

Improving Sarasota County Water Resources: Dona Bay Watershed Restoration Program

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In 2007, the completed Dona Bay watershed management plan included a series of projects that intertwine the resources and opportunities of the Sarasota County (county) Public Utilities Department, which includes the stormwater utility, water and wastewater utility, and solid waste utility. The county developed the Dona Bay Watershed Restoration Program (program) to meet several objectives of its management plan:

- ◆ Provide a more natural freshwater/saltwater regime in the tidal portions of Dona Bay
- ◆ Provide a more natural freshwater flow regime pattern for the Dona Bay Watershed
- ◆ Protect existing and future property owners from flood damage
- ◆ Protect existing water quality
- ◆ Develop potential alternative potable water supply options from the surface water source

The implementation of Phase I laid in the base structure to address the freshwater inflow

imbalances that arose due to the construction of the Cow Pen Slough Canal in the early 1960s—an impact that has persisted for nearly fifty years—while providing water quality improvements to stormwater runoff and wetland restoration, surface water storage for a potable water source, potential for aquifer recharge, a reclaimed water source for agricultural or residential irrigation systems, a 40-year supply of soil for cover for the landfill, and bonus recreational amenities for passive water sports, hiking, and birdwatching.

Supported by the Sarasota Bay National Estuary Program and Charlotte Harbor National Estuary Program, with grant funding from the Southwest Florida Water Management District and the Florida Department of Environmental Protection, construction of Phase I of the program is complete and estimated to remove over 18,000 lbs of nitrogen annually for less than \$35 per lb of nitrogen removed. In Phase 1, diversion of water effectively reduces

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the peak volumes discharging to Dona Bay, allows greater opportunities for evapotranspiration and natural infiltration, and provides hydrological restoration for nearly 100 acres of wetlands before the residual flow is released into Salt Creek, a tributary of Cow Pen Slough.

Historical View

In the early 1900s, the watershed for Dona Bay was approximately 16 sq mi. Decades of drainage projects used to control mosquitoes, create farmland and pastures, and reduce flooding dramatically changed the flow of runoff to the bay. The most significant of these projects are the Cow Pen Slough and Blackburn Canal (constructed in 1959). These two projects diverted over 60 sq mi of runoff from the Myakka Basin to the Dona and Roberts Bay—more than five times the original watershed.

The Cow Pen Slough is actually an incomplete project. Construction was halted in 1975 after a study conducted by Mote Marine (a laboratory and aquarium in Sarasota) raised concerns about the long-term impacts of the project to the health of the estuary system in the bay.

The runoff diverted into the bay by these projects has altered the natural salinity regime of the Dona and Roberts bays and made fresh water the most significant pollutant for them. The estuary is subjected to flashy, quick spikes of fresh water during storm events and prolonged freshwater inflow during the rainy seasons, impacting the resilience and viability of oyster beds and seagrasses. The runoff also has carried sediments to the bay, changing the bottom habitats in the receiving creeks and bays.

Figure 1 shows the median daily inflow to Dona Bay/Shakett Creek based on the current

