

# McKay Bay Restoration (McKay Bay Mitigation Site and McKay Bay Dredge Hole Restoration)

## Tampa Port Authority

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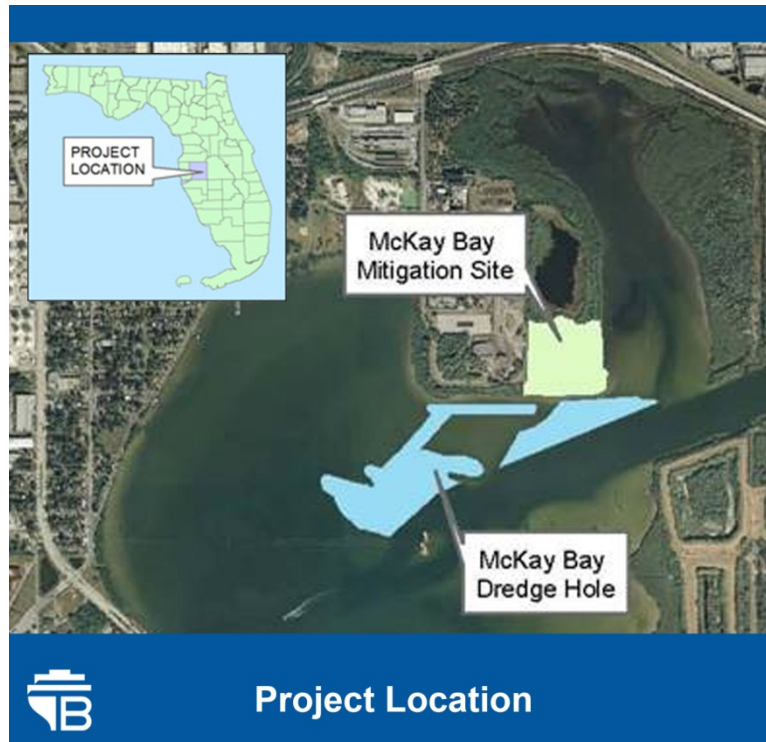
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# 1. Introduction

The Tampa Port Authority, with assistance from the Southwest Florida Water Management District (SWFWMD), embarked on a combination of wetland restoration projects within the McKay Bay Ecosystem in the Tampa Bay Estuary. This work has resulted in the restoration of 78 acres of estuarine wetlands and adjacent shallow intertidal bay bottom. The project has, in return, resulted in immediate and positive impacts to the 980 acre impaired water body of McKay Bay.



The McKay Bay Ecosystem has been subjected to numerous impacts over the past century. Parts of McKay Bay were filled to create uplands and dredge material containment sites while other areas were dredged for flood control. Various activities resulted in tidal flow constriction, and pollution from urban stormwater runoff adversely affected water quality. These man-made disturbances resulted in significant loss of estuarine wetlands, reductions in aquatic dissolved oxygen content, and the pollution of bay waters and underlying sediments.

The subject restoration work *is one of the largest Tampa Bay ecosystem improvement efforts completed to date* and is an important step in restoring the health of McKay Bay and the larger Tampa Bay estuary. The work included the creation of a diverse assemblage of wetland and surface water habitats and *the beneficial reuse of excavated material from the wetland creation site and sediments from a Port of Tampa dredge project.*



## 2. Goals and Objectives

The goal of the original project was simple – compensate for wetland impacts associated with a port development project by improving wetland resources within one of Florida’s most degraded estuarine ecosystems. Objectives evolved as a partnership with SWFWMD developed into a combination of projects. Not only would a large-scale estuarine wetland system be created, but an adjoining dredge hole restoration project would complement the project and magnify the improvements to McKay Bay. Goals and objectives for the project were further enhanced by the planned beneficial use of dredge material to restore the historical dredge hole.

Planning and construction became even more important factors in the project’s success as multiple components were now combined into a single project. Construction of the project required coordination of project schedules and project execution to ensure that material removed from the historical McKay Bay dredge disposal site (mitigation site) and Berth 222 could be efficiently placed into the submerged dredge hole. Involved parties (owners, consultants, and contractors) worked closely together to ensure that all project objectives were met and that the project was a complete success.



