Significant Land Reclamation in The United States

PROFESSIONAL PORT MANAGER (PPM®) PAPER

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Figure 1- Eighteen (18) Acre land Reclamation Project - Tamp Bay 2015

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PORT TAMPA BAY

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Biography

PATRICK BLAIR, P.E., S.I

Patrick Blair is the Vice President of Engineering at Port Tampa Bay, joining the Port in 2010. As Vice President of Engineering, he oversees all of Port Tampa Bay's capital improvements including design, permitting, construction and dredging. As well as overseeing the maintenance of the Ports approximately 5,000 acres including two Spoil Islands and over 75 Berths.

Patrick has more than 20 years of engineering and construction experience. Before joining the team at Port Tampa Bay, Patrick was a structural design consultant at Weber and Tinnen Structural Engineers and has been a principal and owner at several structural consulting firms.

Mr. Blair is also a Forensic Engineer working on approximately a thousand cases, providing expert opinions as well testimony in both depositions and trials.

Patrick is a Licensed Professional Engineer, and Special Inspector in the State of Florida. He has a Bachelor of Science in Civil Engineering from the University of South Florida, with a Capstone in Structural Engineering.

Mr. Blair served as a decorated Sergeant in the Unites States Army, receiving two NATO Medals for his participation in the Kosovo and Bosnia campaigns.

Abstract

Ports are a vital part of the world trade network comprised of many land and sea routes. These sea routes require deep water channels to allow ingress and egress of maritime vessels. These deepwater channels can be extremely expensive to create and maintain. New channels can also have a significant negative impact on environmental resources such as sea grass, oyster beds, coral, and others. Thus, existing land adjacent to the existing deepwater channels is the best location for new a terminal comprised of a berth, wharf, and enough upland lands to load, unload, operate, and store products.

These uplands adjacent to deep water channels are becoming scarcer, due to growth and development of ports as well as urban development encroaching on seaports. One of the few solutions to the diminishing uplands required to provide food, fuel, and other necessities to a local economy is land reclamation. When the land reclamation is significant in size it can become very difficult and complex due to environmental permitting, funding needs, and submerged land rights.

The objective of the paper will be to create a resource for other Ports who may not have experience with a substantial land reclamation project and may not investigate it as a potential solution.

Background

Many ports struggle with the lack of availability of land adjacent to a deepwater channel. Purchasing land adjacent to a deepwater channel would be ideal, but un-fortunately there is a lack of available undeveloped parcels, and/or lack of willingness of owners to sell the land.

The public can be misinformed on the topic and assume that Ports can simply go anywhere, not understanding that the Federal and private Channels that provide safe and efficient navigation of maritime vessels are extremely costly to construct and can be demanding on environmental resources. This can create public relations challenges while undertaking the project.

The Figure below provides data from the Army Corp of Engineers (ACOE) Jacksonivlle District on recent deepening projects. The average cost per cubic yard is $81 including mobilization/demobilization and general conditions. At this cost per cubic yard rate a standard 500 feet wide by 45 feet deep Trapezoidal Channel would be $438 Million per Mile.

Location	Project Cost, (Millions $)	Quantity (Millions CY)	Environmental Mitigation Costs	Status
Miami	220	5	~$30M (8 acres hardbottom reef, 24 acres seagrass)	Construction Complete
Jacksonville	420	18	~$3M (wetlands and SAV)	Construction Complete
San Juan	60	2.2	N/A	Construction Start Imminent
Tampa	1,000	21	TBD	Study to Complete Aug 2024
Port Everglades	1,350	5	~$675M(Coral Impacts)	Study Ongoing

[1]Figure 2- Jacksonville District Channel Deepening Costs

The costs of creating a new deep-water channel can easily make a potential terminal project have a negative return on investment. The data above is for deepening projects which have at one point in the past accounted for the environmental impacts. Though some of these examples

[1] Table created by Bryan Merrill, Project Manager U.S. Army Corps of Engineers, Jacksonville District

include significant environmental impacts costs due the increased footprint resulting from the trapezoidal shape of channels causing every foot of deepening to yield four feet of additional first cut dredging at the edges of the new channels.

A completely first cut new channel would not only be extremely costly but would take years if not decades to perform environmental studies, permitting, and congressional approval if done under a federal action. Due to the sizes of the modern vessels and their limited ability to maneuver, navigable channels have to be in linear path and void of abrupt changes in direction, with significant minimum widths and turn radius of significant sizes. This requires channels to be at specific locations not allowing them to be designed to avoid natural resources such as sea grass, oyster beds, coral, and other resources. Recent deepening dredging projects have had, and are proposed to have, significant negative impacts on natural resources.

The National Oceanic Atmospheric Administration (NOAA) report[2] stated that the Port of Miami deepening project from 2015 to 2016 caused severe impacts to coral reef habitat, over an estimated 278 acres of reef. This impact has increased scrutiny of first cut dredging and deepening projects, with greater study and examination into environmental impacts.

The Army Corp of Engineers (ACOE) reported that the Port Everglades navigation improvement project is projected to have an estimated coral loss due to the proposed deepening project of 449,000 units that includes about 26 acres of coral habitat, and a projected cost for mitigation, avoidance, and protective measures of $675 Million.[3]

[2] Examination of Sedimentation Impacts to Coral Reef along the Port Miami Entrance Channel, December 2015 and April 2016, NOAA's National Marine Fisheries Service , August 29, 2023, Page 1

[3] Port Everglades Improvements Mitigation Industry Day Presentation, January 12, 2023 Page 9 and 12

Due to the scarcity of undeveloped land adjacent deep-water Channels, as well as the cost and environmental implications of dredging a new deep-water channel, other options need to be explored. Land reclamation can be a solution to this issue by creating land adjacent to an existing deep-water channel by filling the water column. This paper will explore the requirements for significant land reclamation in different regions of the United States, including the East Coast, West Coast, and Gulf Ports.