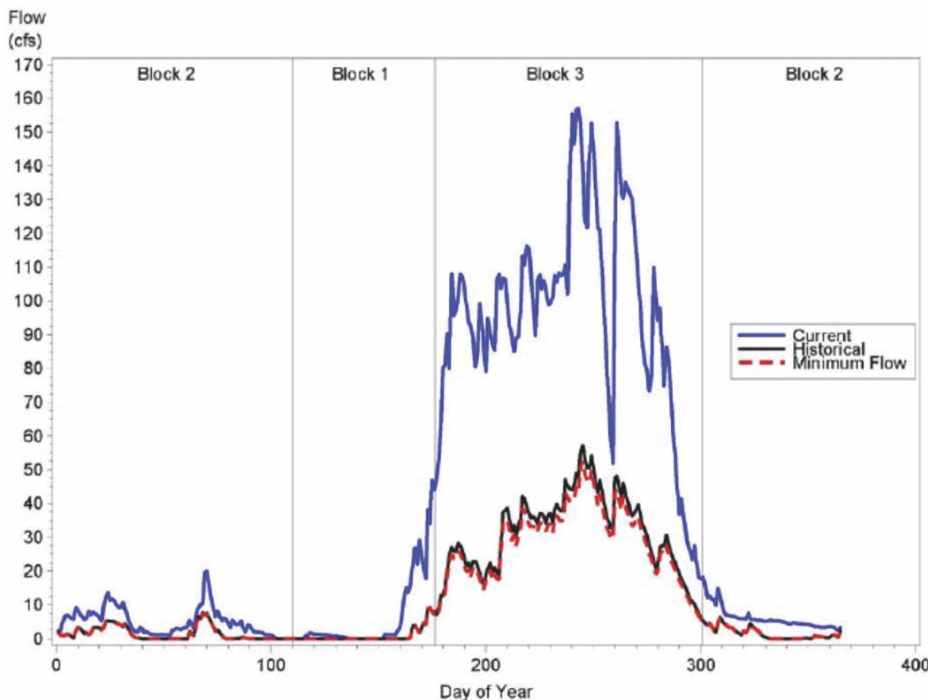


Figure 1. Dona Bay/Shakett Creek median daily flow.

flow record (blue line), historical benchmark flow record (black line), and a modified historical flow record derived by removing the maximum allowable withdrawals defined by the proposed minimum flows (red dashed line) for 1985 through 2005. The timeframe is as follows:

- Block 1 – April 20 through June 25
- Block 2 – October 27 through April 19
- Block 3 – June 26 through October 26

Dona Bay: Phase I

The program's Phase 1 construction was substantially completed by November 2016, with final grading and punch list items completed by July 2017. Overall, the project moved 1.7 mil cu yds (yd³) of earth, creating a new 100-acre surface water storage facility, hydraulic connections to and between two existing land locked lakes, and construction of pipe for conveyance from the southern lake to the wetland area for rehydration of the wetlands.

Positive Impacts of Dona Bay: Phase I

The water quality benefit to Dona Bay and the public began in November 2016 when Phase I of the project was effectively operational, with Cow Pen Slough diverted via the concrete diversion weir through the project.

The Phase I project diversion of water effectively reduces the peak volumes discharging to Dona Bay, provides nutrient removal through deep pool storage and residence time in the new 100-acre storage facility, provides an increase in surface area to promote evapotranspiration and an increase in soil water interface

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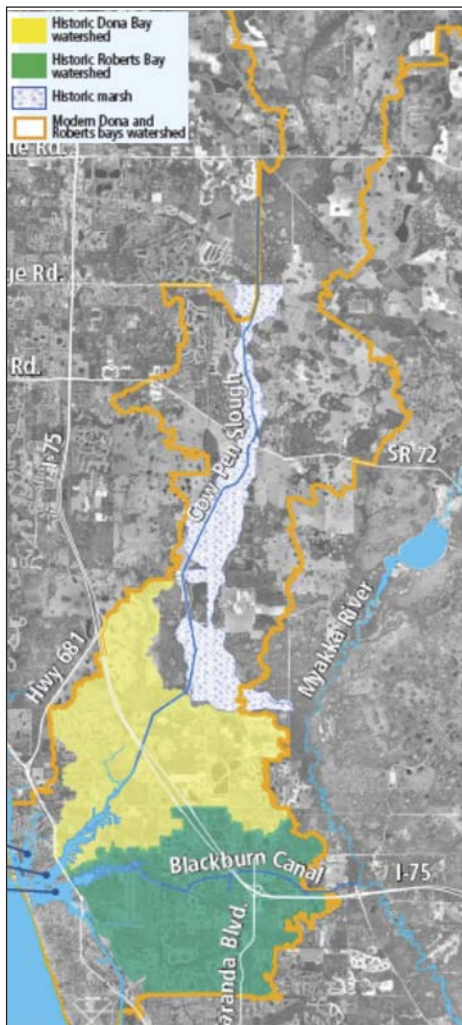


Figure 2. Watershed boundaries.

