



Memorandum For the Record

To: Robert Selsor, Philadelphia District USACE

From: Jerry Diamantides, DMA

Date: 15 February, 2010

Re: Delaware River and Bay Channel Deepening Project: Current and Future Port Assessment

This report presents a summary assessment of the potential impacts of changes in existing and without-project conditions on projected Delaware River Deepening Project benefits. Included in this report are changes concerning liquid bulk, dry bulk, and containerized commodities. Overall, apart from the substantial reduction in dry bulk commodity imports due to the recent recession, changes in liquid bulk, dry bulk, and containerized commodity imports suggest that project benefits are likely to be greater than estimated in 2004. The potential increase in benefits would be related to greater than projected steel imports, an increase in petroleum product imports, and an additional large containership service calling at the Packer Avenue Terminal.

There have been no major structural changes related to maritime trade on the Delaware River in the years since the 2002-2004 Economic Reanalysis. All of the commodities, modes of transport, and vessel operations identified in 2004 as “benefiting” from the proposed project are still in place in 2010. The severe recession experienced in the downside of this business cycle does not alter the long-term benefit stream generated by the project any more than the upside of the business cycle experienced in 2005 – 2007. Commodity forecasts and benefit calculations used in the 2004 Economic Reanalysis are based, conservatively, on long-term trends and not on peaks and troughs of recurring business cycles.

The long-term trends identified in the 2004 Economic Reanalysis, which are the underlying forces generating project benefits, continue to be substantiated by observation and analysis. For example:

- Philadelphia continues to be one of the major refrigerated cargo ports on the US East Coast
 - Fresh and frozen meat tonnage is 12% greater in 2007 than in 2003
 - The port is currently constructing a new cold-storage facility that is double the size of the existing facility, which will open in mid-2010

- The Energy Information Administration's Annual Energy Outlook for 2010 predicts stable and slightly increasing long-term demand for petroleum-based liquid fuels
 - Reductions in refining capacity at Delaware River facilities have induced increased petroleum product imports on deep draft vessels at Delaware River facilities
- The US Geological Survey's Mineral Commodity Summary for 2009 reports that imported steel mill products are a consistent component of domestic steel consumption (27.7% in 2004 and 27.5% in 2008)
 - Steel import tonnage on the Delaware River has exceeded the 2004 Economic Reanalysis projections in each year through 2008
 - The new Paulsboro Marine Terminal, specializing in break-bulk commodities, is under construction and scheduled to open in 2012.

The economic recession has adversely impacted commodity tonnages handled at most US ports. For example, the year-over-year measure of total US import and export tonnage has been negative for each month between November 2008 and November 2009. Although negative, the year-over-year change has been improving each month since August 2009. Another measure of the impact of the recent recession is that the total amount of US containerized foreign trade, measured in twenty-foot equivalent units from January through November 2009, is 14% lower than trade in the first 11 months of 2008. However, the total number of TEUs in November is an improvement over the total number in October, which itself was an improvement over September. The Journal of Commerce (08 Feb 2010) reports that the Institute of Supply Management's monthly US manufacturing index has registered a reading of over 50% for the fifth consecutive month in a row, which indicates an expanding manufacturing sector.

In general, the indication is that imports and exports are beginning to recover from the worst impacts of the recession. It is important to note that in the 2002-2004 Comprehensive Reanalysis project benefits were not based on strong projected growth, but were mostly based on stable levels of trade as observed in 2000 – 2003. By the time the project becomes operational (2014), the impact of the recent economic recession on project benefits would likely be minimal.

Liquid Bulk – Petroleum Commodities

Half of the benefits calculated in the 2004 Supplemental Economic Reanalysis were based on the movement of petroleum-related import commodities from foreign origins to refineries and storage facilities along the Delaware River. The petroleum-related commodities included imported crude oil and imported refined products. The imported crude oil gets processed at Delaware River refineries into transportation fuels, heating oil, and other mostly fuel-related refined products. The imported refined petroleum products serve the same purposes as domestically refined products. The 2004 Economic Reanalysis was based on a 0.2% average annual growth rate for petroleum based commodities. More current projections of future demand

for petroleum based fuels also indicate stable slow growth. The DOI Annual Energy Outlook 2010 projects a steady domestic demand for petroleum based fuel oils with an average annual growth rate of 0.34% from 2007 through 2035. The 2007 domestic demand for liquid fuels was the equivalent of 39.93 quadrillion BTUs. Projected domestic demand increases slightly by 2027 to 40.09 quadrillion BTUs and to 41.4 quadrillion BTUs by 2035(AEO2010 18Dec09).