Significant land reclamation requires the rights to the submerged land at the bottom of the water column, extensive permitting through Federal and State permitting agencies, mitigation for environmental impacts, unique construction techniques, geotechnical improvements, and significant capital costs.

Submerged Land Rules and Ownership Rights

The ability for Port to reclaim land is contingent on having rights to the land at the bottom of the water column, these lands are commonly called submerged lands. Until 1937, coastal states controlled the seabed without dispute by the federal government. In 1945 the Federal Government sued the State of California for the rights to the submerged lands within three miles from the coastline, as well as Texas and Louisiana in 1950, each time the Supreme Court ruling in favor of the Federal Government. Congress passed the Submerged Lands Act, and in 1953 President Eisenhower singed the Bill into Law[4]. The Submerged Lands Act grants coastal states title to natural resources located within three miles from their coastlines. Thus, typically submerged lands are owned by the States, but some of these submerged lands were privately owned prior to the formation of the State and remains privately owned today with little to no restrictions.

Some ports are not special districts or entities but State Ports and will have ownership rights to the submerged lands such as Mississippi, Alabama, Georgia, South Carolina, North Carolina, Virgina, Maryland, Massachusetts, and New Hampshire.[5] These ports would not require purchasing, leasing, or an easement to fill the submerged lands.

Other ports and local municipalities own the rights to the Submerged Lands, due to granting by the State. Both the City of Los Angeles and the City of Long Beach were granted

[4]James W. Corbitt Jr., The Federal-State Offshore Oil Dispute, 11 Wm. & Mary L. Rev. 755 (1970),
[5] Seaport Governance In The United States And Canada By Rexford B. Sherman, Director Of Research And Information Services American Association Of Port Authorities

sovereign tide and submerged lands in trust in the early 1900s from the State of California for development of the Port of Los Angles and the Port of Long Beach. In 1911 the State of California passed a statue in 1911,[6] that said "lands shall be used by said city and by its successors, solely for the establishment, improvement and conduct of a harbor, and for the construction, maintenance and operation thereon of wharves, docks, piers, slips, quays, and other utilities, structures and appliances necessary or convenient for the promotion and accommodation of commerce and navigation, and said city, or its successors, shall not, at any time, grant, convey, give or alien said lands, or any part thereof, to any individual, firm or corporation for any purpose whatsoever; provided, that said city, or its successors, may grant franchises thereon, for limited periods, for wharves and other public uses and purposes, and may lease said lands, or any part thereof, for limited periods, for purposes consistent with the trusts upon which said lands are held by the State of California and with the requirements of commerce or navigation at said harbor."

In 1927 the Texas State Legislature granted the Port of Houston "all the submerged lands lying and being situated under the waters of Buffalo Bayou, San Jacinto River, White Oak Bayou, Bray's Bayou, Simms Bayou, Vinces Bayou, Hunting Bayou, Greens Bayou, Carpenters Bayou, Old River, Lost River, Goose Creek and Cedar Bayou, and all other streams within the authority tributary to the Houston Ship Channel, so far up said streams as the State may own same … for public purposes and for the development of commerce"[7]

In 1945 Florida established the Tampa Port Authority, formally Hillsborough County Port Authority, currently doing business as Port Tampa Bay. The special enabling act creating

[6] California Statuets.1911, Ch. 676, p. 1304

[7] Special District Local Laws Code Title 5 Chapter 5007. Port Of Houston Authority of Harris County, Texas

the Hillsborough County Port Authority as a port district gave "Title to, right of entry upon, and the right to regulate the improvement of all submerged lands belonging to the State of Florida contained within the area designated in Section 2 of this Act are hereby granted to the Port Authority, subject to the riparian rights of the respective owners of the uplands adjacent thereto. Such titles and rights shall effectually and fully vest in said Port Authority from time to time upon said Authority filing with the Trustees of the Internal Improvement Fund of the State of Florida a certificate of territorial designation and of requirement or necessity of and for such submerged lands or any part thereof, and no action by said Trustees shall be required to vest the title to the submerged lands so designated in said Authority. . . ."[8]

Surprisingly research on Costal States laws, regulations, and policies on submerged lands yielded that every Coastal State leases submerged lands.[9] While these rules varied State to State, all Coastal States leased Submerged lands, and some still sell submerged land rights, with restrictions on access and navigation.

There is an apparent availability to submerged lands rights, by either ownership, lease, purchase, or easement which provides a method of rights to almost every port to create or reclaim land adjacent to an existing deep-water channel that otherwise would not be available.

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[8] O'Connor, Thomas J. (1987) "Forty Years of the Tampa Port Authority," Sunland Tribune: Vol. 13 , Article 11.

[9] New Tools For Marine Conservation: The Leasing And Ownership Of Submerged Lands
MICHAEL W. BECK, THERESA D. MARSH,SHAUNA E. REISEWITZ,AND MARCI L. BORTMAN
Marine Initiative, The Nature Conservancy & Institute Of Marine Sciences, University Of California–Santa Cruz

Permitting and Mitigation

All land reclamation projects will require Federal permitting through the Army Corps of Engineers, as well as potential permitting from the State and local governments.