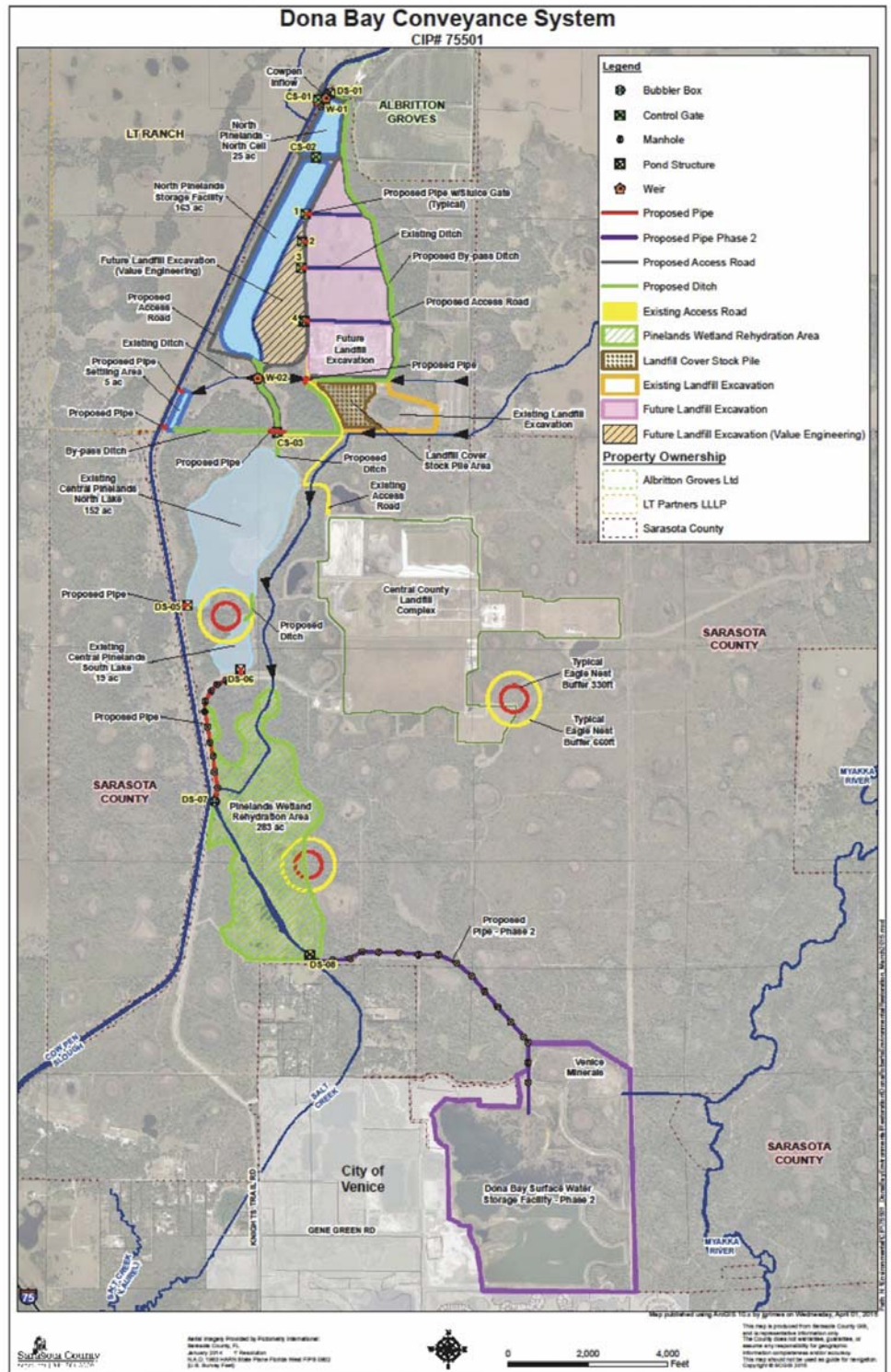


Figure 3. Dona Bay conveyance system.

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to promote natural infiltration, and provides hydrological restoration for nearly 100 acres of wetlands before the residual flow is released into a tributary of Cow Pen Slough.

By connecting the two existing lakes to the system, the treatment train is expanded, and the lakes benefit from fresh water flushing. Over 4,200 lin ft of 72-in. reinforced concrete pipe conveys water from the south lake to the wetlands. The reduction of the runoff peaks (fresh water pulses) to Dona Bay is expected to improve its salinity regime and reduce the impacts on the oyster and seagrass beds.

Site and Environmental Considerations

Dona Bay Phase I project was possible due to unique opportunities. The project was constructed on a portion of over 6,000 acres of publicly owned

land purchased for the county's landfill and environmental preservation. The landfill is located central to the 6,000 acres and the remaining site is the Pinelands Preserve, with passive recreation trails available for public use. Excess excavated material from the Dona Bay Phase I construction was stockpiled for use as future landfill cover.

