

The cover features a dark blue background on the left with a blurred image of a water tap. The right side is a solid dark blue triangle. A large, light blue triangle points downwards from the center. The title is in white, bold, sans-serif font on the left, and the date is on the right.

ONE WATER  
STRATEGIES FOR  
NEW BRAUNFELS  
UTILITIES

JANUARY  
2019



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# INTRODUCTION

In February of 2017, Boston University's Institute for Sustainable Energy (ISE) and the Cynthia and George Mitchell Foundation (CGMF) initiated a multi-year project that aims to understand how water utilities in Texas cities can apply the principles of One Water to address the challenges of increasing urban populations, supply changes, and aging water infrastructure. Since summer 2018, the ISE team has engaged with New Braunfels Utility (NBU) to understand the opportunities relating to One Water for them as a mid-size utility serving a rapidly growing population.

The One Water paradigm spans potable water, wastewater, and storm water, and considers opportunities for water sourcing, treatment, and use holistically. Discussions around One Water often focus on supply side strategies, such as how water reuse or rainwater harvesting can provide alternate sources of water. However, demand management and water conservation also play a role in One Water by promoting sustainability, resilience, and reducing the need for additional gray infrastructure.

Ultimately, NBU may explore many strategies related to One Water. We chose to focus on demand reduction due to the utility's concern over potentially large increases in New Braunfels' water demand in the coming years. The ISE team analyzed meter-level data and also pumping data from NBU. We benchmarked NBU water demand, analyzed the demand by type of account, and identified the demand distribution by account. The findings led us to revisit projections of future water demand and generate a new demand projection that suggests demand growth may be slower than previously anticipated. While NBU's supplies are more than sufficient to meet projected demand through 2030, there are other benefits to effective demand management and water conservation practices. Consequently, ISE developed recommendations for a targeted outreach program to high consumers and to promote rebates to developers. We also drafted ordinance revisions related to watering violations.

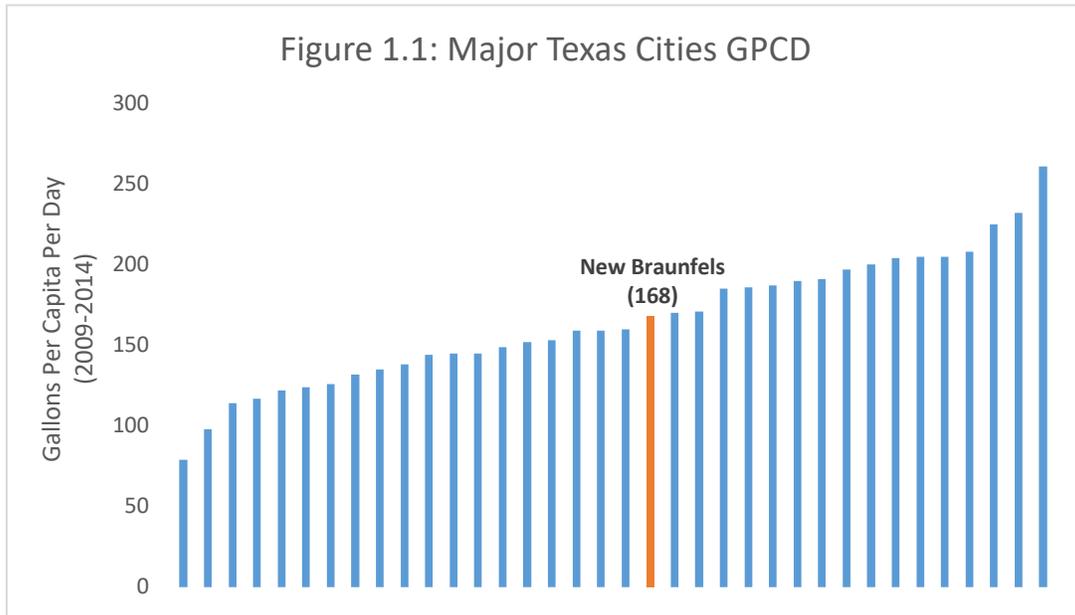
# SECTION 1: UNDERSTANDING WATER DEMAND

A key challenge that New Braunfels Utility (NBU) identified during discussions in summer 2018 was concern that a projected population growth rate of 6% per annum could rapidly increase water demand beyond the current capacity of NBU's water supplies. The potential increase in demand was of particular concern to NBU because the utility has worked hard to increase supplies and has pursued all viable options to expand supply in the short-term. This led the ISE team to consider demand projections, opportunities relating to demand management, and conservation. This report is comprised of analysis and suggestions spanning these three areas.

To better understand water demand, the ISE team looked closely at changes in water consumption over time and by account type, as well as distribution of use by account. It became clear that non-residential consumption was more significant than had previously been understood, and also that a relatively small number of accounts (including a number of non-residential accounts) are high consumers and constitute a large overall demand. These two insights helped ISE develop a revised set of demand projections, and recommendations to NBU for demand management and conservation.

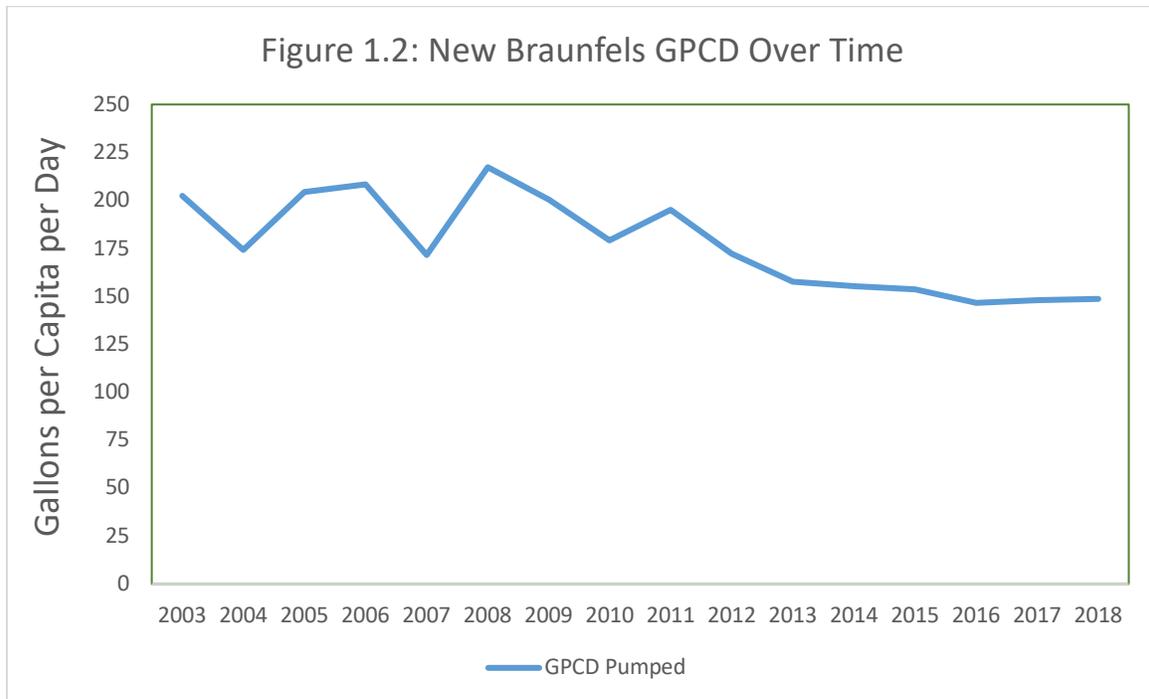
## 1.1 Consumption Benchmarks

New Braunfels' average water consumption (measured in gallons per capita per day, GPCD) is slightly higher than the median, compared to other major cities in Texas with populations above 100,000 people (see Figure 1.1 below). It is important to add a note on how these averages were calculated. The average GPCD for New Braunfels is taken from the [NBU 2018 Water Resources Plan<sup>i</sup>](#) and calculated using data from 2009-2016. The average GPCD for the other cities are calculated using data from 2009-2014. When considering the trend in GPCD, New Braunfels experiences an average decline in GPCD of 3.88% per year from 2009-2016 (see Figure 1.2). Consequently, the additional two years for New Braunfels skews its average GPCD downwards.