The 1972 amendments to the Clean Water Act established federal jurisdiction over navigable waters, defined in the Act as the "waters of the United States". Section 404 of the Clean Water Act requires permitting through the ACOE for the discharge of fill material into all Waters of The United States (WOTUS), including wetlands.[10] Section 404 also gives States and Tribes the right to assume 404 permitting responsibilities. Until recently only two States had assumed responsibility for 404 permitting Michigan and New Jersey. After almost thirty years, since 1994, the Environmental Protection Agency (EPA) approved Florida to assume responsibility for 404 permitting as well.[11] The State of Florida's 404 delegation begins 300 feet from the Mean High-Water Line (MHWL), with the ACOE retaining 404 permitting authority for Florida Seaports.

Due to the desired land reclamation project being near or adjacent to an existing Federal Channel, Section 10 of the Rivers and Harbors Act of 1899 requires permitting through the ACOE for the construction of any structure in or over any navigable water of the United States.[12]

[10] https://www.epa.gov/cwa-404/permit-program-under-cwa-section-404
[11] https://www.epa.gov/fl/floridas-clean-water-act-ss404-permit-program
[12] https://www.spl.usace.army.mil/Missions/Regulatory/Jurisdictional-Determination/Section-10-of-the-Rivers-HarborsAct/#:~:text=Section%2010%20of%20the%20Rivers%20and%20Harbors%20Act%20of%201899,water%20of%20the%20United%20States.

The law applies to any dredging or disposal of dredged materials, excavation, filling, or any other modification of a navigable water of the United States.

In Terms of Federal Permits, regardless of if you're in Michiagan, New Jersey, or Florida all Land Reclamation projects will require a ACOE Permit under section 10 of River and Harbors as well as Section 404 through the ACOE or one of the three above mentioned States.

The ACOE permit under Section 10 of the River and Harbor Act as well as Section 404 of the Clean Water Act, will require proposed avoidance and minimization measures, proposed compensatory mitigation, purpose and need, alternative site analysis, and consideration of cumulative effects.

Avoidance and minimization is required to show that the location selected is being chosen to avoid natural resources such as sea grass, oyster beds, and coral, as well as measures during construction to avoid affecting protected species and their habitats, and studies showing the affected fill project will not affect water circulation and flushing of the Habor or Bay. Natural resources within the footprint of the proposed project site will not restrict the project from being approved but must be justified on why the proposed project site is the best possible option. Typically, surrounding port waters are at a deeper depth and have little to no shallow waters that are capable of supporting marsh, mangrove, or submerged aquatic vegetation, except at small areas along the shoreline. If there are natural resources within the project footprint, they will need to be mitigated. Protective measures during construction are typical and standard practice in modern marine construction, such as turbidity curtains, dedicated species observers, noise abatement, and limiting construction to daylight hours.

Proposed compensatory mitigation is required for any environmental impacts including special aquatic sites and essential fish habitat within the footprint of the proposed project site. Regulation (33 CFR Parts 325 and 332) "Compensatory Mitigation for Losses of Aquatic Resources,"[13] published by the Army Corps of Engineers and the Environmental Protection Agency established a hierarchy of compensatory mitigation that is based upon the likelihood of a mitigation plan being both successful and sustainable. The options in the hierarchy order are as follows.

Mitigation Bank Credits

Mitigation Bank Credits are the regulatory preferred method of mitigation compensation. One of the issues with buying the credits from a third-party bank is that there is a lack of available credit, due to the fact that the credits have to be in the same watershed as the proposed project and be of the same mitigation type. Purchasing credits if available and reasonably priced can be the preferred method in in-leu of constructing your own mitigation project, labeled as Permittee Responsible Mitigation (PRM). Construction of a mitigation project requires years of maintenance and associated costs. The risk of construction overruns as well the final credit amount being variable due to the amount of success of project being unknown. Banks are also a for-profit business, and due to the scarcity of credits, the costs can vary dramatically from one bank to another. Credit costs can also vary depending on the type of credit required for the resource being affected.

[13] https://www.ecfr.gov/current/title-33/chapter-II/part-332

In-Lieu Fee Program Credits

In-lieu fee program credits are similar to a Mitigation Bank, as you pay the for the mitigation compensation via credits, The program is an agreement between a regulatory agency and a single sponsor which must be a public agency or non-profit organization. The sponsor collects funds from the permittees, the sponsor then uses the pooled funds to create mitigation sites. This method is typically very favorable to the permittee as well, but availability of In-Lieu Fee Program Credits can be very limited.

Permittee-Responsible Mitigation

Permittee-Responsible Mitigation (PRM) is compensation provided by the creation of a mitigation project(s). The benefits of a mitigation project are you can potentially create credits at a cheaper cost than purchasing credits, as well as create excess credits that can be banked for future compensation. These projects can be difficult to design, permit and construct. First you need to have rights to land adjacent to shallow water to create a project capable of sustaining aquatic resources after construction. These waterfront lands can be very expensive, and gaining ownership or easements to construct the project can be difficult. The site will require long-term maintenance, the associated costs of such maintenance, and perpetual conservation easements. The number of credits generated is theoretical and won't be fully recognized until years later after success criteria is met. There are three types of PRM, watershed, onsite and in-kind, and offsite and out of kind. The regulations give preference to mitigation in the same watershed to the needs of the watershed, second preference is given to applicants proposing to protect the remaining aquatic resources on the project site by way of maintenance and preservation, the last preference is for a mitigation project not in the same watershed and of different habitat type, this

type of proposed compensation will most likely be rejected, or will require significant documentation as to why the other options are not available.

