Introduction
Water Master Plan Scope

1. Water Demand and WTP Capacity Forecasting

2. WTP Condition Assessment

3. Water Transmission/Distribution System Assessment
Water Demand and WTP Capacity Forecasts
# 439 WSC

## TWDB Region G Population Projections

<table>
<thead>
<tr>
<th>Customer Name</th>
<th>2020</th>
<th>2030</th>
<th>2040</th>
<th>2050</th>
<th>2060</th>
<th>2070</th>
</tr>
</thead>
<tbody>
<tr>
<td>439 WSC</td>
<td>10,220</td>
<td>12,327</td>
<td>14,490</td>
<td>16,700</td>
<td>18,961</td>
<td>21,285</td>
</tr>
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</table>

## TWDB Region G Water Demand Projections (Ac-Ft/Year)

<table>
<thead>
<tr>
<th>Customer Name</th>
<th>2020</th>
<th>2030</th>
<th>2040</th>
<th>2050</th>
<th>2060</th>
<th>2070</th>
</tr>
</thead>
<tbody>
<tr>
<td>439 WSC</td>
<td>1,407</td>
<td>1,658</td>
<td>1,917</td>
<td>2,191</td>
<td>2,483</td>
<td>2,785</td>
</tr>
</tbody>
</table>

![Graph showing population projections](image1.png)

- **Average Daily Demand, AF/Year:**
  - Projected Annual Average Demand
  - Water Supply
  - Existing Water Use

![Graph showing water demand projections](image2.png)

- **Projected Max Day Demand:**
  - Projected Max Day Demand
  - WTP Capacity Interest
  - Existing Water Use
  - 85% Capacity

- **Max Day Water Demand Projections (MGD):**
<table>
<thead>
<tr>
<th>Customer Name</th>
<th>2020</th>
<th>2030</th>
<th>2040</th>
<th>2050</th>
<th>2060</th>
<th>2070</th>
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</thead>
<tbody>
<tr>
<td>439 WSC</td>
<td>2.68</td>
<td>3.15</td>
<td>3.65</td>
<td>4.17</td>
<td>4.73</td>
<td>5.30</td>
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</table>
Bell County WCID3 (Nolanville)

TWDB Region G Population Projections

<table>
<thead>
<tr>
<th>Customer Name</th>
<th>2020</th>
<th>2030</th>
<th>2040</th>
<th>2050</th>
<th>2060</th>
<th>2070</th>
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</thead>
<tbody>
<tr>
<td>Bell County WCID 3</td>
<td>6,100</td>
<td>9,460</td>
<td>11,636</td>
<td>14,996</td>
<td>18,356</td>
<td>19,140</td>
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</table>

TWDB Region G Water Demand Projections (Ac-FT/Year)

<table>
<thead>
<tr>
<th>Customer Name</th>
<th>2020</th>
<th>2030</th>
<th>2040</th>
<th>2050</th>
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<th>2070</th>
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<tbody>
<tr>
<td>Bell County WCID 3</td>
<td>872</td>
<td>1,352</td>
<td>1,663</td>
<td>2,144</td>
<td>2,624</td>
<td>2,736</td>
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Max Day Water Demand Projections (MGD)

<table>
<thead>
<tr>
<th>Customer Name</th>
<th>2020</th>
<th>2030</th>
<th>2040</th>
<th>2050</th>
<th>2060</th>
<th>2070</th>
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</thead>
<tbody>
<tr>
<td>Bell County WCID 3</td>
<td>1.54</td>
<td>2.38</td>
<td>2.93</td>
<td>3.78</td>
<td>4.62</td>
<td>4.82</td>
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</table>

Bell Co WCID No. 3

- Projected Annual Average Demand
- Water Supply
- Existing Water Use

Max Day Demand, MGD

- Projected Max Day Demand
- WTP Capacity (2.25 mgd)
- Existing Water Use (85% Capacity)
**City of Belton**

### TWDB Region G Population Projections

<table>
<thead>
<tr>
<th>Customer Name</th>
<th>2020</th>
<th>2030</th>
<th>2040</th>
<th>2050</th>
<th>2060</th>
<th>2070</th>
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</thead>
<tbody>
<tr>
<td>City of Belton</td>
<td>22,850</td>
<td>28,600</td>
<td>36,000</td>
<td>45,100</td>
<td>56,600</td>
<td>71,000</td>
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### TWDB Region G Water Demand Projections (Ac-Ft/Year)