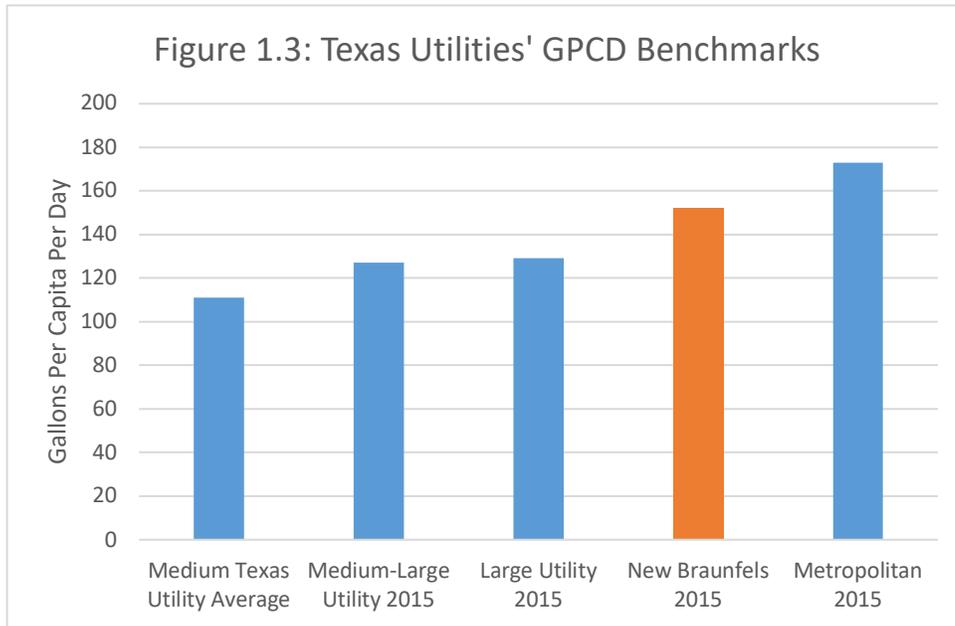
*Source: Texas Water Conservation Scorecard, May 2016<sup>ii</sup>*

While the average may be skewed downwards, it is important to highlight the consistent, downward trend in New Braunfels’ GPCD, down to 149 GPCD in 2018 (shown in Figure 1.2). With continued demand management and conservation efforts, including high-efficiency fixtures and systems as well as behavioral changes, New Braunfels’ GPCD is likely to continue to fall over time.



*Source: New Braunfels Utility Pumping Data*

A final comparison we made in consumption was relative to utilities of different sizes in Texas. That indicates that NBU's consumption was slightly higher than that of other medium-large sized (population between 50,000 and 100,000) utilities in Texas in 2015 (see Figure 1.3).

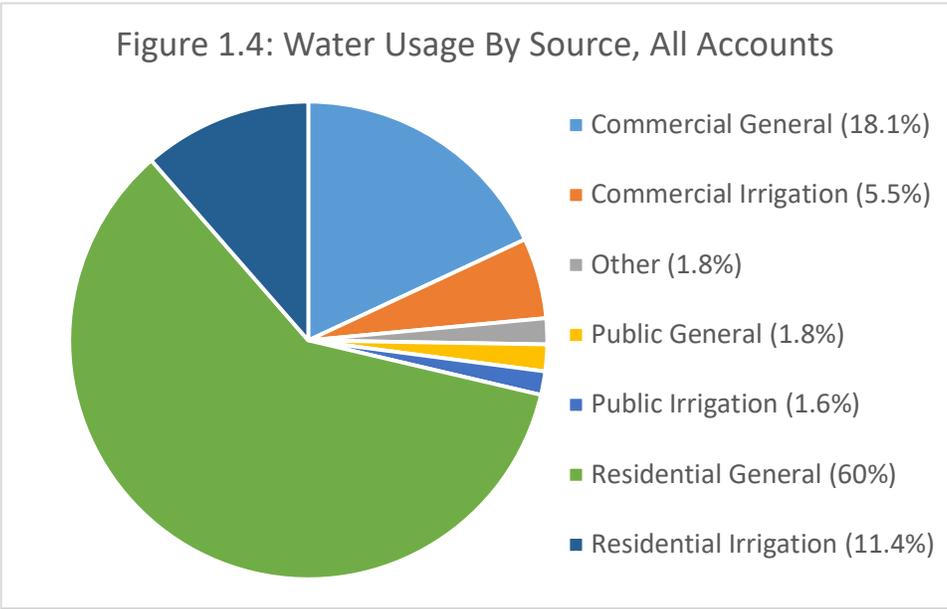


*Source: Water Use of Texas Water Utilities 2017 Biennial Report<sup>iii</sup>*

Recognizing that NBU is working to establish itself as a recognized water management leader with lower consumption and innovative programs, we focused on identifying immediate opportunities to reduce water consumption, and these are described in Section 3.

## **1.2 Demand Composition**

The ISE examined meter-level billing data provided by NBU in order to understand NBU's sources of water demand. A large majority of NBU accounts are residential rather than commercial, and this had led to NBU anticipating that future water demand would be likely to increase proportionally to population. However, we observed that NBU's demand data indicates that water demand has grown at a slower rate than population in recent years. This led the ISE team to examine consumption by account type in order to understand the relative proportions of end-use consumption.