The needs of the watershed can allow for creative mitigation solutions outside of in-kind mitigation. For example, the Florida Department of Transportation recently mitigated seagrass impacts by installing a new culvert under a nearby causeway, which resulted in significant water quality improvements to the area upstream of the causeway. Improvements to the seagrass bed are readily seen. Typically, the Departments would've had to undertake an expensive and risky seagrass planting project to mitigate these impacts or purchased credits, if available. Seagrass credits are hard to obtain due to the unpredictable nature of seagrass bed growth.

Purpose and need for a port to expand should be simple to justify, as need to expand its existing deep-water cargo facilities to sustain the region's growth and meet the consumer demand. The need for water dependency is simple as well to justify, as berths and wharfs are water dependent.

Alternative analysis is required per Section 404 of the Clean Water Act[14], for projects that include the discharge of dredged or fill material to waters of the United States. No action is compared to the preferred project and alternatives based on the following criteria: site availability, minimum navigation access, minimum backland size, and location. The least environmentally damaging practicable site will be selected.

[14] https://www.epa.gov/cwa-404/memorandum-appropriate-level-analysis-required-evaluating-compliance-cwa-section-404b1

Site Availability

Potential sites must be available and not currently leased to port tenants or under private ownership.

Minimum Navigation Access

To accommodate additional demand for deep-water cargo service, potential sites must be waterfront and adjacent to a deep-water channel.

Minimum Backlands Size

Backlands are needed to load, unload, and provide temporary storage for cargo as well as operational infrastructure. Backland area is essential to provide the temporary storage needed until the product can be inspected by US Customs and Border Patrol. Operational needs require a minimum of 10 to 20 acres of backlands depending on the type of operation, such as bulk, break bulk, container and cruise.

Location

The preferred location needs proximity to existing Port infrastructure such as security operations, Custom and Boarder Protection, rail, utilities, roadway and highways, or enough land to create a similar cluster. Tenants can require close proximity to other tenants with related and compatible service.

Consideration of cumulative effects will be evaluated in determining if a permit should be issued, based on the proposed projects probable benefits over time compared to the expected

detriments. Port expansion projects will typically generate benefits to the public that will outweigh the one-time environmental impacts and the perpetual minor loss of habitat that can be mitigated elsewhere.

All land reclamation projects will require Federal permitting through the Amry Corps of Engineers, under Section 10 of the River and Harbor Act as well as Section 404 of the Clean Water Act. Permitting significant land reclamation project can be intimidating, but port expansion projects have a justifiable purpose and need as well as a net positive cumulative effect on the public interest to receive permitting. Environmental impacts are typically minimal with port land reclamation projects due to the natural deeper waters surrounding ports, as well as the ability to select a location to fill that avoids these resources. The environmental impacts that are not avoidable can be mitigated through either purchasing of credits or RPM projects to offset these impacts. The costs associated with mitigating these environmental impacts can be extremely low in comparison to the overall project costs.

Construction Methods, Requirements and Costs

Land reclamation in its simplest definition is creating land from filling waters. Significant land reclamation requires large volumes of fill material, such as sand, clay and rock. The two main methods of procuring the fill material, one is to dredge the material from the ocean/sea floor, or the harbor/bay bottom, the other main source of material is to import the material via upland location sites.

The preferred fill material needed to create a large land reclamation project would be sandy soils, and rock due to their near immediate consolidation. Clay is the least preferred fill material as it requires some type of geotechnical improvements to prevent future settlement issues prior to construction of upland structures including cargo yards. Sand can be found in abundance on sea/ocean floors, as well as harbor/bay bottoms at some depth. Poor quality sediments may sit atop the sandy soils, but with proper site selection they can accessed reactively easily with a hydraulic dredging operation. Sandy soil borrow pits are extremely common, but trucking, transportation, and placement costs compared to a large-scale dredging operation can be significantly more.

When the volumes are low, importing material from an upland borrow site is the most common and economical method, but when the volumes become significantly large, as is required for a significant land reclamation project, dredging becomes the more economical option. This is due to the significant costs of mobilizing a larger hydraulic dredge operation as well as the additional permitting and potential environmental impacts of a large dredge site. Also, large volumes of material can be placed significantly quicker with dredging and pumping

the material than importing via dump trucks and placing with upland construction equipment such as front loaders.

Figure 3- Hydraulic Dredge Filling at Palm Jebel Ali in 2002

Figure 4- Upland Land Reclamation Using Front Loader Placement

In general, a significant land reclamation project will be done with dredge materials, due to both the cost savings, as well as the reduced time to construct the project, but these projects will still be very costly and capital intensive. Creative planning can reduce these costs by adding time or using less preferred material types such as unsuitable soils like clays or concrete debris.

