TraPac Automated Terminal- Port of Los Angeles

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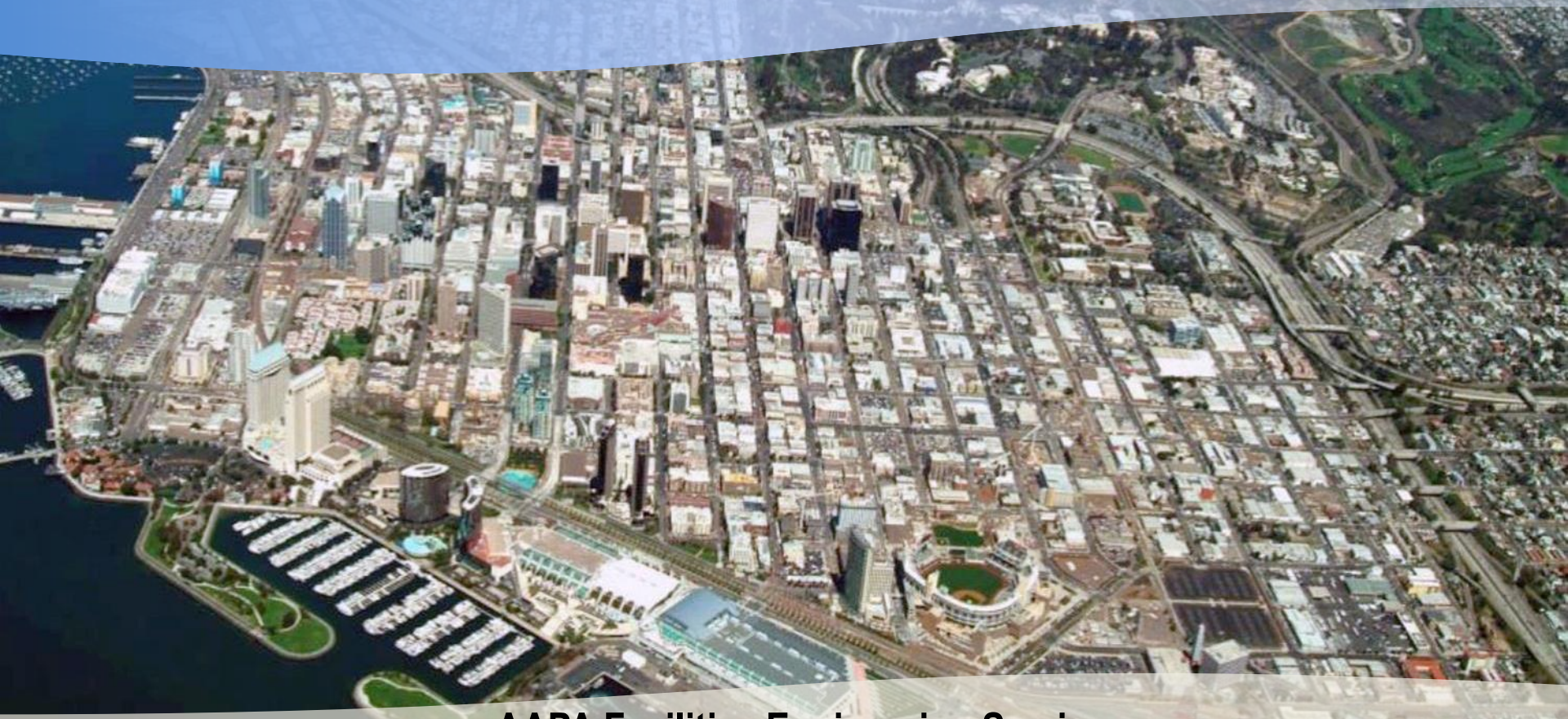

AAPA Facilities Engineering Seminar

San Diego

October 2015

ch2m

Agenda

- Introduction
- Overview of Automated Stacking Crane Block and Operations
- Infrastructure Design Challenges & Solutions
- Construction Lessons Learned
- Operational Results
- Q & A

CH2M HILL Today

We are an industry leader in consulting, design, design-build, operations, and program management.

