MOFFATT & NICHOL

Creative People, Practical Solutions.

Process for Port Master Planning

Presented by

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Moffatt & Nichol

- Founded in 1945 in southern California to serve the evolving Naval, Port and Maritime Industries
- 550+ employees; 27 offices (North America, Europe, Latin America, Middle East, Pacific Rim)
- A recognized leader in marine terminal planning, analysis, design, and goods movement economics
- Marine terminal specialists made up of Planners, Engineers, and Economists

Process for Port Master Planning

- Understanding the Influences:
  - Demand
  - Land
  - Environmental
  - Access
  - Operations

Process for Port Master Planning

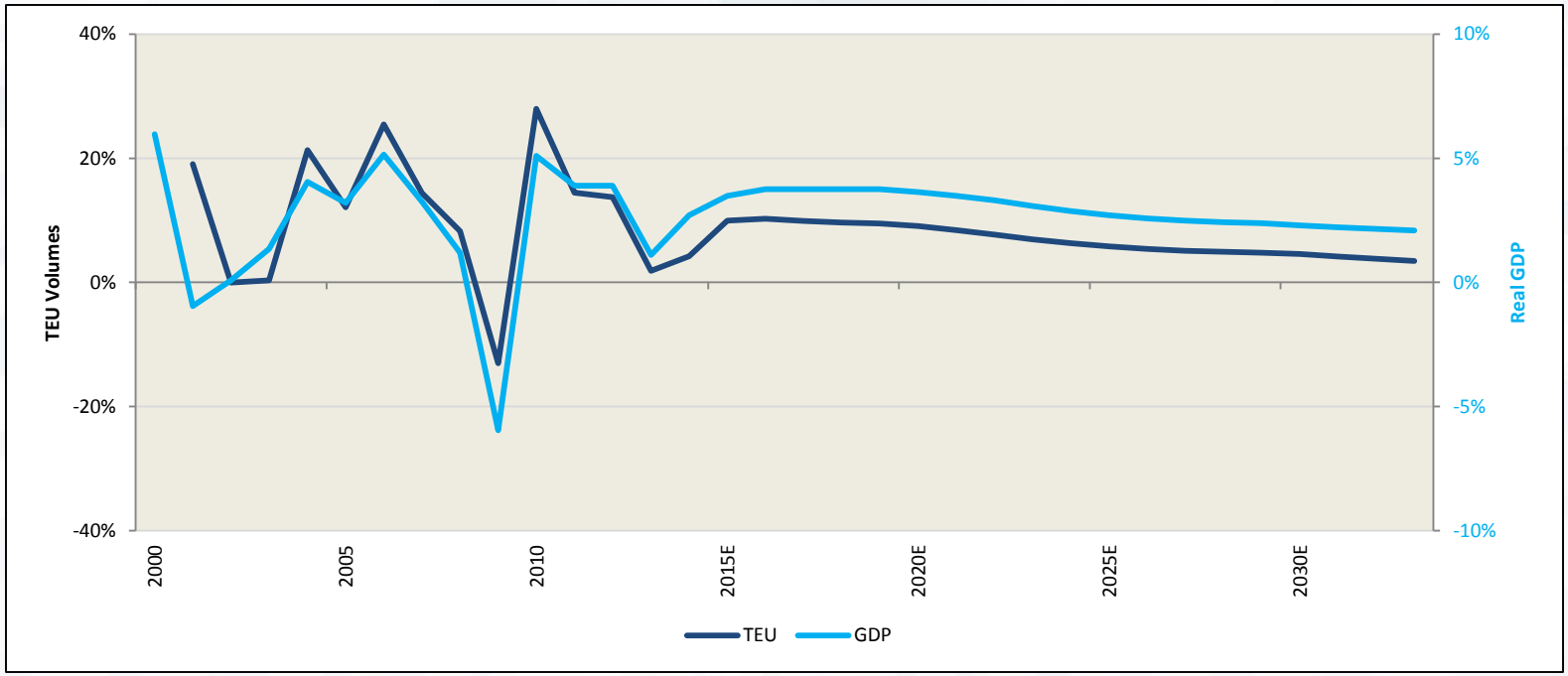
- Process will include:
  - Economic, market, & financial analysis
  - Port use definition
  - Project financing options
  - Environmental studies
    - Site evaluation
  - Facility planning

Economic, Market, & Financial Analysis

- Market forecast
- Market share analysis
- Pricing analysis
- Competition analysis
  - Least Cost Market Area (LCMA)

Market Forecast

- Container, RoRo, and bulk cargo forecasts
  - Long term global economic trends
  - Structural economic changes
  - Supply chain analysis



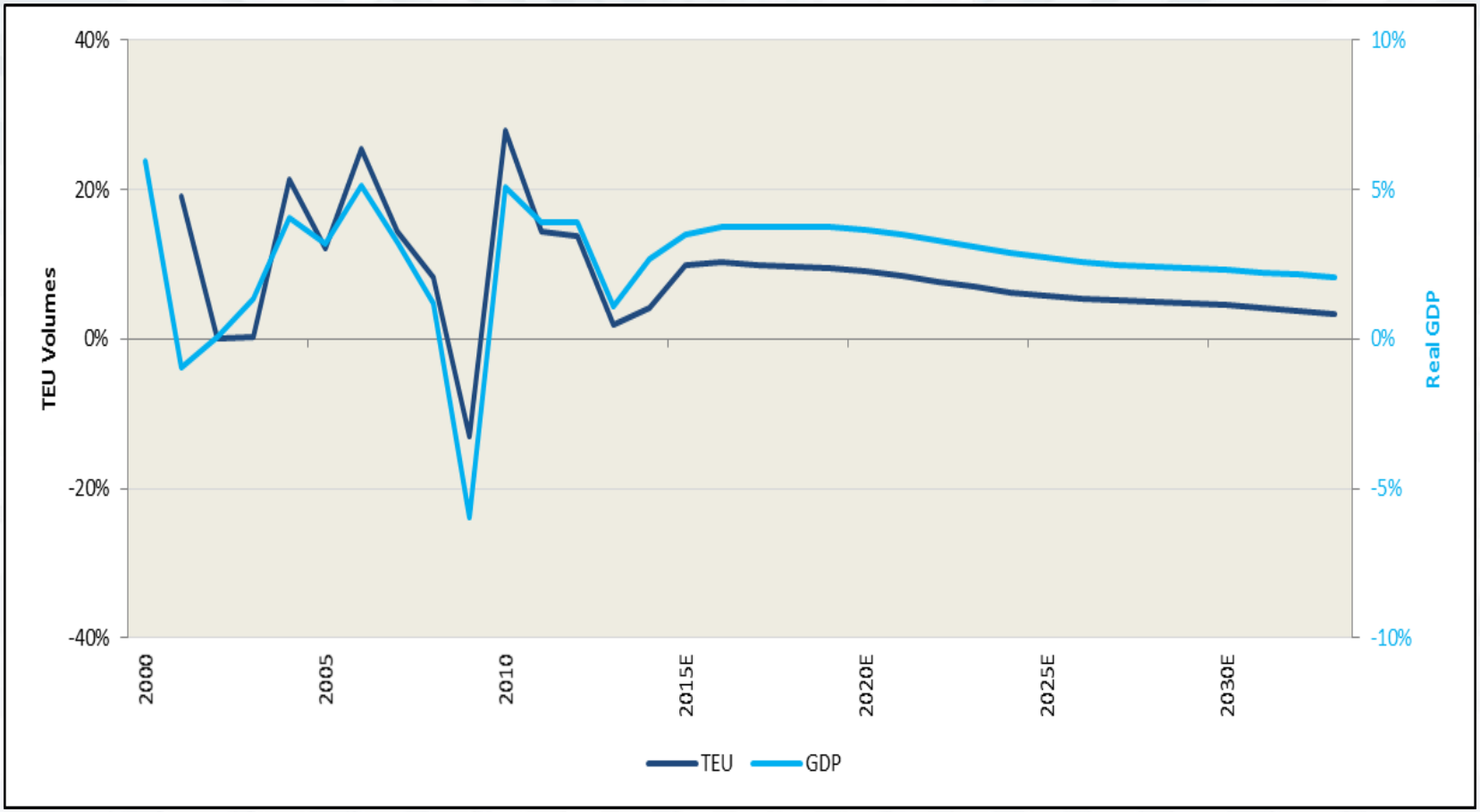
Example of Containerized Cargo Forecast

Mexico is the largest economy in Central America and second largest in Latin America, trailing only Brazil

- Mexico gateway (import and export) volume is driven by demand from growing manufacturing and consumer sectors
- Transhipment volumes are driven by ports on the Pacific Coast of Central America who continue to rely on hub-and-spoke transhipment services.
- The recent energy reform being enacted could provide significant stimulus to the economy and trade

