Oakland County Trenchless Program

Michigan Water Environmental Association
Collections Seminar
East Lansing, MI
September 17, 2013

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Civil Engineer III
Construction Management Department
Water Resources Commissioner
ROAD CLOSED

PROCEED WITH CAUTION
Oakland County Trenchless Program

- Credentials
- Oakland County Fast Facts
- Cities, Villages & Townships (CVT’s) that make up Oakland County
- Water Resources Commissioner (WRC)
- Sewage Districts
- Project Funding
- Current Trenchless Projects
- Benefits to using Trenchless Technology
- Questions & Answers
Credentials

• Bachelor of Science degree in Civil Engineering from the University of Michigan
• Master of Science degree in Engineering Management from the University of Michigan – Dearborn
• Licensed Professional Engineering in Michigan since 1995
• Downriver APWA President - 2010
• Over 22 years of experience as a Project Manager working for municipal consultants, contractor and governmental agency
• Over 14 years of trenchless technology experience ranging from $50K to $7.2M projects
Oakland County Fast Facts

- Oakland County consists of 910 square miles
- 2010 Population = 1,202,362. The County ranks 2nd in population of Michigan counties and 31st in population of all U.S. counties
- Oakland County has more people than each of these states and the District of Columbia:
  - Alaska
  - Delaware
  - Montana
  - North Dakota
  - Rhode Island
  - South Dakota
  - Vermont
  - Wyoming
Oakland County Fast Facts

- Boundaries include
  - 30 cities
  - 21 townships
  - 10 villages

- Oakland County’s most populous city as of 2010 is….(?)
Oakland County Fast Facts

- Boundaries include:
  - 30 cities
  - 21 townships
  - 10 villages

- Oakland County’s most populous city as of 2010 is...

  **TROY**
  (80,980 people)
Cities within Oakland County

- Auburn Hills
- Berkley
- Birmingham
- Bloomfield Hills
- Clarkston
- Clawson
- Farmington
- Farmington Hills
- Ferndale
- Hazel Park
- Huntington Woods
- Keego Harbor
- Lake Angelus
- Lathrup Village
- Madison Heights
- Northville
- Novi
- Oak Park
- Orchard Lake Village
- Pleasant Ridge
- Pontiac
- Rochester
- Rochester Hills
- Royal Oak
- South Lyon
- Southfield
- Sylvan Lake
- Troy
- Walled Lake
- Wixom

30 cities
Townships within Oakland County

- Addison Township
- Bloomfield Charter Township
- Brandon Township
- Commerce Charter Township
- Groveland Township
- Highland Charter Township
- Holly Township
- Independence Charter Township
- Lyon Charter Township
- Milford Charter Township
- Novi Township
- Oakland Charter Township
- Orion Charter Township
- Oxford Charter Township
- Rose Township
- Royal Oak Charter Township
- Southfield Township
- Springfield Township
- Waterford Charter Township
- West Bloomfield Charter Township
- White Lake Township

21 townships
Villages within Oakland County

- Beverly Hills
- Bingham Farms
- Franklin
- Holly
- Lake Orion
- Leonard
- Milford
- Ortonville
- Oxford
- Wolverine Lake
Water Resources Commissioner

- Formerly known as Oakland County Drain Commissioner’s Office
  - In 2008 former Commissioner McCulloch changed the name to Oakland County Water Resources Commissioner
  - Jim Nash is the current Water Resources Commissioner

- In 2012 bought the City of Pontiac WWTP for $55M. Now oversee the water and sewage facilities and WWTP.

