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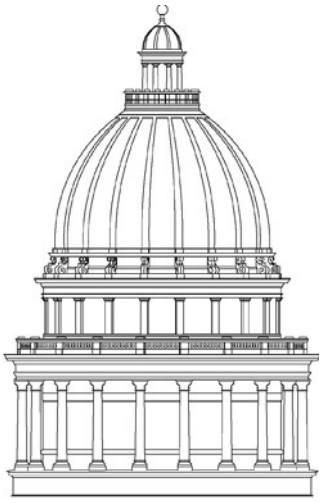
Number 2017-17



An In-depth Follow-up of Projections of Utah's Water Needs

December 2017

Office of the
LEGISLATIVE AUDITOR GENERAL
State of Utah

STATE OF UTAH

Office of the Legislative Auditor General

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AUDITOR GENERAL

December 12, 2017

TO: THE UTAH STATE LEGISLATURE

Transmitted herewith is our report, **An In-depth Follow-up of Projections of Utah's Water Needs** (Report #2017-17). A digest is found on the blue pages located at the front of the report. The objectives and scope of the audit are explained in the Introduction.

We will be happy to meet with appropriate legislative committees, individual legislators, and other state officials to discuss any item contained in the report in order to facilitate the implementation of the recommendations.

Sincerely,

John M. Schaff

John M. Schaff, CIA
Auditor General

JMS/lm

Digest of
An In-depth Follow-up of
Projections of Utah's Water Needs

In May 2015, the Office of the Legislative Auditor General issued a report titled *A Performance Audit of Projections of Utah's Water Needs*. The report raises several concerns about the quality of data used to project the state's future demand for water. Since then, several entities, including the Division of Water Resources (DWRe), the Division of Water Rights (DWRi), and the Division of Drinking Water (DDW) have been working to address those concerns. This follow-up report describes the progress made towards implementing each of the recommendations contained in that report and other areas where further work is needed.

Chapter II
Water Data Accuracy Is Improving

With guidance and funding from the Legislature, several steps have been taken towards improving the accuracy of local water system data. By all accounts, the latest water use data is much improved. However, DWRe and DWRi within the Department of Natural Resources and DDW in the Department of Environmental Quality need more time to finish implementing all of the recommendations made in the May 2015 audit report.

State Water Agencies Have Taken Steps to Improve the Accuracy of Local Water System Data. Our prior audit raised concern for the lack of coordination between DWRi and DWRe to ensure high quality water use data exists. Since the early 1990's, DWRi focused extensively on collecting data that was mired with errors, while DWRe focused on adjusting for errors in its own copy of the data, which the DWRe retained for its own purposes. Starting with the 2016 water data collected during the 2017 calendar year, the three water divisions improved their collaborative process where each has their own defined roles shown here:

Division of Water Rights—

- DWRi staff are now the primary contact for water systems.
- DWRi maintains the database of water use data. DWRe no longer maintains a separate database of adjusted data.
- Visits by DWRi staff help educate local water managers and re-enforce the need for accurate reporting.
- DWRi maintains an online form used by water systems to submit their data.

Division of Water Resources—

- DWRe reports to DWRi any errors found as it evaluates and validates the data.

Division of Drinking Water—

- DDW amended its rules to impose a penalty against the certification of public water systems that do not file the required water use reports with DWRi.

Questionable Trends Raise Concerns about Data Accuracy and Secondary Estimates. Data accuracy issues seem to be on the decline because of efforts by state water agencies, the Legislature, and local water systems to improve data collection. However, some water systems continue to have difficulty reporting accurate water use data. Furthermore, we found problems with DWRe's method for estimating secondary water use. We believe DWRe needs to do more trend analysis and validation of the water use data. For example, we identified errors in the data by identifying water systems that reported extremely different water use figures when compared to prior reporting periods. Furthermore, when we compared DWRe's estimates for secondary water use to other reliable sources, we uncovered some issues in their methodology. We believe the DWRe should perform similar validity tests and trend analysis on the data it receives from local entities. DWRe should also take steps to validate their estimates of secondary water use.

Chapter III
Legislation Promotes Water Conservation But Additional Agency Work Remains

The Legislature has responded favorably to several of our recommendations regarding water conservation. However, further time is needed before all strategies are fully implemented by state and local water agencies.

Legislature Approved Bills Promoting Universal Metering and Conservation Pricing. While the Legislature and Governor have expressed clear support for universal metering, only a few cities have installed meters on their secondary connections. Among those that have installed the meters, there appears to be a 34 percent reduction in water use. We recommend the Legislature consider requiring all water systems to install secondary meters during new construction when the cost is relatively low. Also, each water system should set a goal for when all their secondary connections will be metered.

Similarly, many but not all water systems have complied with the requirement that they adopt a tiered pricing structure. We recommend that the Legislature invite the Utah Rural Water Users Association to provide them with periodic updates on the rate of compliance with the law requiring conservation pricing.

Legislature Has Not Adopted Two Recommendations Related to the Financing of Water Systems. The Legislature considered but did not approve a measure to reduce property tax subsidies. The Legislature has also not yet taken action on our recommendation to clarify how public water systems should fund major infrastructure repair and replacement projects. Specifically, we recommended that as water systems depreciate, that ratepayers be required to contribute to an infrastructure repair and replacement fund. As future Legislatures weigh this decision, we also recommend that the Executive Water Finance Board take up these issues, as well. In addition, the Legislature should consider during its next interim, potential policies mandating or facilitating audits of unaccounted water use. Leaks in a water system are an example of unaccounted use and diminish the efficiency of a water system.

The Division Is Working on Demand Modeling and Basin-Level Conservation Goals. Historical projections and area-specific conservation goals were lacking when our prior audit was conducted. Developing relevant water conservation goals necessitates developing a reliable baseline to track progress, which DWRe and its consultant are currently preparing. Once this task is completed, the DWRe will work with a consultant to develop basin-specific conservation goals based on the individual characteristics of individual basins. To evaluate conservation plans to achieve these goals, the division needs a better model to estimate demand. DWRe's prior model, which was overly simplistic, is now being overhauled to provide a wider range of scenarios that key stakeholders can consider.

Chapter IV
Future Water Supply Projections Are Anticipated

Updated River Basin Plans Are Coming. Three of Utah's 11 river basins have plans that have not been updated since the 1990's. This includes the Kanab Creek/Virgin River basin plan that has not been updated and published recently. However, data for the basin has been updated through the Lake Powell Pipeline evaluation process. The lack of published up-to-date information impairs decision makers who do not have relevant data. The DWRe has developed a schedule where all 11 basin plans will be updated over the next six years. These updates will commence once DWRe's statewide plan is complete next year.

Estimating Growth in Water Supply Presents Challenges That Require Additional Study. The prior 2015 report directed DWRe to prepare future estimates of supply. Specifically, the division was asked to use historic data to identify the amount of agricultural water that would be converted to culinary use. DWRe management has indicated that it is their intent to do so. However, management wants those estimates to be "flexible enough to account for unique conditions present in urban and rural areas of the state." We agree with this approach.

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December 2017

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Chapter I
Introduction

In May 2015, we issued our report, *A Performance Audit of Projections of Utah's Water Needs*. The report raised several concerns about the quality of data used to project the state's future demand for water. Since then, several entities, including the Division of Water Resources, the Division of Water Rights, and the Division of Drinking Water have been working to address those concerns. This follow-up report describes both the progress made in implementing each of the recommendations in the 2015 report and other areas where further work is needed.

Prior audit recommendations are being implemented by several entities, including Utah's three water divisions.

Several Entities Are Involved in Implementing Prior Audit Recommendations

During our follow-up review, several groups worked together to implement the prior report's recommendations. Due to their efforts, much progress has been made in improving Utah's ability to evaluate both its water needs and available resources going forward. The following statements provide a snapshot of the role each group has played:

- **The Utah Legislature:** During its 2016 and 2017 General Sessions, the Legislature considered multiple bills related to our prior audit recommendations. These bills accomplished key policy objectives, such as mandating tiered pricing schedules for public water systems and providing funding for improved data controls and site visits to water systems statewide.

In 2016, the Legislature provided policy guidance and funding to improve the quality of water use data.

- **The Division of Water Resources (DWRe):** DWRe has led various initiatives to better identify errors in water use data and improve forecasts for future water supply and demand. DWRe is implementing various technologies to improve its estimates and forecasts.

- **The Division of Water Rights (DWRi):** DWRi has focused on improving its data collection processes. Using site visits and data controls, DWRi's objective is to improve the quality of

data received and provide valuable feedback and training to water systems when issues are identified in their data.

- **The Division of Drinking Water (DDW):** DDW promoted the submission of accurate water use data by adopting an administrative rule that allows points to be issued to culinary public water systems that fail to do so.

- **Public Water Systems:** Many water systems have reviewed guidance from our prior audit and the Legislature's statutory changes. Subsequently, they amended their pricing structures and are implementing other conservation measures.

Two consulting firms are validating 2015 water use data and estimates.

- **Consultants:** With detailed knowledge of many water systems throughout the state, these experts are providing valuable insight and guidance to DWRe and DWRi. Specifically, two firms are working on validating the use data and estimates serving as the basis for DWRe's municipal and industrial (M&I) use report for 2015.

- **Local Stakeholders:** The Utah Board of Water Resources, the State Water Development Commission, conservancy districts, and others are assisting in the implementation of several recommendations. These stakeholders possess aggregate data, insight, and resources needed to better monitor Utah's water resources.

At times, this report may focus on specific actions by some of these entities. However, it is important to recognize the combined efforts that have gone into improving the state's ability to monitor its water resources. One major initiative that illustrates this collaborative approach is the validation of 2015 M&I use data. While DWRi has focused on the collection of that data, DWRe along with its consultants are validating the data. The consultants have focused on the following:

- Verifying the accuracy of the 2015 and 2010 data collection
- Reviewing the M&I water use data collection process
- Evaluating the methodology for estimating unmetered use
- Determining which years will be used as future baseline years

Recommendations from its consultants will help DWRe implement prior audit recommendations

Completing this scope of work has necessitated input and resources from each of the above-mentioned entities. The current

implementation status of various recommendations is discussed in the following chapters. However, we would like to note that, though not detailed in this follow-up report, much additional work was done in support of their implementation.

Audit Scope and Objectives

During the 2016 Legislative General Session, the Natural Resources, Agriculture, and Environmental Quality Appropriations Subcommittee requested this follow-up of our 2015 audit. The subcommittee's motion called for a follow-up evaluating the accuracy of the state's water-use data with a report to be issued before the 2018 Legislative General Session. In June 2017, the Legislative Audit Subcommittee prioritized the follow-up, which initiated work culminating in this report.

Our prior audit identified three areas of concern with the evaluation of Utah's water needs. Each was discussed in detail in its own individual chapter. The following are the chapter titles in the prior report:

- Chapter II – Reliability of Water Use Data Needs to Improve
- Chapter III – Conservation and Policy Choices Can Reduce Demand for Water
- Chapter IV – Growth in Future Water Supply Should Be Reported to Policy Makers

Each chapter in this report discusses the implementation status of recommendations in corresponding chapters in the prior audit.

Recommendations were made based on audit observations in each of these areas. The chapters in this follow-up report mirror those in our prior report. Each chapter describes the implementation status of each recommendation as follows:

- Chapter II – Water Data Accuracy Is Improving
- Chapter III – Legislation Promotes Water Conservation But Additional DWRe Work Remains
- Chapter IV – Future Water Supply Projections Are Anticipated

As these chapter headings suggest, progress has been made in implementing the recommendations in our prior report. However,

additional work needs to be done in some of these areas and additional recommendations are provided.

