American Association of Port Authorities (AAPA)

2020 Environmental Improvement Awards

Conley Terminal Modernization Program Soil Reclamation and Reuse Initiatives

June 30, 2020

Executive Summary

Conley Container Terminal is an important economic asset for the New England region, serving more than 2,500 businesses, including nearly 700 enterprises based in rural areas. Increasing demand has led to four consecutive container volume records at Conley Terminal, including 300,762 TEUs in CY2019, a 1 percent jump from CY2018 and the fifth consecutive year of record-breaking volume. Altogether, the working port is now home to more than 9,000 blue-collar jobs and responsible for $8.2 billion in annual economic impact.

To maintain its competitiveness, in 2014, the Massachusetts Port Authority (Massport) commenced the Conley Terminal Modernization Program, an $800 MM investment into the infrastructure of the Port of Boston. This Program included partnering with the US Army Corps of Engineers (USACE) on the dredging and deepening of the Boston Harbor, rehabilitation of two existing berths at Conley Terminal (Berths 11 and 12), construction of a new deep-water berth (Berth 10) and expansion of Conley Terminal yard onto an adjacent property, the location of a former oil storage facility. Rather than manage these projects piece-meal, Massport recognized the opportunity to develop and execute a comprehensive and cost-effective Soil Management Program to test, manage, treat, process, and reuse soils onsite for all construction projects at Conley. This successful Soil Management Program allowed Conley Terminal to:

- Maximize soil reuse onsite.
- Minimize the amount of imported fill as part of construction.
- Eliminate 5,200 truck trips through adjacent residential community for off-site soil disposal and another 3,500 truck trips for import suitable fill for construction. The elimination of the combined 8,700 truck trips equates to an elimination of approximately 34,750 gallons of truck fuel, which translates to an estimated elimination of 2.64 short tons of NOx emissions and 390.94 short tons of CO^2 emissions for the project[1].
- Eliminate off-site disposal for soil, which otherwise would have taken up valuable space in a landfill.
- Realize substantial economic benefits in excess of $5 MM.

[1] Assumptions: 50 mile round trip for disposal, 25 mile round trip for fill delivery, and 2009 average model year for trucks.

1.0 Background - Conley Terminal

The 101-acre Paul W. Conley Container Terminal (Conley Terminal) in Boston, MA, operated by the Massachusetts Port Authority (Massport) is a vital transportation and economic resource in New England that is positioned to help address the nation's transportation challenges. Conley Terminal is the region's only full service container terminal with the only deep-water access capable of serving large ships in the Port of Boston. The terminal facilitates the movement of goods to New England's markets with speed and efficiency ensuring that the region's 14 million consumers have the products they need, when they need them, while also providing a gateway to the world for the region's exporters.

FIGURE 1: Paul W. Conley Container Terminal Aerial View

Conley Terminal is in the City of Boston, Massachusetts, serving all 4.2 million residents of the Boston, MA-NH-RI Urbanized Area. The Terminal also services warehousing and distribution for all six New England states. Conley handles nearly 2.3 million metric tons of cargo each year. Top imports through the Terminal include furniture, seafood, wine & spirits, home décor, and auto parts. Top exports include recycled fibers, logs & lumber, wood pulp, metal scrap, and seafood. Conley Terminal promotes economic growth throughout New England by serving as a cost-effective and

FIGURE 2: Cargo Ship Berthed at Existing Berth 12

customer-focused maritime gateway connecting more than 2,500 private sector businesses in the region to the global economy. But Conley Terminal has been facing several challenges that impact its ability to meet the needs of the rural and urban businesses that rely on its services. ***These challenges include: changes in the shipping industry, constraints to the existing port infrastructure and outdated terminal technology.*** In order to address these challenges, in 2014, Massport commenced the Conley Terminal Modernization Program, an $800 MM investment into the infrastructure of the Port of Boston.