Observed petroleum related commodity movements on the Delaware River since the 2004 Economic Reanalysis indicate a steady flow of imported petroleum-related commodities (WCSC 2003 – 2007 (last year currently available from WCSC)).The Waterborne Commerce Statistics Center reports that petroleum-related commodity imports at the Delaware River increased slightly from 65.0 million short tons in 2003 to 65.2 million short tons in 2007. The composition of imported petroleum related commodities shifted during that time from 97% crude oil (by weight) in 2003 to 93% crude oil in 2007. Crude oil imports decreased slightly from 63.3 million short tons in 2003 to 60.7 million short tons in 2007. This slight decrease in crude oil imports was more than offset by a greater than five-fold increase in gasoline imports and a greater than eight-fold increase in imported distillate fuels (diesel, home heating oil, etc.).

Delaware River Petroleum Imports 2003 – 2007
(short tons)

	2003	2004	2005	2006	2007
Total Petroleum					
Commodities	64,994,459	65,328,709	61,019,883	60,880,976	65,214,421
Crude Oil	63,262,812	63,048,236	58,792,467	57,069,966	60,677,465
Gasoline	199,908	332,689	472,780	938,543	1,079,314
Distillate Fuels	287,350	809,509	1,305,810	1,599,700	2,392,570
Other	1,244,389	1,138,275	448,826	1,272,767	1,065,072

Source: Waterborne Commerce Statistics Center

The replacement of some imported crude by imported refined product is also observed in vessel characteristics. Petroleum product vessels typically do not lighter their cargo as a standard operating practice and therefore tend to arrive at the Delaware River with shallower drafts than crude oil vessels, which often lighter their cargo. Data obtained from the Maritime Exchange for the Delaware River and Bay indicates that there were 187 more liquid bulk vessel arrivals in 2007 than there were in 2004, but there were 49 fewer liquid bulk vessel arrivals at drafts greater than 35 feet. The partial shift from crude to refined imports had increased the overall number of vessel calls and decreased the number of vessels arriving at deep drafts.

The potential impact on project benefits due to a small percentage replacement of imported crude oil by imported refined product is two-fold. One aspect of the potential impact is that fewer crude oil deliveries would result in fewer lightering trips, however the 4% reduction in crude oil imports observed between 2003 and 2007 would result in only a 1% reduction in lightered

tonnage (the 2004 Reanalysis estimated that approximately 25% of imported crude tonnage is lightered under without-project conditions). On the other hand, a deeper channel could result in a shift towards larger refined product vessels, which could take advantage of the deeper channel. Under existing and without-project conditions, refined product vessels are loading up to a maximum draft of 40 feet. Under with-project conditions petroleum product vessels with available design draft capability could load more deeply without being impacted by without-project condition under-keel clearance constraints. Lloyd's Register of Ships Online (SEA WEB) indicates that there are more than 700 oil product carrier vessels in the world fleet with dead weight tonnages ranging from 60,000 to 100,000 tons, which could take advantage of channel depths greater than 40 feet.

In 2009, Valero closed its Delaware City refinery, identified as the Motiva refinery in the 2004 Economic Reanalysis. The Motiva facility was estimated to have lightered 35% of its imported crude, but did not generate vessel-related benefits due to the three-mile long access channel, which was not projected to be deepened under with-project conditions. Also in 2009, Sunoco stopped production at the Eagle Point refinery. Sunoco announced that production will be shifted to its Fort Mifflin and Marcus Hook facilities. The Eagle Point facility was estimated in the 2004 Reanalysis to lighter 32% of its imports. The Eagle Point facility was idled in November 2009.

