

Project of the Year

REHABILITATION

Winner



Rehabilitation of the Oakland Macomb Interceptor Drain

BY JIM RUSH



In fall 2004, officials in the Detroit metropolitan areas of Oakland and Macomb counties realized that they had a major challenge ahead when a portion of the Oakland Macomb Interceptor Drain (OMID) suffered a catastrophic collapse that swallowed up a major roadway and threatened nearby houses. The OMID repair presented a technical challenge due to the depth and

diameter of the sewer, and it was also a vitally important piece of infrastructure serving more than 800,000 residents.

Following an emergency repair project in the aftermath of the collapse, the Detroit Water and Sewerage Department, which at that time was the owner, began a program to address the long-term health of the pipeline. Eventually, the pipeline was transferred to the newly cre-

ated Oakland Macomb Interceptor Drain Drainage District, which oversaw the design and construction of what would become one of the largest trenchless rehabilitation projects ever undertaken.

Due to the technical complexity, the urgent need for repair, and teamwork and collaboration that led to the successful completion of this project in July 2016, it has been named the 2016

Trenchless Technology Project of the Year for Rehabilitation.

“One of the most impressive things about the project is the amount of coordination and cooperation that happened all of the different entities involved,” said Jason Edberg, project manager for the NTH Consultants, the prime consultant for the project. “The magnitude of the project speaks for itself, but the thing that doesn’t get seen is the coordination among the people behind it that made it happen.”

The team for the three-phase program comprised Oakland Macomb Interceptor Drain Drainage District (a collaboration between Oakland County, Macomb County and the State of Michigan), five contractors and seven consultants.

Project Background

The Oakland-Macomb Interceptor Drain is a large-diameter sewer system that serves over 800,000 residents of Michigan. This sewer was constructed in-tunnel in the 1970s, and has experienced several catastrophic collapses over the years, with the most noteworthy being the 2004 collapse. The OMID system consists of mostly 8-ft to 13-ft diameter sewer that is up to 110 ft deep, extending below major transportation and power transmission corridors, which serve several million people and businesses.

Based on NTH Consultants inspections in 2005 through 2008, many areas of the sewer were found to be in poor condition and could be subject to additional collapses. There is no redundancy in the system, so any collapse would disrupt service to the entire service population and would affect millions more in terms of disruption of major roadway and power supply. Because another sewer collapse would be so catastrophic to the population of Michigan, this project was a top priority for the owner and the Michigan Department of Environmental Quality.

The owner selected NTH Consultants to lead a team to develop an approach for rehabilitation of the system, and to prepare contract documents for the three-phase rehabilitation and repair program:

- **Phase 1** - Installation of access shafts, flow control gates, and new pump station;
- **Phase 2** - Leak sealing, grouting of voids outside the pipe, and upgrading an existing pump station;
- **Phase 3** - Large-diameter interceptor lining and repair.



The NTH team (l-r): (front) Abdunnasser Almadhoun, P.E., Charles Roarty, P.E., Lawrence Gilbert, P.E., (middle) Jason Edberg, P.E., Keith Swaffar, P.E., and (back) Harry Price, P.E.

The program was completed in July 2016 at a total construction cost of approximately \$170 million.

Setting the Bar

This project was a first for the trenchless industry in many ways. Never before had a repair program been attempted at such a large diameter (up to 13 ft), at such extreme depths (up to 110 ft), at these lengths (more than 7 miles), and without the ability to bypass flow. This unprecedented scope of construction required complex flow control systems; innovative construction means, methods, and equipment; and efficient operations in tight work windows.

The flow control system consisted of new gate structures, retrofit of existing flow control gates, a new pump station, and upgrades to an existing pump station. The controls were owned and operated by three separate entities, OMID, Macomb County, and the Detroit Water and Sewerage Department. Operation of the system required close coordination among the contractor’s flow control manager and each of the utility owner’s staff. Working windows varied from seven to 12 hours per day and, at the end of each work day, flow was released to maintain service to more than 800,000 customers. The upstream portion of the pipeline served as a storage area for sewage while the contractors were working downstream.

“Every morning we would close the gates to flow, the flow would start to back up behind the gates, the workers

would work in front of the gates, and then every night when they left the gates were opened again and sewage flow was introduced back through the area that they just worked in,” Edberg said. “This allowed us to perform the work without the need to construct a bypass system.”

If rain was forecast, work could be performed because although OMID is a sanitary sewer, it is impacted by wet weather.

Once the flow control system was in operation, the critical part of Phase 2 began - sealing leaks in the pipe and filling voids outside the pipe that had been the cause of multiple catastrophic collapses on the system. Over 10,000 gallons of chemical grout was used to seal leaks, and over 100,000 cu ft of cementitious grout was used to fill voids outside the pipe. During this phase of the repair program, OMID began to see a dramatic reduction in system I/I of 6.5 mgd.

Large-scale Relining

The interceptor lining in Phase 3 required an extensive study, evaluation, and pre-qualification program for lining products and manufacturers to assess the available technologies in the industry that could work for this extraordinary project. It was clear that no “off-the-shelf” product existed that could be installed in these conditions. The project team worked with manufacturers to customize their products to fit the project needs, and pre-qualified seven customized products. Lining methods considered included segmental panels, spiral lining and sliplining.

This also improved competition in the marketplace, providing substantial cost savings (over \$10 million below the engineer's estimate). Ultimately, 26,000 lf of 10-ft diameter Hobas pipe was successfully installed. The Hobas liner not only provided a protective barrier against microbially induced corrosion, but system I/I was reduced an additional 10 mgd. With more than 16 mgd reduction in system I/I, the owner stands to save approximately \$23 million in sewerage treatment costs over the next three years.

"In the planning phase, we looked at sliplining as the most likely alternative to repair the sewer, but we didn't want to limit our options because of the unique challenges associated with the project," Edberg said. "So, we issued a Request for Technical Submission to see what other viable options were available. We used a series of bid alternates to allow combinations of the various products."

Jay Dee was the winning bidder for Phase 3. It bid \$46.4 million using the sliplining method. One of the reasons Jay Dee was able to win the bid was its development of a novel pipe carrier that allowed it to reline the entire project using two working shafts instead of the four that was originally envisioned.

The project suffered a setback in August 2014 when heavy rains hit the area and flooded the pipe, damaging sections of newly lined pipe. Because the pipe was in various stages of construction - some fully grouted, some partially grouted and some ungrouted, the contractor, engineer and owner had to develop a plan to demolish the in-place pipe, clean the grout, get the host pipe back into its original condition and reinstall the lining.

"I was very proud of how all the parties worked together to come up with a solution in the face of what could have been a massive project killer," Edberg said.

"It is a critical link in our regional wastewater network and is absolutely vital to our public health," said Macomb County Public Works Commissioner Anthony Marrocco at a groundbreaking ceremony in 2014. "We have taken bold steps to assure the structural integrity of the system, providing our ratepayers with a modern, structurally sound transportation system for delivering wastewater to Detroit for treatment and disposal."

Jim Rush is editor of *Trenchless Technology*

OWNER:
**Oakland Macomb
Interceptor Drain
Drainage District**

ENGINEER:
**NTH Consultants, Ltd.
(Prime); AEW, Inc.;
Applied Science, Inc.; FK
Engineering Associated;
OHM Advisors; Spalding
DeDecker.**

CONTRACTOR:
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who collectively strived to make OMID
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