



Equipment, Automation & Operation

AAPA Facilities Engineering Seminar

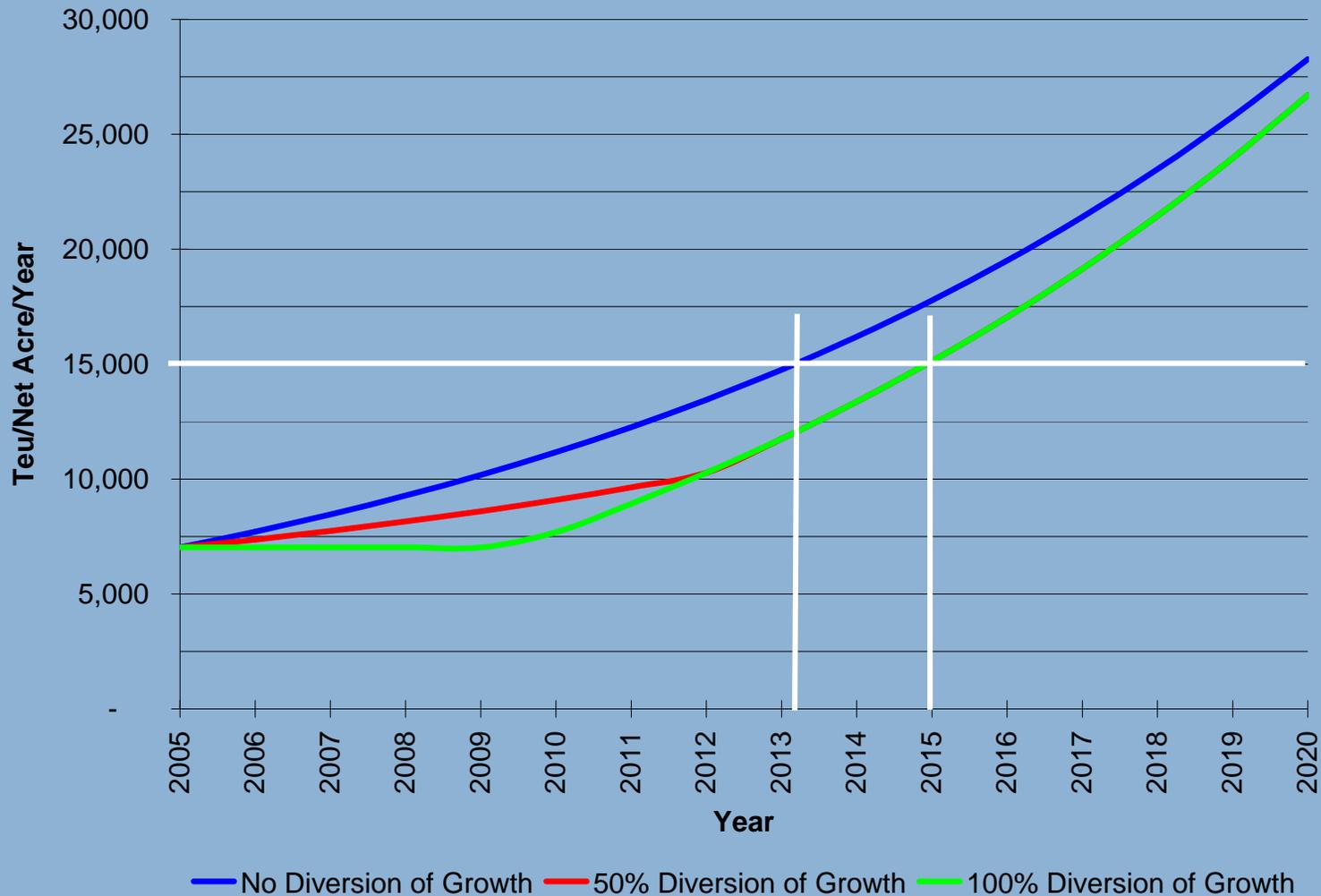
January 12, 2006

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How will new technologies and business processes impact the planning and design of new and existing marine container terminals?