A comparison of import crude oil vessel calls in 2000 and 2009 indicates that there has been relatively little change in the overall number of crude oil vessel calls requiring lightering. Increases in the number of crude oil vessel calls requiring lightering to Valero (Paulsboro) and Ft. Mifflin were offset by decreases in crude oil vessel calls requiring lightering at Conoco/Phillips and Eagle Point. The sale of Maritrans Inc., the primary lightering firm in the Delaware River and Bay at the time of the 2004 Economic Reanalysis, to OSG America has substantially increased the fleet available for lightering in the Delaware River and Bay. OSG America was scheduled to receive two new 330,000 bbl articulated tug-barge vessels in early 2010 for service in the Delaware River and Bay. These vessels will be equipped with a closed vapor balancing system as required by the Delaware Department of Natural Resources and Environmental Control.

Overall, a partial shift from crude oil imports to refined product imports may increase project benefits if the transportation cost savings of avoided refined product trips are greater than the transportation cost savings of reduced lightering. The closing of the Motiva refinery (Valero Delaware City) does not decrease benefits because there were no project benefits associated with this facility. The closing of this refinery may in fact increase project benefits if the fuel oils formerly produced at this refinery must now be imported to Delaware River storage facilities, and if importing vessels can take advantage of a deeper channel. The closing of the Eagle Point refinery may not significantly impact project benefits if production is shifted to Sunoco facilities at Marcus Hook and Fort Mifflin as indicated by Sunoco. Again, if decreases in refinery

production are fully offset by increases in refined product imports, as they appear to have been in the recent past, then project benefits may increase.

Dry Bulk – Slag and Steel

Ferrous slags are a co-product of iron and steel making, which are used in the production of cement. Slag cement replaces a portion of Portland cement in concrete. The use of slag cement is a lower cost and environmentally beneficial alternative to using 100% Portland cement. The St. Lawrence Cement Company operates a slag processing facility in Camden, New Jersey on the Delaware River. In 2007, the facility was granted a NJDEP permit to increase production at the facility from 785,000 metric tons per year to 1,051,000 metric tons per year. The 2004 Economic analysis identified six import slag vessel calls in 2001 for a total of 368,000 tons and projected 17 vessel calls and one million tons by 2009. By 2005 the number of import slag vessel calls had increased to 14. However, slag imports are directly related to concrete production and the construction industry. The impact of the recent recession has been to reduce import slag vessel calls from seven calls in 2008 to only two calls in 2009. Domestic slag production and consumption has also been severely impacted by the recession. Domestic consumption fell by more than 30% between 2005 (21.6 million tons) and 2008 (15.0 million tons).

Slag imports accounted for \$1.8 million average annual benefits, 7.5% of total benefits, in the 2004 Economic Reanalysis. All but one of the import slag vessel arrivals from 2004 – 2009 were in the 38 to 40-foot draft range, with most vessels arriving at a draft of 40 feet. These vessel operating characteristics are consistent with the without-project condition projections used in the 2004 Economic Reanalysis. Domestic slag consumption is expected to increase as a result of increased construction activity associated with economic recovery from the recession. Domestic slag supply is constrained by the number of operating blast furnaces in the US. The USGS reports that the number of domestic blast furnaces capable of producing slag has decreased in recent years and there are no plans for construction of new domestic blast furnaces (Iron and Steel Slag, Mineral Commodities Summary Jan. 2009). The long term growth of slag supply is dependent on imported sources.

The 2004 Economic Reanalysis reported that there were 19 steel import calls delivering 831,000 tons to Delaware River port facilities. Steel imports were projected to increase to 23 calls and one million tons by 2009. The forecast beyond 2009 projected modest growth ranging from 2.4% annual growth in the first 20 years declining to less than 0.5% growth per year in the later years of the project life. Total steel tonnage was projected to eventually increase to 1.6 million tons in 2058 (36 vessel calls). Steel imports accounted for \$3.6 million in average annual benefits, 14.9% of total benefits, in the 2004 Economic Reanalysis.

Actual steel import activity at all Delaware River port facilities from 2003 through 2008 has exceeded the forecasts used in the 2004 Economic Reanalysis. Steel imports increased from 1.5

million tons in 2003 to a peak of 2.7 million tons in 2006. The number of import steel vessel calls reached a high of 80 calls in 2006. Imports were largely from Russia, Brazil, Poland and China with vessel drafts typically ranging from 36 to 40 feet. Since 2006, the number of vessel calls has decreased to 47 in 2007, 30 in 2008, and only four calls in 2009. The recent recession has severely impacted steel demand, however steel imports are expected to revive with the economic recovery. For example, the South Jersey Port Corporation is currently developing a new bulk terminal in Paulsboro, New Jersey (Paulsboro Marine Terminal) in anticipation of renewed steel import activity.

