



The Metropolitan

Water Reclamation District

of Greater Chicago

**WELCOME
TO THE SEPTEMBER EDITION
OF THE 2016
M&R SEMINAR SERIES**

BEFORE WE BEGIN

- * SAFETY PRECAUTIONS

- PLEASE FOLLOW EXIT SIGN IN CASE OF EMERGENCY EVALUATION
- AUTOMATED EXTERNAL DEFIBRILLATOR (AED) LOCATED OUTSIDE

- * PLEASE SILENCE CELL PHONES OR SMART PHONES

- * QUESTION AND ANSWER SESSION WILL FOLLOW PRESENTATION

- * PLEASE FILL EVALUATION FORM

- * SEMINAR SLIDES WILL BE POSTED ON MWRD WEBSITE (www.MWRD.org: Home Page ⇒ Reports ⇒ M&R Data and Reports ⇒ M&R Seminar Series ⇒ 2016 Seminar Series)

- * STREAM VIDEO WILL BE AVAILABLE ON MWRD WEBSITE (www.MWRD.org: Home Page ⇒ MWRDGC RSS Feeds)

Gregory Hottinger, P.E.

Current: Asset Management Program Director, for the Milwaukee Metropolitan Sewerage District (MMSD), Milwaukee, WI

Experience: Worked the last 11 years for the MMSD with positions in project management, construction management and for the last 4+ years as the Asset Management Program Director.
Prior to joining the MMSD , worked for a light gauge steel manufacturer, several consulting firms and the MWRDGC.
My early career focused on structural design in the power, industrial and wastewater industries.

Education: Bachelor of science in Civil Engineering from the University of Wisconsin – Milwaukee

Professional: Professional engineer registered in the State of Wisconsin
Member of the American Society of Civil Engineers and
Member of the Institute of Asset Management.

Asset Management at Milwaukee Metropolitan Sewerage District (MMSD)

Greg Hottinger, P.E. - MMSD
Asset Management Program Director

Asset Management

ISO 55000 Definition :

**“coordinated activity
of an organization to
realize value from
assets”**

BSI Standards Publication

BS ISO 55000 series

Asset management

BS ISO 55000:2014, BS ISO 55001:2014
and BS ISO 55002:2014



bsi.

...making excellence a habit.™

MMSD Planning Area

- 1.1 Million Population
- 411 Square Miles
- 28 Communities
- Possible Extension – Raymond & Caledonia

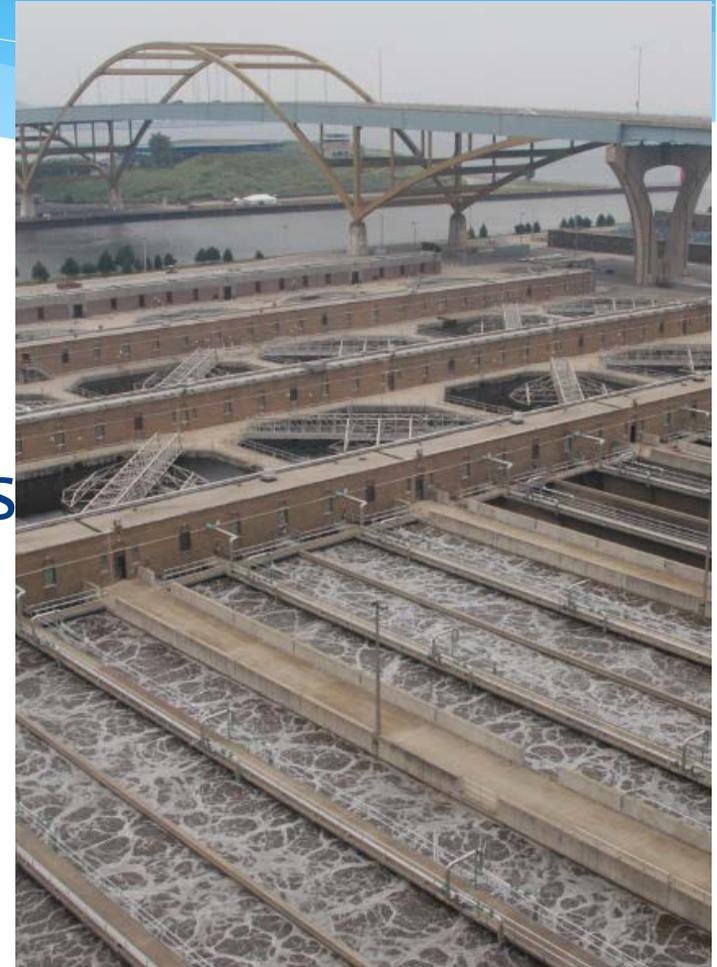


MMSD Asset Systems



Water Reclamation Facilities & Biosolids Handling

- Jones Island & South Shore WRF
 - 575 MGD Daily Max Flow
- Interplant Solids Pipeline
 - 11 mile pipeline for biosolids transfer
- Milorganite Processing
 - 130 tons/day



Conveyance & Storage System

- Approx. 300 miles of interceptor sewer
 - 6% combined, 94% separate
 - 8 inch to 150 inch
- Inline Storage System (“Deep Tunnel”)
 - 32 miles
 - 17 ft to 32 ft diameter
 - 521 MG storage



Watercourse & Flood Management

- Flood management for approx. 129 miles of waterways
- Six watersheds
- 350 acres of land



Green Infrastructure

- 10 – 15 year easements
- 21.5 MG of rainfall capture capacity
 - Since 2002
- Goal – 740 MG



Administrative Facilities

- MMSD HQ & Lab
- WRF Administrative Buildings
- Other Admin. Buildings
 - 13th & College
 - 25th & Canal
 - KK & Milwaukee River Flushing Stations



Asset Management Driver

2002

- Stipulation w/WDNR requires CMOM Program

2005

- CMOM Gap Analysis completed

2007

- AM started as part of CMOM program

Early Years
(2007-2012)