- Southern California ports are processing over 7,500 TEUs per net CY acre per year, and are not adding land
- The annual growth rate ranges from 8% to 10%
- If 50% of annual growth is diverted to other WC ports, they will reach capacity in four to six years
- We must do more with what we have
- At current growth rates, and with a lot of diversion, density in SoCal will increase by 800 TEUs/net acre/year EVERY YEAR for the foreseeable future
- The operators have taken steps to adapt, and are planning further steps
- These steps will impact DESIGN everywhere

- The impact of current 9.7% AGR in SoCal



- Advanced Data Systems
- Gate Automation
- Gate Appointment Systems
- Night Gates
- Yard and Vessel Coordination
- Yard Inventory Automation
- Electric Yard Cranes
- Automated Container Operations
- Tandem/Quad Cranes

- Optical Character Recognition (OCR)
- Differential Global Positioning Systems (DGPS)
- Radio Frequency Identification (RFID)
- Advanced Container Scanning
- Electronic Seals
- Electronic Data Interchange (EDI)
- Mobile Data Terminals (MDTs)



- All these systems automate data transfer between equipment and the Terminal Operating System (TOS)
- All these systems reduce the need for human data collection in the terminal
- All these systems increase the empowerment of the TOS to optimize equipment performance
- All these systems, when properly combined, reduce the cost of container handling
- These systems contribute to reducing the cost of grounded operations

- OCR currently can read 95% to 98% of container and chassis numbers
- OCR can read license plates, but poorly
- Automatic penetrative scanning can check the contents of containers
- E-seals and smart boxes are a good idea, but not yet a reality
- Weigh-in-motion scales are good enough for checking weight against bills of lading, but not for road certificates
- Electronic demurrage payment
- Electronic EIRs
- Pre-lodging of transaction data, including TWIC

- Entry Gate Queue, Trapac LA, 09:40 Monday, January 9
- Old gates are too big
- New gates don't need humans on the ground, except security



- Identify trucker and transaction to be completed within a given time slot
- Time slots can be quite narrow – one hour is not uncommon
- Allow some control of truck flow variability
- Provide advance warning to TOS about near-term transaction volumes and characteristics
- Integration of Transportation Workers' Identity Credential (TWIC)

- Improve transaction quality
- Allow improved integration between trucker and terminal
- Reduce waste moves in grounded operations
- Allow selectivity in densification
- Increase the productivity of grounded storage equipment
- Reduce the cost of grounded storage and retrieval

- Shift gate transactions from weekday days to weekday nights and/or weekend days or nights
- Integrated with appointment systems
- Congestion pricing

- SoCal PierPass Off-Hours Program
- Shift from weekday days to off-peak periods:
 - Import containers through out-gate 40.3%
 - Export containers through in-gate 42.5%
 - Weighted average all cargo-bearing containers: 40.8%

- OCR at the vessel capturing all container IDs
- RFID on transport tractors, matching tractor to container number
- RFID reader at yard crane, matching transport, and thus container number, to tractor
- Tracking equipment at yard crane, matching container number to storage slot
- Automatic vessel stow plan record
- Integrate with TOS to automate instructions to tractor driver, based on container identity, via MDT

- Reduced clerks on the ground at the cranes
- Seamless integration between vessel and yard
- Huge data bandwidth required: wifi, fiberoptic, etc.

