Milwaukee Metropolitan Sewerage District
MMSD

- State Chartered Regional Agency
- Water Reclamation and Flood Management
- 1.1 million customers
- 28 Municipalities
- 411 square miles
Regional Sewer System

- MMSD Sewers: 362 miles
- Municipally owned sewers: ~3000 miles
- Private laterals: ~3000 miles
- 5% combined
- 95% separate
Inline Storage System (ISS) aka “Deep Tunnel”

- 521 MG wet weather store and treat
- Combined and separate wet weather flows
- 28.5 miles long
- 17’-32’ diameter
- ~300’ deep
- Constructed in multiple phases over 30 years
- Began operation 1994
- Last phase operational in 2010
- Reduced overflows from ~50/year to ~2/year
Central Control System

• Communicates with ~320 remote sites:
  – Flow monitoring sites
  – Diversion structures
  – Pump stations
  – Weather stations

• All data transmitted to JIWRF, where system is controlled

• Microwave ring and cellular modems
SCADA System

• “Internet protocol (IP) over wireless”
• 2 primary communication systems:
  • Microwave ring
    • 8 microwave core sites
    • Each core site has pair of 900 MHz radios
  • Cellular modem system
System Control

• Increased flows - some flow redirected
  • System to System
  • JIWRF to SSWRF
• Flows increase - flows will begin entering ISS
  • Passive
  • Active Control
• Operators continuously monitoring system
• Once tunnel fills to 100 MG, District begins “active management”
Diversion from System to System
Passive Diversions to Tunnel
Active Diversions to Tunnel
Wet Weather/Tunnel Management

• ISS used for both SSO and CSO control

• Permit Constraints
  • No tunnel overfill
  • Zero SSO’s
  • 6 CSO’s/year

• Organizational goals
  • Minimize impacts to connections
  • Maximize capture

• Must reserve space in tunnel for separate sewage
  • Combined sewage: high inflow rates (up to 10-12 BGD)
  • Separate sewage: orders of magnitude lower and later in an event
Wet weather/Tunnel Management

- Active management of this “volume reserved for separate sewerage inflow” (VRSSI)
- Conflicting requirements
- Rain forecasts are critical
- VRSSI predictive tool is helpful, but experience and current precipitation is more important
## Tunnel Management

### Weather Data
- **Great Lakes 24 Hr Rain Forecast:** 0.00
- **Current MMSD Rain Total:** 0.00
- **Great Lakes 48 Hr Rain Forecast:** 0.00
- **G.L. 3 Day Previous Snow Melt:** 0.00
- **G.L. 7 Day Rain Total:** 1.69
- **MMSD 7 Day Rain Total:** 2.06

### SS Only Strategy
- **Tunnel Volume Setpoints**
  - 2a - BS0405 / DC0402: START 350, STOP 340
  - 2b - BS0502 / DC0504: START 375, STOP 365
  - 2c - BS0501 / DC0502 & 503: START 375, STOP 365
  - 2d - DC0103 (Bypass & KK0): START 350, STOP 340
  - 3a - DC0405 (NS01): START 375, STOP 365
  - 3b - NS12 (SS Gate): START 405, STOP 395
  - 4 - DC0409 (DIV): START 415, STOP 405
  - 5a - DC0508 (NS03): START 427, STOP 417
  - 5b - NS03: START 427, STOP 417
  - 5c - DC0507 (DIV’s OPEN): START 427, STOP 417

### ISS Separate Sewage Reserve
- **Actual:** 120.00 MG
- **Minimum:** 120.00 MG
- **Great Lakes Predicted:** 0.00 MG
- **ANN Predicted:** 14.97 MG
- **ANN Prediction Selection:** 48 HR / Fall & Winter
- **DATA QUESTIONABLE**

### NWSRS Data
- **Mode 2**
  - **Inflow:** 0.0 MGD
  - **NWSRS Mode:** Mode 2

### ISS Time Predictions
- **Time to Full Tunnel:** 1942.6 HRS
- **Time to SS ONLY:** -61.4 HRS
- **Time to Empty Tunnel:** 13.6 HRS

### ISS Pumpout
- **Gross Total MG Pumped in 2023:** 8595.52
- **Current or most recent Event Total:** 134.72
- **2nd most recent Event Total:** 94.89

### System Flow Rates
- **ISS Inflow Rate (Calculation):** 34.4 MGD
- **ISS Inflow:** 21.4 MGD
- **NWRS Drain:** 0.0 MGD
- **CS Inflow:** 13.0 MGD

### Trending
- **Plant Flows**
  - **JWTP:** 181.9 MGD
  - **SSWTP:** 76.0 MGD
  - **Total:** 259.9 MGD

### ISS Inflow Status
- **-- READY --**
- **ISS Inflow:** 0.0 MGD
- **MIS:** 47.1 MGD
- **J.I. In Plant Diversion:** 0.0 MGD

### ISS Pumps
- **P1:** 67.1 MGD
- **P2:** 67.9 MGD
- **P3:** MIS

### Remaining Capacity to SS Only Mode
- **Volume (Flows):** 56.9 MG
- **Tunnel Flow In - Pump Out (Calculation):** -100.4 MGD

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Trend 199  Wet Weather Event Trend
Tunnel Management

![Tunnel Management Screen](image-url)
Tunnel Management