CECW-CP

MEMORANDUM FOR (SEE DISTRIBUTION)

SUBJECT: Economic Guidance Memorandum (EGM) 05-01, Deep Draft Vessel Operating Costs FY 2005 - General Technical Support Document

1. The deep-draft vessel operating costs (DDVOCs) have been published by the Institute of Water Resources (IWR) and are provided for use by economists and planners of the U.S. Army Corps of Engineers (Corps) for assessment of potential economic benefits associated with waterway improvement projects. Starting with the publication of this EGM, deep draft vessel operating costs will not be posted for public access as some or much of the information used to develop the cost estimates is considered proprietary by commercial sources and protected from open or public disclosure under Section 4 of the Federal Freedom of Information Act, as amended. Accordingly, costs are hereby designated for limited release and distribution only to USACE analysts as required, and as non-disclosure protections allow, for development and review of waterway project analysis. The EGM will only provide periodic update of information concerning the general trends in costs and describe any technical changes to the structure, method or basis for development, and compilation of supporting data or information applied for DDVOCs. Corps economists and planners should contact Ian Mathis of the Institute for Water Resources (USACE-IWR; 703-428-7257) or Lillian Almodovar (HQUSACE; 202-761-5875) to obtain instructions and a password to access the vessel operating costs estimates.

2. The vessel operating cost estimates are generally limited to consideration of ocean-going self-propelled hulls and are not considered directly applicable for other vessel classifications relative to general configuration of propulsion (i.e., barge units, etc.). The current release of costs as compiled is the latest in a series of estimated vessel operating costs (VOCs) which have been typically distributed to USACE analysts every one to two years since the 1960's. This release of costs is provided as an update to costs released in fiscal year (FY) 2002 and supercedes all prior editions of estimated costs with regard to currency of price level, available information for tabulation of costs by category, and applicable interest or discount rate (for capital asset amortization and life-cycle costing)..

3. The DDVOC tables list estimates of various cost components including capital costs of hull replacement (based on a multi-year moving average of newbuild costs brought to current price levels) as well as other categories of costs that are included in total operating costs. Other such costs include crew labor compensation and subsistence, administration, and expenditures for ongoing life-cycle vessel operation and maintenance. Also listed for general information purposes are estimates of vessel size (as measured by metric deadweight tonnage or DWT) and approximate dimensions for length overall (LOA), beam or breadth and maximum summer loadline draught (SLLD).

4. It should be noted that the estimates for physical dimensions are provided primarily for general formation and overall perspective of size relative to costs and were derived

from linear regression relationships from statistics of the world fleet. Accordingly, due to the variability of dimensions across the world fleet relative to deadweight tonnage and vessel cargo capacity, the specific estimates of dimensions as given (length, breadth, draught, etc.) may or may not reflect the physical characteristics of fleet service regime for a given port, harbor, or region and are therefore not intended to serve as a basis for fleet forecasts typically required for detailed studies. The compilation of physical dimensions for vessel service and related forecasts for a particular harbor or region of study is an endeavor and realm of investigation that should be undertaken and verified according to individual study requirements and relevance to waterway engineering, design, and plan formulation.

5. A general description of changes or revisions to methods for estimation of costs is provided in the following sub-paragraphs. These revisions were undertaken to improve the Corps capability to develop credible and defensible estimates of economic benefits for investment decisions. They also reflect the trend towards better capturing economic resource costs in Corps estimates which are more consistent with the concepts and principles in the Principles and Guidelines for estimating transportations savings as NED benefits.

a. Review of recent maritime industry literature combined with on-going efforts to improve the quality of technical analysis conducted by the Corps, revealed that deep-draft vessel operating costs and the procedures by which they are estimated warranted a general procedural or technical review. The general review resulted in a determination that sources of data and methods for estimation of costs should be re-analyzed and revised without losing consistency with the concept(s) of National Economic Development (NED) procedures.