Chapter II
Water Data Accuracy Is Improving

While progress has been made, additional action is needed to fully implement the recommendations from our May 2015 audit, *A Performance Audit of Projections of Utah's Water Needs*. With guidance and funding from 2016 general session legislation, the state's three water agencies and local water systems have taken steps to improve the accuracy of local water system data. However, the Division of Water Resources (DWRe), the Division of Water Rights (DWRi) and the Division of Drinking Water (DDW) need more time to finish implementing all of our recommendations. Figure 2.1 shows the status of the three recommendations in Chapter II of our prior report.

Utah's three water divisions implemented many prior audit recommendations, but need more time to finish implementing others.

Figure 2.1 State Water Agencies Are Addressing Our 2015 Audit Recommendations. In the prior audit, we recommended seven action items focused on the reliability of water use data. This figure shows the implementation status of those seven items.

Chapter II Recommendations	Status
1. We recommend that the Division of Water Resources review water use data annually to perform trend analysis.	In Process
2. We recommend that the Department of Natural Resources work with state water agencies to develop an efficient and effective system of collecting accurate water use data from public water providers. Methods that should be considered include:	
a. Making local water managers responsible for submitting accurate water use data more accountable by requiring them to sign their report and identify their position and credentials.	Implemented
b. Incorporating a routine data edit check feature in the online data collection form that is used to validate the accuracy of the data submitted by public water providers.	Implemented
c. Validating the accuracy of water use data by comparing it to other sources with similar information.	In Process
d. Conducting data validity checks, periodic audits, and training of local water systems to verify the accuracy of water supply and use data.	Implemented
e. Committing additional staff and resources to improving the state's water use database.	Implemented
3. We recommend that the Legislature consider giving statutory authority to the Division of Water Resources to validate the annual water use reported by public water providers.	Implemented

Source: A Performance Audit of Projections of Utah's Water Needs (Legislative Audit Report 2015-01)

With assistance from the Legislature, DWRe and DWRi within the Department of Natural Resources (DNR) have implemented Recommendation 3 and most of Recommendation 2 in Figure 2.1.

While the accuracy of water use data is improving, questions about a reliable baseline and trend analysis remain.

Specifically, the Legislature clarified the roles of DWRe and DWRi in collecting and validating water use data. In addition, DWRe and DWRi have implemented four of the five action items in Recommendation 2, which focused on improving the accuracy of local water use reports. DDW helped ensure culinary water systems comply by adopting a rule that assesses points to a system that does not file use reports with DWRi.

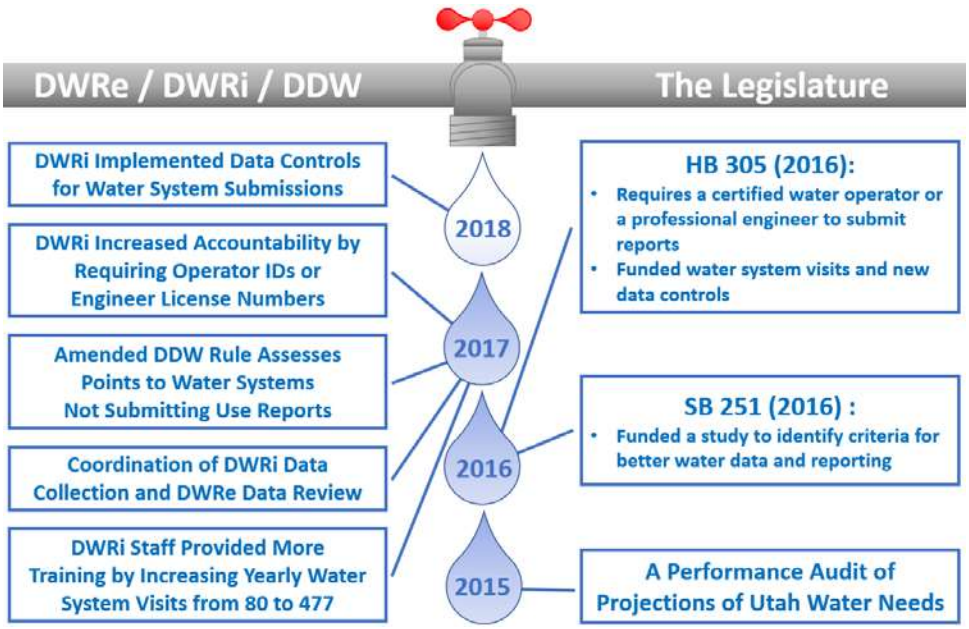
While the DWRe has made some progress in validating the local data, additional work is still required to fully implement Recommendation 1 and action item "c" of Recommendation 2. One improvement is DWRe's use of an outside consultant to validate the 2015 data. In the future, however, DWRe and DWRi will need to increase their efforts to identify inaccurate water use data. These inaccuracies can be identified through historical trend analysis and comparing data with other sources. For example, DWRe should further validate and refine its estimates of unmetered secondary water use with local water system data and studies.

Water Divisions Have Taken Steps to Improve The Accuracy of Local Water System Data

To address data reliability concerns, recommendations from DWRe's third-party review need to be implemented.

In our prior audit, we recommended that DNR "…develop an efficient and effective system of collecting accurate water use data from public water providers." Figure 2.2 shows significant steps taken by the three water divisions and the Legislature, which facilitated the implementation of our recommendations.

Figure 2.2 Initiatives Implemented by the Three Water Divisions Received Legislative Funding and Policy Guidance. Two bills passed during the 2016 Legislative Session helped provide resources and guidance to DWRe, DWRi, and DDW.



Source: Bills from the Legislature and documentation from DWRe, DWRi, and DDW

Legislative policy guidance and funding led to multiple initiatives by the three water divisions.

As shown in Figure 2.2, DWRe and DWRi have consolidated their efforts to collect better use data. In addition, DWRi sent its staff to visit and train nearly every public water system in the state and implemented data controls in its online data collection forms. These changes were initiated by legislation that provided a combination of guidance and funding. These initiatives implemented most of Recommendation 2 and all of Recommendation 3 in Chapter II. The following sections detail how the three water divisions have implemented the recommendations.

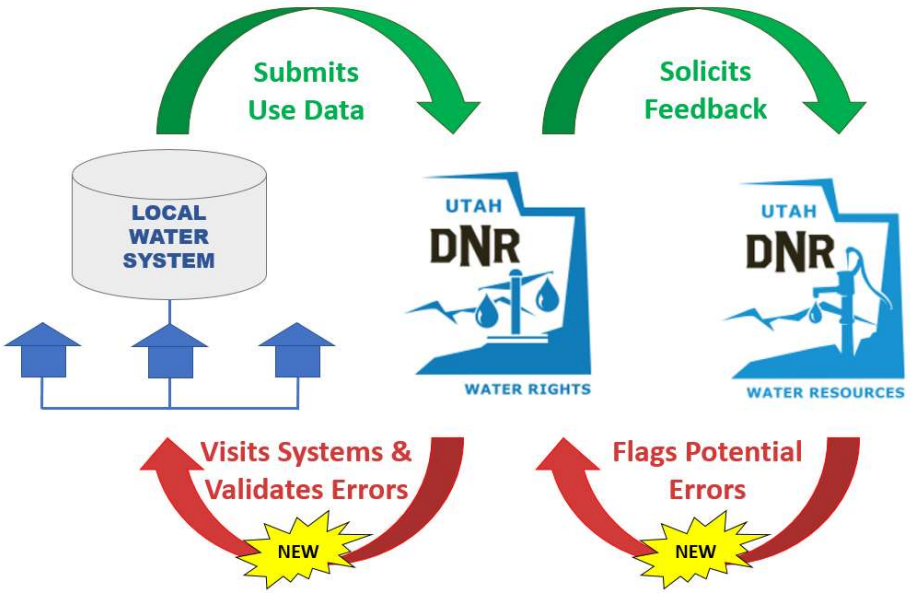
These initiatives addressed multiple recommendations from our prior audit in 2015.

DWRe and DWRi Coordinated Their Annual Efforts to Address Data Issues

Our prior audit raised concern about the lack of coordination between DWRi and DWRe and their ability to work together to ensure that accurate water use data is reported. DWRi had focused extensively on collecting data which, unfortunately, contained many errors. At the same time DWRe had focused on adjusting for errors in its own copy of the data, which DWRe retained for its own purposes.

Starting with the 2016 water data collected during the 2017 calendar year, the three water divisions improved their collaborative process where each has its own defined roles, including feedback mechanisms. Figure 2.3 illustrates the improved process that now exists between DWRe, DWRi, and local water systems.

Figure 2.3 Collaboration between DWRe and DWRi Has Improved. DWRe now identifies errors that DWRi validates with public water systems and makes agreed upon changes to the data.



Source: Documentation obtained from DWRi and DWRe

The new collaborative process between DWRe and DWRi provides valuable feedback to local water systems.

As Figure 2.3 shows, the new process incorporates two feedback mechanisms that did not exist before. The first allows DWRi to serve as the single point of contact for local water systems. This was the intent of the Legislature, which clarified DWRi's role in 2016's House Bill (H.B.) 305 and implemented Recommendation 3 of Chapter II in our prior audit. Second, DWRe flags potential errors so that corrections can be made to DWRi's database rather than maintaining its own database of its adjusted data. This refined process maintains consistency among the data used by the DWRe and DWRi.

It is DWRi staff, rather than DWRe staff, who contact local water systems regarding potential inaccuracies.

DWRi Staff Are the Primary Contact for Water Systems. Historically, staff from DWRi were responsible for collecting data from local water systems. However, any issues with the data that were identified by the DWRe were resolved by DWRe staff. This process left water systems reporting their data to DWRi and fielding concerns from DWRe. The solution, which is defined in statute, is to have DWRi staff be the single point of contact for local water systems.

Now the staff who collect the data will do the validation of potentially problematic data. We believe this is a good approach as it streamlines and simplifies the interaction between local water systems and the three water divisions.

Starting in calendar year 2017, two DWRi staff were assigned to follow-up with local water systems and adjust the single data set used by the DWRe and DWRi. DWRe identified some of the issues for DWRi staff to follow up on during their visits with local water systems. This validation was an action item we included as part of Recommendation 2 in Chapter II of our prior audit.

DWRe No Longer Maintains a Separate Database of Adjusted Data. A biproduct of the new process is that DWRe and DWRi can use a single data source that contains all adjustments. For its review of 2015 water use data conducted during calendar year 2016, DWRe used staff who had to forgo other responsibilities to contact local water systems and correct data. Unfortunately, any changes identified by the staff were only made to the DWRe data set.

Adjustments to local water systems' data are now made in DWRi's database after being confirmed by the water system.

In summary, the roles of DWRe and DWRi have been clarified, which was the intent of Recommendation 3 in Figure 2.1. We believe that Legislature's decision to keep the two responsibilities with DWRi has been beneficial, as it eliminated the need for DWRe to keep its own set of corrected data.

DWRi Staff Visits and DDW Points for Missing Reports Improved Reporting Rates and Accuracy

In our prior audit report, several issues were raised by local water systems about the process to collect water use data. Specifically,

- The purpose of the data and the instructions for collecting the data were unclear.
- Feedback was not provided when errors were identified.
- The person responsible for submitting the data did not always have the training or expertise to report the data accurately.

