

Impact and Opportunities from Global Change

Mark Sisson, PE, AECOM

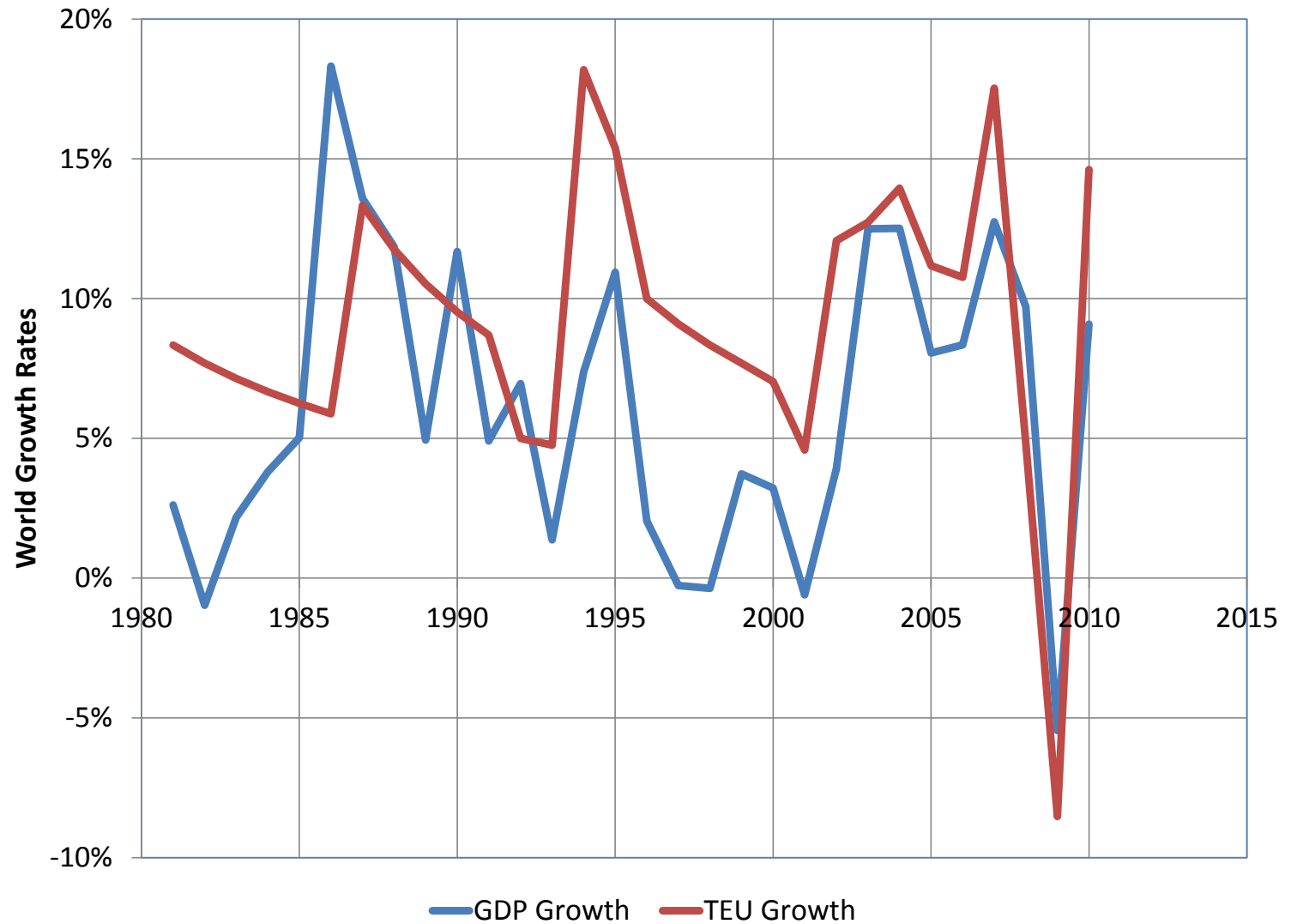
Nov 6, 2013

AAPA Facilities Engineering
Vancouver, BC

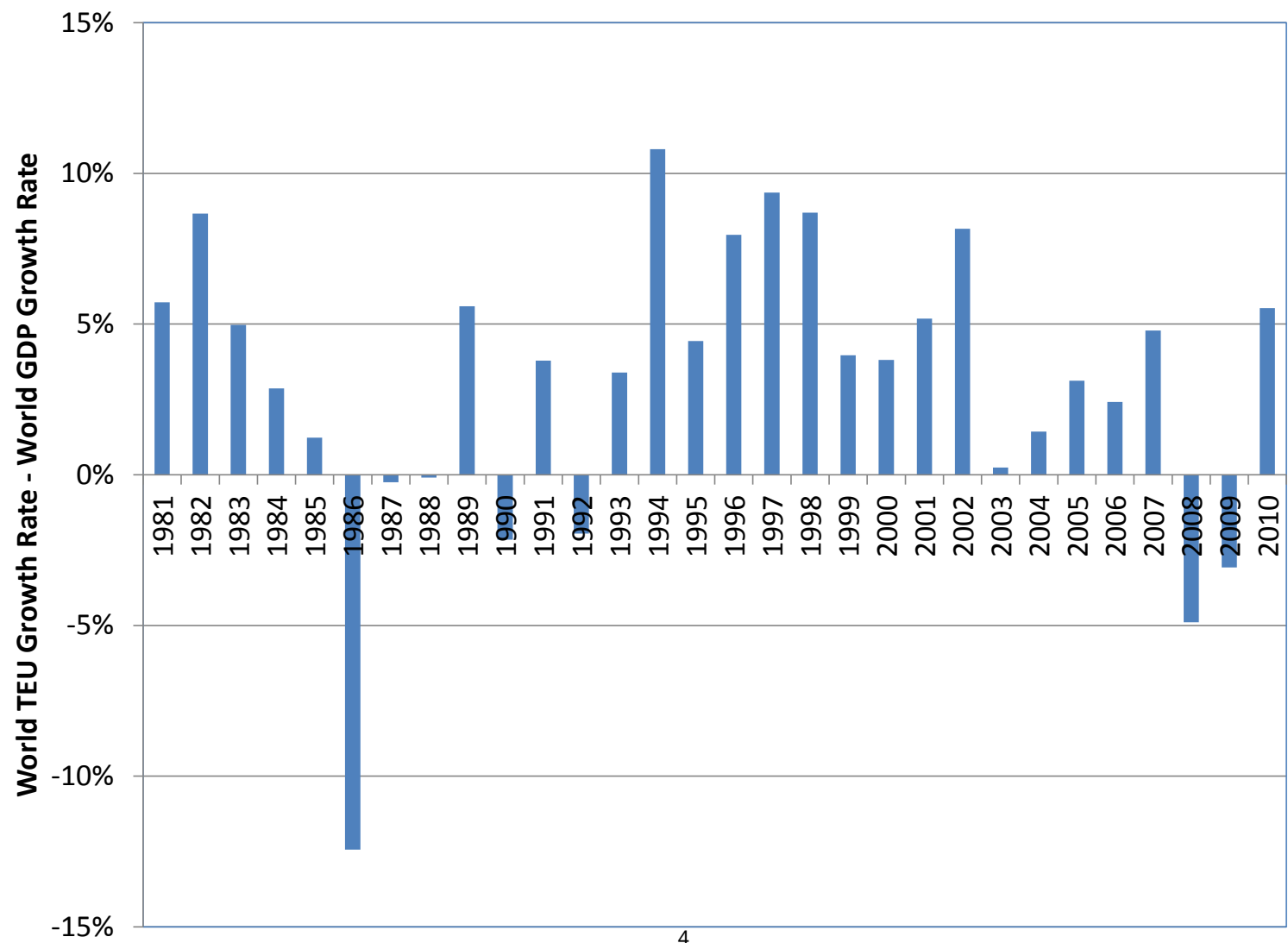
Contents

- Industry Trends
- North America West Coast Impacts
- Ship evolution and terminal size issues
- Terminal Capacity
- The Shift to Automated Terminals
- Sustainable Operations

