DEEP DRAFT NAVIGATION (DDN) PLANNING AND RISK INFORMED MANAGEMENT

PCoP Webinar Series

Presented by:
Deep Draft Navigation Planning Center of Expertise (DDNPCX)
Date: 23, January 2020

US Army Corps of Engineers®

PRESENTATION TOPICS

DEEP DRAFT NAVIGATION PLANNING CENTER OF EXPERTISE

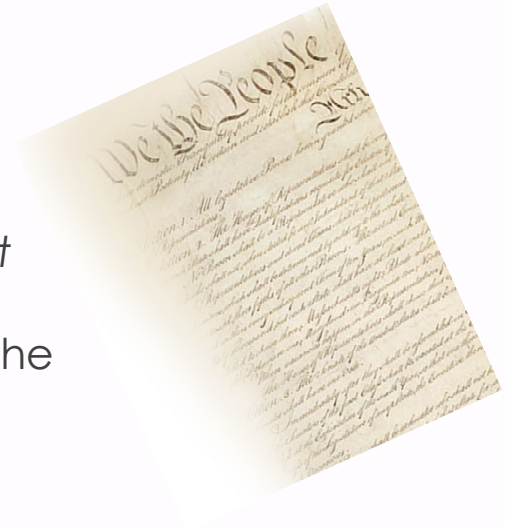
- DDN Mission & Significance
- DDNPCX
- DDN Components Overview
- DDN Planning and Plan Formulation
- Level of Detail at each Planning Milestone
- DDN Economics
- Engineering Design Considerations
- Dredged Material Management
- Environmental Compliance
- Risk and Uncertainty Considerations
- Costs & Cost Sharing
- General DDN Policy Guidance
- Unique Policy for DDN

DEEP DRAFT NAVIGATION MISSION

DEEP DRAFT NAVIGATION PLANNING CENTER OF EXPERTISE

DEEP DRAFT NAVIGATION PROJECTS:

Coastal ports with navigation channel depths greater than 14-feet (ER 1105-2-100)



FEDERAL INTEREST IN DEEP DRAFT NAVIGATION:

Federal interest is established by the Commerce Clause of the Constitution… *and, subsequent court decisions defining the right of the Federal Government to regulate navigation and improve navigable waterways. In* 1824 Congress designated U.S. Army Corps of Engineers as the Federal agency responsible for the Nation's navigation system.

CORPS OF ENGINEERS ROLE IN DEEP DRAFT NAVIGATION:

The role of the U. S. Army Corps of Engineers with respect to navigation is to provide safe, reliable, and efficient waterborne transportation systems (channels, harbors, and waterways) for movement of commerce, national security needs, and recreation. The Corps accomplishes this mission through a combination of capital improvements and the operation and maintenance of existing projects." (ER 1105-2-100)

DEEP DRAFT NAVIGATION

PLANNING CENTER OF EXPERTISE (DDNPCX)

OVERVIEW:

- Provides navigation economics, planning, and technical support in the valuation and development of policy compliant-technically sound feasibility studies.
- Located in Mobile District, South Atlantic Division (SAD)

AUTHORITY AND ROLE:

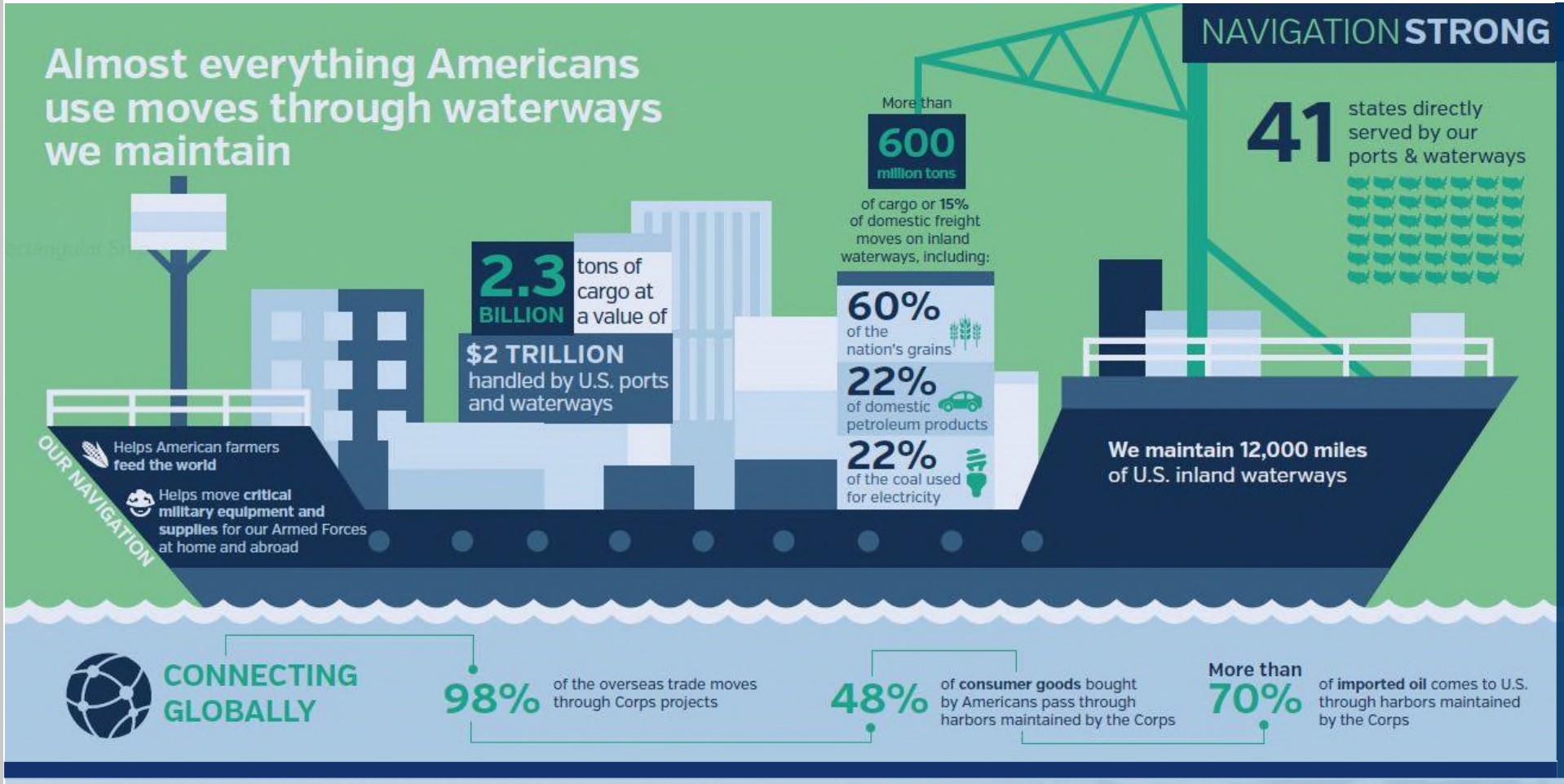
- USACE Operation Order (OPORD 2012-15) signed 24 Feb 2012.
- Designates DDNPCX in SAD as USACE mandatory Economic Production Center for all DDN related economic analysis