We recommended that the Department of Natural Resources "…[commit] additional staff and resources to improving the state's water use database," which is action item "e" of Recommendation 2 in Figure 2.1. The passage of H.B. 305 assisted in this effort, appropriating $70,000 in ongoing funds for an additional DWRi staff member. In addition, DDW amended its rule to assess 50 points to a water system that does not submit its annual water use reports to DWRi.

During its 2016 General Session, the Legislature gave DWRi $70,000 to hire an additional staff to improve data quality.

Visits by DWRi Staff Help Educate Local Water Managers and Reinforce the Need for Accurate Reporting. The newly added staff member and an existing staff member have been assigned to review data submitted by each local water system. As part of their process, the staff visit local water systems throughout the state providing training and guidance. Through October 2017, the two DWRi staff visited 477 of 537 public water systems (89 percent). In the prior two years before DWRi received an additional FTE for site visits, 80 local water systems were visited in 2016 and 10 in 2015.

Dedicating additional staff resources to site visits, DWRi increased site visits from 80 in 2016 to 477 in 2017.

During each site visit DWRi staff attempt to do the following:

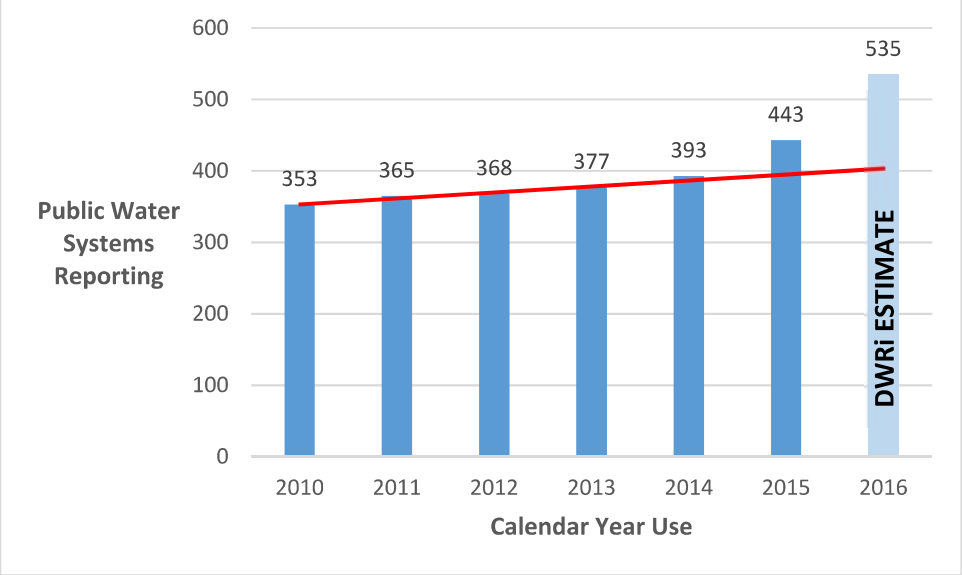
- Explain the purpose of their visit
- Detail why water use data is being collected
- Review submitted data and address potential errors
- Document the GPS location of any wells not indexed
- Train operators on how to submit use reports
- Answer questions from the system operator

Site visits accomplish several objectives, such as training water operators on how to submit use reports.

We found there are clear benefits to having DWRi staff meet with local water system operators. These in-person meetings help local operators become familiar with a person who can serve as a single point of contact for resolving future reporting issues. As discussed in the following section, the efforts of these two DWRi staff helped improve both the volume and quality of water use data submitted for calendar year 2016.

DWRi Staff Visits Have Resulted in More Water Systems Reporting Water Use Data. One benefit of these site visits is increased reporting by public water systems. Figure 2.4 shows the number of entities that submitted use reports to the Division of Water Rights each year, including a red trendline based on 2010 through 2014 reports.

Figure 2.4 More Public Water Systems Are Submitting Use Reports. Increased awareness about use reporting has increased the number of public water systems submitting use reports.



Source: Utah Division of Water Rights

The quantity of 2016 use data reports by public water systems has improved dramatically relative to historical submissions.

Figure 2.4 shows a significant increase in the number of water use reports submitted to DWRi. Historically, DWRi estimated that 80 percent of public water systems submitted reports. However, for the 2016 water reports submitted during 2017, the submission rate had already reached 97 percent (519 systems) by the end of September 2017. By the end of the year, DWRi estimates that 535 public water systems will have reported. This improvement can be attributed in part to the greater awareness of the need for better reporting that resulted from these site visits, and a 50-point penalty from DDW if a system does not report, which is discussed on the following page.

Errors in the Data Have Declined. Not only has the volume of reports increased, but the quality of data being reported also appears to have improved. DWRe has been tasked with reviewing submitted data and flagging potential errors, and its 2016 data looks better than the 2015 data. As evidence of this improvement, DWRe flagged potential errors with 268 public water systems' use reports for 2015, but with only 86 water systems for the 2016 data. The improved quality and quantity of reports illustrates some of the impact these site visits are having.

With the increase in site visits and assistance from DWRi staff, DWRe has flagged fewer potential data inaccuracies.

DDW Assesses 50 Points to Systems Not Filing Required Reports. In addition to the site visits, DDW stipulated a penalty if a culinary public water system does not report its use to DWRi. Effective in November 2016, DDW provided enforcement for HB 305 (2016) that required a certified water operator or licensed professional engineer to submit annual use reports for a public water system. Specifically, *Administrative Rule* 309-400-12(3)(a) was amended to the following:

DDW encouraged reporting by amending its rules to assess a 50-point penalty to water systems who do not submit water use data.

> A public water system that fails to submit water use data required by a state agency or fails to verify the accuracy of the data by including a certification by a certified operator or a professional engineer performing the duties of a certified operator shall be assessed 50 points.

When these points are assessed, they remain on the system's record for one year. To be an approved public culinary system, a water system must have less than 150 points. Thus, assessing these points to a public water system that does not submit its annual use reports is an effective tool to encourage use reporting.

New Data Controls Are Among the Upgrades to DWRi's Online Portal

Another significant improvement since the prior audit is data controls in the online form used by water systems to submit their data. Also, water system operators are now being asked to be responsible for the accuracy of the data they submit.

With its $145,000 appropriation from the Legislature, DWRi has implemented several data controls in its water use data portal.

New Controls Added to the Online Form. The Legislature's 2016 passage of H.B. 305 included a fiscal note of $145,000 to update the DWRi portal for collecting water use data. The funds were used to cover the costs incurred by DTS to install the following controls:

- Measurement units (such as gallons or acre-feet) must be specified by the user; a default unit is not preselected.
- Method of measurement must be selected by the user as metered or estimated.
- Institutional use by schools, parks, cemeteries, churches, etc. must be identified separately.

- Connection counts must be submitted for use categories.
- Annual water uses and water source production is flagged when they exceed expected ranges derived from the system's 10-year average and last year's value.
- The system's population is automatically filled with a projected population value that can be updated by the water system operator.

The above controls will take effect in 2018 when DWRi collects data for the 2017 calendar year.

Water System Operators Will be Alerted to Potential Errors in Their Data. In the prior audit, we observed that Salt Lake City had misreported its 2013 water use. Even though the reported use was more than double the amount reported in prior years, yet the data was not questioned. In response, DWRi has developed a set of data entry controls that will alert water system operators if they submit data that deviates significantly from what was reported during prior years.

Water System Operators to Take Responsibility for the Accuracy of Their Reports. In addition to the above controls, action item "a" of Recommendation 2 in our prior report (Figure 2.1) recommended that local water managers needed to be responsible for the data they submit. H.B. 305 (2016) now requires a certified operator or professional engineer to certify the accuracy of data submitted to DWRi.

To promote greater accountability, water use reports now require a water operator ID or professional engineer license number.

For the collection of 2016 use data during the 2017 calendar year, DWRi began requiring the name and credentials of a water system operator or professional engineer with their submission data. This feature has also been added into the online portal and will be required during calendar year 2018 when use data for 2017 is collected.

In summary, through greater coordination, increased site visits and training for water systems, point penalties by DDW, and new data controls, it appears the accuracy of the local water use data is improving. During the two years since our prior audit, we have seen a change in attitude among local water managers. Water managers seem to have a growing understanding that they can better manage their water systems by tracking water use. In addition, more seem to recognize the importance of submitting accurate reports to the state.

We have observed positive changes in how local water managers approach the quality of data they submit.

While progress has been made, more can be done to validate and correct errors in the data. The remainder of this chapter, describes the challenges DWRe and DWRi face as they try to validate the data, and improve their estimates of secondary water use.

Questionable Trends Raise Concerns about Data Accuracy and Secondary Estimates

Persisting data issues and questionable water use trends still raise concerns about the accuracy of historical data.

Although the problems seem to be on the decline, some water systems continue to have difficulty reporting accurate water use data. Furthermore, we found problems with the DWRe's method for estimating secondary water use. To address these concerns, we believe DWRe needs to do two things recommended in our 2015 report. First, DWRe staff should do trend analysis of each system's historic water use and perform other validity tests to identify those systems that are likely reporting inaccurate data. Second, DWRe can use local data prepared by water conservancy districts as one source of external data to validate data reported by local water systems. While DWRe reports that they worked with water conservancy districts in developing a new method for estimating secondary water use, they should also validate the outcomes from their new methods with those same water conservancy districts.

Some Water Systems are Still Not Submitting Accurate Water Use Reports

Data issues were observed during the follow-up, such as large fluctuations year-to-year, confusing source and use values, and omitting use for certain categories.

Our random tests of local water system data uncovered some of the same problems with the data that were described in our prior audit report. Although we did not conduct sufficient follow-up testing to identify the extent of the problems, some local water managers, in our view, still do not recognize the importance of submitting accurate water use reports. Others appear to lack staff with adequate training. In some cases, the metering technology may not be sufficiently reliable to produce accurate water data. The following are some problems observed during our follow-up work:

- **Abnormally Large Fluctuations in Reported Water Use:** Some water systems are reporting unbelievably large fluctuations in the reported water use, population, and connections. These fluctuations in water use suggest a lack of understanding by those tasked with reporting the water use numbers.

- **Inconsistent Interpretation of Data Requests:** Some water systems are reporting their production at the source as if it were the use at the connection. Such reports cannot be accurate because no system is leak free, as nearly every water system has some unaccounted water use.

- **Use Omitted for Certain Categories:** Some local water systems are reporting no institutional or commercial use of water even though local churches, schools, and businesses are connected to the water system.

The materiality of these problems would be less concerning if these problems were limited to Utah's smaller water systems. However, as shown in the sections below, some of Utah's larger communities still appear to have problems with their data. The apparent errors are large enough to affect a region's average water use figures. During future site visits and training, DWRi staff should identify these water systems and assist them in providing more accurate data.

Inconsistencies with Historic Data Raise Concerns about Water Use Data Accuracy

The first recommendation in Figure 2.1 is that DWRe should perform trend analysis to spot errors in the reported water use. We believe trend analysis should include verifying that recent water use reports are consistent with historic water use data. Other tests could be used to identify outlier water systems that report water use that is well above or below that of peer water systems.

