

ATKINS

2017 WEDA ENVIRONMENTAL EXCELLENCE AWARDS

Project Nomination

BARBOURS CUT DOCK EXPANSION & SAN JACINTO MARSH RESTORATION PROJECT

La Porte, Texas

Submission Category
Navigation Dredging

Submitting Firm
Atkins

April 17, 2017



Summary

The project is defined as navigational dredging, and its root objective was to expand a dock facility for a private client in Barbours Cut along the HSC. The dredging phase called for the removal of 475,000 yd³ of material to connect the expanded slip with the existing federal channel. Dredged material was transported about 9.5 miles inbound along the HSC to the San Jacinto Battleground (BU) site.

San Jacinto marsh is a 350-acre tidal wetland complex which lies at the confluence of the Houston Shipping Channel (HSC) and San Jacinto River. The site is preserved by the Texas Parks and Wildlife Department (TPWD) as the location of the Battle of San Jacinto, which is credited as the pivotal event that won Texas independence from Mexico in 1836. It is also designated as a National Historical Landmark and stands as one of the few functioning tidal wetlands among the heavy industries of Houston.

The site has undergone a series of changes through the years associated with coastal erosion and subsidence. The primary goals of the fill project were to:

1. Restore San Jacinto marsh to a historically accurate condition, helping visitors visualize the events that took place during the 1836 battle.
2. Create an inter-tidal habitat that promotes native marsh grass growth and is tolerant of varying water elevations and salinity levels.

The project faced a host of challenges including scheduling, transport distance, material type, and abundant cultural resources. Atkins' design work took place from March to September 2015 and was constructed by Weeks Marine Inc. from January to June 2016. The final product was a navigational dredging project that incorporated that restored 150 acres of inter-tidal marsh habitat at the San Jacinto Battleground that mimics the conditions of the battlefield in 1836.

Project background



Photo 1.1

Total project work included an expanded barge slip and infrastructure to accommodate expanded capacity at a mid-stream energy product facility. The dredge template included sub-aerial elevations of about +6.0 ft., and was mostly comprised of new-work material including medium-stiff clays. Photo 1.1 shows the overall project footprint.

The final design phase commenced March 2015, when 90 percent of the structural facilities and dredge template designs were in place. Engineers were given only seven months to complete the final design phase of the dock and establish a plan for the conveyance and placement of the dredged material. Project bids went out October 2015 and the owner selected Weeks Marine to complete the construction and

Project background (continued)

dredging phases. The overall project called for an in-service date of September 2016 was requested just 10 months after the notice to proceed.

An accelerated delivery schedule dictated that a non-federal placement site was required for material placement. Available placement options included a regional private dredge material management area (DMMA) and the San Jacinto BU site. The San Jacinto site was ultimately selected based on its readiness to receive material, compatibility with the excavation methods, and benefits to both the environment and historical accuracy at the Park.

A primary driver for TPWD managers to implement restoration at the site was to restore the marsh to conditions that played a pivotal role in Texas' independence. The story of the battle is told through educational plaques placed throughout the site. Photo 2.1 is one of the plaques that tells the battle story and how influential the marsh was in the fight.