Example of Containerinzed Cargo Forecast

- Historical & Projected GDP & TEU Growth

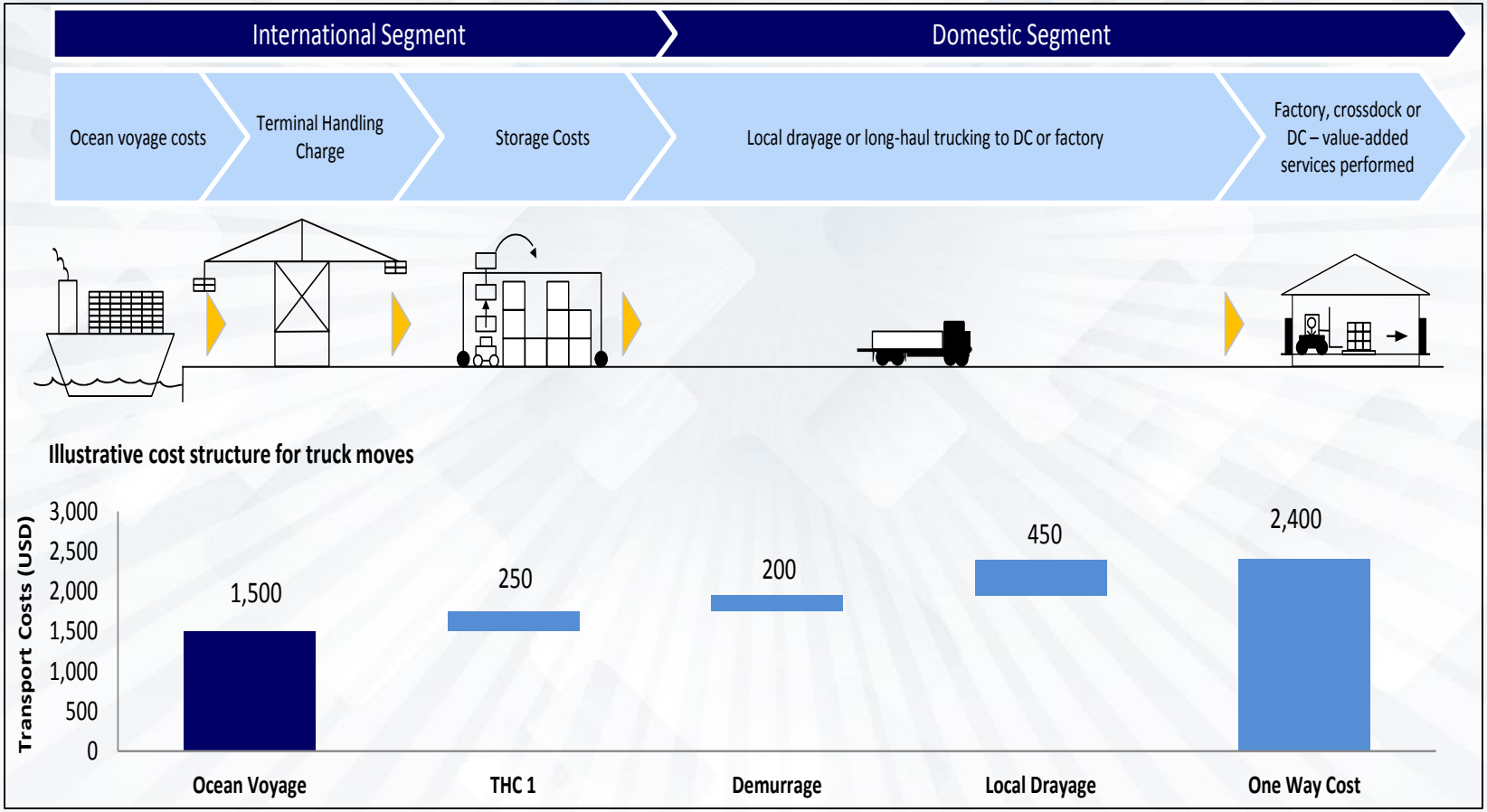


Market Share Analysis

Share of Mexico's container volume by state

Pricing Analysis

Cost Segments of Import Logistics Route



Competition Analysis

Cost differential for LZC over MZO

Project Financing

- Public source
- Private source
- Combination of public & private sources

Project Financing

- Success of a port is influenced by port authority, private port operators, and shipping lines:
  - Public Port Authorities
    - Investment in ports and transportation infrastructure (road & rail systems)
    - Transparent institutional duties and responsibilities
    - Non restrictive and stable import and export rules

Reliable Transportation Infrastructure Example

Alameda Corridor

Project Financing

- Private Port Operators
  - Availability of capital to develop or improve a project
  - Improve capacity by optimizing all terminal systems
- Shipping Lines
  - Continue to demand for improvement in vessel productivity
  - Demand in predictability of vessel productivity

Port Development Roles

- Port Type
  - Common use port (owner/operator)
  - Landlord port

Environmental Studies

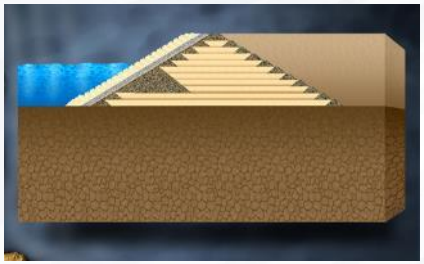
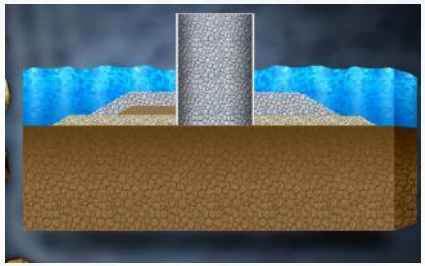
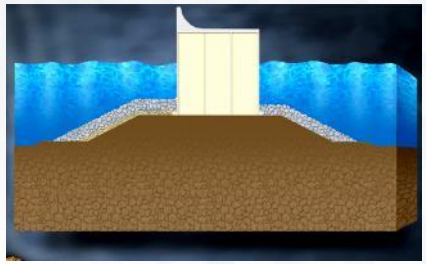
- Key Site Evaluations include:
  - Geotechnical Investigation
  - Coastal & Navigational Studies
  - Environmental Permitting
  - Environmental Risk Analysis
  - Constructability Analysis
  - Construction material availability analysis

Environmental Studies

- Geotechnical Investigation
  - Establish site design condition
  - Initial studies to evaluate site geology and seismicity
  - Subsurface investigations to determine
    - Depths of varying soil conditions (loose soil, rock, sand, clay) with respect to soil stability and load bearing capacity.
  - Landfill recommendations