2.0 Objectives: The Conley Terminal Modernization Program

The $800 MM Program included partnering with USACE on the dredging and deepening of the Boston Harbor, rehabilitation of two of the existing Berths at Conley Terminal (Berths 11 and 12), construction of a new deep-water berth (Berth 10), and expansion of Conley Terminal yard onto an adjacent property, the location of a former oil storage facility. The Initiative includes the following projects:

Landside Projects Leveraged with Federal Funds (2016 FASTLANE Grant): These improvements, highlighted yellow in **Figure 3**, include repairs and strengthening at Berth 11 to support shore-side deepening; backland and fender repairs at Berth 12 to maintain a continuous state of good repair condition on two functional berths; new refrigerated container storage racks to improve energy efficiency and increase capacity; buildout of additional container storage

FIGURE 3: Existing and Plan Map

yard, terminal technology and equipment upgrades that will expedite container processing and increase reliability for trucks transporting goods on the National Highway Freight Network; and new in-gate and exit-gate processing facilities that will rehabilitate severely deteriorated portions of the terminal backlands and reconfigure terminal flow. The overall landside program was estimated at $103 MM, and in 2016, Massport was awarded $42 MM in Federal Funding through a FASTLANE Grant from the United States Maritime Administration (MARAD) of the US Department of Transportation (USDOT) to support these landside FASTLANE projects.

Waterside Projects Leveraged with Federal Funds (Boston Harbor Deep Draft Navigational Project):

The Boston Harbor Deep Draft Navigational Project is a $350 MM Federal, State and Massport's investment in the deepening of the main shipping channel in Boston Harbor. The existing depth of -40 Mean Low Water (MLLW) is being deepened to -47 MLLW, -51 MLLW in the Broad Sound North Entrance Channel area. Massport, as the local sponsor for the Boston Harbor Deep Draft Navigational Project, also committed to construct two deep-water berths at Conley Terminal to a depth of -50 MLLW (three feet below the dredge depth of the Federal Channel). To meet this commitment, Massport is strengthening and deepening the existing Berth 11 and constructing a new Berth 10.

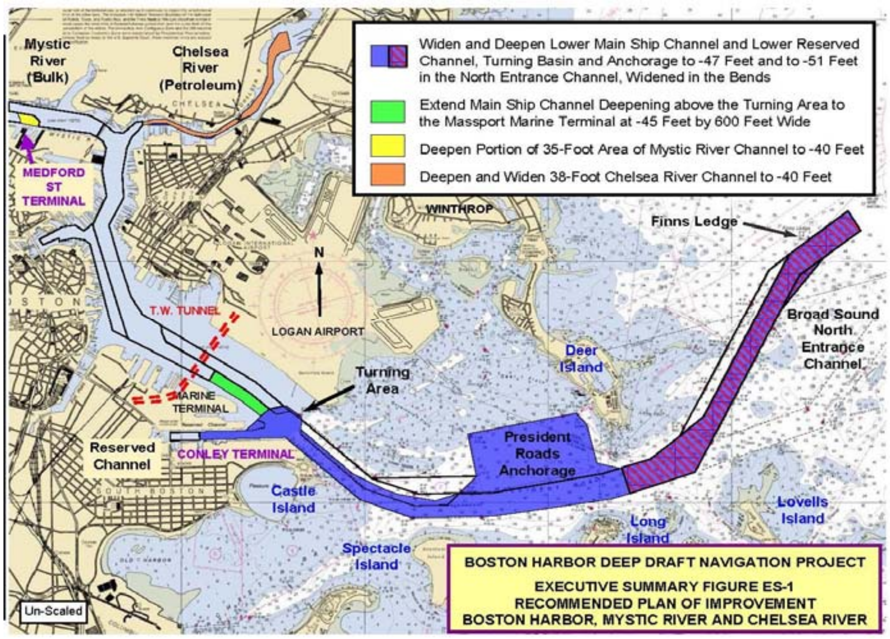

FIGURE 4: Boston Harbor Deep Draft Navigational Project

New Berth Construction Leveraged with State Funds (New Berth 10):

The New Berth 10 project involves the conversion of the shoreline of the former Coastal Oil Facility into a new, modern, deep-water berth capable of accommodating Post-Panamax vessels expected to call on the East Coast of the United States.

