Scope of Presentation

- Review the design, permit requirements and performance of five combined sewer overflow (CSO) facilities operated by Detroit Water and Sewerage Department (DWSD)
- Discuss efforts to minimize total residual chlorine (TRC) to the receiving water bodies
CSO Facility Types

- Retention treatment basin (RTB)
  - Screening
  - Disinfection
  - Settling & Skimming
- Screening and disinfection facility (SDF)
  - Screening
  - Disinfection

Key Design Parameters - RTBs

- Conner Creek RTB
  - Peak design flow: 13,300 cfs
  - Contact Time: 5 min
  - Basin size: 30 MG

- Belle Isle RTB
  - Peak design flow: 66 cfs
  - Contact Time: 20 min
  - Basin size: 0.6 MG
Key Design Parameters - SDFs

- Baby Creek SDF
  - Peak design flow: 5,100 cfs
  - Contact Time: 13 min

- Leib SDF
  - Peak design flow: 1,550 cfs
  - Contact Time: 13 min

- St. Aubin SDF
  - Peak design flow: 250 cfs
  - Contact Time: 13.6 min

<table>
<thead>
<tr>
<th>Facility Name</th>
<th>Evaluation Period (First to Last)</th>
<th>Number of Events</th>
<th>Duration of Events, hours Avg (Min-Max)</th>
<th>Volume Discharged per Event, MG Avg (Min-Max)</th>
<th>Flow, cfs Avg (Min-Max)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baby Creek</td>
<td>02-11-2009 to 12-01-2011</td>
<td>15</td>
<td>15.2 (0.8 – 78.7)</td>
<td>110 (8.7 – 330)</td>
<td>269 (77 – 1658)</td>
</tr>
<tr>
<td>Belle Isle</td>
<td>06-06-2010 to 11-30-2011</td>
<td>8</td>
<td>13.3 (0.3 – 43.1)</td>
<td>1.4 (0.24 – 4.3)</td>
<td>3.9 (5.2 – 22)</td>
</tr>
<tr>
<td>Conner Creek</td>
<td>12-27-2008 to 12-01-2011</td>
<td>30</td>
<td>48.4 (8 – 218.8)</td>
<td>330 (2.6 – 1700)</td>
<td>253 (0 – 3366)</td>
</tr>
<tr>
<td>Leib</td>
<td>02-11-2009 to 11-29-2011</td>
<td>8</td>
<td>4.3 (0.5 – 16)</td>
<td>14 (0.58 – 65)</td>
<td>121 (114 – 559)</td>
</tr>
<tr>
<td>St. Aubin</td>
<td>02-11-2009 to 11-29-2011</td>
<td>28</td>
<td>6.2 (0 – 30.5)</td>
<td>5.9 (0.1 – 28)</td>
<td>35.3 (0 – 129)</td>
</tr>
</tbody>
</table>
NPDES Permit Limits/Operational Goals

- Limits – Fecal Coliforms
  - Summer: 400 cts/100 ml
  - Winter: 1000 cts/100 ml

- Operational Goals – TRC
  - Summer
    - Max: 3 mg/l
    - Avg: 1.5 mg/l
  - Winter
    - Max: 2 mg/l
    - Avg: 1.5 mg/l

Event flows
Performance Graph

summer Conner Creek

TRC eff, mg/l
Fecal Coli, cts/100ml

Summer = 400
TRC Avg Limit= 1.5
TRC Summer Limit = 3.0
Figure 4-4a
Summer Fecal Coliform vs. TRC Performance

Figure 4-4b
Winter Fecal Coliform vs. TRC Performance
Real time operational modes

- Fixed dose (not used)
- Flow paced dose (CT)
- Total suspended solids
TRC Minimization Operational Efforts

- Flexible dosing pump scheme
  - High and low rates
- Increased dosing rate accuracy
  - Reconcile meter, pump and inventory after each event
- NaOCl bulk storage best practices
  - Dilute to 7-8%
  - Periodic recirculating
  - Periodic concentration testing
- Pre- and post-storm briefings
- Staffing plan
- Preventative maintenance
- Basin maintenance/cleaning
- Recordkeeping
- Radar storm tracking
Conclusions

• Best Practices Work Group provides useful information/sharing on CSO issues
• TSS provides additional information to operator, but too variable for direct control
• TRC residual of 1.0 mg/l is an operational minimum
• No accurate way to predict initial chlorine demand, results in exceedance of 3.0 mg/l operational max goal
• Controlling TRC effluent concentrations at SDFs is inherently more difficult than for RTBs due to the lack of detention time

Recommendations

• TRC should continue to be goal, NOT permit limit
• Single sample maximum goal should be removed
• Target TRC should be set based on operational statistics for each CSO facility
  – e.g., 75th percentile range of 2.0 to 4.4 mg/l TRC
• Ongoing use of data warehousing for future analysis/optimization
Ongoing work

- Evaluation of TRC plumes in receiving water bodies
  - Detroit River
  - Rouge River

Acknowledgements

- Kerry Rudolf, DWSD
- Terry Moore, METCO
Questions?

- Mirza Rabbaig rabbaig@dwsd.org
- Todd King kingtw@cdmsmith.com