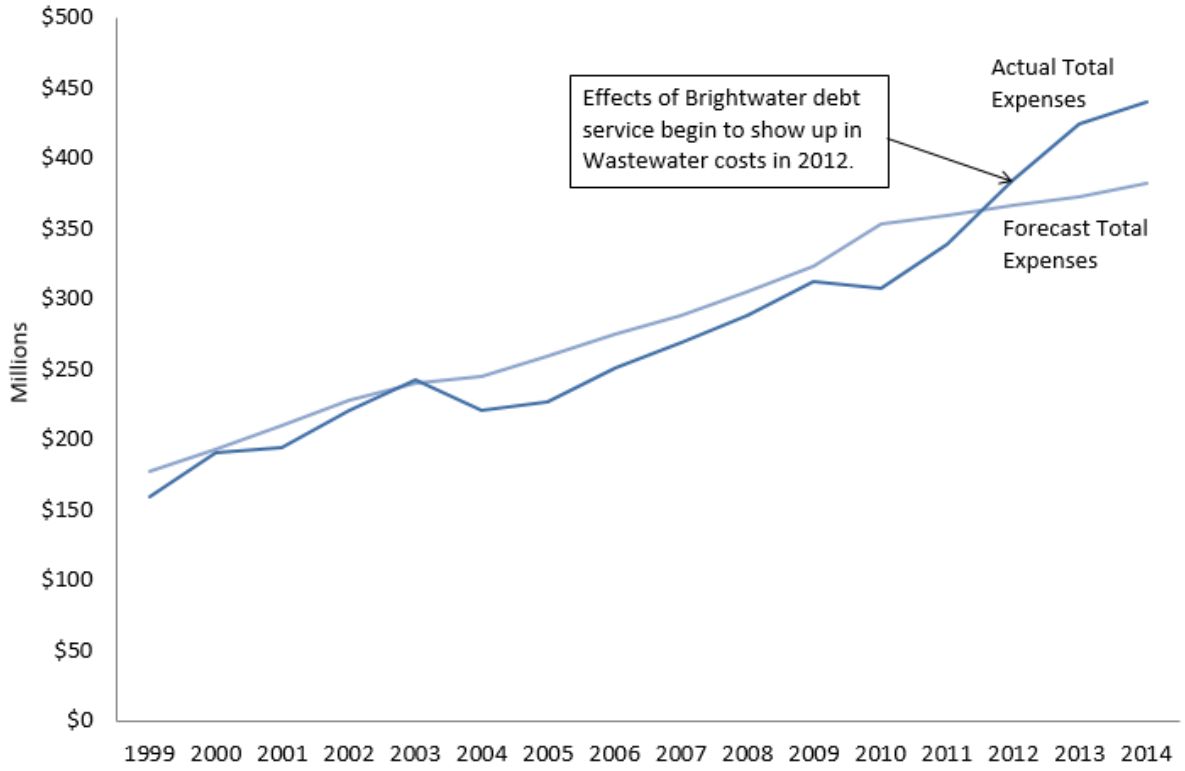
Exhibit F: 1999 Wastewater projection overestimated units of customer service.



Source: King County Auditor's Office analysis

As shown in Exhibit G, below, Wastewater expenses tracked well with the 1999 forecast for some time, but since 2012 total expenses have exceeded the forecast. The recent trend of exceeding the forecast is largely attributable to higher debt service for Brightwater and other capital projects, compared to what was forecast in 1999. The 1999 RWSP rate forecast used highly uncertain planning-level capital cost estimates for projects included in the RWSP. Those estimates turned out to be unrealistic. For example, in 1999 Brightwater was projected to cost $987 million in 2010 dollars. Brightwater's eventual cost was $1.9 billion in 2010 dollars, which was about 89% higher than the planning-level estimate.

Exhibit G: Wastewater total costs close to 1999 projection, but have exceeded projection since 2012.



Source: King County Auditor's Office analysis

How do Solid Waste and Wastewater's rate-forecasting practices compare to best practices?