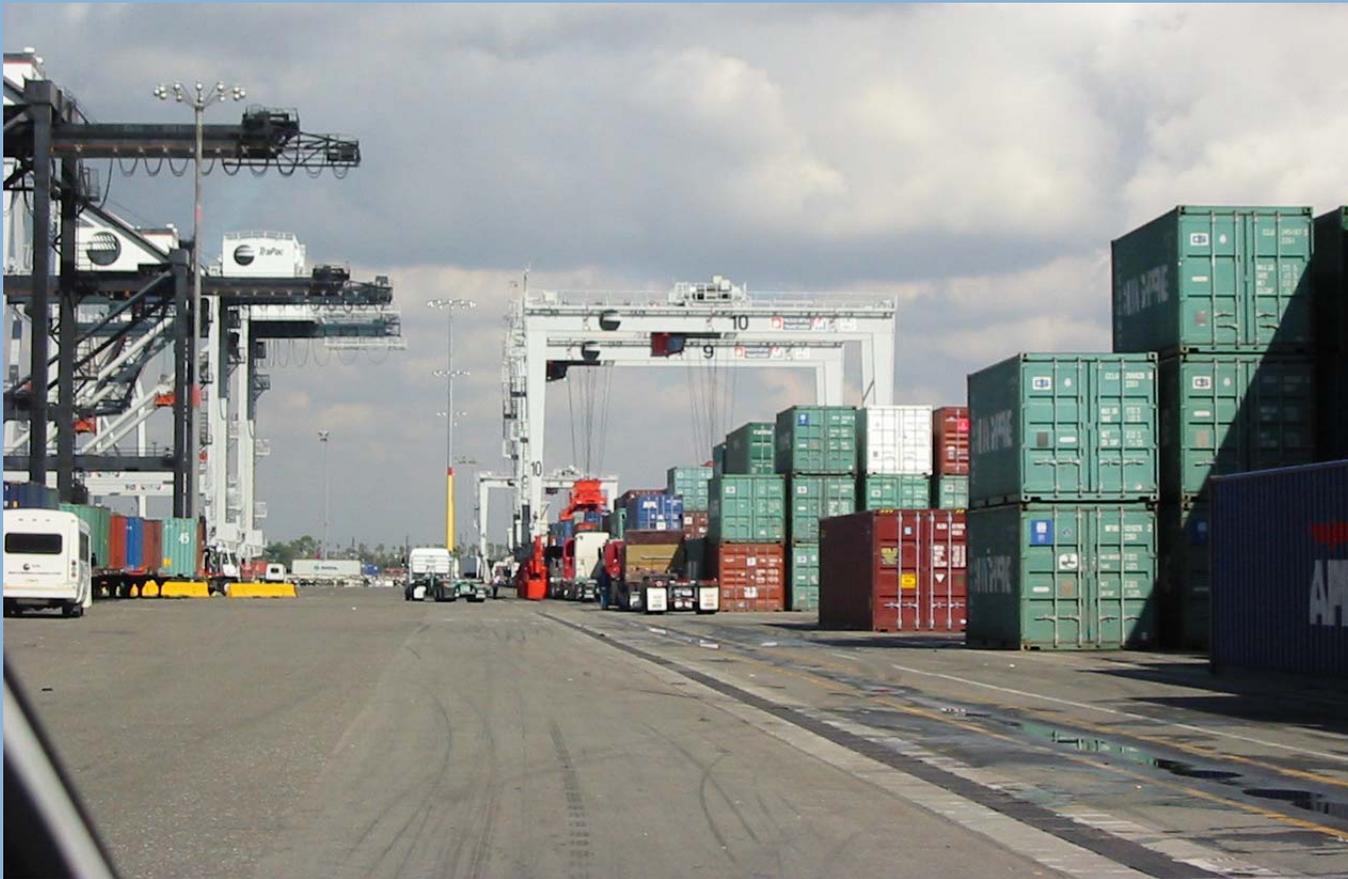


- DGPS and/or other navigation equipment on yard cranes
- RFID on yard tractors, and possibly street tractors
- Automatic container position detection
- Automatic update of inventory

