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SAVANNAH HARBOR EXPANSION PROJECT CHATMAN COUNTY, GEORGIA AND JASPER COUNTY, SOUTH CAROLINA: FINAL GENERAL RE-EVALUATION REPORT AND ENVIRONMENTAL IMPACT STATEMENT JANUARY 2012

COMMUNICATION

FROM

THE ASSISTANT SECRETARY OF THE ARMY, CIVIL WORKS, THE DEPARTMENT OF DEFENSE

TRANSMITTING

THE CORPS' FINAL GENERAL RE-EVALUATION REPORT AND ENVIRONMENTAL IMPACT STATEMENT

PART 9 OF 15

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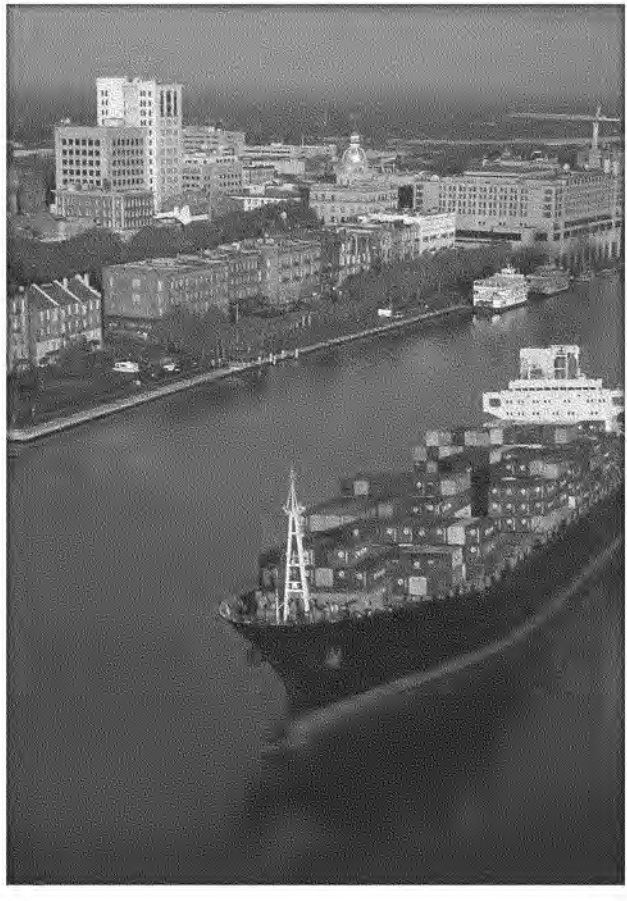
FINAL
GENERAL RE-EVALUATION REPORT
SAVANNAH HARBOR EXPANSION PROJECT
Chatham County, Georgia and Jasper County, South Carolina

January 2012
(Revised July 2012)

Appendix D
and
Appendix E

Volume 9



US Army Corps of Engineers
Savannah District
South Atlantic Division

GENERAL RE-EVALUATION REPORT
APPENDIX D: PLAN FORMULATION

SAVANNAH HARBOR EXPANSION PROJECT

Chatham County, Georgia and Jasper County, South Carolina

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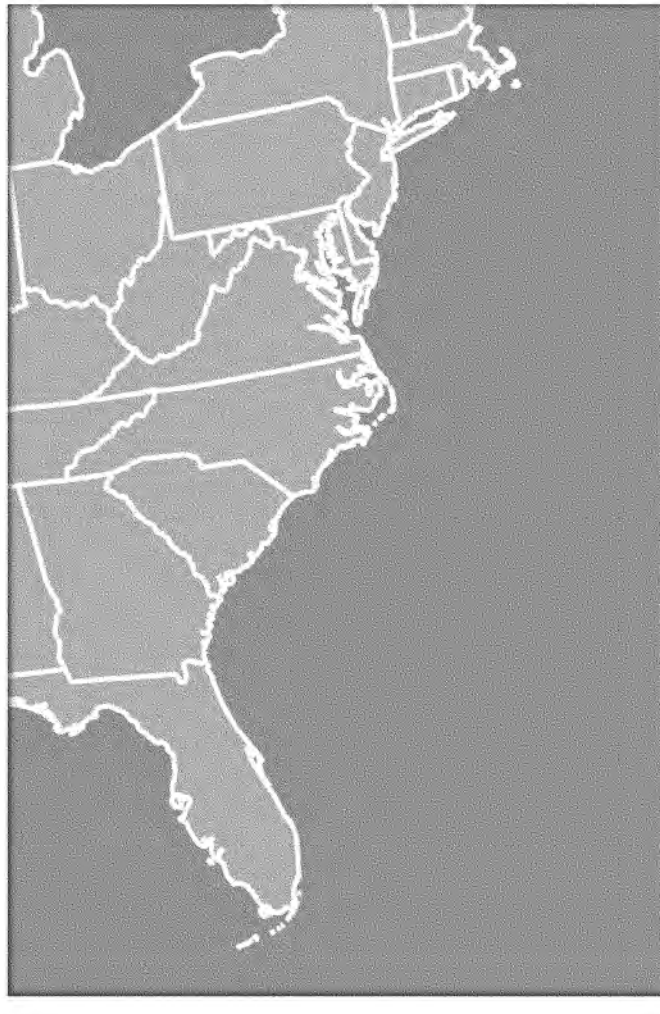

US Army Corps of Engineers
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PLAN FORMULATION APPENDIX

Introduction

The Federal water resource planning process includes the following six steps:

(1) Identify the problems and opportunities
(2) Inventory and forecast conditions
(3) Formulate alternative plans
(4) Evaluate effects of alternatives
(5) Compare alternative plans
(6) Select the recommended plan

The Corps followed those steps in its evaluation of the Savannah Harbor Expansion Project. The initial three steps were included in an April 2005 "Formulation of Alternatives" report. That report was reviewed by the Cooperating Agencies, who agreed with its content. The report was then reviewed by the public in May/June 2005. It is included as Addendum A to this Appendix.

The report identified the navigation problems that are being experienced in the harbor. This focuses the study's efforts on those items that are the heart of the navigation problems that the study should solve. It also identified opportunities that may be available to improve other natural or water resource situations in the study area if a navigation improvement project is constructed. Potential methods of solving the navigation problems are then identified and examined; both structural and non-structural means were considered. Management measures that showed potential for addressing a navigation problem or opportunity were then evaluated based on technical, economic, and environmental considerations. Please see Addendum A for a description of the variety of measures that the Corps considered.