<table>
<thead>
<tr>
<th>Customer Name</th>
<th>2020</th>
<th>2030</th>
<th>2040</th>
<th>2050</th>
<th>2060</th>
<th>2070</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Belton</td>
<td>3,584</td>
<td>4,485</td>
<td>5,646</td>
<td>7,073</td>
<td>8,877</td>
<td>11,135</td>
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</table>

### Max Day Water Demand Projections (MGD)

<table>
<thead>
<tr>
<th>Customer Name</th>
<th>2020</th>
<th>2030</th>
<th>2040</th>
<th>2050</th>
<th>2060</th>
<th>2070</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Belton</td>
<td>6.07</td>
<td>7.60</td>
<td>9.57</td>
<td>11.99</td>
<td>15.04</td>
<td>18.87</td>
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</table>
City of Copperas Cove

City of Copperas Cove Population Projections

<table>
<thead>
<tr>
<th>Customer Name</th>
<th>2020</th>
<th>2030</th>
<th>2040</th>
<th>2050</th>
<th>2060</th>
<th>2070</th>
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</thead>
<tbody>
<tr>
<td>City of Copperas Cove</td>
<td>35,307</td>
<td>49,804</td>
<td>70,253</td>
<td>99,099</td>
<td>139,790</td>
<td>197,187</td>
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City of Copperas Cove Water Demand Projections (Ac-Ft/Year)

<table>
<thead>
<tr>
<th>Customer Name</th>
<th>2020</th>
<th>2030</th>
<th>2040</th>
<th>2050</th>
<th>2060</th>
<th>2070</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Copperas Cove</td>
<td>4,192</td>
<td>5,691</td>
<td>7,870</td>
<td>10,879</td>
<td>15,346</td>
<td>21,648</td>
</tr>
</tbody>
</table>

Copperas Cove

- Average Day Demand, Af/Year
  - Year 2010: 5000
  - Year 2020: 10000
  - Year 2030: 15000
  - Year 2040: 20000
  - Year 2050: 25000
  - Year 2060: 30000
  - Year 2070: 35000

- Projected Annual Water Demand
- Water Supply
- Existing Water Use

Max Day Water Demand Projections (MGD)

<table>
<thead>
<tr>
<th>Customer Name</th>
<th>2020</th>
<th>2030</th>
<th>2040</th>
<th>2050</th>
<th>2060</th>
<th>2070</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Copperas Cove</td>
<td>5.96</td>
<td>8.09</td>
<td>11.19</td>
<td>15.47</td>
<td>21.83</td>
<td>30.79</td>
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</table>
# City of Harker Heights

## TWDB Region G Population Projections

<table>
<thead>
<tr>
<th>Customer Name</th>
<th>2020</th>
<th>2030</th>
<th>2040</th>
<th>2050</th>
<th>2060</th>
<th>2070</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Harker Heights</td>
<td>31,372</td>
<td>36,879</td>
<td>42,566</td>
<td>48,218</td>
<td>50,000</td>
<td>50,000</td>
</tr>
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</table>

## TWDB Region G Water Demand Projections (Ac-FT/Year)

<table>
<thead>
<tr>
<th>Customer Name</th>
<th>2020</th>
<th>2030</th>
<th>2040</th>
<th>2050</th>
<th>2060</th>
<th>2070</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Harker Heights</td>
<td>6,099</td>
<td>7,043</td>
<td>8,042</td>
<td>9,060</td>
<td>9,381</td>
<td>9,377</td>
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</table>
# City of Killeen

## TWDB Region G Population Projections

<table>
<thead>
<tr>
<th>Customer Name</th>
<th>2020</th>
<th>2030</th>
<th>2040</th>
<th>2050</th>
<th>2060</th>
<th>2070</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Killeen</td>
<td>144,243</td>
<td>169,560</td>
<td>195,711</td>
<td>221,697</td>
<td>247,195</td>
<td>272,291</td>
</tr>
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</table>