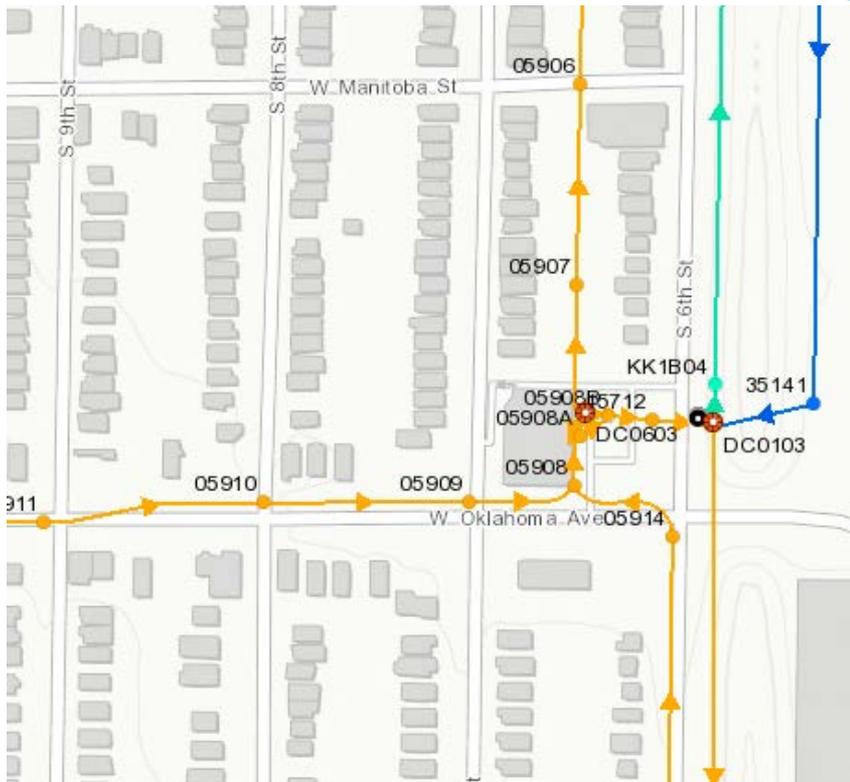
Conveyance
Focused

Limited Staff



Limited
Scope

Conveyance Information



GIS System



Sewer Inspections

Process & Technology



Memorandum

To: Michael Martin, Director of Technical Services
John Jankowski, Manager of Contract Compliance
Peter Topczewski, Water Quality Protection Manager
Susan Anthony, Senior Staff Attorney

Copy: Timothy Bate, Engineering Planning Manager
Tom Simmons, Senior Project Manager
Debra Jensen, Planning Services Supervisor
Tom Petri, Systems Monitoring Group Supervisor

From: Patrick Obenauf, CMOM Program/Asset Manager

Date: March 26, 2008

Subject: Root Cause of Failure Analysis for N 106th St & W Fischer Pkwy Overflow (BS0302/SSO 233) on April 3rd, 2007

EXECUTIVE SUMMARY

The District-owned gravity overflow sewer at N 106th St & W Fisher Pkwy (BS0302/SSO 233) discharged an estimated 87,000 gallons of sewage (as reported to the DNR) into Underwood Creek on April 3rd, 2007. The map in Figure 1 shows the layout of the system in this area. The sewage was spilled rather than allowing it to backup into local sewer systems.

The overflow was caused by precipitation-induced flows from the tributary sewersheds that are above the capacity of the 39" special section (SS) Underwood Creek Metropolitan Interceptor Sewer (MIS).

The Underwood Creek MIS is relieved by the Underwood Creek pump station during high flow conditions. An operating problem with the control system at the Underwood Creek pump station (PS0302) shut the station down for a short period of time during the peak flow of this event. The shut down caused excess flow to be sent to the 39" SS MIS. The excess flow caused the overflow to be sustained for a longer period of time than it otherwise would have been but it was not the primary cause of the overflow.

There is a project (C03005, Underwood Creek MIS Relief Sewer) presently under way addressing the capacity in this part of the system. Modeling results showed that if this relief sewer had been constructed, the system would have conveyed this flow without allowing the levels to rise to the point that flow would spill through the gravity overflow. Because this flow event is considered to be greater than a 5-year recurrence interval, no further construction work is recommended.

One of the tributary sewersheds is listed in the 2020 Facilities Plan as being slightly above (by 1%) the District's Chapter 3 peak flow performance standard. The Wet Weather Peak Flow Management Program is currently (as of 3/26/08) working with Wauwatosa to determine the best place to locate a

Root Cause Analysis

Asset Database System

Early Challenges

Staff understanding

Connection to organization's goals

Authority to make changes

Clear tasks, timelines, resources

2013 - Re-evaluate Program

Goals

Tasks

Resources

WERF SAM-GAP Analysis

Tool

- Comparison to water/wastewater AM best practices
- 150 questions – 7 core elements

MMSD Process

- Interviewed 35 people (Cross Divisional)
- Summarized results – one analysis

SAM-GAP Results

Quality Elements	Weighted Gap	Rank
AM Plans (AMP)	44	1
People Issues (People)	29	2
Organizational Issues (Org)	19	3
Information Systems (Info Sys)	16	4
Data and Knowledge (D&K)	16	4
Process and Practices (P&P)	15	5
Service Delivery (Service Del)	10	6

Business Risk

The key improvements in this area include:

- Review, document, and implement a policy for the evaluation of all business risk exposure on an organization-wide basis, including the definition and allocation of appropriate roles and responsibilities.
- Review, document, and implement processes for risk identification relevant to the whole organization and each business unit, including strategy, finance, information technology, engineering, and operations and maintenance.
- Review, document, and implement processes for quantifying the likelihood and consequences of failure into either a simple points score or full economic costs.
- Review, document, and implement processes for analyzing risks, including the ranking of risks in order to identify which assets, business functions, or parts of the business represent the greatest risk.
- Review, document, and implement processes for managing and tracking the risk reduction program.

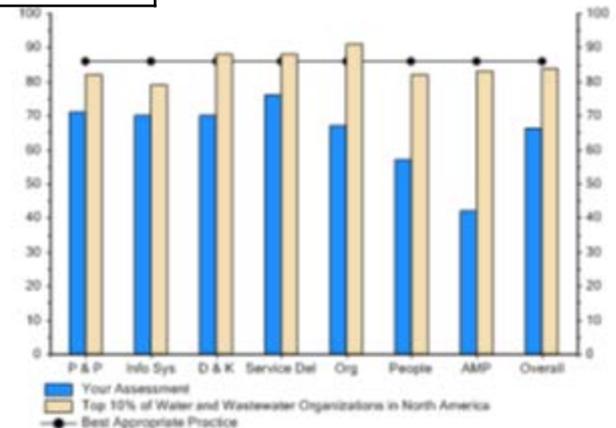


Figure 1 WERF MEASUREMENT OF MMSD GAPS

GAP Analysis - Action Items

- Implementation Strategy
- Program Structure/Steering Committee
- Commission Policy
- Asset Management Plans (AMP's) – Facilities Plan

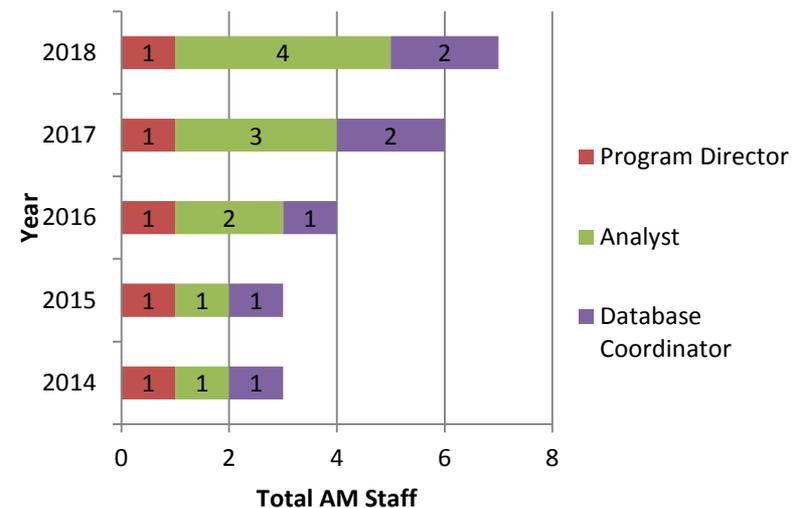
Implementation Strategy

Task List

Goal 1 - Define and document District staff and stakeholder roles and responsibilities required for effective asset management.