Neither vessel traffic coordination nor major straightening of the river were found to be needed. No channel modifications features were identified as being needed at this time to enhance Homeland Security. Inbound vessels are presently required to provide 96-hour advance notice, including a manifest of the cargo and crew. The Harbor Pilots board the vessels offshore before the vessels reach the coastline, so a separate boarding area is not needed.

As part of the plan formulation process, Savannah District evaluated deepening the harbor to locations other than Georgia Ports Authority's existing Garden City Terminal. That evaluation would identify whether deepening to some other location could reduce the total economic and environmental costs. There had been much discussion in the region over the last 20 years about the creation of a new container terminal in Jasper County. The 2005 report contains the full analysis, but the analysis concluded that deepening to the existing Garden City Terminal would be the most cost effective and environmentally acceptable site. For a terminal in Jasper County, the cost of deepening the channel and constructing new landside facilities would outweigh the costs of deepening further upriver to the Garden City facilities.

After completion of the "Formulation of Alternatives" report, the District began evaluation of deepening the Federal navigation channel in 2-ft increments, from the current 42-foot authorized Federal channel up to and including the 48-foot depth to Garden City Terminal.

Development of Detailed Alternative Deepening Plans

Based on the conclusion that the Garden City Terminal would be the most economically feasible location to which a channel deepening should be considered, the District then considered what design features may be warranted.

As a way to reduce impacts and construction costs, the PDT decided that the channel could be deepened on the existing side slopes, rather than moving the side slopes back to maintain the bottom width. Deepening on the existing side slopes would result in a channel with a narrower bottom width, but some dredging costs could be reduced and some landside impacts could be avoided.

However, the narrower channel width could be a problem when large vessels meet each other (two-way traffic). To address this potential impact, passing areas were included at specific sites so two large vessels could meet each other while moving through the harbor. The Harbor Pilots identified the potential locations of two passing areas in the interior portion of the harbor. The Corps evaluated the economic feasibility of the passing lanes in an incremental cost analysis.

Channel design criteria indicated the need to include bend wideners to accommodate a larger design vessel. This need was supported by a Ship Simulation Study. The nine bend wideners identified as being needed for safe transit of the Design Vessel are included as features of the alternative channel designs.

No new navigation aids were deemed to be needed in the inner harbor to enhance the efficiency of vessel transits through the inner harbor. Additional buoys would be needed (and are included) where the Entrance Channel is extended further into the ocean to meet deeper water (from Stations -60+000 to -98+600B). Additional detailed analyses would be performed prior to construction to assess whether the existing aids should be moved to better mark the deepened channel.

All vessels presently calling at the Garden City Terminal use the Kings Island Turning Basin. It is the largest turning basin in the harbor and is located at the upstream end of the Garden City Terminal. That turning basin would need to be deepened to accommodate the larger vessels using the deeper navigation channel. To safely serve vessels the size of the Design Vessel, the turning basin would be expanded to 1,600 feet long by 1,600 feet wide. This expansion and deepening was included in the alternative channel designs.

Description of Alternative Plans

Plan A – No Action

In this plan, no improvements would be made to the existing Savannah Harbor Federal Navigation Project. This is equivalent to the without-project condition. The navigation channel would remain at its presently authorized 42-foot depth in the inner harbor and 44- foot depth in the entrance channel. This plan serves as the basis for comparison of the expected project impacts. It includes the environmental and economic conditions that are expected to occur over the 50-year period of analysis. The plan also identifies the type and volume of commodities expected to pass through Savannah Harbor if no harbor improvements are implemented. The size and number of vessels that would transport those commodities through the harbor are identified. Expected changes in the environmental setting are also be identified.

Plan B – Channel Deepening Alternatives

This plan includes several amounts of harbor deepening so that an incremental analysis can be performed to identify the best solution to the navigation problems. The plan includes the following plans:

- Plan B-44: a 2-foot channel deepening
- Plan B-45: a 3-foot channel deepening
- Plan B-46: a 4-foot channel deepening
- Plan B-47: a 5-foot channel deepening
- Plan B-48: a 6-foot channel deepening

The final channel deepening plans have the following components:

- **Channel Length:** From the ocean to Station 103+500, plus an upstream transition.
- **Channel Width:** Maintain existing side slopes. The bottom width for a 47-foot channel would be 450-feet.
- **Channel Depth:** Channel depth would be examined incrementally.
    - Plan B-44: a 2-foot channel deepening
    - Plan B-45: a 3-foot channel deepening
    - Plan B-46: a 4-foot channel deepening
    - Plan B-47: a 5-foot channel deepening
    - Plan B-48: a 6-foot channel deepening
- **Entrance Channel** Extension: From Station -60+000 to Station -98+600.
- **Turning Basins:** Deepen and enlarge Kings Island Turning Basin to 1,600-feet x 1,600- feet.
- **Bend Wideners**: Three bend wideners identified in the Ship Simulation Study.
- **Meeting Areas**: Two meeting areas identified in the Ship Simulation Study.

Features of the existing authorized navigation project that would not be affected by the proposed deepening would be retained and carried over with a new authorized project. Those features include (but are not limited to) additional deep-draft navigation channel upstream of Station 103+000, the Freshwater Control System, and confined dredged material disposal areas that would not receive sediments excavated as part of this harbor improvement project.

Evaluation of Alternative Plans

Savannah District used hydrodynamic and water quality models to identify many of the impacts to natural resources from the proposed project alternatives. These included impacts to salinity, water quality, wetlands, and fisheries. Impacts to other resources were evaluated using separate analyses. Those evaluations included potential impacts to the drinking water aquifer, adjacent ocean beaches, riverine shorelines, and air quality. The engineering evaluations are described in the GRR-Engineering Appendix. The expected project impacts to natural resources are discussed and described in the Environmental Impact Statement.

After the expected impacts were identified, the Savannah District used the hydrodynamic and water quality models to evaluate ways to reduce those impacts. A flow re-rerouting plan was developed for each depth alternative that minimized impacts to freshwater tidal wetlands, the resource which the natural resource agencies identified as being most at risk from this project. The study team decided to adopt the findings of a separate study which identified injection of oxygen as being the best method to improve dissolved oxygen levels in the harbor.