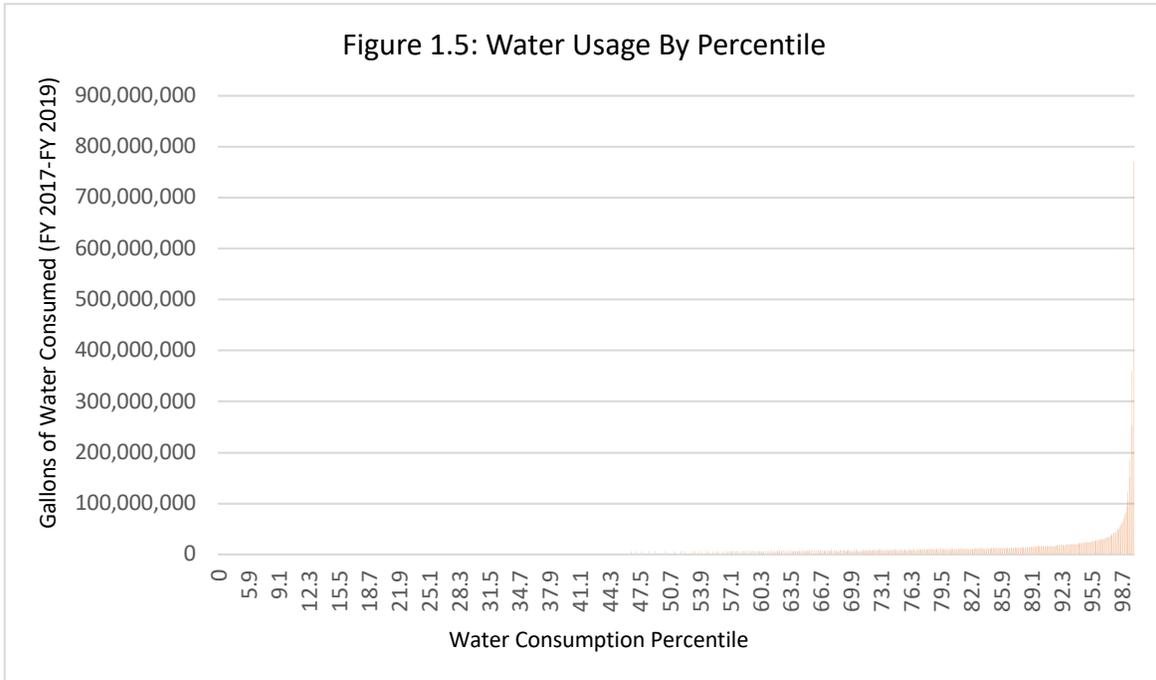


*Source: New Braunfels Utility Billing Data (Fiscal Year 2017-2019)*

Figure 1.4 breaks down total water consumption by end-use account type. Each of the account types are defined using billing codes. Irrigation is listed separately when a dedicated meter is available. Overall, irrigation use is understated because of incomplete penetration of separate metering. Instead, some irrigation use will be captured in commercial, residential, or public general account types. “Public” account types are defined as any accounts owned or operated by New Braunfels’ municipal entities such as government buildings and parks. “Other” captures account types that could not be categorized as either commercial, residential, or public.

Residential water consumption represents nearly 70% of overall water consumption, with non-residential accounts representing a substantial fraction of the overall consumption. This suggests that even if residential demand increases proportionally to population, overall demand may not grow proportionally to population since non-residential demand is significant and may not grow proportionally. (We also note that demand increases may be reduced since newer buildings tend to have more efficient water fixtures and fewer leaks than older buildings.) Realizing that the consumption varied substantially by account type, we then moved to consider distribution of water demand by account, in order to further identify opportunities for targeted interventions for demand management and water conservation. The data indicates that a small percentage of accounts consume a disproportionately high amount of water and comprise a significant portion of total water demand.

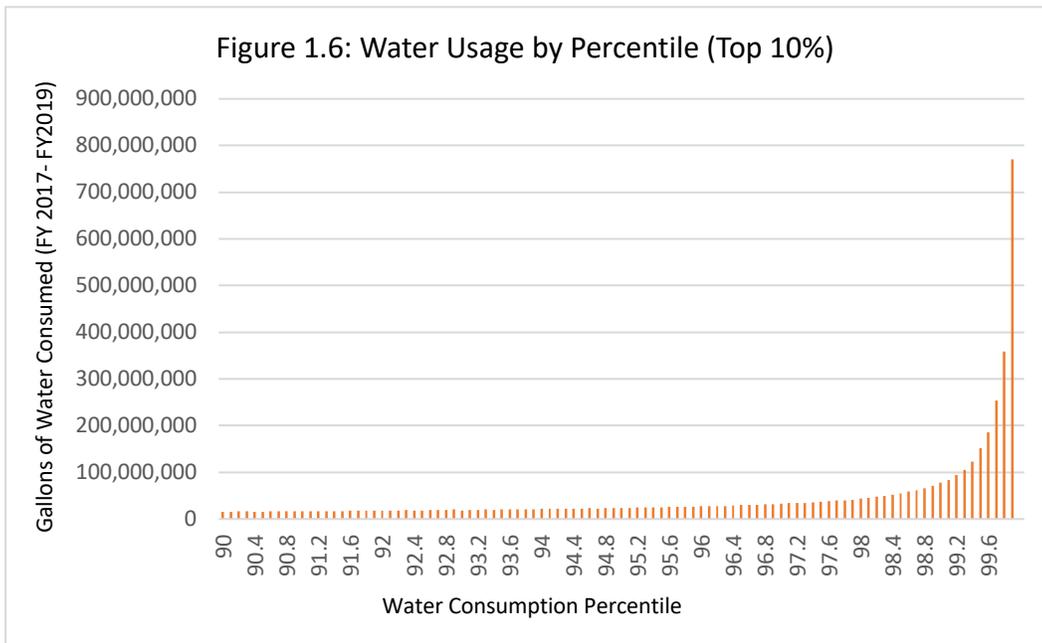




*Source: New Braunfels Utility Billing Data (Fiscal Year 2017-2019)*

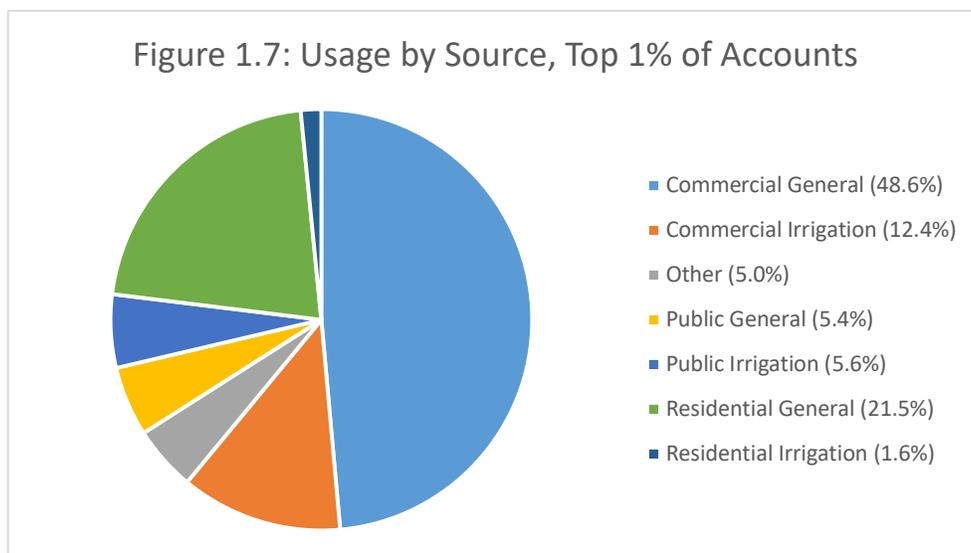
Figure 1.5 is a plot of the amount of water consumed by each 0.1% percentile grouping of all accounts over combined fiscal years 2017-2019. The y-axis lists the combined annual consumption (in gallons) for accounts in each 0.1% percentile group. The 0.1% percentile represents the total usage of 0.1% of accounts with the least usage, and the 99.9% percentile represents the total usage of 0.1% of accounts with the most usage. This visualizes the extremely top-heavy nature of water consumption in the New Braunfels Utility service area, and the importance of focusing NBU’s resources on targeted demand conservation strategies for high-percentile accounts.