Workers were educated and provided materials regarding endangered species, such as the Gopher Tortoise and Eastern Indigo Snake. With three active eagle nests in the project area, Glover Construction, the contractor, scheduled construction in the eagle nest protection zones for non-nesting season and worked efficiently within those parameters.

Stantec was the construction engineering and inspection (CEI) firm during the construction of the project and coordinated with the county to have a biologist frequently onsite. Wildlife protection was exceptional, with no known or reported injuries to wildlife species.

Appropriate erosion and best management practices were in place and inspected daily. Turbidity measurements were taken, and there were no reported violations. The contractor even installed additional erosion control measures, such as riprap, sod, and additional turbidity curtains above what was called for on the construction plans, to mitigate potential effects of imminent storm events. Additionally, the contractor installed underdrains and downspouts in certain areas that were not called for on the plans. These measures provided additional stability and prevented ongoing erosion during berm and side bank construction.

Community Relations

During the development of the watershed management and construction plans, public meetings were held to discuss them, and project-adjacent land owners were engaged and provided with project updates. The county residents were provided updates through the quarterly progress reports given to the board of county commissioners.

Prior to the start of the project, the county held a public workshop for the surrounding community that was attended by a few of the neighbors (the project is remote, so there are few of them). There was open communication during the project with the two adjacent landowners. One landowner granted the owner ingress and egress easements during construction, which were kept to a minimum and there were no complaints from adjacent property owners. A two-page story sheet was developed to communicate with multiple stakeholders about the benefits of the program.

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Figure 4. Wildlife information board at construction site.



Figure 5. Contractor working with wildlife.



Figure 6. Contractor working in adverse conditions.

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Accomplishments Under Adverse Conditions

During project construction, the project team had to make accommodations for the excessive rainfall during the winter of 2016. The contractor efficiently worked in conditions that created challenges, such as equipment sinking in the mud.

In August 2016, Tropical Storm Hermine hit the county and tested the conveyance capacity of the system, bringing excessive rain. The project site was continuously monitored through the county's automated rainfall monitoring system (ARMS) stations. Prior to the storm event, the contractor shored up the bypass canal at the diversion weir construction location, with extra riprap to prevent erosion and flooding. The effort was an effective measure to protect the incomplete construction of Control Structure 1. The dress-up required after this storm was minimal and all erosion from rainfall and storm events was promptly corrected by the contractor. The management by the project team ensured that the rainfall did not cause project delays or additional expense, and the project should still be completed ahead of schedule.

Infield Adjustments

Communication throughout the duration of the project was excellent. The foresight of the contractor for infield project adjustments was well thought out and helped to yield a better project. For instance, using light detection and ranging (LIDAR) for the survey during the design phase provided topographic data over a significant project area; however, field observations identified areas requiring infield adjustments, such as a ditch in an area that would have required a tile drain. The contractor suggested an alternative fix to this problem: removing the ditch and substantially widening one side of the berm, which made the tile drain unnecessary.

The contractor also found a large amount of extra pipe in the ground from historic citrus groves that was unknown during the design phase. The pipe had to be removed and disposal of the pipe was coordinated. Although this required an additional cost, the work was performed and did not cause any delays in the schedule of the project. When the job was complete, the contractor was approximately 10 percent under budget.

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Figure 7. New Control Structure 1 viewed from upstream (old control structure) during Tropical Storm Hermine.



Figure 8. Looking upstream at Control Structure 1 during Tropical Storm Hermine.



Figure 9. Cow Pen Slough looking downstream from Control Structure 1 during Tropical Storm Hermine.



Figure 10. Construction of Control Structure 1.



Figure 11. Diversion weir into the Dona Bay Phase I system.



Figure 12. Demolition of the old control structure.



Figure 13. Preconstruction, July 2015.



Figure 14. Post-construction, January 2017.



Figure 15. Preconstruction, July 2015.



Figure 16. Post-construction, January 2017.



Figure 17. Preconstruction, July 2015.



Figure 18. Post-construction, January 2017.