Using the selected flow-re-routing plans, the District used the models to determine whether changes would be required to the preliminary design of the D.O. injection systems. Changes were found to be needed, and those changes were included when the models were rerun to identify the remaining impacts to fishery resources.

This iterative modeling revealed that the proposed mitigation features (flow-altering plans and oxygen injection systems) would substantially reduce project impacts to freshwater wetlands, dissolved oxygen, Shortnose sturgeon, American shad, and Southern flounder. However, substantial adverse impacts would still remain to freshwater wetlands, Shortnose sturgeon, and Striped bass. Because of those remaining impacts, additional mitigation consisting of replacement or compensation was deemed appropriate.

Mitigation Planning

Mitigation plans for all the project depths evaluated are shown in Table 1. The mitigation plan for the 47-foot project depicted in Table 2 includes demolition of the Tidegate

structure in Back River, including removal of its northern and southern earthen abutments.

It also includes construction of a sill across the throat of the Sediment Basin that would result in the Basin filling with sediment to pre-harbor improvement conditions. The Tidegate and Sediment Basin were constructed in the late 1970's as a means of reducing annual maintenance dredging costs. A restored lower Back River (filling the Sediment Basin) would reduce saltwater intrusion up Back River by creating a partial barrier to incoming tidal waters. Less saltwater movement up Back River would protect valuable tidal freshwater wetlands located along portions of Back River. Removal of the Tidegate and allowing the Sediment Basin to fill with sediment would return the Inner Harbor shoaling regime to pre-Tidegate conditions. The expected increase in yearly channel maintenance costs is included in the economic analysis of the proposed alternatives.

Other mitigation features are construction of a diversion structure at McCoys Cut and the deepening of the upper portions of Back and Middle Rivers to allow more freshwater into the Back and Middle River areas. This would protect valuable tidal freshwater wetlands located along those rivers, as well as protect the entrance of the freshwater diversion canal into the Savannah National Wildlife Refuge. These actions are expected to require the removal of 70,800 cubic yards of O&M sediments every 10 years. The costs for that action ($114,000/year) are included in the economic analysis of the proposed alternatives.

Maintenance of the fish bypass at the New Savannah Bluff Lock and Dam is expected to be required, consisting of clearing and snagging every 2-3 years to maintain the flow. The costs for that action ($50,000/year) are included in the economic analysis of the proposed alternatives.

Table 1: SHEP Mitigation Plans by Depth

	-44 feet	-45 feet	-46 feet	-47 Feet	-48 feet
Real Estate	$0	$10,714,500	$12,377,500	$12,698,125	$5,161,875
Dissolved Oxygen	$67,428,750	$64,053,750	$67,428,750	$70,803,750	$74,178,750
CSS Georgia	$13,914,375	$13,914,375	$13,914,375	$13,914,375	$13,914,375
McCoy's Cut Modifications	$25,357,110	$34,467,085	$34,467,085	$34,467,085	$34,467,085
Rifle Cut Modifications	$828,914	$828,914	$828,914	$828,914	$828,914
Tidegate & Abutment Removal	$3,575,643	$3,575,643	$3,575,643	$3,575,643	$3,575,643
Tidegate Embankment Removal	$17,969,583	$17,969,583	$17,969,583	$17,969,583	$17,969,583
Fish Passage	$29,577,470	$29,577,470	$29,577,470	$29,577,470	$29,577,470
Boat Ramp	$624,953	$624,953	$624,953	$624,953	$624,953
Brackish Marsh Restoration	$17,594,949	$17,594,949	$17,594,949	$17,594,949	$17,594,949
Broad Berm - Sediment Basin	$8,362,500	$8,362,500	$8,362,500	$8,362,500	$8,362,500
Striped Bass	$2,067,500	$350,000	$606,250	$3,276,250	$3,387,500
Water Impoundment	$25,187,500	$25,187,500	$25,187,500	$25,187,500	$25,187,500
Monitoring & Adaptive Mgmt	$58,792,500	$59,818,750	$60,160,000	$60,195,000	$60,468,750
Total	$271,281,747	$287,039,972	$292,675,472	$299,076,097	$295,299,847

Table 2: SHEP Mitigation Plan (47-Foot Project Depth)

Mitigation Element	Cost	Contingency	Total Cost
Real Estate	$10,158,500	$2,539,625	$12,698,125
Fish Passage - New Savannah Bluff	$23,661,976	$5,915,494	$29,577,470
CSS Georgia	$11,131,500	$2,782,875	$13,914,375
McCoy's Cut Diversion Channel	$2,324,082	$581,021	$2,905,103
Deepen McCoy's Cut, Upper Middle & Little Back	$7,287,980	$1,821,995	$9,109,975
ROCK Berm at Mouth of Back River	$16,824,049	$4,206,012	$21,030,061
Close Rifle Cut	$663,131	$165,783	$828,914
Removal Tide Gate Pier and Abutments 10	$2,860,514	$715,129	$3,575,643
Embankment at Tide Gate Removal	$14,375,666	$3,593,917	$17,969,583
Close Lower McCoy's Cut Western Arm	$1,137,557	$284,389	$1,421,946
Construct Dissolved Oxygen Injection Sys - On site	$56,643,000	$14,160,750	$70,803,750
Construct Marsh at Disposal Site 1S	$14,075,959	$3,518,990	$17,594,949
Boat Ramp	$499,962	$124,991	$624,953
Broad Berm Basin - Back River	$6,690,000	$1,672,500	$8,362,500
Water Impoundment	$20,150,000	$5,037,500	$25,187,500
Mitigation Costs for Striped Bass	$2,621,000	$655,250	$3,276,250
Mitigation Sub Totals	**$191,104,876**	**$47,776,219**	**$238,881,095**
Pre-construction Monitoring	$2,893,000	$723,250	$3,616,250
During Construction Monitoring	$8,734,000	$2,183,500	$10,917,500
Post Construction Monitoring	$16,828,000	$4,207,000	$21,035,000
Adaptive Management	$16,701,000	$4,175,250	$20,876,250
Monitor After Adaptive Management	$3,000,000	$750,000	$3,750,000
Mitigation Monitoring Sub Totals	$48,156,000	$12,039,000	$60,195,000
Total	**$239,260,876**	**$59,815,219**	**$299,076,095**

Regional Port Analysis

Purpose of Analysis

In response to concerns expressed by members of the public that the Federal Government should deepen one port in the South Atlantic region rather than deepening several competing ports, Savannah District conducted a Regional Port Analysis (RPA). The belief is that deepening one port would reduce both Federal expenditures and environmental impacts (because several ports would not be deepened).

