

**SMART Rivers 2011 Conference  
New Orleans, September 2011**

**San Joaquin River Marine Highway**

By Willard Price, PhD, PE

Professor of Operations/Engineering Management

University of the Pacific; [wprice@pacific.edu](mailto:wprice@pacific.edu)

With Richard Aschieris and Mark Tollini,

Port of Stockton

# Seaport/ Supply Chain Research: Marine Highway Project

- Framework to examine Marine Highway (MH) design, provision, operation and performance
- Preliminary data from M-580 and M-80 Marine Highway Corridor Project via Delta waterways
  - River parallel to IS 580: OAK to SCK
  - Shipping Channel parallel to IS 80: OAK to SMF
- Project collaboration of Ports of Oakland, Stockton and West Sacramento - Stockton as lead agency
- Not a full articulation of this MH project - the effort in early development, many choices yet to decide

# Marine Highway Study Design

- Reap the SC reward from Globalization
  - Explain the seaport opportunity from GSC
  - Discuss Modal Tradeoffs and arrival of MH
- Detail MH Network: Nodes and Modes
  - Describe the Provision of MH Network facilities
  - Explain OAK-SCK specific strategies/choices
- Present SC/MH performance
  - Detail seaport service quality: The “Right Stuff”
  - Argue the commercial viability of MH projects

# Globalization's Reward and Risk

- Globalization under trade agreements
  - Reward for the macro and micro US economy
  - Free trade or fair trade; protection response
  - Global great recession hurts trade
- Created a global supply chain (GSC) with:
  - Complex multimodal transport with a very long reach
  - SC now a large share of product cost (>60%)
- Logistics gets its reward
  - Many SC actors, mostly US companies
  - Seaports reap the business, mostly growing

# Seaport Opportunities

- Growing GSC provides many cargo types
  - Ports and shippers favor the shipping container
  - Closed box for high value smaller weight products
- Import – Export balance – in economy, at each port
  - Import surge – production aboard + US consumption
  - Export balance needed - how US will grow again
- Port is indifferent about import or export, unless one direction is better for volume
- Do containers flow outbound empty?

# Shipping Container Concentration

- Container business concentrates at larger ports
  - Water depth necessary for modern vessels - bigger
  - Big cities and transport routes preferred - denser
  - Port infrastructure capital readily available - richer
- Capacity does not match Demand at major ports
  - Infrastructure never keeps up with growth
  - Carrying capacity of community exceeded
  - Congestion and pollution above limits

# Container Cargo Distribution

- My preference:
  - Distribute cargo to all significant seaports, provide economic benefits in smaller communities
  - Reduce impact on big cities of noise, congestion, delay, safety and emissions
  - Get container movement off public highways and eliminate at-grade crossings
  - British Columbia is a leader with these objectives:
    - Grow ports outside Vancouver
    - Avoid rail conflict with other traffic
    - Separate trucks from automobiles
- Marine Highways accomplish same objectives

# Modal Tradeoffs - Choosing

- Air vs. Sea
  - Cargo cube limits air; high volume needed to justify
  - Cargo speed favors air to satisfy JIT demands
  - Both ships and planes getting bigger – who wins?
- Rail vs. Road
  - Short haul for trucks; long haul for trains
  - Road availability and flexibility favor trucks
  - Rail advantage is rising; railroads learning to compete



# Marine Highway Arrives

- New modal tradeoff: Highway vs. Waterway
  - Truck is powerful with speed and flexibility of roads
  - Marine barges on reduces congestion and emissions
  - Large metro areas are unwilling or unable to provide infrastructure capacity
  - Smaller regional communities benefit from logistics
  - SC vehicles should not compete with other traffic for limited infrastructure, not willing to pay for separate commercial vehicle lanes

# Marine High/Waterway Design

- River corridors do not require increasing water depth
  - Shallow draft barges
  - Even locks for elevation control are navigable
- Two way traffic allows passing, except for locks
  - Expect both upstream and downstream traffic or import and exports
  - Coping or avoiding empty shipping containers

# Waterway Design (cont)

- Marine Highway network: Nodes and Modes
  - Nodes:
    - Terminals are for modal transfer and create “dwell”
    - Where the cargo changes transport mode or stays still for some time - it is dwelling and being delayed
    - Dwell can charge fees - return needed by the port
  - Modes:
    - Transport carriers for ocean, air, road or rail
    - Routes or corridors for travel – separate path and single or multiple usage
    - Ownership/control of the path – public or private

# Network Stages

- Stage order and flow:
  - Ocean vessel arrives at pier
  - Cargo transferred to shore for staging or directly to barge (on-dock or near-dock)
  - Barge with tug upstream
  - Barge arrives alongside pier at inland port
  - Cargo transferred from barge for staging or directly to truck or train (on-dock or near-dock)
  - Cargo forwarded to intermodal terminal for staging, separating or consolidating for final distribution