Containerized Commodities

The containership-related benefits calculated in the 2004 Economic Reanalysis were based on two services: one from Australia-New Zealand and one from the east coast of South America. Both of these services are operating in the same manner as projected under without-project conditions. In addition, a weekly service from the west coast of South America and a weekly service from Northern Europe are calling at the Packer Avenue Terminal. Both of these services currently use Panamax size vessels. A second liner service from Australia and New Zealand, which operates on a bi-weekly basis, also now calls at the Packer Avenue Terminal, but with smaller vessels.

Meat, produce, and wine were identified in the 2004 Economic Reanalysis as important import commodities for containerized trade on the Delaware River. The Waterborne Commerce Statistics data shows consistent tonnage for meat imports and high, but somewhat fluctuating tonnages for fruits and nuts (excluding bananas and plantains).

Delaware River Imports (short tons)

	2003	2004	2005	2006	2007
Fresh Frozen Meat	406,838	467,556	460,974	451,282	455,125
Fruit & Nuts (not bananas)	730,608	698,120	1,090,306	568,613	682,745

Source: WCSC

The United States Department of Agriculture provides annual statistics on total US import tonnage from specific countries. Important levels of Delaware River meat imports were identified as coming from Australia and New Zealand in the 2004 Economic Analysis. USDA data indicate that total US meat imports from this part of the world increase more than five-fold from 2003 to 2004, and nearly doubled from 2004 to 2008. South American produce imports to the US, another important containerized commodity identified in the 2004 Economic Reanalysis, have grown by 13% from 2004 to 2008. Wine imports to the US from Australia, New Zealand, and South America have grown by 33% from 2004 to 2008. The strong growth exhibited by

these containerized commodities is greater through 2008 than had been projected by the 2004 Economic Reanalysis, which had been based on constant trade volumes.

US Imports: Selected Commodities and Countries
(metric Tons)

	2004	2005	2006	2007	2008
ANZ Meat	4,105	23,486	28,229	34,803	44,650
S. American Produce ¹	1,079,308	1,170,187	1,203,229	1,306,550	1,218,005
ANZ & S. American Wine ²	526,007	589,976	634,814	682,709	700,779

¹ Excludes Bananas and plantains; ² Measured in kiloliters

Source: USDA

Although the number of containership calls to the Delaware River has fluctuated from 2004 to 2009, the total number of calls in each year since 2004 is greater than the number of calls in 2004. The total number of calls in 2009, even with the impact of the recession is sufficient for six weekly services and additional bi-weekly calls. The data also indicates that containerships regularly sail at drafts that approach the depth constraint.

Delaware River Containership Calls

	2004	2005	2006	2007	2008	2009
Total calls	340	418	516	459	435	354
Calls >35 ft	99	97	103	86	77	55

Source: Maritime Exchange of the Delaware River and Bay

Panama Canal Expansion

The Panama Canal Expansion project, which is projected to be operational in 2014, will accommodate vessels with drafts up to 50 feet. The expanded Panama Canal is a major change to projected future conditions, and was not included at the time of the 2004 Economic Reanalysis. The expansion project adds more than ten feet to the controlling depth of the Panama Canal as well as channel widening and is projected to have a substantial impact on the transportation of Asian imports to the US East Coast. The expansion will increase the competitiveness of Asian import bulk commodities to the US East Coast, such as steel, which had previously been constrained by a Panama Canal sailing draft of 39.5 feet. Similarly, containerized imports on the all water route from Asia to the US East Coast (via the Panama Canal) will gain an additional transportation cost advantage over the land bridge route, which predominantly transports Asian imports from U.S. West Coast ports to the central and eastern US by rail. There is a high likelihood that some containerized imports to the US will shift from

West Coast ports to East Coast ports, in response to the Panama Canal Expansion project. Similar shifts are expected for exports to Asia.

Overall Impact on Project Benefits

The changes that have occurred in navigation operations at the Delaware River since the 2004 Economic Analysis are mostly captured within projected without-project conditions, with the notable exception of the short-term impacts of the recent recession. Changes which might influence benefits include reduced imported crude oil tonnage, increased imported petroleum product tonnage, imported steel tonnage, and containership services.