Hub and Spoke Analysis

A regional port would function similar to an airline hub. One can evaluate this using a hub and spoke analysis. A hub and spoke analysis assesses the throughput of regional cargo from a load center port perspective. Like an airline hub, large capacity vessels with economies of scale would move substantial cargo volumes between hub ports while smaller capacity vessels would serve outlying ports that have lower volumes. Ports which serve as the hubs could be expanded to accommodate the larger vessels, while the outlying ports need not be deepened as much to accept the smaller capacity vessels.

This analysis includes: (1) an examination of the existing throughput capacity at South Atlantic container terminals, (2) consideration of planned expansions at each of those terminals, and (3) projections in the growth of TEUs for each port. The first two components were developed as part of this Regional Port Analysis, while the third component (projections of container growth) was taken from the economic analysis.

In the absence of a specific vessel operation plan, the hub and spoke port development concept was analyzed by the ability to shift existing capacity and/or demand (TEUs) among the existing ports to a possible South Atlantic hub port. The concept was that the "hub" port would be sufficiently large to absorb the capacity of other ports or future increases in their TEUs as the regional port load center.

The Corps completed this analysis in 2007 and it is described in detail in the GRR-Economics Appendix, Regional Port Analysis. The following sections provide an overview of the information in that report.

Port Capacity Analysis

Port Capacity Inputs – Estimations of the container terminal capacities were developed by GEC from secondary data for the major ports between Norfolk and Jacksonville, including Wilmington, Charleston, and Savannah. Marine container terminal capacity is expressed in millions of 20-foot equivalents (TEUs) that can be moved during a year. Estimates of annual capacity were developed for existing, developing, and prospective terminals at each port. *Existing* capacity is that capacity which is present today; *Developing* capacity is that which has been budgeted and planned for, while *Prospective* capacity is that capacity that may be available in the future. Capacities for the existing

and developing categories are reasonably robust. The capacities for the prospective terminals are conceptual in nature and are not viewed as exhaustive of possible expansion capability at the different ports.

Port Demand Projections – Table 3 depicts the projected TEUs for the ports within the South Atlantic region. For the base year of 2005, the major ports of Savannah, Charleston, and Norfolk, are near 2.0 million TEUs, while the ports of Jacksonville and Wilmington are near 0.8 and 0.2 million TEUs respectively. Between each of the three five-year periods between 2005 and 2020, each of these major ports are expected to grow by a total TEU volume of approximately 0.5 million TEUs.

Table 3
Projected TEUs for South Atlantic Ports, 2005 – 2050 (000,000)

Port	2005	2010	2015	2020	2030	2040	2050
Jacksonville	777,318	1,006,703	1,222,665	1,494,088	2,292,258	3,495,617	5,173,587
Savannah	1,901,520	2,367,443	2,741,929	3,185,607	4,401,918	6,253,091	8,979,257
Charleston	1,986,586	2,548,356	3,023,868	3,547,181	4,937,292	6,996,577	9,970,878
Wilmington	148,784	214,105	276,009	348,061	559,737	929,115	1,574,085
Norfolk	1,981,955	2,447,650	2,757,875	3,107,570	4,107,155	5,721,327	8,263,768
Grand Total	6,796,163	8,584,257	10,022,346	11,682,507	16,298,360	23,395,727	33,961,575

NOTE: This table was developed in 2004 as part of the Regional Port Analysis that was completed in 2007. Updated numbers were used in the benefits analysis for the detailed alternatives.

Port Capacity Projections – The capacity at each of the ports was determined for existing, developing, and proposed terminals. This capacity was then compared to current and projected throughput TEU volumes (Table 4). Results for 2005 indicate that there was substantial capacity (10,176 million TEUs) when compared to the throughput of 6.797 million TEUs. However, by 2010 the existing capacity at most ports was expected to be nearly fully used. For example, the 2010 projected TEUs for Savannah was 2.367 million, compared to the capacity at that time of 2.652 million TEUs. Consequently, additional capacity would be needed after 2010 at most ports to meet projected demand.

Table 4
Estimated TEU Annual Capacity of South Atlantic Ports, Existing, Developing, and Other Terminals (millions of TEUs)

Ports	Terminals	Capacity TEUs	2005	Projected TEUs 2010	2015	2020	2030	2040	2050
Jacksonville	Existing	1.178	0.777						
	Developing	0.900							
	Other	0.000							
	Total	2.078		1.007	1.223	1.494	2.292	3.496	5.174
Savannah	Existing	2.652	1.902						
	Developing	2.421							
	Other	3.300							
	Total	8.373		2.367	2.741	3.185	4.402	6.253	8.979
Charleston	Existing	2.646	1.987						
	Developing	1.430							
	Other	2.000							
	Total	6.076		2.548	3.023	3.547	4.937	6.997	9.971
Wilmington	Existing	0.500	0.149						
	Developing	0.000							
	Other	2.000							
	Total	2.500		0.214	0.276	0.348	0.560	0.929	1.574
Norfolk	Existing	3.200	1.982						
	Developing	4.660							
	Other	0.000							
	Total	7.860		2.448	2.758	3.108	4.107	5.721	8.264
Grand Total	Existing	10.176	6.797						
	Developing	9.411							
	Other	7.300							
	Total	26.887		8.584	10.021	11.682	16.298	23.396	33.962

NOTE: This table was developed in 2004 as part of the Regional Port Analysis that was completed in 2007. Updated numbers were used in the benefit analysis for the detailed alternatives.

Port Demand and Capacity Shifts – To test a regional port concept, the District evaluated concentrating existing capacity and/or future growth in demand at a particular "port" in the region by shifting port throughput (Table 5) and shifting growth of container volumes. The South Atlantic port region, including Norfolk, is dominated by three large container ports (Norfolk, Charleston, and Savannah). Shifts in port throughput for the two smaller ports of Jacksonville and Wilmington are relatively inconsequential to capacity utilization when compared to Norfolk, Charleston, and Savannah. Similarly, shifts in future growth of container volume at Jacksonville and Wilmington can be more

readily absorbed by existing and developing capacities at major ports compared to shifts of container volume growth away from the major ports.