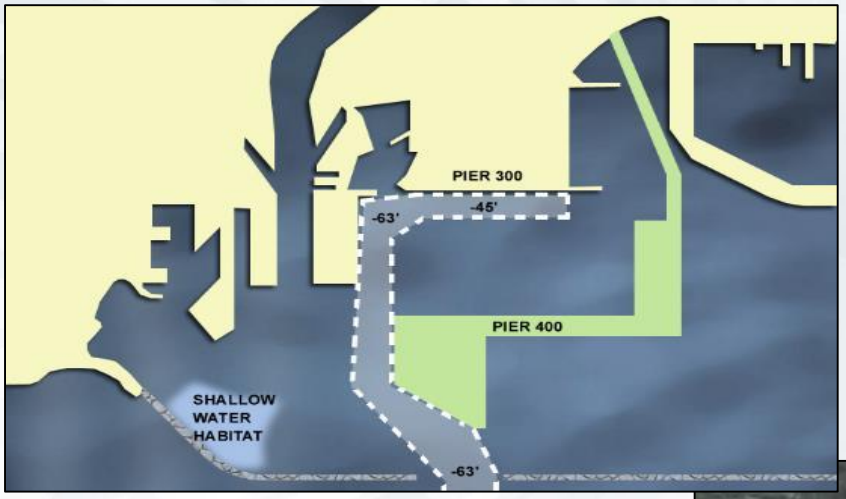
Environmental Studies

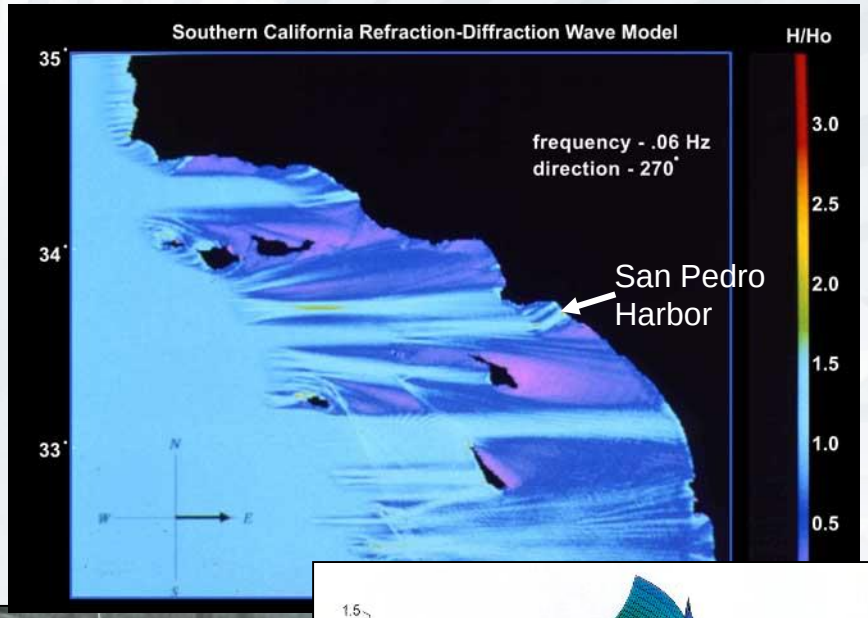
- Coastal & Navigational Studies
  - Wave climate modeling
  - Develop alternative harbor layouts
  - Investigate alongshore sediment transport
  - Hydrology, hydraulics, and sedimentation studies
  - Navigational channel, berth dredging, and land reclamation plan
  - Develop breakwater conceptual design

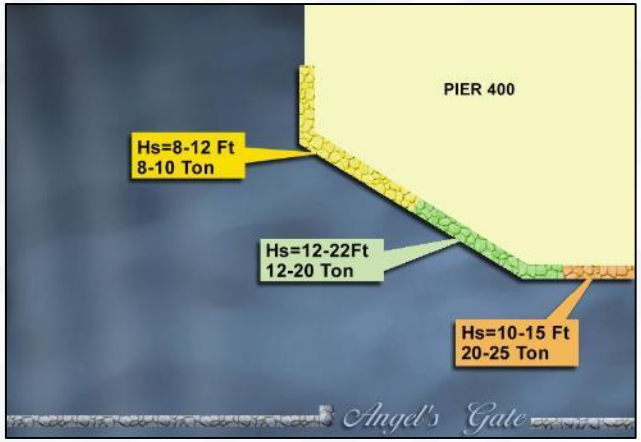




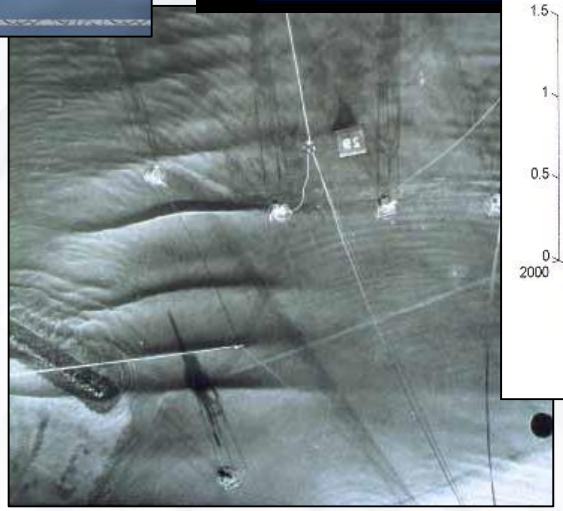

Wave Climate Modeling Example

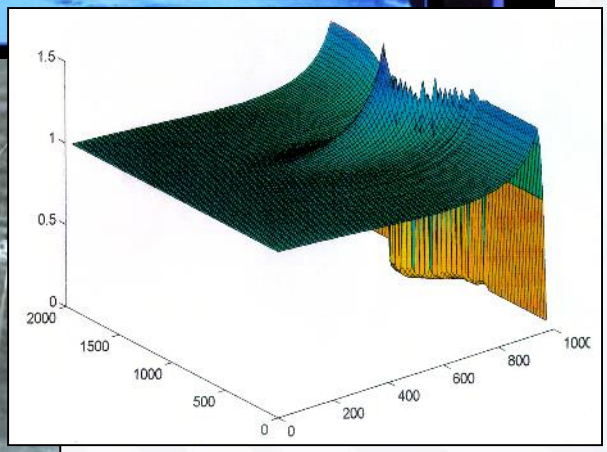
- POLA Pier 400









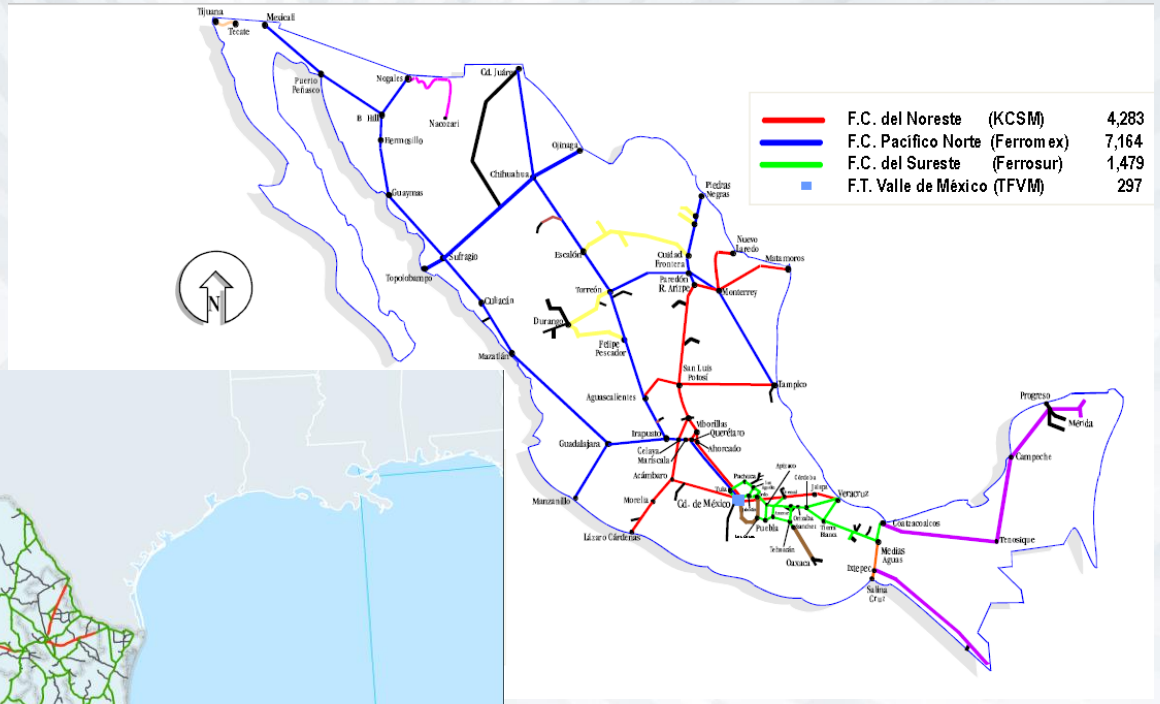


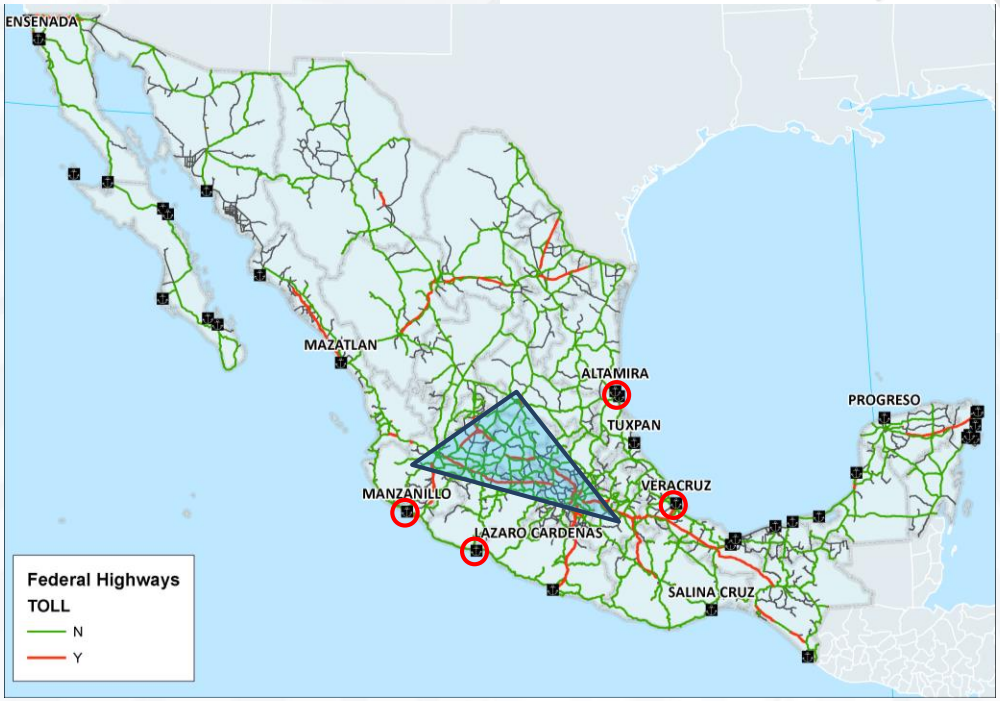
Environmental Studies

- Identify permit requirements, approval process, and schedule
- Risk Assessment
  - Hazardous materials and cleanup requirements
  - Environmental impact to local area
    - Especially from operational pollution.
  - Any requirements for project mitigations particularly from the creation of landfill
  - Wildlife Habitat Mitigation
  - Water Quality
  - Storm Water Management

