PORT NOLA
THE PORT OF NEW ORLEANS

May 31, 2017

Mr. Ed O'Connell
Facilities Engineering Recognition of Excellence Award
American Association of Port Authorities
1010 Duke Street
Alexandria, VA 22314-3589

RE: Mississippi River Intermodal Terminal Improvements

Dear Mr. O'Connell:

Enclosed is the Board of Commissioners of the Port of New Orleans' application for the AAPA Facilities Engineering Recognition of Excellence Award. The project submitted for consideration is the Port's newly expanded and redesigned Mississippi River Intermodal Terminal. It is strategically located on-dock and adjacent to our container operations and thus is a significant addition to our Napoleon Avenue Container Terminal. The project essentially rebuilt and repurposed a former rail yard and storage yard for empty containers into a modern, fully intermodal (ship, truck and railroad) container transfer facility. The project features five acres of 18-inch thick concrete designed for heavy loading, 10,000 linear feet of new railroad track (four simultaneous working rails), two new state-of-the-art electric rubber-tire gantry cranes, new high-mast lighting and all new electrical, mechanical and water service utilities required for safe, efficient operations.

The terminal was designed to be efficient in layout and in cargo movement and employed the use of software to simulate traffic and cargo flow. This process allowed focused study of all the design parameters and options for layout, type of equipment, and cargo processing and routing. These modern, current, methods of analysis, together with sound engineering principles and experience, yielded confident design decisions for this modernization project. The success of the project is readily evidenced by pertinent data which indicates improved cargo throughput, efficiency and customer and user satisfaction since commissioning of the new facility.

On behalf of the Board of Commissioners of the Port of New Orleans, please consider the Mississippi River Intermodal Terminal Improvements for this prestigious AAPA award. If you have any questions please do not hesitate to contact me.

Sincerely,

Brandy D. Christian

Brandy D. Christian
President and Chief Executive Officer

Enclosure

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PORT NOLA
THE PORT OF NEW ORLEANS

AAPA American Association of Port Authorities
Alliance of the Ports of Canada, the Caribbean, Latin America and the United States

2017 Facilities Engineering Awards:
Design and Construction of Marine Structures

Title of Project

Mississippi River Intermodal Terminal Improvements

Name of Applicant

Port of New Orleans

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Date Submitted

May 31, 2017

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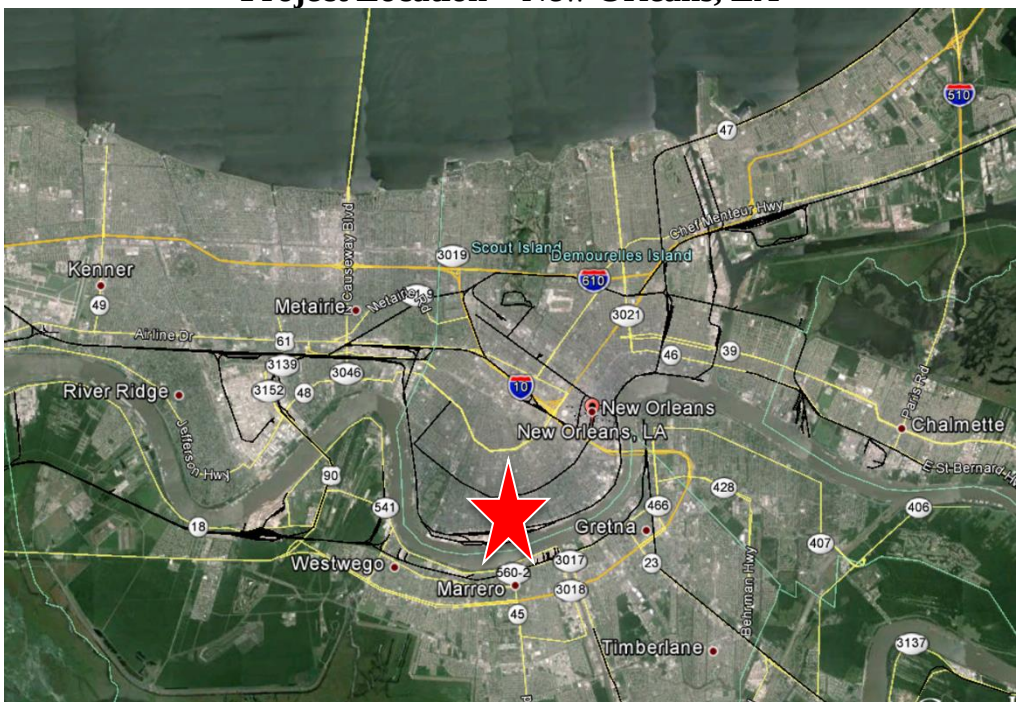
Table of Contents