In Table 5 the total 2005 capacity for all ports was 10.176 million TEUs, compared to a 2005 total throughput of 6.797 million TEUs. If Norfolk's existing capacity was excluded (Total, ex Norfolk) the total existing capacity would be 6.976 million TEUs compared to total current throughput of 6.797 million TEUs. Similar results occur for excluding Charleston (Total, ex Charleston) and Savannah (Total, ex Savannah), suggesting that there are limited opportunities to accommodate a load center port volume at one of the existing major ports without substantial new port capacity, tantamount to a new port at one or more locations for existing capacity and throughput.

Table 6 compares the projected growth in TEUs (Growth TEUs) at each port with existing and planned capacity improvements. For example, while Savannah had sufficient existing capacity (2.652 million TEUs) for current volumes (1.902 million TEUs) the growth in TEUs by 2010 (0.465 million TEUs) was expected to increase total throughput to 2.367 million TEUs, thus necessitating new (developing) capacity to become available. Over a longer period of time, the ports would be even more stretched between growth TEUs and projected increases in total throughput. For example, Charleston and Savannah together were projected to experience nearly one million TEU in growth between 2005 and 2010 and nearly two million TEU in growth between 2010 and 2015. This type of significant sustained growth suggests that all of the large existing ports would require expansion, rather than the development of a single hub port.

The projected containerized cargo growth (Table 6) projected for the five ports during the period 2005 to 2050 was 1.787 million TEUs during the period 2005 to 2010, nearly doubling to 3.224 TEUs by 2015 *and finally to 4.884 million TEUs by 2020*. This data indicates that the major ports (Norfolk, Charleston, and Savannah) would experience nearly 0.5 million growth in TEU each during the period 2005 to 2010 and slightly less in the ensuing five-year periods of 2010 to 2015 and 2015 to 2020.
As shown in Table 7, in 2010, moving just the growth TEUs to one selected "Hub Port" would result in that port being pushed beyond its capacity for TEUs. This would require that the developing capacity of each of the ports be brought on-line by 2010, and, in some cases this would still not bring the port up to the capacity that is needed. Note that even if all of the developing TEU capacities are brought on-line, only the Ports of Savannah and Norfolk would have any remaining excess capacity.

Table 5
Estimated TEU Annual Capacity of Total South Atlantic Ports, Existing, Developing, and Other Terminals, Excluding One Port (millions of TEUs)

		Capacity	Projected TEUs						
Ports	**Terminals**	**TEUs**	**2005**	**2010**	**2015**	**2020**	**2030**	**2040**	**2050**
Total	Existing	10.176	6.797						
	Developing	9.411							
	Subtotal	**19.587**							
	Other	7.300							
	Total	26.887		8.584	10.021	11.682	16.298	23.396	33.962
Total, ex Norfolk	Existing	6.976	6.797						
	Developing	4.751							
	Subtotal	**11.727**							
	Other	7.300							
	Total	19.027		8.584	10.021	**11.682**	16.298	23.396	33.962
Total, ex Wilmington	Existing	9.676	6.797						
	Developing	9.411							
	Subtotal	**19.087**							
	Other	5.300							
	Total	24.387		8.584	10.021	11.682	**16.298**	23.396	33.962
Total, ex Charleston	Existing	7.530	6.797						
	Developing	7.981							
	Subtotal	**15.511**							
	Other	5.300							
	Total	20.811		8.584	10.021	11.682	**16.298**	23.396	33.962
Total, ex Savannah	Existing	7.524	6.797						
	Developing	6.990							
	Subtotal	**14.514**							
	Other	4.000							
	Total	18.514		8.584	10.021	**11.682**	16.298	23.396	33.962
Total, ex Jacksonville	Existing	8.998	6.797						
	Developing	8.511							
	Subtotal	**17.509**							
	Other	7.300							
	Total	24.809		8.584	10.021	11.682	**16.298**	23.396	33.962

Table 6
Estimated TEU Annual Capacity and Throughput Growth at South Atlantic Ports (millions of TEUs)

		Capacity	Projected TEUs						
Ports	**Terminals**	**TEUs**	**2005**	**2010**	**2015**	**2020**	**2030**	**2040**	**2050**
Jacksonville	Existing	1.178	0.777						
	Total	2.078		1.007	1.223	1.494	2.292	3.496	5.174
	Growth TEUs			0.230	0.446	0.717	1.515	2.719	4.397
Savannah	Existing	2.652	1.902						
	Total	8.373		2.367	2.741	3.185	4.402	6.253	8.979
	Growth TEUs			0.465	0.838	1.283	2.500	4.351	7.077
Charleston	Existing	2.646	1.987						
	Total	6.076		2.548	3.023	3.547	4.937	6.997	9.971
	Growth TEUs			0.561	1.036	1.560	2.950	5.010	7.984
Wilmington	Existing	0.500	0.149						
	Total	2.500		0.214	0.276	0.348	0.560	0.929	1.574
	Growth TEUs			0.065	0.127	0.199	0.411	0.780	1.425
Norfolk	Existing	3.200	1.982						
	Total	7.860		2.448	2.758	3.108	4.107	5.721	8.264
	Growth TEUs			0.466	0.776	1.126	2.125	3.739	6.282
TOTAL	Existing	10.176	6.797						
	Total	26.887		8.584	10.021	11.682	16.298	23.396	33.962
	Growth TEUs			1.787	3.224	4.885	9.501	16.599	27.165

For example the number of Growth TEUs expected for the South Atlantic region by 2010 was 1.787 million TEUs. If these were to be concentrated in Savannah along with the predicted TEUs for 2005, it would have increased the number of TEUs going into Savannah by 94%. This would have exceeded the existing capacity by 1.037 million TEUs. As shown in Table 7, all of the ports in the South Atlantic region would push past their capacity if any one of them were selected as the Hub port and receive the growth TEUs from the other ports.