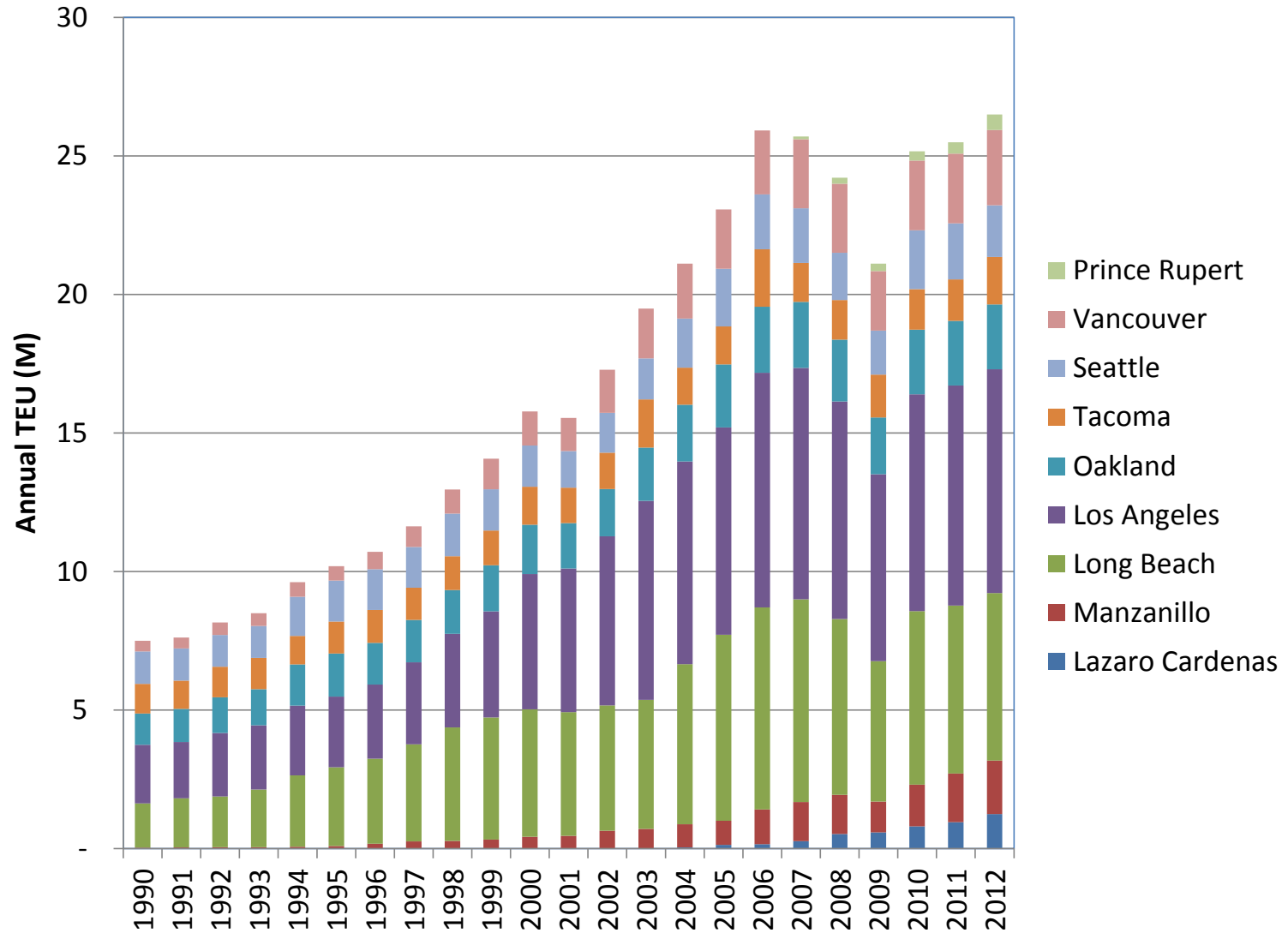
Containerization vs. GDP



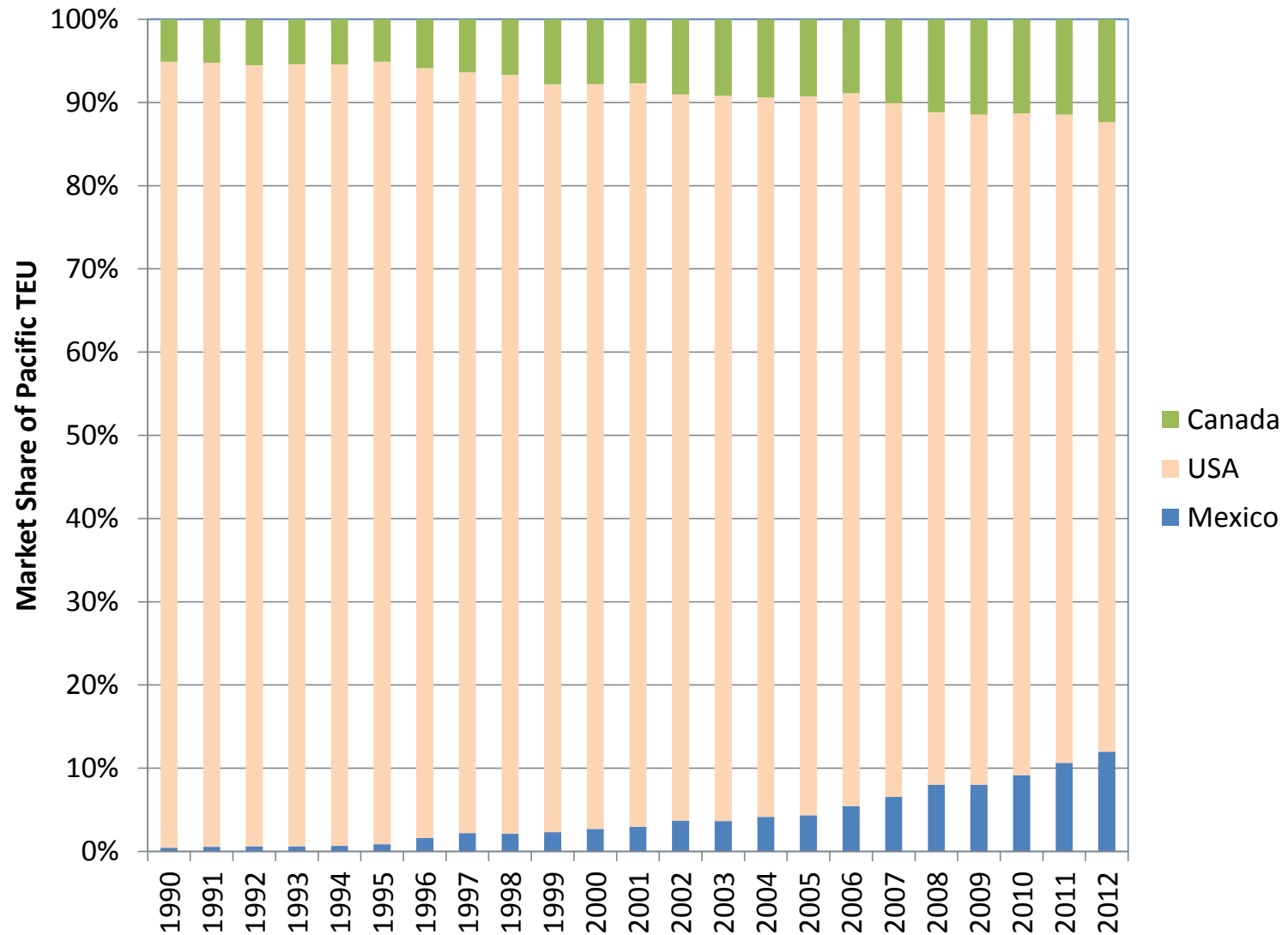
World TEU Growth - GDP



NA West Coast TEU



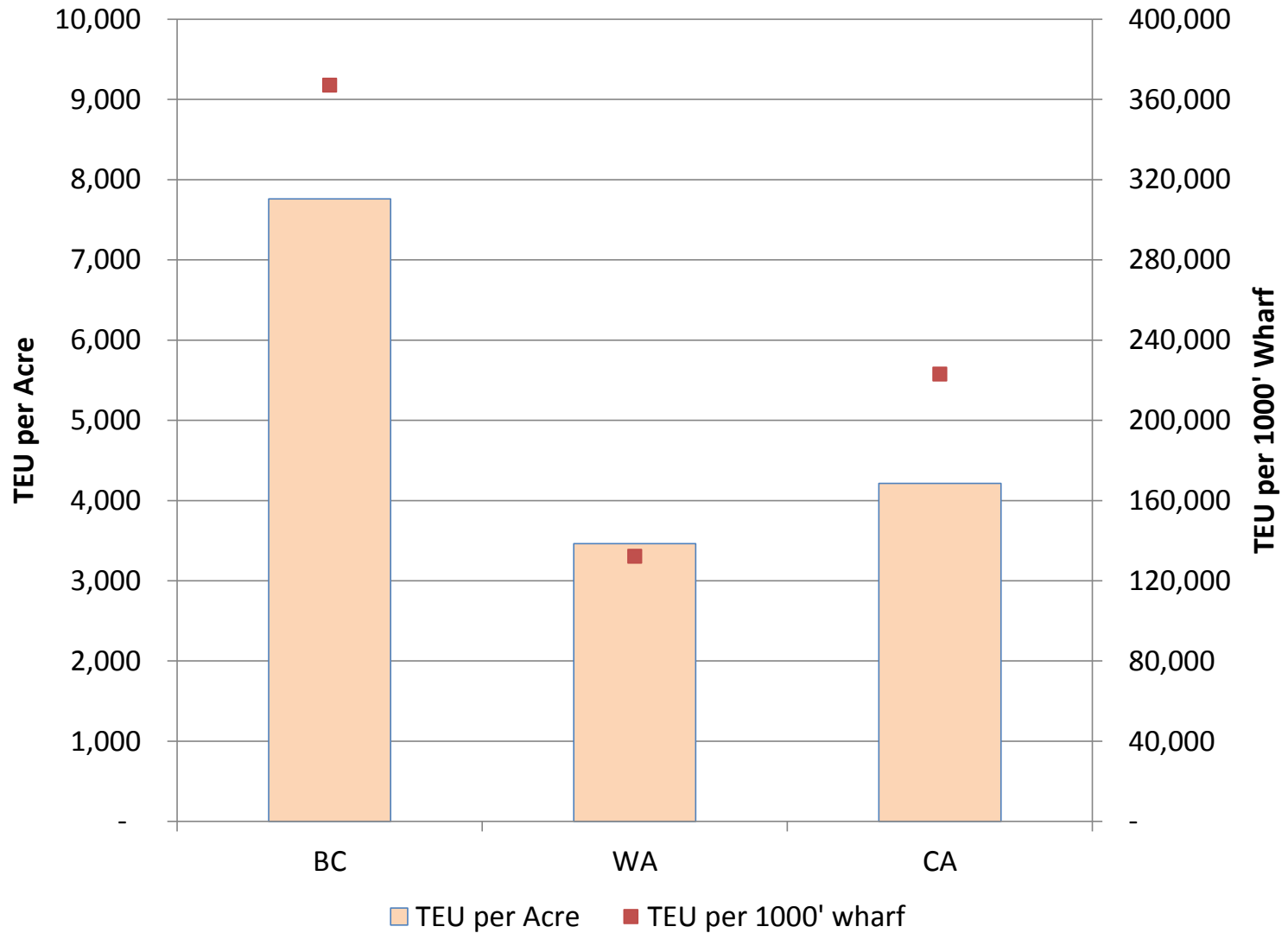
NA West Coast Market Share by Country



Slowing Growth In Container Volume

- Mature business, most of what can be containerized, is.
- Most of what can be made overseas, is
- More likely tied to GDP
- Big growth areas (Prince Rupert) are cannibalizing traffic from elsewhere
- Bigger canal (and Polar routes?) will further increase options for shippers to reach the East Coast

