



Florida Everglades Restoration: New Technology to Combat a Pervasive Problem

By Barry Meyer, PE

Compromised by an exploding population and declining water supply, southern Florida's 50-year-old water management system – the Central and Southern Florida (C&SF) Project – has significantly altered the area's ecosystems, including the Everglades and Florida Bay.

In response to the deteriorating environments in the region, the U.S. Army Corps of Engineers (USACE) – in collaboration with the South Florida Water Management District (SFWMD) and various other state, federal and local agencies – completed a comprehensive review study of the 1,000 miles of canals, 720 miles of levees and several hundred water control structures that comprise the C&SF project.

The resulting Comprehensive Everglades Restoration Plan (CERP) seeks to restore the ecosystems of central and southern Florida while regulating the quality, quantity, timing and distribution of water. The 30-year, \$7.8-billion project, which will also ensure clean and reliable water supplies and provide flood protection, includes more than 60 elements.



The Spillway 381 project – part of the Comprehensive Everglades Restoration Plan (CERP) – has been designated as one of 34 critical projects needed to improve Florida's Everglades.

Stormwater Treatment Key to CERP Success

The Spillway 381 project is a component of the Western C-11 Water Quality Treatment critical project. These critical projects were authorized in Section 528 of the Water Resource Development Act (WRDA) of 1996 and were conceived with the overall objective of developing specific water quality-related projects that are essential to the restoration of the Florida Everglades. This project was ranked fifth out of 34 critical projects in order of importance.

The Western C-11 project consists of constructing a pump station and a gated spillway located in Broward County, Florida, east of Water Conservation Area (WCA) 3A between Fort Lauderdale to the north and Hollywood to the south. The purpose of this project is to improve the quality and timing of stormwater discharges from Western Canal 11 (C-11) drainage basin to WCA-3A and WCA-3B by pumping cleaner seepage water back into WCA-3A at the same rate it enters. The S-381 structure acts as a canal divide to separate the urban area to the east of the structure from the mainly natural area located to the west. The urban runoff can then be diverted to stormwater treatment areas that will clean the water prior to discharge into the Everglades.

Typically, S-381 will be closed (spillway gates in an up position) and the stormwater runoff will be pumped into water conservation areas for treatment. During storm events, however, the gates will be lowered if flood conditions are eminent. The gates will be controlled remotely from the SFWMD Command Center. SFWMD employs a team of meteorologists to forecast/track storm events to assist in the timely operation of structures such as S-381.

Flood Concerns Prompt Structure Redesign

The USACE Jacksonville District was already in the process of constructing the S-381 spillway divide structure when it was discovered that the structure – as originally designed – would restrict water flow from the eastern urban/agriculture drainage areas to such an extent that the structure posed a potential flood hazard.

The conventional structural design utilized two bays, with a 23-foot-wide vertical lift gate in each bay. The vertical lift gate system is limited in width because of the structural system required to support the gates and the gate operation equipment. It would be prohibitively expensive to install wider gates or increase the number of bays with this design.

USACE recognized that a redesign of the structure utilizing the Obermeyer Hydro, Inc. (OHI) bottom-hinged pneumatic gate system would eliminate the increased flood hazard by allowing for

free flow of flood water through the structure.

The OHI structure offered a unique advantage over the conventional vertical lift gate structure because of the ability to adjust structure width and height to accommodate virtually any design condition. The OHI gates are bottom-hinged gates; therefore, the structural design of the gate is not affected by the width of the bay. Based on hydraulic calculations performed by USACE, three 30-foot-wide spillway bays were selected. This change in design reduced the head loss through the structure to

one-tenth of the vertical lift gate system.

In addition to the hydraulic benefits, the new design also offered significant environmental benefits by being more friendly to manatees (protected under the Florida Endangered Species Act) and other aquatic animals. Lifting a vertical gate to open could result in a sudden flow of water beneath the structure. Manatees or other animals in the vicinity could be pushed beneath the steel gate and injured. Originally, a warning system was to be installed to avoid animal injury; however, this could affect gate operation. Instead, a “manatee friendly” OHI bottom hinge gate system was designed to protect the animals from getting trapped beneath an opening or closing gate. As the gate is lowered and water flows over the top of the gate, an animal would not be injured crossing the gate during operation.



Use of an Obermeyer Hydro, Inc., gate system provides additional protection to manatees and other animals that could be injured by a conventional steel gate.

Additional Design Challenges

There were several challenges that the design team encountered. Although USACE design standards were used for this project, SFWMD – as local sponsor – needed to review and concur with the design. This is especially true for the features that directly relate to the operational function of the facility, since SFWMD is responsible for operating the project. The limited familiarity with

A Closer Look: Obermeyer Dam in Southwest Florida

With the need to store water in the upper reaches of the Withlacoochee River to facilitate groundwater recharge, the Southwest Florida Water Management District (SFWMD) constructed a “Fabridam” structure in 1964 near Lake Panasoffkee. The Rufe Wysong Dam – which consisted of a 250-foot-long rubber bladder that crossed the river – was removed some 20 years later because of instability due to design and construction limitations that restricted the structure’s use.

In 1999, SFWMD – citing the critical need for a structure that provides water storage and enhances the overall environmental success of the river – began an effort to replace the Wysong Dam.

HDR was selected to design a replacement bladder system, including the use of rubber bladders, for an operable lock system that provides for the maintenance of river traffic. The replacement strategy centered on providing SFWMD

with a cost-effective system that has the flexibility to operate at varying heights while maintaining water surface stability. The recommended dam system is an Obermeyer structure that consists of multiple air-filled bladders that are used to raise metal plates that form the water control surface.

This system provides the operational flexibility required by SFWMD at a cost less than half of a typical replacement bladder system.

Construction on the \$2.1-million replacement project – which included ancillary structures and appurtenances such as boat ramps, airboat access, control structures and buildings – began in February 2002 and was completed six months later. The new Wysong-Coogler Adjustable Water Conservation Structure (AWACS) was dedicated in October and received accolades from both the SFWMD Governing Board and the Withlacoochee River Basin Board.

USACE design standards resulted in an unexpected learning curve by SFWMD.

The redesign also had to consider construction work completed for the original design. This was important to maximize efficiency of work already completed. It presented somewhat of a problem because pre-construction surveys obviously did not reflect partial construction completed, resulting in some problems understanding current site conditions that would be encountered for construction of the redesigned facility.

Project Status

Final design documents have been completed and the construction bid package is being prepared. Construction is scheduled to begin in summer of 2003, and should be completed

in early 2004. Although the \$5 million estimated construction cost is roughly the same for the redesign, there are significantly more features and enhancements to the operations of the facility.

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Editor's note: For more information on Obermeyer Hydro Inc., gate systems, visit www.obermeyerhydro.com.