- **Headquartered in Englewood, Colorado, USA**
- **More than 24,000 employees**
- **US$7 billion in revenue**
- **100 percent owned by our employees**
- **Broadly diversified across multiple business sectors**
- **Performing work in more than 140 countries**
- **2015 ENR Ranking – Program Management #1, Ports & Maritime #3, Transportation #3**
- **Engineer of Record Automated Terminals - TraPac Port of LA, APMT Portsmouth Virginia, Global Container Terminal New Jersey**

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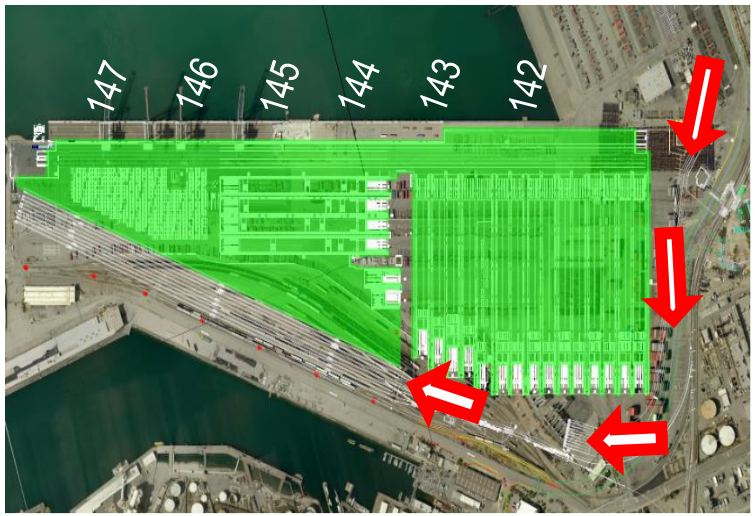
Port of Los Angeles