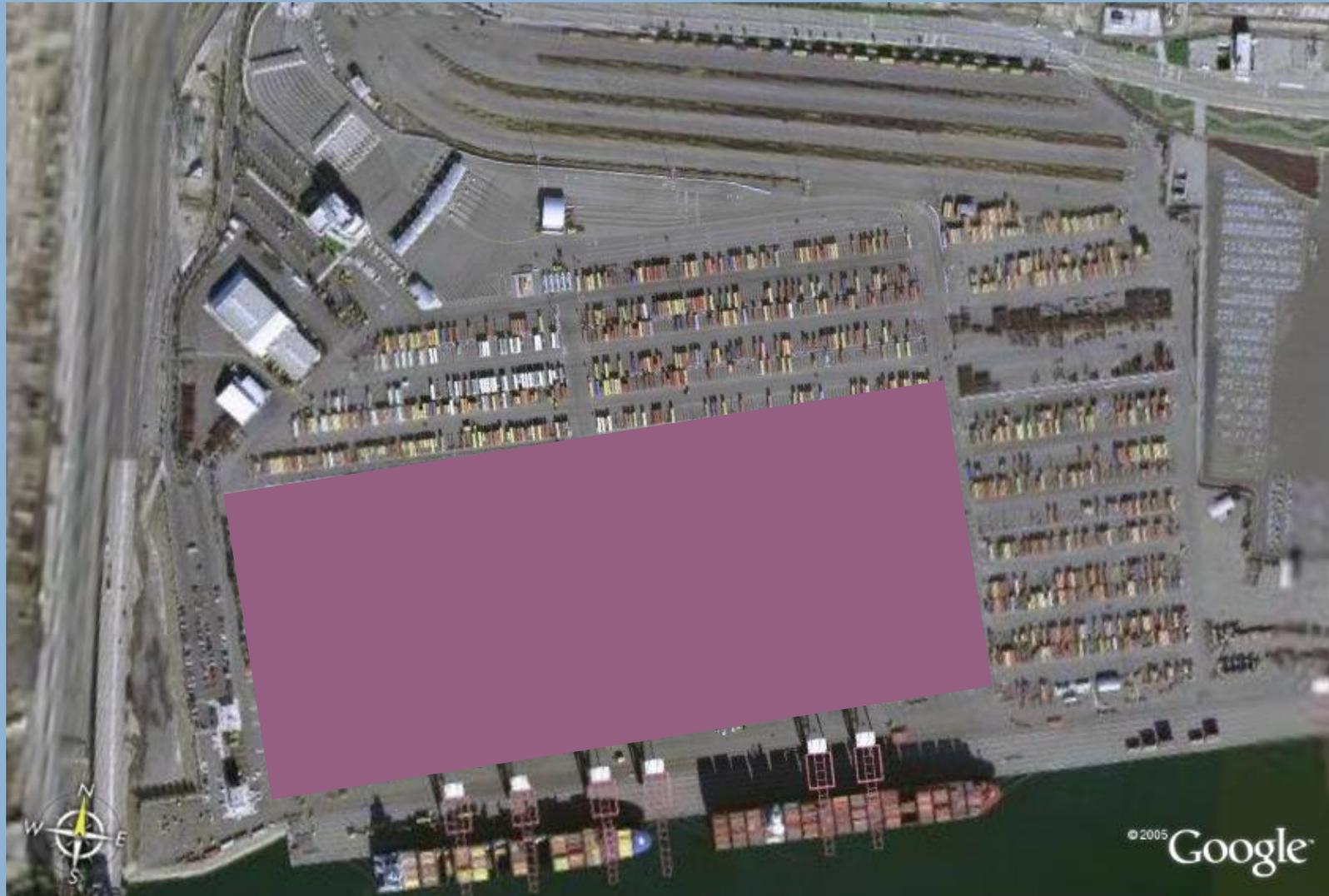
- Eliminate on-the-ground clerical control of yard cranes
- Allow centralized coordination of yard crane activities
- Reduce waste-move rehandles
- Increase yard crane productivity
- Reduce truck queuing
- Reduce emissions
- Increase safety
- Reduce the cost of grounded operations