Pacific Region Comparison



Why Rail Connections Matter

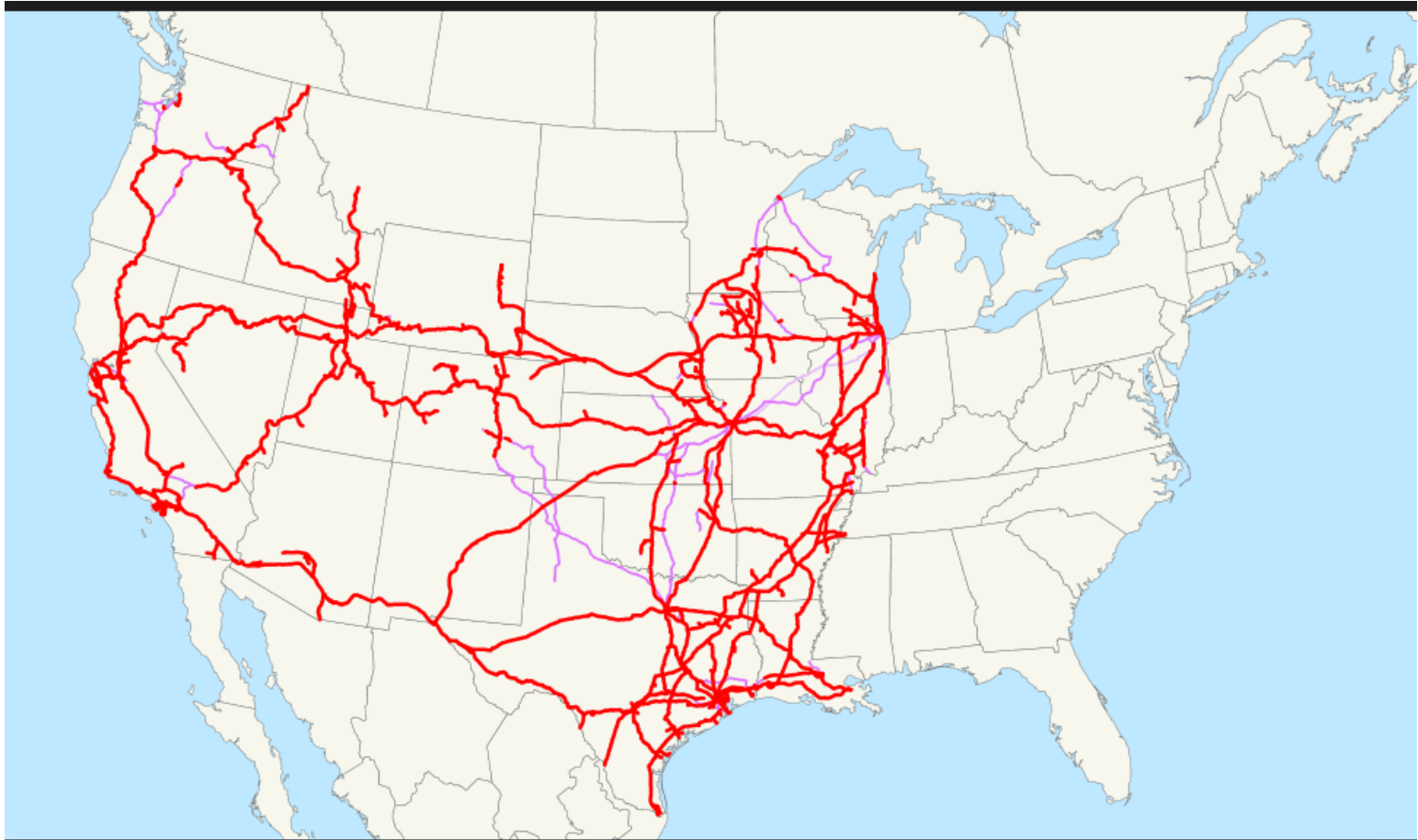
- Canadian RRs go into the US, but not vice versa
- Not all terminals have on-terminal rail
 - Extra dray cost
 - Lack of “branding”
- Higher volume ports (LA/LB) make it easier to build unit trains on terminal