★ **TraPac**

Berths 142 – 147



Acronyms

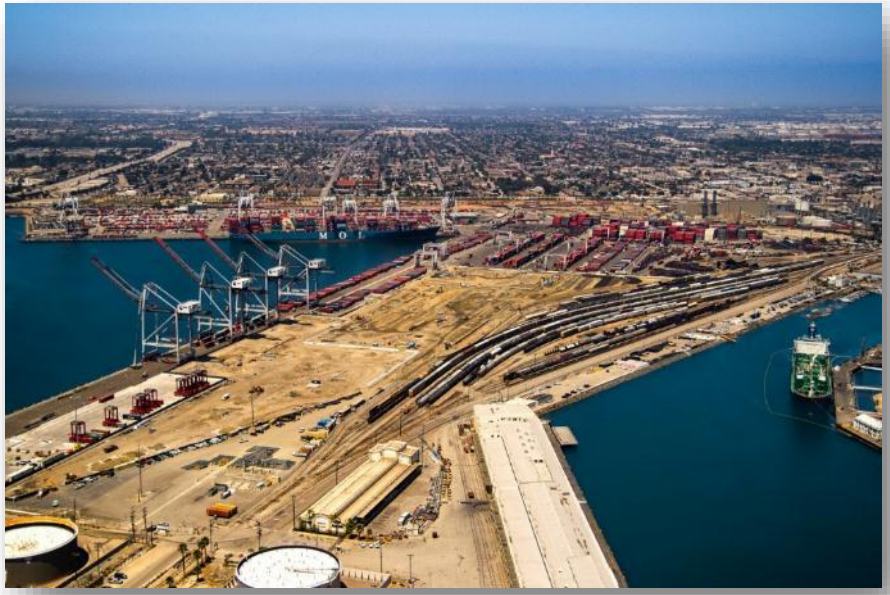
STS = Ship-To-Shore Crane

RTG = Rubber Tired Gantry Crane

ASC = Automated Stacking Crane

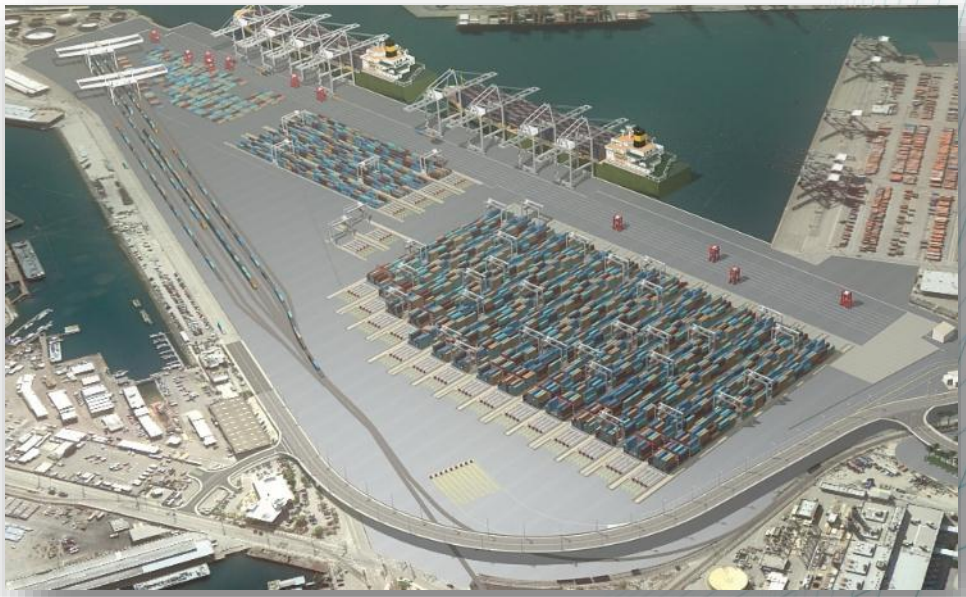
SC = Automated Shuttle Carrier

Scope (Phases 1-5)