I. Project Description 4
Project Location – New Orleans, LA 4
II. Introduction – Project Highlights 5
III. Goals and Objectives / Business Problem 5
IV. Discussion 6
A. Background 6
B. Objectives and Methodology 7
C. Hardware/Software Used 10
D. Project Cost 11
D. Performance Measures 11
E. How the Project Fulfills the Award Criteria 11
V. Conclusion 14
Appendix

I. Project Description

The *Mississippi River Intermodal Terminal* project provides the Port of New Orleans (Port NOLA) with a new on-dock intermodal railyard at the Napoleon Avenue Container Terminal with access to the six Class I railroads located in New Orleans. The intermodal terminal includes 10,000 linear feet of rail track along with five acres of heavy-duty concrete paving for container marshaling. Two electric rubber tire gantry cranes with 60-ton twin pick capability transfer the containers to and from the rail cars. The railyard is capable of handling 160,000 TEUs (twenty-foot equivalent units) per year with one track turnover per day. Opened in March 2016, the *Mississippi River Intermodal Terminal* affirms Port NOLA's claim as America's most intermodal port.

Project Location – New Orleans, LA



II. Introduction – Project Highlights

After being awarded a $16.7 million Transportation Investment Generating Economic Recovery Program III grant (TIGER grant), Port NOLA hired AECOM Technical Services, Inc. and its team of consultants to provide design and construction administration services for the *Mississippi River Intermodal Terminal* project. The following are highlights of the project:

- Efficient layout of four process tracks and one through track providing the greatest capacity in the limited available space.
- Use of two electric rubber tire gantry (RTG) cranes that span the four process tracks and a 12-foot wide truck lane - capable of stacking containers 2-high on rail cars.
- Five acres of 18-inch thick unreinforced concrete pavement on a 24-inch layer of crushed stone base, including high-mast lighting and other utilities.
- Removal of a rail through-track that bisected the property while still providing efficient rail service to surrounding breakbulk facilities.

III. Goals and Objectives / Business Problem

Under-developed property adjacent to Port NOLA's Napoleon Avenue Container Terminal was slated to be developed into modern container handling facilities. The *Mississippi River Intermodal Terminal* project was the first step in achieving this objective by developing a new intermodal rail terminal on the cityside edge of the property. This allowed for the removal of the antiquated railyard and through track bisecting the property thus opening up area closer to the berth for marshaling and other container operations.

The *Mississippi River Intermodal Terminal* project helped Port NOLA achieve many goals, including:

1. **Modern On-Dock Intermodal Yard**

   The new on-dock intermodal railyard was constructed on an under-developed parcel closer to the cityside of the property using a modern configuration and efficient use of space. The four process tracks have a working pad length of 1,550 linear feet each and the yard has a compressed air system to service the brakes of rail cars.

2. **Efficient Space for Container Growth**

   The construction of the new intermodal yard allowed for the demolition of the old railyard that bisected the property so the space closer to the berths could be used for container marshaling.

3. **Maintain Operations**

   Construction was phased to allow for the continuity of tenant cargo operations. In addition, the new railyard was constructed and operational prior to removal of the old railyard so rail operations were not stopped at any time.

4. **Efficient Rail Service**

   The project provides an alternate cityside through-track that serves the new intermodal yard and an adjacent breakbulk terminal allowing for the removal of a through-track that bisected the property.

5. **Sustainable Development**

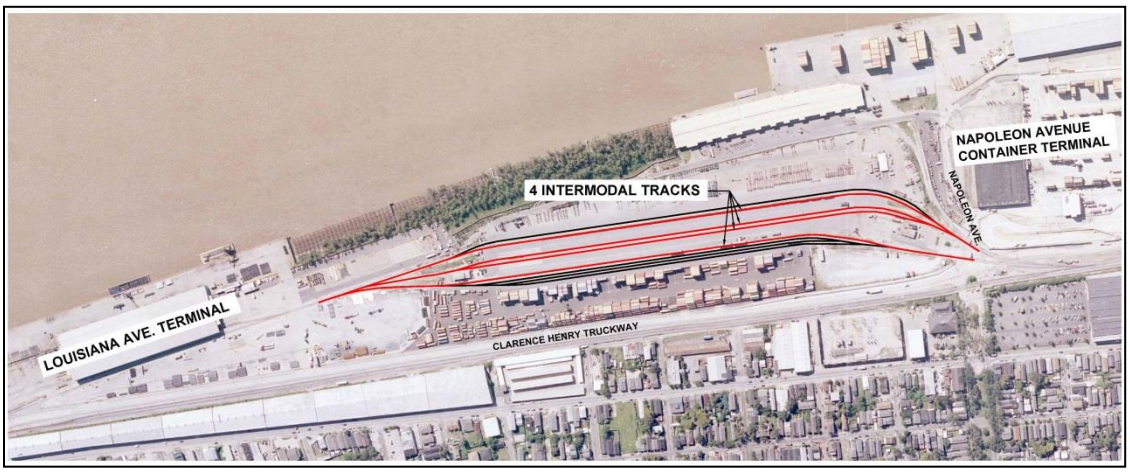
   Electric rubber tire gantry cranes were purchased to operate in the intermodal yard providing reduced fuel consumption, zero emissions and reduced downtime due to maintenance.