We note that at the current time pursuing water conservation in newer buildings is likely to not be the most efficient use of NBU’s resources because the same conservation efforts would likely result in greater water savings in less efficient, older buildings. Therefore, we suggest prioritizing older buildings now, and revisiting broader opportunities to promote efficiency later. Similarly, pursuing additional conservation efforts with residential users may not be the highest near-term priority, if NBU seeks to drive larger consumption reductions first and focus on smaller consumption reductions later. While residential users are the majority of NBU’s customer base, they are not necessarily the most inefficient (or largest) users of water. We recommend that initially NBU target the relatively few, large accounts that contribute to a significant portion of total demand, and consider conservation efforts for residential accounts at a later date.



*Source: New Braunfels Utility Billing Data (Fiscal Year 2017-2019)*

Figure 1.6 is an expanded section of Figure 1.5, focused on the top 10% of accounts by consumption, and shows the usage of each 0.1% in the top 10% of yearly account consumption across FY17, FY18, and part of FY19. This further demonstrates the top-heavy nature of water consumption in NBU’s service area because there is significant weight at the top even within the top 10% of accounts. Overall, the top 0.1% of accounts constitute 10% of total water demand and the top 1% of accounts (between 400-500 accounts depending on the fiscal year) constitute 27% of total water demand.



*Source: New Braunfels Utility Billing Data (Fiscal 2017-2019)*

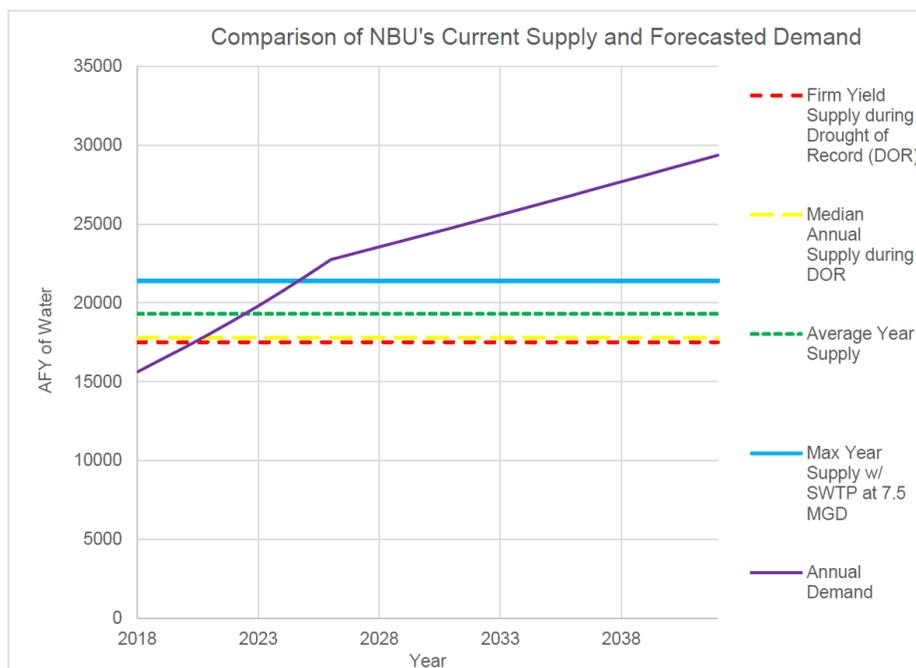
Figure 1.7 decomposes the end-use consumption of the top 1% of accounts. Within the top 1% of accounts, Commercial accounts made up more than 60% of total demand. This reinforces that strictly targeting residential accounts for demand conservation would miss many of the largest users.

Focusing in on details about the top 30 users, the most consumption came from healthcare facilities, senior homes, and municipalities such as the sheriff's office, schools, and parks. In a pilot scheme started in late 2018, NBU found that double digit percentage reductions in demand among the top 30 users could be achieved with relative ease because some of the largest users consumed water inefficiently or had leaks. For example, two NBU wastewater treatment plants that are part of the top 30 users are improving the efficiency of their treatment processes. NBU estimates that such improvements will lower the plants' water consumption by 75%. This illustrates the opportunity for large benefits when conservation efforts are focused on the small group of consumers that constitute a large proportion of total demand. Whether that is the top 10%, 1%, 0.1% or top 30 accounts remains at NBU's discretion, but successfully reducing the consumption of those top users can result in a significant reduction of total water demand. The conclusion drawn from this analysis is that top consumers of water are the low-hanging fruit for demand conservation efforts.

## **SECTION 2: DEMAND PROJECTIONS**

NBU had indicated concern that water demand could exceed its drought on record (DOR) firm yield supply capacity as early as 2020. This statement was based on the water demand projections in the Water Resources Plan, reproduced in Figure 2.1 below. The methodology of this projection involved projecting gallons per capita per day usage through 2042 starting from the baseline of 168 GPCD, assuming a linear growth rate in water demand in proportion to the projected population growth rate. The BU ISE team realized that a more detailed demand projection could draw a more accurate picture of demand growth.

**Figure 2.1: Comparison of NBU's Current Supply and Forecasted Demand**

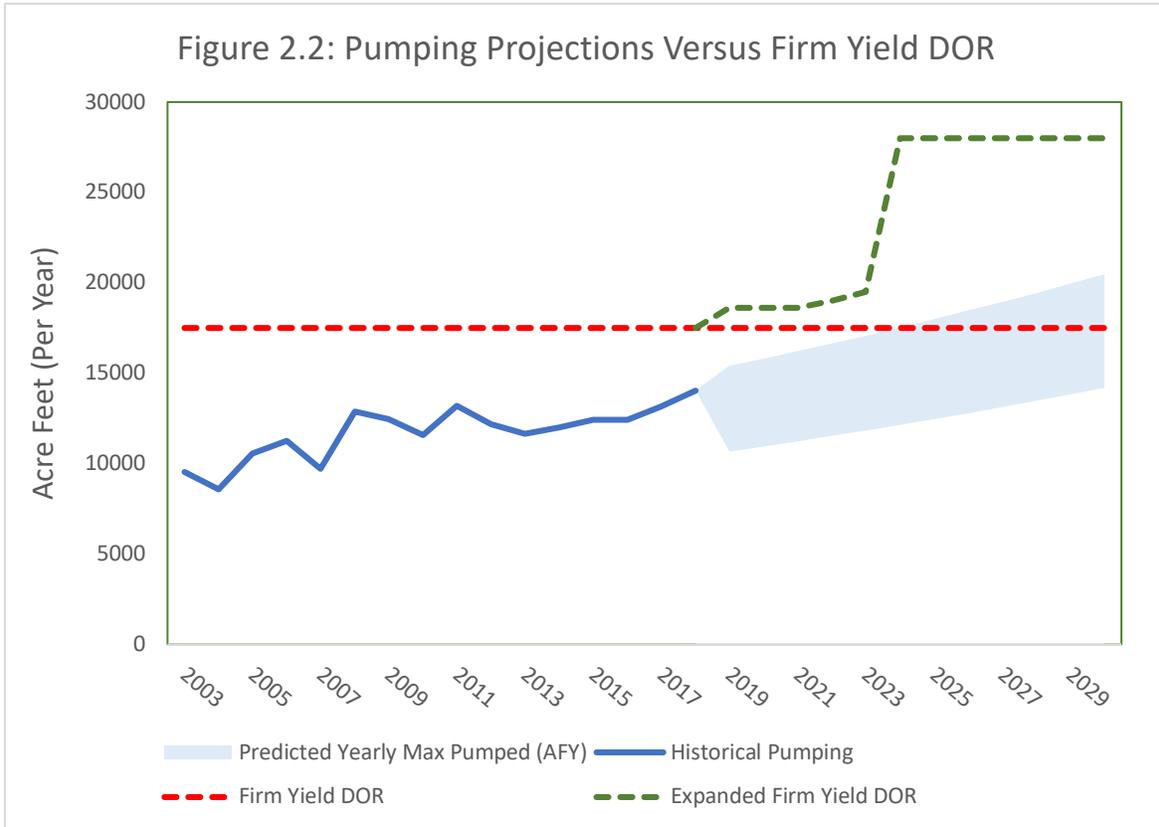


*Source: New Braunfels Utility 2018 Water Resources Plan<sup>iv</sup>*

ISE developed a model for pumped water through 2030 in order to recreate the analysis done in the Water Resources Plan, using historical data to serve as a guide. The monthly demand model projects a maximum and minimum aggregate water demand level out to 2030 using a fixed growth rate based on a historical average. This range is determined by projecting the historical monthly maximum and minimum pumped totals at a constant growth rate and summing them together. For example, it searches all years of historical data for the highest (or lowest) January pumped level and then does so for all the other months and then aggregates them.