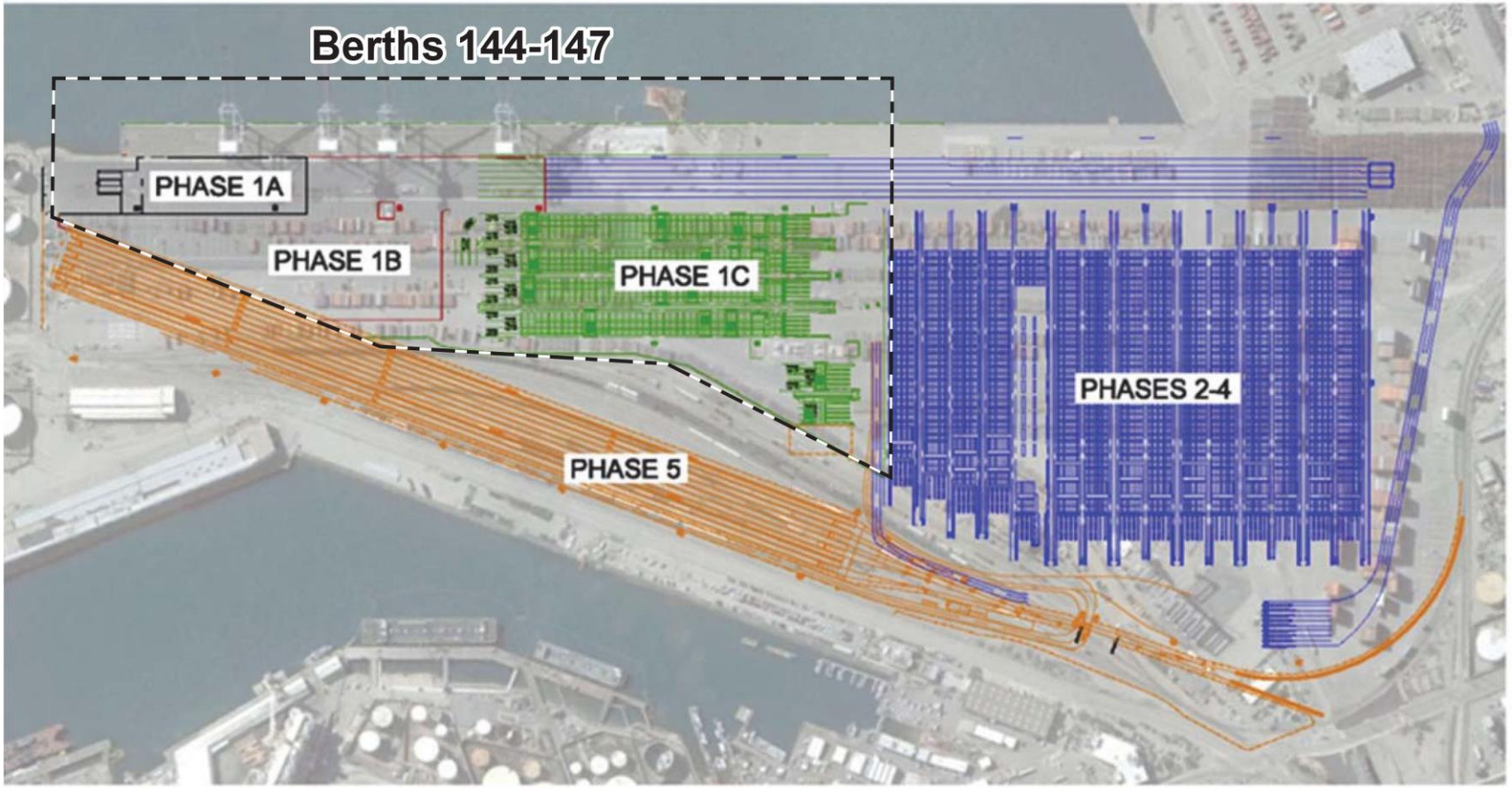
Project Site In Construction

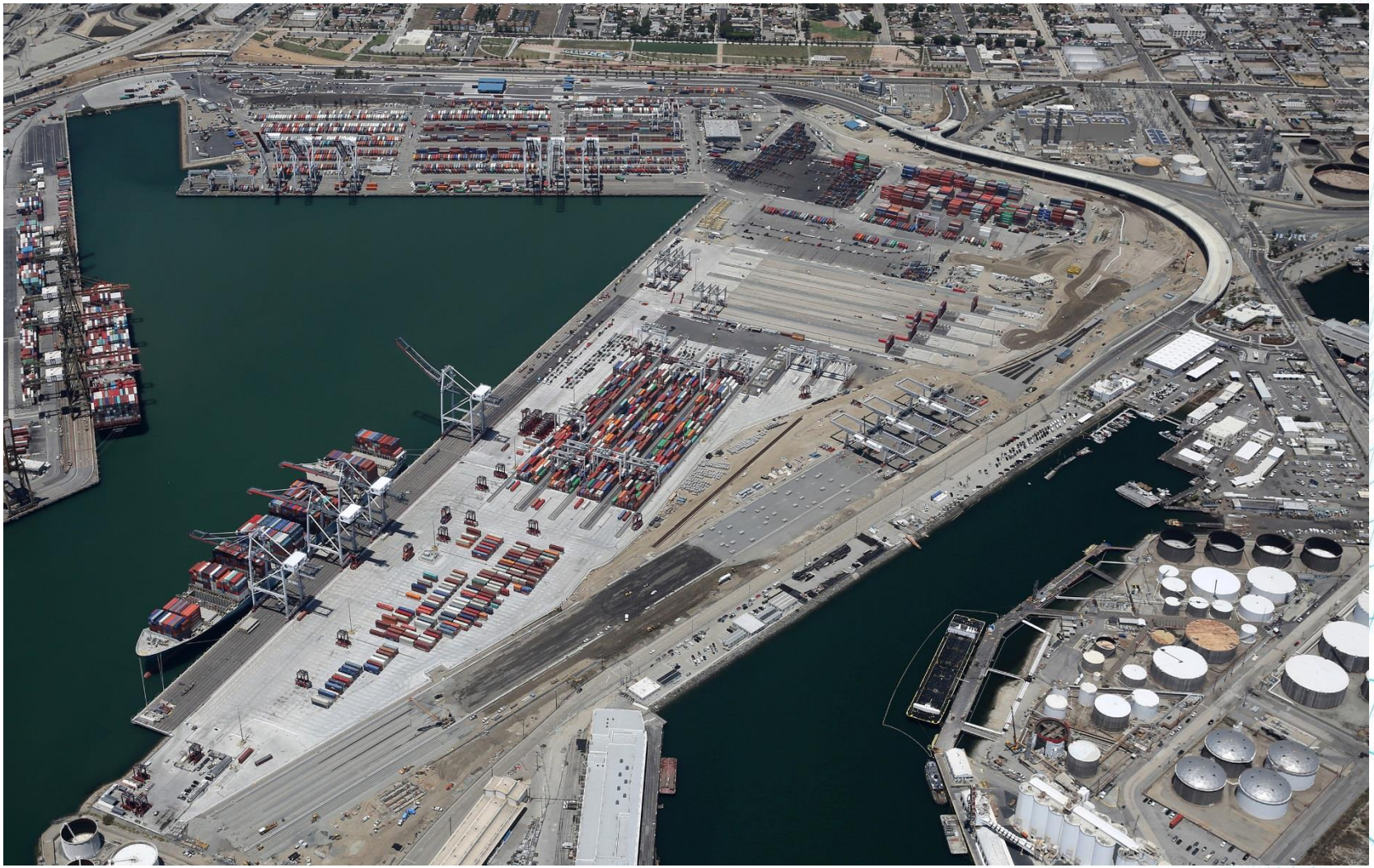
- 200 Acres (81 Hectares)
- Throughput 1.6 M TEU)
- 19 Automated Stacking Blocks
- 2 Mini Automated Stacking Block
- On dock rail yard



