Phased Approach for New Water Supply

December 2015
History of Discussions

- Previous water resources plan – known as the Integrated Local Water Supply Plan – completed in 1993
- Team of consultants, economists, and staff involved in the current process
- Public input generated last year

- **September 2012**: Began water resources planning analysis
- **October 2013**: Adopted Drought Response Plan
- **December 2013**: Finished discussions with Chamber Committee on Water Resources
- **April 2014**: Initial water supply options presented to Council
- **May – July 2014**: Consideration of water supply options as part of Council Strategic Planning efforts
- **August – November 2014**: Community consideration of full ASR enhancement project
Current Water Supplies

- Two main sources supply Wichita with water
- Equus Beds includes senior water rights that date back to 1940 and water produced through ASR
- Mix is changed based on supply conditions and is currently more than 80% from Cheney Lake
Current Water Supplies

- Demand increased gradually through the 1980s
- Growth rate in total demand has slowed over the past 30 years
- City is using less Equus Beds water now than at anytime since the wells were first tapped 75 years ago
Drought Tolerance

- A 2% drought is a six year drought similar in severity to the 1950s
- A 1% drought lasts eight years and is similar to the Dust Bowl from the 1930s
- City decided on a 1% drought tolerance last year to provide greater water supply resiliency
### Planning Horizon

- Necessary water resources are dependent on the length of time in the planning process

- Goal of Water Resources Plan is to provide sufficient water through 2060

- Syncs with timelines in State’s water planning efforts
Achievable Conservation

- Water conservation is important approach in long-term strategy
- Targeting 0.35% annual water conservation to reduce the need for new water supplies
- Previous efforts have reduced base demand over past five years
New Water Supply

- Numerous engineers and data sources have been included in the planning process
- Independent firms were consulted to test modeling and assumptions
- City’s water resources approach validated by third-party experts
Step #1
Exist. Supply

- First step in the process was to determine future water demands
- Next step was to identify how much water would be available from current sources
- Quantified the gap in the projected demand compared to available supply
Step #2
Conservation

- Conservation can be the lowest cost strategy for closing the water supply deficit
- Must avoid cutting water usage so severely that growth in customer base cannot keep up
- Concept and model verified by independent water economists
Step #3  
New Supply

- Adding new water sources is the final step in closing the water supply deficit.
- Amount of new supply needed is roughly equal to how much savings is achieved through conservation.
- Goal is to avoid harsh restrictions in Drought Response Plan.
Current Projections

- Average annual demand is expected to grow to nearly 84 million gallons per day (MGD)
- Current sources can support about 63 MGD during a 1% drought
- Conservation strategies and new supply can jointly meet future needs

<table>
<thead>
<tr>
<th>Drought Tolerance</th>
<th>1% Drought</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timeframe</td>
<td>2015 – 2060</td>
</tr>
<tr>
<td>Achievable Rate of Annual Conservation</td>
<td>0.35%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Projected Demand by 2060</th>
<th>83.8 MGD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Available from Cheney and Equus Beds</td>
<td>63.4 MGD</td>
</tr>
<tr>
<td>Demand Deficit</td>
<td>20.5 MGD</td>
</tr>
</tbody>
</table>

Demand Deficit Met through Conservation 10.9 MGD

Amount Needed for New Water Supply 9.5 MGD
Drought Response

- Without new supplies, the Drought Response Plan can ensure resiliency in a 1% drought
- Plan approved in October 2013 after most recent drought concluded
- Goal of Water Resources Plan is to avoid the harsh restrictions in Stages #3 and #4

<table>
<thead>
<tr>
<th>Stage</th>
<th>Trigger</th>
<th>Restriction</th>
<th>Exemption</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>70% - 90%</td>
<td>None – voluntary conservation</td>
<td>NA</td>
</tr>
<tr>
<td>2</td>
<td>50% - 70%</td>
<td>Outdoor watering allowed only one day per week</td>
<td>Food producing gardens and businesses reliant on irrigation</td>
</tr>
<tr>
<td>3</td>
<td>35% - 50%</td>
<td>All outdoor watering banned</td>
<td>Food producing gardens and businesses reliant on irrigation</td>
</tr>
<tr>
<td>4</td>
<td>Below 35%</td>
<td>All outdoor watering banned. Base demand reductions of 15%</td>
<td>No exemptions for irrigation. Hospitals exempt from base demand reductions</td>
</tr>
</tbody>
</table>

*Trigger is the 12-month average lake level at Cheney*
ASR Shakeout Period

- Similar treatment plants have a period after acceptance testing known as a shakeout period.
- Represents an intermittent number of days of operation since the plant was completed.
- ASR finished its shakeout period in less time than the industry average.

