Project Timeline

• April 2019
  – Council identified as priority project and awarded contract to Carollo Engineers.

• May 2019
  – Staff and Carollo began working on Master Plan (first comprehensive plan).

• January 2020
  – Master Plan analysis and Draft CIP complete.
  – Tonight’s objective: Provide update on Water System Master Plan and receive input from City Council
Purpose of Master Plan

20-Yr Roadmap:
Aging Infrastructure
New Facilities
Capital and Maintenance Costs

Condition of Priority Facilities

Future System Needs
Water System Overview

- City owned and operated
- 14,800 service connections (customer population 66,000)
- Service area: Watsonville, Corralitos, Freedom, Pajaro Dunes
- 9 pressure zones
- Groundwater and surface water
- 12 MG of storage reservoirs
- >182 miles of pipelines
# Scope of Work

<table>
<thead>
<tr>
<th>Task</th>
<th>Facilities</th>
<th>Benefit to City</th>
</tr>
</thead>
</table>
| Condition Assessment                | • 4 Steel Tanks  
• 2 Earthen Reservoirs  
• 2 Pump Stations  
• 11 Wells                                                              | Anticipate remaining useful life of assets                |
| Hazard Vulnerability Evaluation     | • 4 Steel Tanks (Seismic)  
• 2 Pump Stations (Seismic)  
• Various Wells and Pump Stations (Flood)                               | Mitigate seismic and flood hazard vulnerability          |
| Hydraulic Model Analysis            | • All Wells, Pump Stations and Storage  
• Distribution System                                                    | Plan for future infrastructure needs with development    |
| Prepare Recommendations, Costs & 10-Yr CIP | Those recommended for facility improvements                              | Forecast projects and costs by priority (criticality and timing) |
Condition Assessment and Hazard Vulnerability

- Structural Assessment
- Power Distribution System
- Mechanical Assessment
- SCADA and PLC Network System
- Seismic Vulnerability
- Flood Risk
# Original Useful Life

<table>
<thead>
<tr>
<th>Asset Category</th>
<th>Description (1)</th>
<th>Original Useful Life (Yrs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structural</td>
<td>Concrete Steel</td>
<td>50+ Depends on Rebar</td>
</tr>
<tr>
<td></td>
<td>Steel</td>
<td>25+ Depends on Coating</td>
</tr>
<tr>
<td>Mechanical</td>
<td>Pumps – Water Valves</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>Electrical</td>
<td>Motor Control Centers Variable Frequency Drives</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15</td>
</tr>
</tbody>
</table>

Notes:

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**Age of Tanks:**
- Airport (Steel): 35 Yrs
- Hames (Steel): 50 Yrs
- Rider (Steel): 47 Yrs
- Amesti (Steel): 48 Yrs
- Freedom (Earthen): 89 Yrs
- Pajaro Dunes (Earthen): 54 Yrs

**Age of Pump Station Buildings:**
- Airport PS: 35 Years
- Fowle PS: 49 Years

**Age of Wells:**
- Drilled 12 to 92 Years Ago (Avg 45)
- Pumps 6 to 30 Years Old (Avg 16)
## Condition Rankings

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
<th>Renewal Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Very Good</td>
<td>(0% renewal required)</td>
</tr>
<tr>
<td>2</td>
<td>Good</td>
<td>(5% renewal required)</td>
</tr>
<tr>
<td>3</td>
<td>Fair</td>
<td>(10-20% renewal required)</td>
</tr>
<tr>
<td>4</td>
<td>Poor</td>
<td>(20-30% renewal required)</td>
</tr>
<tr>
<td>5</td>
<td>Very Poor</td>
<td>(&gt;50% renewal required)</td>
</tr>
</tbody>
</table>

Adapted from the International Infrastructure Management Manual (IIMM)
Condition and Asset Decay Curve

LIFE REMAINING (%) vs. CONDITION

1 2 3 4 5
Structural Assessment Considerations

- Replace Anchor Bolts at Pipe Supports
- Repair Cracks or Spalling
- Recoat Corroded Metal Surfaces
Seismic Evaluation Considerations