## TWDB Region G Water Demand Projections (Ac-Ft/Year)

<table>
<thead>
<tr>
<th>Customer Name</th>
<th>2020</th>
<th>2030</th>
<th>2040</th>
<th>2050</th>
<th>2060</th>
<th>2070</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Killeen</td>
<td>19,713</td>
<td>23,702</td>
<td>27,164</td>
<td>30,299</td>
<td>33,783</td>
<td>37,213</td>
</tr>
</tbody>
</table>

## Killeen

- Average Day Demand, AF/Year
  - 2010: 15,000
  - 2020: 20,000
  - 2030: 25,000
  - 2040: 30,000
  - 2050: 35,000
  - 2060: 40,000
  - 2070: 45,000

  **39,964 Ac-Ft/Yr**

## Max Day Water Demand Projections (MGD)

<table>
<thead>
<tr>
<th>Customer Name</th>
<th>2020</th>
<th>2030</th>
<th>2040</th>
<th>2050</th>
<th>2060</th>
<th>2070</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Killeen</td>
<td>29.04</td>
<td>34.92</td>
<td>40.02</td>
<td>44.64</td>
<td>49.77</td>
<td>54.82</td>
</tr>
</tbody>
</table>

- **42.0 mgd**

## Killeen

- Projected Max Demand
  - 2020: 30.00
  - 2025: 35.00
  - 2030: 40.00
  - 2035: 45.00
  - 2040: 50.00
  - 2045: 55.00
  - 2050: 60.00
  - 2055: 65.00
  - 2060: 70.00
  - 2065: 75.00
  - 2070: 80.00

  **85% Capacity**
Fort Hood

**TWDB Region G Population Projections**

<table>
<thead>
<tr>
<th>Customer Name</th>
<th>2020</th>
<th>2030</th>
<th>2040</th>
<th>2050</th>
<th>2060</th>
<th>2070</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fort Hood</td>
<td>16,936</td>
<td>17,196</td>
<td>17,282</td>
<td>17,282</td>
<td>17,282</td>
<td>17,282</td>
</tr>
</tbody>
</table>

**TWDB Region G Water Demand Projections (Ac-FT/Year)**

<table>
<thead>
<tr>
<th>Customer Name</th>
<th>2020</th>
<th>2030</th>
<th>2040</th>
<th>2050</th>
<th>2060</th>
<th>2070</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fort Hood</td>
<td>3,874</td>
<td>3,850</td>
<td>3,815</td>
<td>3,809</td>
<td>3,804</td>
<td>3,804</td>
</tr>
</tbody>
</table>
Summary: Water Supply
Summary: Water Treatment

WTP Capacity Needs

- 17 MGD Stillhouse WTP Expansion
- 25 MGD Belton WTP Expansion

Year
- Bell County WCID3
- Killeen
- Belton
- Copperas Cove
- 439 WSC

WTP Capacity Needs (MGD)
WTP Assessment
Lake Belton WTP
Lake Belton WTP
Lake Belton WTP

- PLANT NO. 1
- PLANT NO. 2
- PLANT NO. 3
- PLANT NO. 4
Lake Belton WTP

- PLANT NO. 1
- PLANT NO. 2
- PLANT NO. 3
- PLANT NO. 4
- COMMON FACILITIES (TO TWO OR MORE PLANTS)
Results of Plant Assessment

HIGH CRITICALITY UPGRADES

1. Upgrade existing Plant 3 solids contact clarifiers with new equipment
2. Upgrade Plant 1 and 2 air scour blowers with automated flow control
3. Conduct corrosion evaluation of filter pipe gallery piping and make modifications
4. Implement chlorine leak detection and alarm systems where needed
Results of Plant Assessment

MEDIUM CRITICALITY UPGRADES

6. Replace Plant 1 redwood baffles in flocculation basins
7. Implement filter pipe gallery pipe coating plan for all 4 plants
8. Modify raw water pump header to increase pumping capacity
9. Replace bulk chemical storage tanks in poor condition
10. Replace sludge transfer pumps
11. Construct new 4.0 MG clearwell
1. Demolish existing Plant 3 reactor clarifiers
2. Construct new Administration Building, roadway, and parking
3. Demolish existing Maintenance Building
4. Demolish existing Administration Building
5. Demolish Lagoon No. 4
6. Construct new Plant 3 conventional rapid mix/flocculation/sedimentation basins (25 mgd total)
Expansion from 90 mgd to 115 mgd