Environmental Studies

- Site Access
  - Vessel, Road, Rail





Environmental Studies

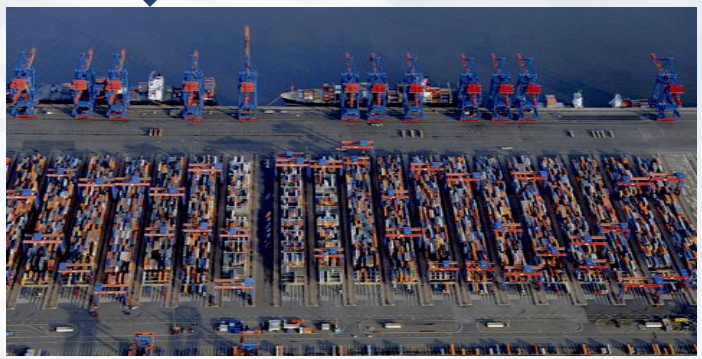
- Utility Availability/Reliability
  - Electrical Power
  - Water
  - Sanitary Sewer System
  - Other Utilities

Facility Planning

- Purpose to Balance
  - Berth
  - Container Yard
  - Gate
  - Rail Yard
- To Provide
  - Adequate capacity
  - Required productivity
  - Predictable cost / opex
  - Weekly reliability

Terminal Business Case is to Recieve/Deliver Cargo from/ to Vessel, Train, & Truck; and Manage Cargo in the Storage Yard

Vessel
- **Up to 14,000 ctr per call**
- **Regular schedule with some variation**
- **Demand for short port stay time**



Container terminal
- **to handle**
- **to store**
- **to sort and consolidate**

Train
- **"Call size" 600 or less**
- **tight and regular schedule**

Truck
"Call size" normally 1 to 2 ctr
- **Almost random appearance**
- **Demand for short turn time**

Use of Simulation in Developing proven Master Plan

- Simulation FlexTerm FXT to develop proven master plan

RTG Terminal.mp4

Conclusion

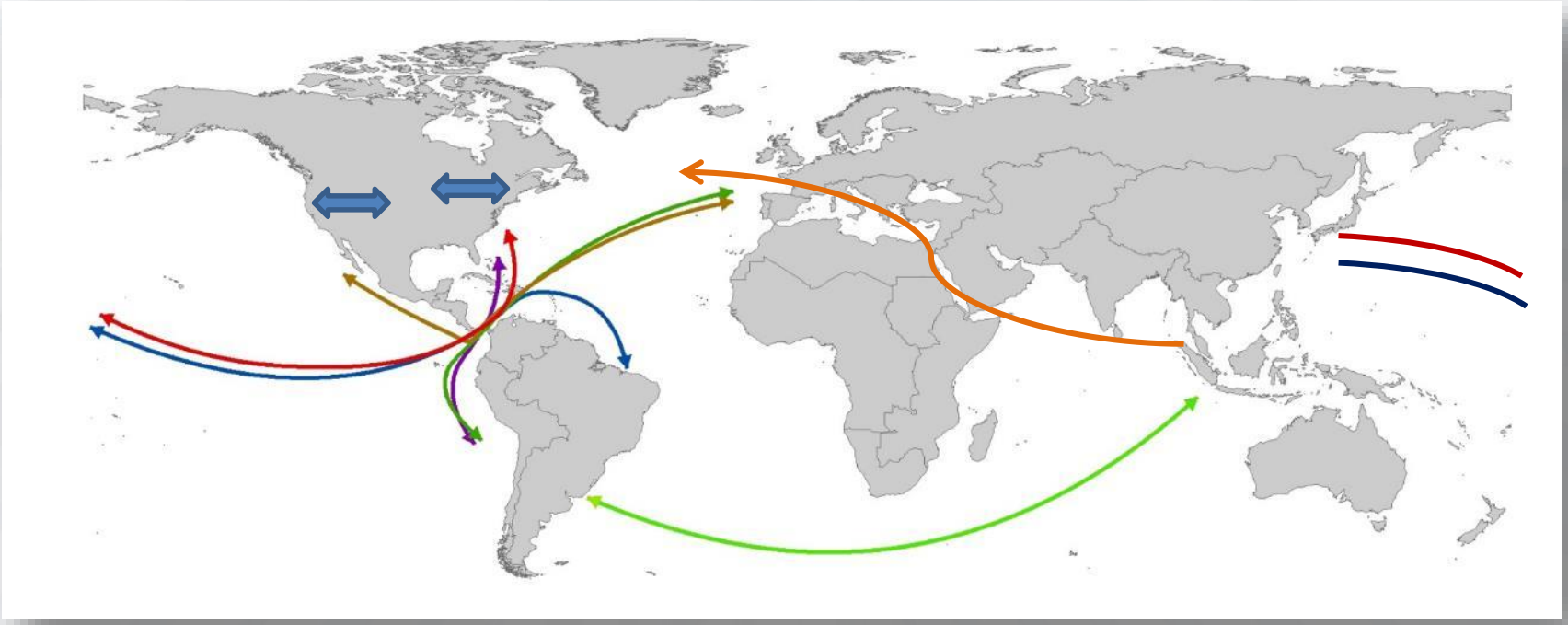
- The Port Master Planning Process
  - The application of
    - Economic analysis
    - Environmental studies
    - Planning tools
  - To understand the port project influences
    - That are aligned with your development responsibility