Anchorage of Roof Beams to Walls

Tank Footing Settlement

Electrical Panel Seismic Anchors
Mechanical Assessment Considerations

Vibration or Overheating

Operational Performance

Maintenance History

Test Results

<table>
<thead>
<tr>
<th>Test Date: 21/02/2018</th>
<th>Tester: Bob Fisher</th>
</tr>
</thead>
<tbody>
<tr>
<td>Run Number (n) used for cost analysis:</td>
<td>6-1</td>
</tr>
<tr>
<td>1. Pumping Water Level (ft):</td>
<td>173</td>
</tr>
<tr>
<td>2. Standing Water Level (ft):</td>
<td>135</td>
</tr>
<tr>
<td>3. Drop Down (ft):</td>
<td>38</td>
</tr>
<tr>
<td>4. Recovered Water Level (ft):</td>
<td>155</td>
</tr>
<tr>
<td>5. Discharge Pressure at Gauge (psi):</td>
<td>16</td>
</tr>
<tr>
<td>6. Total Lift (ft):</td>
<td>219</td>
</tr>
<tr>
<td>7. Flow Velocity (ft/sec):</td>
<td>5.5</td>
</tr>
<tr>
<td>8. Measured Flow Rate (gpm):</td>
<td>1,134</td>
</tr>
<tr>
<td>9. Customer Flow Rate (gpm):</td>
<td>1,380</td>
</tr>
<tr>
<td>10. Specific Capacity (gpm/ft² drawn):</td>
<td>36.1</td>
</tr>
<tr>
<td>11. Acre Feet per 24 Hr:</td>
<td>5.3</td>
</tr>
<tr>
<td>Million Gallons per 24 Hr:</td>
<td>1,921</td>
</tr>
<tr>
<td>12. Cubic feet per Second (cfs):</td>
<td>3.0</td>
</tr>
<tr>
<td>13. Horsepower Input to Motor:</td>
<td>133</td>
</tr>
<tr>
<td>14. Percent of Rated Motor Load (%):</td>
<td>97</td>
</tr>
<tr>
<td>15. Kilowatt Input to Motor:</td>
<td>96</td>
</tr>
<tr>
<td>16. Kilowatt-hours per million gal:</td>
<td>1,232</td>
</tr>
<tr>
<td>17. Cost to Pump a million gal:</td>
<td>$308.19</td>
</tr>
<tr>
<td>18. Energy Cost (dollars/hour):</td>
<td>$54.75</td>
</tr>
<tr>
<td>19. Base Cost per KWh:</td>
<td>$0.269</td>
</tr>
<tr>
<td>20. Nameplate rpm:</td>
<td>1,785</td>
</tr>
<tr>
<td>21. rpm at Overhead:</td>
<td>0</td>
</tr>
<tr>
<td>22. Overall Pumping Efficiency (%):</td>
<td>74</td>
</tr>
</tbody>
</table>

Remarks:
All results are based on conditions during the time of the test. If these conditions vary from the normal operation of your pump, the results shown may not describe the pump’s normal performance.
Overall efficiency of this plant is considered to be fair assuming this run represents plant’s normal operating conditions.
Electrical & Instrumentation Considerations

Age and Obsolescence

Power Issues

Corrosion
Key Condition Findings
Storage

Evaluated 7 Reservoirs:
- Airport Tank 3.0 MG
- Amesti Tank 1.0 MG
- Hames Tank 0.5 MG
- Rider Tank 0.5 MG
- Freedom Reservoirs 5.3 and 0.7 MG
- Pajaro Dunes Reservoir 0.24 MG
Steel Tanks Condition Assessment

Tank Interior Corrosion (Four Steel Tanks)

Tank Exterior Corrosion (Airport Tank)

Rider Reservoir Exterior Corrosion Repaired
Steel Tanks Hazard Vulnerability

Seismic Vulnerability at Four Steel Tanks

Example of Potential Seismic Damage

Staff to evaluate mitigation opportunities by operational strategies and/or seismic retrofits.
Earthen Reservoirs

Freedom Reservoirs with Floating Covers (0.7 and 5.3 MG)

Pajaro Dunes Reservoir with Wood Cover (0.24 MG)

Approaching end of useful life, with structural and seismic deficiencies. Major upgrade or replacement recommended in 5 to 10 yrs.
Booster Pump Stations

Evaluated 2 high-priority pump stations.
Airport Booster Pump Station

Good condition for 35-year age but seismic vulnerability exists. Retrofit project recommended.