1. Demolish Lagoon No. 5
2. Construct new Plant 3 conventional rapid mix/flocculation/sedimentation basins (50 mgd total)
3. Construct New 4.0 MG clearwell
4. Increase Plant 3 chemical storage and facilities
5. Increase finished water pump capacity
Transmission/Distribution System Assessment
System Overview

- North Transmission System
- South Transmission System
- Customer delivery points
Transmission System Analysis

Parameters
- Evaluated transmission system under existing and future contract demands
- Included Stillhouse WTP and new Belton Pump Station
- Evaluated transmission system with one leg out of service

Findings
- Existing system provides acceptable service under current contract demands
- Transmission system improvements are required to accommodate 115-mgd future flow
- System cannot deliver contract demands with north leg out of service
Transmission System Analysis

Alternatives

Options to provide contract demands with north leg out of service:

1. Parallel north leg
2. Improve south leg
   - Replace 24-in from Belton WTP to Nolanville Wye
   - Replace 18-in from Nolanville Wye to Station 3
   - Add storage and pumping at Nolanville Wye and Station 3

Either alternative creates resilience by replacing or paralleling aging pipes.
Resilience and Reliability

Figure 1. Service Life Curves - Water Mains – by Age

Source: City of Raleigh - Public Utilities Department 2018

Source: 2018 Utah State Univ Water Main Pipe Break Study
Summary and
Recommendations
Cost Summary:  
Raw Water Supply & Treatment Projects

<table>
<thead>
<tr>
<th>Project Number</th>
<th>Description</th>
<th>Completion Year</th>
<th>Project Cost Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>WTP-CIP1</td>
<td>Existing Plant Upgrades – High Criticality</td>
<td>2023</td>
<td>$2.18M</td>
</tr>
<tr>
<td>WTP-CIP2</td>
<td>Existing Plant Upgrades – Medium Criticality</td>
<td>2025</td>
<td>$1.2M</td>
</tr>
<tr>
<td>WTP-CIP4</td>
<td>Plant Expansion – Phase 1 (Replace Plant 3 Clarifiers with new Flocc/Sed Basins)</td>
<td>2026</td>
<td>$28.5M</td>
</tr>
<tr>
<td>WTP-CIP5</td>
<td>Plant Expansion – Phase 2 (Expand Plant 3 by 25 MGD with new Flocc/Sed Basins)</td>
<td>2035</td>
<td>$88.7M</td>
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</tbody>
</table>
## Cost Summary:
### Pumping & Transmission Main Projects

<table>
<thead>
<tr>
<th>Project Number</th>
<th>Description</th>
<th>Project Cost Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIST-CIP1</td>
<td>Upsize 24” from Belton WTP to Nolanville Wye to 36”</td>
<td>$16.6M</td>
</tr>
<tr>
<td>DIST-CIP2</td>
<td>Upsize 18” from Nolanville Wye to Killeen Station 3 to 36”</td>
<td>$17.4M</td>
</tr>
<tr>
<td>DIST-CIP3</td>
<td>Construct 5 MG GST at Nolanville Wye</td>
<td>$5.2M</td>
</tr>
</tbody>
</table>
| DIST-CIP4      | Construct 3 MG GST at Killeen Station 3  
(Note: May be able to utilize existing GSTs at Killeen Station 3 as more demand is moved to Chaparral Road delivery point) | $3.8M                 |
| DIST-CIP5      | Install new pump station at Belton WTP (pumping to south transmission main should total 57.1 MGD at 140’ TDH) | $6.75M                |
| DIST-CIP6      | Install new pump station at Nolanville Wye (53.5 MGD at 230’ TDH)           | $10.6M                |
| DIST-CIP7      | Install new pump station at Killeen Station 3 (32.5 MGD at 126’ TDH)        | $5.75M                |
Emergency Power

- Systems serving >250 connections that do not meet elevated storage requirement:
  - Must deliver a minimum of 0.35 gpm per connection to the distribution system during loss of normal power supply

- Failure to provide min. 35 psi following a natural disaster:
  - Revised emergency preparedness plan or justification regarding pressure drop to be submitted for review/approval within 180 days of date normal power is restored
  - Executive director may require additional/alternative auxiliary emergency facilities
Questions?