FIGURE 5: New Berth 10 Project Location

FIGURE 6: Coastal Oil (1974)

The Former Coastal Oil facility, located adjacent to Conley Terminal, operated for decades as a bulk oil storage facility on the Reserved Channel in Boston Harbor. Massport purchased the facility in early 2000, demolished the remaining tanks at the facility, and began a comprehensive environmental assessment and remediation program to address historic soil and groundwater contamination at the facility. Areas of concern included light non-aqueous phase liquid (LNAPL) on the surface of groundwater in multiple locations, contaminated fill which was both oil contaminated and characteristically hazardous, sediment with elevated levels of oil and anthropogenic contaminants, and a periodic sheen present at the waterline on the Reserved Channel. While more than 66,000 gallons of LNAPL was recovered or remediated at the former fuel terminal, residual oil contamination remained throughout the site. Since the construction of the 1,300-foot long, 110-foot wide Berth 10 required cutting back the existing shoreline, resulting in a “fresh face” of oily soil/sediments and residual LNAPL that could seep into the adjacent surface waters of Boston Harbor, Berth 10 was constructed as a remediation project under the Massachusetts Contingency Plan.

The first phase of Berth 10 construction entails environmental remediation of the shoreline of the former Coastal Oil facility, installation of a new bulkhead along the shoreline, use of in-situ concrete stabilization of

FIGURE 7: Coastal Oil Prior to Berth 10 Construction

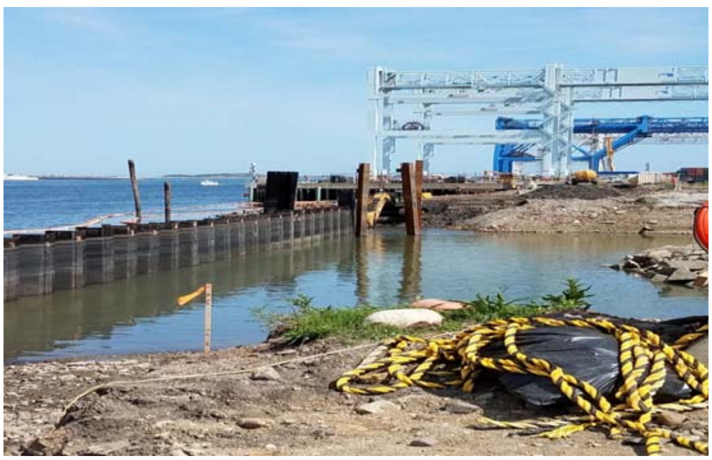

FIGURE 8: Bulkhead Installation at Coastal - 2018

existing soils and sediments behind the bulkhead, dredging in front of the bulkhead, and underwater rock blasting to achieve the target dredge depth of -50 MLLW. The next phase allows for the construction of a pile supported deck at the water line, crane rails, bollards, and fenders to support the berthing loads of the new vessels. Also included is full-depth paving of the backland area for container storage, installation of new utilities, installation of new Rubber Tired Gantry Crane runways, and new overhead lighting. Phase III is the procurement of three new ship-to-shore cranes. The last phase involves the construction of a new substation and relocation of an existing Site Switch House out of the container stacking area.