RESPONSIBILITIES:

- Review and endorse DDN Review Plans (RPs)
- Maintain USACE Corporate Economic Planning Models (Harborsym, RECONS)
- Provide DDN Planning, Plan Formulation, Technical and Policy Support
- Conduct Economic Analyses and Prepare Feasibility Report Economic Appendix (including District Quality Control (DQC) of the Economics)
- Manage draft and final Agency Technical Reviews (ATRs) and DDN Independent External Peer Reviews (IEPRs)
- Maintain relevant DDN policies, databases and technical resources
- Provide Oversight and Support to the Small Boat Harbor Planning Subcenter of Expertise (SBH-PSCX) in Pacific Ocean Division (POD)

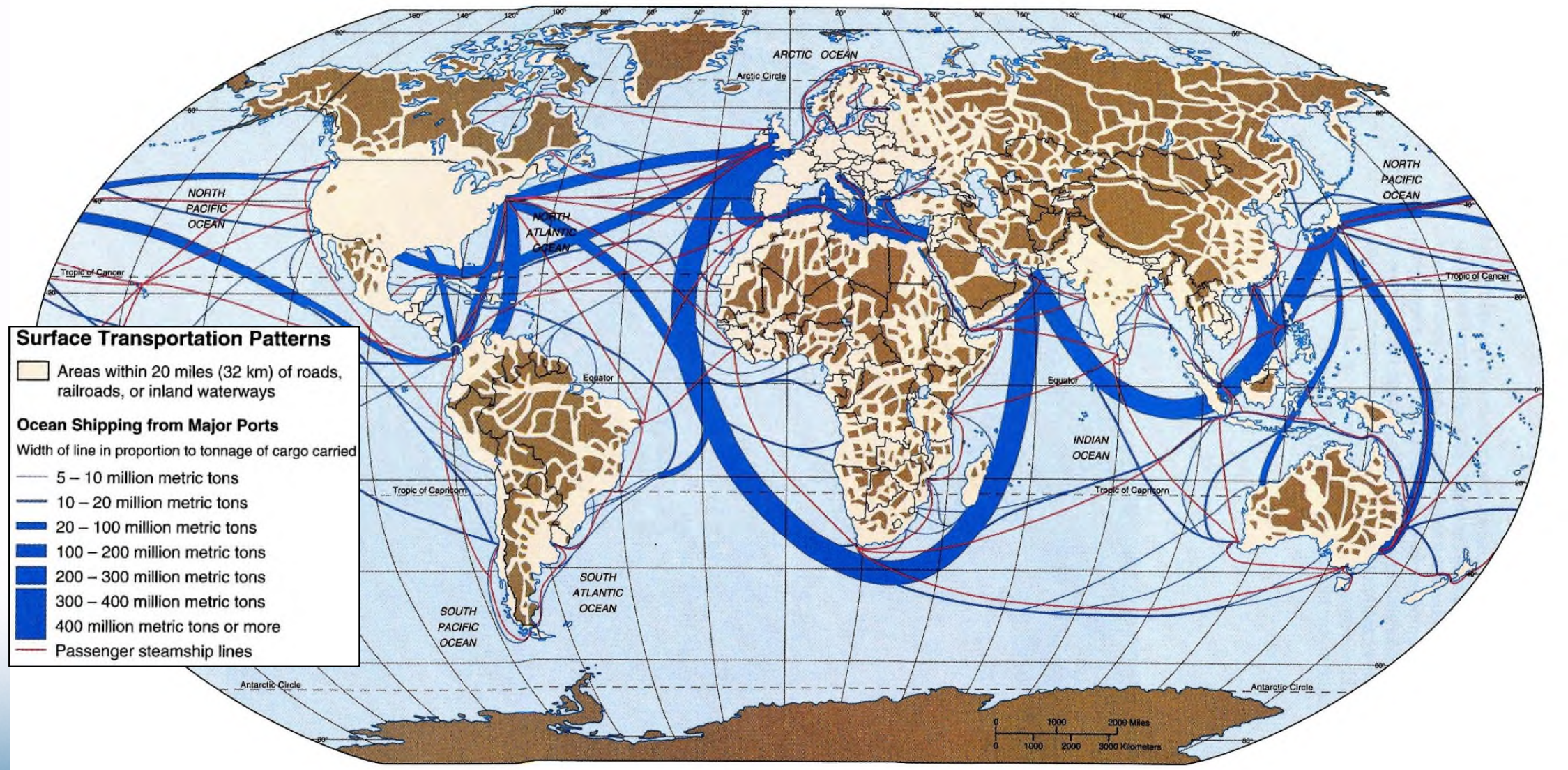
WHY DO DDN PROJECTS MATTER?