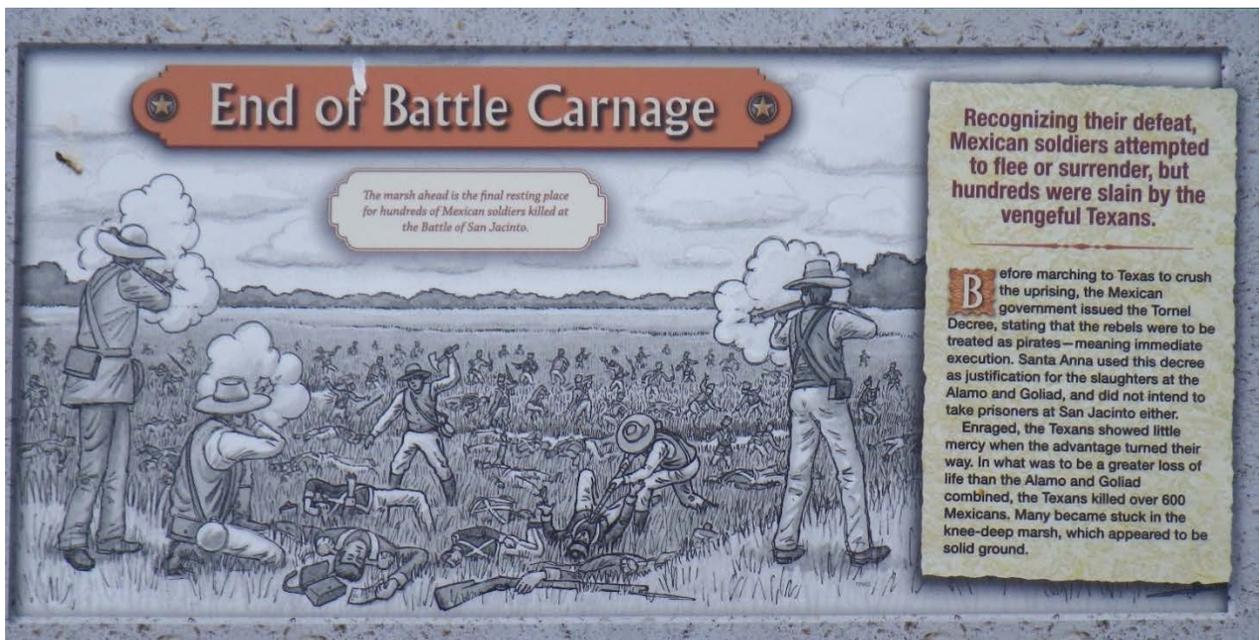


Photo 2.1

Significant subsidence has occurred within the marsh since the time of the battle, leaving behind a shallow lake where inter-tidal habitat once stood. The result of the subsidence has been the loss of historical accuracy of the site as well as the slow degradation of valuable marsh habitat for the region. As shown in photo 3.1, the pre-restoration condition of the site left park visitors wondering “why would the Mexican Army try to run across that lake?”



Photo 3.1

Project background (continued)

The San Jacinto site has received dredge fill in various capacities during past years with varying degrees of success. For this event, the park managers were interested in restoring the historical and ecological functionality of the site, provided the result would yield the desired outcome without disturbing sensitive habitats or archeological resources. The primary goals of the fill project were to:

- 1) Restore the San Jacinto marsh to an historically accurate condition that allows visitors to visualize the events that took place during the 1836 battle.
- 2) Create an inter-tidal habitat that promotes native marsh grass growth and is tolerant of varying water elevations and salinity levels.

Construction at the fill site began January 2016 and continued through November 2016 which included containment levees, dewatering, and several resting periods. Approximately 475,000 yd³ was dredged from the new dock at Barbours Cut with delivery to the San Jacinto site that established about 150 acres of restored habitat that mimics the conditions of the 1836 battle. Photo 4.1 is an aerial view of the construction site. Both phases of the project were delivered ahead of schedule by Weeks Marine. Atkins is currently performing a 2-year monitoring event to observe consolidation of the dredged sediments.



Photo 4.1

Project team members

Enterprise Products, LLC (project owner)

Texas Park and Wildlife Department (BU site)

Atkins (dredging engineer of record)

Weeks Marine (dredging and marine construction contractor)

Texas Historical Commission (historic preservation office)

United States Army Corps of Engineers, Galveston District (operations coordination)

Environmental benefits

Design fill elevations were established by analyzing existing healthy marsh habitat at the site in combination with recorded water levels for the area to restore the site to a functional inter-tidal habitat. Focus was given to the landward limit of *Spartina alterniflora*, which generally delineates the boundary between high and low marsh in this location. Initial target elevations were selected based on anticipated total consolidation and compaction rates after a two-year resting period. Filling operations targeted the upper portion of the tolerance to maximize capacity.

The value of inter-tidal habitat in the Texas-Gulf region is well documented, as is the loss of regional habitat due to industrial development. The timing of the project was such that filling activities concluded during seeding season for native plants. Immediate results were seen with the recruitment of native vegetation, such as *Scirpus maritimus*, *Schoenoplectus americanus* and *Spartina alterniflora*. Newly restored vegetation has increased habitat for birds, small mammals, and marine species like shrimp larvae and crabs, mitigating some of the effects of industrial development in the area. Photo 5.1 shows the before and after photos of the BU site.