Re-Developed Terminal

- Total Equipment:
  - 39 – 8 wide ASCs
  - 1 – 10 Wide ASC
  - 28 – Automated Shuttle Carriers
  - 3 – ARMGs for rail yard


Berths 144-147
PHASE 1A
PHASE 1B
PHASE 1C
PHASES 2-4
PHASE 5



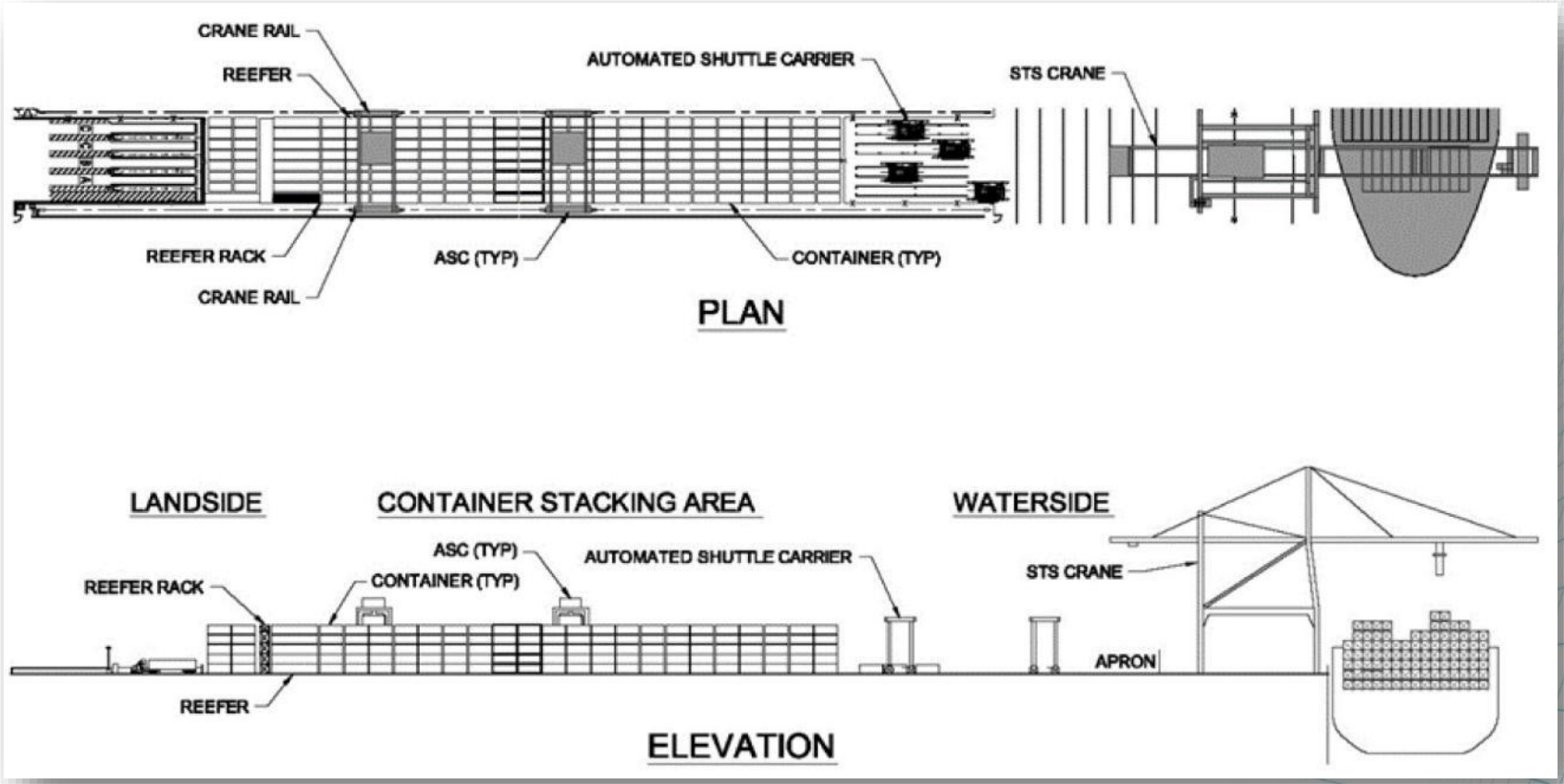
Fully Operational Berths 144-145

Automated Equipment

Automated Shuttle Carrier (SC)