Our Validity Tests Uncovered Water Systems with Unbelievably Large Reductions in Water Use. We performed several tests on the 2015 water study to identify local water systems that likely misreported their water use. These tests uncovered inconsistencies in the data that led us to question the validity of some water use reports. We believe DWRe can do more data validation to identify local systems that are most in need of their attention. The following shows the results of one such test, which shows water systems with implausibly large reductions in water use.

We compared local water use data reported for 2015 data with the data set from DWRe's 2010 state water study. We found some

Two water systems report 2015 potable use that notably deviates from potable use reported in DWRe's 2010 M&I study.

individual water systems reported extreme reductions in water use. Figure 2.5 show the total potable use reported for two public water systems in 2015 and 2010. Based on these data sets, the two systems show extreme reductions in potable water use. These public water systems were highlighted because they showed declines in water use that are highly unlikely.

Figure 2.5 Major Deviations in Metered Potable Use Exist for Certain Public Water Systems. To understand changes in basin-level data, these public water systems show significant changes that drove basin-level trends.

Public Water System	2015 Potable Use (Acre-Feet)	2010 Potable Use (Acre-Feet)	Difference	Percent Reduction
Ogden	13,862	20,886	(7,024)	34%
Clearfield	5,055	7,854	(2,799)	36%

Source: Division of Water Resources Data

As Figure 2.5 shows, recent water use reports show reductions of about a third in potable water use for these systems. To rule out the possibility that these reductions were offset by increased secondary use, we verified that a similar increase in secondary consumption was not reported.

The potable use reductions for Ogden and Clearfield alone account for 71 percent of the Weber River Basin's reduction from 2015 to 2010.

To put some of these reductions in context, the combined potable use reduction for Ogden and Clearfield, which are both part of the Weber River Basin, was 9,823 acre-feet. All 81 public water systems that reported potable use in 2015 and 2010 in the Weber River Basin combined for a total reduction of 14,158. Thus, these two public water systems accounted for 69 percent of the basin's total reduction. These unlikely reductions in potable water use could be explained by errors in the 2010 data, errors in reported 2015 water use, or both.

We anticipate that DWRe consultants can provide insight as to whether 2010 or 2015 data is more reliable.

As required in Senate Bill 251 (2016), DWRe has hired an outside consultant to validate its 2015 water study. We anticipate that DWRe's consultant will provide better insight about what the cause may be and how reliable the 2010 and 2015 data sets and unmetered secondary estimates may be. However, in the future, the DWRe may not always be able to hire outside consultants to perform tests on local water use data. We believe DWRe staff can conduct some of these tests themselves.

DWRe Can Validate Results and Estimates Against Other Available Sources

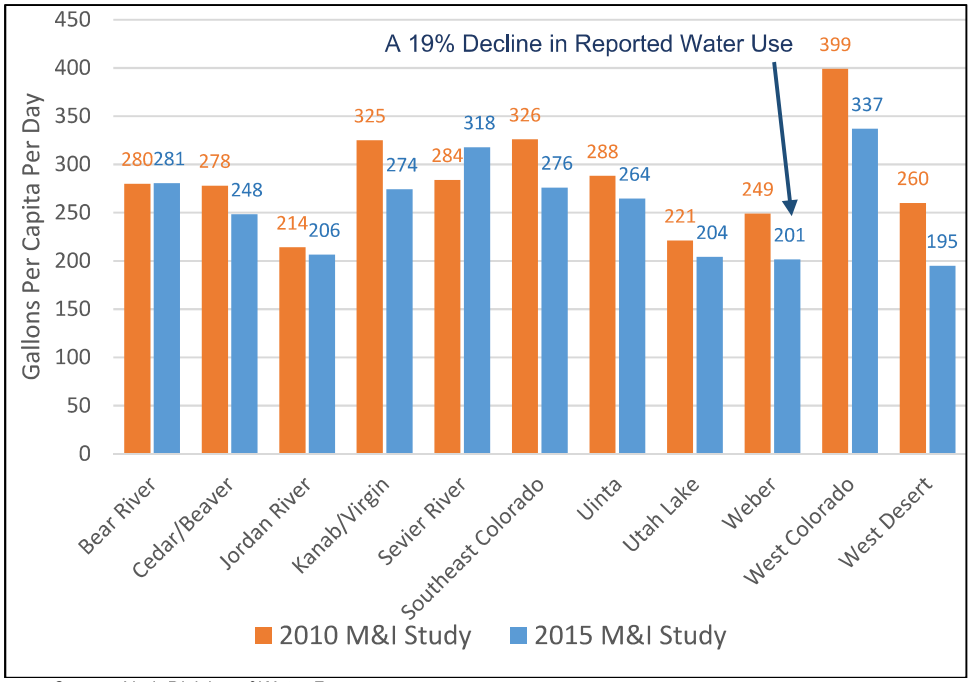
Local water conservancy district data and studies can serve as a different source to validate data and trends against.

Action item "c" of Recommendation 2 in Figure 2.1 suggested that DWRe validate its water use study by comparing the data to other sources with similar information. We conducted several such tests by asking local water conservancy districts to validate some of the data from DWRe's draft 2015 water study. These tests often led us to question the accuracy of some of the data. The following describes the results of one such test.

Reported Decline in Weber River Basin's Water Use Is Not Accurate. We used DWRe's draft 2015 water study to identify the per capita water use for each river basin in Utah. We then compared our figures to those reported in DWRe's 2010 study. The results, shown in Figure 2.6, show that the Weber River Basin reduced its water use by a surprising 19 percent in just five years.

Figure 2.6 Water Use in the Weber River Basin is Reported to have Dropped by 19 Percent. Except for the West Desert Basin, the Weber River Basin is reported to have the lowest level of water use of any basin in the state.

Using draft 2015 use data published on DWRe's website, uncharacteristic reductions in use were observed in the Weber River Basin.



Source: Utah Division of Water Resources

This figure shows that Weber Basin experienced the largest percentage drop (19 percent) in water use of any basin, except the West Desert

Basin (25 percent). Among Wasatch Front basins (Weber River, Jordan River, and Utah Lake), the Weber River Basin went from the highest to the lowest rate of water use.

Weber Basin Water Conservancy District concurred with our concern that the Weber River Basin had the lowest use among Wasatch Front river basins.

We asked the Weber Basin Water Conservancy District to verify this information, and to confirm that they had indeed reduced their water use by 19 percent to only 201 gallons per capita per day. The district staff told us that although their region had reduced its water use significantly in recent years, that water use in their region was still much higher than 201 gallons per capita per day. Furthermore, they confirmed that the water use in the Weber River Basin could not be the lowest among the basins along the Wasatch Front because they have a disproportionate amount of unmetered secondary connections which historically have higher levels of use.

DWRe Needs to Use Local Data to Validate Its Estimate Methodology. With help from the staff of the Weber Basin Water Conservancy District, we were able to pinpoint some of the causes for the abnormally low reports of water use in the Weber River Basin. The main cause, we found, was DWRe's method for estimating secondary water use.

For 2015, DWRe changed its methodology to estimate unmetered secondary water, which reduced estimates.

DWRe relies on estimates of local secondary water use because most pressurized irrigation systems are not metered. For its 2015 water study, DWRe developed a new method for estimating secondary water use that seems to have led to lower reported use. The DWRe's calculation relies on two components: 1) the amount of water applied per acre, and 2) the amount of irrigated acreage to which the water is applied. The following describes problems we found with both variables which led to a low estimate of the secondary water use.

1. **DWRe's Assumptions about the Rate of Application were Low.** In 2010, the DWRe assumed that residents applied the water duty for secondary irrigation. The water duty is the amount of water necessary to maintain one acre of crops, which for the Weber and Davis Counties is 48 inches (4 acre-feet) of use. However, in 2015, the DWRe began using "net

evapotranspiration,[1]" and an efficiency ratio which is based on the rate at which irrigation water is applied. Based on these two variables, DWRe estimated that in 2015 Weber River Basin residents were applying 42 inches of water instead of the 48 inches used in the prior estimate. The result was a 13 percent reduction in estimated water use that was based solely on the change in methodology. This explains, in part, the reduction in the water use by residents in the Weber River Basin.

The new secondary water use methodology reduces estimates in Weber River Basin by 13 percent on average.

2. **DWRe Underestimated the Amount of Irrigated Acreage:** As mentioned, DWRe's estimates of secondary water use are based, in part, on assumptions regarding the amount of land being irrigated by water users. For most communities in the Weber River Basin, the DWRe assumes that the average lot size is 0.25 acres and that 50 percent of the property is irrigated, resulting in 0.125 irrigated acres per connection. However, a WBWCD study found that customers in a three-city region of the Weber River Basin had much more land than 0.125 under cultivation. Using digitized mapping for the area, WBWCD determined that the average irrigated acres per connection was 0.205, which is about one and a half times the amount used in DWRe's estimates.

Concern was also raised about assumptions regarding DWRe's irrigated acre estimates.

DWRe Needs to Use Local Data to Validate Its Methods for Estimating Secondary Water Use. The above example shows the benefits that DWRe can obtain by relying on multiple sources to validate its data and study methods. We do not question DWRe's new method for estimating secondary water use. However, DWRe needs to take steps to continue to refine its methods. In fact, DWRe is currently working on a process to do so, using digitized mapping and infrared imaging of parcels to determine the percent of irrigated space in specific areas, which is discussed in greater detail in Chapter III.

DWRe should work with local water systems and conservancy districts to further refine its method for estimating secondary water use.

For some basins like the Weber River Basin, where unmetered secondary water accounts for 39 percent of total use, the accuracy of DWRe's estimates is critical. Thus, we recommend that, as DWRe adjusts its methodology for estimating unmetered

[1] "Net evapotranspiration" is a measurement (usually in inches) of the amount of water required for plant growth after subtracting for naturally occurring precipitation.

irrigation water use, it vets its estimates against local water system data and studies.

Recommendations

1. We recommend that the Division of Water Rights staff continue conducting site visits and focus on addressing potential data issues identified by the Division of Water Resources.

2. We reiterate our recommendation that the Division of Water Resource perform trend analysis to validate whether locally reported data is reasonable and consistent with historic water use. *(See Figure 2.1 - Recommendation 1)*

3. We reiterate our recommendation that the Division of Water Resources further validate its secondary water estimation methodology with available studies and data provided by local water systems and basin conservancy districts. *(See Figure 2.1 - Recommendation 2, Action Item "c")*

Chapter III
Legislation Promotes Water Conservation But Additional Agency Work Remains

Chapter III of our 2015 report, *A Performance Audit of Projections of Utah's Water Needs*, discussed multiple issues related to water demand and conservation. The Legislature has responded favorably by considering legislation related to the conservation strategies recommended in the prior report. However, it may take some time before all strategies are fully implemented by state and local water agencies. Figure 3.1 shows the implementation status of the prior audit's recommendations for Chapter III.

The Legislature has considered several conservation policies recommended in our prior 2015 audit.

Figure 3.1 Response to Recommendations Was Positive. All legislative recommendations were considered. Additional time and resources are needed for state and local water agencies to implement the new legislative policies.

