



**BEGIN JOURNEY** 



## Impact of Lake Michigan Water Levels on District Assets

Susan Coyle, P.E., CFM | Senior Project Manager

20 October 2022







#### Milwaukee Metropolitan Sewerage District Envisions a healthier, cleaner, resilient region.



#### What Does MMSD Do?





#### Water Reclamation

#### **Flood Management**





#### **1.1 Million People**

**28** Municipalities

#### 423 Square Mile Planning Area

# Where Does The Water Go? 300 **Miles Of MMSD Sewers** 3,000 **Miles of Municipality Owned Sewers**

**3,000** Miles of Private Laterals







# 98.4%

Capture & Clean Since 1994



#### WE CAN BE PARTNERS FOR A

#### **CLEANER ENVIRONMENT!**

## **Project Purpose**

Protect District assets from the adverse effects of high and low lake and river levels and become more resilient to climate change



#### Lake Michigan-Huron

Monthly Mean Level

Long Term Average Annual



Source: https://lre-wm.usace.army.mil/ForecastData/GLBasinConditions/LTA-GLWL-Graph.pdf

MMSD's 2035 Vision Strategic Objectives

- Integrated Watershed Management
- Climate Change
  Mitigation/Adaptation

### Background Conveyance System

- Clear water coming in
- Combined sewer overflows cannot discharge





#### Background Water Reclamation Facilities (WRFs)

#### Flooding in January 2020 at Jones Island WRF



## Background Jones Island WRF

- High Lake Level
  - $\circ$  Overland flow
  - Infiltration
  - Effluent pumps
- Low Lake Level
  - Pile deterioration
  - Exposed intakes



### Background Jones Island WRF

- New Coastal FEMA Maps
- Wave Runup
- Floodwall Results in Higher Flood Elevation



![](_page_14_Figure_0.jpeg)

### Background South Shore WRF

- Sump pumps work fulltime – critical to keep basements dry
- Storm Sewers
  - Surcharge
  - $\circ$  Sand
  - Outfalls covered by lake sediments
  - Unknown condition

Background Headquarters (HQ) Dock

- Current dock is fixed
- Fluctuating water levels not usually an issue
- Very high or very low levels – difficult, unsafe to load monitoring equipment

![](_page_15_Picture_4.jpeg)

Analysis Parameters Lake Michigan Water Elevations

- Low: 576 ft (NAVD88, -4 ft MMSD)
- Average: 579.7 ft (NAVD88, -0.6 ft MMSD)
- High: 584.9 ft (NAVD88, +4.6 ft MMSD)

![](_page_16_Figure_4.jpeg)

Source: Baedke and Thompson (2000)

## Analysis Parameters River Water Elevations (typical)

- HEC-RAS models from recent MMSD watercourse projects.
- Average: mean daily flow
- High: 500-year flows
- Note: river/lake impacted outfalls will use the greater elevation

FLOOD PROFILES MILWAUKEE RIVER FEDERAL EMERGENCY MANAGEMENT AGENCY MILWAUKEE COUNTY, WI AND INCORPORATED AREAS 79P

## Analysis Parameters Design Storms for

Conveyance Modeling

- 3-year event: June 2, 1954
- 10-year event: July 17, 1959

Event Year	Total Overflow Volume (MG)	Number of Modeled Outfalls with Overflows <sup>1</sup>	Rank	Wastewater Recurrence Interval	
2008	3222	110	1	125.3	
1986	1802	116	2	47.0	
2010	1435	111	3	28.9	
1941	912	101	4	20.9	
1940	812	88	5	16.3	
1997	351	77	6	13.4	
1959	344	80	7	11.4	Potential 10-Year Events
1976	179	52	8	9.9	
1960	158	72	9	8.7	
1978	156	72	10	7.8	
1987	113	63	11	7.1	
2000	99	48	12	6.5	
2013	99	32	13	6.0	
1977	84	41	14	5.5	
1990	81	39	15	5.2	
1950	80	37	16	4.8	
1983	36	20	17	4.5	
1993	34	18	18	4.3	
1999 April	25	19	19	4.0	
2006	25	22	20	3.8	
1989	24	19	21	3.7	
1999 June	20	19	22	3.5	
1991	20	16	23	3.3	Potential 3-Year Events
1954	18	15	24	3.2	
1969	4	7	25	3.1	
1970	0	1	26	2.9	

### Study Findings Jones Island WRF

![](_page_19_Figure_1.jpeg)

WAVE RUNUP SCENARIO (JIWRF)					
High Lake Level Coastal Flooding Storm Event at JIWRF Assuming Runup on Vertical					
Blukhead Shoreline Structure					
STILL WATER LEVEL (SWL), (FT, IGLD 85)	582.6				
WAVE HEIGHT (FT)	3.7				
WAVE RUNUP (FT)	8.4				
TOTAL WATER LEVEL ELEVATION, (FT, IGLD 85)	591.0				
EST. LIKELIHOOD	100-Year Return				
DEFEDENCES (NOTES	Base on draft FEMA coastal flood map				
REFERENCES/ NOTES	transect 14 for JIWRF.				

![](_page_19_Picture_3.jpeg)

#### Study Findings Jones Island WRF

![](_page_20_Picture_1.jpeg)

#### Study Findings South Shore WRF

![](_page_21_Picture_1.jpeg)

![](_page_21_Figure_2.jpeg)

# Study Findings Conveyance System

![](_page_22_Figure_1.jpeg)

# Questions?

![](_page_23_Picture_1.jpeg)

![](_page_24_Picture_0.jpeg)

## Contact Us

![](_page_24_Picture_2.jpeg)

<u>www.mmsd.com</u>

![](_page_24_Picture_4.jpeg)

scoyle@mmsd.com

![](_page_24_Picture_6.jpeg)

260 W Seeboth Street Milwaukee, WI 53204

![](_page_24_Picture_8.jpeg)