- Comprised of approximately 250 employees

- Consists of the following departments:
  - Construction Management
  - Mapping / GIS
  - Plan Review & Permitting
  - Sewer Systems
  - Wastewater Systems
  - Water Systems
  - Construction Drain Maintenance
  - Pump Maintenance
  - Sewer Maintenance
  - RTB Maintenance
  - Electronics
  - Billing
Water Resources Commissioner

Sewer Infrastructure consists of:

- 1,123 miles of gravity sewer
- 25,623 manholes
- 140 miles of pressure sewer and force main
- 4 Retention Treatment Basins (RTB’s)
  - Birmingham RTB
  - Acacia Park RTB
  - Bloomfield Village RTB
  - George W. Kuhn RTB
Water Resources Commissioner

Water Infrastructure consists of:

- 975 miles of water main
- 10,770 hydrants
- 10,394 gate valves
1. Clinton-Oakland Sewage District

- Auburn Hills
- Clarkston
- Independence Township
- Lake Angelus
- Lake Orion
- Oakland Township
- Orion Township

- Oxford Township
- Oxford Village
- Rochester
- Rochester Hills
- Waterford Township
- West Bloomfield Township
2. Evergreen-Farmington Sewage District

- Auburn Hills
- Beverly Hills
- Bingham Farms
- Birmingham
- Bloomfield Hills
- Bloomfield Township
- Farmington
- Farmington Hills
- Franklin
- Keego Harbor
- Lathrup Village
- Orchard Lake
- Southfield
- Troy
- West Bloomfield Township
3. Commerce-White Lake Sewage District

- Commerce
- White Lake
4. **Walled Lake - Novi Sewage District**

- Walled Lake
- Novi
5. **Huron-Rouge Sewage District**

- Northville
- Novi
- Novi Township
6. **Oakland Macomb Interceptor Drainage District (OMIDD)**

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7. George W. Kuhn Drainage District

Formerly known as Twelve Towns Drainage District

- Berkley
- Beverly Hills
- Birmingham
- Clawson
- Ferndale
- Hazel Park
- Huntington Woods
- Madison Heights
- Oak Park
- Pleasant Ridge
- Royal Oak
- Royal Oak Township
- Southfield
- Troy
Trenchless Funding for Projects in Oakland County

1. Switched from water usage billing to meter flow based billing
   - Some communities now pay more, while others now pay less
   - Those communities paying more transitioned over a 3-year period

2. Those communities paying less received grant money to use towards I&I projects
   - Money was obtained from a USEPA Grant

3. Bond Sales

4. Reserve Funds within WRC budget
What?

How can a community now paying less get grant money?
How it Worked

Those communities now paying less under the meter based billing actually **overpaid** under the old system over the three-year transitional period.

Therefore, as a means of reimbursement, WRC allotted grant money to those communities to be used to tighten up their system.
AGING INFRASTRUCTURE
Recent WRC Trenchless Projects

1. Oakland Macomb Interceptor Drainage District
2. Bloomfield Township Rehabilitation Project
3. West Bloomfield Township I & I Reduction Project
4. City of Southfield Inflow & Infiltration Reduction Project
5. Amy Relief Sewer Rehabilitation
6. City of Troy I & I Reduction Project
7. City of Walled Lake Sewer Rehabilitation
1. Oakland Macomb Interceptor

- Project Funding:
  $163,000,000± SRF Loan, S2 Grant, Cash, Federal Grant, Conventional Bonding
  - Repaid by sewer rates
- Starting quantities
  - 18,750 FT of sewer lining (9’-0” to 12’-9” pipe)
  - Grouting 120,000± CF of cement grout
  - 12,000± gal of chemical grout
- Anticipated project completion by 2016
1. Oakland Macomb Interceptor
   Segment 2

- Grouting existing cracks to prevent infiltration.
- The water coming into pipe is also carrying the fines from the outside soils.
- Non-reinforced pipe, therefore losing the structural strength from the surrounding soils.
- Pipe becomes distorted and more cracks develop.
- Grouting outside the pipe to regain soil strength.
1. Oakland Macomb Interceptor
   Segment 3

- Installing 100 ft deep shafts to facilitate the necessary lining work.
- Base bid consisted of 7 shafts – Contractor only needs 2 shafts to perform the work.
- Considered alternative technologies for pipe liner
  - Spiral winding
  - Segmented panels
  - Pre-lined concrete pipe
  - Slip lined pipe
- Base bid consisted of glass reinforced polymer mortar pipe.
- Contractor is proposing to use Hobas pipe.