Chapter III Recommendations	Status
1. We recommend that the Division of Water Resources work with local water providers to create conservation goals for each river basin. The new goals should reflect each basin's individual capacity to conserve and account for their unique mix of residential, commercial, industrial, and institutional uses.	In Process
2. We recommend that the Division of Water Resources regularly update its projections of future demand as new information becomes available and provide a range of options that includes investment, conservation, or supply development under a range of demand scenarios.	In Process
3. We recommend that the Legislature consider adopting policies that will require the phasing in of universal metering.	Implemented
4. We recommend that the Legislature consider the following pricing policies to encourage efficient water use: a. Reduce water provider reliance on property taxes currently used to subsidize water system costs. b. Require that water providers create reserve funds to cover the cost of infrastructure repair and replacement. c. Promote the use of conservation pricing structures.	Implemented

Source: A Performance Audit of Projections of Utah's Water Needs (Legislative Audit Report 2015-01)

Additional time is needed for state and local water agencies to implement new conservation policies.

As shown in Figure 3.1, the Legislature responded favorably to two recommendations by considering legislation related to universal metering and pricing policies that encourage efficient water use. During the 2016 and 2017 Legislative General Sessions, bills covering

the four action items were introduced and considered, yielding mixed results. Recommendation 4, action items "a" and "b" were not passed, but the Executive Water Finance Board is reviewing these issues.

Figure 3.1 also shows that the Division of Water Resources (DWRe) is in-process of implementing two recommendations. Before developing new conservation goals, DWRe needs to verify a reliable data on which to base its goals. That validation process is still underway. In addition, projections of future demand necessitate the development of models for the various conservation variables that could be affected. DWRe has developed some of these models, but they have not yet been implemented.

DWRe is completing work that is necessary to develop future conservation goals and demand projections.

This chapter first describes the progress being made on two legislative policy items, universal metering (Recommendation 3) and conservation pricing (Recommendation 4, action item "c"). Toward the end of this chapter, DWRe's efforts to monitor conservation goals (Recommendation 1) and to improve its method for projecting future water use (Recommendation 2) are discussed.

Legislature Approved Bills Promoting Universal Metering and Conservation Pricing

The Legislature adopted policies regarding universal metering and tiered pricing structures.

The Legislature considered several bills during its 2016 and 2017 general sessions that addressed the third and fourth recommendations in Figure 3.1. These bills targeted conservation through various initiatives like universal metering and tiered pricing, which passed. However, some local water systems still need to amend their flat rate structures to reflect the tiered structure the Legislature desires.

Policies regarding the financing of local water systems should be considered by the Governor's Executive Water Finance Board.

The Legislature did not act on two action items included in Recommendation 4 in Figure 3.1. These were to reduce provider reliance on property taxes to subsidize water systems, and to require the use of capital improvement funds for local infrastructure projects. The Governor's Executive Water Finance Board should consider these matters and suggest solutions for the Legislature to consider.

In addition, the Legislature should consider during its next interim potential policies mandating or facilitating audits of unaccounted water use. Leaks in a water system are an example of unaccounted use and diminish the efficiency of a water system.

Universal Metering Is Now Recognized As an Effective Conservation Tool

While the Legislature and Governor have expressed clear support for universal metering, only a few cities have started to install meters on secondary connections. During the 2016 general session, the Legislature passed Senate Concurrent Resolution 1 which stated that "…the Legislature of the state of Utah, the Governor concurring therein, encourages public water suppliers to implement metering on all retail public and private water systems." By approving this resolution, the Legislature and the Governor have expressed the intent, as a matter of public policy, that all secondary water systems will eventually be metered. The resolution does not provide funding or a time line by which the goal should be achieved.

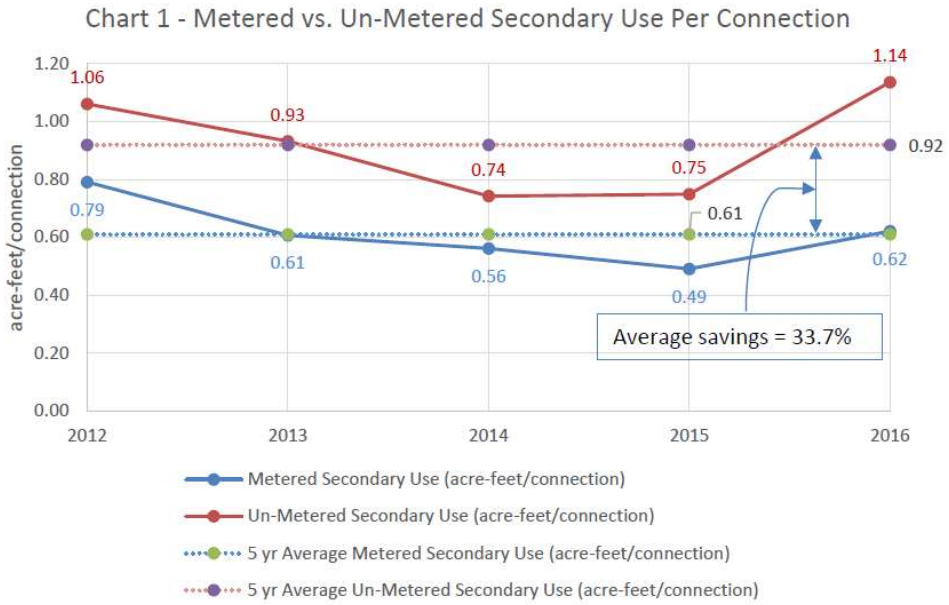
The Legislature and Governor concur that universal metering is a statewide policy that local water systems should pursue.

The use of meters reduces the demand for water, which reduces the cost of the service. We identified several water systems that either installed meters on their secondary water systems or are in the process of doing so. They include the cities of Mapleton, Saratoga Springs, and Spanish Fork, and Wolf Creek Improvement District. In addition, Lehi and Toquerville have begun the process of installing meters on their irrigation systems. The Weber Basin Water Conservancy District has installed nearly 5,000 meters on its secondary system and plans to have 10,000 meters installed by the year 2020.

Several local water systems have installed meters on their secondary water connections.

The water systems that have installed the meters are reporting substantial reductions in water use. For example, the Weber Basin Water Conservancy District conducted a five-year study of the impact of installing meters on secondary water connections. Figure 3.2 shows the study results. It compares the rate of water use among metered and unmetered users in the same tri-city region.

Figure 3.2 Metered Use Is Lower than Unmetered Secondary Use. Weber Basin customers that have metered connections to the irrigation system use 34 percent less water than unmetered users.



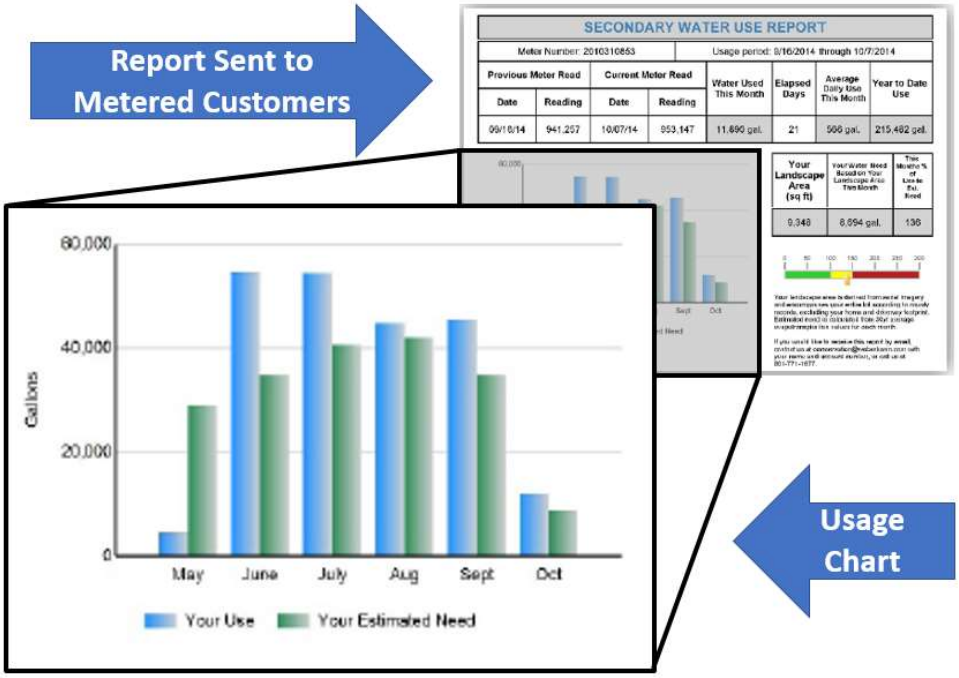
Source: Weber Basin Water Conservancy District – Saving Water through Secondary Water Metering and Increased Consumer Awareness (March 2017)

A study by Weber Basin Water Conservancy District shows a 34 percent reduction in secondary use when meters are installed.

The blue line in Figure 3.2 shows the water use of several thousand customers on Weber Basin's secondary system who have metered connections. The red line represents the rate of secondary water use by customers on the Uintah Bench area of Weber County. The water use by un-metered connections was measured at the source, or head gate meter.

The figure suggests that metered connections reduce water use by 34 percent. These results are particularly interesting because it shows the effect the meters have on human behavior. When people know they are accountable, they tend to use less water. To reinforce the message that people should only use as much water as needed, the district sends a water use report (shown in Figure 3.3) to each customer with a metered connection.

Figure 3.3 Water Use Reports Helped Consumers Evaluate Their Water Use. Customer use (blue) is charted against the district's estimate of needed use (green), which is included in secondary use reports sent to metered secondary customers.



Source: Weber Basin Water Conservancy District – Saving Water through Secondary Water Metering and Increased Consumer Awareness (March 2017)

As Figure 3.3 shows, customers in the study were given a report that includes a chart showing their actual use (blue) compared to what the district estimated their need should be (green). This information provided valuable feedback to consumers about their watering habits and prescribed new use patterns to be considered.

Individual use reports sent to metered customers show actual use relative to district-calculated needs.

While the benefits of metering are understood, the cost of installing meters remains a significant barrier to universal metering. Cost estimates range from $400-$500 on new construction to between $1,000 and $1,300 on existing connections. Despite the cost, several water systems report that installing meters on their secondary systems is an effective way to improve their efficiency. Water managers are finding fewer and fewer opportunities to acquire additional sources of low cost water. Secondary meters allow them to do more with their existing supply.

The cost of installing secondary meters remains a significant hurdle for local water systems.

Figure 3.4 shows a photo of one of these devices. The standard version of these meters transmits the flow reading by radio signal. The

more advanced meters can communicate remotely by wi-fi signal that can be received by cell towers.

Figure 3.4 An Example of a Secondary Meter Used by Water Systems. Once communities start metering the use of irrigation water, residents begin to reduce their rate of consumption.

Source: Weber Basin Water Conservancy District – Saving Water through Secondary Water Metering and Increased Consumer Awareness (March 2017)

The Utah Board of Water Resources is helping facilitate secondary meter installation by setting aside $3 million annually within its loan program.

It is assumed that funding for the meters should be paid by the water system and ultimately the ratepayers who benefit. However, some outside funding, such as the loan program established by the Utah Board of Water Resources in December 2016, could help facilitate meter installation. The board set aside $3 million annually within its loan program at a discounted interest rate for systems interested in installing secondary meters. So far, just one irrigation company has taken advantage of the loan program.

Requiring that water conservation plans discuss secondary metering or adopting a deadline for large systems may promote meter installation.