The navigation mission is the largest component of the Corps' Civil Works program.



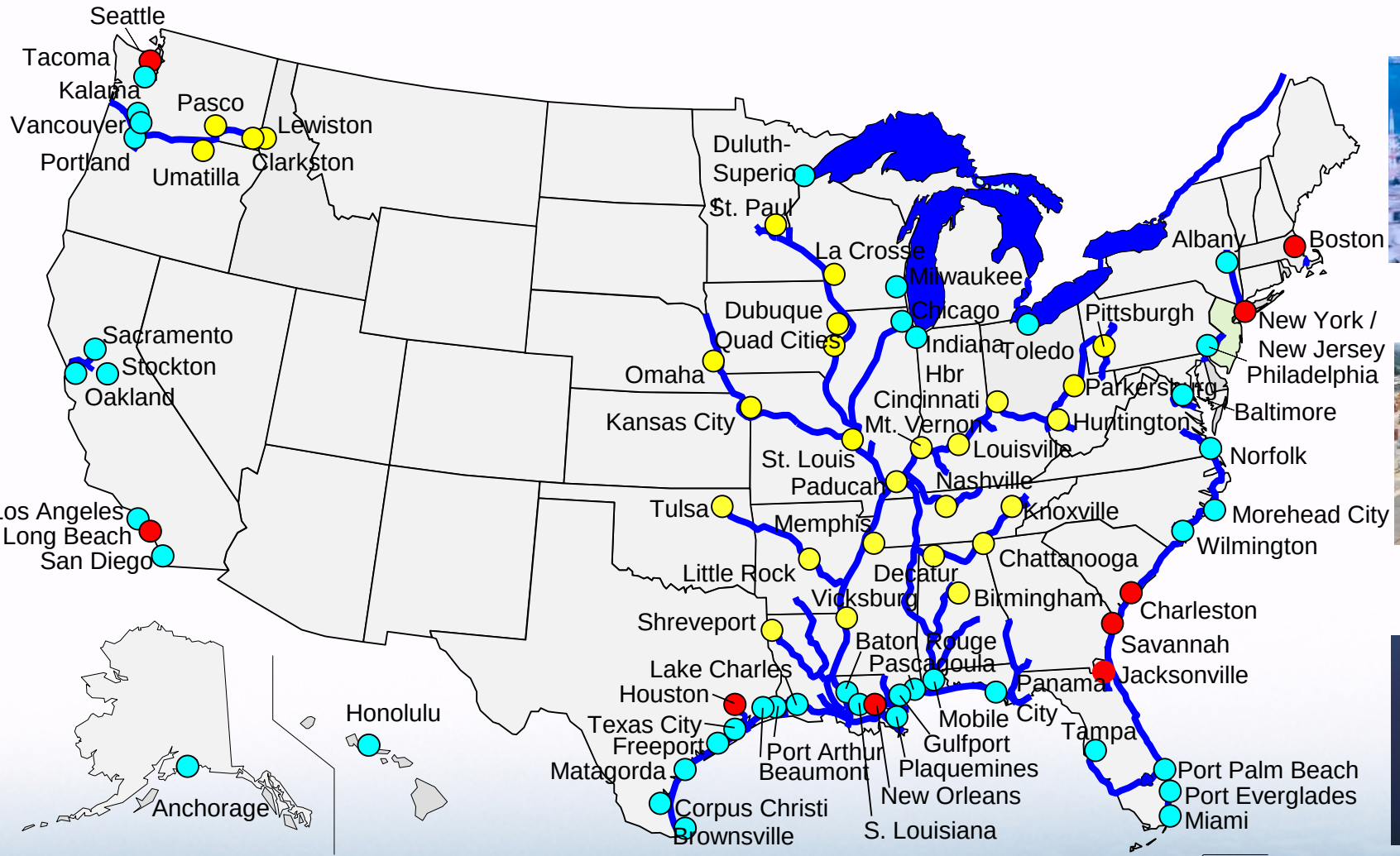
- The annual navigation budget for planning, engineering, construction, and operations and maintenance exceeds $1.7 billion.
- ~21 % is for new construction, ~79 % is for Operations and Maintenance (O&M).
- Corps is responsible for maintenance of ~ 300 deep draft port and harbors.
- These ports and harbors handle 2.6 billion tons of domestic and foreign cargo each year
- This accounts for 90% of U.S. maritime trade.
- U.S. ports and harbors support more than 13 million jobs nationwide.
- Most environmental form of transportation.

WORLD MARITIME SHIPPING ROUTES



(Source: McGraw-Hill)

U.S. NAVIGATION SYSTEM AND DEEP WATER PORTS



A FEW SIGNIFICANT DEEP WATER PORTS ACROSS THE NATION

Port of Seattle

Port of Long Beach

Houston Ship Channel

Port of New Orleans

Port of Jacksonville

Port of Savannah

Port of Charleston

Port of NY/New Jersey

Port of Boston

KEY PLAYERS IN DEEP DRAFT NAVIGATION

Public Institutions

- Corps, Port Authorities (Non-Federal Sponsor)
- U.S. Coast Guard (USCG)
- Federal/State/Local Government Agencies
- Federal/State Resource Agencies

Private Organizations

- Carriers, Carrier Alliances, Pilots Associations
- International Longshoreman's Association
- Shipping Associations
- Maritime Associations
- Harbor Safety, Navigation, and Operations Committees
- Environmental Groups
- Other Port Tenants
- Citizens at Large

U.S. COAST GUARD

- Underkeel clearances can be imposed by harbor and port authorities, Bar Pilots, vessel owners / operators, or the USCG as a safety measure
- Marine accident records are available
- Modification of Bridges that Obstruct Navigation (P.L. 76-647, Bridge Alteration Act)
- Responsible for Aids-to-Navigation (ATON)

PILOT ASSOCIATIONS

The Harbor Pilots are responsible for ensuring the safe navigation of ships from sea to their berth.

