The Marquette Interchange renovation, an $810-million project in Milwaukee, has been completed three months early and is expected to be $15 million under budget. The aging interchange accommodated roughly 300,000 vehicles daily and was the scene of numerous traffic accidents prior to its reconfiguration. On average, three accidents occurred daily as cars weaved across the highway to access on- and off-ramps located on both sides of the highway. The Wisconsin Department of Transportation (WisDOT) requested that the design team streamline the interchange, straighten curves, and place entrances and exits on the right-hand side of the highway to improve safety. It also required that, during the project, at least two traffic lanes be maintained in all four cardinal directions during daytime hours.

Reconfiguring the interchange, which connects three interstates—94, 43, and 794—was a huge endeavor, according to Michael Paddock, P.E., A.M., ASCE, the project manager for the design consultants, Milwaukee Transportation Partners, a Milwaukee-based joint venture formed by HNTB Corporation, of Kansas City, Missouri, and CH2M HILL, of Englewood, Colorado. The project included 52 lane miles (83 lane kilometers) of freeway, 180 structures (including 56 bridges and 30 ramps), 2.1 million sq ft (195,090 m²) of bridge deck, and 5 mi (8 km) of retaining walls, most of which were drilled secant pile walls designed to combat the site’s perched groundwater table. During construction, approximately 38,000 tons (34,473 metric tons) of structural steel was placed. “That was all the compilation of ten thousand two hundred and fifty-four plan sheets, so a pretty good-sized plan set,” says Paddock.

According to Paddock, the original Marquette Interchange opened in 1968, and by the late 1990s decades of freeze-thaw weather cycles had badly degraded it. The WisDOT was forced to consider prohibiting truck traffic on some parts of the interchange, “which would have [had] a devastating impact on the economy,” Paddock says.

In addition to straightening curves and relocating entrances and exits, the new design provides additional ramp lanes, as well as increases in ramp and merge distances. While some new right-of-way was purchased, other parcels of land will be returned to the community because they are no longer being used for the interchange.

An eight-story chemical manufacturing facility that was located within the footprint of the original interchange, the ramps extending above and around it, was demolished. The company relocated elsewhere within Milwaukee so that the 400 jobs that the facility provided would remain within the city. The replacement involved intricate scheduling because the new plant had to be built, tested, and brought onstream before the existing facility could be removed. “It was really a nice cooperative effort between the City of Milwaukee, the state, the Department of Transportation, and the Department of Commerce to pull together a package so that [the company] could recon-
struct a new, sixty-five-million-dollar plant within the city limits,” says Paddock.

The interchange’s bridges have been built for a 75-year design life. Dual steel tub girders 7 ft tall (2 m) that sit atop concrete piers support the 40 ft wide (12 m) decks of the system’s large ramps, providing redundant load paths for the elevated structures. The lower-level structures are bridges constructed with girders of prestressed concrete. The decking for both types of structures is formed from 10 in. (254 mm) deep high-performance concrete, of which the top 2 in. (51 mm) is a sacrificial layer that can be milled off and replaced as necessary. Because the sacrificial layer will protect the reinforcing steel within the decking from the corrosive effects of salt and water, Paddock does not expect the road to require its first milling and replacement for 20 years.

With the exception of the bridges, the roadways are topped with asphalt to ensure that any pavement failure that does occur starts at the surface and proceeds downward—the reverse of typical designs. With the so-called perpetual pavement that was used, “you try to keep stresses and microstrains down to a . . . minimum so that there isn’t any cracking at the bottom of the asphalt surface, and the top is where you get the higher stresses and strains,” Paddock says. “So that’s where it’s going to fail first.” The asphalt that fails can then be milled off and replaced, while the lower levels of asphalt remain intact.

According to Paddock, local business owners were concerned that reconstructing the interchange would have a deleterious effect on their sales. To ensure that everyone would feel comfortable navigating the interchange during construction, the design team developed a mapping system that was available on the Web and provided up-to-date driving directions.

Donald Reinbold, P.E., the director of the WisDOT Marquette Interchange team, explains how the project was completed early. “We set up a whole new document control system and everything that went on between the contractors and us was in writing,” he says. “Every issue was entered into a log [and] there was an estimate to the cost of what the issue might be. We tracked who had the issue, and almost all the issues were resolved in just a few days and the project moved on.” Furthermore, the contractors for the project “hit the job quickly, and they did a lot of work the first year,” Reinbold says. “Through the first winter they actually got a leg up on a couple of the phases.”

On-site safety played an important role as well, and the leadership team takes pride in the fact that there were no serious injuries at the work site. Reinbold credits the record to an owner-controlled insurance program, an intensive safety training program, drug testing, strict on-site regulations, and the presence of safety inspectors.

The ribbon-cutting ceremony for the interchange took place on August 19.

—Catherine A. Cardno, Ph.D.

ENVIRONMENTAL ENGINEERING
Long-Delayed Dredging of Miami River Channel Draws to a Close

First dredged approximately a century ago, the Miami River navigational channel in Miami was deepened to 15 ft (4.6 m) by the U.S. Army Corps of Engineers in 1933. Yet more than 70 years would pass before the channel was dredged for maintenance purposes. Over time, the accumulated sediment