Both Solid Waste and Wastewater follow many best practices for rate forecasting, including using a model capable of conducting sensitivity analysis of the impact of key assumptions. However, neither agency presented their rate forecast as a range of possible outcomes to reflect the inherent uncertainty of long-term forecasts, a best practice for economic analysis. Both Solid Waste and Wastewater have robust rate models which include projections of all elements of expenses, and which use sophisticated forecasting methods for projecting growth in units of customer service. Using these models allows for sensitivity analysis of key assumptions. However, there are inherent uncertainties associated with long-term projections. For example:

- The performance of the economy affects how much service is demanded by customers.
- Droughts or efforts to conserve water can affect demand for wastewater services.
- Efforts to increase recycling can affect solid waste tonnage.
- Planning-level forecasts of future capital costs can be highly inaccurate.

Utility Rates: Long-Term Forecasts Should Reflect Uncertainty

Due to the inherent uncertainties of long-term projections, it is a best practice to conduct sensitivity analysis around key assumptions and present long-term forecasts as a range of outcomes. Since uncertainty cannot be avoided, it is necessary to identify assumptions that represent the most risk to the forecast and quantify the impact of using different assumptions in a sensitivity analysis. The use of sensitivity analysis is a best practice in economic analysis. Another best practice is to present the outcome as a range of possible rates instead of a single point estimate. While both Solid Waste and Wastewater have indicated that they do conduct sensitivity analysis, by presenting rate forecasts as a single point rather than a range of projected rates, the presentation of these forecasts does not reflect the inherent uncertainty they contain, and does not provide full information to the County Council or ratepayers about potential rate outcomes. Wastewater has begun to present rate forecasts relating to potential cost impacts of combined sewer overflow projects as a range in response to a previous Auditor's Office recommendation.

What does the Auditor's Office recommend to improve the accuracy of long-term forecasts?

Solid Waste and Wastewater are taking steps to improve their forecasts, but should present long-term rate forecasts to decision-makers showing a range of potential rate outcomes reflecting the inherent uncertainty of these forecasts. Solid Waste and Wastewater are already taking steps to improve the accuracy of their long-term forecasts. In response to previous audit findings and a County Council proviso, Wastewater is taking steps to improve its planning-level capital cost estimates. Wastewater has also reduced its projection of long-term unit growth in more recent forecasts. Solid Waste has revised its tonnage forecast methodology to incorporate new relationships between economic factors and waste generation to reflect changing conditions following the recession**.** While both agencies have indicated that they conduct sensitivity analysis around key assumptions, neither agency has presented long-term rate forecasts to the County Council showing how changing the assumptions could affect future rates.

Recommendation 1

Solid Waste Division should:

- identify key assumptions affecting long-term rate forecasts
- conduct sensitivity analysis around the key assumptions
- present long-term rate forecasts to decision-makers portraying a range of potential rate outcomes reflecting different values for key assumptions.

Recommendation 2

Wastewater Treatment Division should:

- identify key assumptions affecting long-term rate forecasts
- conduct sensitivity analysis around the key assumptions
- present long-term rate forecasts to decision-makers portraying a range of potential rate outcomes reflecting different values for key assumptions.

Conclusion

Solid Waste and Wastewater prepare long-term rate forecasts in conjunction with major strategic planning efforts. These strategic plans are often the impetus behind expensive new capital programs. Solid Waste and Wastewater's past long-term forecasts have generally underestimated future rate increases. Improving the accuracy of these forecasts, and presenting the forecast in a range of potential rate outcomes reflecting their inherent uncertainty, allows for the County Council and ratepayers to have a better understanding of the potential rate impacts of these plans.

Ongoing audit work. We performed a detailed review of Solid Waste's rate model during a previous effort and found several areas where the model could be improved. We have not recently conducted a thorough review of Wastewater's rate model, and elements of the model are extremely complex, particularly related to the calculation of the capacity charge. We will be conducting a second phase of this audit to review Wastewater's rates model in detail.