Seismic Vulnerability at Roof

Example of Roof Collapse
Fowle Booster Pump Station

Seismic Vulnerability

Fair condition for 50-year age but has seismic vulnerability and needs mechanical & electrical upgrades. Recommend further evaluation with Freedom Reservoirs improvements.
Groundwater Wells

Evaluated 11 wells throughout service area.
Groundwater Wells

- Mechanical and Electrical upgrades needed at some sites due to age and obsolescence.

  - Electrical and Instrumentation upgrades needed due to end of useful life

  - New emergency generators at Wells 14 & 18
Well Flooding Potential

• Submersible or elevated pumps = safe
• Electrical or instrumentation panels = at risk; elevate asset or floodproof building

Example of Floodproofing
Hydraulic Model Analysis
Impact of Future Demand Projections

Used Hydraulic Model from 2018-19 Project to Evaluate Future Demands’ Impact on Existing System:

- Capacity
- Pipe Age and Material
- Emergency Supply and Storage
- Infrastructure Reliability Gaps
Future Demand Projections Map

Total Average Daily Demands:
• 6.0 mgd (2020)
• 6.7 mgd (2030)
• 7.3 mgd (2040)

Major Projects in City
2030: 0.2 mgd
2040: 0.2 mgd

Downtown
2030: 0.4 mgd
2040: 0.7 mgd

Vacant City
2030: 0.1 mgd
2040: 0.3 mgd

Legend
- Downtown Area
- Vacant Parcels within City of Watsonville
- Major Projects within the City of Watsonville
- Freedom Blvd/East Lake Corridor Projects
- Vacant Parcels in Unincorporated Santa Cruz
- Major Projects in Unincorporated Santa Cruz
- City limits
- Owner Parcels
- Waterbody
- Railroads
Recommended Zones 1 & 2 Projects

- New Zone 2 Reservoir (2 MG) and Pump Station (Yr 6-10)
- Replace Airport Reservoir: 2 MG or match future need (Yr 10+)
- New Zone 2 Well: 1400-1500 gpm (Yr 1-5)
- Replace Freedom Reservoirs (4 MG), Well 1, and Fowle Pump Station (Yr 6-10)
Recommended Projects in Other Zones

- **Poppy Hill Pump Station:** Add 1000 gpm capacity (Yr 1-5)

- **Replace Pajaro Dunes Reservoir:** (Yr 6-10)
Recommended Pipeline Projects

• City In-House Annual Replacement at 1.75 miles/yr (Current)

• Add 1.2 miles of new 8- to 12-inch pipe for system reliability (Start Yr 1-5)

• Replace 7.9 miles of pipe with larger diameters: 8- to 12-inch (Start Yr 1-5)

• Increase Annual Replacement by 0.5 miles/yr (Start Yr 1-5)
CIP and Maintenance Cost Development
Capital and Maintenance Improvements