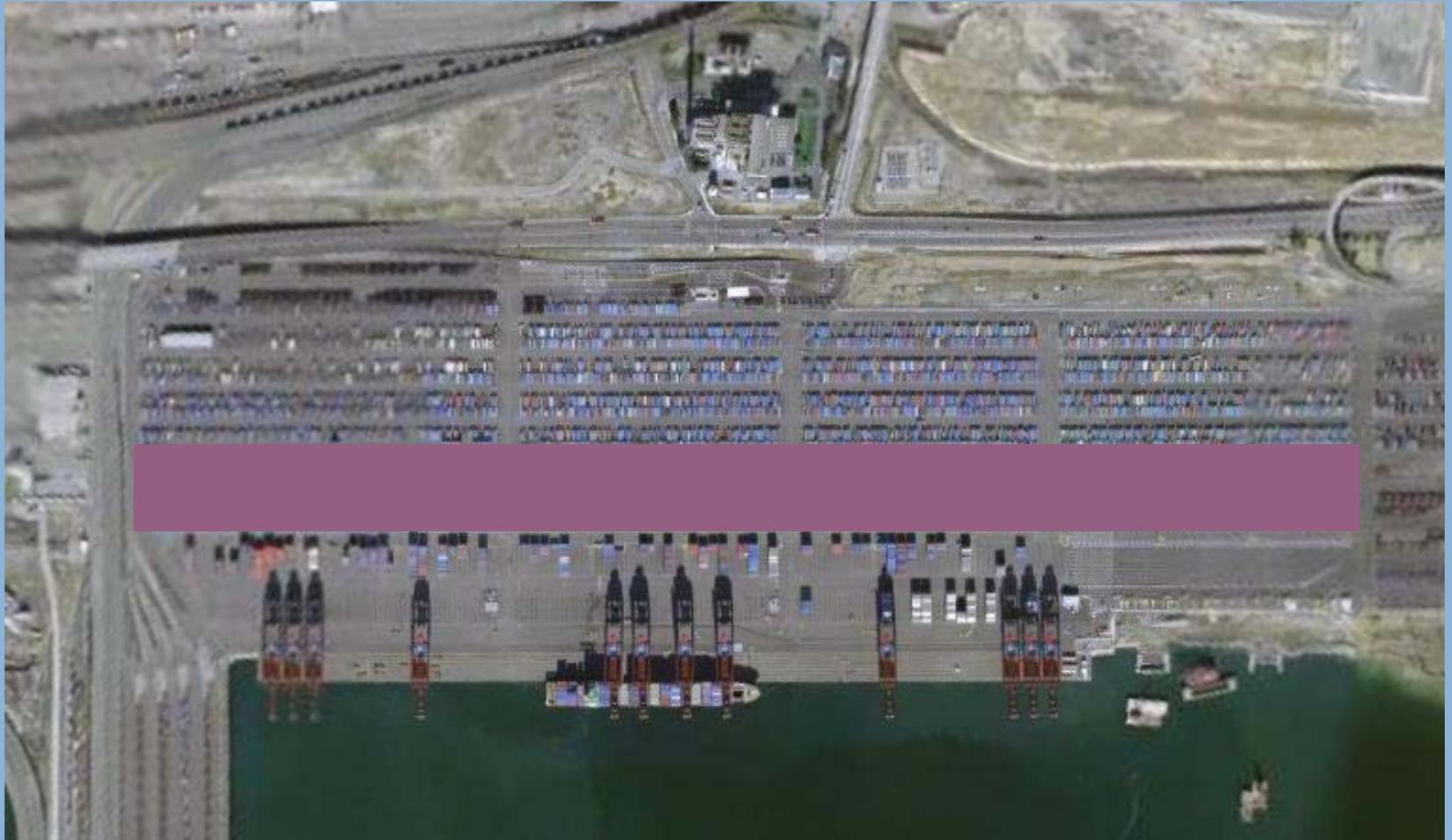
- Trapac Los Angeles – RTGs at the waterfront
- Trapac observes that new technologies increase RTG productivity by 40%



– Pier A Long Beach



– Pier T Long Beach



– Pier J Long Beach



- West Basin Terminals, Los Angeles



- Kalmar Electric-Cable RTGs in Oslo



- ZPMC Cordless Capacitor/Hybrid Cranes



- Lower emissions – zero on-site emissions
- Lower energy cost – regeneration is mature
- Reduced crane deployment flexibility

- ZPMC Altenwerder



- Workerless container handling and transport
- Slightly higher storage density and capacity
- Low emissions
- Rapid truck service
- Decent vessel productivity
- Reduced lighting
- Greatly increased safety