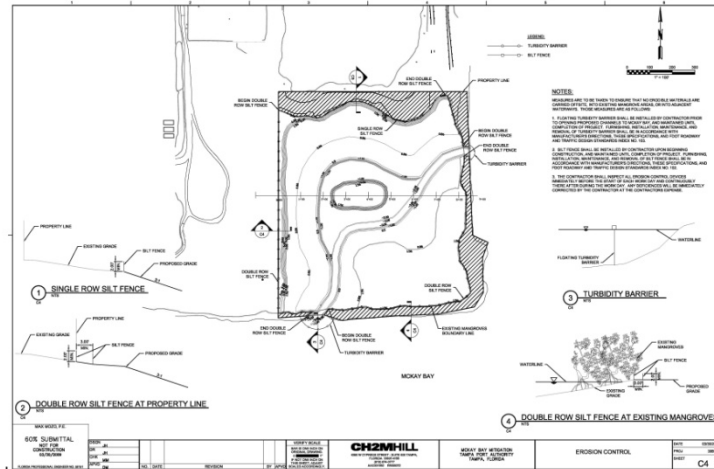
## 3. Discussion

### 3.1. Background

As stated in the introduction, the Tampa Port Authority and SWFWMD acted as inter-agency partners to accomplish this McKay Bay restoration project. The McKay Bay ecosystem has been subjected to numerous impacts over the past century. These man-made disturbances have resulted in significant negative impacts to this estuary and its connecting waterways. The completed restoration work represents a major step in restoring the health of McKay Bay and Tampa Bay as a whole.

The **first** project component was the *McKay Bay Mitigation Project*. This wetland restoration work was designed to mitigate the impacts associated with the East Port development project located along the 22<sup>nd</sup> Street Causeway in the Port of Tampa. The selected mitigation site is located along the northern shoreline of McKay Bay, on a spit of man-made land that was originally a dredge material disposal area created sometime in the 1950's. The mitigation consists of a 19 acre estuarine wetland system with a myriad of habitats including mangroves, salt marsh, tidal channel, oyster reef, and freshwater marsh. Exotic plant species were removed around the site fringes to promote long-term success of the created habitat.

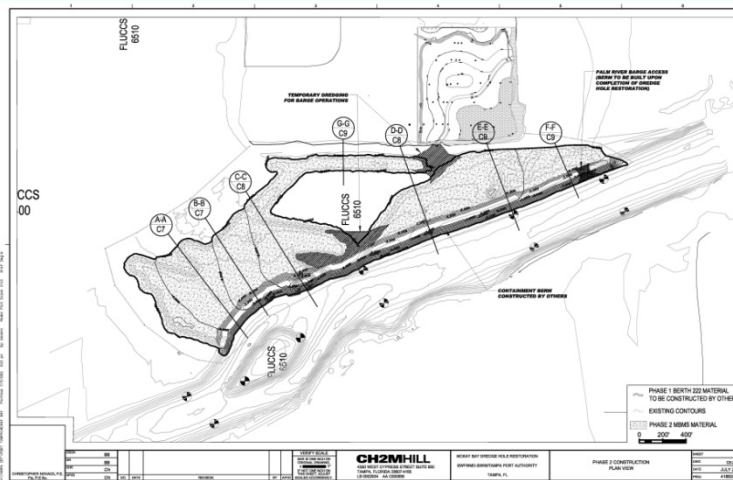




McKay Bay Mitigation Site - Plan View

The **second** project component, initiated through an agreement between the Tampa Port Authority and SWFWMD, was the *Restoration of the McKay Bay Dredge Hole*, a degraded tidal area in the McKay Bay ecosystem immediately adjacent to the mitigation site previously described. Financed by SWFWMD through the Surface Water Improvement and Management (SWIM) Program, the restoration project was constructed by the Tampa Port Authority.

The project involved the restoration of the historical dredge hole through filling with material originating from the dredging of the new Berth 222 in the Port of Tampa and the material excavated for the creation of the McKay Bay mitigation site. The final dredge hole restoration design included placement of up to 326,000 cubic yards of material within 59 acres of the dredge hole, from the new mitigation site southward to the northern edge of the McKay Bay/Palm River channel cut.