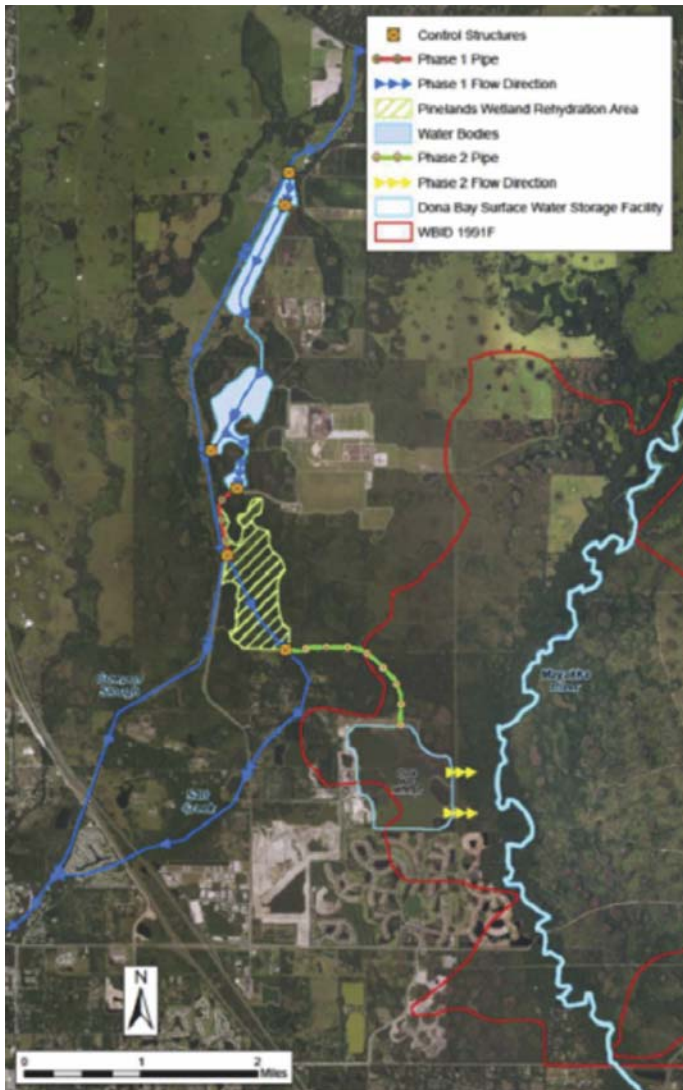


Figure 19. Main features of the Dona Bay Phase II project.



Figure 20. Salinity benefits from diversion.

Dona Bay: Phase II

The second phase of the program has been designed, and the construction documents and logistics of dewatering the old Venice Minerals 380-acre lake are being finalized. To continue to reduce the fresh water runoff to this phase of the program, the focus is on the storage and diversion of 3 mil gal per day (mgd) of water to the Myakka River. In a study completed by Environmental Science Associates (ESA), it was determined that the diversion will not create flooding impacts to the Myakka and that the nutrient concentration of the water discharged from the Phase II project is less than the nutrient concentration in the river. Also, the nitrogen loads from the project are just over 1 percent of the estimated nitrogen load for the Myakka River.

In a future phase of the program, the county may investigate the optimum volume to divert from Cow Pen Slough to the river to maximize the restoration of the salinity regime in the Dona Bay estuary.

The study by ESA also provided estimated shoreline and acreage of the creek bottom expected to benefit from increased salinities due to the 3-mgd diversion and from a potential 6-mgd diversion. For the 3-mgd diversion, the annual benefit from the salinities would be 4,000 lin ft and 50 acres of creek bottom; for the 6-mgd diversion, the annual benefit from the salinities could be 7,000 lin ft and 70 acres of creek bottom.

Dona Bay Restoration Program

Additional phases of the program have been identified by the county and presented as a program to the Gulf Consortium for Sarasota County Restore Act funds. Among the future phases, the county is investigating the feasibility of aquifer storage and recovery wells and a low-flow weir in the Blackburn Canal to limit the fresh water flow from the Myakka River into Roberts Bay, and evaluating the value of a control structure (the Kingsgate Weir) further downstream.

While the initial stages of the program focus on mechanical controls for the fresh water runoff to Dona Bay, additional phases of the program focus on wetland rehydration and shoreline restoration in the contributing tributaries to Dona and Roberts bays once the salinity levels are stable and conducive for successful shoreline and creek bed restorations. Additional information about the future phase can be found in the county's Dona Bay fact sheet and in the Florida state expenditure plan prepared by the gulf consortium.

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