b. One of the most significant determination for estimation of vessel operating costs is that estimates should reflect economic resource costs as opposed to merely financial or accounting costs. As such, costs ideally should allow for the estimation of value for the productive or marketable life of the hull asset from laydown of the keel until the hull is permanently withdrawn from applicable vessel service or is broken for salvage. As a result of initiatives to migrate vessel operating cost estimates toward a resource cost basis, some changes governing the calculations of costs have been undertaken to better reflect life-cycle economic resource costs. Some of the adjustments implemented represent minimum levels of expected adjustment based on available information as of 2004 with continued refinement in adjustments projected over the next two to three years. Most of the changes to prior practice which have been implemented for the 2004 release of costs concern the estimation of average annual equivalent (AAEQ) hull costs and will be discussed for each general constituent or component of costs where applicable.

c. It should be noted that the additive impact of all applicable adjustments is significant for some types and class of carriers with particular reference to containerized carriers. With significant deviation from prior estimates of costs for some carriers it was determined that a phased adjustment period would be appropriate as otherwise, summary total adjustment in a single year would tend to impose significant volatility for many

carrier costs. With a single adjustment to realign costs, costs would be adjusted significantly downward only to be followed the next year by probable upward adjustment. A general objective of vessel cost estimation is to develop costs over interim to long-term periods of time commensurate with the underlying rationale of project life-cycle cost evaluation and uncertainty regarding future cost levels. Given the objective to minimize volatility while realigning costs within a responsive period of time, it was determined that adjustment would require generally no more than two to three years. This is due to the fact that some cost constituents such as labor are expected to continue to increase while capital or physical asset costs are incrementally adjusted (generally downward) toward revised cost levels. The method or procedure for adjustment of total in-port and at sea vessel operating costs will involve simple adjustment of the marginal difference between prior release values and current or revised values with the margin proportionally reduced over each year of the adjustment period. The adjustment period is projected not to exceed three years beginning with 2004 costs undergoing the first year of adjustment .

d. Vessel Capital Newbuild or Replacement Costs - The interest or discount rate applicable to estimates of average annual equivalent (AAEQ) hull replacement costs for FY 2004 is 5 6/8 percent; a reduction from that applied for the prior release of vessel costs at 6 1/8 percent for FY 2002. This change by itself results in a reduction in costs of approximately three to four percent (assuming comparable or constant price levels) as opposed to an increase that would otherwise be expected with an upward movement in interest or discount rate. Other changes to hull replacement or investment costs concern a.) the span of time for assessment of the applied moving average of replacement or base investment cost, b.) the period of time for amortization of costs, and c.) consideration of economic return for proceeds from withdrawal from service and subsequent sale or breakage and salvage.

e. Prior editions of vessel costs have generally employed a moving average of costs to limit volatility or price market fluctuation and to better reflect long-term average costs. Historically, the moving average for vessel costs has been based on a ten-year period. Review of industry literature and sources for quotation for newbuild prices indicates prices have declined considerably in recent years, largely due to changes in shipbuilding technology (and related reductions in shipyard manpower requirements) and aggressive development of shipbuilding capability in various cost-competitive locals, notably China. Each of these considerations are expected to be long-term influences in the pricing structure of future shipbuilding markets. Correspondingly, the estimation of costs based on a ten-year moving average has not allowed hull cost estimates to maintain a viable pace with the precipitous decline in costs. This has resulted in hull capital costs that are considered inordinately high both currently and for the foreseeable term (i.e., the next three to five years).

While review of available information combined with recent and foreseeable trends in hull costs basically affirms that a ten-year average extending historically to 1992-94 is no longer technically viable or applicable, it is difficult to assess precisely the best interval universally applicable to all types and class(es) of self-propelled vessels.

