

Let's Get This Program Started

Hidden Challenges of Large Diameter Sewer Rehabilitation Projects

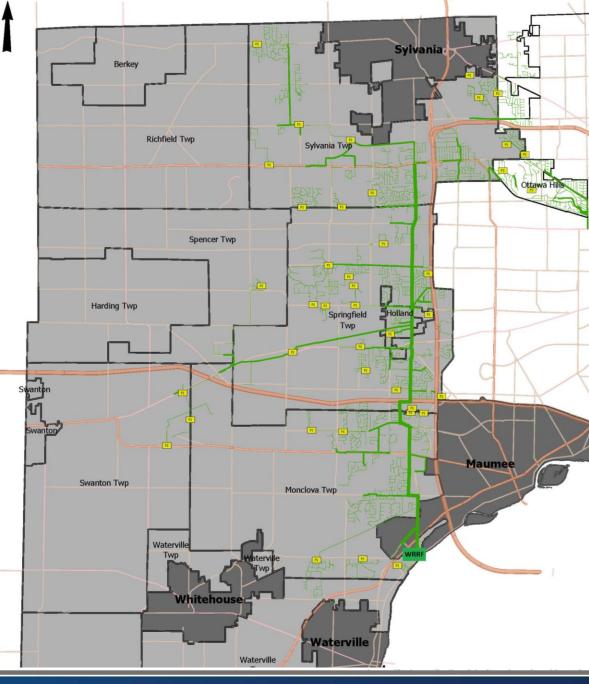




- Population Served (2018) ~115,000
- LCSE operates the Lucas County Water Resource Recovery Facility (WRRF)
- ~18,000 customers
- Partnership of the following communities:

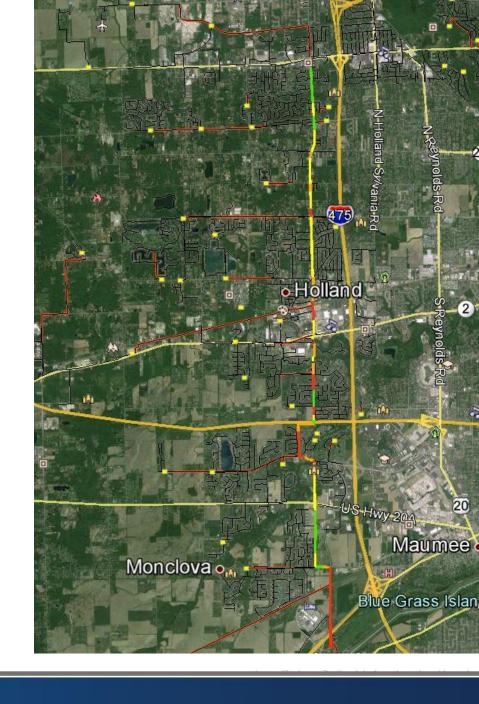
Maumee, Sylvania, Waterville, Whitehouse

Serves Townships –
 Monclova, Springfield,
 Sylvania, Waterville,
 Whiteford, Perrysburg



Sewer No. S-500 McCord Road Interceptor

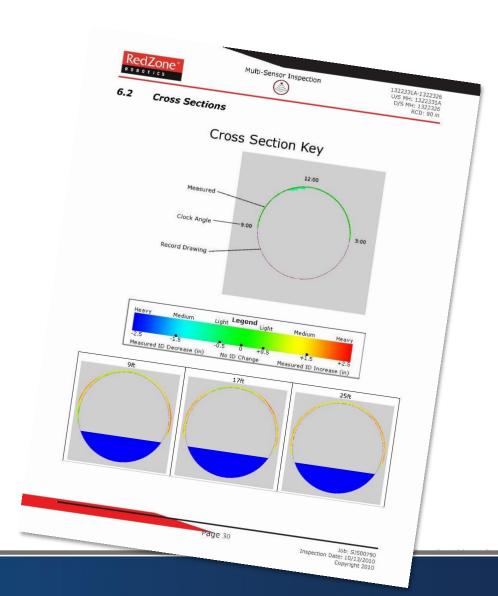
- Approx. 53,000 ft (10 miles) of sewer N-S through the area
- Pipe diameters 60 to 90 inches
- Reinforced concrete pipe installed in 1972-1980
- Three double-barreled inverted siphons: Swan Creek, Cairl Ditch and Wolf Creek
- Design flow of 66 MGD