IV. Discussion

A. Background

A number of Port NOLA's facilities are located in a narrow section of land between the Mississippi River and the adjacent neighborhood, and the Napoleon Avenue Container Terminal is no exception. With no

room available for terminal expansion, in 2002, Port NOLA purchased from the Illinois Central Railroad 26 acres adjacent to its container terminal. This property included a railyard and other under-developed lands ready for improvement to serve as a modern container marshaling area. Beginning in 2007, four of the original railyard tracks were used for on-dock intermodal operations handling approximately 32,000 TEUs per year (see picture below). However, a new railyard was planned to be constructed a little farther from the waterfront opening up space closer to the berths.



B. Objectives and Methodology

The goals of developing the new intermodal terminal were to improve overall terminal productivity and efficiency, increase intermodal yard capacity in preparation for growth, maximize use of the limited available space, and manage capital costs.

As a part of the planning process to determine the most effective yard layout, the planning team focused on the internal yard operations with respect to current and proposed equipment types. Over 35 yard layouts with different track and equipment configurations were evaluated during the planning phase. The evaluation considered the internal and external operations of the facility to quantify the capacity and projected volume of containers. Internal factors that were considered included location of rails with respect to the dock, type

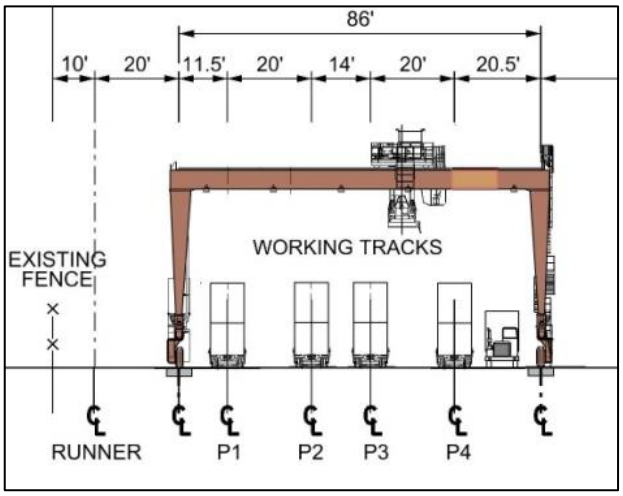
of handling equipment, operational area for each equipment type, number of each type of equipment, number of tractors needed to serve each piece of handling equipment, equipment cost, supporting infrastructure cost and track accessibility. External factors affecting the overall capacity of the yard included time limitations when rail moves can occur and limitations of the railroad network serving the yard.

Model simulations were performed to analyze the capacity and operation of the viable layout options. The modeling activities produced the following conclusions:

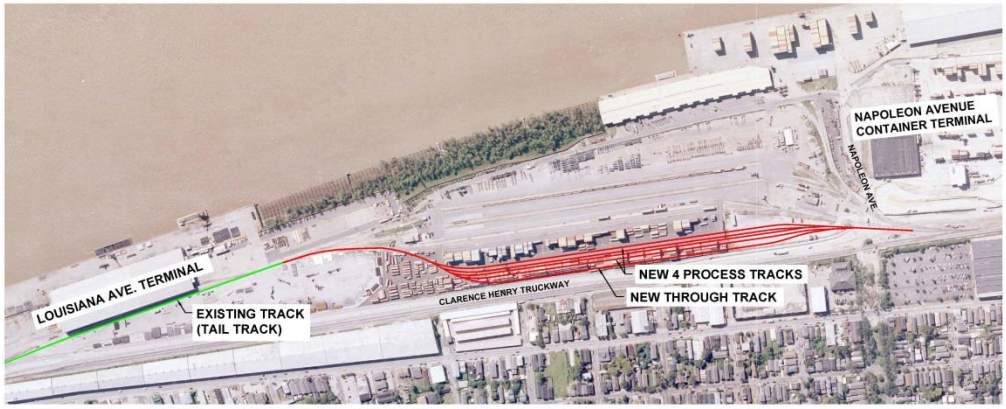
- The productivity of railyard handling equipment depended on the number of tractors used to transport containers between the intermodal yard and the container yard.
- The railyard productivity decreased slightly by moving the railyard further away from the ship to shore cranes, but this loss in productivity was offset by using additional tractors to transport containers to and from the railyard.
- The container yard productivity increased by moving the empty stacks closer to the container yard.
- The railyard capacity was dependent upon the ability to move rail cars in and out the facility. Restrictions that only allow rail moves overnight when the terminal gate is closed limit the capacity of the intermodal yard.
- Longer yard tracks provided more static capacity which was compatible with the operations of the facility.
- The facility ran at its optimum when enough containers were present for a crew to work a full day.