Alternatively, inherent market volatility in the short to interim term combined with requirements for class and related thresholds over time for owner\operator decision(s) concerning asset management and turnover indicates a period of less than five years is probably too limited. It was therefore decided that a period of seven years would be applied for the general basis of moving averages corresponding to the approximate average age of hulls (in the world fleet) for which the other constituents of costs (crew, administration, etc.) are benchmarked. The applied period of time will be reviewed with future releases of costs and further or subsequent recommendations for proposed adjustment will be applied as deemed appropriate. The adjustment in moving average duration from ten to seven years resulted in a significant change in capital hull costs across many deadweight tonnage (DWT) categories and by vessel type with adjustments to containerized cargo carriers generally being the most notable. Across the four vessel types, changes in moving average period would result in some capital hull costs requiring readjustment by as little two to five percent downward to as much as twelve to twenty percent downward from prior estimates for vessel costs.

f. The amortization of hull costs represents another area of vessel cost estimation which by definition of economic resource cost mandates revision and clarification. As stated previously, economic resource costs for hull assets involves the assessment of life-cycle economic value of vessel hulls and fleet composition over the applicable service life of hull assets from laydown to terminal withdrawal from service (and any related economic returns or consequences pertaining thereto). Prior to the current release of costs, cost estimation practice incorporated a twenty-year period of amortization for capital recovery subject to the applied interest or discount rate. Originally, this period for amortization of costs when first selected was intended to reflect approximate duration of functional service life (with nearly equal or secondary consideration of a maximum period for financial or accounting cost recovery). The estimated twenty-year period was based on then-current knowledge and limited availability of information concerning vessel service lives and applicable shipbuilding technology during the initial years when USACE vessel costs were first devised. Over time, the twenty-year period has arguably become somewhat arbitrary compared to actual service lives and consideration of economic resource costs.

Accordingly, IWR has undertaken an initial review of service life for self-propelled hulls and has determined that in the full context of service life for economic resource cost estimation, the period of twenty years is too limited and should be adjusted upward. General review of service lives indicate the overall period of service can vary considerably with purpose of vessel or nature of service, owner\operator care, practices for maintenance, and technological development of shipbuilding design and fabrication. The review of applicable service life according to type and DWT class of carrier is ongoing but currently available information indicates that an average *minimum* adjustment upward from twenty to twenty-five years is appropriate as an interim measure until the assessments of service life according to carrier type are complete. This extended duration of service life and its relationship to amortization of costs generally results in a reduction of average annual equivalent (AAEQ) hull replacement costs of approximately ten to eleven percent (assuming comparable or constant price levels and interest or

discount rate). Adjustment to the period of amortization more reflective of overall service life combined with changes in interest rate(s) and the reduction in the span of time for moving averages results in significant downward pressure on vessel costs compared to FY 2002 estimates but with adjustments which better (re)align cost estimates with requirements for estimation of subject costs relative to an economic resource cost basis.

g. A final consideration for adjustment of capital costs beginning with this release of vessel costs pertains to accounting for returns derived from breakage or scrap value of hull assets at the terminal year of applicable service life. Commensurate with estimation of economic resource costs, values for return on breakage or scrap have been generally estimated according to current value for light displacement tonnage (LDT) given its market standard to relationships for recoverable materials such as steel and salvageable vessel components. The value for return is then discounted according to the number of years assumed for overall asset service life (i.e., twenty-five years) and subtracted from newbuild or initial acquisition costs to determine net capital costs applicable for allocation over the service life of the vessel. Due to the discounting process, this adjustment proves to be comparatively minor even with relatively high scrap or steel values for 2004. As future vessel operating cost estimates are released additional scrap or salvage value data will be incorporated into a moving average database that will eventually extend for a period of time equal in years to the moving average period for newbuild pricing. Current estimates for scrap value are based only on the 2004 data year. It was not deemed critical to research and incorporate values for a historical period of five to seven years given the relatively minor impact of this adjustment combined with the general procedure for adjustment to total vessel costs described previously which will be implemented over the next three years beginning with 2004 costs.

6. Operations and Maintenance Costs (excluding bunkerage) - Primary constituents of related costs display general upward trends though review of insurance cost levels included in the FY 2002 (particularly for vessels of U.S. registry) indicated some insurance costs required downward or moderating adjustment. This in part appears attributable to perception(s) or realization of reduced risks for asset liability and potential loss due to trends for increased safety (or demonstrated reductions in loss) and some consolidation of underlying management of various P&I financial pools.