This model leads to growth projections depicted in Figure 2.2 that differ from those in the NBU water resources plan. This difference can be accounted for by the weight each model puts on population growth: the model in the water resources plan is based on water demand increasing proportionately to population growth, whereas ISE's model uses historical growth rates (and introduces a range to the forecast based on possible variations in annual precipitation). There are two primary reasons why a given population increase may not yield a proportional water demand increase: first, residential

demand is just one component of overall demand, and not all other demands (commercial & industrial etc.) will grow proportionately with residential demand. Second, per capita demand is dropping in water utilities across the country as fixtures become more efficient in new homes and water consumption behavior changes, so even residential demand may not increase at the same rate as the overall population increase.

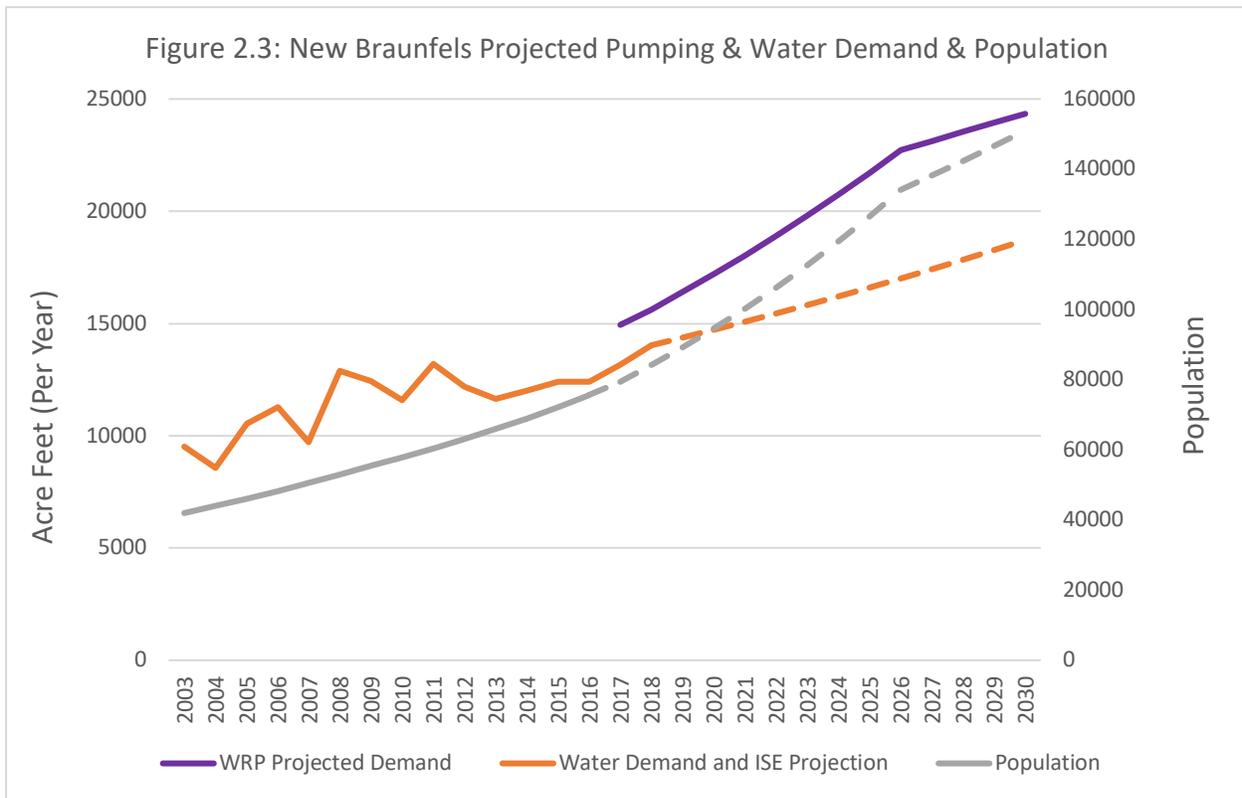


Source: New Braunfels Pumping Data and ISE Model

Whereas the NBU Water Resources Plan concluded that NBU’s water demand will exceed firm yield supply as early as 2020, the model from the ISE predicts this will not happen until 2024 at the earliest, assuming the existing 17,500 acre feet of firm yield capacity during a drought on record. (Firm Yield DOR taken from [NBU Water Resources Plan 2018 \(June 2018\)](#)<sup>v</sup>. However, NBU’s Water Resources Plan called for the development of additional water supply sources (alongside demand conservation efforts and ASR development) and NBU entered into a contract with Guadalupe-Blanco River Authority (GBRA) for 8,000 acre feet of water annually, as well as other small supply contracts. This large supply expansion is represented by the green dashed line in Figure 2.2, which shows that long term supply concerns are eliminated on a time frame extending beyond 2030.

While these considerations of annual consumption show a favorable comparison of supply and demand, we note that peak water demand in the summer months already exceeds firm yield capacity regularly and is expected to exceed the current firm yield by increasing amounts over time. This

indicates the importance of demand management, development of ASR, and other water management practices that can reduce peak demand.

