On borrowed ground

Tell contractors the Wisconsin Department of Transportation (WisDOT) is planning to build 20 miles of four-lane highway in some of the most environmentally sensitive areas in the state.

Tell them final rules for jurisdictional determination of wetlands by the U.S. Army Corps of Engineers are still being worked on and this job will be going through a lot of them. Tell them they will build 20 bridges with some of the heaviest wide-flange pre-stressed concrete girders yet placed in the state; they’re going to construct 300 acres of wetland mitigation and move about 9 million cu yd of dirt where dirt is hard to find and practically all of it sits below groundwater. Oh yeah, and don’t forget to mention that they don’t have enough time to do this with a normal schedule. The work is split into seven separate contracts, and they’re going to have to keep it open to traffic all the time. Plus, some of that traffic is going to be 100-ft-plus loads of wide and low wind-tower turbine parts being moved on a daily basis through the project.

I suspect the typical answer to all of that is, “Are you nuts???” Here in the WisDOT Northeast Region the answer had to be, “When do we begin?”

Four for 41

The Northeast Region’s Oconto to Peshtigo Project converted a heavily traveled two-lane highway between the cities of Oconto and Peshtigo into a four-lane expressway with freeway bypasses around the two communities. This route currently carries up to 21,800 vehicles per day with 17.3% of the load heavy trucking.

The U.S. Highway 41 corridor is located on the western shore of Green Bay. From the city of Green Bay to the city of Marinette, this is one of the largest continuous freshwater wetlands in the state, if not in the nation. According to Wisconsin Department of Natural Resources (WisDNR) biologist Al Stranz, this region is characterized by lacustrine formations with successive beach remnants formed when the last glacier receded from the state of Wisconsin around 13,000 years ago.

These wetlands are of special concern to the WisDNR wildlife biologists, since they serve as the best spawning areas for northern pike in the Green Bay watershed. Each spring, northern pike move up the sloughs and swales and ditches throughout this three-county area to spawn in flooded areas. The pike and their newly hatched fry move downstream while these wetlands have enough melt water for the fish to make it back into the bay.

To compensate for the loss of 200 acres of wetland habitat taken by this...
project, WisDOT Regional Environmental Coordinator Mike Helmrick bought or leased 300 acres of suitable land to convert to wetlands.

The Northeast Region originally committed to completing the project in three years. However, writing the environmental document and getting it approved took the first of those years. The region decided to adhere to the original completion date and accelerate the schedule. As a consequence, the first project was started late in 2007, and the last project was scheduled to be complete late this fall.

During slightly more than two years of construction, crews will build 24.6 miles of four-lane divided highway. They will build three complete interchanges and two half interchanges. In that time contractors also will construct 20 large prestressed concrete girder structures, two long pedestrian culverts and numerous smaller drainage culverts.

Since groundwater is never far from the ground surface in this part of Wisconsin, Ken Hanzel, the Northeast Region soils engineer, specified a grade line of at least 4 ft above the original ground line. With very little vertical relief throughout the project limits, this grade line meant that the project would be constructed almost entirely out of borrow excavation. In the course of this two-year project, earthmoving contractors would haul almost one-third of the dirt normally moved in Wisconsin during this time period.

Feeling challenged all over

The entire corridor can be broken into three geographical areas, each with unique problems that contractors had to overcome. Taken in chronological order, the first area dealt with the conversion of the existing highway between the cities of Peshtigo and Oconto into an expressway.

WisDOT considered the expressway portion to be the highest priority because of the high crash rate on the section. During the five years between 1998 through 2002, a total of 438 crashes (excluding deer hits) occurred along the U.S. 41 corridor. About 57% of the crashes involved property damage, and about 41% involved personal injury. There also were eight fatalities during this period.

The primary challenge in this section was constructing the roadway under traffic.

In late August 2007 contractors began the construction of the expressway portion of the project. Michels Corp. of Brownsville, Wis., was the prime contractor. They employed

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RelyCo of DePere, Wis., to move about 1.6 million cu yd of earth. To meet the aggressive schedules, RelyCo had to move a million yards of the dirt in the first year so that Michels could begin placing the 420,000 tons of crushed aggregate base course and 330,000 sq yd of 10-in. warranted concrete pavement.

During that fall and through the winter, Lunda Construction constructed the first half of the four box culverts in the project limits. Although winter work is hard on men and equipment, the combination of tight schedules and the many environmental constraints of working within Wisconsin’s water resources required it.

In this corridor, construction on all of the culverts and bridges crossing waterways was timed to not disturb or endanger the fish during spawning season. That meant the contractors could not work in waterways between March 15 and July 1.

Since WisDOT was converting a two-lane highway to a four-lane facility, culverts were constructed half at a time on the new grade. After paving of the first half, traffic was switched onto the new two lanes. Then the bridge contractor remobilized to complete the second half of the work after the July 1 restriction was over.

The second section is the Oconto bypass. The unique challenges in this section were the construction of long bridges spanning the Oconto River and the presence of the Douglas Bake Memorial Airport.

The first project in this section was let to bid on March 11, 2008. Lunda Construction was the successful bidder on this project, which called for the grading of the southernmost section and the construction of four bridges.

The accelerated schedule was perhaps the biggest challenge for Lunda. Lunda developed a strategy that had the Oconto River crossing structures as the controlling item through the entire project duration. That meant girders would be fabricated in the casting yard in Green Bay and hauled to the project site prior to completion of the roadway embankments.