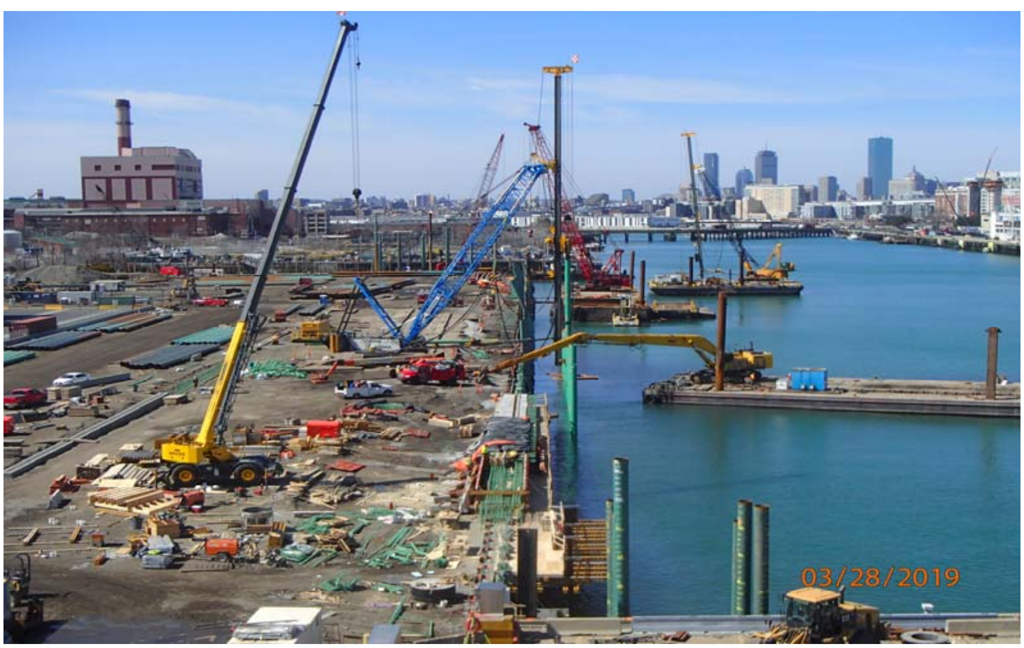

FIGURE 9: Berth 10 Construction

3.0 Methodology: The Conley Terminal Soil Reclamation and Reuse Program (the "Program")

Early on in the design phase, it was clear that a sizable volume of soil, concrete, gravel, and dredge spoils, upwards of 61,000 cubic yards, would be generated as part of the various Conley projects. It was also clear that handling and off-site disposal of the generated material would be a major cost driver for the overall Program. Large stockpiles of materials onsite were not welcome by the surrounding neighborhood. Massport also recognized, through various engagement meetings with the community and local elected officials, that construction traffic must be managed and minimized to the greatest extent possible. Much of the material generated was impacted with oil, anthropogenic compounds, and in some cases, soils or dredge spoils would be regulated under RCRA due to hazardous characteristics. In order to minimize environmental impacts and maximize efficiency of the project, Massport, its contractors, and consultants worked together to test, manage, treat, process, and reuse soils onsite within a framework deemed: The Conley Terminal Soil Reclamation and Reuse Program (the "Program"). Said program involved the following aspects:

- **Characterization**: Fully characterize material both geotechnically and environmentally prior to excavation, such that it can be segregated precisely onsite.
- **In-situ Concrete Stabilization (ISS)**: ISS mixes soil with concrete while it is still in the ground (i.e. in-situ). ISS can simultaneously improve the geotechnical properties of soil/sediment and bind contaminants into a matrix so they are no longer in contact with humans or the environment.
- **Identification of Suitable Material**: Identify and mine material geotechnically suitable for reuse onsite where possible; balance the use of geotechnically suitable material into the voids left by the mining process.
- **Processing and Reuse**: Crush concrete generated on other projects and process asphalt, brick and concrete with previously geotechnically unsuitable soils to produce Granular Aggregate Base Course (GABC), a suitable pavement sub-base.

- **Contaminant Isolation:** Complete remediation efforts via the isolation of remaining contamination onsite via the installation of a shoreline bulkhead, ISS along the length of the bulkhead, and the physical isolation of remaining contaminants via the capping of the site with a paving layer.
- **CAD Cell Disposal**: Early identification of dredged materials for disposal in the Boston Harbor Confined Aquatic Disposal (CAD) Cell.

Characterization

One of the initial steps to adequately sort the soil and debris streams to be generated as a part of all the projects of the Initiative was to suitably characterize the material. In particular, the exact boundaries of the oil contaminated material was critical to adequately characterize, because there were limits as to the types and quantities of oil contaminated material and characteristically hazardous material that could be reused on-site. In addition to adequate environmental characterization, geotechnical analysis was required for material reuse due to the rigorous criteria necessary to support the anticipated future use of the facility. The results of the criteria guided the contractor as well as onsite consulting staff overseeing operations as to where specific material could be reused onsite. Additionally, approximately 13,000 cubic yards of marginally impacted sediment, originally designated for off-site upland disposal was reclassified and approved for disposal in the Boston Harbor Confined Aquatic Disposal (CAD) Cell. The CAD Cell had always been an anticipated disposal option for sediment on the project; however, this additional characterization allowed a larger volume of sediment to be disposed at the CAD Cell instead of offsite. It is worth noting that Massport worked closely with the USACE on the design, permitting and construction of the CAD Cell in anticipation of the disposal of certain volume of dredged materials from Conley and other Massport facilities. Said CAD cell is anticipated to be capped once it is filled.