- Set/enforce navigation guidelines and/or navigation restrictions for their harbor
- Assist in planning of new port development or changes in ship operations
- Participate in Corps studies; providing in depth knowledge of the existing conditions and/or operational concerns
- Provide a record of how vessels operate in the channel with Pilot logs and records

CHARACTERISTICS OF MARITIME HARBORS AND PORTS

GENERAL NAVIGATION FEATURES (GNF)

- Entrance Channel
- Interior Channel
- Channel Wideners
- Channel Deepening
- Transitions
- Turning Basin
- Jetties
- Anchorage Area

*Advance Maintenance Features

OTHER PORT CHARACTERISTICS

- Terminals
- Berthing Dimensions
- Terminal Capacities
- Port Institutions
- Master Plan
- Data Source - Port Series
- Land Available for Growth
- Rail and Road Access
- Distribution/Production Centers
- Port Operating Restrictions

CLASSIFICATIONS OF MARITIME CARGO & VESSELS

GENERAL CARGO - BARGE

Break Bulk:
- Sacks
- Cartons
- Crates
- Drums
- Pallets
- Bags

Neo Bulk:
- Lumber
- Paper
- Steel
- Autos

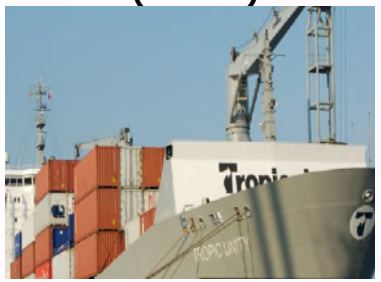
BULK CARRIER

- Grains
- Fertilizers
- Building materials
- Scrap metal
- Sand/Gravel

TANKER

Liquid bulk:
- Crude oil
- Petroleum products
- Liquid chemicals

REFRIGERATED CARGO (REEFER)



Cargoes requiring refrigeration or other temperature control.

CAR CARRIER

Rubber tired vehicles that can be rolled on to and off (RO/RO) of the vessels:
- cars in trucks
- cargo in trailers
- transportation or construction equipment.

CONTAINER

- Cargoes that can be shipped in standardized metal boxes
- Load on/Load off (LO/LO)

TUGS

Provide assistance to vessels for:
- Stopping
- Turning
- Controlling speed
- Required escort through environmentally sensitive areas

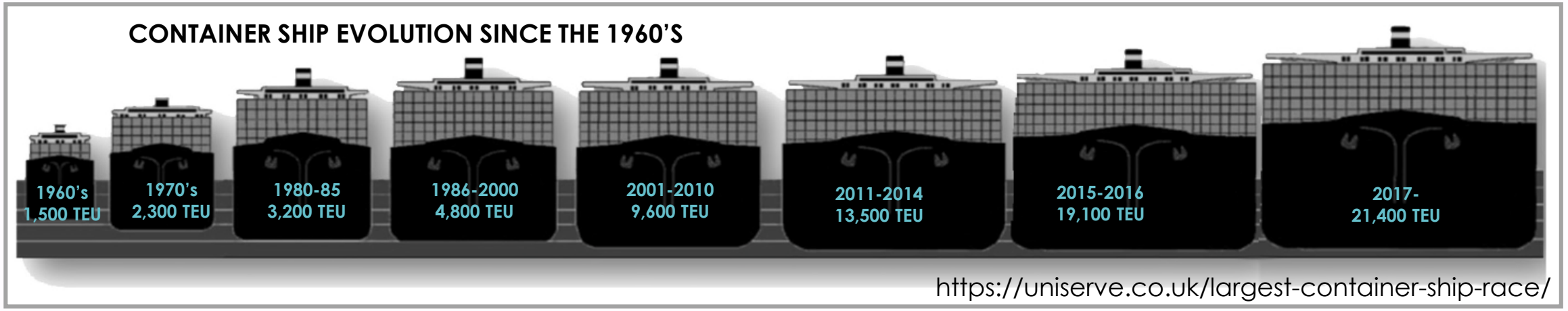
CRUISE

- Influenced by wind
- Vertical clearance issues
- Draft ~27 feet
- Schedule driven

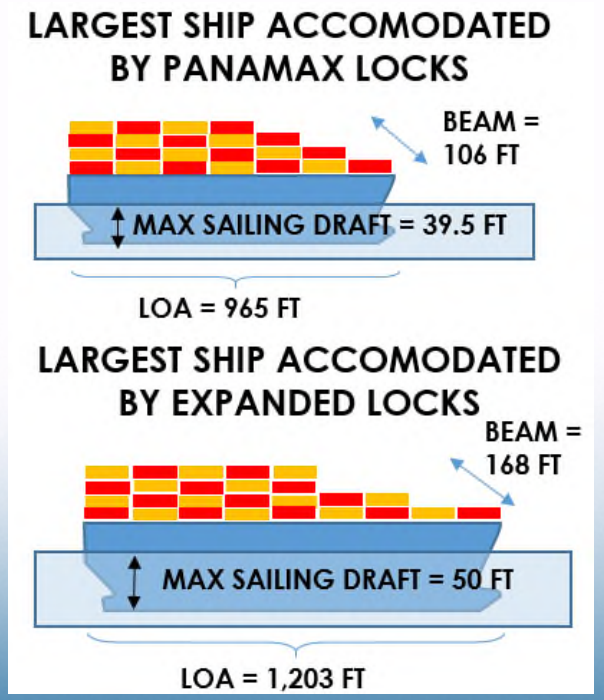
LNG/LPG CARRIER

Vessels which carry liquefied natural gas or liquefied petroleum gas

VESSEL SIZE GROWTH



https://uniserve.co.uk/largest-container-ship-race/



MAX TEU CAPACITIES:

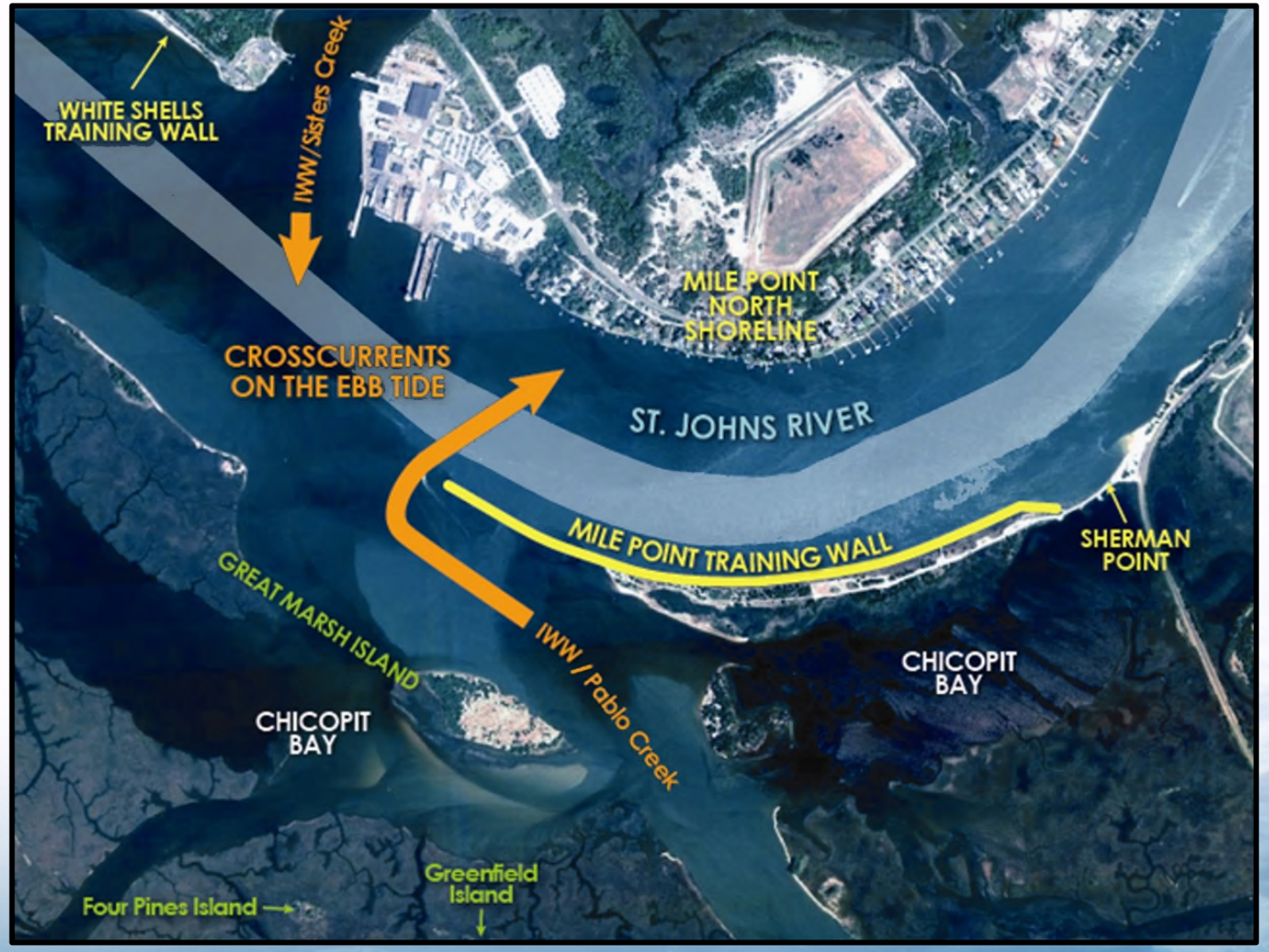
- **PANAMAX LOCKS ~5,000 TEU**
- **EXPANDED LOCKS (2016) ~14,000 TEU**

Larger vessel transiting the new Panama Canal locks in 2016

COMMON PROBLEMS

- Physical Conditions
  - Crosscurrents
  - Shoaling
  - Wind
  - Channel Configurations
- Vessel Delays
- Light Loading
- More Frequent Trips
- Lightering
- Congestion
- Navigation Restrictions*
- Navigation Inefficiencies

*Safety concerns are typically mitigated with navigation restrictions; restrictions are an economic cost (inefficiencies).



PLANNING PROCESS OVERVIEW

- **Step 1** Identify POOCs
- **Step 2** Step 2: Inventory Existing/FWOP
- **Step 3** Step 3: Formulation Alternative Plans
- **Step 4** Step 4: Evaluate Alternative Plans
- **Step 5** Step 5: Compare Alternative Plans
- **Step 6** Step 6: Select Plan

POOCs – Problems, Opportunities, Objectives, Constraints
FWOP – Future Without Project Condition
FWP – Future With Project Condition
LPP – Locally Preferred Plan
NEPA – National Environmental Policy Act

Engineering:
- Physical conditions
- Ship simulation
- Widening Considerations
- Shoaling
- Geotechnical

Economics:
- Commodity and fleet data & projections
- Economic conditions
- Population projections

Team assumptions with Environmental & Plan formulation

Economic model runs => FWOP

Team assumptions with Environmental & Plan formulation

Economic model runs => FWP

Team assumptions with Environmental & Plan formulation

Team/Environmental:
- Economic costs/benefits analysis
- NEPA Effects Analysis
- NED/LPP identification

National Economic Development Plan (NED) – the plan that reasonably maximizes net benefits to the nation from cost savings.