Photo 4.1

Innovation

The Barbours Cut expansion and San Jacinto Marsh restoration project is an example of turning project challenges into project opportunity during the design process. Circumstances, for example scheduling, aligned to make marsh restoration at San Jacinto the preferred option. The

Innovation (continued)

dredge cut abuts the Spillmans Island Federal DMMA which was permitted to receive fill along with six other federal sites – an obvious choice for material disposal. There were three problems with the obvious choice:

1. Spillmans Island DMMA was undergoing construction to raise containment dikes.
2. The estimated duration needed to gain authorization to use a federal placement site would have put the project behind schedule.
3. DMMA availability in this region is at a premium value both in terms of capacity and availability.

At first glance, the San Jacinto BU site was an intimidating option for material placement. The prospect of transporting medium-stiff plastic clays 9.7 miles to a site that would be used as marsh fill was cause for initial hesitation. The receiving site was also limited in its capacity, accommodating only 132 percent of the base bid quantity and 105 percent of the maximum bid quantity.

The project was only feasible for a specific equipment spread, with a flexible contract, and only if the fill site performed as predicted. The equipment spread employed by Weeks on the project included their 30" CSD *E.W. Ellefsen* which filled scows through a spider barge. The *Weeks 115* Unloader received scows and re-fluidize the clay for hydraulic delivery to the marsh. A schematic of the dredging technique for the project is provided in Photo 6.1.

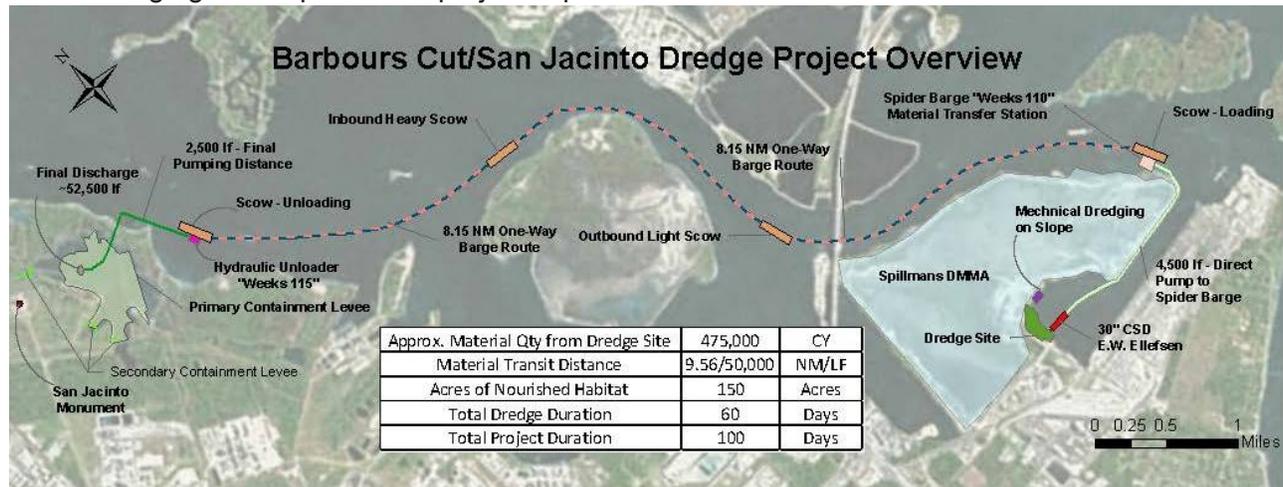


Photo 6.1

Several challenges for the successful restoration project were present. While none of these challenges is particularly difficult to deal with on their own, their cumulative impacts made for a special project:

- **Cultural resources** - significant concentrations of artifacts throughout the site.
- **Limited capacity** - nearly 1:1 ratio of excavation quantity to capacity (max dig to neat capacity).
- **Accelerated schedule** - project needed to be complete within 20 months.
- **Utilities:** active utilities surrounded and bisected all locations of the work.

Innovation (continued)

- **Freshwater Inputs** - site features three upland inputs of freshwater that drained through the site. The ability to convey that water through the site needed to be maintained during and after construction.
- **Dredge material** - borrow source for the site consisted mainly of medium to stiff plastic clays. Some fine sand and silt was intermixed, especially where the new cut overlapped with the existing maintenance material.
- **Transport distance** - material was transported 9.7 miles to its destination.
- **Active construction site** - borrow source was a new dock currently under construction, requiring constant coordination to accommodate the various pieces of equipment working together at the same site.
- **Weather** - An unusually wet season during the spring and early summer of 2016 brought record flooding to the area and posed some dewatering challenges to the project.