In-situ Concrete Stabilization (ISS)

Construction of Berth 10 required installing a new king pile bulkhead, excavating/dredging of contaminated soil and sediment on the waterside of the bulkhead, and filling an existing cove located landside of the bulkhead with the contaminated material. During this phase of work, ISS was integrated into various parts of the construction sequence and used for multiple purposes. Within the cove, ISS was used to simultaneously increase the geotechnical properties of fill material such that it would have enough bearing capacity to support the high surcharge loads for the new facility ***and*** to render that material inert so it was no longer oil contaminated or characteristically hazardous.

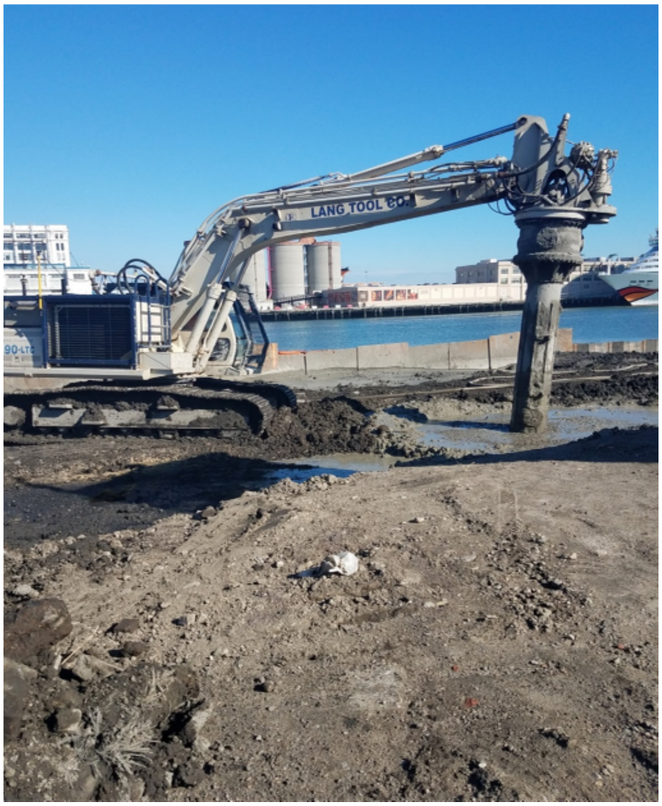

FIGURE 10: In-Situ Concrete Stabilization Operation

ISS was also used to treat and reuse excess oil-impacted dredge material in excavations created from on-site mining of gravel, to isolate (in combination with the new shoreline bulkhead) any potential oil from the former Coastal site from leaking into the Reserved Channel, and to improve soil behind portions of the bulkhead for use as an anchor point for bulkhead tie-backs. Therefore, ISS allowed for stabilization and reuse of the most contaminated material onsite (which, after treatment, no longer posed an environmental hazard), while improving the material to serve as a solid base for the rigorous loadings anticipated at the terminal.

Identification of Suitable Material

During the early phases of construction, the Berth 10 project team identified a number of locations within the Coastal site with possible geotechnically suitable material, located below the proposed excavation elevation for the various projects at the Terminal. Upon analysis and testing, the geotechnical consultant for the project was able to confirm that the material identified was suitable for reuse as sub-base without any segregation or processing. Further, when processed with less suitable soil, it allowed for a wide range of soils to become suitable for reuse as backfill material. As a result, other areas of the facility were investigated to locate additional pockets of geotechnically suitable material. Once delineated, these suitable pockets were mined for material (totaling almost 15,000 cubic yards) which was segregated, processed, and reused. The voids were then filled with geotechnically unsuitable material, such as material saturated with oil, or material containing too high a level of organic matter, some of which was treated with ISS to ensure its feasible reuse below the sub-base layer.