One of the ways of reducing costs to a land reclamation project is to allow the local community to use the site as a landfill for concrete construction debris and unsuitable soils such as clays. A Request for Proposal (RFP) can be advertised to include a lease of the site which includes protective legal measures to the port. This requires extensive construction oversight by port staff or contractors to ensure unwanted debris such as metal, rubber, or trash is not placed into the site. This method would also require significant testing of the material to prevent contaminated soils from being placed on the site. This method would reduce costs extensively but would take significantly longer to complete the project. A site with a subgrade composed of a high amount of clay material will have significant settlement in future if a geotechnical improvement project is not performed. If the overall site can be phased into construction and operation, which is not uncommon, some portions of the site can be surcharged with soil piles. These soil piles will squeeze the water out of the clays over time. A relatively cheap method of speeding up this process is wick drains. Soil piles and wick drains in combination can reduce the consolidation process significantly and typically be accomplished within one year.

The overall challenge of reducing costs of a significant land reclamation project can be broken into the components of purchasing, transporting, and installing suitable fill material. Thus, one of the most effective ways of reducing a significant land reclamation project is to construct the project with beneficial use material from an existing dredging project, since the cost of removing, transporting, and placing the material is already included in the dredging

project, and the only additional costs would be the difference in the transportation distance, and placement method. Typically, maintenance dredging projects are too low in volume to fill a large land reclamation project and the material quality is very poor. A deepening project typically yields more volume than the local disposal system can handle and requires offshore placement. Thus, any beneficial use will provide cost savings to the dredging project and provide free fill material and save costs on transportation. Beneficial use projects are usually environmental in nature and require different equipment types such as mechanical placement, and thus increase placement costs. But land reclamation projects can be pumped in a similar method to typical disposal and would have no increased costs for placement.

Deeping projects are not frequent or commo, but with proper planning and permitting can be a great opportunity for a port in need of more land, to create land that otherwise may not be able to do so.

Public Relations

Significant land reclamation projects are typically not well received by the public or local environmental organizations. Regardless of the avoidance of environmental impacts, lack of impacts to flushing and circulation of water ways, and positive impacts to economy, generally many will be opposed to the project. Constructing a mitigation project in leu of purchasing credits, can present positive public perception. Engagement with the local environmental organizations on projects they would prefer or already have a desire for, can change public perception.

There are typically many projects that both the local environmental originations and agencies would like to construct but lack the proper funds and/or manpower and knowhow to do so. The amount of dredge material created from a deepening project can be so large that it creates the opportunity for many beneficial use projects that the local environmental community desires, and these projects can create a positive public relation message.

Example Project- Eastport- Port Tampa Bay-

Port Tampa Bay (PTB) in 2011 permitted approximately 1.4 million cubic yards of dredging, (24) acres of land reclamation and 2,000 linear feet of bulkhead in Eastbay located in Tampa harbor. The project was mitigated via a Permittee-Responsible Mitigation project due to the lack of available mitigation bank credits and in-lieu Fee program credits, as well as desire to create a positive public perception. The McKay Bay mitigation project one multiple environmental awards including the Future of the Region Awards program of the Tampa Bay Regional Planning Council and winner in the Mitigation category of the American Association of Port Authority's (AAPA) Annual Environmental Improvement Awards program.[15]

Figure 5- McKay Bay Mitigation Site

[15] https://www.aapa-ports.org/advocating/PRdetail.aspx?itemnumber=19958

In 2015, PTB constructed approximately (18) acres and 400 linear feet of bulkhead, stopping short of the permitted amount of land and bulkhead it was allowed to construct, due to the realization that if future reclamation would be done at this site, valuable marine infrastructure, such sheet pile wall would be buried.