Despite the challenges mentioned above, the project had several advantages that were critical to its success. There was good cooperation between the owner, park managers, contractors, and engineers. From the onset cooperation began and continued throughout construction. All interests were aligned toward a common objective. The operations department of United States Army Corps of Engineers (USACE) Galveston District supported the project because it supported their objective to conserve federal DMMA capacity. The bid schedule was structured in a way that allowed incremental increases in quantity depending on fill site performance, and the site was monitored closely by qualified staff. The marsh responded well to fill manipulation and accepted additional capacity via thin-layer placement in vegetated areas. Photo 7.1 shows the equipment used on this project. An ideal equipment spread successfully transitioned virgin material from Barbours Cut into a functional marsh habitat at the San Jacinto Battleground.



Photo 7.1

Economic benefits

The option to send material to the San Jacinto BU site was a more expensive top-line investment than other alternatives. However, with all factors accounted for, it is presumable that a bottom-line gain was realized by the owner in expediting the work. In this situation, private industry bore the incremental cost of marsh restoration, because they could not wait for a less-expensive option to become available. The State received a marsh restoration at minimal cost, and regional Federal Navigation projects benefitted by conserving valuable DMMA capacity.

The marsh restoration at San Jacinto provides enhanced ecosystem services to the region while the wetland's restoration helps sustain significant public activities at the San Jacinto State Park such as wildlife observation, photography, environmental education, lecture tours, and environmental interpretation.

Private industry investment for the restoration was necessary for its timely completion. Had the site been nourished from the neighboring federal project in the HSC, the associated costs would have been born by state and federal governments. The availability of the site to private industry resulted in an on-time opening of the Barbours Cut Dock and the regional jobs and revenues that came with it.

Transferability

Common perceptions on limiting factors for dredge projects would easily dismiss the San Jacinto BU site as not feasible based on transport distance, material type, and available fill capacity. This successful project is an example of industry's ability to create a work product that challenges conventional thinking on dredge equipment capabilities. There is almost always a way to use dredged material as a resource instead of spoil. In all likelihood, there are dozens of suitable borrow sources that could have restored the San Jacinto site. The Barbours Cut Navigation project found opportunity in the San Jacinto Marsh Restoration, and all parties benefitted as a result.

The successful restoration of the San Jacinto Battleground to improve the historical accuracy of the site is a unique application of dredged material and is a fantastic example of "*Why Dredging is Good*". The project team ensured cooperation between dredge engineers and contractor firms at the designing phase, stated a clear objective for the BU site, and demonstrated a willingness to pay for it by the owner. Project scheduling motivated the organizers to look beyond obvious placement solutions, and is an example of aligning common interests among all parties to achieve a better work product and successful project completion.

Outreach and education

In a region where dredged material capacity is an ongoing issue, the San Jacinto BU Site showcases the positive uses of dredge material to a large audience – tourist and residents. The project received publicity in local media outlets. Press releases were disseminated by the Texas Parks and Wildlife Department to garner support and to keep the public updated on the project's progress. Roughly 250,000 people visit the park annually, and area school supervisors report that a field trip to the San Jacinto Battleground is standard curriculum for social studies class in Texas.

Outreach and education (continued)

During a visit to the park, guests can access a panoramic view of the preserve from the top of the 570 ft. tall monument, often with a dredge in view somewhere on the shipping channel. Self-guided tours are available along walking, biking, and vehicle routes. One of the trails takes visitors along a boardwalk through the marsh, where an informational placard tells the story of the site's subsidence and subsequent renourishment from dredging. Guided tours educate visitors about the importance wetlands had on the battle, benefits to the environment, and the role navigational dredging played in restoring the site. The newest addition to the trail system is planned to be the primary containment dike at the south end of the project – designed and built to serve as a walking path after dredging is complete.

The park hosts an annual reenactment in remembrance of those who fought in battle. It is the most well attended event of the year at the park with crowds being bussed in from parking facilities several miles away. This year will be the first event in a generation where site conditions at the marsh will emulate the environment that played such pivotal role in Texas gaining their independence.

For additional questions contact

Mark B. Stroik, project manager

100 Paramount Drive, Suite 207

Sarasota, FL 34232

Phone: 941.225.4826 | Fax: 941.371.7297 | Email:

Mark.stroik@atkinsglobal.com

© Atkins Ltd except where stated otherwise.

The Atkins logo, 'Carbon Critical Design' and the strapline
'Plan Design Enable' are trademarks of Atkins Ltd.