McKay Bay Dredge Hole Restoration - Plan View

### 3.2. Objectives and Methodology

Project objectives evolved over the course of the project. The initial objective involved the design and construction of a highly diverse and functioning wetland system within McKay Bay to compensate for the Tampa Port Authority’s East Port project. The Port was then approached by SWFWMD and asked to assist with an adjacent dredge hole restoration through the beneficial reuse of sediments removed from the mitigation site and a deep-water berth located in the Port proper.

#### Methodology

McKay Bay Mitigation Site: Design and permitting the McKay Bay Mitigation Project first involved the identification of available port property within the imperiled McKay Bay ecosystem. The mitigation site was historically bay bottom that was used as a portion of a dredge material containment site and filled sometime in the 1950’s. The materials excavated from the adjacent dredge hole, adjacent channel, and the lower Palm River appear to have been used to create the peninsula of land that currently contains the City of Tampa waste to energy facility and various other city facilities.



Once identified, the site was surveyed and delineated for wetlands. Due to the site’s history, extensive sediment testing was undertaken to ensure that material excavated from the site could be safely deposited in the adjacent dredge hole. The final design, consisting of the 19 acre wetland restoration project, involved the following design components:

- Preservation of a 1.7 acre mangrove shoreline;
- Creation of 3.5 acres of mangrove habitat;
- Creation of 8.4 acres of saltwater marsh;
- Creation of a 3.6 acre tidal channel and intertidal pond lined with 1,500 linear feet of artificial oyster reef;
- Enhancement of 0.3 acres of freshwater marsh and
- Creation of a 1.3 acre upland buffer by removing invasive Brazilian pepper and planting native vegetation.

A Conservation Easement was established over the entire 19 acre mitigation parcel, which will preserve the site in perpetuity as an environmental preservation area.



McKay Bay Dredge Hole Restoration: Design and permitting for the McKay Bay Dredge Hole Restoration was initiated by SWFWMD as part of their SWIM Program, which was created to protect, restore, and maintain Florida’s highly threatened surface water bodies. SWFWMD reached out to the Port to assist with this important restoration activity and formed an inter-agency agreement to accomplish the task.

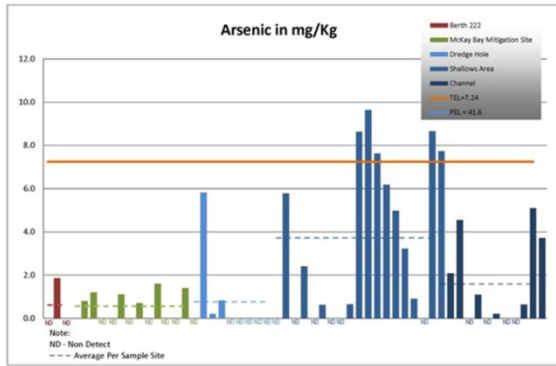


It was quickly determined that excavation material from the adjoining, planned mitigation site and from a planned berth deepening could be used as fill material for the dredge hole restoration. This *unique approach to the project resulted in significant cost savings for both entities* and provided SWFWMD with a clean, readily available fill source for the restoration of the dredge hole. The approach also eliminated the cost of purchasing fill material and gave the Port a location much closer to Berth 222 deepening and the mitigation site, thereby greatly reducing the cost of hauling excavated material from the mitigation site and eliminating the need to barge dredge material from Berth 222 to the disposal islands.

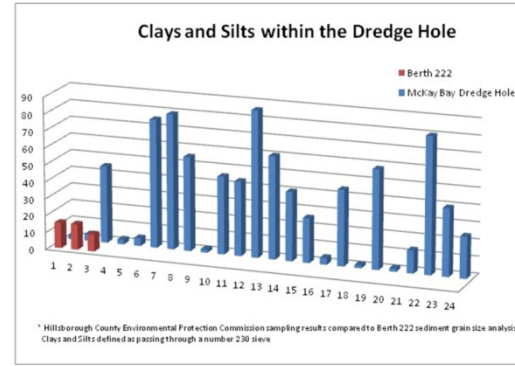
The dredge hole originated as a network of man-made, historical dredged areas located in McKay Bay, due west of the Palm River/McKay Bay confluence. Interpretation of 1948 and 1968 aerial photographs indicated that the dredge hole and the nearby McKay Bay channel cut were excavated in the 1950's and 1960's as part of the Palm River access channel dredging and dredge material containment project. This dredged material was the same material used to create the containment site where the McKay Bay mitigation site was located.