1. Key Findings
2. Planning Costs
3. Group by Needs

Prioritize

10-Yr CIP and Maintenance Projects
Basis of Planning Costs

$ 1 Direct Cost

30 cents Estimating Contingency

33 cents Contractor GC, O&P

50 cents Engineering, CM, Permits

5 cents Sales Tax

$ 2.2 CIP Cost
### 10-Yr CIP & Maintenance Planning Costs

<table>
<thead>
<tr>
<th>Improvement type</th>
<th>FY 2020-25</th>
<th>FY 2025-30</th>
<th>Total Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIP Rehab &amp; Replacement (Exist. Facilities)</td>
<td>$35.4M</td>
<td>$53.5M</td>
<td>$88.9M</td>
</tr>
<tr>
<td>CIP Capacity (New Facilities)</td>
<td>$3.6M</td>
<td>$13.6M</td>
<td>$17.2M</td>
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<tr>
<td>CIP Studies</td>
<td>$0.2M</td>
<td>$0</td>
<td>$0.2M</td>
</tr>
<tr>
<td><strong>Total 10-Yr CIP Costs</strong> ¹</td>
<td><strong>$39.2M</strong></td>
<td><strong>$67.1M</strong></td>
<td><strong>$106.3M</strong></td>
</tr>
<tr>
<td>Maintenance Rehab &amp; Replacement</td>
<td>$5.9M</td>
<td>$4.9M</td>
<td>$10.8M</td>
</tr>
<tr>
<td><strong>Total 10-Yr Maintenance Costs</strong> ²</td>
<td><strong>$5.9M</strong></td>
<td><strong>$4.9M</strong></td>
<td><strong>$10.8M</strong></td>
</tr>
</tbody>
</table>

**Notes:**
1. Approximately $54.1M of add’l CIP projects proposed for beyond FY 2030.
## 10-Yr CIP Costs - Master Plan/Existing City

<table>
<thead>
<tr>
<th>CIP Term</th>
<th>Master Plan Projects</th>
<th>Previously Identified City Projects</th>
<th>Total Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY 2020-2025</td>
<td>$ 6.4M</td>
<td>$ 32.8M</td>
<td>$ 39.2M</td>
</tr>
<tr>
<td>FY 2025-2030</td>
<td>$ 61.1M</td>
<td>$ 6.0M</td>
<td>$ 67.1M</td>
</tr>
<tr>
<td>Total 10-Yr CIP Costs</td>
<td>$ 67.5M</td>
<td>$ 38.8M</td>
<td>$ 106.3M</td>
</tr>
<tr>
<td>Item</td>
<td>Cost</td>
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<td></td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chromium 6 Treatment Plants</td>
<td>$22.5M</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Zone 1 or Zone 2 Well</td>
<td>$3.0M</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Additional 0.5 Mile/Yr Pipeline Replacement Beyond Current 1.75 Mile/Yr Replacement Rate</td>
<td>$2.1M</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Airport, Hames and Amesti Reservoir Coating</td>
<td>$1.5M</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical/Instrumentation Upgrades at Various Sites</td>
<td>$0.8M</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poppy Hill Booster Pump Station Capacity</td>
<td>$0.5M</td>
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</tbody>
</table>
## FY 2026-30 Key CIP Projects

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freedom Reservoirs Replacement</td>
<td>$21.7M</td>
</tr>
<tr>
<td>New 2.0 MG Zone 2 Reservoir</td>
<td>$10.9M</td>
</tr>
<tr>
<td>Additional 0.5 Mile/Yr Pipeline Replacement Beyond Current 1.75 Mile/Yr Replacement Rate</td>
<td>$5.2M</td>
</tr>
<tr>
<td>Well 1 Replacement</td>
<td>$5.0M</td>
</tr>
<tr>
<td>Fowle Booster Pump Station Replacement</td>
<td>$4.3M</td>
</tr>
<tr>
<td>Pajaro Dunes Reservoir Replacement</td>
<td>$3.3M</td>
</tr>
</tbody>
</table>
Water Enterprise:
10-Year CIP

CAPITAL IMPROVEMENT PLAN (CIP)

- Freedom Reservoir: $41.2 M
- Chromium VI: $32.8 M

Airports Reservoir: $14.3 M
- FY 2020: $1.1 M
- FY 2021: $11.9 M
- FY 2022: $6.9 M
- FY 2023: $3.4 M
- FY 2024: $4.3 M
- FY 2025: $21.8 M
- FY 2026: $21.9 M
- FY 2027: $5.5 M

Debt Funded
Cash Funded
In Summary

• Completed Master Plan allows Water Division to strategically plan for facility improvements over next 20 years to serve growing community and regulatory needs.

• Next steps:
  – Incorporate projects into 5-year rate study.
  – Update future water demand projections with development and land use changes every 5 to 10 years. Project priorities and design criteria may need updating.
  – Consider funding opportunities such as grants.
Questions and Discussion