- Current 12’-9” sewer (16,350 FT)
  - Installing 10'-0” Hobas
- Current 9’-0” sewer (6,600 FT)
  - Installing 8’-0” Hobas

Estimated Completion Sept. 2015
1. Oakland Macomb Interceptor

Future Repairs

SEGMENT 4

• Seal running and gushing leaks and sewer lining
• Currently under design
• Starting quantities
  ➢ 3,450 FT of 36” sewer
  ➢ 1,020 FT of 42” sewer

SEGMENT 5

• Seal running and gushing leaks
• Cement grout multiple cracks (1,200 LF)
• Repair interior surface of pipe wall (1,920 SF)
2. Bloomfield Township Rehabilitation Project

- Project Funding
  $3M Bond Sale

- Project is still ongoing

- Completed 45,766 FT of CI PP for 8” – 21” sewer
2. Bloomfield Township Rehabilitation Project

Project made local news after 75% of the project had been completed.

Can you guess why?
2. Bloomfield Township Rehabilitation Project

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Can you guess why?

a) Located a collapsed sewer
2. Bloomfield Township Rehabilitation Project

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Can you guess why?

a) Located a collapsed sewer
b) Sewer backup occurred at Township Hall
2. Bloomfield Township Rehabilitation Project

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Can you guess why?

a) Located a collapsed sewer
b) Sewer backup occurred at Township Hall
c) Caused a local high school evacuation
2. Bloomfield Township Rehabilitation Project

Project made local news after 75% of the project had been completed.

Can you guess why?

a) Located a collapsed sewer
b) Sewer backup occurred at Township Hall
c) Caused a local high school evacuation
d) Found an alligator in the sewer
2. Bloomfield Township Rehabilitation Project

Answer is…….

c) Caused a local high school evacuation
What happened?

Performing CIPP lining across the street from the high school and the styrene odor got drawn into the school’s fresh air intake system.
2. Bloomfield Township Rehabilitation Project

- Next steps to reduce the odor included:
  - Possibility of using non-styrenated resin
  - Possibility of using epoxy resin
  - Possibility of using StyRedux®
2. Bloomfield Township Rehabilitation Project

• Next steps to reduce the odor included:
  ➢ Possibility of using non-styrenated resin
  ➢ Possibility of using epoxy resin
  ➢ Possibility of using StyRedux®

• Choice was to incorporate StyRedux® into the mix
  ➢ This product is a styrene collecting agent that is meant to grab onto the free styrene that is floating around in the water/steam and create a by-product that can later be filtered out and removed
2. Bloomfield Township Rehabilitation Project

• Performed extensive testing on site to measure the styrene odor

• Determined the following:
  ➢ StyRedux® did reduce the odor in the air
  ➢ The highest volume of styrene was when the refer truck doors were first opened on site
2. Bloomfield Township Rehabilitation Project

Things to keep in mind are….

- Check out the area to determine if lining near a school, nursing home, hospital, office complex, etc. Locate their air intake system
- Perform CIPP near schools during the summer
- Pre-plan if using steam since there is a perception of more steam equals more problems
- Work with building staff to possibly shut down their intake system for a few hours
- Determine the best hours of lining (i.e. office complex after 5:00 p.m.)
3. West Bloomfield Township
I & I Reduction Project

- Project Funding
  $781,000 grant

- Starting quantities were
  - 30,853 FT of sewer cleaning (8” – 27” pipe)
  - 146 locations of joint grouting (8” – 27” pipe)
  - 11,193 FT of CIPP (8” – 27” pipe)

- Project completed June 2012
3. West Bloomfield Township I & I Reduction Project