According to the publication "*Tampa Bay Dredged Hole Habitat Assessment Project*" (Tampa Bay Estuary Program, 2005), the McKay Bay dredge hole had a polyhaline mud habitat exhibiting abnormally low dissolved oxygen levels during the fall and spring months. The studies also showed that metals concentrations (including cadmium, chromium, copper, nickel, lead, zinc, and the pesticide Lindane) exceeded Florida Department of Environmental Protection sediment quality guidelines. The study ranked the McKay Bay dredge hole last (lowest environmental quality) among 11 dredge holes studied in Tampa Bay and recommended the filling of the hole to surrounding depths.

A detailed sediment comparison study performed in support of the dredge hole restoration compared particle size and metals concentrations between proposed borrow areas and the dredge hole. Study results concluded that sediments from the proposed borrow sources were generally of better quality than sediments in the dredge hole and that the work should result in a net increase in aquatic resource functions and values in the project area.



 Example metals comparison conducted for all sites



 Grain size comparison conducted for the dredge hole

The final dredge hole restoration design included placement of up to 326,000 cubic yards of material within 59 acres of the dredge hole. The McKay Bay/Palm River channel cut was excluded from the project boundaries to preserve the conveyance function of the channel and avoid potential upstream impacts in the Palm River watershed. This open confluence between the dredge hole and the channel cut complicated the dredge hole restoration design because fill material placed in the dredge hole would not be contained and could slough into the open channel. This issue was resolved by designing a containment berm at the edge of the channel. Large-grained sediments with minimal silt content were used for this purpose to ensure the integrity of the submerged berm and the success of the restoration work. Fill material was then placed in the dredge hole to effectively match adjacent submerged elevations.

Interestingly, the upland material removed from the McKay Bay mitigation site to create wetlands for this project was historically removed from the adjacent bay bottom through dredging. This material has now been returned to its place of origin in the dredge hole. Previous dredge hole restoration projects in Tampa Bay have been only partially successful. By all accounts, this restoration work has been a complete success (fill material is contained and stable) and is a model for future dredge hole restoration work in Tampa Bay and beyond. Follow up environmental monitoring will be conducted by SWFWMD to measure anticipated improvements in water quality, sediment quality, and benthic flora and fauna.

Construction, which took 16 months, has been completed and the wide diversity of habitats are maturing quickly. The wetlands are used extensively by more than a dozen species of wetland and shore birds, some of which are nesting in the restored wetlands. Seagrasses have been observed colonizing in the open tidal channel and oysters are beginning to colonize the constructed oyster shell hash. Mitigation monitoring is being conducted for a five year period to verify the success of the restored wetlands.



A manatee is observed feeding at the mitigation site

The City of Tampa Parks and Recreation Department plans a 7-mile extension to the existing greenways trail located adjacent to the project site. The City envisions the newly created mitigation site and restored dredge hole as the “Crown Jewel” of the McKay Bay Nature Park. Working in conjunction with the school district, Florida Aquarium, and The Audubon Society, the City will look to further develop nature education programs.

The creation of the McKay Bay mitigation site and restoration of the McKay Bay dredge hole will provide opportunities for citizens to observe wildlife and enjoy passive recreational activities in concert with the natural environment for generations to come.



Shorebirds foraging in the newly created habitat

### 3.3. How the Project Fulfills the Award Criteria

The Tampa Port Authority believes that the identified project fulfills or exceeds each of the six award criteria. The project is unique, primarily because of the combination of restoration elements employed. Never before has a port created a wetland mitigation site, teamed with a sister agency to restore an adjoining dredge hole while beneficially reusing sediments from one project to accomplish the other!

#### 3.3.1. Level and Nature of Benefits

The benefits to the McKay Bay environment are diverse and reflect the ambitious nature of this project. The nature of these benefits included wetland and open water habitat creation and restoration, water quality enhancement, creation of passive recreation opportunities, improved wildlife utilization, and more. The level of benefits is as impressive as the variety; a total of 19 acres of wetland habitat was created, a total of 325,000 cubic yards of excavated and dredged material were beneficially reused to restore a dredge hole, more than a dozen bird species are now using the created wetlands and restored tidal flats, and the City of Tampa plans to make the restoration area a showpiece and environmental learning opportunity of its McKay Bay Nature Park.