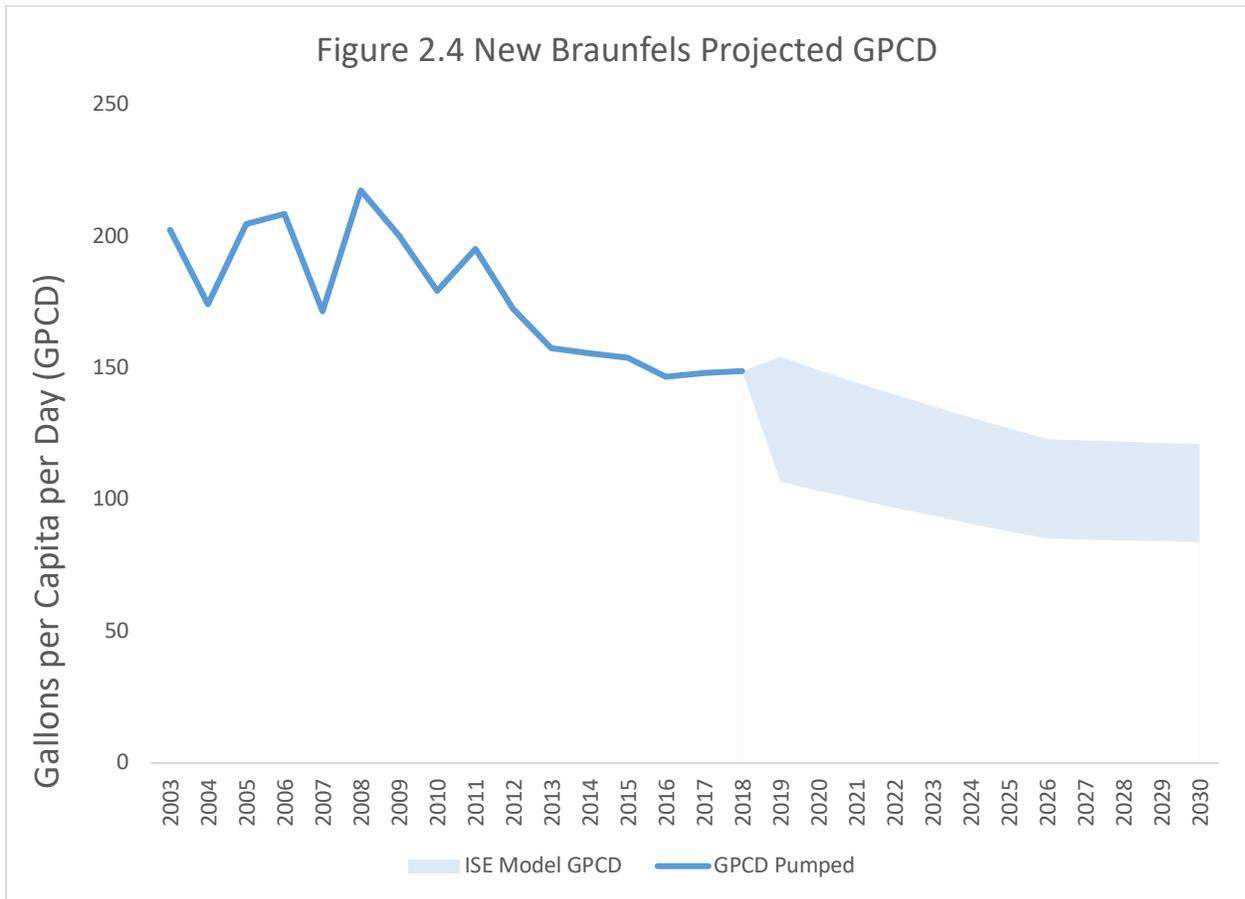


Source: New Braunfels Utility Water Resources Plan

To put the new water demand projections in context of previous demand estimates, we constructed Figure 2.3. This shows how NBU projected population grows at ~6% per annum then 3% per annum starting in 2027 (dotted gray line) in their water resources plan. The plan also called for GPCD to decline from 168 in 2009-2016 to 120 in 2042. Both the population growth and GPCD decline are considered in NBU’s projection of its water demand (solid purple line). This figure also shows a forecast of future water demand growth based on the historical demand growth (orange dotted lines), and how population and demand have changed historically (solid gray and orange lines). The solid lines are actual data while dotted lines represent projected data. Firm Yield DOR is taken from [NBU Water Resources Plan 2018 \(June 2018\)](#)<sup>vi</sup>. The data show that historically, the water demand increase has not been proportional to the increase in population growth. Instead, while population has grown at 6% per annum, water demand has grown at an average of approximately 2.43% per annum. This insight is the key reason that ISE chose to apply its own model to forecast water demand growth that is not based on population and is instead based on historical growth patterns. (We do, however, note that there are likely to be limitations in projecting the historical growth rate forward over 10 years, and these forecasts should be revisited and revised as more data becomes available.)

Considering the demand projections in the context of the GPCD metric suggests that GPCD will decline steadily to between 84 and 121 GPCD in 2030 (see Figure 2.4). Although this may sound low,

it is worth noting that some cities in Texas do have GPCD values at or below 100 presently, such as Brownsville, TX. This finding is primarily a result of the insight that water demand has grown more slowly than population growth historically; we reiterate a projection 10 years into the future based on current trends inevitably includes some uncertainty. With serious water conservation efforts, NBU's 120 GPCD goal can be achieved even sooner and can mark NBU as a leader in water conservation and water efficiency.



*Source: New Braunfels Pumping Data and ISE Model*

Having established that projected annual consumption compares favorably to supply availability, we focused in on demand management and water conservation opportunities that can help to manage short-term peak demand and can contribute to NBU establishing itself as a leader in water management. Our findings above led us to consider targeted outreach opportunities, rebates, and potential ordinance revisions.

## SECTION 3: RECOMMENDATIONS

With a better understanding of the top-heavy nature of water demand in the New Braunfels service area, ISE sought to develop demand conservation strategies which take this into account. As water demand continues to grow in different patterns across account types, it is important to prioritize demand reduction for the largest accounts, regardless of the account type. The largest accounts represent the low-hanging fruit for demand conservation efforts because they are a relatively small number of accounts and tend to consume water inefficiently. Water conservation can be as simple as reaching out to these top consumers, taking a close look at their demand profile and offering specific consumption reduction recommendations and custom rebates through direct contact. On the other hand, offering specific recommendations and custom rebates through direct contact to all accounts is an impossible task because it would require an unreasonable amount of resources. The alternative method for demand reduction of offering generic recommendations and generic rebates through mass communication dilutes the effectiveness of water conservation significantly, as evidenced by universally low participation rates for generic rebate programs across water utilities. This comparison of water conservation efforts illustrates that greater water savings can be achieved with focused targeting of top consumers.

While NBU may profit from each marginal unit of water sold, it nonetheless benefits from demand reduction in two ways. First, it avoids the fixed, investment costs associated with the development of new supply infrastructure. Second, NBU removes any potential economic losses it may face when forced to develop new supply in a constrained manner to meet demand in the short-run. If NBU is free to develop new supply based on a long-time horizon, it can be free to choose the most cost-efficient supply infrastructure. If it is forced to pay for a new supply source simply because it was the only option which could be quickly constructed, that supply source may not be cost-efficient. Therefore if NBU consistently works to curtail the water demand of the highest consumers, it can avoid having to frequently invest in new supply and also have a longer period of time to develop the most cost-efficient supply source.

The ISE has four specific recommendations to help NBU achieve its larger goal of managing water demand within its service area:

- 1) An outreach program and budget that NBU can use to reduce the consumption of its top users of water.
- 2) A specific set of scaled fine structures for water violations.
- 3) Rebates in the form of subsidies on broader categories of high-efficiency technology retrofits.
- 4) Predevelopment meetings between NBU and developers, in which NBU offers rebates on high-efficiency technology.

### **3.1 Outreach Program and Budget**

Through a combination of research, data analysis, and discussions with NBU on priorities, the ISE team developed tailored water demand conservation recommendations for NBU. Observations from NBU's current demand conservation programs revealed a low participation in water rebates. Improving participation in these programs is a slow and potentially costly process, as is any solution that aims to reduce water demand through universal voluntary behavior changes. Informed by the data on the percentage of water used by top users and the inefficiency of this use, ISE recommends that NBU instead focuses water conservation efforts on top water users. Water conservation among top users can be achieved through the development of strong utility relationships with the users. Likewise, NBU can offer tailored water conservation solutions and rebates up to the full amount of the cost of retrofits. These measures have potential to reduce demand significantly, can be achieved relatively quickly, and are inexpensive demand conservation options relative to the costs of building new supply. Moreover, such efforts have public relations potential to promote NBU as a One Water and demand conservation leader.