![ASR vs. Industry Standards on Shakeout Days](chart)

- **ASR Plant**: 30, 23, 22
- **Average Low End**: 90
- **Average High End**: 270

Legend:
- 2013
- 2014
- 2015
### ASR Production

- Production at ASR can be limited by the amount or the quality of water in the river.
- High quantities of atrazine and bromide can prevent ASR from running.
- Anticipated annual yield discussed in 2014 is not being revised.

#### 2015 ASR Operational Results

<table>
<thead>
<tr>
<th></th>
<th>Prior to Shakeout</th>
<th>After Shakeout</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Duration</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potential Hours to Run</td>
<td>668 Hours</td>
<td>585 Hours</td>
</tr>
<tr>
<td>Hours Operated</td>
<td>400 Hours</td>
<td>533 Hours</td>
</tr>
<tr>
<td>Operations Ratio</td>
<td>60%</td>
<td>91%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Prior to Shakeout</th>
<th>After Shakeout</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Quantity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amount of Available Water</td>
<td>724 MG</td>
<td>633 MG</td>
</tr>
<tr>
<td>Amount of Water Processed</td>
<td>250 MG</td>
<td>573 MG</td>
</tr>
<tr>
<td>Perc. Of Total Water Captured</td>
<td>35%</td>
<td>90%</td>
</tr>
</tbody>
</table>
ASR Production

- Major changes have improved operations this summer
- Ability to process full amount of available water has become more reliable through operational changes
- Around 90% of the available water has been processed since mid-June
ASR Rainfall Impact

- Annual rainfall totals in Wichita do not correlate to the number of days that ASR can operate.
- Duration, volume, and timing of the rains influence water availability.
- Rain must also be located in the watershed north of Wichita.

Wichita Rainfall and 30 MGD Operating Days

<table>
<thead>
<tr>
<th></th>
<th>Days of Operation</th>
<th>Inches of Rainfall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Rainfall (1967)</td>
<td>80</td>
<td>23</td>
</tr>
<tr>
<td>High Rainfall (2013)</td>
<td>67</td>
<td>40</td>
</tr>
</tbody>
</table>
Outcomes without ASR

1% Drought Starting in 2016

Days in Drought Stage

<table>
<thead>
<tr>
<th></th>
<th>#1</th>
<th>#2</th>
<th>#3</th>
<th>#4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>548</td>
<td>1,880</td>
<td>653</td>
<td>0</td>
</tr>
</tbody>
</table>

Cheney Conservation Pool and Drought Response Stages

- 12 Month Average
- Daily

Stage 1

Voluntary Conservation

Stage 2

Outdoor Watering once per week

Stage 3

Outdoor Watering Banned

Stage 4

Outdoor Watering Ban & 15% reduction on Indoor Usage
Outcomes with ASR

<table>
<thead>
<tr>
<th>Days in Drought Stage</th>
<th>#1</th>
<th>#2</th>
<th>#3</th>
<th>#4</th>
</tr>
</thead>
<tbody>
<tr>
<td>531</td>
<td>1,862</td>
<td>594</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

1% Drought Starting in 2016

Cheney Conservation Pool and Drought Response Stages

- 12 Month Average
- Daily

- Stage 1
- Stage 2
- Stage 3
- Stage 4
Outcomes without ASR

- Models show how system would react if ASR had never been built
- A drought starting in 2060 would trigger almost six years of harsh water restrictions
New Supply Options

- Full ASR improvements presented last year are still an option
- Additional analysis has been conducted on the feasibility of El Dorado Lake
- Council direction in early 2015 to develop a phased plan of water source improvements

<table>
<thead>
<tr>
<th>ASR Plan</th>
<th>El Dorado Plan</th>
<th>Phased Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Improvements Constructed at Once</td>
<td>Continuous Flow Provided to Wichita</td>
<td>Incremental Improvements Over Years</td>
</tr>
</tbody>
</table>
El Dorado Analysis

- Drought of Record at El Dorado Lake not a 1% design drought
- High Country Hydrology developed a simulated 1% drought on the lake
- Implementing its Conservation Plan, El Dorado Lake cannot supply sustained 10 MGD to Wichita with current customers

![Graph showing El Dorado Reservoir contents during a 1-percent drought](chart)

- Stage 3 goal: 25% demand reduction by banning outdoor water use
- Conservation Plan
  - Reservoir Elevation
  - Stage 1: 72%
  - Stage 2: 56%
  - Stage 3: 49%
El Dorado Analysis

- The contributing drainage area around El Dorado Lake is 35% the size of the drainage area serving Cheney Lake.