Table 7
Impact of Concentrating Growth TEUs at One Port in 2010
(Millions of TEUs)

Ports	Terminals	Capacity in TEUs	Projected 2010 TEUs	Growth TEUs in 2010	Total TEUs	Percent Increase in TEUs	Percent Increase Over Total Capacity	Deficit in Capacity
Jacksonville	Existing	1.178	1.007	1.787	2.794	177.5%	237.2%	(1.616)
	Developing	0.900						
	Total	2.078	1.007	1.787	2.794	177.5%	134.5%	(0.716)
Savannah	Existing	2.652	2.367	1.787	4.154	75.5%	156.6%	(1.502)
	Developing	2.421						
	Total	5.073	2.367	1.787	4.154	75.5%	0.0%	0.919
Charleston	Existing	2.646	2.548	1.787	4.335	70.1%	163.8%	(1.689)
	Developing	1.430						
	Total	4.076	2.548	1.787	4.335	70.1%	106.4%	(0.259)
Wilmington	Existing	0.500	0.214	1.787	2.001	835.0%	400.2%	(1.501)
	Developing	0.000						
	Total	0.500	0.214	1.787	2.001	835.0%	400.2%	(1.501)
Norfolk	Existing	3.200	2.448	1.787	4.235	73.0%	132.3%	(1.035)
	Developing	4.660						
	Total	7.860	2.448	1.787	4.235	73.0%	0.0%	3.625
Grand Total	Existing	10.176	8.584	1.787	10.371	20.8%	101.9%	(0.195)
	Developing	9.411						
	Total	19.587	8.584	1.787	10.371	20.8%	0.0%	9.216

Both shifting port throughput (Table 5) and shifting growth TEUs (Table 7) indicate that there isn't one port in the South Atlantic region that could be designated as a hub port without extensive expansion. In fact, it may take several hub ports to accommodate the amount of TEUs coming into the South Atlantic region now and expected in the future.

Environmental Considerations

No matter which port might be considered to serve as a regional port, environmental issues arise with any large construction project. The GEC report looked at various environmental factors and determined that substantial environmental issues face any port that may be expanded to the extent required to keep up with the regional growth expected in container trade. The GEC report cites environmental impacts of new infrastructure, wetlands, air, and water quality issues, and social impacts of expansion of existing port facilities into areas currently dedicated to other uses.

Institutional Considerations

GEC identified that a true regional port would require more land than is currently available at any of the Southeast U.S. ports. In addition, other institutional issues such as the lack of a non-federal sponsor as required by the Water Resources Development Act of 1986 (WRDA 86) and the unknown position of states with respect to state Coastal Zone Management plans raise serious questions about whether a regional port could ever be built even if a study showed it to be a reasonable theoretical possibility. A full feasibility level study would be necessary to determine the expected benefits and costs of a regional port. Experience has shown that a study over such a wide geographic area with so many interrelated and often competing issues would require many years and millions of dollars to complete. Deferring all other port improvements until such a study is complete, and then its results implemented, would seriously constrain U.S. international trade.

Conclusion

The Regional Port Analysis confirmed that the major ports are growing rapidly relative to existing terminal capacities and in substantial volumes compared to the capability of planned marine container terminals. Such growth could not be accommodated at a single load center port. The expected growth in container volumes is so large that no single port in the region could readily absorb it, even one of the present major ports.

A regional port to handle the growth expected in container trade appears impracticable. This conclusion is based on the absence of sufficient land area to accommodate the anticipated growth of container volumes, a serious concern about intermodal capacity at a regional port, stress on land transportation facilities, the added transportation costs resulting from re-handling and greater land distances, and environmental issues at all the possible port locations.

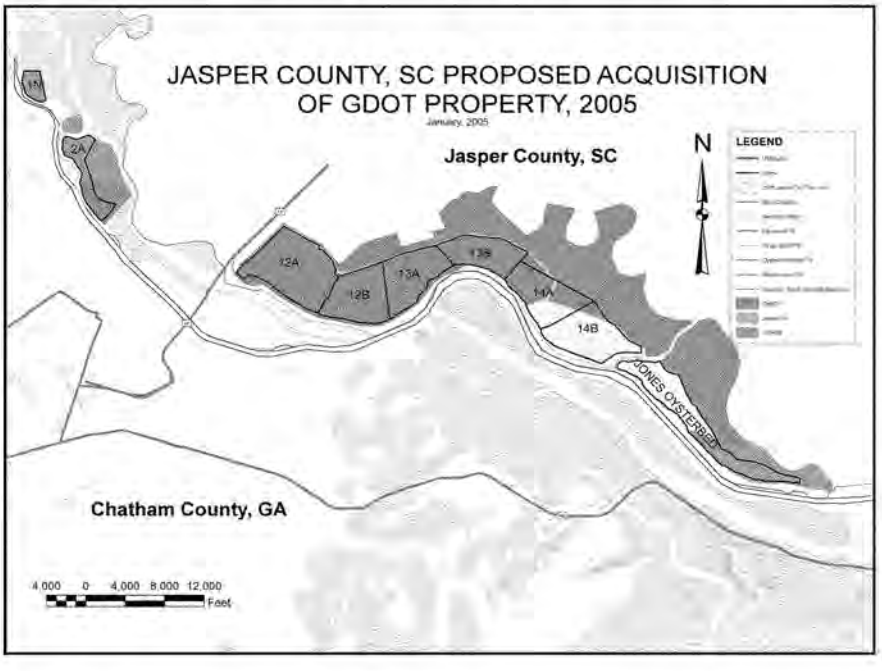
Jasper County Terminal

Savannah District received numerous requests for an analysis of a proposed Jasper County Terminal as part of the Savannah Harbor Expansion Project. The 2005 Formulation of Alternatives Report documented that constructing a new container terminal in Jasper County and deepening the harbor to that location would cost more than deepening to the existing Garden City Terminal.

In light of the continued interest in the potential new terminal, the District also evaluated the potential effects of such a terminal on the economic justification of deepening to the Garden City Terminal. The District conducted a sensitivity analysis of the project's economic justification to address this concern.