SMART GOALS	Target Date	Gaps Addressed
Review existing documentation describing roles and responsibilities of staff dedicated to asset management (i.e. the Asset Management Department) and modify as necessary. Review current AM staff level and identify additional staffing requirements and proposed timelines for additions.	April 2014	5.01 - Organizational Issues
Define and document roles, responsibilities and recommended staff members for the Asset Management Executive Steering Committee (AMESC) and the Asset Management Team (AMT). Identify positions that should have membership in either the AMESC or AMT included in their job descriptions and accountabilities.	April 2014	5.01 - Organizational Issues
Define and document asset management roles and responsibilities for staff in all District departments. In addition, define AM responsibilities of stakeholders, designers and contractors.	April 2014	5.01 - Organizational Issues
Develop process to incorporate asset management responsibilities into staff job descriptions and accountabilities. Identify staff responsible to review existing job descriptions and accountabilities and develop timelines to make required updates.	September 2014	5.01 - Organizational Issues

Staffing Forecast



Program Structure

Strategic

Commission/Steering
Committee– Org.
Goals/AM Comm. Policy

Tactical

AM Teams– KPI's/AM
Strategy/AMP's

Operational

Business Units – PI's/SOP's

Steering Committee



Steering Committee - Duties

- Program guidance
- Review and approve high-level documents
- Approve AM staffing recommendations
- Quarterly meetings

Commission Policy



Asset Management can be defined as a **management strategy** developed to achieve the following objectives:

- * Utilize assets to provide defined levels of service
- * Maintain a level of risk acceptable to the organization
- * Achieve service level and risk objectives at the lowest life cycle cost

Asset Management Plans (AMPs)

Answer the following questions:

- What is my required level of service?
- What is the current state of my assets?
- Which assets are critical to sustained performance?
- What are my best operations, maintenance and capital improvement program investment strategies?

Facilities Plan - Asset Management Basis

1. Levels of Service (LOS)
2. Future Demand
3. Assessment of Existing Facilities
4. Business Risk Assessment
5. Risk Management Strategies
6. Optimized Plan
7. Financial Summary
8. Plan Improvement and Monitoring