To provide an added incentive for water systems to begin installing secondary meters sooner rather than later, the Legislature should consider ways to promote universal metering. One suggestion has been to set a date when all secondary water systems with a certain number of connections must be metered. Even if it is 10 or 15 years away, the requirement should motivate water systems to start installing the meters before they face water shortages. Another option would be to require that each water system include in its water conservation plan a timeline or goal for metering secondary water

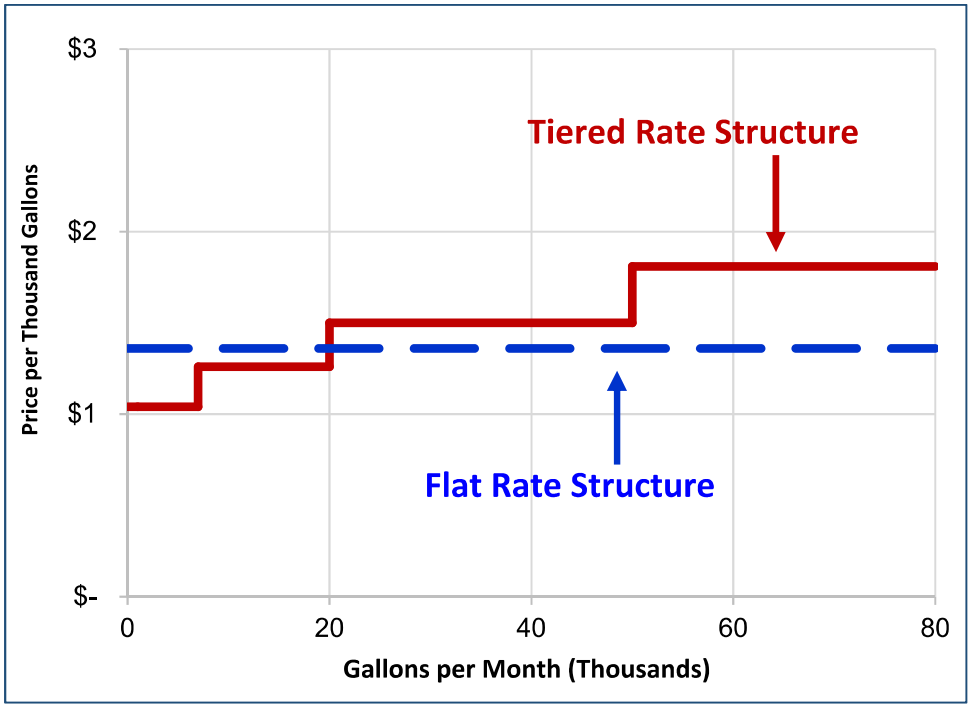
systems. At the very least, the Legislature should consider requiring all water systems to install secondary meters during new construction when costs are comparatively low.

Tiered Pricing Aims to Discourage Over Watering and Encourage Conservation

During its 2016 General Session, the Legislature mandated tiered pricing.

During the 2016 Legislative General Session, the Legislature approved Senate Bill (S.B.)28, which requires water systems to adopt a rate structure that "…provides for an increase in the rate charged for additional block units of water used." It also requires that each billing statement identify the amount of water used at each connection. The objective of this legislation was to discourage flat pricing structures, such as the blue line shown in Figure 3.5. It represents the flat rate structure West Jordan had before S.B. 28 was passed. Under a flat rate structure, consumers are charged the same rate regardless as to the number of gallons used. As a result, they have little incentive to minimize water use.

Figure 3.5 West Jordan City Replaced Its Flat Rate Structure with a Tiered Rate Structure. Flat rates (shown in blue) provide little incentive to conserve water use. A tiered rate structure (in red) encourages conservation by charging water users a higher rate as water use increases.



Source: Flat Rate: As reported to Division of Drinking Water in 2013.

In compliance with S.B. 28, West Jordan replaced its flat rate structure shown in blue with the tiered rate structure shown in red. The new rate structure gives residents an incentive to limit their water use as incremental costs rise at specific thresholds.

Many Cities Still Have Flat Rate Structures. While many cities have switched to a tiered rate structure, we found that many still have a flat rate structure. According to a 2013 Division of Drinking Water report, 96 water systems had flat rate structures. Our 2015 audit report identified another four systems with flat rate structures. Of those 100 water systems, we identified the current rate structure of 49 entities, finding that 30 continue to have flat rate structures, 12 have adopted tiered rate structures, and 7 are in the process of adopting a new rate structure. Due to the time constraints of this audit, we were unable to contact the remaining 51 water systems and do not know whether they have adopted tiered pricing structures.

In our sample of 49 entities that had a flat rate structure, 30 did not adopt a tiered structure.

Since some systems still lack tiered rate structures, we believe that additional efforts to educate and monitor implementation of the statute is needed. We recommend that the Utah Rural Water Users Association encourage all its members to come into statutory compliance. In addition, the Legislature should consider inviting the association to provide periodic updates on the rate of compliance with the tiered pricing requirement.

The Utah Rural Water Users Association should encourage its members to comply with the statute and provide updates on implementation.

Legislature Did Not Adopt Two Recommendations Related to Financing Water Systems

The use of conservation pricing was one of three pricing policy issues raised in our 2015 audit report. The other two dealt with problems associated with use of property taxes to subsidize water use and concern that water systems were not required to bear the full cost of system repair and replacement. In recommending the Legislature consider addressing these issues, we also observed that the Governor had created an Executive Water Finance Board to consider these and other issues as well. Because the Legislature has not yet passed any bills on these issues, we encourage the Executive Water Finance Board to consider how best to address these issues.

A Legislative Committee Voted Down a Provision to Minimize Property Tax Subsidies for Water Systems. When property taxes are used to subsidize water systems, water rates are kept

artificially low, encouraging overuse. In addition, low water rates make justifying the cost of some conservation strategies difficult as customers do not see the full water costs on their bills. Introduced during the 2017 Legislative General Session, S.B. 151 would have required, under certain conditions, that "property tax collections by a water conservancy district may not exceed 15% of a district's total annual revenues." While the bill was considered in committee, it was tabled without further action being taken.

A bill limiting property tax collections by water conservancy districts to 15 percent of annual revenues did not pass committee.

The state auditor has raised concern about whether proper accountability can be maintained when communities use other revenue sources to support their water systems. Accountability concerns would also arise if communities used funds from their water systems for other community purposes. For these reasons, we recommended that the Legislature take steps to encourage water systems to lessen their reliance on outside revenues such as property taxes. Instead, water systems should be required to rely, as much as possible, on water rates for their revenue.

No Legislative Action Has Yet Been Taken on How to Pay for Local Infrastructure Costs. The concern raised in the 2015 audit report was that water systems needed some clarification on how to fund major infrastructure repair and replacement projects. Ideally, as assets depreciate, rate payers should be contributing to an infrastructure repair and replacement fund. As systems wear out, water systems would then have funds available to cover the cost of repair projects. No legislation was proposed or considered on this matter.

No action was taken on how to pay for water infrastructure upgrades and repairs.

Executive Water Finance Board May Take Up These Issues. When we issued our 2015 audit report, the Governor and the Utah Foundation were expressing similar concerns about the challenge of funding Utah's growing water systems. Eventually, the Governor formed an Executive Water Finance Board to study these issues. As future Legislatures weigh these matters, we encourage the Executive Water Finance Board to do so, as well.

Managing Unaccounted for Water Uses Can Increase System Efficiency

Local water systems have expressed growing interest to improve their efficiency. One way to accomplish this goal is to identify and address the system leaks and other unaccounted uses. DWRe and the American Water Works Association (AWWA), sponsored a pilot

program that assisted water systems with better managing their leaks and other uses that are unaccounted.

Orem City, Granger Hunter Improvement District and the Kearns Improvement District participated in a water audit pilot program sponsored by DWRe and the AWWA. With the assistance of these agencies, each water system systematically identified the chief sources of unaccounted water use, especially leaks, and have taken steps to reduce unaccounted flows. Independent of the pilot, Spanish Fork reduced the leaks in its system, decreasing unaccounted water use from 33 percent to less than 20 percent of water supplied by its system.

Several states, such as California, Georgia and Hawaii, have adopted legislation requiring water systems above a certain size to audit their unaccounted use. As the Legislature considers ways to encourage Utah's water systems to be more efficient, mandatory audits of unaccounted use or ways to facilitate additional audits may be a study item for the Legislature to consider during the 2018 interim. The remaining section of this chapter addresses the data validation, water projection, and goal development work that the DWRe can continue to address in support of the issues already before the Legislature.

DWRe Is Working on Demand Modeling and Basin-Level Conservation Goals

Before establishing conservation goals specific to a water basin, a reliable baseline must be identified.

Historical projections and relevant conservation goals were lacking when our prior audit was conducted. Developing relevant goals necessitates a reliable baseline to track progress, which DWRe and its consultant are currently preparing. Once this task is completed, DWRe will work with a consultant to develop river-basin-specific conservation goals.

DWRe needs a more sophisticated model to run multiple demand scenarios. DWRe's prior model, which was overly simplistic, is now being overhauled to provide a wider range of scenarios that key stakeholders can consider. DWRe has implemented some components of its new forecasting model, but additional elements are needed.

New Conservation Goals Require Finalizing the 2015 Data Quality Check

Our 2015 audit report observed that the rate at which residents use water varies significantly from one river basin to another. For this reason, we recommended that separate conservation goals be prepared for each river basin. The Legislature concurred with this recommendation when it passed S.B. 251 during the 2016 general session. The bill directed the DWRe, the Board of Water Resources, and State Water Development Commission to establish new water conservation targets by river basin.

Senate Bill 251, passed during the 2016 General Session, directed that new water conservation targets be established for each river basin.

In response to this charge, DWRe management agreed that they would work with local water systems to develop updated conservation goals at the basin level. Management still expresses the desire to create basin-level goals but wants to have a reliable baseline from which to develop those goals.

As discussed earlier in Chapter II, DWRe is engaged in a significant effort to validate the municipal and industrial (M&I) water use data reported by water systems for 2015. Currently, DWRe's consultant is finalizing its review of data submitted by water systems and estimates by DWRe. Dependent on the consultant's findings, DWRe intends to use its study as a baseline for setting new goals. 2016's S.B. 251 includes a provision to hire a consultant to help develop regional water goals. Therefore, DWRe is currently completing the first of two-steps to develop conservation goals with its consultant.

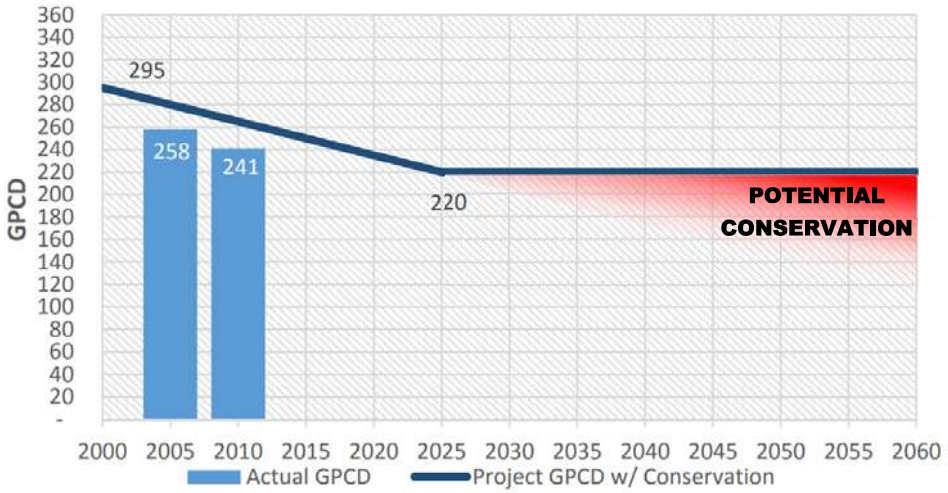
DWRe's consultant should recommend a reliable baseline that will serve as the basis for future conservation goals.