# Network Obligations

- Reverse order of stages for export; avoid conflict with import cargo, maybe occurs at terminals
- Security regimes (contain scanning) may be required at port of embarkation or at port of debarkation
- Security expected at foreign port before US arrival, with trusted SC partners
- US debate:
  - Use “risk based analysis” to select containers for “integrated security system” scanning
  - Scan 100% of containers destined for US or in US ports

# Provision of Network Facilities

- Fixed IF; communication/control/security systems; mobile equipment, vessels and vehicles/rolling stock and maintenance resources
- A framework for providing these fixed assets:
  - Ownership of facilities and equipment - controlling usage and planning rehabilitation/replacement
  - Providing CAPITAL INVESTMENT for assets – fixed costs
  - OPERATING/MAINTAINING facilities/equipment/vessels/vehicles and employing workers/operators/drivers – variable costs

# Provision via Public-Private Partnerships (PPP)

- A hot topic in IF development, even being encouraged by the Federal Government (PPP or P3):
  - Public and private sector actors assuming different roles in the partnership through a legal agreement (contract)
  - Risk (uncertainty) sharing – capital, costs, revenues
  - Public vs. private risk – both or one?
  - Uncertain events - silence or vagueness in agreement
  - Dispute resolution method – arbitration/litigation
  - Disputes tend to favor private partner - public loses more often

# PPP – Agreement Design

- Plenty of alternative designs – risk sharing, role responsibility, payment arrangement and dispute resolution
- Best for both parties to address all **uncertain events or outcomes** – can hardly overstate in a PPP contract
- Need for evidence to determine the alternative designs predicting higher performance, service quality
- But **uncertainty causes “over-runs”** and reduces the chance of commercial viability for both partners
- Why not less “under-runs” and better net revenues



# Oakland-Stockton Specifics

- MH Project is at an early stage, just selecting a logistics management company to execute project
- Management company will develop facilities and equipment, contract with operators/carriers and oversee project operations and viability
- This company will have a PPP agreement with the Port of Stockton – with financial arrangements
- Service expectations will be specified and rewarded
- If I can influence the PPP - little will be left to the variance of nature, operations or external forces

# Some Data on MH Barge

- Vessel draws about 8 feet and has freeboard = 18 feet
- About a 7-8 hour trip from Oakland to Stockton
- Volume per barge trip = about 150-300 containers depending on size - 20, 40, 53 feet
- Barge is not self-propelled or self-unloading – tug and shore crane required

# MH Service Quality

- Deliver the “right stuff”: right item, quantity, condition and place, safe and secure (accuracy)
- Respond quickly to meet promised time (speed)
- Flexible delivery to meet customer request (agile)
- Information on shipment status (real time/online)

# Additional MH Performance

- Cycle time (CT) – from disembarking to delivery
  - CT determines capacity and seen as flow rate
  - CT can be reduced to gain capacity:
    - Shorten travel time and distance
    - Increase velocity of movement
    - Eliminate delay or dwell
- Resource consumption and “carbon footprint”
  - Energy usage and alternative fuels
  - Emissions and pollution of water, chemicals, waste
  - Community congestion, noise and inconvenience

# Commercial Viability

- Investment capital:
  - Federal MH initiative, with grant contributions
  - More economic stimulus/jobs may be coming via an Infrastructure Bank and PPP encouragement
  - Private capital from investment funds or infrastructure development companies (sitting)
  - Logistics partners with capital or debt capacity
- Revenue requirements:
  - Fees along the MH trail with incentive pricing
  - Demand levels needed for viability, given a global recession - from other logistics options or growth

# Research Questions To Answer

- Design and performance of PPP with Logistics Management Company
- **Risk sharing** design in PPP and outcomes with operations and agility
- **Cargo commitments** achieved in the near term for project viability
- **Service level** delivered and customer satisfaction
- **Intermodal high tech hub** and contribution to cargo movement and distribution

# References: Short Sea Shipping and Marine Highways

- Bill Lewicki, Port of Stockton, CA, “Short Sea Shipping: Creating Economic Growth in California through Freight Movement on the Marine Highway”
- Cameron McWhirter, “Muddy Waters for River Shippers”, Wall Street Journal, February 12, 2011
- John Frittelli, “Can Marine Highways Deliver”, CRS Report for Congress, 7-7500, Congressional Research Service, January 14, 2011
- US Department of Transportation, “US Transportation Secretary LaHood Announces \$7 Million in Grants to Jumpstart America’s Marine Highway Initiative”, Congressional Quarterly, September 26, 2010
- Sean Kennedy, “Short Sea Shipping in the US – The New Marine Highways”, Tulane Maritime Law Journal, Vol. 33, pp. 203-227, 2008
- Matt Hilburn, “New Believers: The Short Sea Shipping Concept Gains Support, but Doubters”, Seapower, May 2007