Tandem/Quad Cranes

- Two 40s, or four 20s, or two 20s + one 40



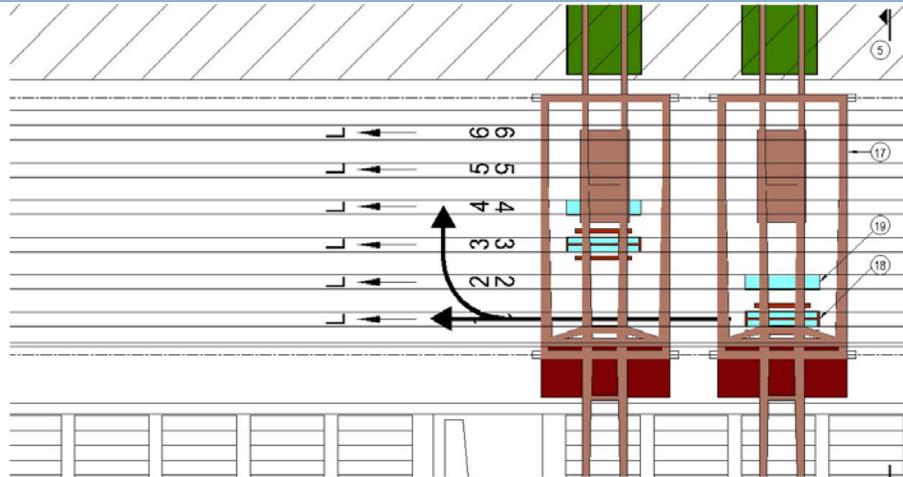
Tandem Operations

- Low-res video, Dubai, May 2005
- 2.5-minute cycle times to two trailers



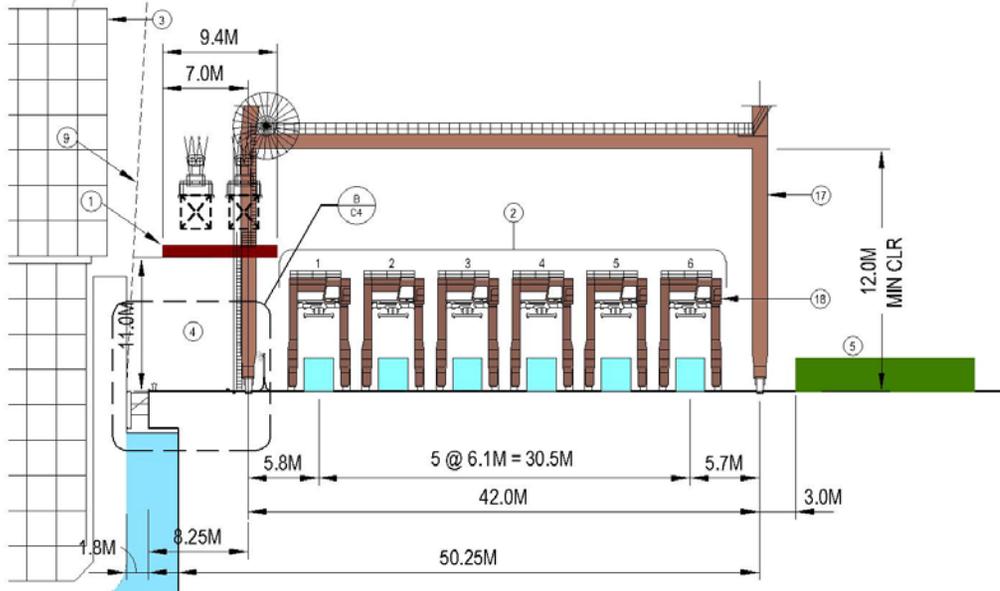
- Potentially much higher vessel productivity
 - First generation cranes are very good, but not perfectly reliable
- Wharf traffic congestion will be an issue
- Coning / de-coning is an issue
 - Upstream / downstream or on-crane coning may be required
- Cranes are very heavy
- 100-foot standard crane gage is probably too narrow
- Recommended design for Jebel Ali New Container Terminal has 42 m (138 ft) gage

Dubai Tandem-Crane Wharf



TANDEM LIFT - SHUTTLE CARRIERS IN INDEPENDENT LANES

- 1:400
- 42.0M GAGE CRANES
 - 6 WORKING LANES
 - 1ST AND 4TH CRANE SHARE LANES WHEN WORKING TANDEM 40'S
 - CONING ON PLATFORM

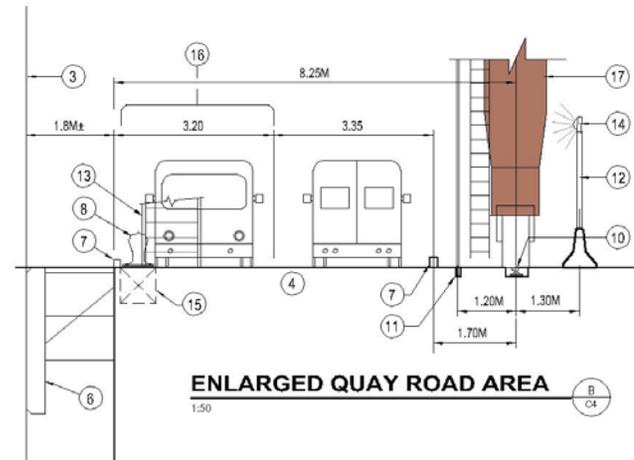


SECTION

LEGEND

- IBC PLATFORM
- HATCH COVER ON GROUND
- CONTAINER

- ELEVATED IBC H CHECKER CAB -
- TRANSIT / LOAD
- VESSEL
- VESSEL SERVICE
- HATCH COVER L
- FENDER
- CURB
- BOLLARD
- 3° LIST CLEAR O
- WATERSIDE CR
- POWER CABLE T
- FENCE TO SEPA OPERATIONS FR OPERATIONS.
- VESSEL GANGW
- QUAY AREA SER
- VESSEL SERVICE
- THIS SPACE USE PARKING, LINE- AND GANGWAY
- QUAY CRANE
- SHUTTLE CARRI
- CONTAINER ON