Results

• Project involved some extensive bypass pumping operations, which required additional effort by the contractor
3. West Bloomfield Township I & I Reduction Project

Results

• Project involved some extensive bypass pumping operations, which required additional effort by the contractor

• TV and cleaning revealed that the gravity sewer downstream of the force main was worse off than anticipated, due to the production of hydrogen sulfide gas
3. West Bloomfield Township
I & I Reduction Project

This resulted in a large void at the crown of the pipe and exposed rebar throughout the sewer
3. West Bloomfield Township I & I Reduction Project

• Due to the horrible condition of the sewer, it was determined to CIPP the entire length of gravity sewer instead of the first few segments

• Therefore, we had to reprioritize the work to have enough money to add 1,266 FT of extra 18” CIPP to the gravity sewer
  ➢ Stopped any further cleaning
  ➢ Eliminated all grouting work
  ➢ Evaluated all remaining CIPP work
3. West Bloomfield Township
I & I Reduction Project

This not only resolved a structural problem but also an infiltration problem since the joints also had excessive leaks
3. West Bloomfield Township
I & I Reduction Project

Important things that were learned….

- Walk the site to determine if and how bypass pumping can be configured.

- Make certain that any gravity sewer downstream of a force main is thoroughly inspected.
3. West Bloomfield Township I & I Reduction Project

Ending quantities

- 17,322 FT of sewer cleaning
- 0 locations of joint grouting
- 9,177 FT of CIPP
4. City of Southfield
Inflow & Infiltration Reduction Project

- Project Funding
  $1,250,000 grant
- Starting quantities were
  - Remove & replace lids on 145 manholes
  - Sealing 375 manhole chimneys with an internal coating system
  - Sealing joints in 200 precast manhole walls
  - Sealing 165 VFT of brick manhole walls
- Project completed October 2012
4. City of Southfield Inflow & Infiltration Reduction Project

Used an aromatic urethane product that provides 800% elongation.

Installation of the primer
4. City of Southfield Inflow & Infiltration Reduction Project

Installation of the chimney sealer
4. City of Southfield
Inflow & Infiltration Reduction Project

Work completed on the project:

- Removed and replaced 143 lids
- Installed 690 manhole chimney seals
- Sealed joints in 214 precast manhole walls
- Sealed 130 VFT of brick manhole walls
- Removed and replaced 92 manhole steps
4. City of Southfield
Inflow & Infiltration Reduction Project

Things that turned out good prior to and during construction….

- Coordination with 2 different MDOT agencies
  - Oakland Transportation Service Center (TSC)
  - Detroit TSC (work along 8 Mile Road)
- Daily communication with City’s Officer in Charge informing them of the work area
5. Amy Relief Sewer Rehabilitation

- Project Funding
  $1,213,000 reserve funds
- Starting quantities were
  - 6,300 FT of 24” CIPP
  - 750 FT of 21” CIPP
  - Remove and replace 225 manhole steps
  - Epoxy lining and sealing 34 manholes
- Project completed in November 2012
5. Amy Relief Sewer Rehabilitation
5. Amy Relief Sewer Rehabilitation

Design Process

• Diverted the DWF from the Amy Pump Station into the North Evergreen Interceptor to verify the predictions of the hydraulic model.
• Surveyed the manholes and homes in the low laying area. Data was used to update the model.
• The model determined that there are critical manhole elevations that would surcharge under extreme flow conditions.
• Rainfall data showed that September & October were the driest months of the year for flow below 13.8 cfs
• Therefore, in order to divert the pump station flow into the NEI, a temporary bypass was required for flows between 5.5 cfs and 13.8 cfs.
5. Amy Relief Sewer Rehabilitation
5. Amy Relief Sewer Rehabilitation

Temporary Bypass

• Worked with Cranbrook School to gain permission to install the temporary bypass.
• Cranbrook requested that the bypass be laid out before the school year started.
• There was concern of the students having to step over the pipe, therefore the contractor buried the pipe at certain locations.
• Pipe was also buried in road way areas in lieu of installing vehicular ramps.
5. Amy Relief Sewer Rehabilitation

Bypass pipe shown was buried to allow students to access the athletic field.