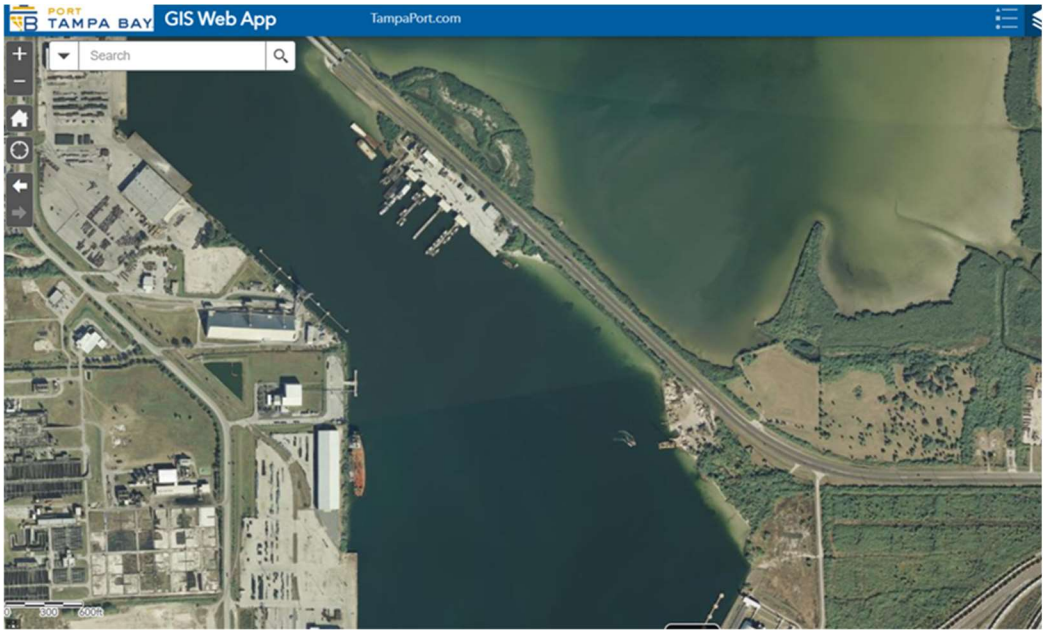

Figure 6- Eastbay 2009 - Tampa Harbor

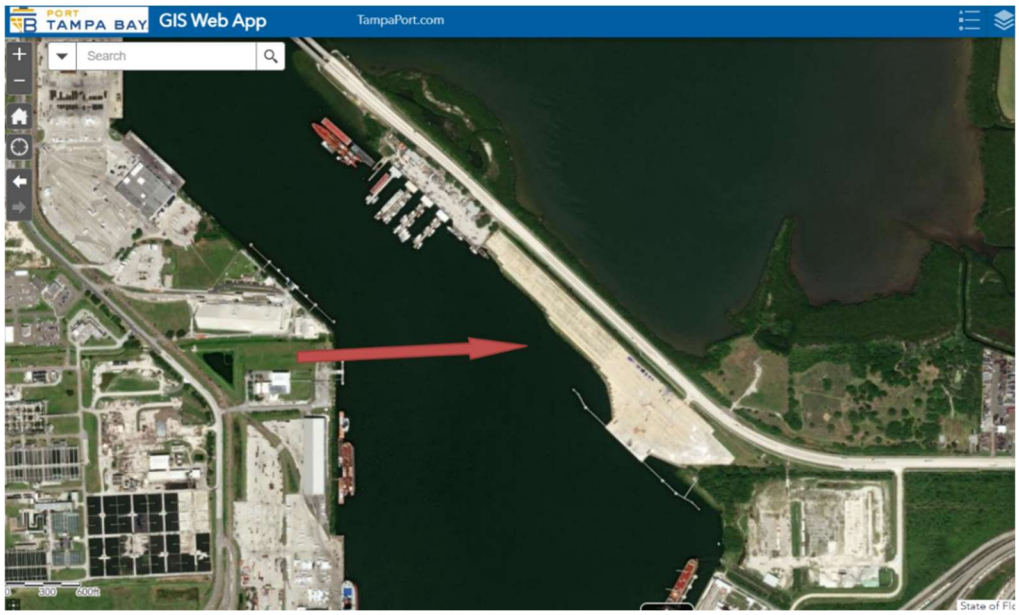

Figure 7- Eastbay- 2022 - Tampa Harbor

In 2015, PTB started collecting additional data and studies to prepare for the next expansion project permit. This included multiple pre-application meetings with environmental agencies and meetings with the local environmental organizations. In 2018, PTB submitted a permit for an additional (63) acres including 3.6 million cubic yards of fill material and 6-7 berths. It was initially intended to fill the project with upland select sandy soils from a borrow pit, but the construction estimates done periodically kept increasing to the point of 70+ Million and the project's return on investment, put the projects viability in jeopardy. Recent discussions with Marine Contractor, Orion Marine Construction, estimate import fill from uplands borrow pits with transportation and placement in the water for land reclamation at over $40 per cubic yards. This would give a current estimate for the fill only of the (63) acres at over $144 million.

At the time of submitting the permit there were not enough Mitigation Bank credits to offset the proposed environmental impacts. There were no in-lieu fee program credits, at the time and recent investigation found there still is not any available fee program credits available (5) years later. PTB engineered and permitted a mitigation site, the property had other agency funds tied to it with restrictive easements. After years of trying to get a tri-party agreement to start construction, additional mitigation bank credits came on the market at a good price, and created a cost savings compared to the construction of the mitigation site with less risk of construction overruns, maintenance costs, and the potential to not generate all the credits due to lack of success of the project.

In 2021, PTB in conjunction with the ACOE started a General Revelation Report (GRR) deepening study of Tampa Harbor. The study yielded that the proposed deepening from - 43 feet

MLLW to - 47 MLLW will yield 21 million Cubic Yards of dredge material. Due to the fact the port had permitted and mitigated a land reclamation site, the ACOE agreed to include it as a beneficial use disposal site as part of the ACOE deepening of Tampa Harbor. The fill portion of the (63) acres, would have zero additional cost to the port. The ACOE met held multiple design charrettes for beneficial use of the 21 million cubic yards, and this created positive public relations and about multiple beneficial use projects for the local community.

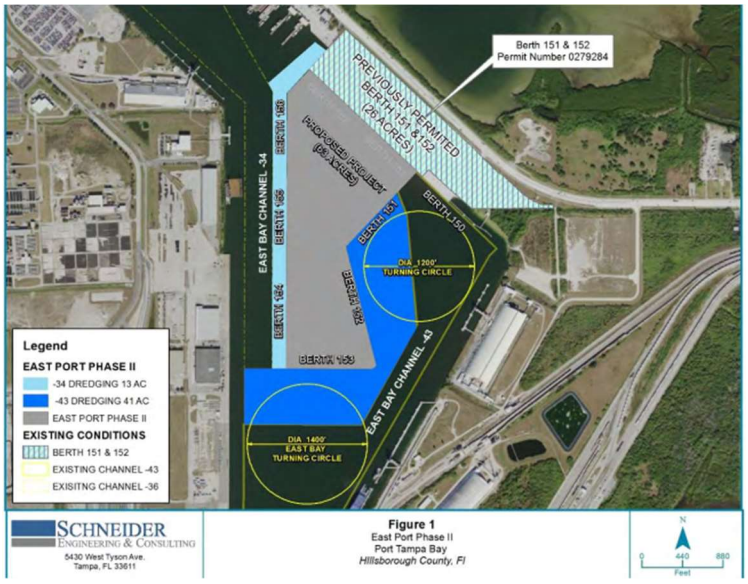

Figure 8 - Eastport- Final 60+ Acre Fill Permit

Example Projects- Pier 400 – Port of Los Angles

The Port of Los Angeles and the U.S. Army Corps of Engineers completed Phase I of the Pier 400 Project in 1997 and Phase II in 2000, the biggest dredging and landfill project in the USA. The project included deepening existing channel, and lengthening existing channels. The approximately 58 million cubic yards of dredge material were used to create nearly 600-acres of deep-water access uplands to provide future growth for the Port of Los Angles. [16]