Process for Port Master Planning

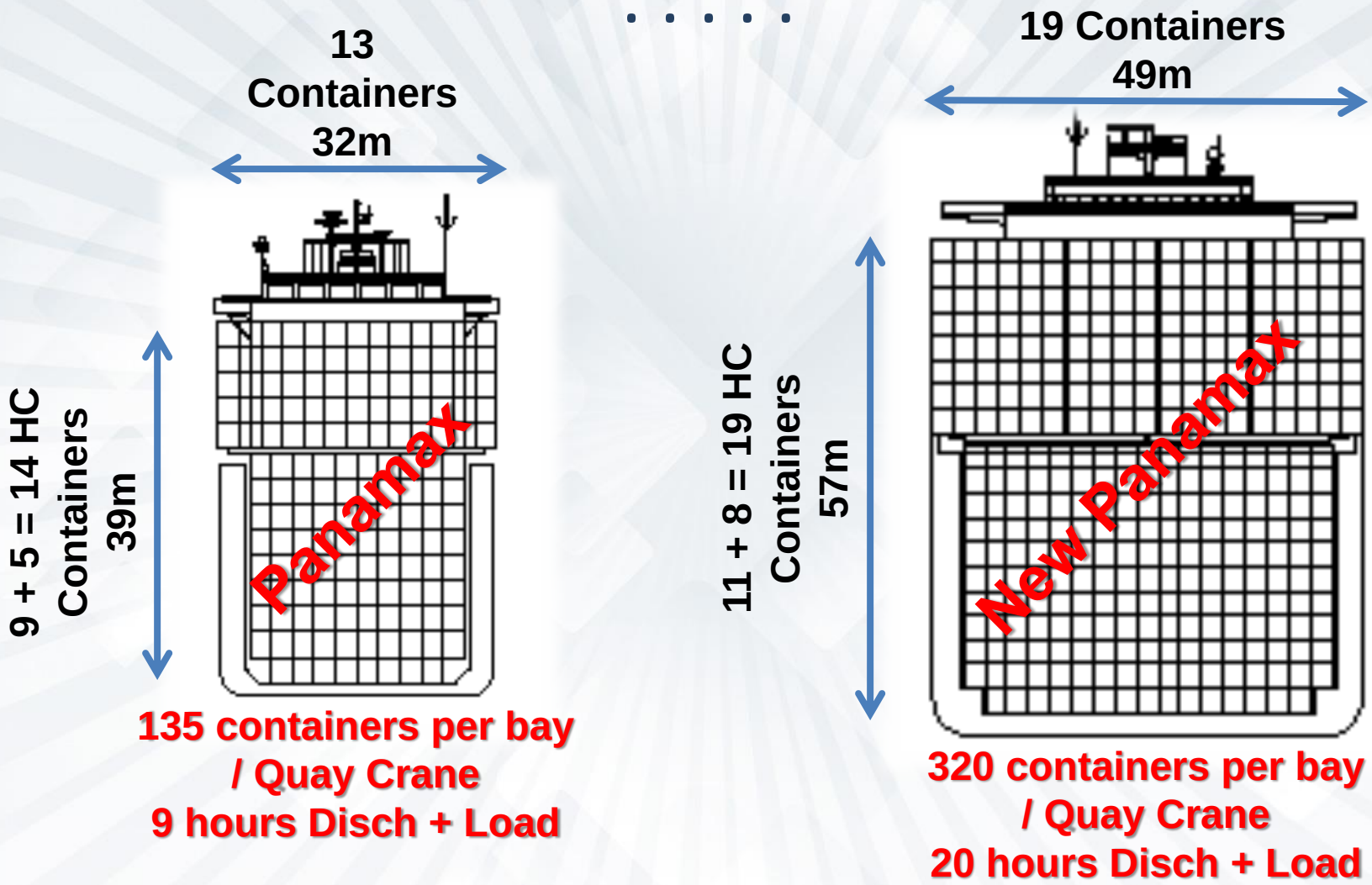
Muchas Gracias

Port Master Planning

- Panama Canal expansion may be a Game Changer for some ports
  - The PC expansion will result in larger vessels transiting the canal
  - New Panamax vessel capacity = 250% of Panamax vessel capacity
  - Initially, there will be fewer vessels
  - Cargo will concentrate in a fewer ports and will cause pressure on logistic chain

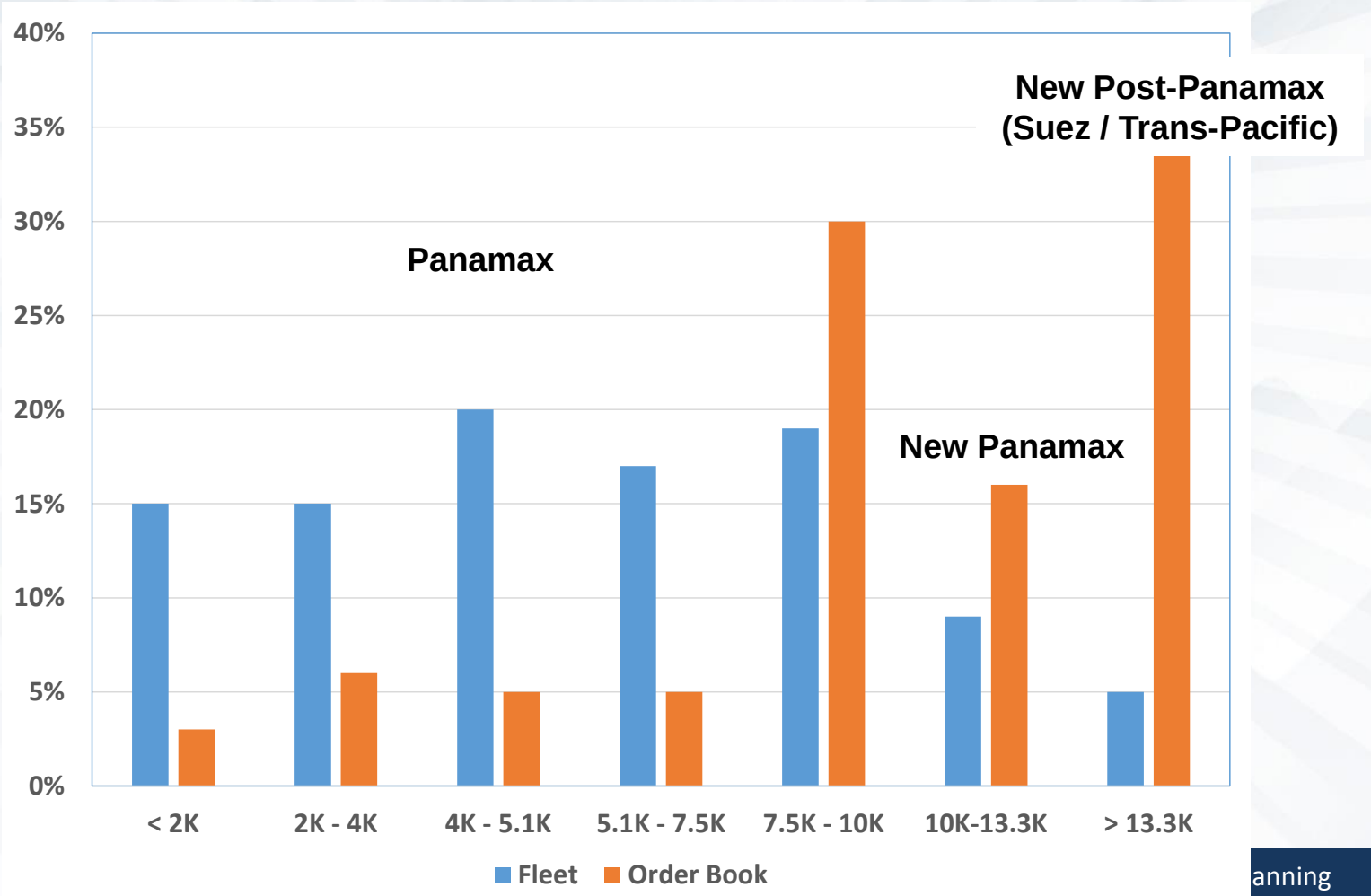


Port Master Planning



Port Master Planning

Global Fleet Composition by Capacity



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Port Master Planning

Limitation to vessel sizes

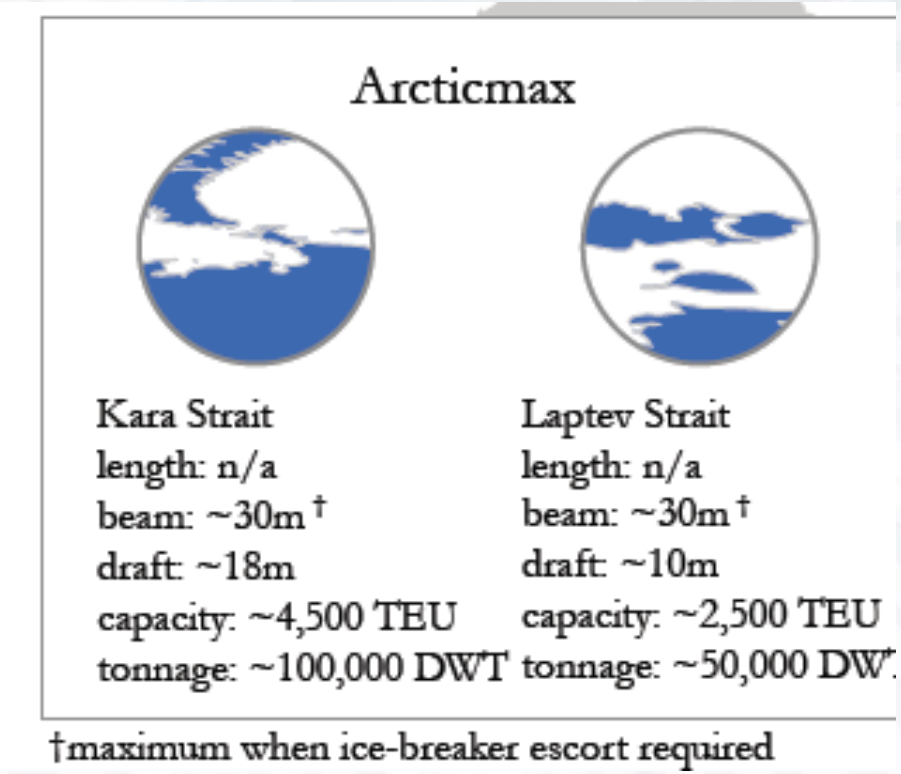
New Panamax	Suezmax	Malaccamax	Chinamax*
			
Panama Canal length: 366m beam: 49m draft: 15.2m capacity: 13,000 TEU tonnage: 120,000 DWT	Suez Canal length: n/a beam: 77.5m draft: 20m capacity: >18,000 TEU tonnage: 200,000 DWT	Malacca Strait length: 400m beam: 60m draft: 21m capacity: >18,000 TEU tonnage: 240,000 DWT	Port Terminals length: 360m beam: 65m draft: 24m capacity: n/a tonnage: 400,000 DWT