Automated Stacking Crane (ASC)

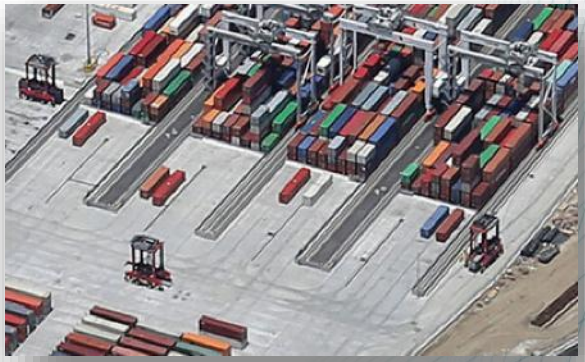
ASC Block Components



Berths 144-145 Interchange Areas and Container Stacking Area

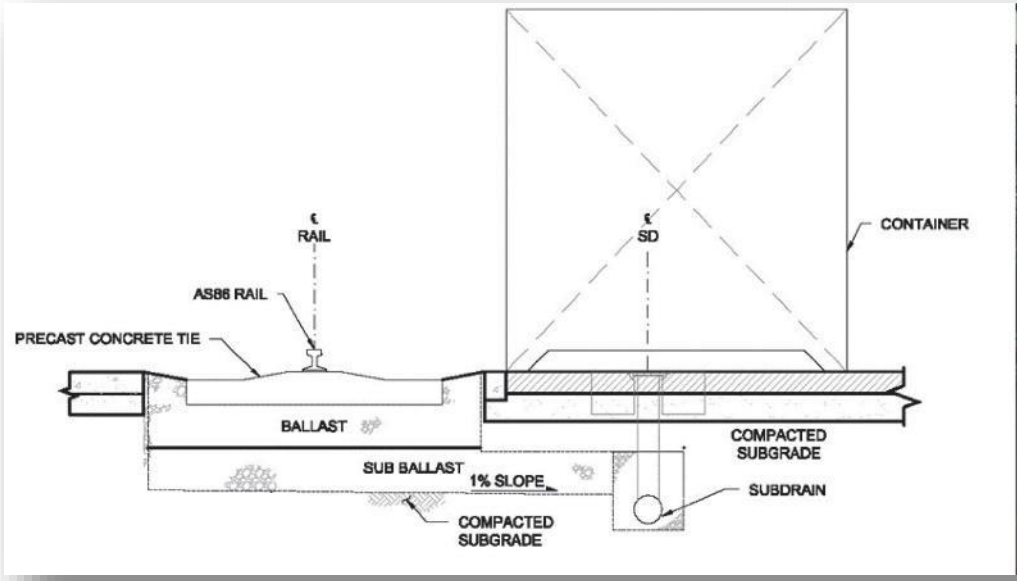
Landside Interchange Area

Container Stacking Area



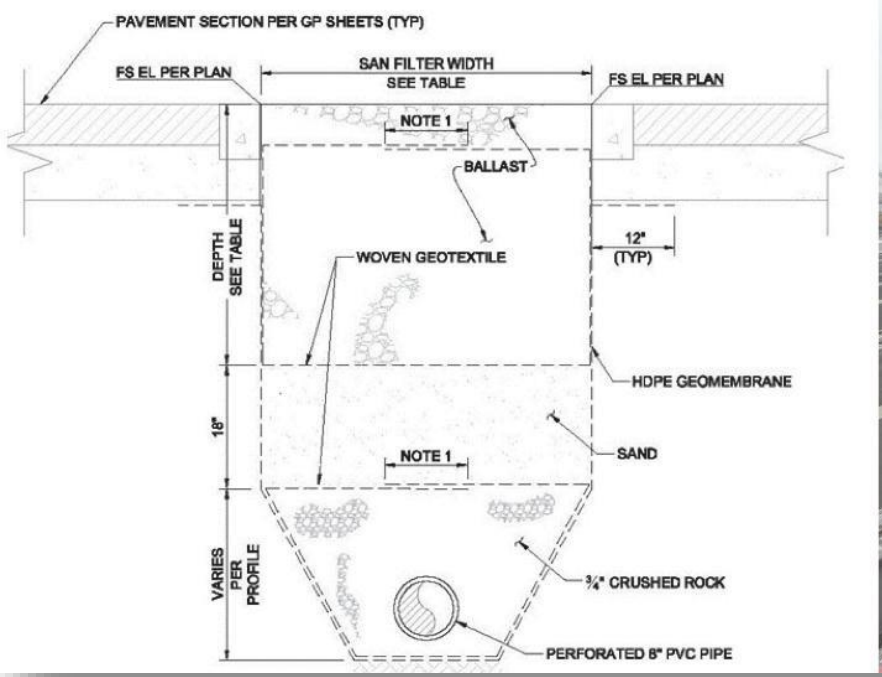
Waterside Interchange Area

Crane Rail Foundation



- European Rail Section (AS 86)
- Flash Butt welds vs. Thermite