TETRA TECH

Inspected entire interceptor in 2010 by Redzone using Multi-Sensor Unit

- Video and PACP inspection
- Ovality and Deflection
- Sediment
- Gas
- Corrosion and Buildup



Initial Results

- 109 sewer reaches inspected
- 27 with grade 5 structural defects

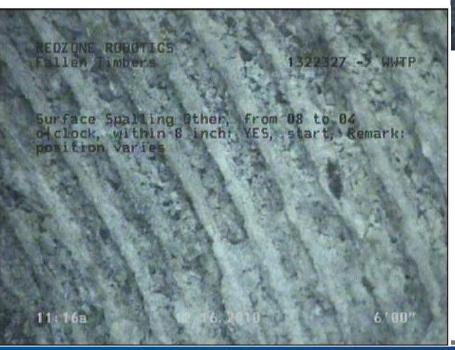




Corroded Reinforcement

Initial Results

 20 with grade 4 structural defects





Visible, Exposed Reinforcement

Initial Results

 36 with grade 3 structural defects



REDZONE ROBOTICS
Fallen Timbers 1322327 → WWTP

Alignment Right, 20 °, start

12:24p 12.16.2010 813'82"

Increased roughness and Spalling Concrete



Defect Trends

- Near WRRF Influent Chamber
- Force Main Discharges
- Abrupt bends
- Up and Downstream of Inverted Siphons
- (Siphons not inspected)



Whitehouse and Waterville Force Main Discharge

Recommendations – 2015 LCSE Master Plan Update



- Identified 5 Priority Areas
- CIP to Repair all Pipes with Grade 5 defects within 10 years

Project Description	Estimated Cost	Est. Construction Date
S-500 Interceptor Rehab Priority 1 - WWTP to Monclova Rd	\$11,000,000	2016-2017
S-500 Interceptor Rehab Priority 2 - Salisbury Rd to Ohio Turnpike	\$4,900,000	2019-2020
S-500 Interceptor Rehab Priority 3 - Pilliod to Morningdew	\$3,400,000	2021-2022
S-500 Interceptor Rehab Priority 4 - South of Airport Rd	\$2,200,000	2023-2024
S-500 Interceptor Rehab Priority 5 - Misc. North of Airport Rd	\$2,400,000	2025-2026
Total ALL CIP \$23,900,000		

Included several lower rated pipe segments between grade 5 pipe segments



2018 Program Initiation

LCSE Plan

- Construct CIP Break Into Smaller Projects (\$2-3 Million Average)
 - Priority Area 1 divided into multiple phases
- Utilize Grants and Other Funding Mechanisms
 - WPCLF
 - OWDA
 - OPWC







- Contracted with Tetra Tech for design services
- Phase I Construction to be completed by end of year to meet funding deadlines



2018 Program - Revised CIP

Developments

- Solicited quotes for inverted siphon cleaning and inspection
 Estimated cost of \$250,000
- Preliminary investigation revealed siphon chambers severely deteriorated
- 3 total inverted siphon rehabilitation projects add to highest priority

Revised Near-Term CIP

Project Description	Estimated Cost	Est. Construction Date	
S-500 Interceptor Rehab Phase I - WRRF to MH 2 (1,900 feet - 90")	\$2,600,000	2018	
S-500 Cairl Ditch Rehab - (140 feet - Double Barrel Siphon 54")	\$1,100,000	2019	
S-500 Wolf Creek Rehab - (160 feet - Double Barrel Siphon 54")	\$1,400,000	2019-2020	
S-500 Interceptor Rehab Phase I - MH 2 to MH 4 (1,950 feet - 90")	\$3,000,000	2019-2020	
S-500 Swan Creek Rehab - (160 feet - Double Barrel Siphon 60")	\$1,500,000	2020	
Total ALL CIP \$9,600,000			