Sources: Carnel, Lloyd's Register, Maritime Connector, Ranger

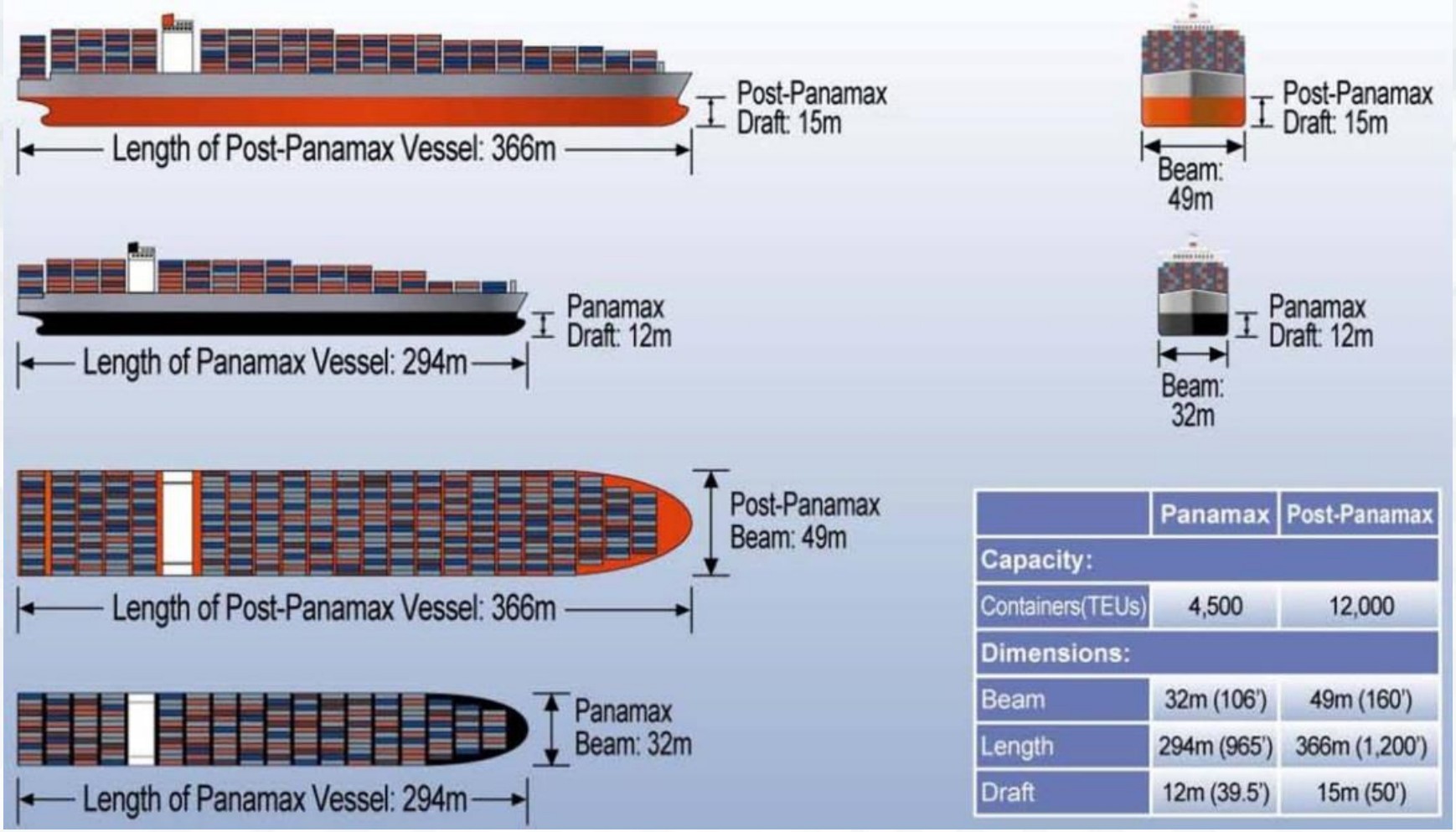
* also referred to as Valemax

Port Master Planning

Limitation to vessel sizes



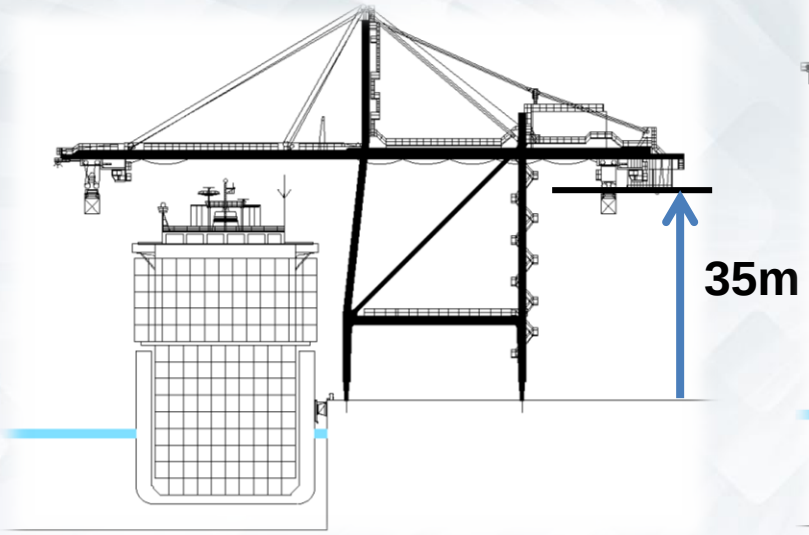
Vessel / Service Forecast



	Panamax	Post-Panamax
Capacity:		
Containers(TEUs)	4,500	12,000
Dimensions:		
Beam	32m (106')	49m (160')
Length	294m (965')	366m (1,200')
Draft	12m (39.5')	15m (50')