CN System Map

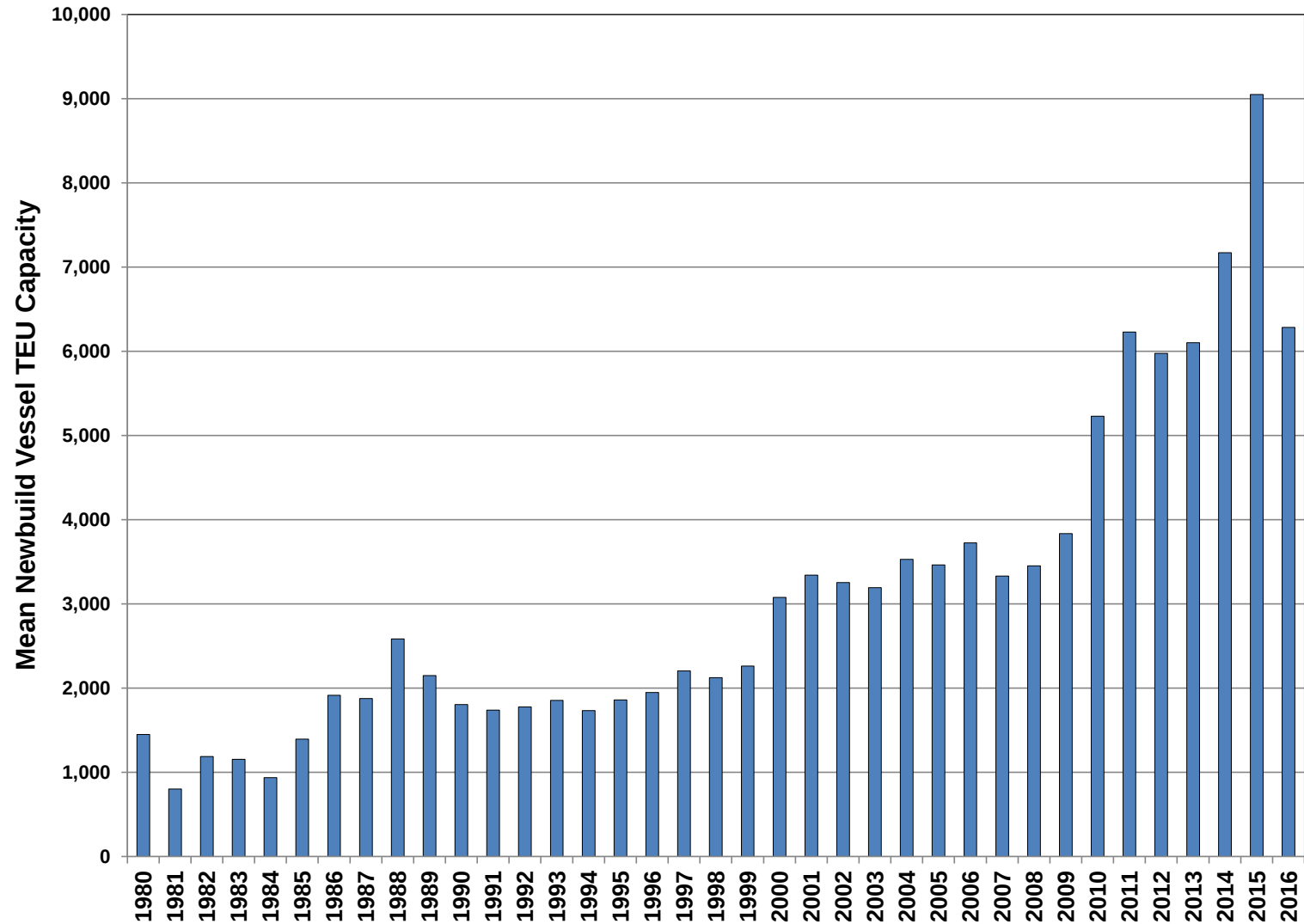


UP System Map

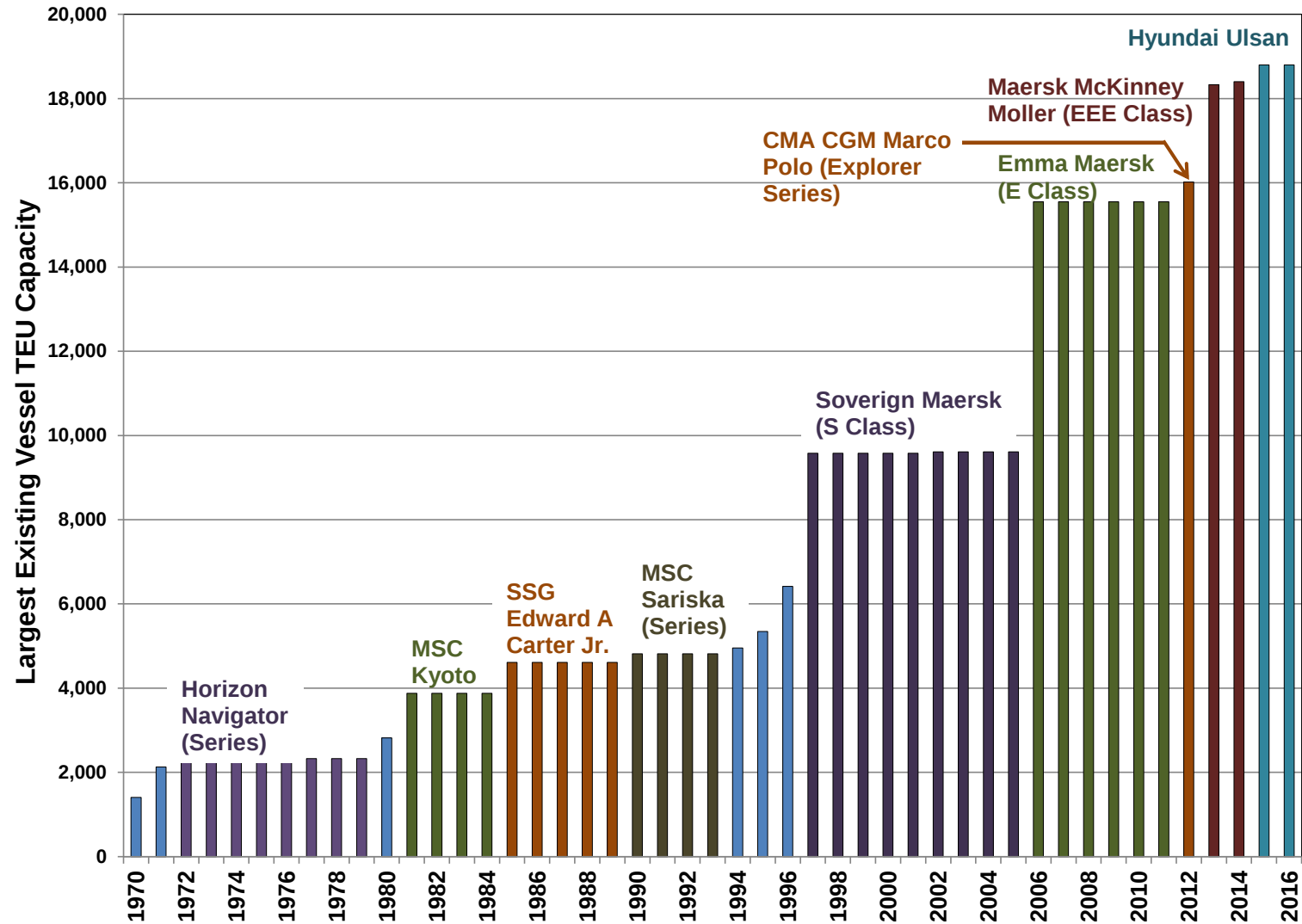


Ship Size Evolution

Mean Newbuild Vessel Size vs. Year of Build

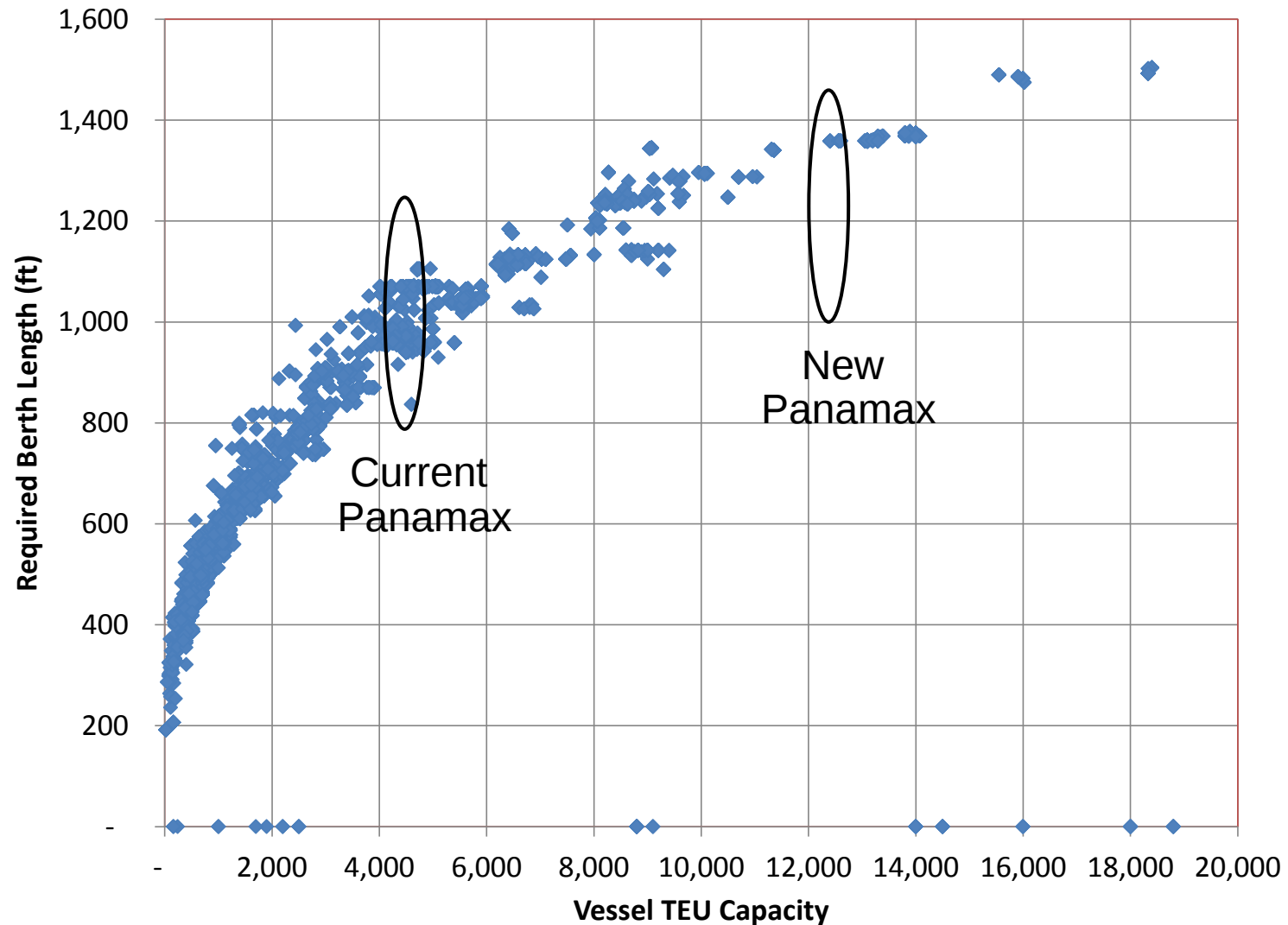


Largest Vessel Size over Time



Dot Chart of TEU vs. Length at Berth

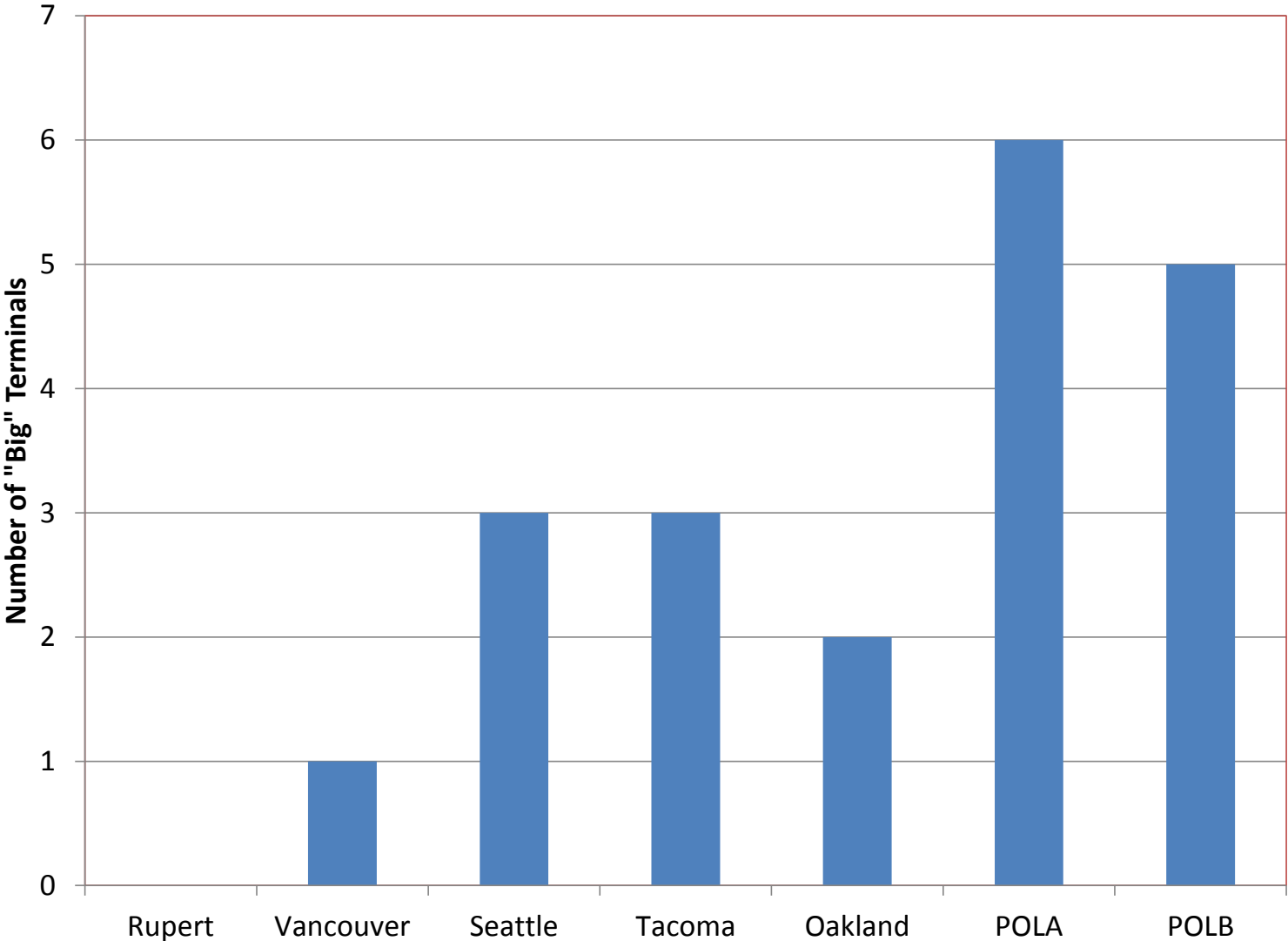
a 2000' wharf is no longer a two berth terminal!



DPW Centerm, Vancouver



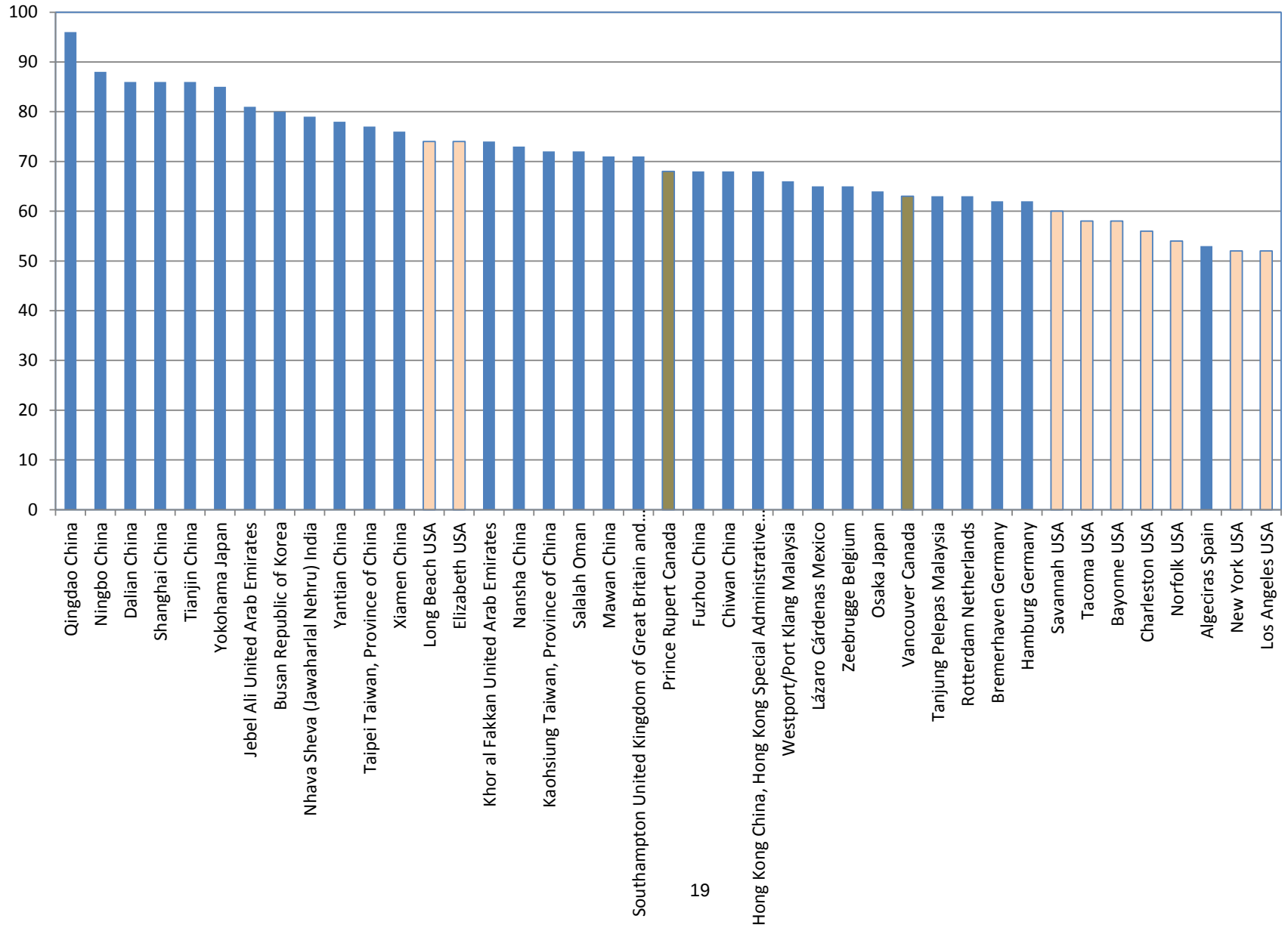
Terminals That Can Handle At Least Two New Panamax Ships at the Same Time