- Ballasted Rail System
- Lower initial capital cost
- Ballasted Track provides Cross Drainage
- Minimizes Impact to Existing Utilities

Block Sand Filter

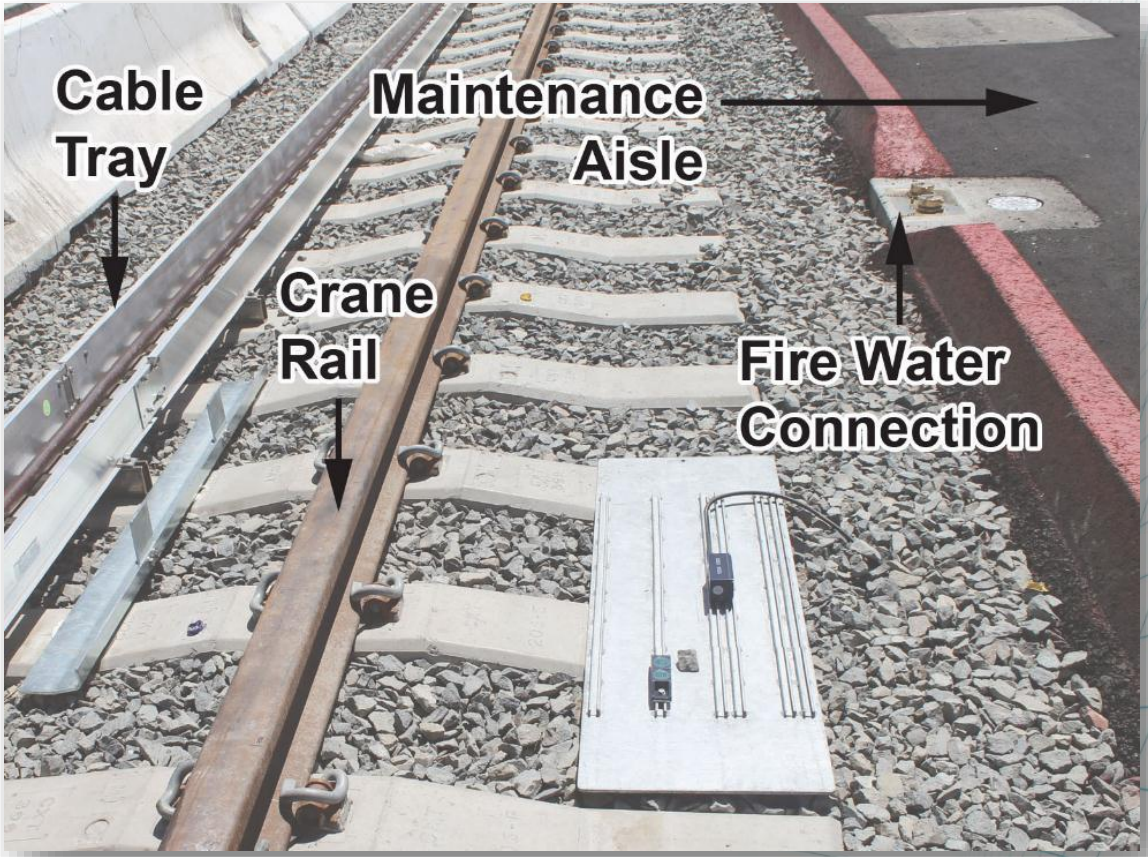


Objective:

1) Compliance with City of Los Angeles Standard Urban Stormwater Mitigation Plan (SUSMP)
2) Drain site without affecting precision of ASC equipment
3) No infiltration due to chemically impacted soil