Executive Response

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October 7, 2015

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King County Auditor
Room 1033
COURTHOUSE

Dear Ms. Waltmunson:

Thank you for the opportunity to review and comment on the Confidential Draft of your proposed final report – "Utility Rates: Long-Term Forecasts Should Reflect Uncertainty" received September 21, 2015. As indicated in the attached table, we concur with the report's recommendations that the Solid Waste Division (SWD) and the Wastewater Treatment Division (WTD) should provide a range of rate estimates to reflect the uncertainty inherent in long-term rate forecasts. Some sensitivity analysis has been an element of both utilities' long-term rate forecasts but more could be done. In the past, this has occurred primarily in conjunction with major system planning efforts. For example, WTD's May 1997 Draft Financing Plan for the Regional Wastewater Services Plan (RWSP) included significant sensitivity analyses of alternative assumptions and changes to rate structure policy. Similarly, the SWD presented the rate impact of alternative landfill management scenarios in the Solid Waste Transfer System plan of 2007.

The discussion and development of complex planning efforts such as strategic plans often take place over long periods of time and incorporate multiple sources of information and analysis that support each other. A good example of this was the development and adoption of the Regional Wastewater Services Plan (RWSP). When assessing an analysis such as a long-term forecast, it is important to reference the context in which the forecast was made including its specific purpose, other analyses and information that may be relevant (but not explicitly represented in a particular document) and subsequent updates of the forecast that incorporate significant changes to the original conditions, including state law and local policy choices.

The forecast done in conjunction with the Operational Master Plan (OMP), which was used in this audit as a benchmark, was but one piece of the analyses shared with elected officials in the multi-year decision-making process for the RWSP. Many of the analyses provided during the RWSP discussion had specific purposes or topics that informed other work and analyses. Using a single specialized report such as the OMP to characterize the entire analyses misses

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relevant information provided to decision-makers and stakeholders during deliberations. A relevant example to the audit discussion is the May 1997 Draft Financing Plan which evaluated many of the assumptions that were the basis of the forecast presented in the OMP. This document included sensitivity analyses, which would not have been appropriate in the OMP, including 1) changes in long-term economic assumptions such as inflation, unanticipated lower population growth and differences in debt structure and; 2) changes in rate structure including the impact of a cost of service based capacity charge, Inflow/Infiltration (I/I) charges and Combined Sewer Overflow (CSO) charges. The purpose of the Draft Financing Plan was to inform all participants of the uncertainties involved in the long-term planning process and the impact on the long-term outlook and results.

As stated in the report, long-term forecasts are inherently uncertain. Additionally, certain events will lie outside the range of any reasonable sensitivity analyses. These include major droughts, recessions and significant legal changes affecting rate structure. In light of this uncertainty, subsequent updates of a long-term forecast are important in evaluating the changes that have occurred and how they alter the outlook. For example, the capacity charge forecast included in the OMP reflected law in effect at the time. Concurrently, King County, through its legislative agenda, was aggressively pursuing significant changes to the authority and method under which the capacity charge was set. The explicit goal was to allow the County to set the capacity charge at a higher level that resulted in growth paying their fair share of expanding facilities. In this sense the "forecast" of the capacity charge in the OMP presented a continuation of current conditions highlighting the need for changes the County was actively pursuing. As noted in the preceding paragraph, a comparison with a potential new approach was provided in the Draft Financing Plan. Once the state laws were amended, a new methodology proposal was transmitted to Council that was extensively analyzed. It was not the purpose of the OMP to provide alternative futures on the capacity charge. That was the subject of a separate on-going analysis focused on the capacity charge in which Council was fully engaged and evaluated a multitude of alternatives and sensitivities.

A final note is that the projections used in the RWSP were largely trend projections. Given the long time period, accurately forecasting turning points, especially in the distant future, was beyond the scope of the analysis.

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We agree with the auditor that long-term forecasts are inherently uncertain and we are dedicated to providing decision makers with the best, relevant, information possible. As such we concur with the reports recommendation. If you have any questions regarding our audit response, please contact John Bodoia, Chief Financial Officer in the Department of Natural Resource and Parks, at 206-477-4542.

