Serves 7-county Twin Cities Metro Area (3,000 sq mi)
- 250 mgd on average
- 8 WWTPs
- 600 miles of interceptors
- 2+ million wastewater customers in 108 communities
Reclaimed Water Use in U.S.

Typical drivers:
• Conserve potable water, avoid new water source development
• Mitigate salt water intrusion, land subsidence, etc. due to declining groundwater levels
• Support/augment wetlands, other surface features

Geography:
• 90% of wastewater reuse occurs in: CA, AZ, TX, FL
• Reuse increasing across N. America

Wastewater Reuse in Minnesota

• City of Mankato
  – 1.5 – 2 mgd Mankato Energy Center cooling water
  – 750,000 gallons: city parks and green spaces
  – 175,000 gallons: street sweeping
  – Irrigate gravel bed tree farm on WRF site

• Golf course irrigation
  – Multiple locations
  – 0.2 mgd

• Shakopee Mdewakanton Sioux Community
  – Approx. 1 mgd wetland enhancement

• Numerous spray irrigation applications
MCES’ Wastewater Reuse Drivers & Progress

**Drivers:**
- Alleviate interceptor capacity constraints
- Conserve & supplement groundwater and surface water
- Help meet receiving water waste load allocations

**Progress:**
- LCCMR-funded *Industrial Reuse Study*, 2007
- E. Bethel Water Reclamation Facility: July 2014
- Ongoing sub-regional reuse studies
- Water reuse & conservation initiative at MCES WWTPs
- Collaborations (e.g., City of Eagan)
EAST BETHEL WATER RECLAMATION FACILITIES

Site A

Site E

Potential Future Golf Course Irrigation
E. Bethel Groundwater Component

Generalized hydrogeologic cross section of Site E vicinity, East Bethel
Effluent Design Targets Surpass Permit Requirements to Protect Groundwater Quality

- Initial Construction Capacity: 0.41 mgd
- Membrane bioreactors with UV disinfection

<table>
<thead>
<tr>
<th>Parameter</th>
<th>SDS Permit</th>
<th>Effluent Target</th>
<th>Operational Data Avg., Jan. – Dec., 2015</th>
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<tbody>
<tr>
<td>CBOD5</td>
<td>25 mg/L</td>
<td>5 mg/L</td>
<td>&lt;2 mg/L</td>
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<tr>
<td>TSS</td>
<td>30 mg/L</td>
<td>5 mg/L</td>
<td>&lt;1 mg/L</td>
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<tr>
<td>Total N</td>
<td>10 mg/L</td>
<td>5 mg/L</td>
<td>4.8 mg N/L</td>
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<tr>
<td>Total P</td>
<td>1.0 mg/L</td>
<td>0.5 mg/L</td>
<td>0.1 mg P/L</td>
</tr>
<tr>
<td>Disinfection</td>
<td>&lt;2.2 total coliform/100 mL</td>
<td>&lt; 2.2 total coliform/100 mL</td>
<td>&lt;1 total coliform/100 mL</td>
</tr>
</tbody>
</table>
Increase Wastewater Reuse within MCES WWTPs

- **Currently**
  - Incineration:
    - 6 mgd for Metro WWTP air quality scrubbers
    - 2 mgd for Seneca after cooler
  - Heat recovery: Eagle’s Point WWTP
  - Yard hydrants, tank cleaning, service water in some WWTPs
- **Under design**
  - Metro WWTP
    - Shift tank flushing/cleanup and seal water use from city water &/or service water (groundwater) to plant effluent
    - 2,000 gpm (approx. 3 mgd) reuse system with UV disinfection, cloth disk filtration, and storage tank
    - Phases 1 & 2: reuse water for pump seals, compressor cooling, & tank cleaning: $6.7 million; construction in 2017
    - Phases 3 & 4: Convert fire water supply to reuse water
- **Other WWTPs in future**
Wastewater Reuse Beyond MCES WWTPs: Sub-Regional Scenarios