New Demand Model Variables Will Allow for Better Projections

In our 2015 audit report, we recommended that DWRe regularly update its projections of future demand and "…provide a range of options…" that accounts for factors including investment, conservation, and supply development. This recommendation was based on a concern we had with DWRe's future projections. Specifically, DWRe forecasted future water use after 2025 would remain constant at 220 gallons per capita per day till 2060 as shown by the dark blue line in Figure 3.6. However, given the historical trend of declining consumption, we believe that some reductions in future demand are possible.

Our prior audit in 2015 recommended that DWRe provide a range of demand scenarios accounting for various levels of investment and conservation.

Figure 3.6 Utah's Per Capita Water Use Projection by Year. While DWRe assumes the state's per capita water use will remain steady after 2025, historical trends suggest additional demand reductions could occur, which are shown in red.



Source: Division of Water Resources

The problem with past projections is that they reflect the state's 2025 goal. With no longer term goal, the projection in Figure 3.6 shows no additional conservation after 2025, which no one expects to occur. This assumption was described in our prior report.

DWRe's old model was relatively simple, applying a yearly conservation rate to future population growth.

Historically, DWRe has taken a relatively simple approach to modeling future demand. Future demand was the product of multiplying base gallons per capita per day by the future population and applying a conservation percentage. This approach allocated all water use, including residential, commercial, industrial, and institutional, into a single per capita figure.

While this approach is simple, it does not lend itself to considering multiple scenarios. For example, it would be difficult to adjust for a shift from single-family to multi-unit developments or reductions in the amount of lawn that homeowners choose to have. Thus, DWRe has developed a new model that can more easily adjust for changes in future demand.

DWRe Is Developing More Sophisticated Models

DWRe's new model considers the following four components, each of which can be adjusted based on observations or scenario assumptions:

- Population
- Residential indoor use
- Residential outdoor use
- Commercial, industrial, and institutional use

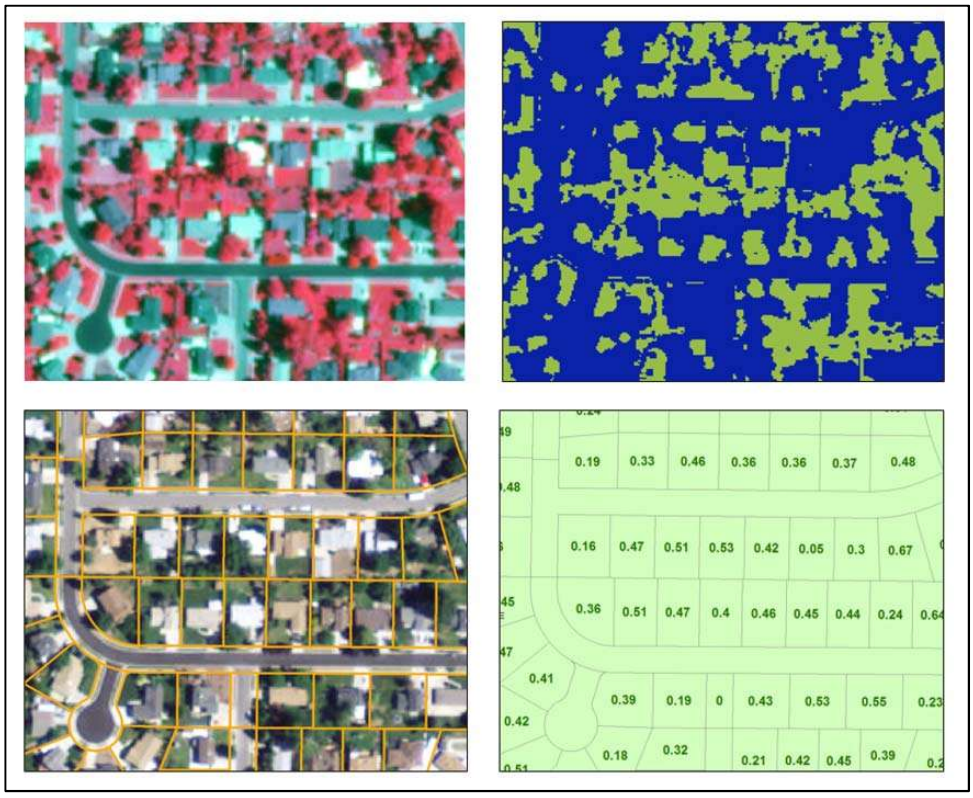
The new model allows for customized scenarios for population, indoor use, and outdoor use.

For each component, different scenarios can be applied. For example, if high, medium, and low population projections are provided, DWRe can model the future impact on demand. Thus, municipalities and water systems can estimate what their water needs will be if different growth scenarios are realized. Creating these scenarios has necessitated that DWRe develop a more robust demand model that can handle more variables. DWRe demonstrated some components of the demand model for us.

DWRe Is Now Using Advanced Imaging Techniques to Identify Irrigated Acres. Another component that could be adjusted is residential outdoor use, which is estimated by applying a water use value to the number of irrigated acres. A key factor in estimating irrigated acres is the percent of residential lots that are irrigated. DWRe has now developed a process, shown in Figure 3.7, whereby infrared imaging (top left) is converted to irrigated or not irrigated maps (top right). Then this result is applied to geographical information system (GIS) parcel data (bottom left) to calculate the percent of residential lots that are irrigated (bottom right).

DWRe is using GIS models and infrared imaging to generate data-based irrigated acre assumptions in its future demand models.

Figure 3.7 DWRe Uses Infrared Imaging to Estimate Irrigated Acres. This process allows DWRe to estimate the actual percentage of lots that are irrigated rather than using an estimation.



Source: Division of Water Resources Presentation – Future of Water Demand Modeling in Utah (5/16/17)

With more accurate estimates of actual irrigated acreage for residential properties, DWRe can project future demands if multiple conservation measures are applied, such as converting lawns to xeriscape, decreasing the amount of water that residents apply to their lawns, or smaller lot sizes. DWRe's implementation of this more sophisticated modeling technique allows for greater scenario building and planning by key stakeholders.

DWRe plans to develop other improvements to its demand model in the future.

Additional Improvements Will Enhance DWRe's Projections of Water Demand. DWRe has made improvements to its demand modeling. Future modeling enhancements that DWRe wants to implement include the following:

- Indoor use estimates
- Commercial, industrial, and institutional water use projections
- Current and future water supply
- Price elasticity of water

While these components all would be insightful, we are particularly interested in improved modeling of current and future water supply. As will be discussed in Chapter IV, if similar scenario modeling for demand could be applied to the supply side, then an additional tool would be available for key stakeholders. We recognize DWRe's accomplishment in improving its demand model, and we reiterate our prior audit recommendation that DWRe continue working on supplementing its demand model with adjustments for supply.

Recommendations

1. We recommend that the Legislature consider ways to promote universal metering, including:

    a. Requiring all water systems to install secondary meters during new construction when the cost is relatively low.

    b. Set a date when all secondary water systems with a certain number of connections, must be metered.

2. We recommend that the Utah Rural Water Users Association encourage each of its members to come into compliance with the statutory tiered pricing structure requirement.

3. We recommend that the Legislature invite the Utah Rural Water Users Association to provide periodic updates on the rate of compliance with the tiered pricing requirement.

4. We recommend that the Governor's Water Finance Board consider ways to accomplish the following:

    a. Reduce the reliance on property taxes to subsidize water systems, and

    b. Promote the use of capital improvement funds for local infrastructure projects.

5. We recommend that the Legislature consider as a study item during the 2018 interim, the use of mandatory water audits and other methods to help water systems reduce their unaccounted use.

6. We reiterate our recommendation that the Division of Water Resources regularly update its projections of future demand as new information becomes available and provide a range of options that includes investment, conservation, or supply development under a range of demand scenarios.

Chapter IV
Future Water Supply Projections Are Anticipated

In our 2015 audit report, concerns about understating future growth in Utah's water supplies were presented in Chapter IV. Known projects for four water conservancy districts were the only growth in water supply that the Division of Water Resources (DWRe) included in its most recent river basin plans. In response, we made three recommendations in Chapter IV that focused on updating river basin plans with better projections of future municipal and industrial (M&I) supply.

Figure 4.1 DWRe Is in the Process of Addressing Prior Audit Recommendations about Future Water Supply. This figure shows the implementation status of the 2015 report's three Chapter IV recommendations.

Chapter IV Recommendations	Status
1. We recommend that the Division of Water Resources begin estimating added supply in their M&I studies to account for water made available through the conversion of agricultural water and other locally developed sources of supply.	In Process
2. We recommend that the Division of Water Resources update state and basin plans on a regular basis as new information is gathered to ensure plans are relevant.	In Process
3. We recommend that the Division of Water Resources base its future estimates of the agricultural water available for municipal use on the actual historic data of past transfers.	In Process

Source: A Performance Audit of Projections of Utah's Water Needs (Legislative Audit Report 2015-01)

Updated state and river basin plans as well as better projections of future supply were recommended in the prior audit.

Recommendation 2 discussed in the next section, points out the need for DWRe to update river basin plans; some of them were prepared 20 years ago and their projections are outdated. Recommendations 1 and 3, which are discussed in the latter half of this chapter, focused on providing better projections of future supply, as supply modeling was not as robust as demand models. While DWRe has been working on these recommendations, additional work still needs to be done. For example, DWRe has developed a schedule for future basin plans, but drafting and publishing them is where the majority of implementation will take place.

Updated River Basin Plans Are Coming

As part of the statewide water planning process, DWRe periodically publishes a state water plan, 11 river basin plans, and other documents with pertinent information for stakeholders. Three of Utah's 11 river basin plans have not been updated since the 1990s. This includes the Kanab Creek/Virgin River basin plan that has not been updated and published recently. However, data for the basin has been updated through work for the Lake Powell Pipeline evaluation process.

Multiple setbacks have delayed publishing an updated statewide water plan and subsequent river basin plans.

The lack of published up-to-date information impairs decision makers who do not have relevant data. The DWRe has developed a schedule where all 11 river basin plans will be updated over the next 6 years. These updates will commence once DWRe's statewide plan is complete next year. Setbacks in obtaining municipality-level population data, validating use, and setting regional water conservation goals has delayed the statewide water plan's release. Updating river basin plans will commence after the statewide plan has been made public.

20-Year-Old River Basin Plans Will Be Updated within Four Years

DWRe has not initiated an additional river basin plans since our prior audit because it has been focused on finishing its 2015 M&I study.

While good basin plans should be the basis for statewide planning, our prior audit reported that many river basin plans were far out of date. Since that report, only the Uintah Basin plan has been released. During the past year, the DWRe has focused on producing its 2015 municipal and industrial (M&I) use study, which has been a significant undertaking. While DWRe has not initiated any additional basin plans since our prior audit, it has adopted a draft schedule of the anticipated release date for each water basin plan shown in Figure 4.2.

Figure 4.2 The Most Recent Plans for Some River Basins Are Over 20 Years Old. This figure shows the most recent and the next anticipated plan for each river basin based on DWRe's schedule.