DDN MILESTONE GOALS

EXAMPLES OF WHAT TO COMPLETE BEFORE EACH MILESTONE

ALTERNATIVES MILESTONE MEETING (AMM)

- Begin coordination with Port/Pilots/USCG/stakeholders
- Identify & document problems, opportunities, objectives, constraints with Port/Pilots
- Identify design vessel
- Identify Existing Conditions & Restrictions with Port/Pilots
- Begin making assumptions about FWOP conditions
- First Iteration of measures and screening
- First iteration of creating project alternatives from remaining measures
- Review plan submittal to DDNPCX and IEPR checklist
- NEPA Scoping Meeting
- Begin gathering economic data from waterborne commerce, etc
- Determine latest version of HarborSym to use
- Identify risks and level of risk moving forward

TENTATIVELY SELECTED PLAN MEETING (TSP)

- Continued coordination with Port/Pilots/USCG/stakeholders
- Refine problems with Port/Pilots
- Refine Existing Conditions & Restrictions with Port/Pilots
- Refine assumptions about FWOP conditions
- Ship simulation
- Second Iteration of measures and screening
- Second iteration of creating project alternatives from remaining measures
- Review plan endorsement by DDNPCX (& IEPR path forward) & approval by MSC
- Second iteration of creating project alternatives
- ROM costs for alternatives
- HarborSym benefits for alternatives
- Planning and NEPA comparison and evaluation of plans/effects
- Identify NED plan, and LPP if appropriate
- Complete TPCS and CSRA for TSP (including mitigation, ATONS, etc)
- Identify risks and level of risk moving forward

AGENCY DECISION MILESTONE MEETING (ADM)

- Continued coordination with Port/Pilots/USCG/stakeholders
- Hold public meeting during public review period
- Refine problems with Port/Pilots
- Refine Existing Conditions & Restrictions with Port/Pilots
- Refine assumptions about FWOP conditions
- Refine TSP/LPP
- Refine any mitigation assumptions/salinity/air quality analyses
- DQC of Draft report/NEPA & Technical Appendices
- Statement of Legal sufficiency
- Concurrent reviews: (Public/agency, MSC/HQ, ATR, IEPR or waiver) of Draft report/NEPA & Technical Appendices
- SHPO coordination & Draft Programmatic Agreement coordinated with public & tribes, BA, Draft CAR
- Identify risks and level of risk moving forward

OTHER PLANNING CRITERIA FOR EVALUATION & COMPARISON OF ALTERNATIVES

P&G CRITERIA

Completeness
is the extent to which the alternative plans provide and account for all necessary investments or other actions to ensure the realization of the planning objectives, including actions by other Federal and non-Federal entities.

Effectiveness
is the extent to which the alternative plans contribute to achieve the planning objectives.

Efficiency
Is the extent to which the alternative plan is the most cost effective means of achieving the objectives.

Acceptability
is the extent to which the alternative plans are acceptable in terms of applicable laws, regulations and public policies.

P&G FOUR ACCOUNTS

NATIONAL ECONOMIC DEVELOPMENT

Changes in the economic value of the national output of goods and services.

ENVIRONMENTAL QUALITY

Non-monetary effects on ecological, cultural, and aesthetic resources including positive and adverse effects of ecosystem restoration plans.

OTHER SOCIAL EFFECTS

Plan effects on social aspects such as community impacts, health and safety, displacement, energy conservation, and others.

REGIONAL ECONOMIC DEVELOPMENT

Changes in the distribution of regional economic activity.

PLANNING & ECONOMIC CONSIDERATIONS

National Economic Development Plan (NED)– the plan that reasonably maximizes net benefits to the nation from cost savings.

- Primary benefits of Federal involvement in port project improvements involve transportation cost savings.
- Cost savings accrue from making existing ports more efficient through:
  - More efficient use of vessels at the port under consideration
  - Use of larger vessels at the port
  - Reduced transit time at the port
  - Lower port cargo handling and tug assistance costs
  - Shift of Origin:
    - Cost reduction in transporting and producing commodity
    - Shift in mode or Harbor (commodities travel via another more cost effective route to the same destination
- Not intended to garner comparative advantage for individual ports

PRIMARY BENEFITS: TRANSPORTATION COST SAVINGS

BENEFITS = ESTIMATED $ Transportation Cost WITHOUT PROJECT - ESTIMATED $ Transportation Cost WITH PROJECT

NET BENEFITS = BENEFITS - COSTS

A Recommended Plan represents the alternative which most reasonably maximizes NED benefits and is environmentally acceptable

$$\frac{\text{BENEFITS}}{\text{COSTS}} > 1$$

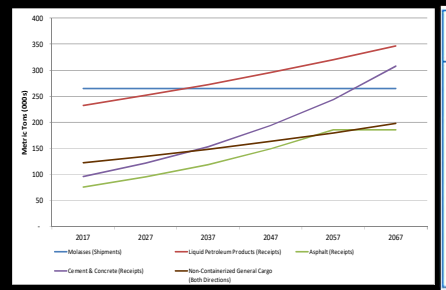
In addition, plans must have a benefit to cost ratio greater than 1.

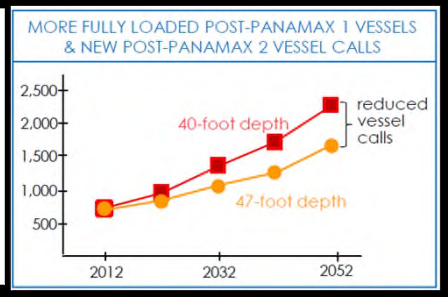
NATIONAL ECONOMIC DEVELOPMENT (NED) ECONOMIC EVALUATION PROCESS

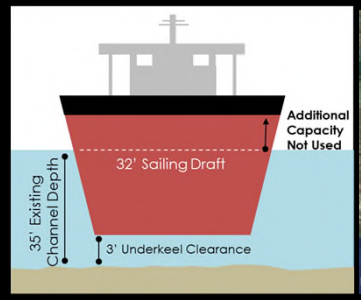
1. Determine the Economic Study Area
2. Identify Commodity Types, Volumes, & Flows
3. Project Waterborne Commerce
4. Determine Vessel Fleet Composition and Costs
5. Determine Current Commodity Movement Cost(s)
6. Determine Future Without Project (FWOP) Conditions
7. Determine Future Without Commodity Movement Cost(s)
8. Determine Alternative Plans & Cost(s)
9. Use Corps certified Model (HarborSym) to run alternative plans to determine benefits/cost savings when compared to FWOP
10. Compute Net Benefits of Each Alternative & Identify NED Plan