- Smaller drainage area means it takes nearly three times as much rain for El Dorado Lake to realize the same inflow rates as Cheney Lake experiences.
Phased Water Plan

- First three phases are currently underway
- Ensure maximum benefit out of existing ASR
- Changes state regulations
- Provides time to gradually introduce components
- Also relies on CIP project to upgrade treatment plant

No costs with these phases
Costs with these phases
Early Phases with No Cost

- ASR facility is being optimized for long-term benefits
- Two components of the State’s regulations are being proposed for revisions
- Regulatory changes are a no-cost way for the State to assist with the City’s water supply efforts

**Phase 1: Optimization**
- Shake out process ongoing to ensure reliability of existing system
- Spare parts being procured, along with on-call contracts
- Optimizing regular asset management and maintenance plans
- Minimizing limitations to water quantity and quality

**Phase 2: Elevation Adjustment**
- Working with State of Kansas to adjust downward the bottom elevation governing the use of recharge credits
- Will allow for use of ASR water during droughts

**Phase 3: Operational Credits**
- Pursuing a regulatory change with the State Engineer.
- Would provide future use credits for water processed through ASR and sent directly to town.
- Could eliminate need for $47 million in new recharge wells
Phased Supply Plan

- Nine diversion wells would be built for $11.7 million
- Ten existing recharge wells would be rehabilitated for $11.3 million to provide additional injection reliability
- An additional 14 recharge wells would be constructed if operational credits are not granted
Summary of Phases

- First phases currently underway and focus on no-cost strategies
- Additional components aimed at minimizing chances of harsh water restrictions
- Phased plan constructs improvements when needed and avoids rate volatility

<table>
<thead>
<tr>
<th>Phase</th>
<th>Title</th>
<th>Date</th>
<th>Capital Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Optimization</td>
<td>2016</td>
<td>-----</td>
</tr>
<tr>
<td>2</td>
<td>Elevation Adjustment</td>
<td>2016</td>
<td>-----</td>
</tr>
<tr>
<td>3</td>
<td>Operational Credits</td>
<td>2018</td>
<td>-----</td>
</tr>
<tr>
<td>4</td>
<td>Diversion Wells</td>
<td>2020</td>
<td>$11.7 million</td>
</tr>
<tr>
<td>5</td>
<td>Rehabilitate Existing Recharge Wells</td>
<td>2020</td>
<td>$11.3 million</td>
</tr>
<tr>
<td>6</td>
<td>Construct New Recharge Wells</td>
<td>2022</td>
<td>$47.2 million</td>
</tr>
</tbody>
</table>
Cost Comparison

- Both the Full ASR and El Dorado plans assume that revenue bonds would be issued to substitute for the 2014 proposed sales tax.
- Phased plan is much lower cost through 2060 than the Full ASR plan.
- El Dorado Lake cannot provide the same amount of water as other options.
Impact to Rates

- Current goal is to level annual rate increases to 3% annually in 2018 and beyond.
- Higher increases would be needed through 2024 to build up financial capacity to issue revenue bonds.
- Current projections show estimated water rate increases at or below 4.5%.
## Impact to Customers

- Financial model assumes across-the-board water rate increases
- Once the final water supply component is built in 2022, customers would be paying 9% more than if a new water supply was not built
- The percentage difference is for water only, not sewer

### Monthly Water Bills

<table>
<thead>
<tr>
<th>Year of Final Water Supply Rate Increase</th>
<th>2024</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline in 2024</td>
</tr>
<tr>
<td>-----------------------------------------</td>
<td>------------------</td>
</tr>
<tr>
<td><strong>Residential Customers</strong></td>
<td></td>
</tr>
<tr>
<td>3,750 Gallons</td>
<td>$25.79</td>
</tr>
<tr>
<td>7,500 Gallons</td>
<td>$35.46</td>
</tr>
<tr>
<td>15,000 Gallons</td>
<td>$98.23</td>
</tr>
<tr>
<td><strong>Commercial Customers</strong></td>
<td></td>
</tr>
<tr>
<td>100,000 Gallons</td>
<td>$281.84</td>
</tr>
<tr>
<td><strong>Industrial Customers</strong></td>
<td></td>
</tr>
<tr>
<td>10 Million Gallons</td>
<td>$25,905</td>
</tr>
</tbody>
</table>
Impact to Customers

- Projection shows how Wichita will compare to 50 largest cities in 2024, when final new supply increase would go into effect
- Based on average water bills in the 2013 Black & Veatch survey of the 50 largest cities
- National average rate increase from 2001-2013 was 5.6% annually
Future Water Plans

- Current phased plan is aimed at addressing drought supply needs
- Additional considerations will inform a long-term water master plan
- Future improvements could be targeted to make the existing system more reliable and provide redundant infrastructure

Possible Future Improvements:
- New Northwest Treatment Plant
- Parallel Pipeline to Equus Beds
- Parallel Pipeline to Cheney Lake
- Rehabilitate Existing Pipelines and Treatment Plant
- Pump Station to Store Cheney Water in Equus Beds
Questions