#### 3.3.2. Level of Independent Involvement and Effort by the Port

The Port of Tampa was the lead entity on all aspects of the restoration work. The Port teamed with SWFWMD on the dredge hole restoration component, an action which should be commended, but the port remained in responsible charge of all aspects of planning, design, permitting, and construction of the project.

#### 3.3.3. Creativity of the Project

The project is creative, primarily through its combination of various restoration elements and techniques. The project combined the creation of a wetland mitigation site, the restoration of an adjoining dredge hole, and beneficial use of sediments from one project to accomplish the other.

The dredge hole restoration design should also be noted. As stated previously, the open confluence between the dredge hole and the channel cut complicated the dredge hole restoration design because fill material placed in the dredge hole would not be contained and could slough into the open channel. This challenge was resolved by designing a submerged containment berm at the edge of the channel. Large grained sediments with minimal silt content were



identified, isolated, and used for this purpose to ensure the integrity of the submerged berm and promote the success of the restoration work.

Project related research and submerged site inspections of other dredge hole restoration projects in Tampa Bay indicated that previous attempts at dredge hole restoration had been only partially successful. So far, this restoration has been a complete success and is a model for future dredge hole restoration work in Tampa Bay and beyond, as evidenced by improved water quality, habitat utilization, and recreational use of the site.

### 3.3.4. Project Results

The project results are readily apparent. The constructed wetland is flourishing and the dredge hole has been restored to historical bottom elevations. Fish and wildlife are flocking to the mitigation site daily as shown in the many recent photographs included in this submittal.

### 3.3.5. Cost Effectiveness of the Project

The cost effectiveness of this project was centered on the use of excavation material (from the adjoining, planned mitigation site) and dredge material (from the planned Berth 222 deepening) as fill material for the dredge hole restoration. This unique approach resulted in significant cost savings for both the Port and SWFWMD by eliminating the expense that would have been incurred if fill material had to be purchased. The dredge hole project was also near the Berth 222 deepening site and the mitigation site, thereby greatly reducing the cost of hauling excavated material from the mitigation site and eliminating the need to transport dredge material from Berth 222 to the disposal islands.

### 3.3.6. Transferability of the Technology or Idea to the Port Industry

The dredge hole restoration technology and the supporting environmental studies used for this project are easily transferable to other entities in the port industry, as are the design components and studies associated with design of a highly functioning wetland mitigation site. Restoring a dredge hole sounds simple, but success depends on consideration of many factors such as fill quality, structure of the recipient site, environmental testing, post placement subsidence, flow vectors and more. Based on the low success rate of other restoration attempts in the region, this restoration work should be used for a model for future dredge hole restoration work in Tampa Bay and beyond.

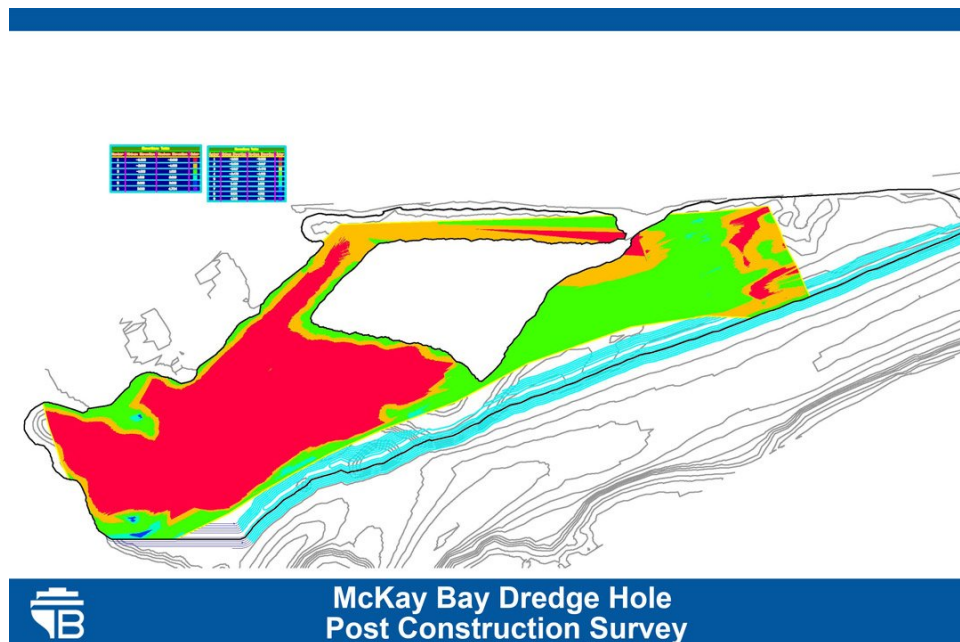
In terms of a transferable idea, the concept of the “beneficial reuse of dredged material” should be considered more frequently by the port industry. The concept has been around for many years, mostly due to the U.S. Army Corps of Engineers whose work helps to promote and utilize the concept. Ports should consider this option whenever dredging is