Background

On 13 March 2007, Georgia Governor Sonny Purdue and South Carolina Governor Mark Sanford announced the creation of a joint task force to promote the development of a maritime terminal by the two states in Jasper County, South Carolina, and the creation of an independent Bi-State Authority pursuant to a Bi-State compact. The Bi-State compact was entered into on 27 January 2008. The objective of the agreement is to address the need to increase port capacity in Charleston and Savannah by building a new terminal in Jasper County, South Carolina. The agreement authorizes the Georgia Department of Transportation to sell its holdings in Jasper County to the Bi-State Port Authority, after the United States Congress ratifies a proposed Bi-state Compact. As directed by the Term Sheet set forth by the Governors of South Carolina and Georgia, the Georgia Department of Transportation has petitioned the U.S. Army Corps of Engineers for the release, removal or modification of its existing perpetual disposal easements on the properties in question, which total 1,776 acres. Both governors also said they expected



private enterprise to play a significant role in building and operating the port. The Term Sheet agreement also states the intention of the governors to cooperate and to urge state and federal agencies and the public to cooperate in deepening the Savannah River channel as conditionally authorized by WRDA 99.

As a result of the Governors' agreement, the Savannah Harbor, Georgia Expansion Project General Reevaluation Report (GRR) must further consider the possibility that a container terminal may be developed at Jasper County and evaluate the potential impact that this might have on the justification and recommendation of a proposed channel deepening project in Savannah Harbor. This report documents the analyses conducted to address this potential development.

Terminal Development Uncertainty

At the time of this writing there is a high degree of uncertainty regarding the development of a container terminal in Jasper County. There is some doubt about whether a terminal will be constructed, and if it is constructed, the timing of construction, the exact location where the terminal might be built and how it would operate. Although a draft Intergovernmental Agreement has been published and the states are continuing to work in a collaborative manner, numerous uncertainties still exist regarding the development of a new terminal at Jasper County. A terminal design has not been developed nor have permits been obtained or even sought for construction. Other unknowns include the terminal development costs, the number of ship berths that would be available, the amount of storage capacity, accessibility for rail and truck, and ultimate throughput capacity. In addition, impacts to Corps operations and maintenance of the existing Federal Savannah River channel are not known, nor are the impacts to the existing management strategy and EIS for use of these disposal areas. The areas serve not only as dredged material disposal sites, but also as habitat for critical avian species.

In such situations of great uncertainty, Federal regulations at 40 C.F.R. 1502.22 call for an evaluation based on what might be considered "reasonably foreseeable significant adverse environmental impacts." Because of the uncertainty surrounding virtually all aspects of a potential Jasper Terminal, we have conducted an evaluation at the reconnaissance level in some areas and through qualitative descriptions in others.

Scenario Evaluations

In order to properly address uncertainties related to a potential Jasper County terminal development, a set of three scenarios was evaluated. A range of options was included under each scenario. The purpose of these scenarios is to provide decision makers with a sense for the range of possible impacts, economic and environmental, on a determination of the feasibility of deepening the channel to Garden City if a Jasper County terminal is developed. Scenario One assumes that no terminal will be constructed at Jasper County during the period of analysis. This is the base case for the Savannah Harbor Expansion study and is considered the "most likely" future without project condition.

Scenarios Two and Three are incremental evaluations intended to determine if construction of the channel segment between the proposed Jasper County terminal and the existing Garden City terminal is economically justified under the assumption that the terminal is constructed in Jasper County. Scenario Two presents a "reasonable high impact" scenario. This scenario identifies the maximum potential impact to the Savannah Harbor, Georgia Expansion Project that could reasonably be expected as a result of the proposed Jasper County terminal development. This scenario assumes that a large 6.5 million TEU container facility would be constructed in the area of CDF 12A and 12B, the most upstream terminal development site under consideration (please refer to the map on page 24). Scenario Three is a "mid-range" scenario that will enable decision-makers to put into context the level of risk and uncertainty in the decision-making process. Scenario Three represents the District's best guess regarding potential impacts if a terminal were to develop at Jasper County. This scenario assumes a 2.6 million TEU facility would be constructed at CDF 14A and 14B, which is located downstream from the site that would be located in CDFs 12A and 12B. The location and capacity assumptions adopted for these scenarios are based on information contained in a preliminary siting report prepared by the consulting firm Moffatt & Nichol for the Georgia and South Carolina Port Authorities in July 2007, along with "An Update on the Jasper Ocean Terminal, March 11, 2011 also by Moffatt & Nichols which is the most current information available at the time of this writing.

The updated Jasper Ocean Terminal Report estimates that there will be an eight year permitting process from 2012 to the end of 2019 followed by two years of final design, 2020 through 2022 and three years to construct. The earliest project on-line date would be early 2026 according to the Update on the Ocean Terminal. These scenarios assume that SHEP channel deepening project would be completed in 2017 and Garden City reaches its capacity of 6.5 million TEU's in 2030, four years after the projected project on-line date of Jasper's Ocean Terminal. Under these scenarios no economic benefits accrue until the channel is completed. Construction costs that occur in the future are discounted to the beginning of the period of analysis to insure consistent comparisons of the scenarios. The extent to which estimated channel deepening benefits may be allocated between the Garden City and Jasper County terminals is also unknown. For the purposes of this analysis three benefit allocations will be analyzed. These are benefit allocations of 25% to Jasper County and 75% to Garden City, 50% to Jasper County and 50% to Garden City and finally 75% to Jasper County and 25% to Garden City.

The same 50-year period of analysis, beginning in the year 2017 and ending in the year 2066, is used for all the scenarios. The Federal discount rate of 4-1/8% was used. The analysis is based on construction of the 47' deep channel. Each of the scenarios is described in more detail in the following paragraphs.

Economic Analysis

It is anticipated that the greatest impact of the proposed terminal on economic benefits will be related to the increased throughput capacity that it provides to the region. This impact would be felt primarily during the later years of the period of analysis when commodity shipments are expected to increase to the point where the region could usefully employ additional terminal capacity.

It is anticipated that the proposed Jasper County terminal will have relatively minor impacts on water and landside transportation costs, and that the landside transportation cost of shipping a container through a Jasper County terminal may be somewhat higher than the landside transportation cost associated with shipping a container through Garden City. It is not known if the development of the proposed Jasper County terminal will affect forecasted commodity growth or the vessel/ fleet mix, except to the extent that the additional capacity afforded by the terminal will provide opportunities to ship additional goods later in the period of analysis. For this "reasonable high impact" scenario it will be assumed that the majority of the commerce moving through Jasper County will be transferred from commerce that would otherwise have moved through the Garden City terminal and there will be no additional increase in the commodity forecast or the vessel/fleet mix. Detailed incremental analysis of tidal delays and passing lanes that would normally be done for a feasibility level evaluation has not been conducted for these reconnaissance level evaluations.