Figure 9 Port of LA - 1994

[16] https://www.dredge.com/2016/06/the-port-of-los-angeles-pier-400-project-advancing-to-second-stage-great-lakes-dredge-dock-uses-ellicott-dredge-florida-to-pump-50-million-cubic-yards-of-land-fill/

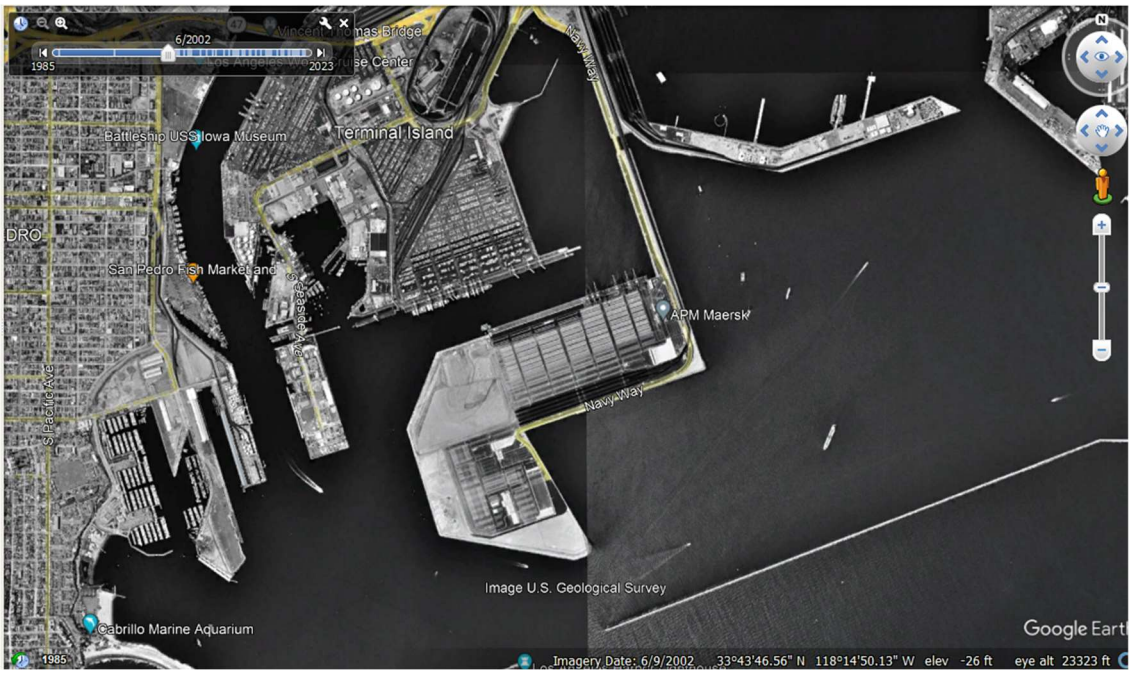

Figure 10 - Port of LA- 2022

Example Projects- Hookers Point– Port of Tampa Bay

The Army Corp of Engineers and Tampa Port Authority deepened the Federal Channel in Tampa Harbor from -34 feet to -43 feet in the early 1970's. The dredge spoils were used to create over 500 acres of upland lands adjacent to the Federal Channel called Hookers Point, by creating levees with the dredge spoils and filling behind the levees with additional dredge material. Some of these areas were reclaimed by the port entering into a long-term lease with a local contractor to use the site as a landfill. The lease required the material to be free of contamination and unwanted debris such metal, rubber and trash. This required the port to have a full-time inspector on the job site for years, inspecting the fill material being placed as well as verifying that there was test result for contamination at the specified intervals.

The port was able to reclaim significant upland acres for near zero costs but had multiple geotechnical issues to address in the future. Large amounts of clays deposited within the site footprint increased future construction costs of individual smaller projects, require deep excavation of the clays to construct pavement sections, or unique geotechnical improvements such as dynamic compaction. Dynamic compaction consists of dropping a large mass such as block of concrete with crane from high elevations in repeated pattern. Some of these areas were surcharged with large soil stockpiles for over 20 years, squeezing the water out of the clays and allowing for immediate use in the future. Other areas that did not have the time or the resources to be surcharged in the past but did not require immediate use were improved with wick drains and short term surcharge projects for one to two years. The wick drains provided a quick path for the water to leave clays.