Basin	Most Recent Plan	Next Anticipated	Years Between
Statewide	2001	2018	17
Cedar/Beaver	1995	2018	23
Kanab Creek/Virgin River	1993	2019	26
Sevier River	1999	2020	21
West Colorado	2000	2020	20
Southeast Colorado	2000	2020	20
West Desert Basin	2001	2021	20
Bear River	2004	2021	17
Weber River	2009	2021	12
Jordan River	2010	2022	12
Utah Lake	2014	2022	8
Uintah Basin	2016	2023	7

Source: Division of Water Resources

Figure 4.2 shows when the most recent plan was published for each river basin, the next anticipated plan, and the number of years between publications. For 6 of the 11 river basins, 20 or more years will have passed before updated data is published. This lag in pertinent data and projections provides less than optimal information for decision makers who rely on this information.

Six of the 11 river basin plans are over 20 years old since they were last updated.

Going forward, DWRe has developed a plan to publish new pertinent information for each river basin on a seven-year rotation. To clarify, this is a goal and may be subject to change. While this plan has not been executed yet, we believe that it is consistent with our prior audit recommendation that river basin plans be updated on a regular basis as additional information is gathered and relevant.

To facilitate a more frequent reporting schedule, DWRe is in the process of working with stakeholders to identify pertinent information. Specifically, DWRe has met with the Executive Water Task Force and Water Development Commission to document what information in these plans is most important. In addition, DWRe is also taking direction from the *Recommended State Water Strategy* that was released in July 2017 by the Governor's Water Strategy Advisory Team.

To facilitate more frequently updated river basin plans, DWRe is soliciting feedback from its stakeholders.

Updated river basin plans will be produced once the statewide water plan is published and new regional conservation goals are established.

Based on their feedback, DWRe currently anticipates creating an online modular format for plans. This structure will enable consistent information, like river basin geology, to remain constant and information that changes over time, such as current use and future demand projections, to be updated. Future river basin plans are on hold until the 2015 M&I study and statewide basin plan are completed and new regional water conservation goals are established.

The Upcoming Statewide Plan Encountered Multiple Setbacks

The statewide water plan encountered multiple delays from obtaining population projections and validation of 2015 M&I data by a third party.

DWRe has intended to publish an updated statewide plan, but it has encountered multiple delays. According to DWRe, the plan was ready to public in May of 2015, but it held off doing so because of the release of our previous audit. In 2017, DWRe management told us that the plan was about 80 to 90 percent complete before unexpected delays occurred. First, updated population projections were provided at the county level rather than at the municipality level that DWRe needs. Second, the consultant verifying 2015 municipal and industrial (M&I) water use data was delayed because the scope of work and contract encountered challenges prior to being finalized. Consequently, DWRe's statewide plan will be delayed until sometime in 2018.

Population Projections Necessitate Additional Analysis to Provide Municipality-Level Data. In July 2017, the Kem C. Gardner Policy Institute at the University of Utah released statewide population projections at the county level. To conduct water use projections for the state's 11 river basins, the DWRe uses municipal-level projections. Therefore, the Utah Department of Transportation (UDOT) and its consultant will be working with the seven Associations of Governments (AOG) and municipalities to allocate projected county growth to the municipality level.

DWRe's third-party review of 2015 M&I data should be complete in December.

The Consultant Review of 2015 M&I Use Data Is Ongoing. DWRe requires reliable data as a baseline when making future projections. DWRe's consultant is nearing completion of its data review. Based on the consultant's recommendations that should be made in late December, DWRe will work on developing regional water conservation goals with its next consultant.

As we discussed in Chapters II and III, the reliability of data and capacity for conservation varies from river basin to river basin.

Therefore, the statewide water plan will provide valuable information. However, updating specific river basin plans will provide more pertinent insight on the narrower geographic regions. As was shown in the statewide study, issues causing delays can occur. Therefore, it is important to emphasize that the anticipated schedule of future basin plans in Figure 4.2 is a draft and may be subject to change.

Estimating Growth in Water Supply Presents Challenges That Require Additional Study

The first and third recommendations in Figure 4.1 directed the DWRe to include future estimates of supply. Specifically, the inclusion of agricultural conversion was recommended based on estimates relying on historic data. DWRe management has indicated that it is their intent to so but wants those estimates to be "…flexible enough to account for unique conditions present in urban and rural areas of the state." The following section discusses some unique conditions in southern Utah, where agricultural conversion estimates and assumptions can be quite different from one region to another.

In developing agricultural conversion estimates, DWRe wants a method that is flexible to account for unique conditions in urban and rural areas.

Agricultural conversion occurs when a farmer or rancher's land is developed for residential or commercial use. Water once used for growing crops is converted for human consumption and use. In some cases, agriculture water cannot be fully converted to culinary use. This situation is outlined in the *Lake Powell Pipeline Project – Water Needs Assessment* that was released in April 2016. In the assessment, agricultural conversion estimates and limitations were provided for the following three areas, each having different amounts of agricultural water available for conversion.

The water needs assessment for the Lake Powell Pipeline illustrates how agricultural conversion can vary from area to area.

- **East Fork Virgin River Sub-Basin and Alton Town:** Agricultural conversions would be sufficient to meet M&I demand within the planning period. It was "assumed 20 percent of irrigated agricultural water use could be transferred to M&I. Estimate is based on full conversion of agricultural diversions to M&I diversions, assuming no increase in consumptive use."

- **Washington County:** Agriculture water can be converted to secondary water use in the Washington Fields area. "As agricultural lands are developed, water will be converted from

agricultural to municipal uses . . . poor water quality limits cost-effective use of this water by secondary untreated systems."

- **Kanab and Johnson Canyon Area:** No agricultural water can be planned on for future conversion to M&I use. "Kanab Irrigation Company policy is not to allow for any conversions to M&I as properties are developed, but to transfer irrigation to other parcels which are readily available." This policy is supported by historical data indicating that agricultural lands have increased by 20 percent over the past five years.

As these examples and excerpts show, agricultural conversion for specific areas within the same region of the state can have vastly different potential yields. Contrasting the Kanab and the East Fork Virgin River Sub-Basin, no agricultural conversion is available from one (Kanab), while full conversion is assumed in the other (East Fork). This stark contrast illustrates why DWRe desires flexibility in its agricultural conversion estimation methodology.

DWRe is drafting its process for estimating agricultural conversion for future projections.

As of July 2017, DWRe had begun drafting a process to determine accurate and timely estimates of agricultural conversion. The process is still in the preliminary phases. It is important to reiterate that DWRe implement the prior audit report's Recommendation 3 (Figure 4.1), which is that future estimates of agricultural conversion should be developed based on a methodology that uses historical transfers.

Projections of future water demands and sources are valuable information that decision makers need to plan for future growth. As pointed out in our prior report, information is incomplete when a full picture of future supply is not presented. Thus, better estimates and projections of future supply are very important. We recommend that DWRe continue its efforts to develop a flexible approach to projecting future supply.

Recommendations

1. We recommend that the Division of Water Resources continue developing the online format for state and basin plan reporting.

2. We recommend that the Division of Water Resources follow its draft schedule for producing updated basin plans for Utah's 11 basins over the next five years.

3. We reiterate our prior recommendation that the Division of Water Resources base its future estimates of the agricultural water available for municipal use on the actual historic data of past transfers.

4. We recommend that the Division of Water Resources continue its efforts to develop a flexible approach to projecting future supply.

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Agency Response

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GARY R. HERBERT
Governor
SPENCER J. COX
Lieutenant Governor

State of Utah
DEPARTMENT OF NATURAL RESOURCES
MICHAEL R. STYLER
Executive Director

Dear Mr. Schaff,

We would like to thank you, Darin Underwood, Jim Behunin, Tim Bereece and others for working collaboratively with us in order to create "An In-Depth Follow-up of Projections of Utah's Water Needs." As the report describes, our Division, along with our partners in the divisions of Water Rights (DWRi) and Drinking Water (DDW), have made significant progress towards applying the recommendations outlined in the 2015 audit. We are also working to make further progress. Below are our responses to the updated recommendations.

Chapter 2 Recommendation Responses: Water Data Accuracy is Improving

Recommendation 1: We agree that the Division of Water Rights' staff should continue conducting site visits and focus on addressing potential data issues as identified by our Division. We have seen marked improvement since this new process started, and anticipate further progress over the coming years.

Recommendation 2: We agree that performing trend analysis to validate whether locally reported data is reasonable and consistent with historic water use is important. At times, we may see comparative discrepancies as our data and processes improve due to better reporting and methods. We will continue to help local entities improve their reporting in partnership with DWRi and DDW.

Recommendation 3: We agree with the need to further validate secondary water estimates and methodologies. We also encourage universal secondary water metering in order to reduce the amount of water use that currently has to be estimated. Measurement through metering strengthens accuracy and decreases the need for estimate-related methodology.

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Chapter 3 Recommendation Responses: Legislation Promotes Water Conservation, But Additional Agency Work Remains

Recommendation 1: We strongly support legislation that encourages universal secondary water metering. We encourage laws and statutes at the state or local level to require secondary water metering for new construction. Additionally, we support legislation setting a deadline by which all systems, with a certain number of connections, must be metered. Secondary water metering technology has advanced significantly, and universal metering would simultaneously remove the need to estimate secondary water use and promote water conservation as has been seen in several communities. We, along with Weber Basin Water Conservancy District, vocalized our support of these concepts to the Legislative Water Development Commission in November 2017, and we will continue to support them.

Recommendation 2: We agree with the recommendation for Utah Rural Water Users Association to encourage its members to implement tiered pricing. We believe the Utah League of Cities and Towns should engage its membership related to these issues as well. We will look for other opportunities to encourage entities ourselves through increased education on this topic.

Recommendation 3: We agree that there needs to be follow up related to tiered pricing until the local entities are 100 percent compliant with the statute.

Recommendation 4: We agree that the Governor's Water Finance Board should promote the use of capital improvement funds for local infrastructure projects. Repairing and replacing inefficient and damaged infrastructure results in less water loss and stretches supplies. We also are in favor of the Board working closely with water systems to identify ways to improve current processes.

Recommendation 5: We agree that making American Water Works Association (AWWA) water audits mandatory would improve community water systems statewide. Our division supported an AWWA water audit pilot program recently, and we are convinced of the benefit to both systems and the public.

Recommendation 6: We agree to update projections of future water demand as new information becomes available. We will provide a range of scenario options that include investment, conservation, or supply development.

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Chapter 4 Recommendations: Future Water Supply Projections Are Anticipated

Recommendation 1: We are excited about creating a more fluid, publicly accessible online format for state and basin plan reporting. We will reference the best examples available in order to create a tool that is easier to update as new information becomes available, and can be accessed by anyone at any time.

Recommendation 2: We are working towards following the schedule outlined in the report, and updating the mechanism for delivery (Recommendation 1) will help with that.

Recommendation 3: We will continue to develop reasonable methodologies for estimating agricultural transfers. We would like to work with the Utah Farm Bureau, Utah Department of Agriculture, DWRi and others to solidify these methodologies.

Recommendation 4: All River Basin and State Water Plans will implement a flexible approach for projecting future water supply.

The Utah Division of Water Resources believes these measures will improve our efforts to fulfill our mission to plan, conserve, develop and protect Utah's water resources.

Sincerely,

Eric L. Millis, P.E.
Director
Utah Division of Water Resources

Michael R. Styler
Executive Director
Utah Department of Natural Resources