• Purpose:
  • Develop potential reuse scenario to foster communication & collaboration
  • Identify next steps
  • Not an implementation plan, preliminary engineering study, direction for local communities or potential users

• Significant consultation and collaboration needed

• Current sub-regional areas: SE Metro, NE Metro, City of Eagan
SE Metro Potential Wastewater Reuse Scenario

Satellite membrane filtration/reverse osmosis WWTP to serve Pine Bend Refinery

2040 Residential & Commercial Growth Areas

Reclaimed water distribution system to residential/commercial services in growth areas

Empire WWTP Discharge Pipe

Additional treatment & storage at Empire WWTP to serve residential/commercial toilet flushing & irrigation and agricultural irrigation

Reclaimed water distribution system to centralized locations in agricultural areas

Agricultural Areas North & East of Empire WWTP
SE Metro Potential Wastewater Reuse Scenario

- Assumed reuse demand: 10 mgd ADF/21 mgd peak
- Empire WWTP flow: 10 mgd current/24 mgd avg. design
- Reuse incremental cost estimate: $5 – $10/1,000 gallons
- Cost drivers:
  - Salts & nitrate reduction
  - Distribution system
- Twin Cities water rates: $1 - $5/1,000 gallons

Note: This scenario is a first-cut at potential uses, locations, demand, & treatment requirements in order to estimate costs & begin a collaborative conversation about information needs, issues, & next steps. It is not an implementation plan, preliminary engineering study, or design document & is not intended as direction for local communities or potential users.
Potential reuse water source:
• Underdrain dewatering water
Potential reuse water use:
• Commercial irrigation – near term
• Other uses – future
Preliminary est. demand: 0.5 mgd
Final report: early summer
Overall Findings

1. WWTP effluent quality requirements drive reuse treatment costs:
   - Total dissolved solids, sodium, chloride
   - Nitrogen reduction: avoid contributing nitrate to groundwater

<table>
<thead>
<tr>
<th>Constituent</th>
<th>Metro</th>
<th>E. Bethel</th>
<th>Other WWTPs (Avg. &amp; Range)</th>
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</thead>
<tbody>
<tr>
<td>TDS, mg/L</td>
<td>797</td>
<td>654</td>
<td>1236 (688 – 2176)</td>
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</table>

<table>
<thead>
<tr>
<th>Constituent</th>
<th>Impact on Irrigation</th>
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<tbody>
<tr>
<td>TDS, mg/L</td>
<td>None</td>
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<tr>
<td></td>
<td>Slight to Moderate</td>
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<tr>
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<td>Severe</td>
</tr>
<tr>
<td>&lt; 450</td>
<td>450 – 2,000</td>
</tr>
<tr>
<td>&gt; 2,000</td>
<td></td>
</tr>
</tbody>
</table>


WWTP sampling data is average for 3 months of sampling (1) sample/week) June – August, 2015 by MCES.
Overall Findings

2. Location and type of potential users/uses drive distribution system costs:
   - Few large potential users
   - Limited number of large, contiguous future development areas
   - Where there are:
     - Distribution system costs from existing WWTPs are high
     - Costs may offset cost of new or relieving interceptors
     - Concept of satellite WRFs
   - Seasonal use (e.g., irrigation) doesn’t reduce wastewater infrastructure requirements; year-round uses more beneficial
Overall Findings

3. Comparisons among water management alternatives needed

• Potable water is inexpensive
  • Twin Cities water rates: $1 - $5/1,000 gallons
  • Estimated incremental reuse cost: $5 – $10/1,000 gallons

• Integrated, total water cost/benefit analyses using consistent methodology needed, considering:
  • Cost of new water source
  • Cost/benefit of reuse for groundwater recharge or other water sustainability benefits
Next Steps

• Collaboration
  – Reclaimed water feasibility studies
  – Total dissolved solids (including chloride) reduction
  – Comparison among water management alternatives

• MCES outreach
  – Local communities/MCES wastewater customers
  – Water utilities
  – Regulatory agencies
  – Potential users & partners