Figure 11-Hookers Point - Early 1970's Tampa Harbor

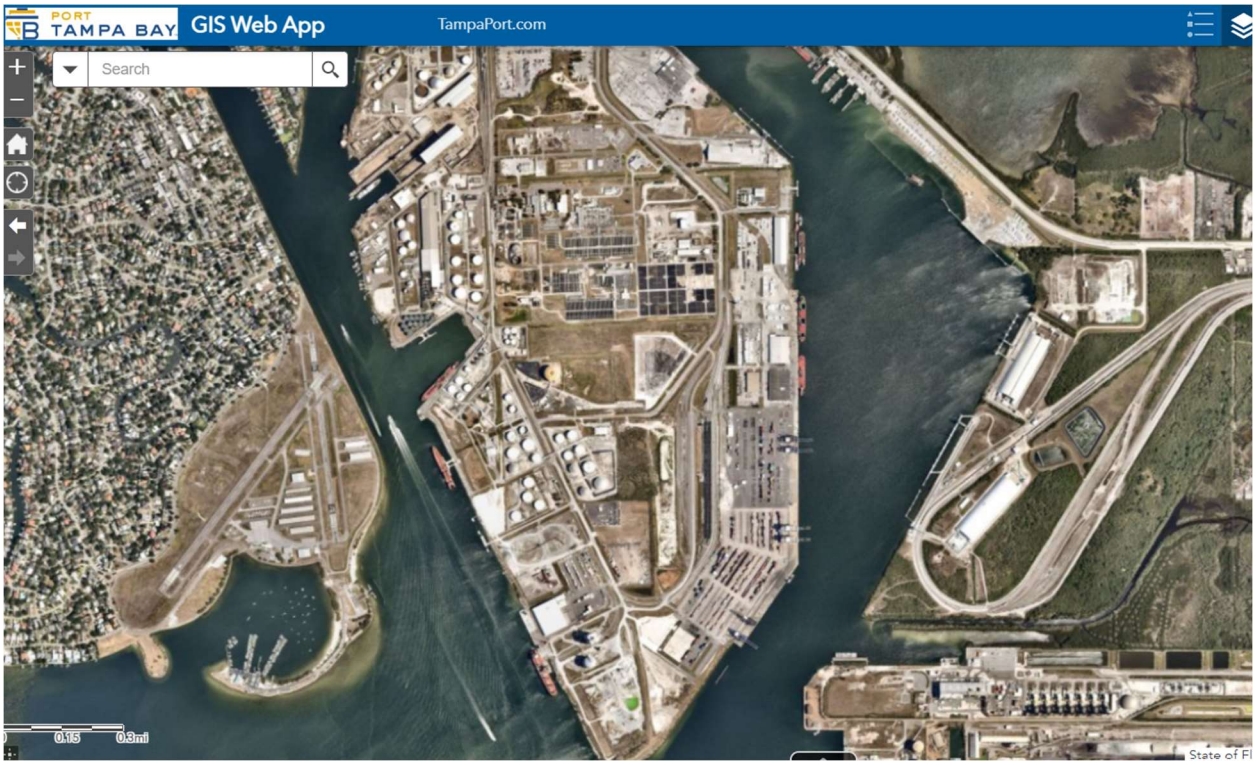

Figure 12- Hookers Point - 2023 - Tampa Harbor

Summary

Port growth and continuing development is required to meet the increasing demand for goods such as food, fuel, and other items as local community's populations increase. Ports are a vital part of the world trade network comprised of many land and sea routes. These sea routes require deep water Channels to allow ingress and egress of vessels, and terminals comprised of a Berth, Wharf, and enough upland lands to load, unload, operate, and store products. These uplands adjacent to deep water channels are becoming scarcer, due to growth and development of ports as well as urban development encroaching on seaports.

One of the solutions to this problem is land reclamation. Almost all ports have access to submerged land rights, such as ownership, leases, or easement to fill the submerged lands and create new lands. Ports also have a justifiable purpose and need as well as a net positive cumulative effect on the public interest to receive permitting for such large land reclamation projects. Environmental impacts are typically minimal with port land reclamation projects due to the natural deeper waters surrounding ports. Mitigation projects can be constructed to offset the environmental impacts, and with local environmental agencies and organizations input, can create net positive public relations from the project.

The cost of a significant land reclamation project can be very high, in the hundreds of millions at the time of this paper, but there are solutions to mitigate the costs. When ports undergo deepening projects, which are rare, there is an opportunity to create a significant land reclamation project at near zero costs. Typically, the amount of dredged material being created greatly exceeds any local disposal site capacity and requires offshore disposal, thus a land

reclamation project would have reduced transportation costs. Also, the method of placement for filling a land reclamation project is same as a typical disposal site, not requiring different equipment for placement such as those used for environmental benefit use projects. Ports need to take advantage of these opportunities, by taking the lead in studying, engineering, and permitting a land reclamation project ahead of deepening project. There are also other unique ways of reducing the costs of a land reclamation project such as leasing the site out as a local landfill, but this can create challenges in the future when the site is being developed.

Ports are one of the few entities with the rights and ability to permit and fill a large land reclamation project. Land reclamation should always be considered as a possible solution, with enough captiol these projects can be started and completed quickly and efficiently. With proper planning in the future there are opportunities to create land and significantly lower, and all ports should at least consider land reclamation during its master planning.

Reflections on Learning

This paper provided the candidate with a deeper understanding of significant land reclamation, and all the complexities associated with it. The candidate was surprised to find every costal State appeared to lease submerged lands, that three states had assumed 404 permitting from the EPA, or that mitigation bank credits and in-lue Fee Program Credits for estuarine impacts were rare among all the States. The candidate also gained knowledge in land reclamation in other States such California and how Port of Los Angles, and Port of Long Beach are almost completely comprised of dredge reclamation, and the unique mitigation projects they performed to compensate for environmental impacts receiving praise from the local community.

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