The above conclusions contributed to the final yard layout. Railyard tracks could be closely spaced if yard equipment for loading and unloading containers consisted of more expensive track straddling equipment such as RTGs or rail mounted gantries (RMGs) (see figure below). Railyards operated with top loaders or reach stackers must have tracks spaced widely apart to allow room for this side loader equipment to maneuver. Since the railyard would be constructed parallel to the Mississippi River and its operations would

be controlled by its ability to receive rail cars, it was important to maximize the length of the tracks while minimizing the footprint of the rail operations. Therefore, it was essential to opt for a layout with closely spaced tracks to maximize the limited space available for container marshaling.

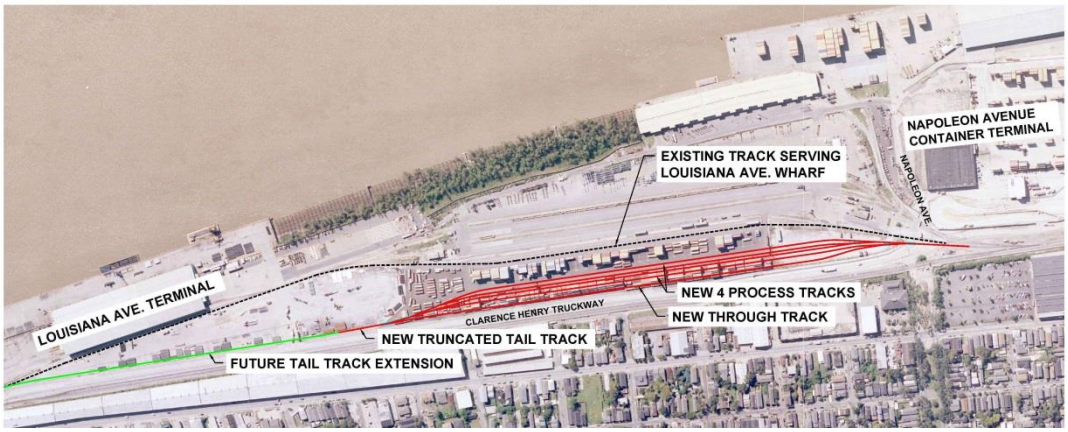


The length of the new railyard tracks was constrained on one end by the container terminal and on the other end by Louisiana Avenue Terminal, an active breakbulk facility. The preference was to have a tail track of sufficient length so two track-lengths of cars could be pulled into the yard. The layout below shows how that could have been immediately attainable by using as the tail track an existing track serving the Louisiana Avenue Terminal. However, this would provide a tail track at the expense of the working length of the yard tracks and the optimal use of the available space.



Another option was to construct the railyard to be parallel to the river for the entire length of the yard to provide the maximum yard track working length of 1,550 linear feet and maximize the space available for future container marshaling. However, this would require initially operating the yard in a less efficient manner until conditions allowed for the construction of an adequate tail track. The figure below shows this option and the truncated tail track that would have to be used for engine escape so rail cars could be pulled

onto the tracks until a longer tail track could be constructed. However, only one track length of cars could be pulled into the yard at a time using the truncated tail track. This latter option was ultimately chosen for the layout of the intermodal yard since it provided the greatest yard capacity and efficiency, allowing for the ultimate extension of the tail track so that two track lengths of cars could be pulled into the yard at once.



An added benefit of the extended tail track was it allowed for the removal of the track that served the Louisiana Avenue Terminal that further bisected the property purchased from the ICRR. The Louisiana Avenue Terminal could then be served via the through track in the railyard and the extended tail track, both of which also serve the intermodal yard.

The simulations showed that the RTG option with four 1,550 foot long process tracks provided an intermodal yard capacity of 160,000 TEUs per year, which represented an ability to achieve five times Port NOLA's then current volume of 32,000 TEUs per year.

C. Hardware/Software Used

The model simulations were performed using the General Marine Terminal Simulation model, a proprietary model that analyzed the capacity of terminal facilities and its operations and has been used in over fifty terminal planning studies worldwide. Required model inputs included terminal geometry, equipment fleet and performance and peak day loading. Model outputs included equipment productivity, street truck service times, and 2D and 3D simulations of the facility. Modeling tasks included model calibration using the current terminal layout and operations, analysis of the productivity of various

equipment types with relocated working tracks, analysis of dock crane productivity as impacted by relocation of empty container stacks, terminal capacity calculation and confirmation of rail switching impacts on terminal capacity.