Capacity Constraints

- BC is near capacity
- USWC (and USEC) is not
- Outside of BC, projects are done to
 - Reduce cost
 - Reduce environmental impact
 - Replace old, obsolete terminals
- Manual operations can be high density, all electric, and highly productive
- USWC terminal labor is most expensive in the world, but USWC terminals are not the most productive

Vessel Productivity (mv/hr) at Top World Ports – JOC Data

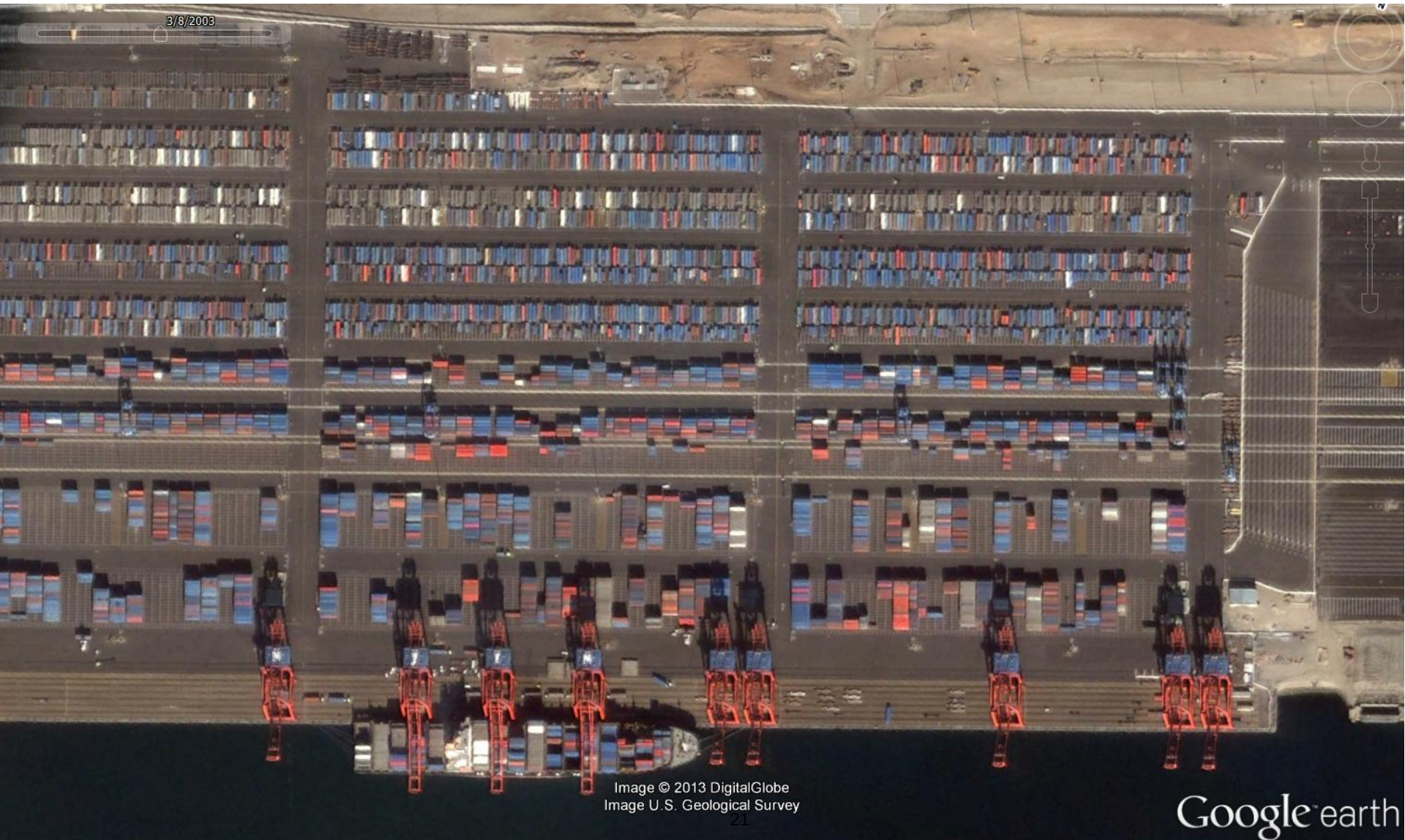


Why Are US Containers Stored on Wheels?

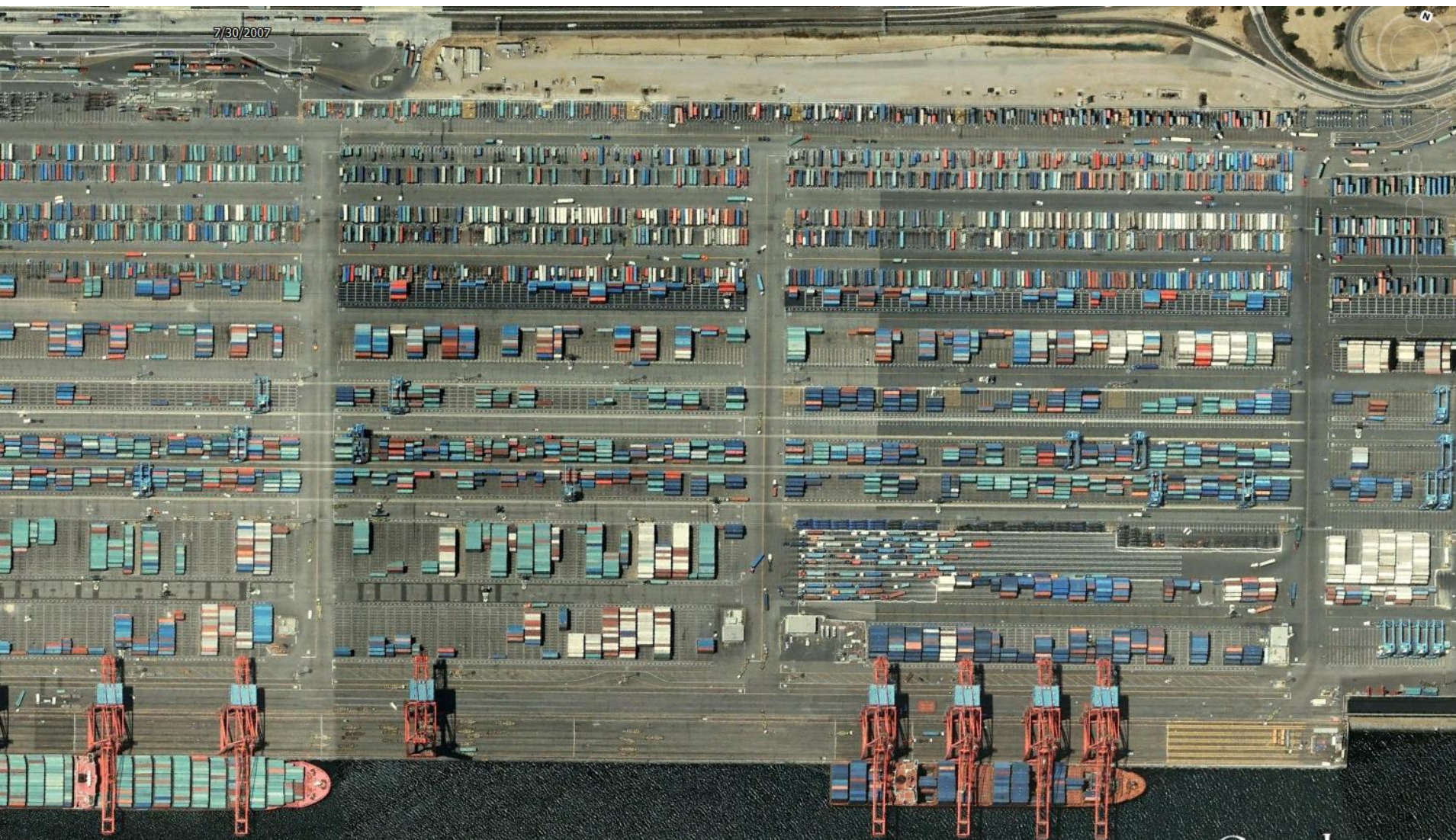
- Legacy of Malcolm McLean's trucking heritage
- Very convenient for gate service
- No cost for yard equipment