In late 2018, the ISE recommended that NBU identify its top users of water, reach out to them individually and work with them on a case-by-case basis. After initial outreach efforts, NBU was able to reduce the water consumption of some of its top users at little cost to NBU beyond staff time. With this initial success, ISE recommends NBU pursue these outreach efforts more broadly.

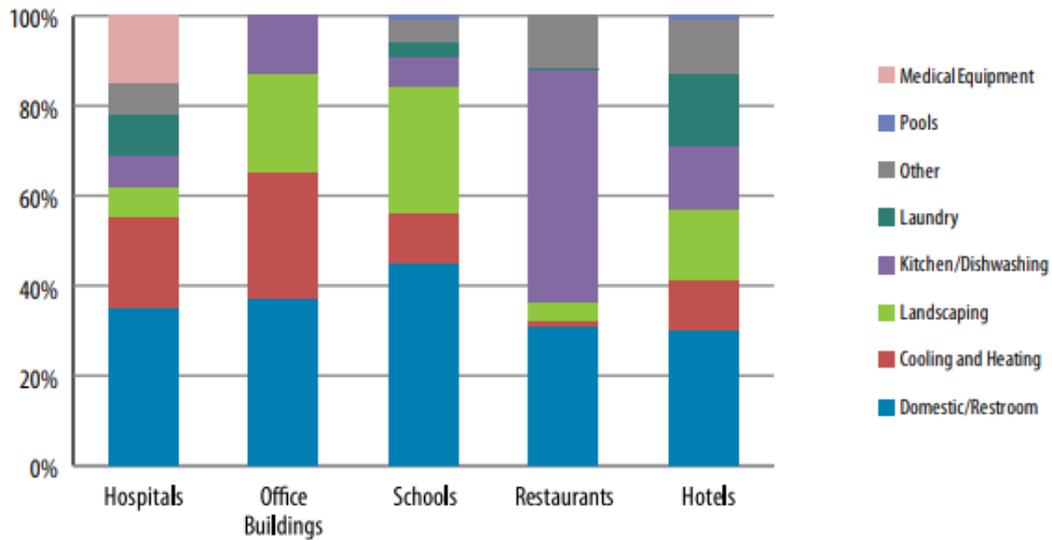
Key steps in the outreach are to identify high-percentile accounts, and determine the end-uses of water that are most impactful for each account. Where is the water going? Is it optimized? The next step is to determine if it is possible to implement a one-time change through retrofitting and/or complete overhaul of infrastructure. Examples of scenarios where reductions can be made are a commercial customer uses a significant amount of water in an industrial process, and NBU determines if there are leaks or opportunities to improve water efficiency through infrastructure retrofits, or a residential irrigator is willing for NBU to facilitate/pay for replacing grass with artificial turf or overhaul their garden with drought resistant plants.

A more detailed outline of an outreach process is as follows:

- 1) Choose a particular number of customers to reach out to from the top 1% of its customers
- 2) Reach out to these customers in as many ways as possible: cold call, email, mobile phone application notification, billing notification.
- 3) Once in contact with a customer, ask them preliminary questions that can help to narrow down the potentially largest and/or most inefficient sources of their water consumption

E.g., Figure 3.1 illustrates the typical relative proportions of end-use water consumption for five categories of Commercial and Industrial customers. If a top consumer falls into any of these categories, NBU can start by asking questions related to their end-uses of water that are typically high for that customer type.

Figure 3.1: End Uses of Water in Various Types of Commercial and Institutional Facilities



*[WaterSense at Work: Best Management Practices for Commercial and Institutional Facilities](#)<sup>iii</sup>*

- 4) After asking preliminary questions, work through section 1.2 of the EPA WaterSense at Work publication. This section is called Water Management Planning and begins on [page 13 of the PDF document](#).

We recommend starting at “Step 2 – Assessing Facility Water Use,” to inventory major water-using fixtures and create a water balance for a facility.

After Step 2, we recommend moving directly to “Step 4 – Creating an Action Plan,” to clearly identify potential gains in water efficiency through retrofit or behavioral efforts. This step is the most important, for both the customer and NBU, as it will help the customer to understand the economic benefit of new technologies or behavioral changes and will help NBU to determine which retrofits will have the greatest return on investment, if NBU chooses to partially subsidize or fully pay for the retrofit technologies. Likewise, NBU can determine if the costs fit in with its larger annual outreach program budget. It is critical that NBU clearly communicates the long-term economic benefit to the customer of retrofits and/or behavioral changes.

There are numerous examples of the minimum or average percentage water savings throughout the WaterSense at Work publication that occur when a particular water-efficient technology is implemented:

- a. Average of 10% reduction for commercial ice machines
- b. Installing drip irrigation reduces water usage by 50% relative to conventional sprinklers
- c. EPA WaterSense certified products guaranteed to use at least 20% less relative to conventional products
- d. High Efficiency urinals, showerheads, faucets, and urinals all guarantee at least 20% reduction in consumption relative to conventional products
- e. WaterSense urinals are 50% more efficient than standard urinals

After inventorying current water-using fixtures and their typical water usage, NBU can retrofit with these water-efficient technologies (or others).

“Step 5 – implementing the action plan” involves implementing actions (retrofit or behavioral) that NBU evaluates as net positive ROI and customer agrees to pay for (likely subsidized cost).

Then by following Steps 6 and 7, and by measuring a customer’s water consumption reduction efforts, NBU can determine if the investment is actually paying off and justify annual outreach budget with cost savings and sustainability benefits that emerge. Carefully monitoring the consumption of outreach program participants is critical to the longevity and viability of a program like this.

## **Budget**

The following methodology can be used to develop a budget for an outreach program:

- 1) NBU needs to estimate and/or assume what it believes to be a reasonable percentage reduction that can be made each year over a certain period. EPA estimates suggest that it is reasonable to assume that a 15% reduction in water consumption can be made through outreach efforts for top users over a period of 15 years.<sup>viii</sup>
- 2) With a yearly percentage reduction, NBU can estimate the number of gallons to be saved through outreach efforts.
- 3) From there, NBU can multiply the number of gallons saved each year by the variable cost of the water source utilized in each year and discount the budgets for future years to present-value.
- 4) The resulting net-present value is the maximum budget for the outreach program – as long as NBU spends less than the budget, its outreach and retrofit efforts are profitable.

For example, an outreach program budget for the top 1% of users can be calculated as follows: according to NBU billing data, the top 1% of NBU’s water users (between 300 and 400 users) used approximately 2,976 acre feet of water in fiscal year 2018.

The variable cost of water is calculated from the GBRA project costs, based on the O&M portions added together and divided by the 8,000 acre-foot annual capacity NBU is purchasing. The leases, fees, and debt service are all considered fixed costs. The variable cost total per acre foot is \$686.

After multiplying through the costs to find the value of water saved from an outreach program that reduces the top 1% of water consumers usage by 15% over 15 years, we discount to present value using a discount rate of 7%. The total present value works out to \$2,981,684. This is the budget for staff, customized rebates, and other cost associated with the outreach program. Spending less to achieve the same amount of water savings is considered profitable for NBU based on the variable cost of water, but spending more would be unprofitable.