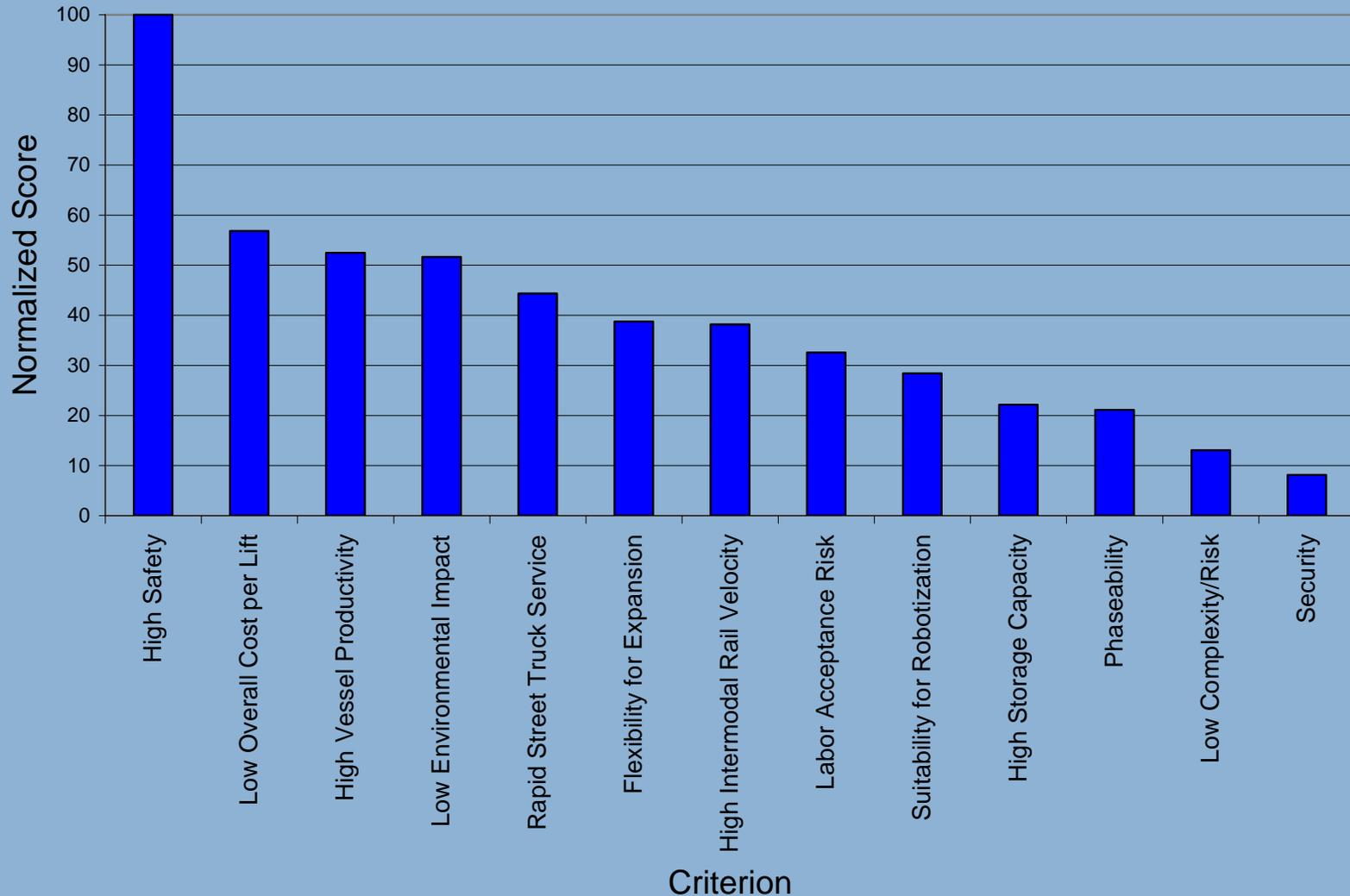


ENLARGED QUAY ROAD AREA

1:50

What is Important?

- Survey of three major operating company's management



This isn't your grandma's
marine terminal:

It is:

Denser

Faster

Safer

Greener

Smarter

More Expensive to Build
Cheaper to Operate