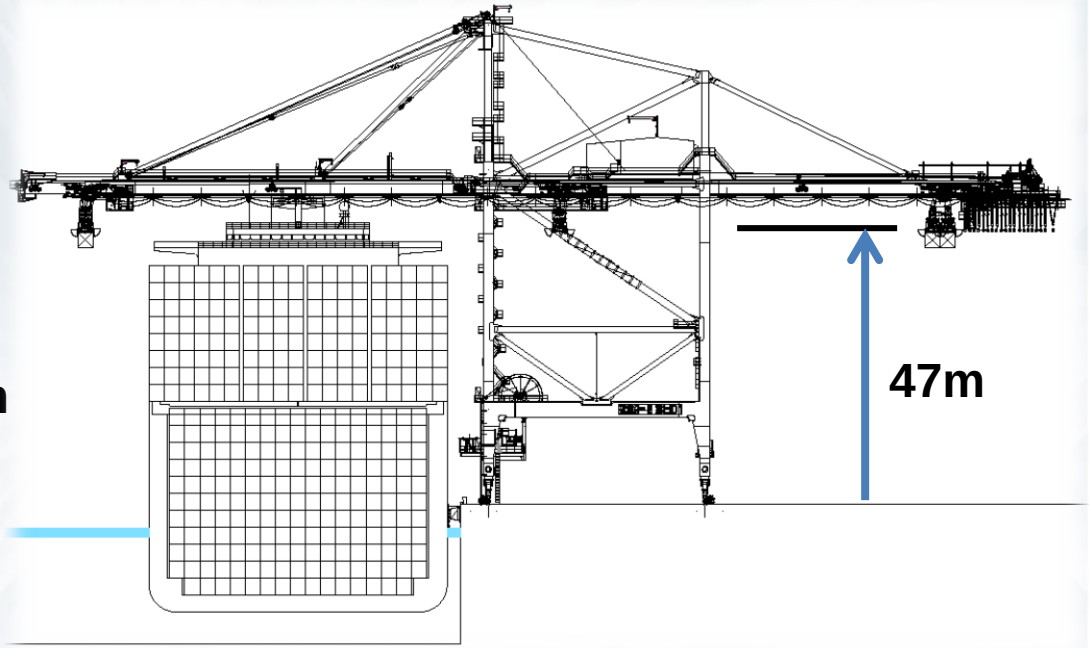
Source: ACP

Panamax vs New Panamax STS Cranes



Panamax

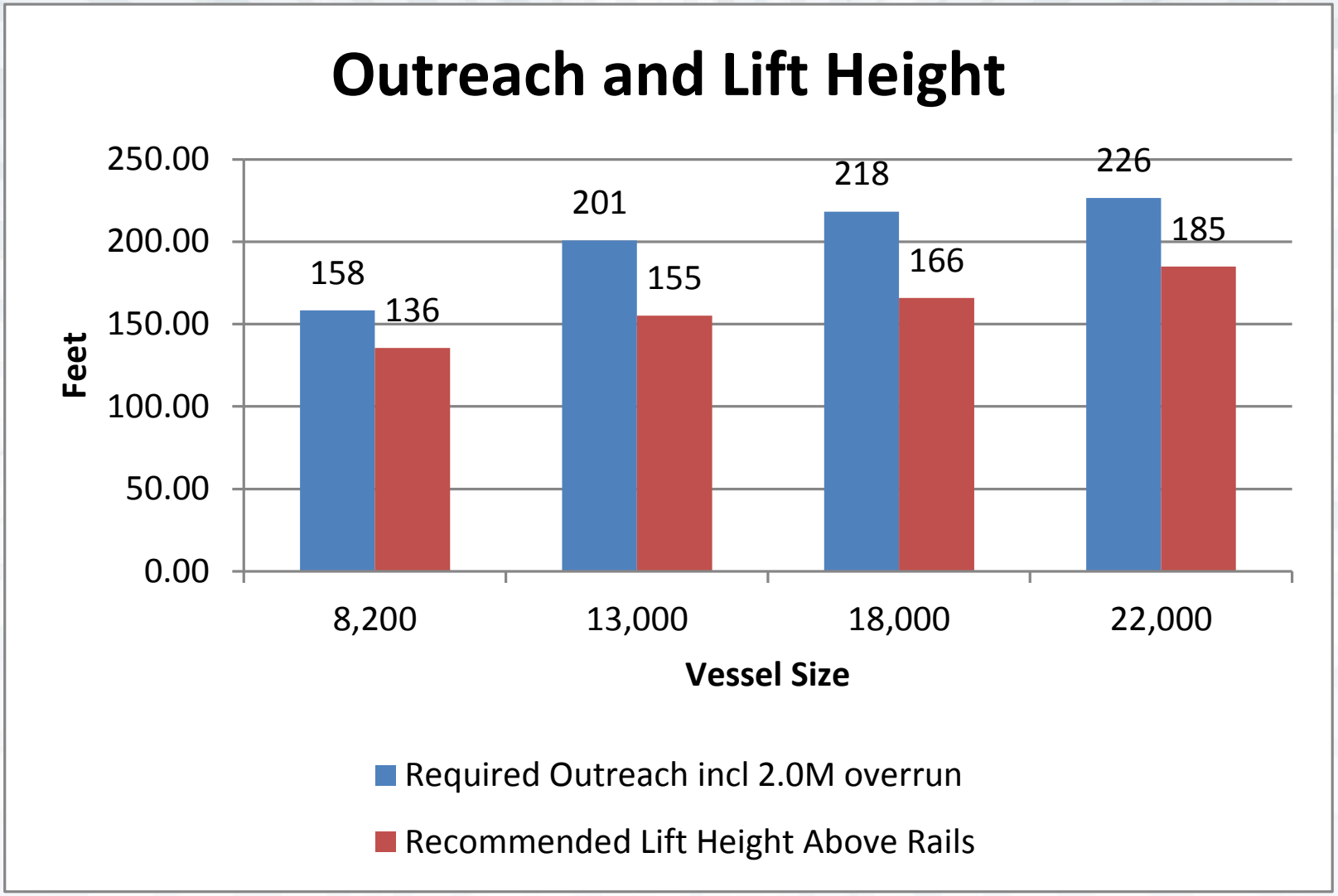
Single Trolley
Twin 20’ Spreader



New Panamax

Single Trolley
Twin 20’ / Tandem 40’ Spreader?

STS Crane Dimensions



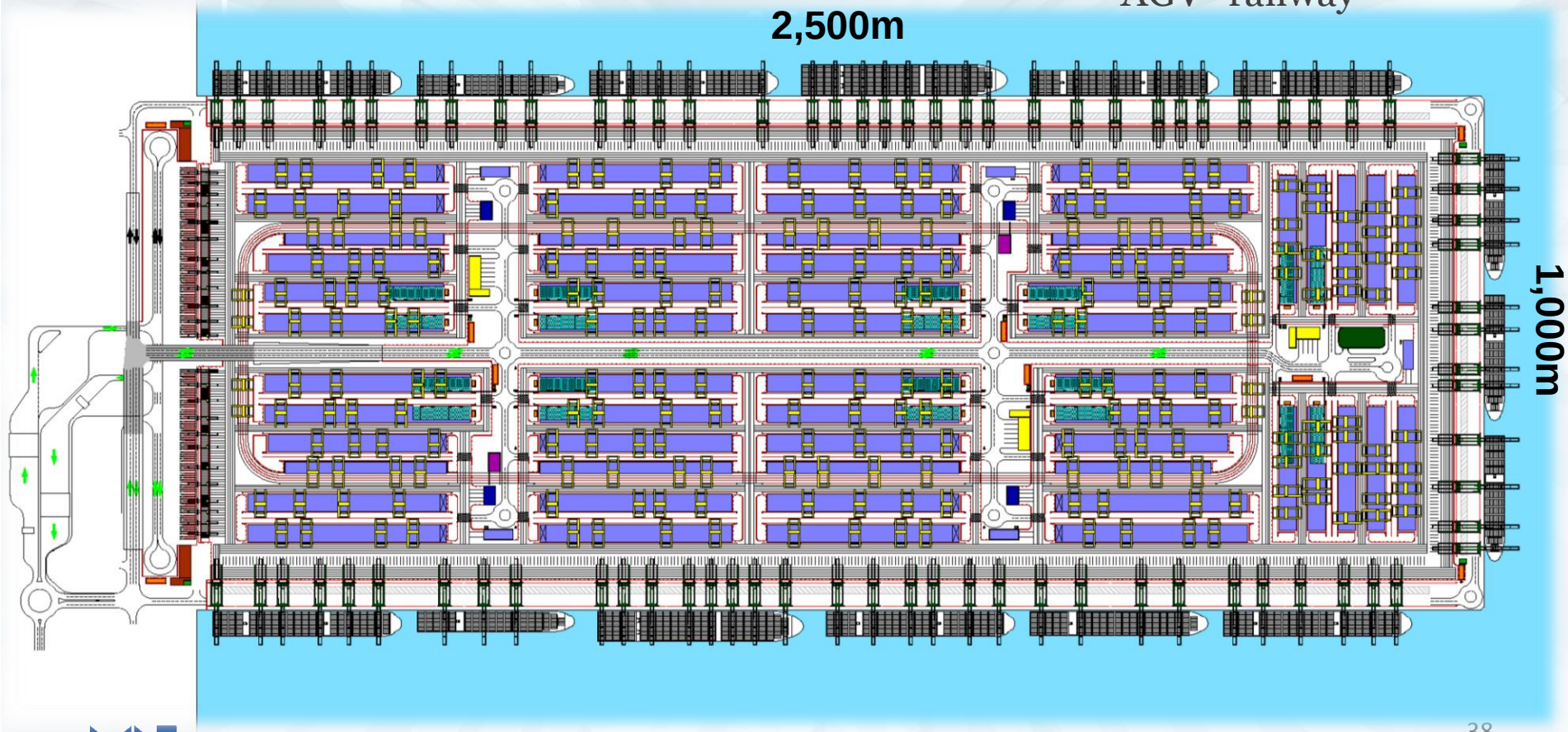
“Terminal of the Future”

