Lone Star State Experience
Provides Lessons on Successful Water Supply Planning

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Drought is a familiar sight in Texas.

Water supply planning is a hot topic in Texas. The state's population is expected to increase 38% in the next 30 years, adding another 18 million people to Texas' population centers that are already busting at the seams[1]. Compounding the additional demands are increasingly more severe droughts, like the one that hit Texas in 2010–2012, which resulted in the hottest, driest year on record[2] and dwindled the state's water supplies to an all-time low. During this period, many water suppliers in Texas implemented drought contingency plans, with some entities spending millions of dollars on emergency supplies to keep the faucets flowing.

One of Texas' largest population centers weathered the drought quite well in spite of the extreme conditions. When other entities in the Dallas-Fort Worth metroplex were in stage 4 of their drought plans and were laying pipe to other sources — miles away from their demand centers — the City of Dallas was cautiously confident through the drought and closely monitoring the supplies in its system of six water supply reservoirs. Dallas voluntarily enacted stage 2 of their drought plan, even though triggers tied to reservoir levels were still at stage 1 levels. The forethought of water supply planners from 60 years ago provided the impetus for Dallas' well-earned good fortune during the statewide water supply crisis.

Until this most recent drought, the 1950s drought had been considered the most critical in Texas. That drought spurred water supply reservoir construction that has not been equaled since. City of Dallas planners understood the criticality of having water supply for their citizens and developed plans to provide adequate supply should similar critical events occur in the future. It took about 60 years, but these drought conditions returned with a vengeance; yet Dallas was ready with water supply to spare for thirsty neighbors.

Since the 75th Texas Legislature passed Senate Bill 1 in 1997, water supply planning in Texas has taken on a bottoms-up regional approach, resulting in 16 regional water plans and a State Water Plan every five years. The regional and state water plans are critical pieces of water supply planning, but many entities see the benefit of developing their own system-specific plans and diving into details far beyond the scope of the regional planning efforts. HDR has partnered with numerous clients in the development of these system-specific plans over the last 20 years and has accumulated several lessons learned to share with entities that embark on planning for and securing their water supply future.

Lesson 1: Start With the End in Mind

The end result of water supply planning can vary widely depending on the needs of an entity. Focusing on the questions that you need the plan to answer at the beginning of the scoping effort is an important step in the process. For the City of Dallas, HDR led the development of the 2014 Dallas Long Range Water Supply Plan to 2070 and beyond[3]. The initial activities of the project included asking several key questions that served as the foundation of the efforts that followed. Some of the questions were:

- How much water supply risk is acceptable?
- How can climate variability risk be quantified?
- How do we identify and include every possible water management strategy that could be used to serve Dallas in the future?
- How can we evaluate the potential strategies beyond just the traditional cost and supply metrics?

Developing a plan to address these questions throughout the planning process was a key factor in delivering a successful plan.

Successful planning begins with an understanding that the One Water concept fundamentally supports the direction of the analysis and ultimately drives the development of a sustainable water supply plan.

Starting with the end in mind also includes a conversation on how deep into the details the planning effort will go. Many entities choose to keep their water supply planning efforts "outside the fence," meaning that the focus is on the big picture of demands, supplies, the resulting needs, and strategies to meet those needs. This method leaves the details of the treatment and distribution system to other more focused master plans specific to these critical components. For the Dallas plan, there was a look "inside the fence" at the City's three water treatment plants as related to treating the future supplies destined for these facilities. Dallas also chose to look at the "micro-demands" of its system, breaking up the system demand numbers by the major pressure planes in the system, which can be served by one or maybe two of the water treatment plants. This effort resulted in identifying which of Dallas' water treatment plants would be receiving the newly identified water supplies.

Providing an adequate, clean water supply for your customers during wet times or times of critical drought drives your infrastructure development, and knowing when and what to build to stay ahead of growth and changing climate conditions critically affects your success. Water supply planning provides critical information that drives your system's growth. Choosing to be proactive instead of reactive can result in millions of dollars in savings, whether you serve 20,000 customers or 3 million. We have learned the lesson that having a good plan for your water supply planning effort provides the best foundation for a successful project.

Lesson 2: Know Your Audience

A key question to ask at the beginning of the planning process is, who is going to read, implement, and rely on this report? The answer may drive the process more than you would expect. The obvious answers are water utility staff and leadership, city engineers, and other city departments. What about local political leadership? Have you considered what a third-party environmental group might say after reviewing your plan? What about your customers? Can Jane Q. Ratepayer understand the information you are presenting in your report? Once your identified projects move on to permitting and implementation, will there be review by state and federal regulatory agencies? Your plan can be shaped in many ways by the answers to these questions and by identifying which groups you are messaging.