The closing of one refinery and the merging of three refinery operations into two facilities will likely reduce crude oil imports. This reduction in imports will likely reduce benefits generated by crude oil tankers because there will be fewer of these vessels using the system, however it is important to note that one closed facility (identified as Motiva in the 2004 Economic Reanalysis) did not generate project benefits. The reduction in crude oil vessel calls may not reduce lightering benefits because the remaining facilities on the Delaware River are currently doing more lightering than observed in the 2004 Economic Reanalysis. Furthermore, any reductions in crude oil related benefits will most likely be offset by increases in benefits related to petroleum product vessels which have substantially increased activity on the Delaware River in response to the reduction in domestic refining capacity. The overall impact to benefits based on changes in all petroleum related trade is potentially an increase in project benefits.

The recent recession has reduced steel and slag imports to Delaware River facilities. Slag imports (used in concrete production) are directly related to domestic construction activities, which have been most severely impacted by the recession. Post-recession import slag tonnage is expected to return to levels achieved prior to the recession which are fully consistent with the expectation of the 2004 Economic Reanalysis without-project condition. Until 2009, steel imports to Delaware River facilities were greater than projected by the 2004 Economic Reanalysis. It is important to note that a substantial proportion of imported steel tonnage was delivered to facilities other than, and north of, the Packer Avenue facility. Under with-project conditions, these facilities, which are beyond the Delaware River-Philadelphia to the Sea limits of the proposed project, will be at a comparative disadvantage because they will have a maintained authorized depth of 40 ft compared to the proposed project depth of 45 ft. The economically rational expectation is that, under with-project conditions, Delaware River steel deliveries could shift between facilities within the project boundaries. This expectation is supported by the fact that the northern-most facility, which has recently received the largest share of steel imports, is owned by a firm (Kinder Morgan Terminals) which also has a southern bulk terminal operation within the project boundaries (at Camden, NJ). Additionally, a new bulk terminal has been constructed in Paulsboro, NJ. This new bulk terminal is owned by a firm currently operating another bulk facility within the project boundaries in New Jersey. Overall,

project benefits related to dry bulk commodity imports would potentially increase due to the evolution of expected steel import tonnage.

Changes in containership operations since the 2004 Economic Reanalysis include the addition of a new service from Northern Europe, and greater commodity tonnage than projected. The benefit generating services identified in the 2004 Economic Reanalysis continue to call at the Packer Avenue Terminal and operate in the same manner as identified in 2004. Currently and under without-project conditions, Philadelphia is typically shallower than the preceding port and the next port in the service rotation, which indicates that controlling depth at the Delaware River poses a constraint on containership services. Prior to the recession, the number of containership calls at depths approaching the without-project constraint has been consistent at approximately two calls per week. The Panama Canal Expansion may provide an additional positive effect on containership-related project benefits, if vessel sizes increase as generally expected.

Summary of Probable Impacts on Project Benefits

Commodity	Vessel Type	Type of Change Observed	Probable Impact on Benefits
Refrigerated	Containership	Increased tonnage	Increase
General	Containership	New liner service	Increase
Crude Oil	Tanker	Non-benefiting refinery closed; One refinery closed & operations consolidated with others	Decrease
Crude Oil	Lightering vessels	Increased lightering at some refineries	Ambivalent
Petroleum Products	Tanker	Increased tonnage to offset decreased refinery capacity	Increase
Steel	Break Bulk	Tonnage greater than projected	Increase
Slag	Dry Bulk	Recession sensitivity	None

A sensitivity analysis was conducted to identify the net impact on the December 2009 Economic Update summary table benefit-cost ratio (BCR) if benefits (under a pessimistic scenario) are decreased by 20% for each commodity category, or increased by 20% (under an optimistic scenario). The BCR of 1.35 in the 2009 Economic Update would be bracketed by BCRs of 1.14 (pessimistic) and 1.56 (optimistic). A BCR of unity (1.00) would necessitate a reduction of approximately 34% in benefits for the commodity categories.

In summation, other than the short-term impacts of the recession, changes in navigation operations at the Delaware River would potentially increase project benefits. Changes which would likely have a negative impact on project benefits, such as the reduction in crude oil imports, would be expected to be offset by the positive effects of increases in petroleum product, steel, and containerized import categories.