STANDARD PARAMETERS ASSESSED IN NAVIGATION BENEFITS ANALYSIS

COMMERCE FORECAST | FLEET FORECAST | LOADING PATTERN | CALLING CAPACITY | TRADE ROUTE | SHIPPING ROUTE





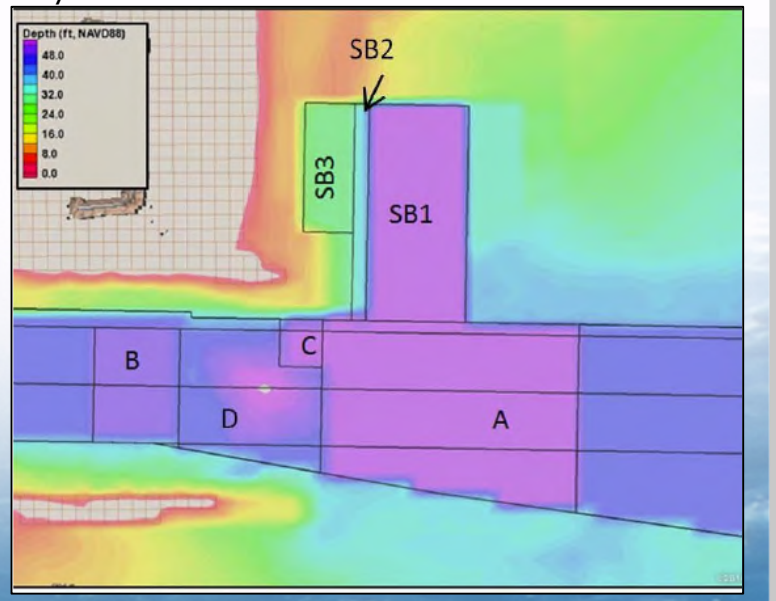


ENGINEERING & DESIGN CONSIDERATIONS

- Identification of Design Vessel
  - Usually the largest ship(s) of major commodity movers expected to use project improvements on a frequent and continuing basis
- Ship Simulation & Report
  - Used to test design vessels in without project and with project alternatives with Pilots for widening footprint
- General Navigation Features: Facilitate safe vessel movement in and out of Port
  - Channels, Turning Basins, Jetties, etc.
  - EM 1110-2-1613 Hydraulic Design of Deep Draft Navigation Projects
- Dredge Plant Type, Dredged Material Management, and Disposal Capacity Needs
  - Geotechnical characteristics and quantity of material (soil/rock) to be excavated
  - Increases in O&M material due to project, if appropriate
  - Advance maintenance features, if appropriate
- Other considerations
  - Storm surge analysis
  - Salinity modeling analysis
- Sea level rise analysis (3 curves) and considerations ER 1100-2-8162 and Engineering Technical Letter (ETL) 1100-2-1)
  - Resilience
  - What port is doing to protect infrastructure with or without project
  - Adaptations/considerations for mitigation if needed to get claimed habitat benefits

Ship Simulation – Ship Tracks

Bathymetry – Hydraulic Considerations



SHIP SIMULATIONS

ENGINEER RESEARCH & DEVELOPMENT CENTER (ERDC)

DEEP DRAFT NAVIGATION PLANNING CENTER OF EXPERTISE

- Virtual, real-time simulation of ship / tow movement.
- Accurately accounts for currents, wind and wave conditions, shallow water effects, bank forces, ship handling, ship to ship interaction, fender forces, anchor forces and tug assistance.
- Used to optimize the design of navigation channels and turning basins.
- Additional guidance is forthcoming

Ship Simulation available at ERDC HQ (Vicksburg, MS) & STAR (West Palm Beach)

DREDGE MATERIAL MANAGEMENT PLANS & PLACEMENT AREAS

Base Plan/Federal Standard

- Determine the least cost and environmentally acceptable alternative

Dredged Material Management Plans (DMMP)

- All Federally maintained navigation projects must demonstrate that there is sufficient dredged material placement capacity for a minimum of 20 years.
- Will the proposed navigation improvement require additional capacity over the next 20 years for O&M material?
  - ➢ No: Tell the story in the main report, and an additional appendix if needed.
  - ➢ Yes: Create a DMMP - alternatives may include:
    - Open Gulf/Ocean placement (Ocean Dredged Material Disposal Site)
    - Confined Disposal Facilities (Upland Disposal)
    - Beneficial Uses/Regional Sediment Management (RSM)

ENVIRONMENTAL COMPLIANCE

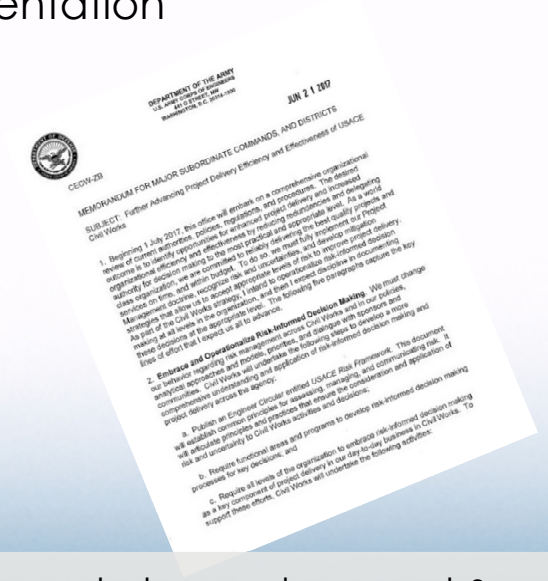
- National Environmental Policy Act (NEPA)of 1969
  - Analyzes the effects of the Recommended Plan, alternative plans, and the No Action alternative on the human environment, including considerations for cultural resources and environmental mitigation if appropriate
  - Coordination with Federal agencies including NMFS, USFWS, and USEPA, as well as appropriate state agencies
  - Includes coordination under other environmental laws, including EFH, CWA, NHPA, **ESA**, MBTA, **MMPA**, CAA, FWCA, and CZMA
- Beneficial Use of Dredged Material
  - ER 1105-2-100: "Where environmentally beneficial use of dredged material is the least cost, environmentally acceptable method of disposal, it is cost shared as a navigation cost. Section 204 of the WRDA of 1992, as amended, provides programmatic authority for selection of a disposal method for authorized projects, that provides aquatic restoration or environmental shoreline erosion benefits when that is not the least costly method of disposal. The incremental cost of the disposal for ecosystem restoration purposes over the least cost method of disposal is cost shared, with a non-Federal sponsor responsible for 25 percent of the costs."
- Other considerations:
  - Mitigation if needed
  - Environmental windows
  - Existing restrictions (dredge types, etc)