For safety reasons the school required snow fence on both sides of the bypass pipe.
5. Amy Relief Sewer Rehabilitation

Pipe is buried to allow access to parking lot

In lieu of ramps, pipe was buried underneath service drive
5. Amy Relief Sewer Rehabilitation

Wooden bridge was built over pipe to allow for students and facility to use walking path
5. Amy Relief Sewer Rehabilitation

- Unique characteristics to the project
  - No water source within Woodward Avenue median
  - Working in 3 communities (Bloomfield Hills, Bloomfield Township, Birmingham)
  - Working with 2 agencies (MDOT – Woodward Avenue / RCOC – Quarton Road)
  - Restricted lane closures and hours of operation by MDOT
  - CCTV determined that the sewer was “spongy” throughout the project
5. Amy Relief Sewer Rehabilitation

- Contractor setup two lining crews (water inversion & steam inversion)
- Contractor’s responsibility to determine lining operations based on the weather.
- Contractor trucked water onto the site. Considered running pipe through the storm sewers underneath Woodward Ave.
- Once lining operation was complete, spray lined all the manholes after removing the steps
5. Amy Relief Sewer Rehabilitation

Things that were positive are….  

- Performed modeling and field investigation to determine the location of the bypass configuration.
- Maintained a strong working relationship with Cranbrook School.
- Contractor and WRC Pump Maintenance established a daily communication log.
6. City of Troy
I & I Reduction Project

- Project Funding
  - $247,000 grant

- Starting quantities were
  - 2,300 FT of CIPP
  - 14 sewer spot liners

- Majority of the lining was in rear yards

- Project was completed in November 2012
6. City of Troy
I & I Reduction Project

- Agreed to eliminate spot liners and perform full MH to MH lining operations
- When possible, added extra line segments to allow for road side setups in lieu of rear yard setups
- Contractor was responsible for obtaining easements (permission) from residents to access rear yards
6. City of Troy
I & I Reduction Project

- Final Quantities
  - 4,692 FT of CIPP (8” – 12”)
  - Clean and grouted 14 service laterals
  - 0 spot liner repairs
6. City of Troy
I & I Reduction Project

Things that went well during the project include….

- Contractor suggested some value added services of lining the entire sewer instead of installing the spot repairs
- Worked in City streets therefore no agencies were involved
- Grouting of service lead connections to help eliminate infiltration
7. City of Walled Lake Sewer Rehabilitation

- 328 FT of 8” sanitary sewer with six (6) services
- Link sleeves installed in April 2008
- Major traffic control needed due to the manhole locations along the curb and in middle of the intersection.
7. City of Walled Lake Sewer Rehabilitation

- Due to excessive cleaning, the link sleeve tabs got bent
- Concerned that additional cleaning would require open cut to fix the problem
7. City of Walled Lake Sewer Rehabilitation

- Link sleeves were reshaped after using the restorer, an inflatable bladder made of a rigid PVC pipe
- Decided to CIPP over the link sleeves
7. City of Walled Lake Sewer Rehabilitation

Actions taken to make this a successful project:

- Communicated with businesses regularly to keep them informed of the project
- Determined best day and time to perform the lining operation (Monday after 2:00 p.m.)
- Worked with Road Commission to establish an acceptable traffic control set up
- City working with restaurant to prevent future grease buildup
Benefits to using Trenchless Technology

• Not having to deal with road closures
• Less disruptions to residents
• Multiple options are now available
• Many times it is more cost effective
• Excavation is needed only for pipe repairs
• Project is completed quicker than open cut
• Minimal impact on existing infrastructure
• Requires less exposed work area, and therefore safer of both workers and community
• Eliminates the need for spoil removal and pavement damage
Questions and Answers

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