Level of Service Categories

Environmental

Permit/Legal

Energy

Environmental
Improvements

Social

Customer
Service

Safety

Economic

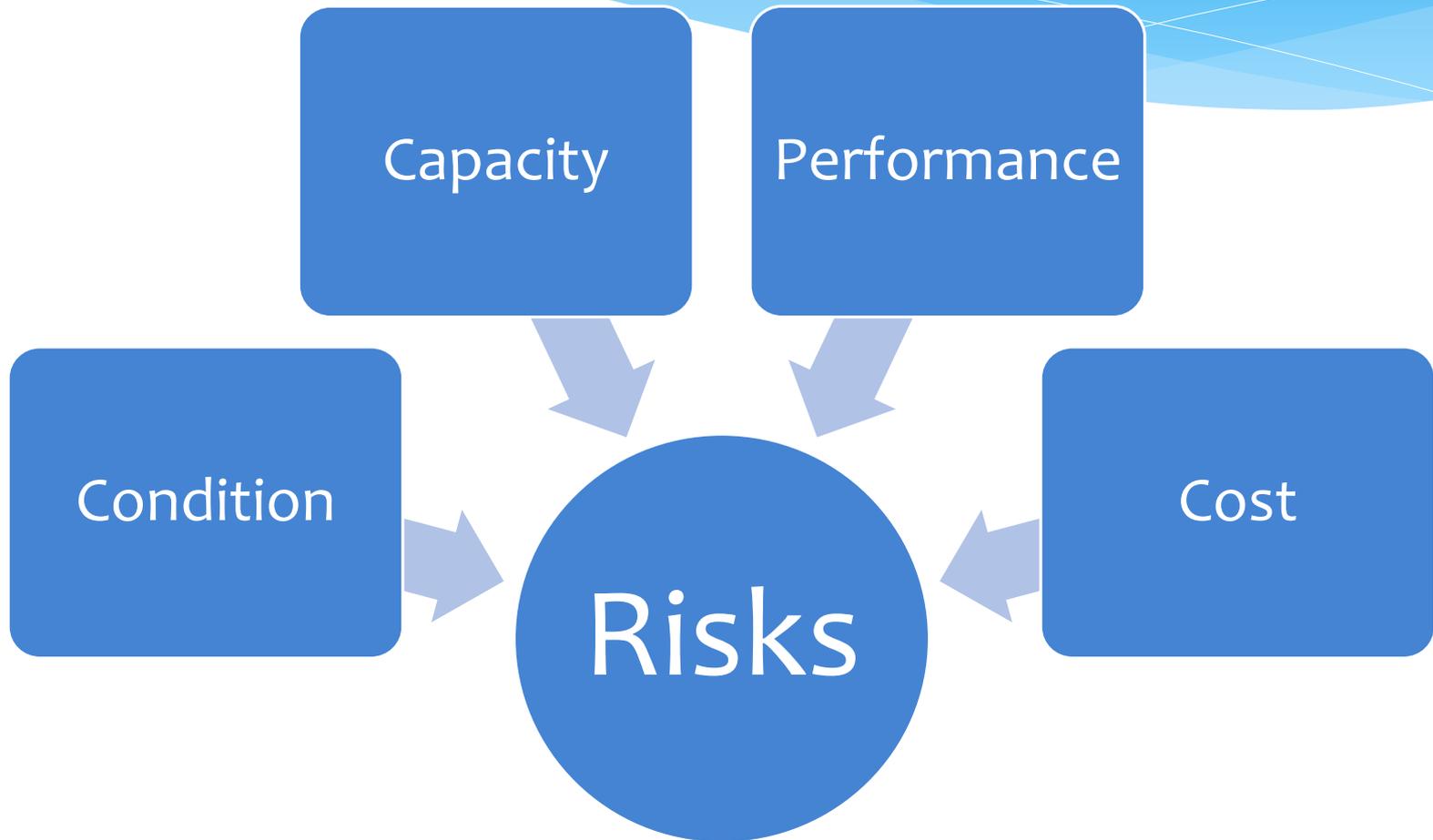
Financial

Management
Effectiveness

Level of Service - Metrics

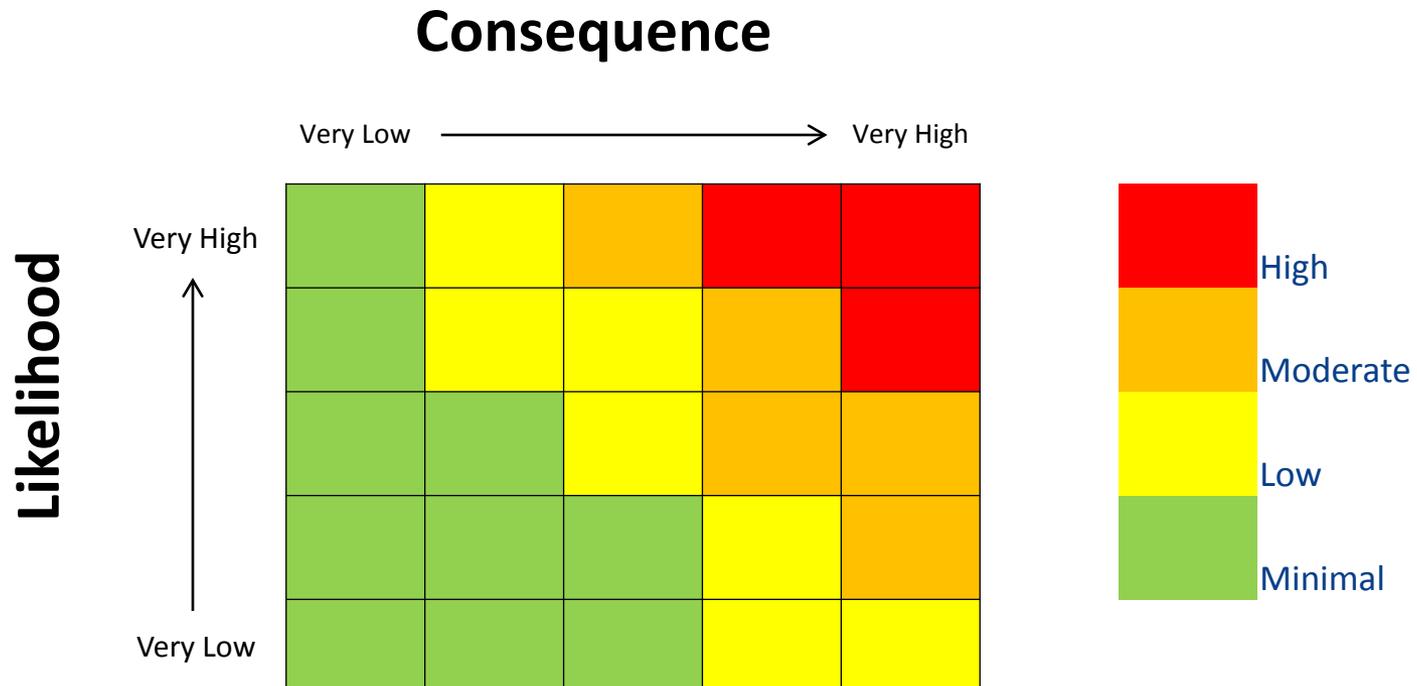
Environmental	Permit/Legal – SSO events/year	Energy - % of energy from renewable sources	Environmental Improvements – Total GI capacity installed (MG)
Social	Customer Service – Odor complaints/year	Safety – # of buildings in 1% probability floodplain	
Economic	Financial – Annual tax levy increase	Management Effectiveness – AMP's updated annually	

Assess Facilities



Risk Based

**RISK = LIKELIHOOD OF FAILURE X
CONSEQUENCE OF FAILURE**

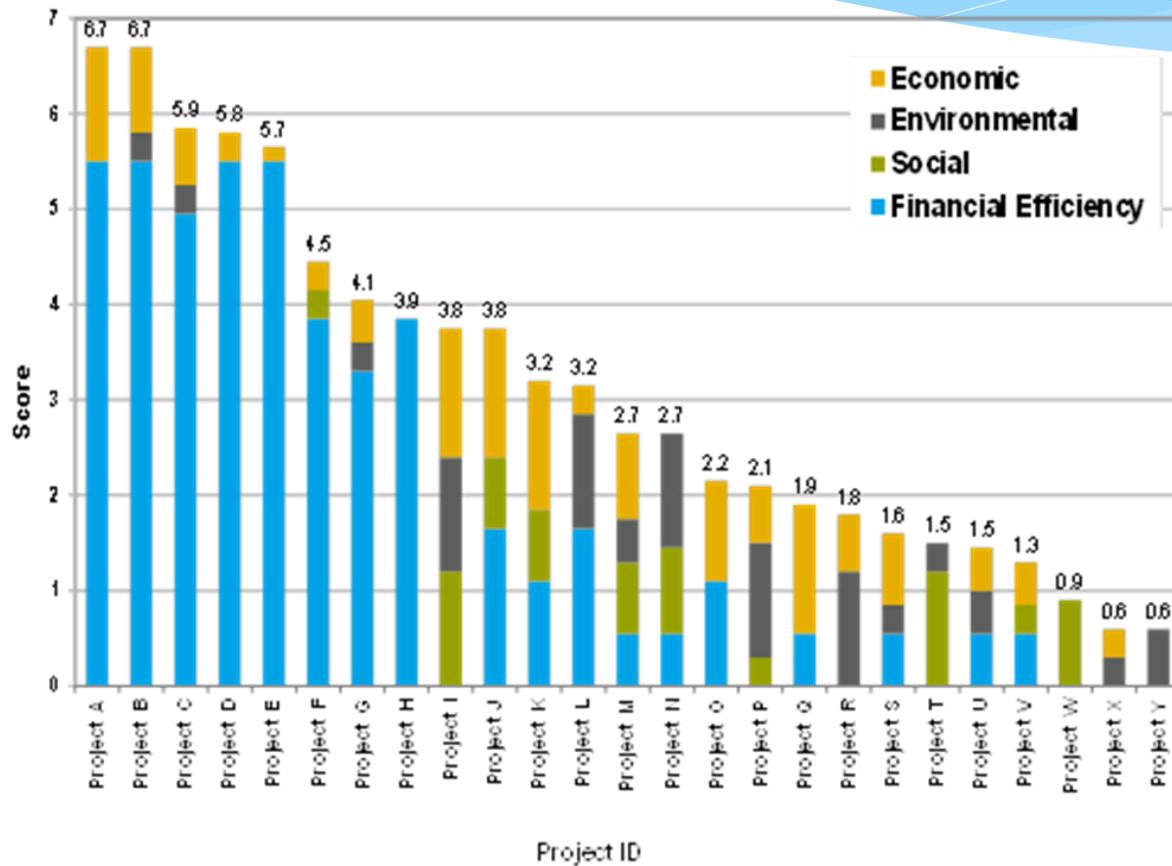


Evaluate Risks & Identify Alternatives

- Focus on highest risks
- Perform Business Case Evaluation (BCE)
- Alternatives include:
 - Rehabilitation
 - Replacement
 - Operational Change
 - Revised Maintenance
 - Program/Policy