Fire Protection System

- **Maintenance Lanes (3 m) Access for mechanics and emergency vehicles only**
- **Standpipes with valves along service and maintenance lanes with outlets every 46 m**
- **Heat sensor cameras placed at each 30 m HMP along perimeter**
- **Fire hydrants at 122 m spacing at HMP along perimeter**
- **Air lock areas for inspection of leaking containers**



Electrical Infrastructure

Berths 144-145

- **14,000 ft of Duct Bank - Med Voltage (12.47 KV), low voltage (600 V), and communications (Fiberoptic, Ethernet, WiFi, RFID, OCR) duct bank.**
- **124 Reefer Plugs**
- **Step up transformers**
- **Tight space of ASC blocks present challenge.**
- **Identify all conduits early on**
- **Install the conduits stub outs, pull boxes, manholes, and pads precisely**

Unique Features at TraPac

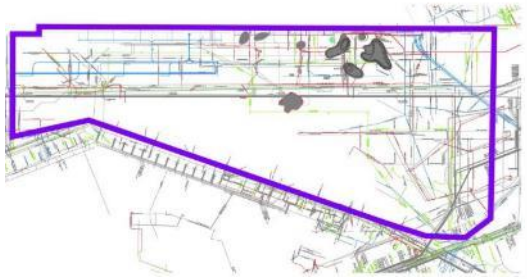
- **Fully automated both waterside & landside ASC block operations**
- **SCs deployed in conjunction with ASCs Blocks**
- **Containers transferred directly from waterside area to on-dock rail yard**
- **Two mini ASC blocks for hot cargo**
- **SCs uses magnets in pavement for navigation**

Video-Automated Operations at Berths 144-145

Challenges

- Irregular Shaped Terminal
- Integrate Crane Equipment, Serving Utilities, Operations & Infrastructure Design
- Maintain Terminal Operation During Construction
- Existing Underground Utilities & Chemically Impacted Soil
- Meet Precise Crane Manufacturer Parameters
- Power System Load Estimation & Infrastructure

Irregular Site Shape Dictates ASC Block Layout



Site Shape

Collaborative approach between POLA, CH2M HILL, TraPac, and Cargotec leads to operations, equipment, & infrastructure design that is integrated

Civil Construction and Crane Equipment Integration

Workshops and Weekly Meetings

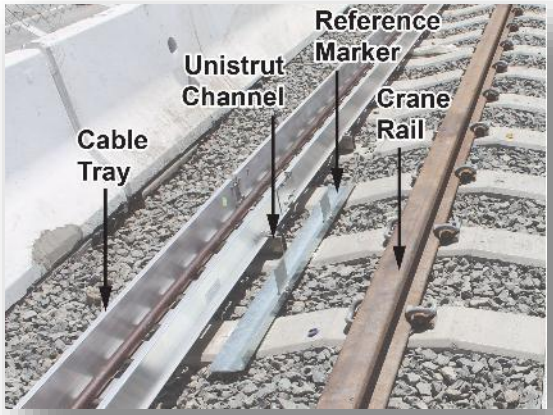
Phasing and coordination with TraPac helps maintain shipping operation

Phasing of Construction Activity

Berth 142-147 Active During Construction

Construction Lessons Learned

- Construction Sequence of Maintenance Aisle



- Allowance for Crane Movement, Rail Placement and Appurtenances
- Add Survey as a Separate Bid Item

- Accurate Layout of 14,000 ft of Duct Bank Backbone
- Naming Convention of Conduits
- Electric Utility Coordination on Power Supply and Protection.
- Plan the Power Energization and Commissioning Timeline

Operational Results

OPERATIONAL RESULTS

The operational data in Table 1 for the five ASC blocks at Berths 145-147 are based on the second quarter of 2015.

Table 1. Operational Data.

Throughput	Planned/ Target	Actual	Remarks
Overall (5 Blocks)	250,000 moves per year	200,000 moves per year	
Landside Interchange Area	12 to 14 moves per hour per block	9 moves per hour per block	When automated truck handling is activated, the throughput is expected to meet the planned criteria.
Waterside Interchange Area	18 to 20 moves per hour per block	12 to 14 moves per hour per block	
Ship-to-Shore (STS) Crane	27 moves per hour	20 moves per hour	Limited by number of Shuttles. At times, STS has to wait for shuttles. TraPac is working on better synchronization between crane drivers and shuttles. Also, the STS cranes are not dual hoist. Therefore, they are limited on drop-off/pickup lanes for shuttles.

Acknowledgement

Port of Los Angeles

QUESTIONS AND ANSWERS