Water supply planning is not rocket science, unless they find water on Mars and it becomes economically feasible to bring it back to Earth. But it does have its own technical language that many of us in the industry take for granted. How much water is in an acre-foot? What do you mean by gallons per capita day? One million gallons per day sounds like a lot of water, and the list goes on. One thing to keep in mind is that communicating to your audience does not just happen at the end of the process in the final report. Many times, it occurs along the way through stakeholder meetings, staff workshops, City Council presentations, and community outreach. One important aspect when moving to project permitting and implementation is to consider regulatory agencies as part of your audience. It's unlikely that your plan will be detailed enough to satisfy certain aspects of the permitting requirements process (National Environmental Policy Act as part of a United States Army Corps of Engineers 404 permit, for example). If the goal of your plan is to establish a foundation for moving a project into permitting, be sure and involve NEPA practitioners early in the process to provide for the best responses to regulators' questions.

We routinely incorporate strategic communications specialists into our planning efforts to reach diverse audiences and effectively communicate the efforts, process, and results of the planning. Engineers are technical. Our audiences may or may not be technical. Our strategic communications staff takes what the engineers develop and turns it into something that laypeople can understand. Communication is a two-way street, and many times getting feedback from key stakeholder groups is

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an important part of the process. For the Dallas Long Range Water Supply project, we held staff workshops, stakeholder meetings with wholesale and retail customers, and one-on-one meetings with environmental interest groups to receive all of their feedback for incorporation into the planning process. Reports, oral presentations, websites, infographics, and video are all at your disposal to help you communicate with your constituents. We have learned that focused, two-way, open communication is a key element to a successful water planning project.

Lesson 3: Non-Solutions Can Be Just as Key as Solutions

Typically, a water supply plan includes three key elements: demands, supplies, and strategies to meet future needs. Demands take into account things like population growth, per capita use, industry, economic development, and generally anything that drives a community's need for water. Quantifying supplies usually involves computer simulation to determine reliable yield from surface water or groundwater sources, evaluate existing contracts, and consider how these may change under variable, future climate scenarios. The third component involves real technical creativity by looking at many different solutions to solve an entity's future water supply demands. Will you consider conservation? What about reuse? Direct and indirect, potable and non-potable? Surface water, groundwater or perhaps aquifer storage and recovery? There are many combinations when you consider the possibilities, such as an aquifer storage and recovery project that relies on scalped stormwater flows mixed with a reuse component and stored in an off-channel reservoir before being injected into an available aquifer formation. This is where the One Water concept is crucial to successful water supply planning.

We evaluated over 300 water management strategies for the Dallas Long Range Plan, covering many different categories of supply development. For the City of Kerrville Long Range Water Supply Plan (population < 25,000), the number was much smaller (less than 20) but specifically focused to address lingering questions about the future of the town's water supply. Many of the strategies that we evaluated in the Kerrville plan were ideas that had been around the community for years, sometimes with staunch support and advocacy to City and County officials. The City asked us to evaluate these options to determine if they were viable or not. In the case of many of these, they were not viable, either too expensive, impractical, or deficient in the amount of reliable supply developed. This allowed the City to present the findings and lack of viability for these strategies, allowing them to focus on the more likely path forward without having to always address the what-ifs from the community.

When it comes to water supply planning, knowing what the answer is not can be just as beneficial as knowing what the answer is. Being able to evaluate and mark off strategies allows entities to focus on the truly viable supply options. It helps to bring the community on board, and provides a clear path for permitting where alternatives must be evaluated. We helped do this for the City of Dallas, taking those initial 300 strategies down to a potential 40 and ultimately recommending seven for implementation with seven additional alternatives to take Dallas through the next 50 years and beyond, meeting the water supply needs of its customers. We have learned the lesson that detailed analysis of many options actually allows for a more focused result and clearer path forward in water supply planning.

Learning Lessons the Easier Way

We have been helping clients identify and develop their next water supplies in Texas for the last 40-plus years. During this time, the structure around water supply planning has changed, even though the key elements of demand, supply, and strategies to meet needs have not. The evolution of water supply planning has really been in the economic feasibility and technical acceptance of new and emerging technologies.

Learning the lessons over the last 40 years has helped us provide better solutions to our clients while better preparing entities to face increase demands and droughts more severe than previously experienced.

Emphasizing the importance of understanding the One Water concept, with how traditional sources—stormwater or reuse—are all on the table for crafting creative solutions for tomorrow's water supply problems.

There is no one-size-fits-all water supply plan. Each plan should be tailored to your specific system. It should be developed with open communication in mind with key stakeholder groups. Your plan should be broad enough to rule out the outliers, whatever they may be, allowing you to focus on your most successful strategies moving forward. We share these lessons learned with you to provide some additional insight as you embark on your own water supply planning journey. City of Dallas' water supply journey continues by implementing the recommendations from the 2014 LRWSP, while continuing to evaluate the metrics established to confirm that the reality of supply and demand over the last 5 years is tracking with the forecasts in the plan.

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1: https://demographics.texas.gov/Data/TPEPP/Projections/

2: https://journals.tdl.org/twj/index.php/twj/article/view/6463

3: https://dallascityhall.com/departments/waterutilities/DCH%20Documents/2014_LRWSP_Final_Report_all_11302015.pdf