7. Bunkerage Consumption and Costs - The physical relationships for fuel consumption remain the same for the 2004 release of vessel operating costs. Retention of the previous consumption relationships for bunkerage was applied even though available information concerning technological developments for self-propelled hulls are pending. Large-scale reciprocating engine and propeller technology currently being developed for both newbuilds and refit applications indicates increased fuel efficiencies will probably be applicable to revisions of costs in the FY 2006-2008 period and beyond (as application of new technology finds its way into ranks of the world fleet with asset turnover or replacement and refit). Also of note for future revisions to costs is an increasing emphasis on the variable duty-sized generator set for in-port use to reduce both costs and emissions while in port.

Sufficient information was not available to acceptably assess impact or change of described developments for the current release of costs due to uncertainty of possible mitigating impacts associated with evolving or more stringent emission(s) requirements that may limit net efficiencies and the notably limited deployment of such technology to the existing fleet. Of particular note however has been the significant increase in bunkerage unit prices (i.e., per metric tonne) for all general classes of fuel (HVO, IFO, MDO, and MGO) with price levels in many port markets reaching record highs. Bunkerage costs like hull costs however are based on moving averages (i.e., five years for bunkerage) to account for volatility versus interim to long-term costs and therefore the impact of recent surges in bunkerage prices over the past year is only partially realized in aggregate 2004 estimates. Nonetheless, the increase is significant with the moving average prices of HVO and MDO exceeding $130 and $230, respectively. It is anticipated that fuel prices will decline from levels of the current year but review of some industry sources indicates that prices will probably not decline (even over the long-term) to the relatively low levels of two to four year previous or more. In balance of these considerations, it is presently accepted that the applied span of time for the moving average basis of bunkerage costs should not be revised but will be assessed on an ongoing basis to determine if future adjustment to the moving average time period is appropriate.

8. Stratification of Vessel Operating Costs by Vessel Size Class - When DDVOCs were first distributed in existing general form with deadweight tonnage (DWT) stratifications (many of which are still largely evident in the current VOC tabulations), the structure of the world fleet from which general specifications for capacity and dimensions were derived reflected a significantly different period for naval architecture, prime mover and generator set efficiency, hull asset employment, international trade volumes, and market pressures for unit cost efficiencies. Correspondingly, the existence and employment of some DWT classes as listed in the VOC tables has declined considerably and in some circumstances certain classes simply no longer represent a significant portion of the world fleet. Certain classes of carrier have simply been displaced by larger or alternative configurations and scale for handling of some cargo and it is anticipated certain DWT classes will not be replenished with replacement tonnage as time progresses. Nonetheless, subject classes are still listed in the tabulation or tables as sometime comparative reviews, updates, and revisions are required for prior studies.

The note of caution is that these carrier classes are not in many cases viable for forecasts of future fleet service and economic analysis of waterway improvements. Costs for these classes will however continue to be listed in the DDVOCs tables for historical perspective but it will remain the responsibility of project analysts to determine applicability for a given project analysis. Also of particular note are the physical characteristics and estimation of costs for upper size classes of cellular containerized carriers. Until the past year the universe of second-generation (6,000 TEU or greater) Post-Panamax carriers from which to develop aggregate statistics has been largely limited to one or two operators and information concerning operating costs of these vessels has been limited. In addition, some of the information assembled for hulls constructed to-

date indicates cost efficiencies may not increase along the same trend as the general composition of the world fleet for preceding vessel classes due to initially limited facilities and dry docks to accommodate construction and the labor costs of construction in selected countries. The view of aggregate costs formulation however is to develop costs comparatively representative of long-term trends for construction and operation and it is anticipated costs for containerized carriers exceeding 90,000 to 95,000 DWT will normalize compared to smaller classes as more newbuild orders are be placed with yards in various countries (including Japan, Korea, and China) which have greater representation of cost structures within the universe of the world fleet.

Harry E. Kitch, P.E.
Deputy, Planning Community of Practice
Directorate of Civil Works