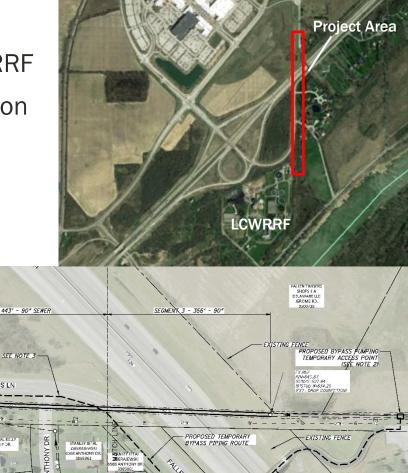
S-500 Rehabilitation Phase I

Project Information:

- 1,900 feet of 90 inch sewer influent to WRRF
- Downstream 190 feet laid in an "S" curve on WRRF grounds

BYPASS PIPING ROUTE SEE BYPASSING PUMPING NOTES

- 40 feet of cover at upstream end
- Crosses the Anthony Wayne Trail (US24)



Bid Different Technologies against each other - Treat as pilot project

FALLEN TIMBERS LN

15" SEWER BLIND



Sliplining

Pros

- Experience with Sliplining from 2017 project for McCord Road Underpass
- Doesn't require full bypass
- Majority of interceptor straight

Cons

- Significant diameter change - 90 inch to 78 inch ID Hobas pipe
- Not ideal due to curved pipe segment





Cured-in-Place

Pros

- Familiarity with technology
- Minimal loss of diameter
- Can line curved pipe

Cons

- Requires full bypass
- Pipe accessibility
- Water intensive





Sprayed-in-Place

Pros

- Flexible pipe access
- Minimal loss of diameter
- Can line curved pipe

Cons

- Requires full bypass
- Pipe preparation
- Newer material/technology





Design Feature – New Manhole

- Where S-bend begins on WRRF site
- "Level the playing field" for different technologies
- At low point very shallow excavation
- Large laydown area for construction equipment on WRRF property

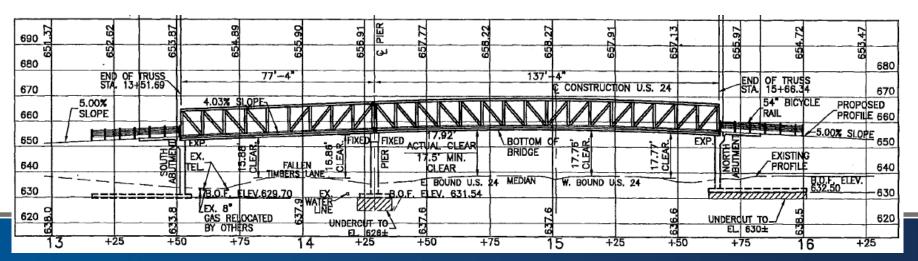


Design Feature – Bypass Pumping Route



- Need to access pipe upstream of rehab limits – deep excavation
- Flows to WRRF extremely variable
- Discharge piping route –
 freeway crossing, side streets
- Design for shaft and bypass footprint

- Provide 2 years of average flow data at WRRF in construction documents
- Worked with Toledo Metroparks
 & ODOT to utilize pedestrian
 bridge for bypass piping
- Buried bypass piping across side streets to minimize impacts





Bidding Results

- Low Bid Michels Corp
- Proposed Using Spray-in-Place Geopolymer Liner Geospray by Milliken



Bidder	Technology	Bid Price
Michels Corp	SIPP Geopolymer Liner	\$2,535,137
IPR	SIPP Geopolymer Liner	\$2,596,300
Insituform	CIPP Liner	\$2,632,339
Spinello	Slip Liner	\$2,633,000
Quadex	SIPP Geopolymer Liner	\$3,275,512
Turn-Key Tunneling	Slip Liner	\$3,873,800



Bypass Pumping - Suction

- Mersino Dewatering proposed using vertical turbine pumps
- Accommodate depth
- Minimal pipe access requirements
- Michels Proposed 8 foot diameter steel caisson shaft to access pipe in lieu of braced excavation.