FIGURE 11: Sources and Destinations of Program Material

Processing and Reuse

Advancement of the Initiative generated approximately 61,000 cubic yards of oily soil, urban fill and sediment, and the removal of more than 12,800 cubic yards of concrete, asphalt, brick and granite obstructions from old mooring foundations as well as former oil tank foundations. Excess concrete, asphalt and brick were crushed and blended with on-site soils to produce Granular Aggregate Base Course (GABC) for on-site pavement subgrade. The crushing, segregation and

FIGURE 12: On-site Material Processing Facility

blending operation operated at a maximum rate of approximately 1,500 cubic yards per day, and lasted for approximately four months

Contaminant Isolation

As previously noted, construction of Berth 10 required installing a new king pile bulkhead, to support the terminal yard loads inshore of the pile supported deck. Inboard of the bulkhead, ISS was used to solidify the oil-impacted material to successfully create a cutoff wall to prevent migration of LNAPL to surface waters. To support the future loads at the terminal, a three (3) foot thick pavement cross-section was specified, including sub-base, binder, and top course. The new pavement was designed to distribute the heavy loads at the terminal and shed water to stormwater management systems thereby reducing the incidence of any leaching of residual contaminants. It further serves as a physical barrier to prevent direct contact with impacted soils and residual LNAPL at the facility. The result is a highly functional, cost-effective facility constructed from materials recycled at the site itself that also isolates contaminants from both the environment and human contact.

4.0 How the Project Fulfills the Award Criteria

The Conley Terminal Modernization Program was a multi-year, multi-project initiative to revitalize Conley Container Terminal in South Boston, Massachusetts. Massport partnered with its contractor and consultants to test, manage, treat, process, and reuse soils onsite through the Conley Terminal Soil Reclamation and Reuse Program. No urban fill, oily soil, or sediment was transported for off-site disposal in landfills. Instead, it was treated, rendered inert, or processed and retained on-site.

This innovative and comprehensive management of approximately 61,000 cubic yards of materials substantially reduced impact to the community (which was particularly sensitive to the disruption of truck traffic) and the environment. It eliminated 5,200 truck trips for off-site disposal and 3,500 truck trips for import of subbase material through adjacent residential neighborhoods. The elimination of these truck trips resulted in the elimination of the use of an estimated 34,750 gallons of truck fuel, which translated to an estimated elimination of 2.64 short tons of NOx emissions and an estimated elimination of 390.94 short tons of CO^2 emissions for the project[2].

2020 AAPA Environmental Improvement Awards

AAPA Award Criteria		Conley Terminal Soil Reclamation and Reuse Program
Level and Nature of Benefits to Environmental Quality, Beautification or Community Involvement	✓	• **Eliminated** transportation of urban fill, oily soil, or sediment for off-site disposal. • **Preserved** scarce landfill capacity. • **Prevented** 8,700 truck trips through local community, thereby eliminating the need to use 34,750 gallons of truck fuel, resulting in elimination of 2.64 short tons of NOx emissions and 390.94 short tons of CO^2 emissions. • **Ended** oily seeps to adjacent Boston Harbor. • **Isolated** historic contamination from the humans and the environment.
Level of Independent Involvement and Effort By the Port	✓	• **Initiated** program independent of any regulatory requirement.
The Creativity of the Solution or Program	✓	• **Involved** using existing technologies in innovative ways to secure a better solution. • **Invited** collaboration between Massport, consultants and contractors over multiple projects.
Whether the Project Results are Apparent (The Project Must Be Complete Through Some Beneficial Increment)	✓	• While the Initiative is still ongoing, the key aspects of the Program (environmental isolation and fill, soil and sediment reuse) have already been completed. • Benefits/Results have already been realized.
The Cost Effectiveness of the Activity or Program	✓	• Massport realized a Program savings of approximately $5 MM. • Massport's Contractors also realized significant savings via reduction in offsite disposal costs.
The Transferability of the Technology or Idea to the Port Industry	✓	• For ports that are located in historically industrial areas, fill management can be a key driver in project cost. • Comprehensive fill management can also result in similar benefits in other locations.

[2] Assumptions: 50 mile round trip for disposal, 25 mile round trip for fill delivery, and 2009 average model year for trucks.