Pier T March 2003



Pier T July 2007



Google earth

Pier T May 2009

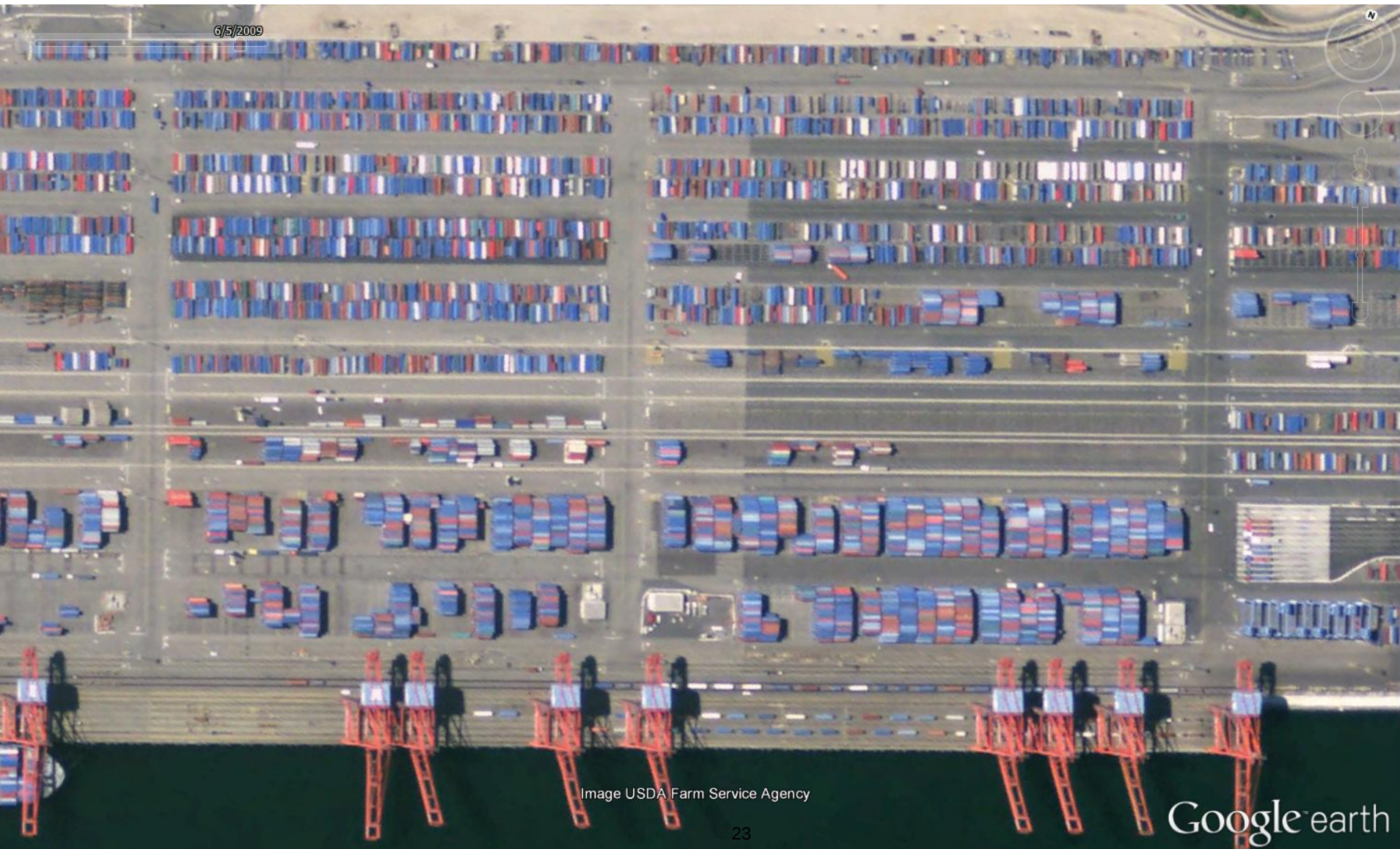
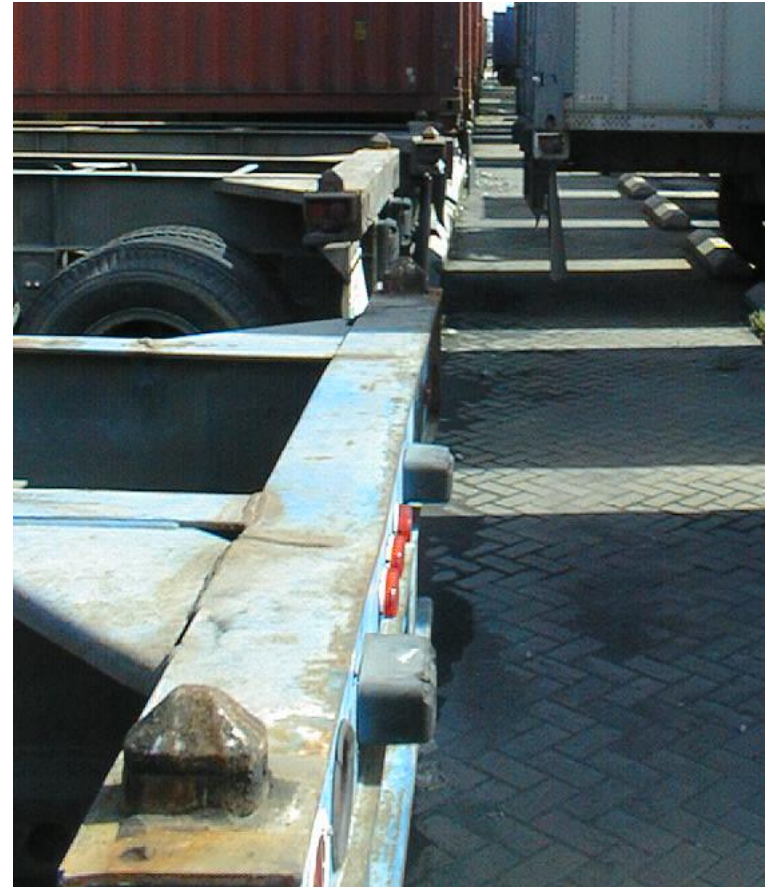


Image USDA Farm Service Agency

What's Bad About Wheeled Operations

- Very land intensive
- Cost, complexity, and liability of managing large chassis fleets
- Technically difficult for dock crane driver to discharge to street chassis vs. terminal chassis
- Long distance from CY to crane means many terminal tractors required