The Oconto River Bridges are parallel 718-ft prestressed concrete girder structures. WisDOT has been specifying wide-flange prestressed concrete girders for a few years. The girders across the Oconto River were 72-in. x 165-ft girders each weighing about 70 tons. These girders were the largest cast in the Green Bay area and the heaviest erected by Lunda’s Hilbert office.

Alongside these two bridges the contractor also had to erect a pedestrian bridge that was nearly as complex as the two highway structures. All of the bridges have architectural treatments on the piers. Pedestrian bridges and culverts have distinctive...
decorative motifs with stained concrete finish on the inner surfaces of the parapets.

Since the pier caps were not standard WisDOT-specified shapes, all of them were constructed with custom-built wood formwork.

In the one construction season allotted for the job, Lunda would drive over two miles of steel piling, erect three miles of concrete prestressed girders and form and pour 6,700 cu yd of concrete structure reinforced with more than 1.1 million lb of steel reinforcing.

In the meantime, Hoffman Construction of Black River Falls, Wis., working under a subcontract with Lunda, excavated and placed more than 700,000 cu yd of earth. Hoffman controlled their grading on all of their projects with GPS-controlled machinery.

The Northeast Region let the first contracts with GPS grading in mind on pilot projects in 2007. These projects were let giving contractors the option to use automated grading by altering the contractor staking provisions of the contract.

In April 2008 Hoffman won the contract to construct the bypass of Oconto north of the Oconto River. Hoffman contracted to complete the project by the end of July of this year. During that time Hoffman excavated 5.9 million cu yd of earth. Working under subcontract, Lunda drove another mile and a half of steel piling, set a mile of prestressed concrete girders and poured another 3,700 cu yd of concrete.

Both of these projects were within 10,000 ft of the airport. Because of Federal Aviation Administration rules, the contractors could not create excavations for borrow that attract waterfowl. That meant earthmovers could not enlarge or create new open-water habitats.

On the southern project, Hoffman pumped an existing 5-acre pond to use the earth below. They also truck-hauled sources removed from the project to provide the material.

In the 2009 season Zignego Construction from Waukesha began construction of the S.R. 22 interchange and the mainline paving of the entire bypass. DOT engineers had selected a close bypass of the city of Oconto. The bypass is constructed by the Copper Culture State Park on one side and important industrial and apartment properties on the other side. DOT designed the roadway with roundabouts at the interchange terminals. These work well in the narrow corridor but are difficult to construct under traffic. For this project, S.R. 22 was detoured most of the summer for the construction.

The last portion of the work bypasses the city of Peshtigo. This segment has two complete interchanges. The crossing of the Peshtigo River, two crossings of the Canadian National Railroad and the presence of rare bog wetlands presented particular challenges for the contractors in this area. This also is the location of the greatest amount of wetlands and was generally heavily forested. The east interchange area is in close proximity to the railroad crossings and other side roads. Space was often limited for all of the equipment carrying out various items of work.

Hoffman Construction was low bidder on the two projects that comprised this work.

The primary challenges were coordinating the work between structure contractors, earthmovers and the paving contractor, the environmental challenges of excavating borrow pits below groundwater and the large amount of work to be done in the short time allotted.

Borrow sites filled with groundwater as fast as they were dug. Excavating in or below water surface naturally suspends sediments in the water. Hoffman devised large-scale pumping schemes to dewater the pits. This sometimes entailed pumping water almost a mile to outlets where the water could be treated by removing sediments prior to discharge.

In one construction season, Lunda would drive over two miles of steel piling and erect three miles of concrete prestressed girders.
Hoffman would dig one pit, get it measured for payment and then use that pit as a settling basin as they dug and pumped the next pit. These borrow pits were often irregular, meandering affairs since they were essentially ridges in surrounding wetlands. As a result, the 37 ponds built as borrow sources adjacent to this project have very natural-looking lake features. They kept equipment and crews moving sometimes 24 hours a day to stay ahead of the schedule and the groundwater.

On this project the U.S. Fish and Wildlife Service also required WisDOT to mitigate in direct proportion to the taking in the watersheds of the Peshtigo and Oconto rivers. The U.S. Fish and Wildlife Service also required the mitigation to be the same type of wetland. Previously WisDOT constructed mostly marsh and allowed remnant seed in the soil to revegetate the area. About 70% of the wetland taken in this area is wooded swamp. Therefore, the USF&WS required crews to plant replacement trees and shrubs.

The region had never designed a tree-planting project that was not for landscaping purposes prior to this. One of the designers researched tree planting and designed a plan that specified planting 93,563 trees and shrubs in four mitigation sites. Last fall WisDOT let that contract, and early this spring crews from Snowden Inc. of Escanaba, Mich., using hand tools, slogged through the mud of mitigated wetland and planted those trees.

Hoffman Inc. constructed the mitigation sites in the Peshtigo and Oconto bypasses. Because of their concern with the need to excavate very true horizontal shelves in the sites, they employed scrapers towed with tractors equipped with rubber tracks. Hoffman felt site conditions would require equipment with low ground pressure and decent traction to cut the sites without causing widespread rutting.

Borrow pits and other classes of roadway excavation now are measured without survey reference lines and sections. Original and final earth measurements are taken in x, y, and z coordinates with GPS equipment. Digital terrain models of the original and final ground surfaces are created by WisDOT surveyors. The surveyors then generate cross sections and compute volumes with average end areas.

Noel is the WisDOT project development supervisor in Oconto and Marinette counties.