D. Project Cost

In 2011, Port NOLA was awarded a $16.7 million TIGER grant by the U. S. Department of Transportation Maritime Administration for the construction of a new, modern railyard. An additional $1.5 million was provided by the Louisiana Port Construction and Development Priority Program. The total project cost was $25.7 million so the difference of $7.5 million came from Port NOLA's operating revenues. The TIGER grant funding was applied to the cost of the infrastructure improvements but was not used for the procurement of any equipment that would be operated at the terminal.

The project was divided into four contracts as follows:

- Intermodal Railyard - $16.8 million
- Rubber Tire Gantry Cranes - $5.3 million
- RTG Maintenance Building - $1.1 million
- Through-Track Extension - $2.5 million

D. Performance Measures

The most important measurable criteria considered in evaluating the success of the project are capacity of the railyard and the efficient use of space - and the *Mississippi River Intermodal Terminal* delivered on both. At 160,000 TEUs per year with one daily track turnover, the new railyard offers substantial room for intermodal business growth. Additionally, use of RTG cranes allowed for closely-spaced rail tracks creating room for five additional acres of container marshaling space.

E. How the Project Fulfills the Award Criteria

The *Mississippi River Intermodal Terminal* project fulfills the Award Criteria of the AAPA through innovation in design, engineering and construction methods, and by meeting budget goals.

Innovative Design: It was noted through the planning activities that the then current yard operations were most effectively conducted with the use of side loaders and reach stackers due to the low container volume, but the projected growth in container volume and the ability to increase the facility capacity required equipment that could be efficient in as small a space as possible. Therefore, gantry cranes that could straddle multiple tracks were chosen as the best equipment to serve the new railyard. Two types of gantry cranes were evaluated: the RTG and the RMG. While the RMG was the most productive equipment choice, the high capital cost for the equipment and additional infrastructure (rail installation), along with the projected container volume, outweighed the benefit of the increased productivity. Additionally, it was determined that two RTGs could be procured for the cost of one RMG. The two RTGs in parallel operation could provide a similar level of productivity as one RMG. The two RTGs also allowed for redundancy so operations could continue if one RTG was out of service. The planning of the yard operations also considered three RTGs, but the productivity benefit was outweighed by the wasted labor effort since the railyard would preferably be replenished only once per day. So, it was decided that the best equipment configuration for the new railyard was two RTGs working in parallel.

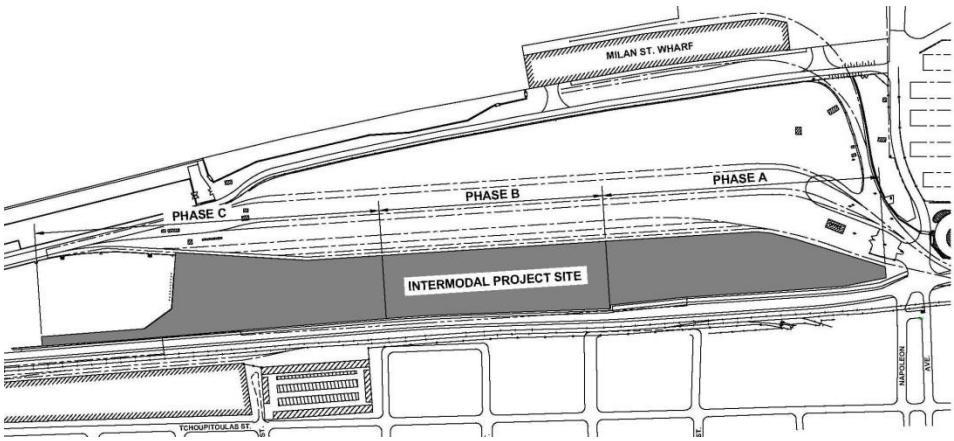
In an effort to reduce carbon emissions associated with port operations, energy efficient electric RTGs were chosen. The advantages of the electric RTG as compared to a diesel equipped RTG included reduced fuel consumption, zero emissions and reduced downtime due to maintenance. Two types of systems to deliver power to the RTG were evaluated: cable reel assembly and a bus bar raceway. While the electric supply would be in a low traffic area, there is a service road alongside the RTG runway. There were concerns that the proximity of the contact rail for the bus bar system to the road would subject the contact rail

installation to damage. Since there were no required crossings along the RTG travel path, the cable reel proved to be the best power delivery system. To protect the cable, a curb was installed between the cable and the service road to separate vehicles from the cable.