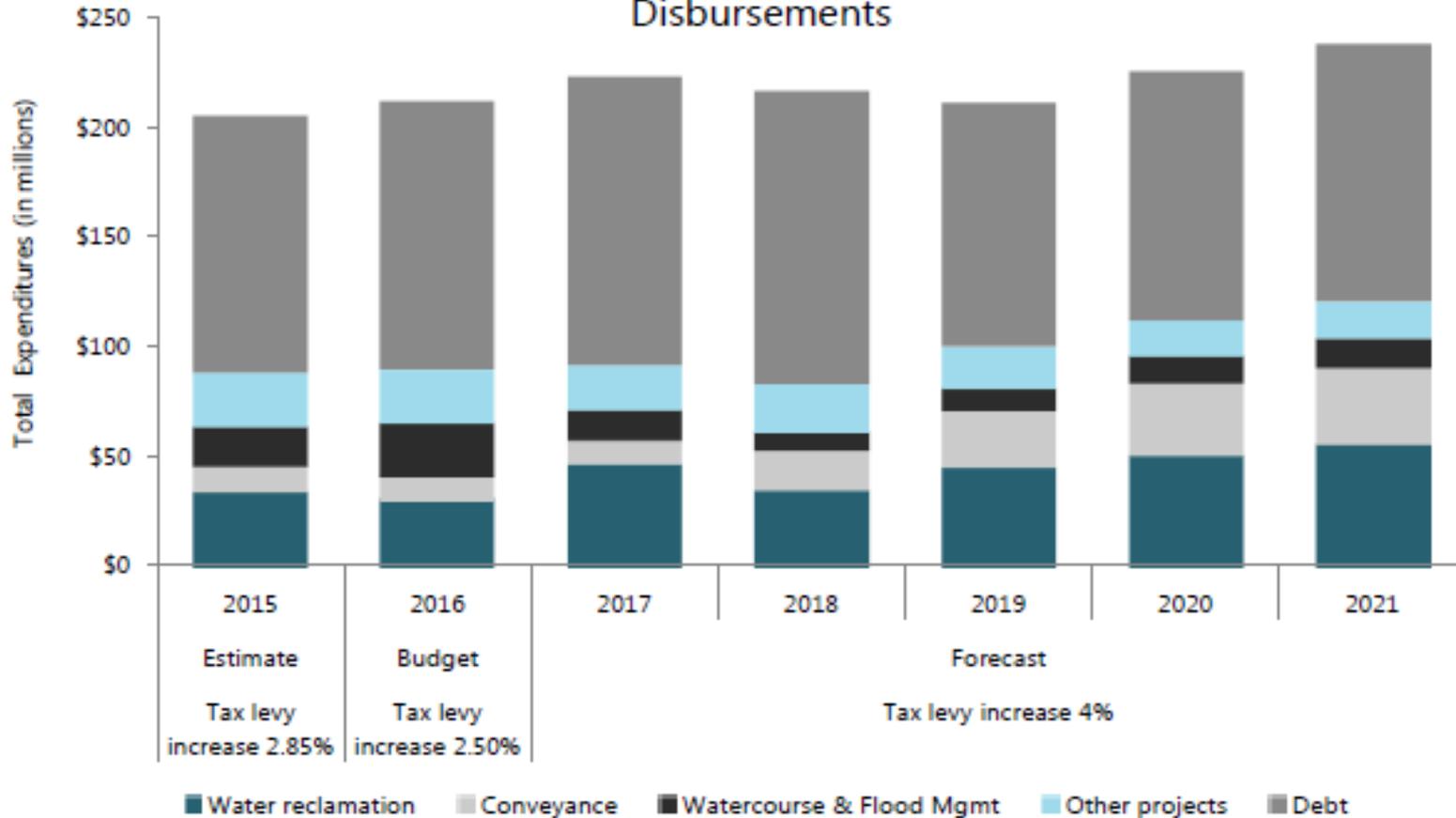


Prioritize Investments



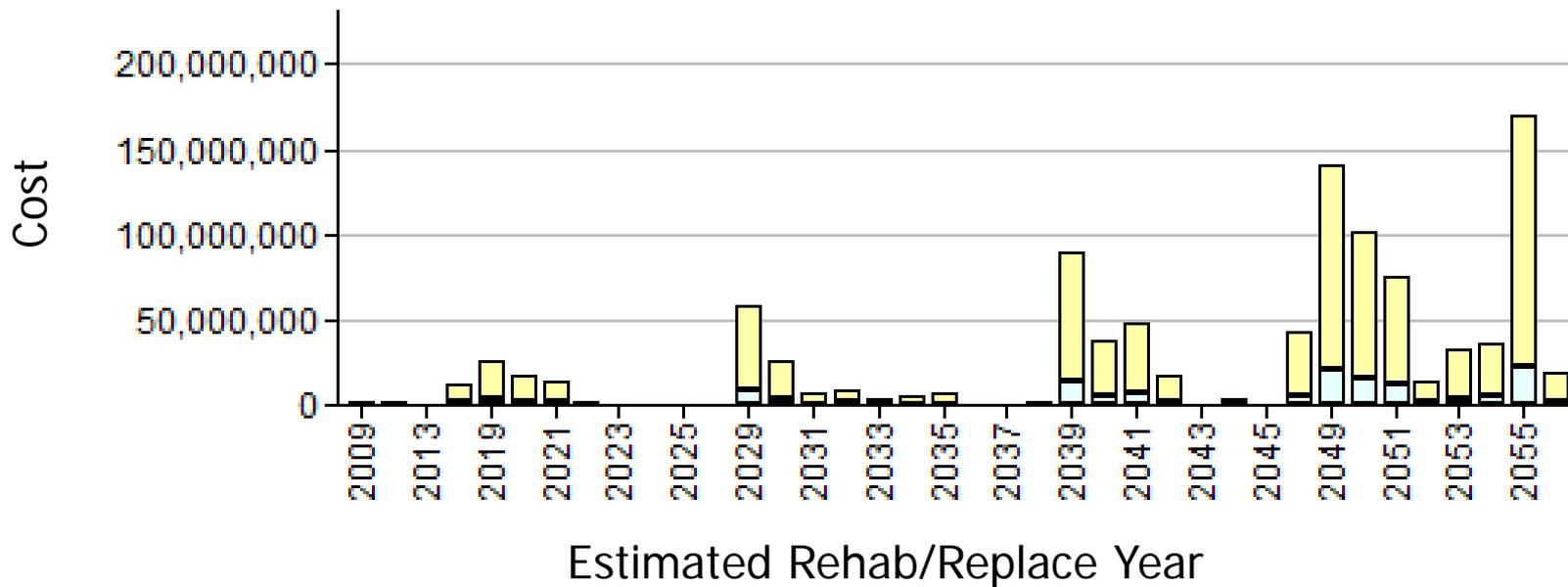
Capital Budget Forecast

2015-2021: Capital Improvement Program Expenditures and Disbursements

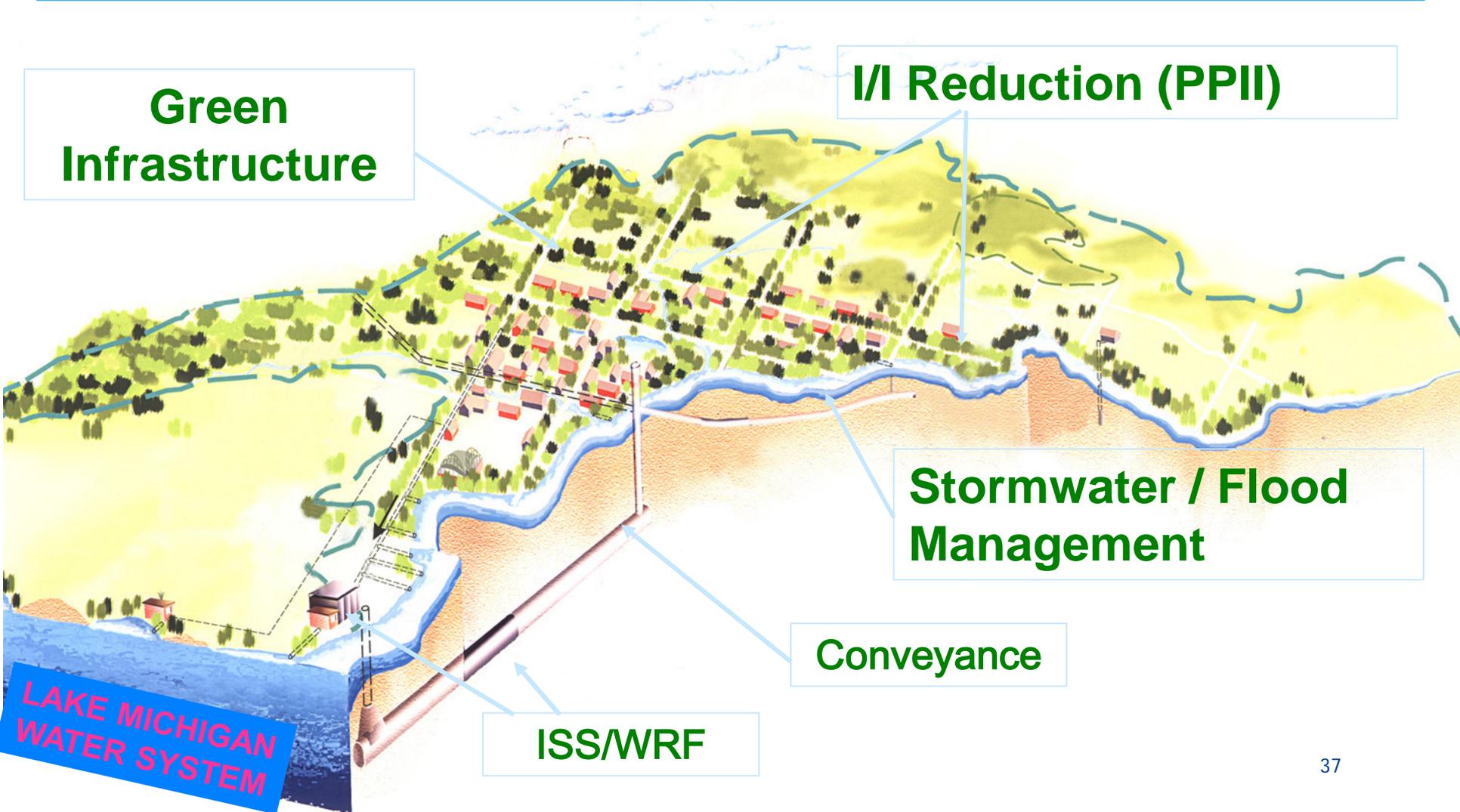


Long Range Rehab/Replace Costs