Singapore – MN Next Generation Container Port Competition

- 20M TEU per year
- 80% Transshipment

- 200,000 slots
- 78 STS cranes
- 200 Yard cranes

- 27 Landside transfer cranes
- Recessed terminal “AGV” railway



If automation is an option

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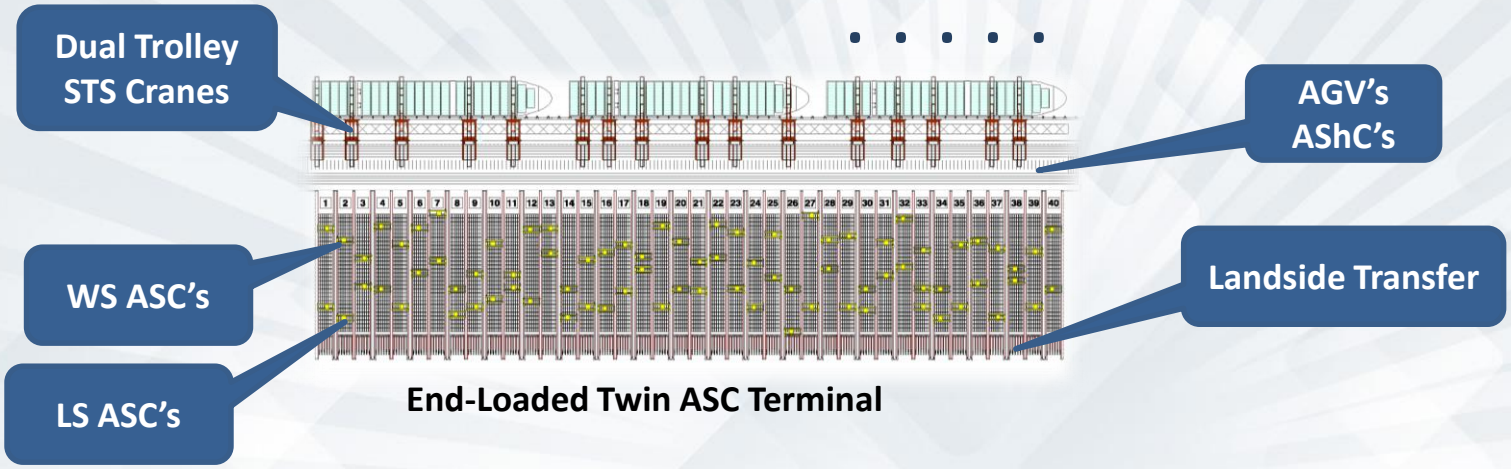

End-Loaded Twin ASC Terminal

Side-Loaded Twin ASC Terminal

- *None automated well optimized terminal may be a solution for many terminals*

New Generation of STS Cranes

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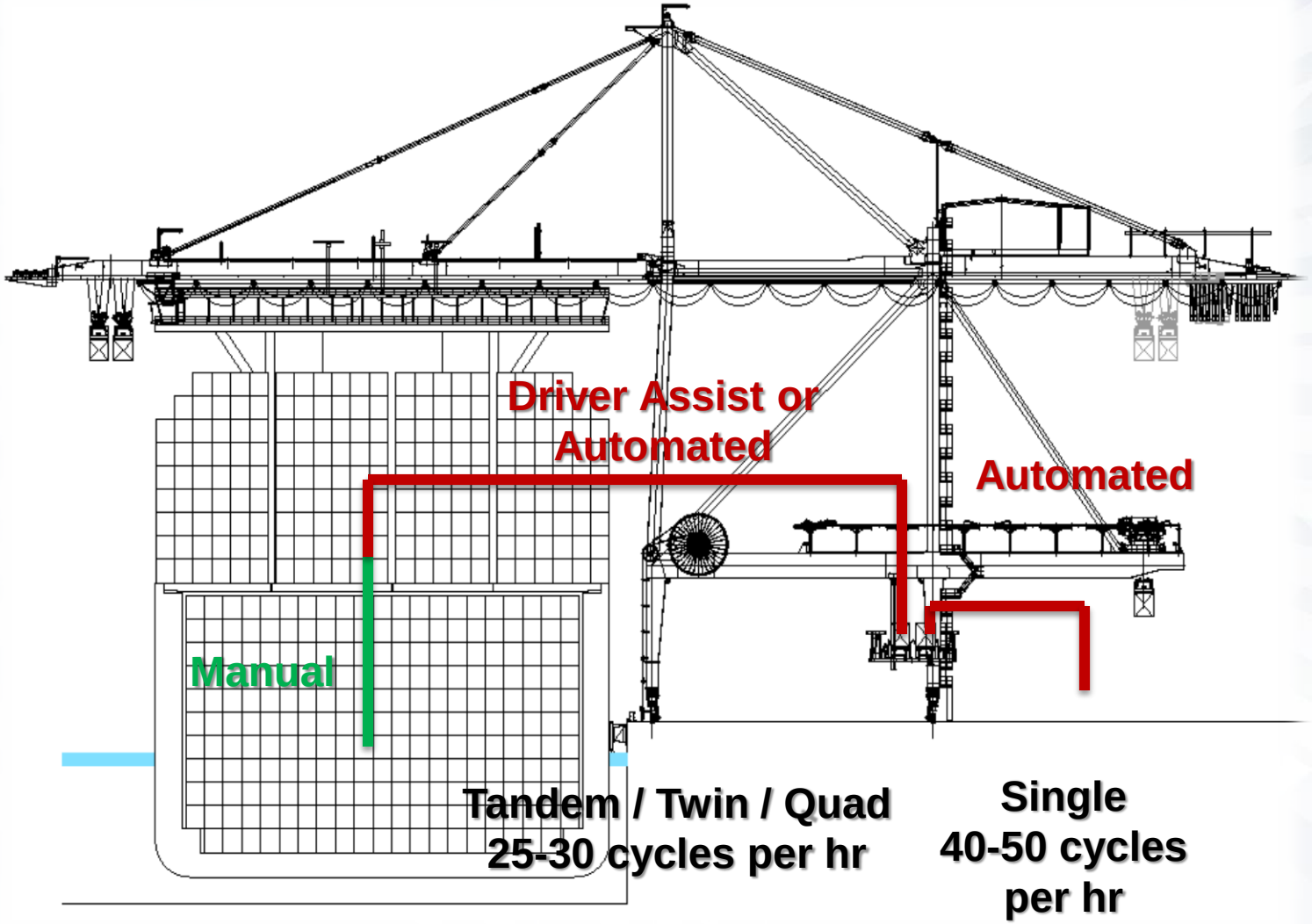
New Generation of STS Cranes



New Generation of Horizontal Transport

. . . . .

- Detailed gathering and distributing tasks to/from storage
  - Move any box, from any location to any location at any time
- Must be rubber-tired
  - AGV (battery operated)
  - AShC (hybrid diesel)

New Generation of ASC

- End-loaded stacking/retrieval cranes
- Side-loaded stacking / retrieval with landside transfer cranes

Automated Straddle Carriers & RTGS

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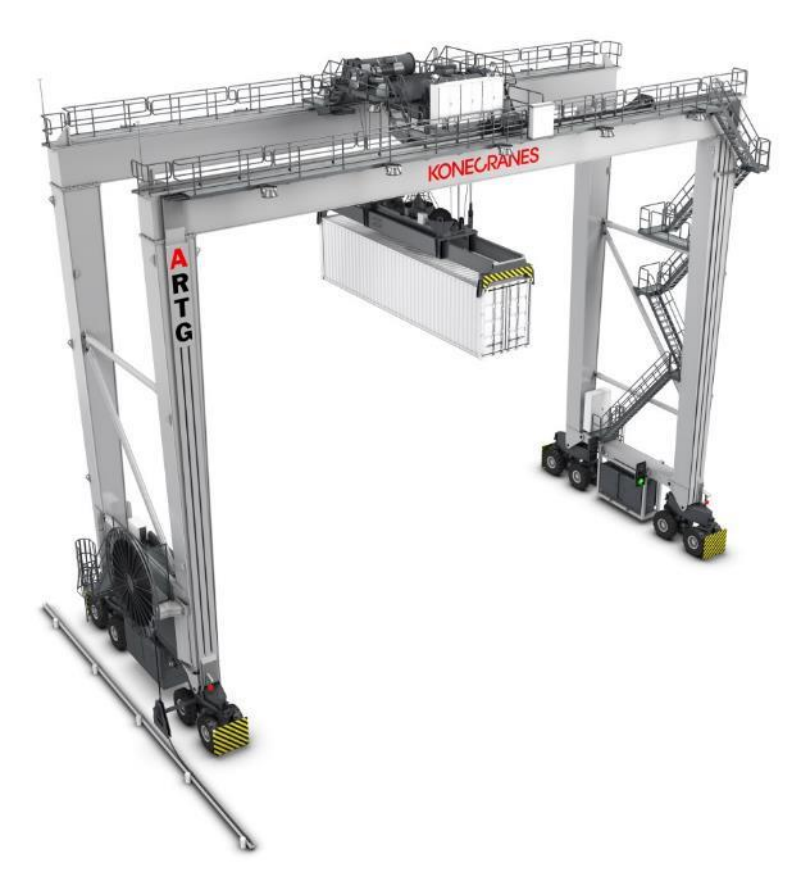

Flexible Terminal Master Plan

- Develop a master plan with a provision to change from one mode of cargo to another with minimal investment
  - Start with RoRo, bulk, or break bulk
  - If the economic trend changes to containerized cargo, make the required changes when needed
- Develop a master plan for container terminals with provision to convert from non-automated to automated

Phased Terminal Development is a Challenge

- To minimize the impact of the first phase
  - Offsite satellite terminal
  - Build expansion area first
  - Increase the density
  - Lose some of the business
- Capacity ahead of demand for subsequent phases

Phased Development is a major challenge and requires a well coordinated plan

Phased Terminal Development is a Challenge