Chassis Corner Pins are Very Hard to Hit from Over 100' in the Air



Pier 300, Port of Los Angeles



Pier 400, Port of Los Angeles

Last of the Manual, Wheeled, Mega-fill Projects

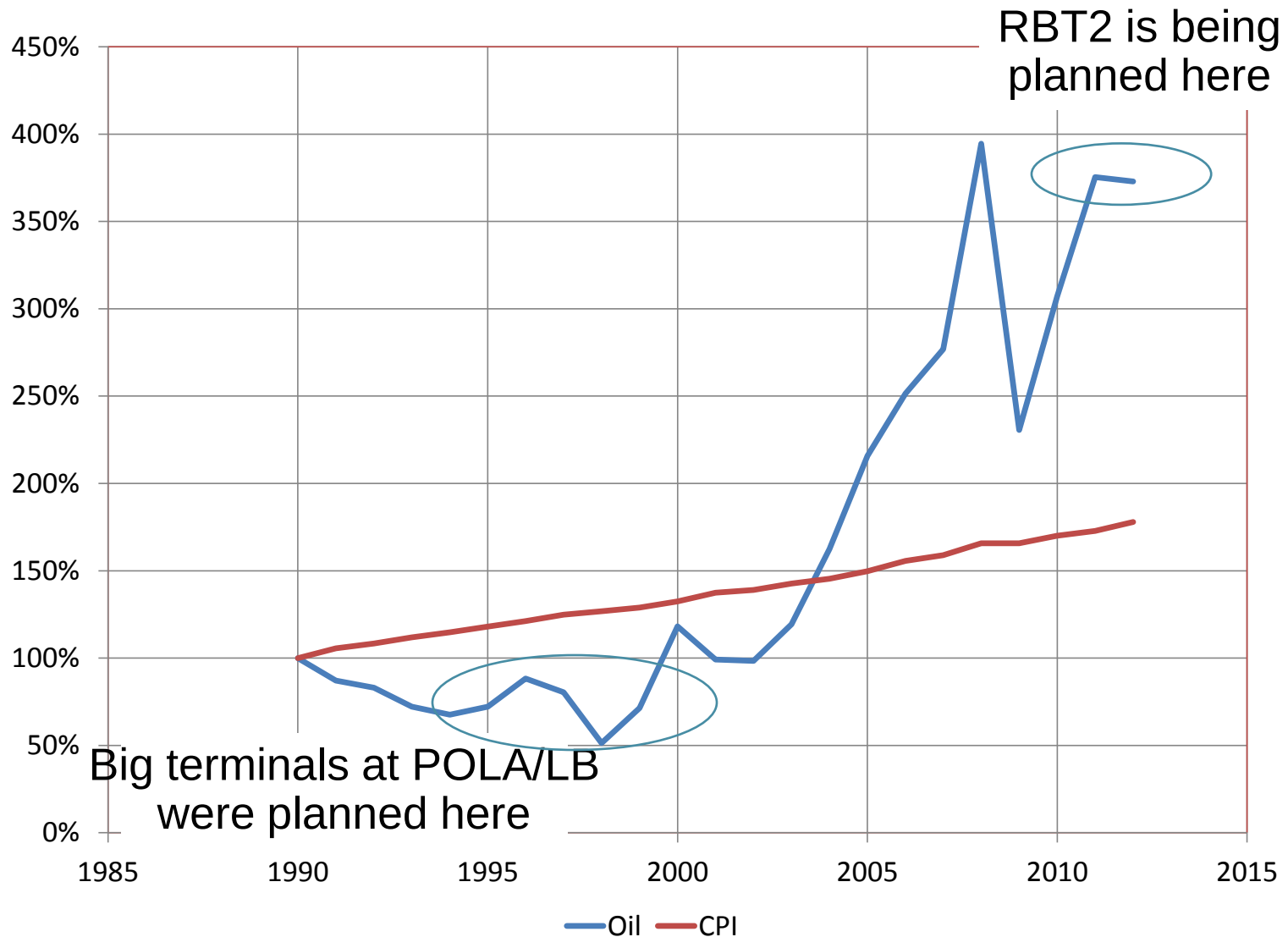


Pier 400, Port of Los Angeles

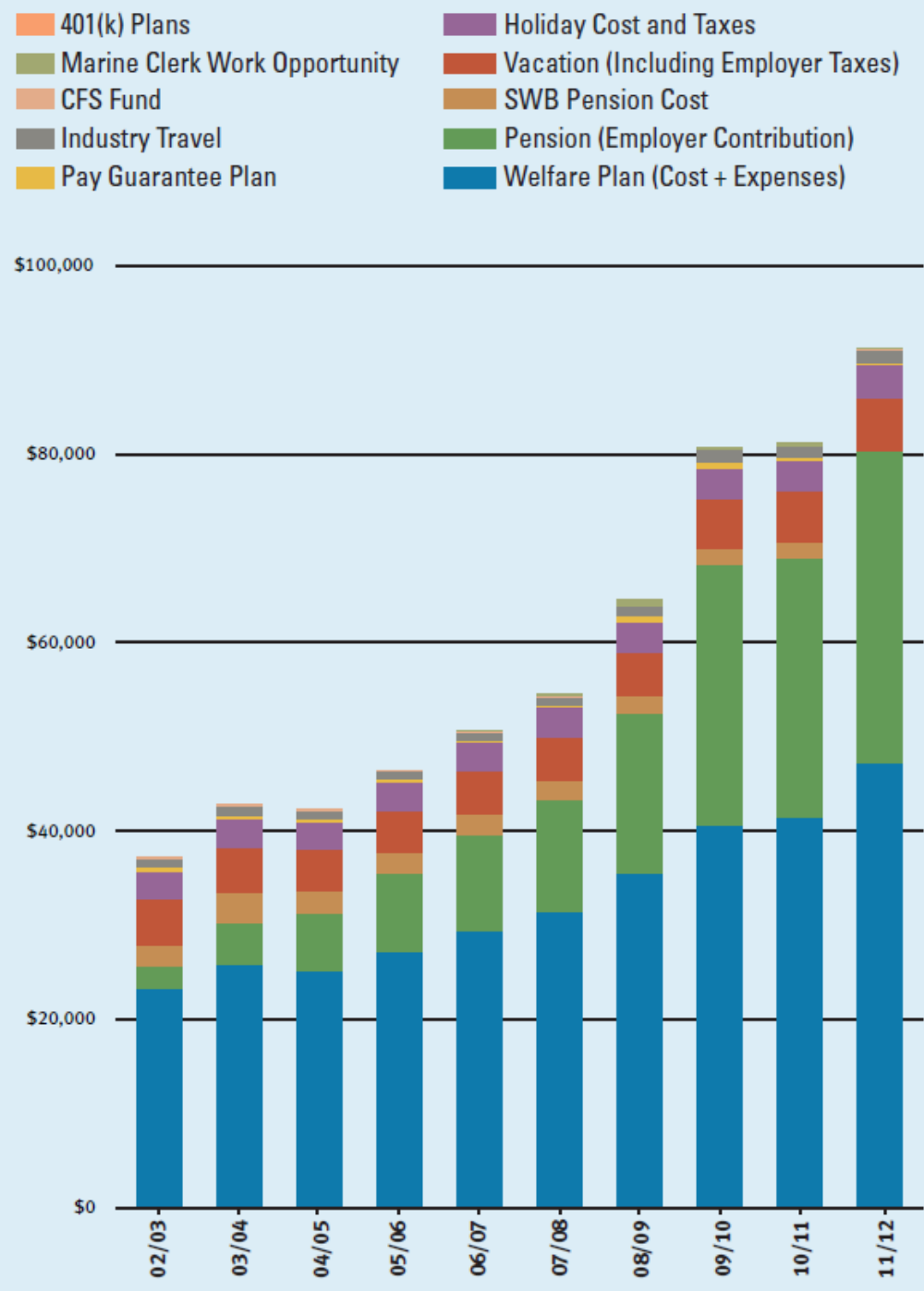
Last of the Manual, Wheeled, Mega-fill Projects



Change in Oil Price vs. Inflation Since 1990



US Longshore Benefit
Costs
(these do not include wages!)
source: PMA 2012 Annual
Report



Terminal Automation

Process Automation

- OCR data capture
- RFID equipment tracking
- Terminal equipment position detection
- Container inventory
- Truck appointment systems

Machine Automation

- Driver assist
 - RTG gantry
 - Dock crane “autopilot”
- Robotic vehicles
 - AGVs
 - Straddles
 - RMGs
- Remote operation of dock cranes

Euromax Rotterdam – a typical “fully automated” Terminal



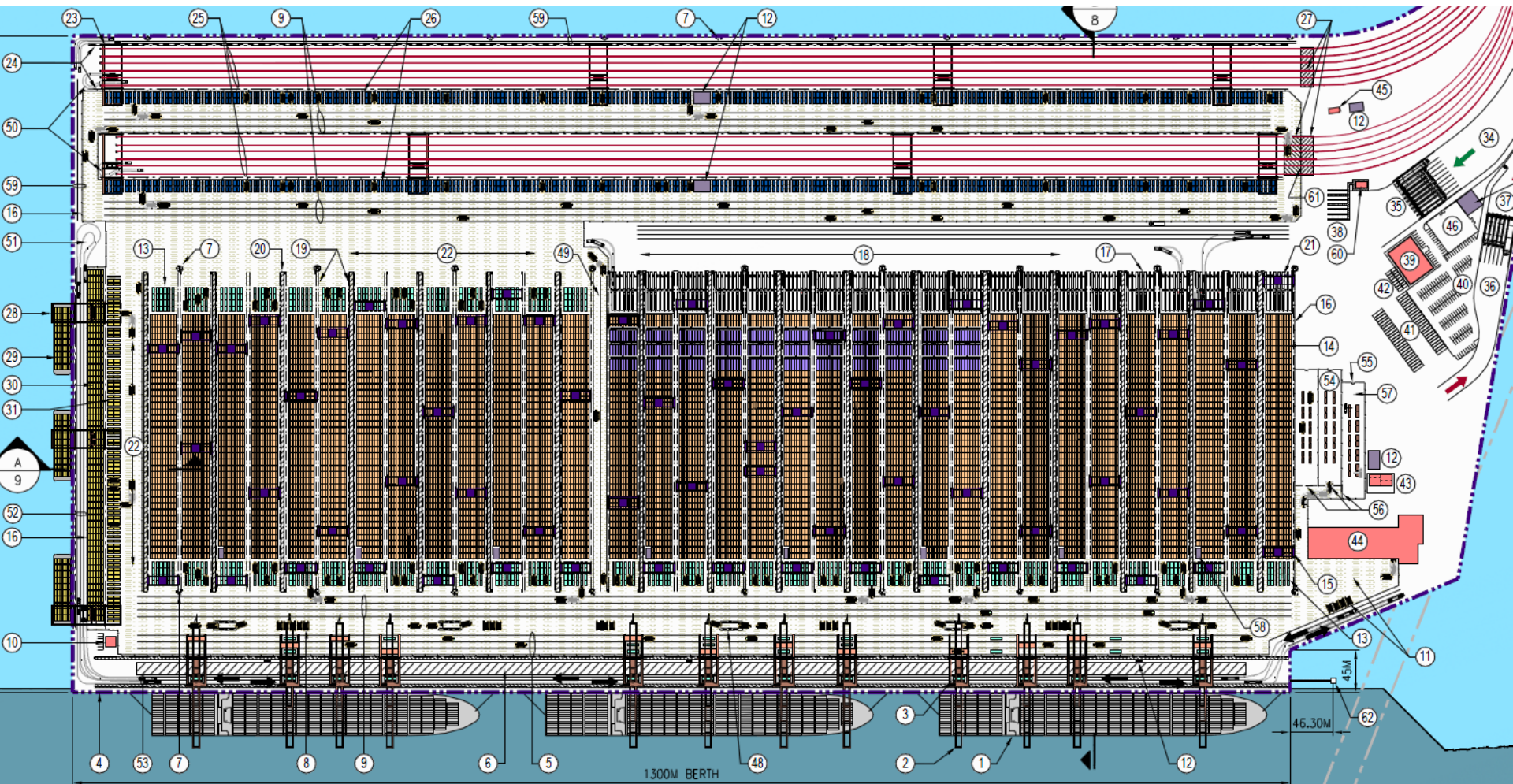
RBT2 - Rendering of Final Conceptual Layout

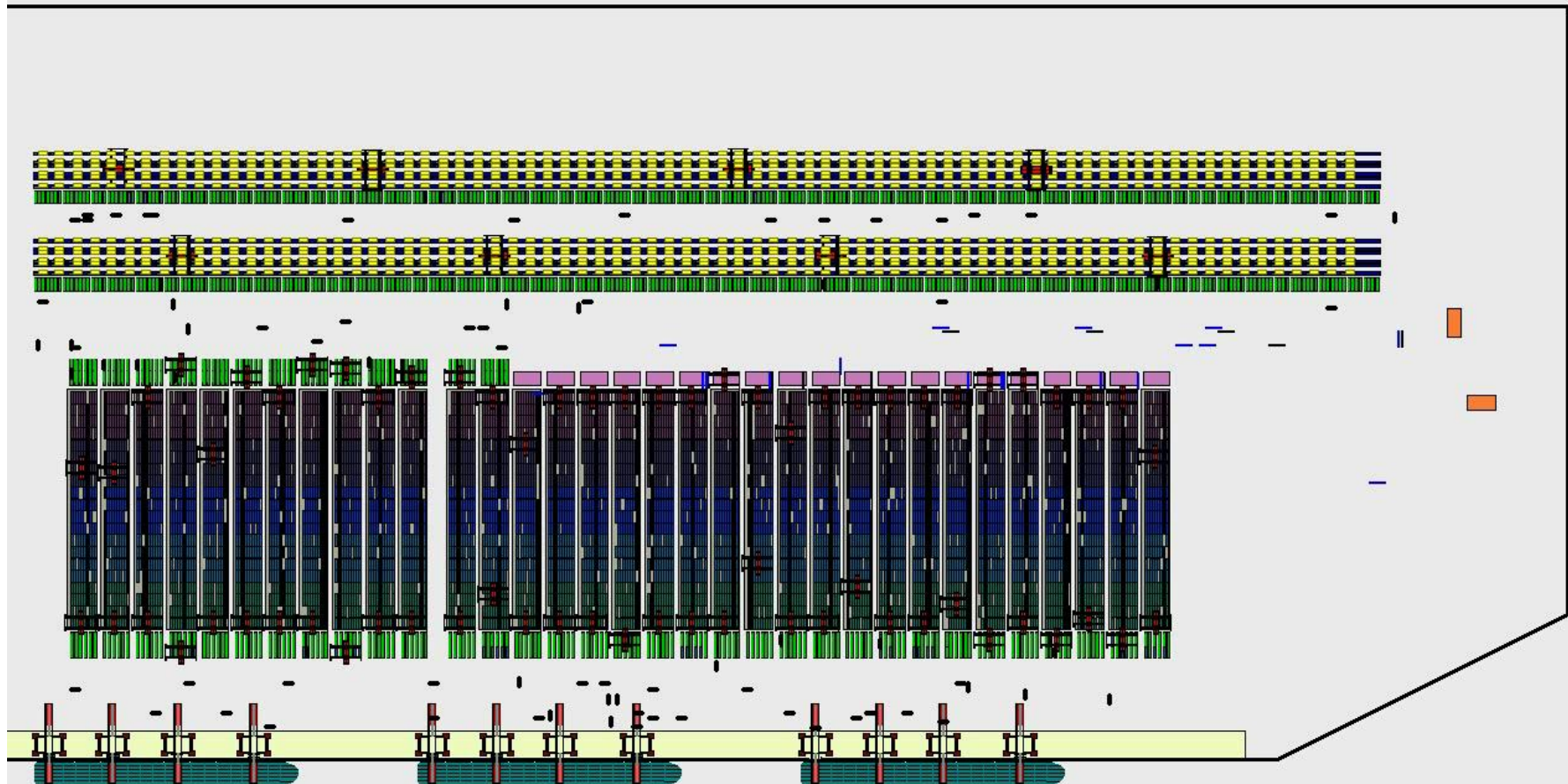
DELTA

Proposed Roberts Bank
Terminal 2

Existing
Roberts Bank Terminals

RBT2 - Final Concept





Automated Stacking Cranes (ASCs)
served by shuttle carriers

The Social License to Operate

- POLA lost lawsuit to NRDC over China Shipping in 2001 that changed the industry
- Public realizes impacts from Port operation
- Freight doesn't vote
- Big, verifiable reductions have been made at POLA/LB (see next slide)