Shaft would be converted to manhole to facilitate future phases





Bypass Pumping - Discharge

- Concerned about piping across pedestrian bridge
- Temporary bypass piping buried across side streets left in place and converted to permanent road culverts





Bypass Pumping - Discharge

- Bypass Pumping Discharge
 - Air relief locations
 - Controlled discharge velocities by upsizing and adding bends
 - Bulkhead to hold back water from re-entering pipe



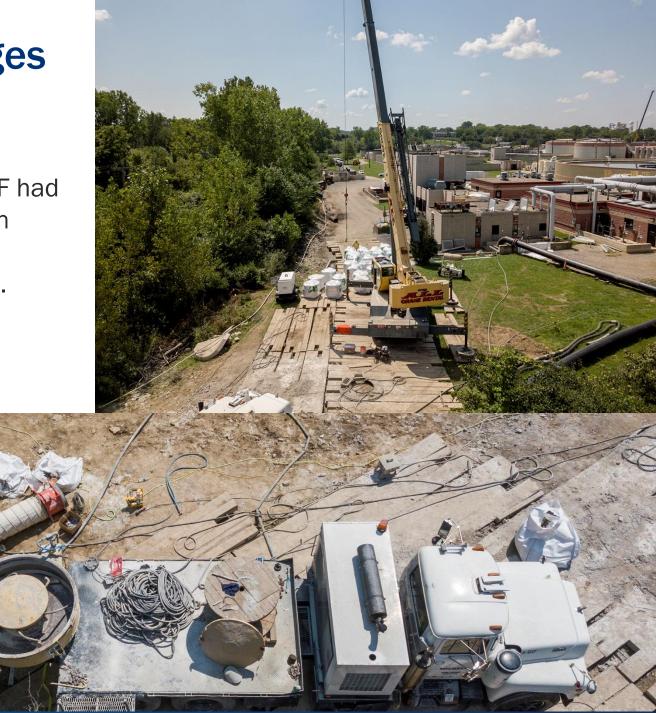
Sewer Cleaning

- Difficult due to pipe depth and manhole spacing
- Process took multiple weeks to fully clean and prepare the pipe for lining
- Removed several loads of debris



Pipe Lining

Site laydown – WRRF had multiple construction projects underway – competing for space.



Pipe Lining

- Typical SIPP range is approximately 500 feet
- Michels developed system to line entire reach from on access point at WRRF
- Electric buggies would carry material from hopper to spraying tool through the pipeline





Weather

- Tropical Storm Gordon in September dropped extreme rainfall and resulted in a failure of the sewer plug
- Another minor incident with tributary sewer flooding handled entirely by the Contractor