Conveyance Pipe Replacement Forecast

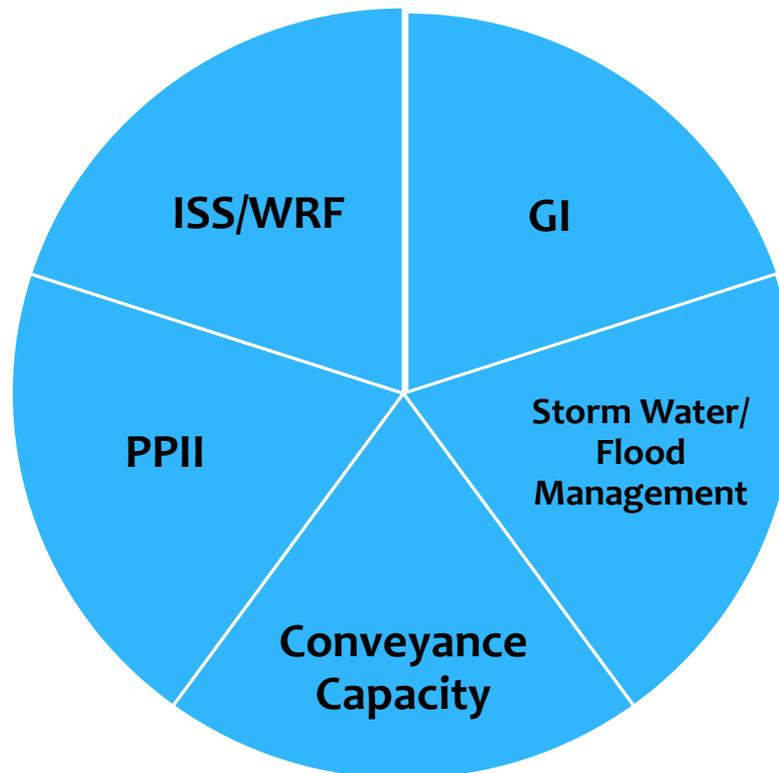


Integrated Water Management – Long Term Thinking



Holistic Approach

- * What mix of management strategies is most cost effective at reducing risk and meeting LOS goals?



Information - how can staff access & use it?