Each RTG has a span length of 86 feet which allows the crane to span the four process tracks and a 12-foot wide truck lane. Both cranes can travel the full 1,550 feet of the process tracks. Each RTG is connected to a power terminal box located at the midpoint of the length of travel via a cable reel assembly. The power terminal box is powered by a 4180V/60Hz transformer located at the upriver end of the yard. The cables lay along the pavement just outside of the crane's travel path. Turnover anchors allow for the power cables to release tension in the cables and direct the cables to remain along its path as the RTGs travel from one end of the process tracks to the other. The cranes have a clear height of approximately 40 feet which allows for working a double stacked container rail car with additional height to transfer the container from the rail car to the terminal truck and vice versa.

Even though the track layout is designed for RTGs, the new track layout still allows for the two river side process tracks to be served by top picks and reach stackers. Therefore, rail cars could still be processed if the RTGs are down or additional rail cars could be staged outside the limits of the 1,550-foot process length for additional capacity.

Construction Methods: Current intermodal operations had to continue while the new railyard was being constructed. The project site was being used for storage of empty containers. This container handling operation had to be relocated elsewhere on Port NOLA's property to make the site available for new construction. Pavement improvements near the Milan Street Wharf provided some space for empty container storage, but in order to allow the tenant to continue to effectively operate on the site, the project was constructed in three phases working from Napoleon Avenue to the downriver end of the yard (see figure below).



The tenant cleared its operations from each area as the contractor moved into each subsequent phase. After the third phase, the contractor occupied the full space of the project to install the rails in long strings for an efficient operation.

Budget Goals: The RTGs and RTG maintenance building were not contemplated when the original project was conceived since it was anticipated that the tenant would provide the yard equipment. However, the influx of an additional $1.5 million of grant funds and a focused design effort allowed for the addition of these project elements while still reducing Port NOLA's anticipated contribution by $600,000.

V. Conclusion

The Mississippi River Intermodal Terminal is a successful project for Port NOLA in that it not only provided a modern container railyard, it also paved the way for further expansion of Port NOLA's container operations. Partnering with the tenant during design and construction minimized disruption of operations

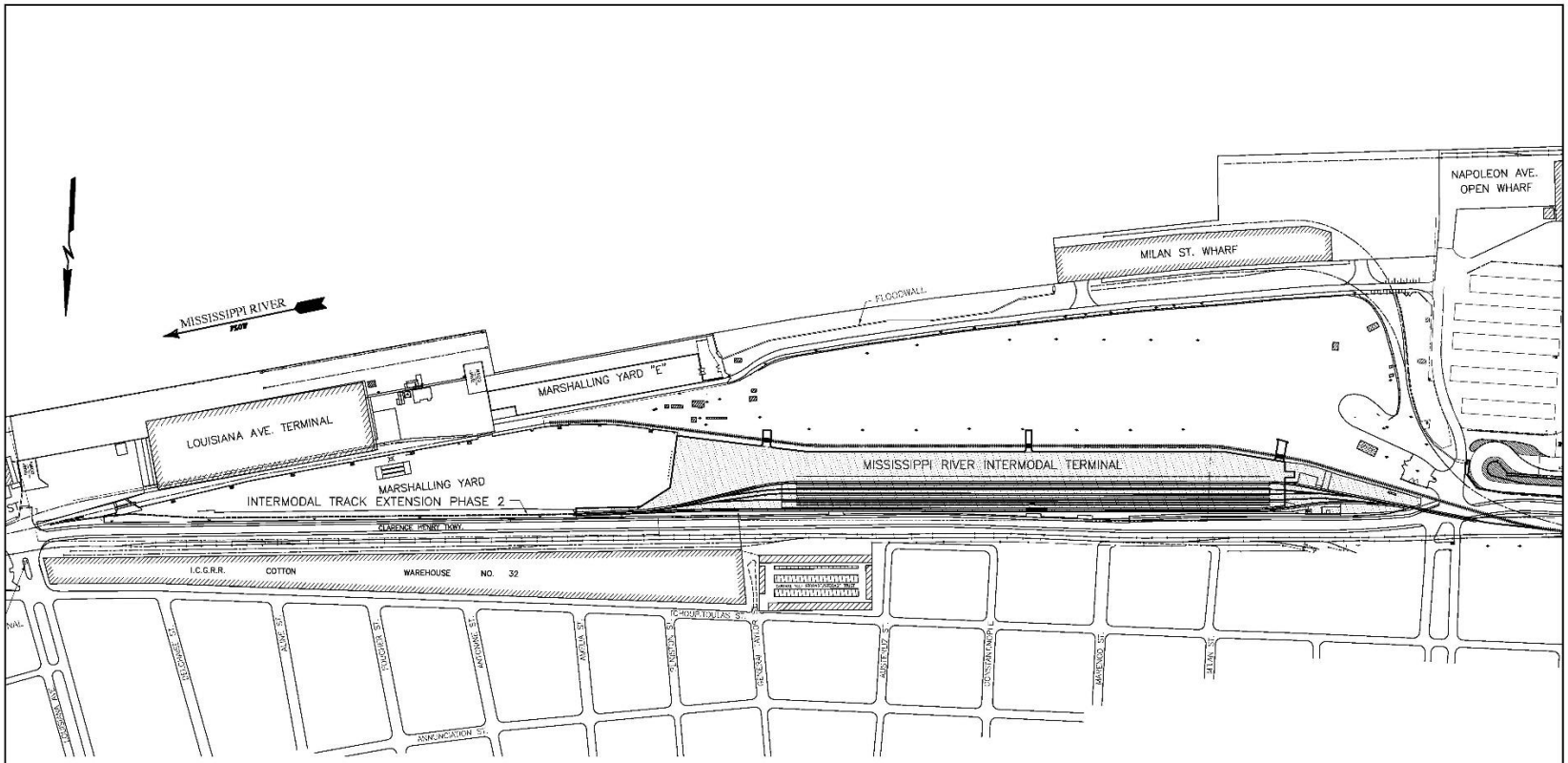
despite significant site restrictions. The successful completion of this project has provided Port NOLA with the opportunity to achieve its container capacity goal of 1.5 million TEUs.