POLA has Achieved Massive Reductions in Emissions Since 2005

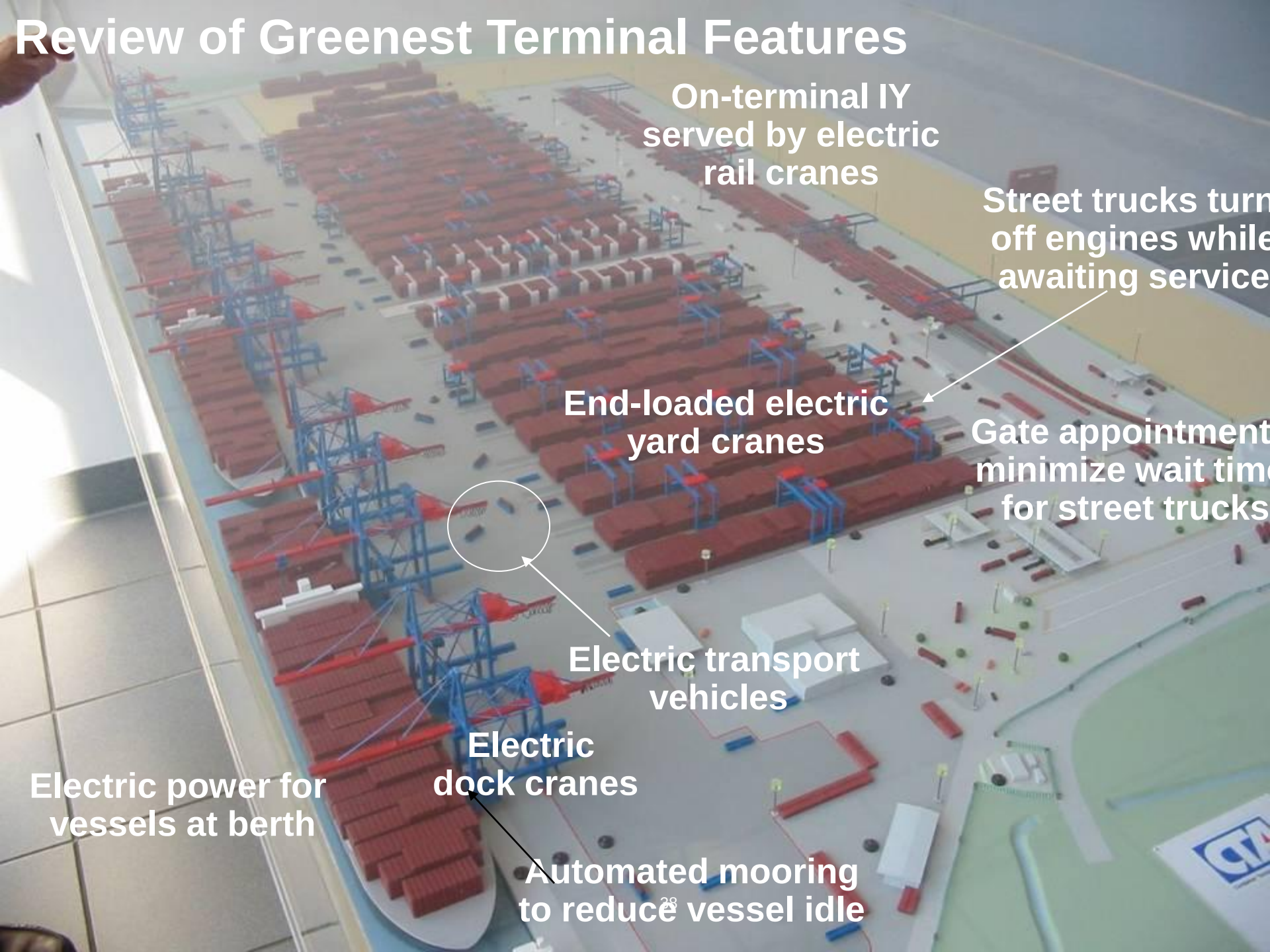
source: POLA Website

EMISSIONS PER 10,000 TEU HANDLED



Pollutant	CY 2005 - 2012	
	%	tons
DPM	81%	0.96
PM _{2.5}	79%	0.88
PM ₁₀	81%	1.06
NOx	59%	12.94
SOx	89%	6.31

Review of Greenest Terminal Features



On-terminal IY
served by electric
rail cranes

Street trucks turn
off engines while
awaiting service

End-loaded electric
yard cranes

Gate appointment
minimize wait time
for street trucks

Electric transport
vehicles

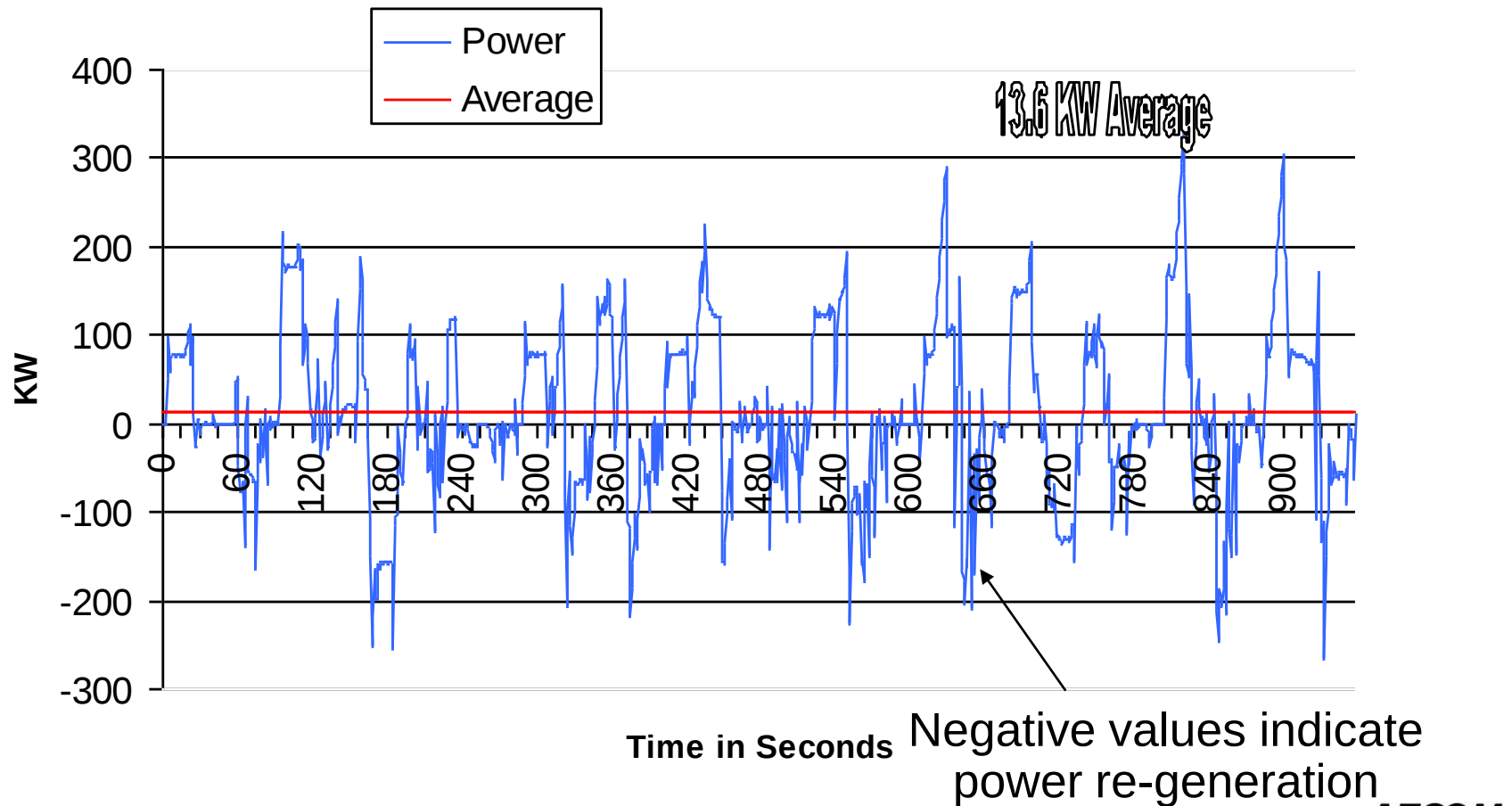
Electric
dock cranes

Electric power for
vessels at berth

Automated mooring
to reduce vessel idle

Electric Cranes can Regenerate Power when Lowering Containers

data from TSI Deltaport



Ports as Renewable Power Stations



Final Thoughts

- Most North American ports have plenty of surplus capacity, but not those in BC
- Radical new technology will change the way terminals operate
- North American cargo growth will be slow and competition will be fierce
- Even the best terminals will be opposed by some people

Thank You



Contact Information

- Mark Sisson, PE
AECOM
2101 Webster St. Suite 1900
Oakland CA, 94612
Phone: 510-844-0549
Email: mark.sisson@aecom.com
Web www.aecom.com