Web-based asset database

Analysis Asset Management

Mechanical Equipment Jan 2014 - Sep 2016

Assets Project Risk Register Analysis Photo Upload

Assets 1-50 of 7,949

Row	Asset ID	Description	Asset Status	Type	Asset Class	Priority	CMMS Capital Project #	Transmittal Num	P&ID o
1	101452	PUMP, SUBMERSIBLE PROPELLER #3, PS0704, V...	Active	ASSET	PUMPS, Submersible		W023GX010	1727	P-2-3
2	118730	COMPRESSOR, AIR, #3, DETENTION BASIN BUBB...	Active	ASSET	COMPRESSOR		W20004C06	2153	
3	118742	GATE, FLAP 48", RETENSION BASIN, CT01, SITE...	Active	ASSET	GATE, CHANNEL FLOW CONTROL		W20004C06	2153	
4	118743	GATE, KNIFE VALVE 48", RETENTION BASIN, CT0...	Active	ASSET	GATE, CHANNEL FLOW CONTROL		W20004C06	2153	
5	118770	HEAT TRACE CABLE (FOR BASIN LEVEL BUBBLE...	Active	ASSET	HVAC		W20004C06	2153	
6	101453	PUMP, SUBMERSIBLE PROPELLER #4, PS0704, V...	Active	ASSET	PUMPS, Submersible		W023GX010	1727	P-2-4
7	101454	PUMP, SUMP, SUBMERSIBLE DRAIN #1, PS0704,...	Active	ASSET	PUMPS, Submersible		W023GX010	1727	P-3-1
8	101455	PUMP, SUMP, SUBMERSIBLE DRAIN #2, PS0704,...	Active	ASSET	PUMPS, Submersible		W023GX010	1727	P-3-2
9	101450	PUMP, SUBMERSIBLE PROPELLER #1, PS0704, V...	Active	ASSET	PUMPS, Submersible		W023GX010	1727	P-2-1
10	101451	PUMP, SUBMERSIBLE PROPELLER #2, PS0704, V...	Active	ASSET	PUMPS, Submersible		W023GX010	1727	P-2-2
11	121471	VALVE, SOUTH SHORE FORCE MAIN DRAIN W / E...	Active	ASSET	VALVE, PIPE FLOW CONTROL		VWPO 8910123123	2250	
12	122099	DRYER, INSTRUMENT AIR (HEATLESS REGENER...	Active	ASSET	COMPRESSOR		VW PO8910130194	2188	
13	124673	EJECTOR, SUBMERSIBLE SEWAGE #1	Active	ASSET	PUMPS, Submersible		VW PO00002822	2305	204-P-1
14	124674	EJECTOR, SUBMERSIBLE SEWAGE #2	Active	ASSET	PUMPS, Submersible		VW PO00002822	2305	204-P-1
15	123592	PUMP, ELEVATOR SUMP #2	Active	ASSET	PUMPS, Submersible		VW PO 8910133378	1131	258-P-3
16	124389	GENERATOR, PORTABLE #20, (GENERAC) (SS)	Active	ASSET	GENERATOR, ELECTRICAL		VW PO 8910130957		
17	123583	PUMP, E. BUILDING SUMP #2	Active	ASSET	PUMPS, Submersible		VW WO 1310063-01	1131	258-P-3
18	114696	GENERATOR, HONDA (TRUCK MOUNTED UNIT #1...	Active	ASSET	GENERATOR, ELECTRICAL		UW PO 28124		
19	114693	HEATER, HOT WATER	Active	ASSET	BOILER		UW PO 00022126		
20	112265	HVAC, HEATER, HOT WATER 40-GAL	Active	ASSET	BOILER		UW PO 00018270	2025	

Filters Asset Type

Text Criticality Risk Register (0) Project (0) Project Assets (0) Work History (11) Photo (0) QA

AMP - SUBSYSTEM DASHBOARD

Asset Management Plan - Conveyance

SUBSYSTEM 1 - 2015

1. SUBSYSTEM DESCRIPTION

Municipalities Served by Subsystem

Subsystem 1 directly serves the municipalities of West Allis, West Milwaukee, City of Milwaukee, Greenfield, St. Francis, Cudahy and Oak Creek.

Description of Legs

Subsystem 1 is comprised of the following sewer legs:

- Leg L2 • Leg M • Leg N • Leg R1 • Leg R2 • Leg R4
- Leg R5 • Leg R6 • Leg R7 • Leg R8 • Leg R9 • Leg R10 • Leg R11 • Leg R12 • Leg R13 • Leg R14 • Leg R15 • Leg R16 • Leg R17 • Leg R18 • Leg R19 • Leg R20 • Leg R21 • Leg R22 • Leg R23 • Leg R24 • Leg R25 • Leg R26 • Leg R27 • Leg R28 • Leg R29 • Leg R30 • Leg R31 • Leg R32 • Leg R33 • Leg R34 • Leg R35 • Leg R36 • Leg R37 • Leg R38 • Leg R39 • Leg R40 • Leg R41 • Leg R42 • Leg R43 • Leg R44 • Leg R45 • Leg R46 • Leg R47 • Leg R48 • Leg R49 • Leg R50 • Leg R51 • Leg R52 • Leg R53 • Leg R54 • Leg R55 • Leg R56 • Leg R57 • Leg R58 • Leg R59 • Leg R60 • Leg R61 • Leg R62 • Leg R63 • Leg R64 • Leg R65 • Leg R66 • Leg R67 • Leg R68 • Leg R69 • Leg R70 • Leg R71 • Leg R72 • Leg R73 • Leg R74 • Leg R75 • Leg R76 • Leg R77 • Leg R78 • Leg R79 • Leg R80 • Leg R81 • Leg R82 • Leg R83 • Leg R84 • Leg R85 • Leg R86 • Leg R87 • Leg R88 • Leg R89 • Leg R90 • Leg R91 • Leg R92 • Leg R93 • Leg R94 • Leg R95 • Leg R96 • Leg R97 • Leg R98 • Leg R99 • Leg R100

Unique Systems

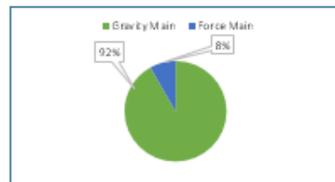
Asset	Amount	Asset	Amount
Gravity Main	42.4 miles	Force Main	3.80 miles
CSO Outfalls	1*	SSO Outfalls	2
Active Manholes	419	Pump Stations	1
Signons	0	Passive Diversions	4
Division Structures	0	Division Chambers	3
ISS Junction Chambers	0	ISS Drop Shaft	0
Sewerheads	85	Active Permanent Flow Meters	27**

* Located at diversion chamber DC0102, outfall not shown on map
 ** DC0101, DC0102, DC0103 and SS0101 each have active permanent flow meters that are not shown on the map

Construction Range Years of Active Sewer Segments in each Leg



Percent Length of Assets



2. PERFORMANCE

Condition of Subsystem

The area of subsystem 1 is approximately 18,400 acres, about 7 percent of the MMSO planning area.

	Compliant	Non-compliant	Analysis not Completed	Total
Manholes*	7	3	5	15

* Enforced manholes part of the Wet Weather Peak Flow Management Program

Condition profile

Percent sewer miles below LOS

Maintenance Concerns

Sewer segments with known access issues will be added after site visits of Veolia's access issue list is completed.

% sewer miles with NASSCO score greater than 2

Performance Indicators

	Annual Goal	Annual Total
% sewer miles less than self-cleaning velocity	0	
Subsystem Annual Energy Consumption	-	
SSO Events	0	0
CSO Events	0	1
% of annual overflow capture of flow into subsystem	100% (25% permitted)	99.83%
Count of MIS and NSO outfalls lacking free discharge to receiving water	0	2
Count of outfalls with receiving water backups into MIS	0	0
Count of Basement Backups caused by the MIS	0	0
Count of Structures with H2S Readings >10 ppm	0	1
Count of Odor Complaints	0	

External Areas of Concern

The Private Property Infiltration and Inflow (PPII) reduction program is intended to reduce the amount of I&I entering the collection system. By lowering the amount of I&I into the collection system, the potential of a sewer overflow occurring is greatly reduced. The program is offered to the surrounding municipalities that are serviced by MMSO and will have an effect on the MMSO conveyance system.

In subsystem 1, **(\$1,000,000)** have been spent to fund the PPII reduction program and **(\$1,000,000)** more have been improved upon and contribute less I&I into the MMSO conveyance system.