Appendix

Site Plan

Cross-Section

RTG Maintenance Building Elevations



SITE PLAN

SCALE: 1"=200'

200' 0 200' 400' 600' 800'

CONSULTING ENGINEERS

AECOM

1333 NEWARK ST., SUITE 200 NEW ORLEANS, LA.

DATE	SCALE	JOB NO.	DRAWN BY
[illegible]	[illegible]	[illegible]	[illegible]

SUBMITTED BY: OBSERVATION NO. ELEV.

NAD 27 or NO. AA-12137-A2A

DRAWN: D.S.S.
DESIGNED: G.J.V.
CHECKED: J.C.M.
APPROVED: J.C.M.

LDEQ/VERIFICATION NO.

BOARD OF COMMISSIONERS
PORT OF NEW ORLEANS

NAPOLEON AVENUE TERMINAL

MISSISSIPPI RIVER
INTERMODAL TERMINAL

SITE PLAN

SCALE: DATE: 6/27/2014

W. LOUIS REVERE
PORT PROJECT ENGINEER

DWG. NO. AA-12137-W2A REG. 072862

NO.	BY	DATE	NO.	BY	DATE	NO.	BY	DATE	NO.	BY	DATE	NO.	BY	DATE	NO.	BY	DATE
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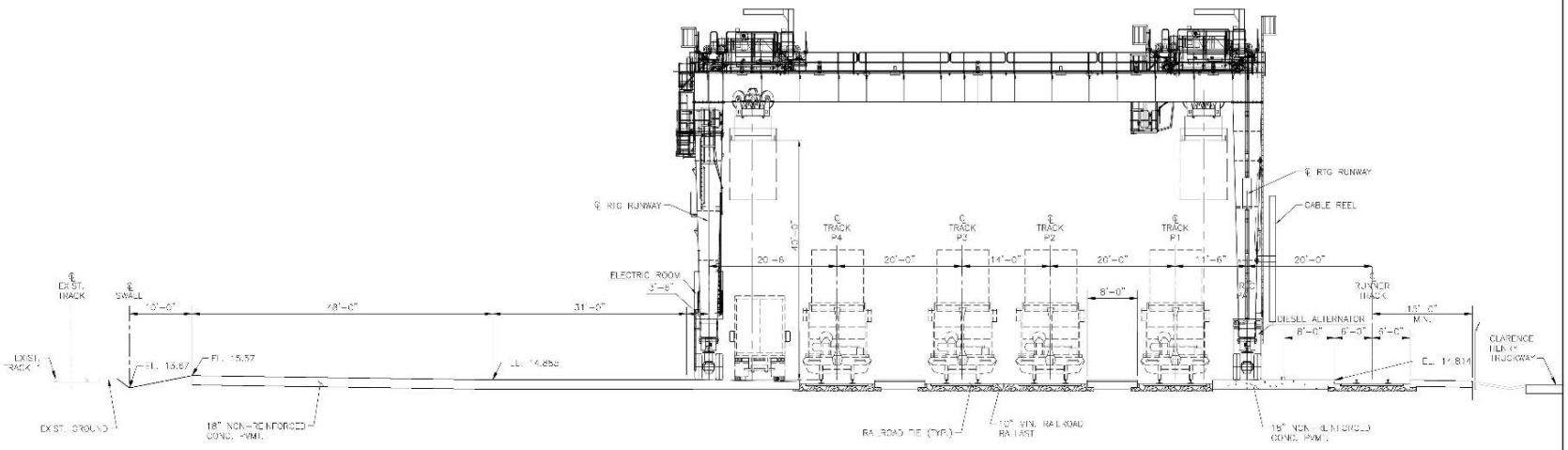

CROSS SECTION

N.T.S.