AREAS OF RISK & UNCERTAINTY

RISK INFORMED PLANNING

June 21, 2017 Memo: Further Advancing Project Delivery Efficiency and Effectiveness of USACE Civil Works

- Embrace and Operationalize Risk-Informed Decision Making
- Incorporate Social and Environmental Benefits into Plan Formulation, Design, and Implementation



IWR APT site can help you document & manage risks: https://iwr-apt.planusace.us/login

IDENTIFICATION OF RISK & UNCERTAINTY

- Example of Typical Risks & Uncertainty:
  - Lack of data
  - Uncertainty with future commodities/vessels/trade routes
  - Lack of time to do additional modeling
  - Lack of coordination with needed agencies
  - Assumptions with environmental data for mitigation in advance of surveys later in PED
  - Assumptions with existing geotech or cultural resource information (pushing surveys and analysis to PED)
  - Sea level rise assumptions
- Early study risks
  - Risk Register
  - Qualitative, should inform early decisions and should have management options to reduce or buy down risk throughout the study
- Project risks
  - Cost and Schedule Risk Assessment (CSRA)
  - Quantitative
  - Become part of a risk based monetary contingency as part of project first cost

COSTS & COST SHARING

USACE COST SHARED FEATURES - GENERAL NAVIGATION FEATURES (GNF)

- Channels
- Jetties
- Anchorages
- Breakwaters
- Locks
- Placement Sites (since WRDA 96)
- Mitigation

LOCAL SERVICE FACILITIES (LSF) (100% NON-FEDERAL)

- Land, Easements, Right of way, Relocation (LERR)
- Docks & Berthing Areas
- Terminal & Transfer facilities
- Local access channels

U.S. COAST GUARD (100% FEDERAL)

- Aids-to-Navigation (ATONS)

Feature	Federal Cost %[1]	Non-Federal Cost % [1]
CONSTRUCTION		
General Nav. Features (GNF)	90% from 0' to 20'	10% from 0' to 20'
	75% from 20' to 50'	25% from 20' to 50'
	50% >50'	50% > 50'
ATONS	100%	0%
LSF & LERR	0%	100%
OPERATION & MAINTENANCE		
GNF	100% except cost share 50% of costs for projects > 50'	0% except cost share 50% of costs for projects > 50'

(1) The Non-Federal Sponsor shall pay an additional 10% of the costs of GNF over a period of 30 years, at an interest rate determined pursuant to Section 106 of WRDA 86. The value of LERR shall be credited toward the additional 10% payment.

GENERAL NAVIGATION POLICY GUIDANCE

Engineer Regulations

- ER 1105-2-100: *Planning Guidance Notebook, Chapter 3-2: Navigation*
- ER 1165-2-131: *Local Cooperation Agreements for New Start Construction Projects, Appendix G: Navigation*
- ER 1165-2-120: *Reimbursement for Advance Non-Federal Construction*
- ER 1165-2-25: *Cost Apportionment of Bridge Alterations*
- ER 1165-2-209: *Studies by Non-Federal Interests*
- ER 1165-2-211: *O&M of Improvements by Non-Federal Interests to Authorized Harbor Projects*

Engineer Pamphlets

- EP 1165-2-1, Chapter 12: *Navigation*

Policy Guidance Letters (PGLs)

- There are a total of 19 navigation PGLs.
- PGLs 44, 47, 49 (superseded), 56 and 62 very useful -all relate to cost sharing.

DDN planning guidance can be found on the planning community toolbox:

https://planning.erdc.dren.mil/toolbox/guidance.cfm?Option=BL&BL=CoastalNav&Type=None&Sort=Default

UNIQUE POLICY APPLICATION FOR DDN STUDIES

- Categorical exemption
  - ER 1105-2-100"For harbor and channel deepening studies where the non-Federal sponsor has identified constraints on channel depths it is not required to analyze project plans greater (deeper) than the plan desired by the sponsor."
  - Only needed for new studies (not for General Reevaluation Reports)
- Section 111, River and Harbor Act of 1968, as amended
  - For shoreline damage caused by Federal navigation projects.
- NED Plan identification
  - ER 1105-2-100 (Appendix G, Exhibit G-1) states the following: "Identification of the NED plan is to be based on consideration of the most effective plans for providing different levels of output or service. Where two cost effective plans produce no significantly different levels of net benefits, the less costly plan is to be the NED plan, even though the level of outputs may be less."
- Benefits not solely justified by NED benefits
  - Section 2006, *Remote and Subsistence Harbors*, of 2007 WRDA, as modified by Section 2104 of the Water Resources Reform and Development Act of 2014 and further modified by Section 1105 of WRDA 2016.

For more information, contact the Deep Draft Navigation Planning Center of Expertise:

- Eric Bush, SAD Chief of Planning, Director, DDNPCX
- Daniel Small, Administrative Deputy, DDNPCX
- Todd Nettles, Deputy Technical Director, DDNPCX Mobile District
- Kimberly Otto, Review Manager, DDNPCX Mobile District

https://www.sam.usace.army.mil/Missions/National-Centers-in-Mobile/Deep-Draft-Navigation/

QUESTIONS?