proposed, especially when dealing with non-construction quality dredge material (such as non-load bearing sediment with a moderate to high silt and clay content). The idea should be pursued because the material can be used for environmental improvements similar to this project and can result in substantial cost savings to the port industry.

## 4. Conclusion

The restoration work described herein is one of the largest Tampa Bay ecosystem improvement efforts completed to date and resulted in the creation of a diverse assemblage of wetland and surface water habitats. The project also involved the beneficial reuse of excavated material from the mitigation site and sediments dredged from a Port of Tampa berth deepening project.

The goal of the original project was simple: compensate for wetland impacts associated with a port development project. But the project evolved into a partnership with a local resource agency to create a large-scale restoration project. All involved parties (owners, consultants, and contractors) worked closely together to ensure that all project objectives were met and that the project was a complete success.



The McKay Bay Restoration project has resulted in major improvements to a degraded estuarine ecosystem in Tampa Bay. With the appropriate endorsement, this project should act as a catalyst for other beneficial reuse projects and efforts to restore diminished and impaired surface waters. Such efforts can originate from a need for compensatory mitigation associated with a port development project or in cooperation with a state or federal resource agency to enhance a local estuary.



# McKay Bay Restoration (McKay Bay Mitigation Site and McKay Bay Dredge Hole Restoration)

## Tampa Port Authority

### Summary

The Tampa Port Authority, with assistance from the Southwest Florida Water Management District, embarked on a combination of wetland restoration projects within the McKay Bay Ecosystem in the Tampa Bay Estuary. This work has resulted in the restoration of estuarine wetlands and adjacent shallow intertidal bay bottom in this historically impaired water body.

The subject restoration work is one of the largest Tampa Bay ecosystem improvement efforts completed to date and an important step in restoring the health of McKay Bay. The work included the creation/restoration of 78 acres of a diverse assemblage of wetland and surface water habitats and also involved the beneficial reuse of excavated material from the wetland creation site and sediments from a Port of Tampa dredge project. The work also resulted in an immediate improvement to the 980 acre McKay Bay ecosystem.

This project meets the six award criteria as follows: 1) The level and nature of benefits to the McKay Bay environment as a result of this combined project are impressive and ambitious, encompassing habitat creation/restoration, water quality enhancement, increased habitat utilization and passive recreational opportunities. This restoration helps negate numerous impacts over the past century by creating ecologically diverse and unpolluted wetland habitat; 2) The Tampa Port Authority was the lead entity on all aspects of the project and was in responsible charge of conducting all aspects of planning, design, permitting, and construction of the project; 3) The project is creative in its combination of restoration components, including the creation of a wetland mitigation site, the restoration of an adjoining dredge hole, and beneficial reuse of sediments from the mitigation site and a berth deepening project to accomplish restoration work at the dredge hole; 4) The project results are readily apparent: the constructed wetland is flourishing and the dredge hole has been restored to historical bottom elevations with fish and wildlife flocking to the mitigation site; 5) The cost effectiveness of this project was enhanced through the unique approach to the project which eliminated the cost of purchasing fill material for dredge hole restoration and gave the Port a short haul distance for excavated and dredged material; and 6) The wetland mitigation design and dredge hole restoration technology used for this project is transferable to other entities in the port industry, as is the beneficial reuse of dredged material for surface water restoration.



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