CONSULTING ENGINEERS

AECOM

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DATE	DRAWN	CHECKED	APPROVED
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PLANNING #	PROJECT NO.
PROJECT DESCRIPTION	PHASE

DRAWN: S.W.S.
DESIGN: C.E.T.
CHECKED: J.G.V.
APPROVED: J.G.V.

IDENTIFICATION NO.

BOARD OF COMMISSIONERS
PORT OF NEW ORLEANS

NAPOLEON AVENUE TERMINAL

MISSISSIPPI RIVER INTERMODAL TERMINAL

CROSS SECTION

SCALE: ---- DATE: 6/27/2014

NATIONAL HEADQUARTERS
PORT PROJECT FACILITIES

DWG. NO. AA-12137-W36 REV. 072862

REV.	BY	DATE
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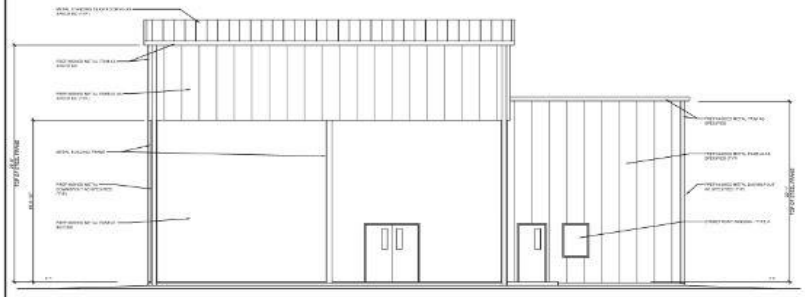
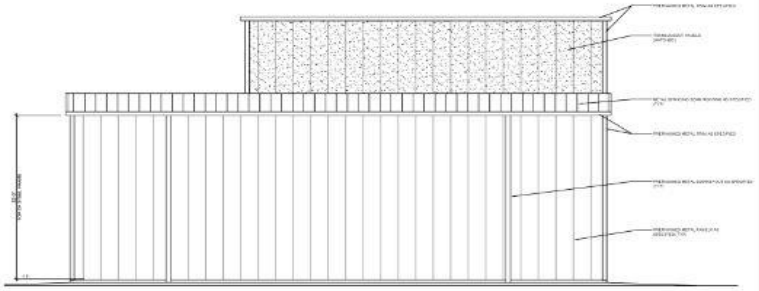
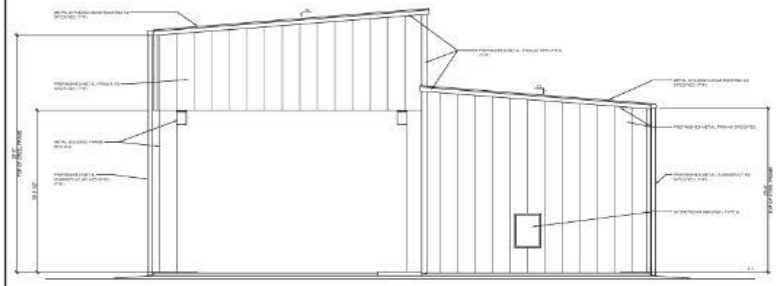


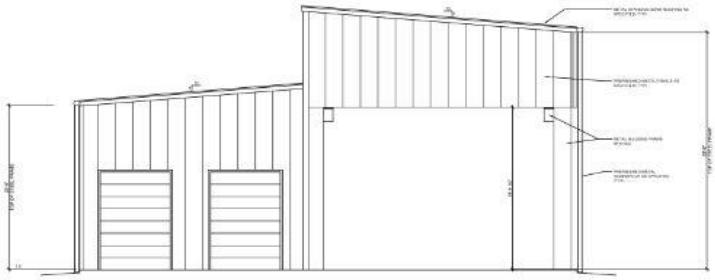
CRANE MAINTENANCE BUILDING - SOUTH ELEVATION



CRANE MAINTENANCE BUILDING - NORTH ELEVATION



CRANE MAINTENANCE BUILDING - EAST ELEVATION



CRANE MAINTENANCE BUILDING - WEST ELEVATION

CONSULTING ENGINEERS

AECOM

BOARD OF COMMISSIONERS
PORT OF NEW ORLEANS

MISSISSIPPI RIVER INTERNODAL TERMINAL

E-RTG CRANE MAINTENANCE FACILITY

BUILDING ELEVATIONS

DWG. NO. AA-12165-A5

REV. 077163