Sincerely,

Dow Constantine
King County Executive

Enclosure

cc: Fred Jarrett, Deputy County Executive, King County Executive Office (KCEO)
Rhonda Berry, Chief of Operations, KCEO
Dwight Dively, Director, Office of Performance, Strategy and Budget
Christie True, Director, Department of Natural Resources and Parks (DNRP)
Pam Elardo, P.E., Division Director, Wastewater Treatment Division, DNRP
Pat McLaughlin, Division Director, Solid Waste Division, DNRP

Executive Response to King County Auditor Report: ***Utility Rates: Long-term Forecasts Should Reflect Uncertainty***

Recommendation	Agency Position	Schedule for Implementation	Comments
1. Solid Waste Division (SWD) should: • Identify key assumptions affecting long-term rate forecasts • conduct sensitivity analysis around the key assumptions • present long-term rate forecasts to decision-makers portraying a range of potential rate outcomes reflecting different values for key assumptions	Concur	The next major strategic planning effort where sensitivity analyses will be applied is the Cedar Hills Site Development Plan update, scheduled to be submitted to Council in early 2017. Alternative values for key assumptions will be identified.	SWD's current practice is to identify key assumptions in both short and long-term rate forecasts; and it has historically employed limited sensitivity analyses in preparing long-term rate forecasts prepared in conjunction with major strategic planning efforts, primarily focused on alternative levels of tonnage resulting from differing assumptions about recycling rates.
2. Wastewater Treatment Division (WTD) should: • Identify key assumptions affecting long-term rate forecasts • conduct sensitivity analysis around the key assumptions • present long-term rate forecasts to decision-makers portraying a range of potential rate outcomes reflecting different values for key assumptions	Concur	The next major strategic planning effort where sensitivity analyses will be applied is the Wastewater Conveyance System Improvement Plan update, scheduled to be submitted to Council in 1st Quarter 2017.	This recommendation reflects the policy that WTD adopted following the audit of the WTD Combined Sewer Overflow program in 2012. WTD has not developed a long-term forecast since that time, but will provide ranges for future long-term forecasts.

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.

Scope of Work on Internal Controls

We discussed internal control processes with agency representatives, and conducted reality checks on data as necessary.

Scope

This audit will look at the accuracy of long-term rate forecasts by the Solid Waste and Wastewater Treatment Divisions.

Objectives

Objective 1: Accuracy of Rate Forecasts

A. How accurate have Solid Waste and Wastewater's long-term rate forecasts been?

B. How accurate have the expenditure and unit projections underlying the long-term rate forecasts been?

Objective 2: Causes of Inaccuracies

To the extent that long-term rate forecasts and the underlying expenditure and unit projections were inaccurate, what explains the inaccuracies?

Objective 3: Forecasting Best Practices

How do Solid Waste and Wastewater's rate-forecasting practices compare to best practices?

Objective 4: Impact of Inaccurate Forecasts

What are the consequences of inaccurate long-term rate forecasts?

Methodology

The audit team compiled information on Solid Waste and Wastewater's long-term rate forecasts and actual rates and reviewed Solid Waste and Wastewater's rate models. We conducted a literature review on best practices in forecasting and rate-setting and compared best practices to Solid Waste and Wastewater's actual practices. We interviewed Solid Waste and Wastewater staff to discuss their rate forecasting processes, and to resolve questions we had.

List of Recommendations & Implementation Schedule

Recommendation 1: Solid Waste Division should:

- identify key assumptions affecting long-term rate forecasts
- conduct sensitivity analysis around the key assumptions
- present long-term rate forecasts to decision-makers portraying a range of potential rate outcomes reflecting different values for key assumptions.

Implementation Date: Early 2017
Estimate of Impact: Decision-makers and ratepayers will better understand the uncertainty of long-term rate forecasts. This is particularly important when considering rate forecasts associated with strategic plans proposing new capital programs.

Recommendation 2: Wastewater Treatment Division should:

- identify key assumptions affecting long-term rate forecasts
- conduct sensitivity analysis around the key assumptions
- present long-term rate forecasts to decision-makers portraying a range of potential rate outcomes reflecting different values for key assumptions.

Implementation Date: 1st Quarter 2017
Estimate of Impact: Decision-makers and ratepayers will better understand the uncertainty of long-term rate forecasts. This is particularly important when considering rate forecasts associated with strategic plans proposing new capital programs.