3. OPERATIONS AND MAINTENANCE

The overall MMSO sewer area dashboard contains information on the following topics:

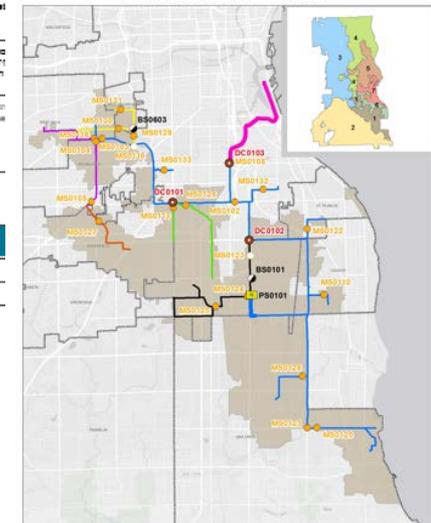
- Cost of operational maintenance
- Sewer televising schedule/issues/local findings
- Sewer cleaning schedule/issues/local findings

This information was gathered from the Veolia 2015 Annual Report on Collection and Conveyance.

4. RISKS

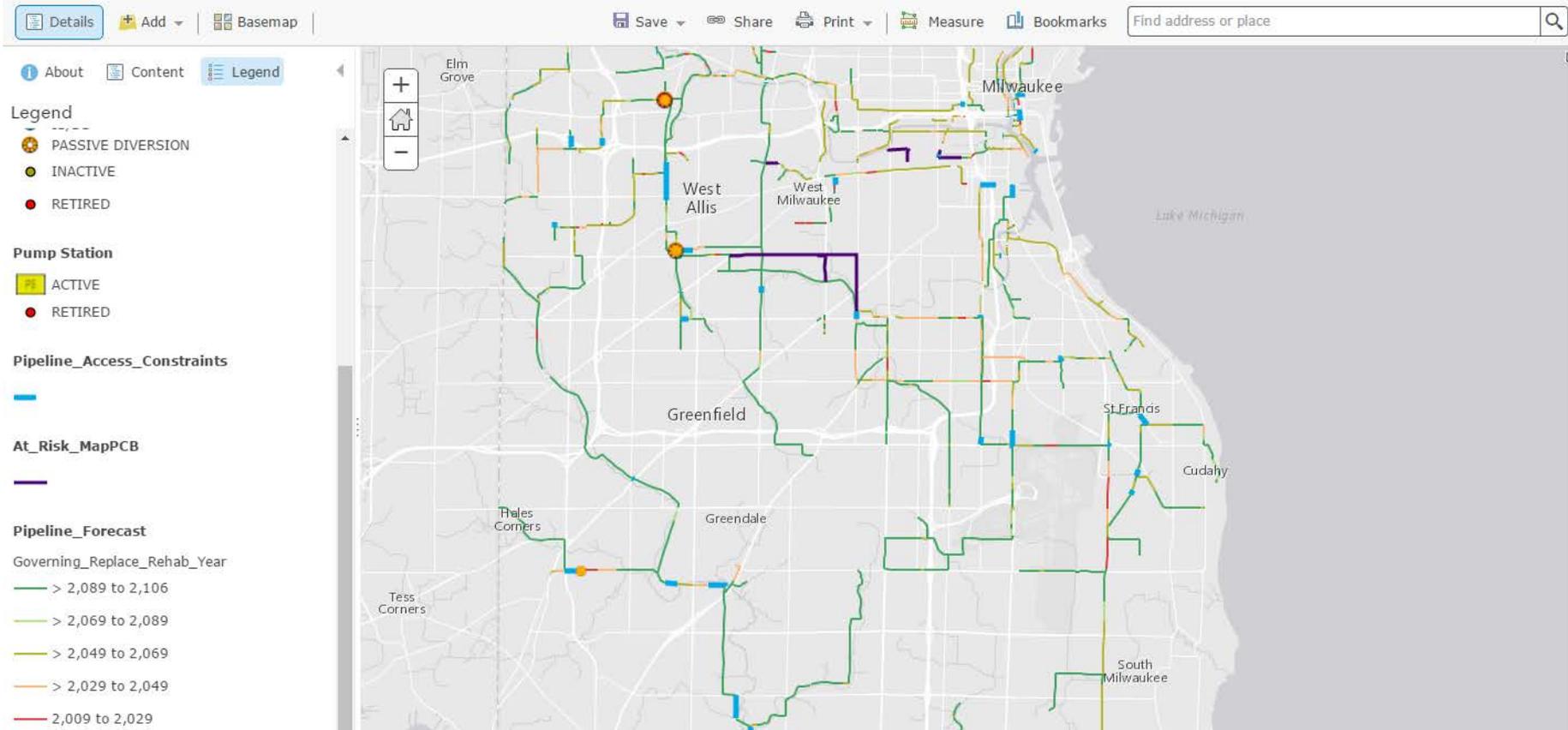
Risk ID	Risk Title	Leg	Risk Description	Risk Level
C088	Future 2025 Flow Allocation methodology - how to address flexibility	Multiple	Present methodology creates challenges for municipal development once flow allocations for the planning horizon are met.	High
C128	High levels of H2S in various MIS locations - plan to address	Multiple	H2S present in MIS in various parts of the conveyance system	High
C108	Increase in water elevation of Lake Michigan to at or above the historic high water elevation.	Multiple	Risk of basement backups in the CSSA when the Lake Michigan elevation is at or above the historic high water level. Presently, the City of Milwaukee can tolerate to 44 feet (City of Milwaukee Datum) at connectors to the local combined sewers. High Lake Michigan water levels may impact the ability of the MMSO to provide relief to the rivers during storm events when the ISS is closed.	Moderate
C089	Sewer Cleaning Greater than 48"	Multiple	No predetermined means to clean sewers greater than 48-inch diameter not required by contract; causes delay in reaction time to address an issue if/when services become backlogged.	Moderate
C085	Promising Sewer Rehab based upon Inspection Videos	Multiple	Ability to plan sewer rehab/replacement: Videos do not adequately show pipe that be hidden below the flow line.	
C131	State Street and Menomonee River MIS Rehab	Multiple	Pipe failure of State Street and Menomonee River MIS Rehab	
C044	Presence of PCBs in sewers which have not been televised and not been cleaned	Multiple	No ability to inspect or clean known PCBs on rehab/replacement PCBs in Lincoln Avenue	

CONVEYANCE ASSETS IN SUBSYSTEM 1



- LEGEND
- PUMP STATION
 - DIVERSION CHAMBER
 - PUMP OUTFALL
 - ▲ OVERFLOW SITE
 - MONITORING SITE ON MIS
 - MONITORING SITE ON LOCAL SEWER LEGS
 - M. GRAVITY
 - F. GRAVITY
 - M. PRESSURE
 - F. PRESSURE
 - M. GRAVITY
 - F. GRAVITY
 - M. GRAVITY
 - F. GRAVITY

Conveyance – Interactive Mapping



WRF's – Lidar Scans, Building Information Modeling (BIM)



Benefits of AM

- Improved communication
- Access to information – break-down silos
- Risk based decision making tied to org. goals
- Improved information to support financial planning
- Consistent, repeatable process developed for continuous improvement
- Line of sight – staff knowledge promotes ownership

Lessons Learned

- Take approach of how can I help you – build bridges
- Cultural change takes time
- Never too soon to get started - It will never be perfect
- Data clean-up is labor intensive

QUESTIONS?



PARTNERS FOR A CLEANER ENVIRONMENT