Year	1	2	3	4	5
<b>Acre-Foot Savings</b>	446	446	446	446	446
<b>Variable Cost</b>	\$686	\$686	\$686	\$686	\$686
<b>Total Value</b>	\$305,956	\$305,956	\$305,956	\$305,956	\$305,956
<b>Present Value</b>	\$305,956	\$285,940	\$267,234	\$249,751	\$233,412

Year	6	7	8	9	10
<b>Acre-Foot Savings</b>	446	446	446	446	446
<b>Variable Cost</b>	\$686	\$686	\$686	\$686	\$686
<b>Total Value</b>	\$305,956	\$305,956	\$305,956	\$305,956	\$305,956
<b>Present Value</b>	\$218,142	\$203,871	\$190,534	\$178,069	\$166,420

Year	11	12	13	14	15
<b>Acre-Foot Savings</b>	446	446	446	446	446
<b>Variable Cost</b>	\$686	\$686	\$686	\$686	\$686
<b>Total Value</b>	\$305,956	\$305,956	\$305,956	\$305,956	\$305,956
<b>Present Value</b>	\$155,533	\$145,357	\$135,848	\$126,961	\$118,655

<b>Total Present Value</b>	\$2,981,684
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We assume that an outreach program to the top 1% of users can save approximately 15% (446 Acre-Feet) of water use over 15 years from a combination of behavioral changes, leak reductions, and fixture retrofits.

### **3.2 Revitalizing Rebates**

NBU indicated their interested in recommendations regarding their rebate programs. ISE suggests some changes to the rebate programs that work in tandem with the outreach program. It does not seem to make sense, from an efficiency perspective, to work on blanket promotion of rebate programs. It makes the most sense to try and maximize the likelihood of a top-consumer utilizing the rebate to install high-efficiency retrofits that will create the greatest water savings for NBU. Likewise, it doesn't make sense to promote specific rebates. Instead, we recommend that NBU offer rebates in the form of percentage subsidies on broader categories of retrofit technologies. This will provide NBU a greater degree of flexibility in its outreach program when working with top customers to reduce their long-term water consumption to determine appropriate high-efficiency retrofits. If a particular retrofit makes the most sense for a top-user, NBU should be able to at least partially subsidize the upfront capital costs that could be a major barrier to the customer. If NBU utilizes a rebate program that is specific, it loses the opportunity to subsidize a more cost-effective retrofit. Not only should percentage subsidies on broader retrofit categories be used, they should be scaled with the cost of the retrofit to ensure the percentage reduction translates to a meaningful dollar-savings. A ten percent reduction on a \$100 technology is very different from a 10% reduction on a \$10,000 technology.

### 3.3 Ordinance Changes

NBU is currently pausing their ordinance revision process to provide an opportunity for ISE to suggest additional revisions. ISE will refine these recommendations in February 2019, but our initial recommendations relate to the fine structure for water violations and are as follows.

Following Aurora Colorado, ISE suggests that NBU introduces fines which scale per thousand gallons (as opposed to the current flat fines) of water consumed as a moving average of the last 12 months of water consumption<sup>ix</sup>. If billing data for the last 12 months does not exist, then the average of however many months of billing data a customer has available will be utilized to calculate the average monthly consumption. The fines will also scale with the number of violations and the stage restriction that was effective during the time of the violation. While these scaled fines will (on average) be higher than the currently suggested flat fines, this will likely serve as a more effective deterrence factor. ISE acknowledges that a scaled fine structure may be subject to pushback and consequently proposes that the fines follow the philosophy of a deposit-refund system. A customer can receive a full refund of their fine, if they accomplish one of the following:

- 1) The customer reduces their average monthly consumption by 10% over the period of 3 months following the month of the violation, as compared to the same 3 months from the previous year.
- 2) If data on those 3 months from the previous year doesn't exist for that customer, the customer must not receive a water violation for the 12 months following the month of the violation.

ISE also recommends that separate, scaled fine structures are created for customer groups because the value of a fine which may deter a residential customer could likely be very different from the value for a commercial and industrial customer, or a developer. Below is a tabulation of the fine structures which consolidate everything discussed:

All Residential (per thousands gal)	Year Round Warning	Stage 1	Stage 2	Stage 3
1 <sup>st</sup> Violation	\$2.50	\$3.00	\$4.00	\$5.00
2 <sup>nd</sup> Violation	\$25.00	\$30.00	\$40.00	\$50.00
3 <sup>rd</sup> Violation	\$50.00	\$60.00	\$75.00	\$100.00
4 <sup>th</sup> Violation (or more)	\$100.00	\$110.00	\$115.00	\$120.00

*\*Maximum fine of \$2,000*

Commercial, Industrial, and Developers (per thousands gal)	Year Round Warning	Stage 1	Stage 2	Stage 3
1 <sup>st</sup> Violation	\$25.00	\$30.00	\$40.00	\$50.00
2 <sup>nd</sup> Violation	\$50.00	\$60.00	\$70.00	\$80.00
3 <sup>rd</sup> Violation	\$75.00	\$85.00	\$90.00	\$100.00
4 <sup>th</sup> Violation (or more)	\$100.00	\$110.00	\$115.00	\$120.00

*\*Maximum fine of \$10,000*

As there is potential for these fines to scale to high amounts, ISE recommends that NBU determine a cap for the maximum fine that a customer can receive that is scaled appropriately for the type of customer.

### **3.4 Predevelopment Meetings**

While it is important to make sure rebate opportunities that encourage high-efficiency retrofits are available, such rebates should also be emphasized during development of new homes, commercial, or industrial facilities. If NBU can help to ensure high-efficiency technologies related to water consumption are making their way into new developments, it can preemptively reduce future water demand. To do so, NBU could mandate a pre-development meeting between itself and a developer that is required for the developer to receive service from NBU. During this meeting, developers should list technologies related to water consumption that it plans to install. From there, NBU can suggest alternative, high-efficiency water - saving technologies that it can subsidize, as per its annual outreach budget. If NBU estimates a rough value of the gallons of water that will be avoided in consumption, it can contextualize that in terms of avoided variable costs of its water supply in order to determine how much it is willing to provide to subsidize the technology. Some examples of retrofit technologies that may be of particular interest to developers:

- a. Zonal Watering Systems
- b. Point source drip systems in grass beds
- c. Pressure regulated heads for grass areas

NBU could also utilize this meeting to clearly explain how water violations and fine structures work and could potentially require the developer to provide a plan of technologies related to water consumption and rough estimates of the water usage of the technologies on an annual basis. It is critical that NBU emphasizes and potentially estimates the economic benefit (kickback period) of paying for the upfront capital costs of these technologies by comparing the long-run cost of a comparable technology with a much cheaper upfront capital cost.

### **3.5 Developing Long Term Demand Conservation Options**

We suggest that NBU develop a pipeline of strategies to reduce water demand in the long-run. One approach to this is implementing WaterSmart software or a similarly capable solution. Such software has the potential to aggregate and analyze consumption data that is relevant to both utilities and consumers alike. WaterSmart software can identify suspected leaks, communicate customized water savings recommendations, and report water usage data to consumers. One study of WaterSmart's home water reporting feature shows that households which receive home water reports reduce their water usage by 5% (as compared to those who did not receive a report)<sup>x</sup>. This software could serve as a powerful, long-run conservation strategy if NBU implements the home water report feature, provides customized savings recommendations to consumers, and uses targeted mass-communication to provide conservation strategies tailored to certain groups. This will help NBU to continuously promote demand conservation with all its customers, rather than just top consumers.

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## Endnotes

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