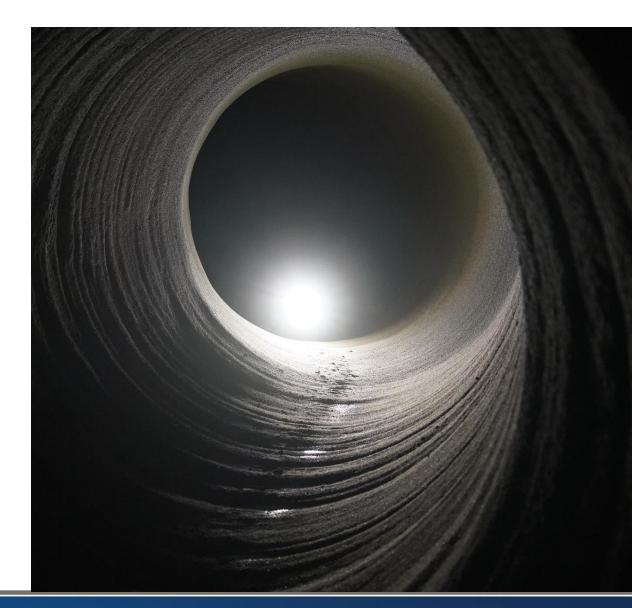
4-6" of rain





Project Successes

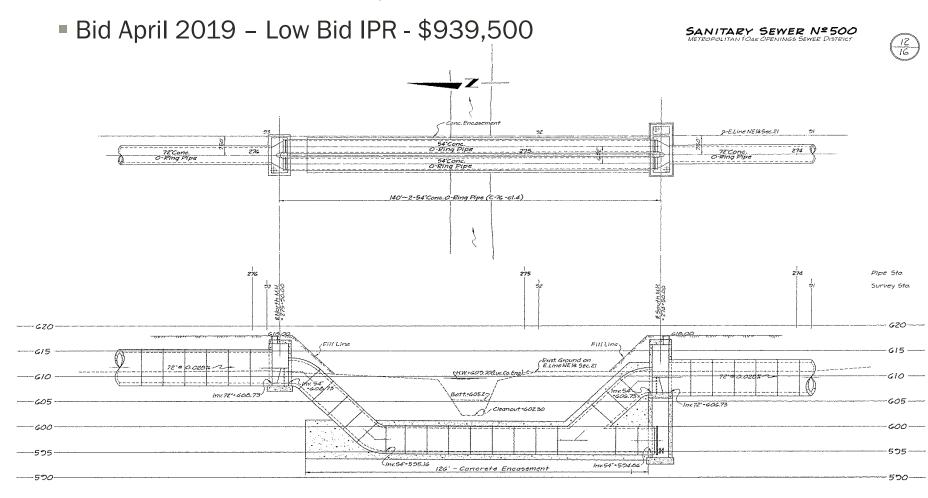
- Minimal change orders
- Bypass Pump
 Access MH to
 facilitate future
 construction
 projects
- On schedule for funding requirements





Upcoming Projects

- Cairl Ditch Inverted Siphon
 - Dual-Barrel 54" Inverted Siphon





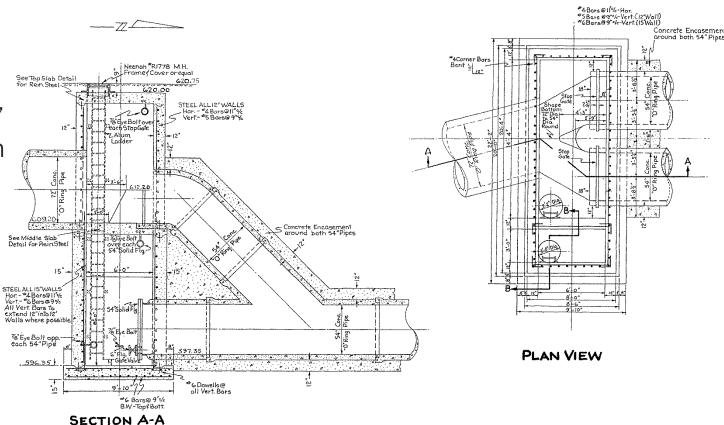
Upcoming Projects

Wolf Creek Inverted Siphon

Dual-Barrel 54"Inverted Siphon

Bidding Early Winter 2020

To be completed by December 2020



SOUTH M.H. OF TWIN 54" SYPHON UNDER WOLF CREEK



Upcoming Projects

- S-500 Rehabilitation Phase II
 - 1950' 90" Interceptor
 - Bidding June 2019
 - To be completed by December 2019





Lessons Learned

- Consider impacts and footprint of different lining technologies and design for disturbance.
- Some areas of the pipeline were in better condition than others – may allow for flexibility in selecting liner design thicknesses in future projects.
- Bidding multiple technologies was successful, but be sure specifications are written to get what you need and equivalent products.
- Design bypass pumping plan understand size and needs for large pumping operations – prepare for peaks!





Questions?



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