It is noted that all evaluations are conducted using "systems benefits" which include benefits to all commerce on each vessel moving through the Savannah Harbor, including commerce which is loaded/unloaded at ports other than Savannah Harbor.

Cost Estimate

Cost estimates have been provided for each scenario described above. The District believes that the non-Federal sponsor (GDOT) will be responsible for making the Federal Government whole with regard to any negative impacts that development of the proposed Jasper County terminal would have on the Corps ability to dispose of dredged material. It is recognized that there is uncertainty regarding the details associated with this assumption. Changes in construction, operation and maintenance costs may occur due to the construction of a proposed Jasper County terminal. However, because of the extremely high level of uncertainty regarding future disposal locations, it is only possible to provide costs at a rough order of magnitude (ROM) level of detail. For this analysis the financial costs of construction are adjusted to reflect economic costs, which include interest during construction, assuming a 3 year construction period.

Scenario One: Under this scenario it is assumed that no terminal will be constructed at Jasper County and all containerized cargo coming into the Savannah River will be handled through Garden City. This is the base case that was evaluated at a feasibility level by the Savannah Harbor Expansion PDT team. It serves as the foundation for comparisons to gauge the possible impact of a terminal at Jasper County on the GRR

Under this scenario the channel deepening project will be complete all the way to Garden City in 2017. This scenario assumes that the Garden City terminal will have a maximum throughput capacity of 6.5 million TEU's[1], which means that commodity shipments through the port will be constrained after the year 2030. It also assumes that the Jasper County terminal is not developed during the period of analysis. Average annual National Economic Development benefits under this scenario are $213,144,000. The total economic first cost of this scenario is $669,878,000. Average annual economic costs are $35,854,000. The benefit-to-cost ratio is 5.9-to-1. Average annual net NED benefits are $177,290,000.

Scenario Two: This is a "reasonable high impact" scenario. The purpose of this scenario is to determine if it is economically justified to deepen the channel increment between the Jasper County terminal and the Garden City terminal, if a large container terminal is developed in Jasper County. The specific location of the Jasper County terminal in this scenario is assumed to be CDFs 12A and 12B. This scenario assumes that the throughput capacity of a Jasper County facility will be 6.5 million TEU's annually. This is a very large facility; indeed there are currently no individual container terminals in the United States that actually handle 6.5 million TEU's at the present time. Scenario Two assumes that the Savannah River channel will be deepened to 47 feet in concert with the Jasper County terminal development, with the first year of operation as the years 2018, 2023 and 2028, as discussed previously. This scenario also evaluates three allocations of NED benefits between Garden City and Jasper County as discussed previously. Benefits and costs are adjusted to the first year of operation using the current Federal discount rate. The total first economic cost of constructing this channel increment is estimated to be $212,233,000 which includes $196,074,000 in total project cost plus $16,159,000 in interest during construction. Incremental operation and maintenance costs are estimated to be $2,773,000. The findings of the Scenario Two evaluations are provided in Table 8.

Table 8
Incremental Analysis
Scenario Two - Reasonable High Impact
Assumes Development of CDFs 12A & 12B, 6.5 Million TEU Capacity

Scenario Two Detail Description	Average Annual Incremental Benefits	Average Annual Incremental Costs	B/C Ratio
Jasper Co. 2026, 75% Benefits to Garden City	$111,510,000	$11,698,000	9.53 -to-1
Jasper Co. 2026, 50% Benefits to Garden City	$74,340,000	$11,698,000	6.35 -to-1
Jasper Co. 2026, 25% Benefits to Garden City	$37,170,000	$11,698,000	3.18 -to-1

Environmental Impacts - Environmental effects do not occur linearly in the Savannah River estuary. Different resources would be impacted to varying degrees depending on

[1] TEU is an acronym for Twenty-Foot Equivalent Unit. It is a common unit of measure for containers. Thus a 40-foot container would be 2 TEU's and a 45-foot container would be 2.25 TEU's.

the location of the proposed terminal. Valuable environmental resources that could be impacted under one scenario may not be impacted at all in another scenario. The site proposed in this scenario (CDFs 12A/12B) is mutually exclusive with components of the harbor deepening alternatives that are being considered. The new terminal would be located adjacent to the Sediment Basin. One of the mitigation features proposed for deepening up to the Garden City Terminal would involve constructing a broad berm near the mouth of the Sediment Basin and allowing it to fill with sediments. These two actions could not occur as presently envisioned. In this scenario, the Jasper County terminal would be constructed prior to deepening from this location up to the Garden City Terminal. With that approach, the mitigation plan for deepening to the Garden City Terminal would need to be modified. The extent of those changes would require substantial hydrodynamic modeling and are beyond the scope of this reconnaissance-level evaluation.

Mitigation costs for this scenario are based on a proportion of the total mitigation believed to be necessary to deepen from the ocean to the Garden City Terminal. For this scenario, those proportions are as follows, with these mitigation requirements being for the reach of the harbor between the Jasper County Terminal and the Garden City Terminal:

Dissolved Oxygen	60 %
Wetlands (salinity intrusion)	25 %
Shortnose sturgeon	80 %
Striped bass	50 %
Chlorides	100 %

These impacts do not include those that would result from construction of a new container terminal in Jasper County, improvements to the transportation system that would be required to serve the new terminal, or actions required to make the Federal Government whole to release the dredged sediment disposal easement on the property that would allow the site to be used for a terminal. Those impacts could be substantial, but they are outside the scope of this evaluation.

Scenario Three: This is a "mid-range" scenario. It identifies the incremental economic justification of deepening the navigation channel from the Jasper County terminal to the Garden City terminal, if a moderately sized container terminal is developed in Jasper County. The specific location of the Jasper County terminal in this scenario is in CDFs 14A & 14B. This scenario assumes that the throughput capacity of a Jasper County facility will be 2.6 million TEU's annually. Scenario Three assumes that the Savannah River channel will be deepened to 47 feet in concert with the Jasper County terminal development, with the first year of operation in 2026. This scenario also evaluates three allocations of NED benefits between Garden City and Jasper County; these are 25%-75%, 50%-50% and 75%-25% as discussed previously. Benefits to Jasper County are constrained under the 50%-50% scenario after the year 2035 and under the 75%-25% scenario after the year 2028 due to the assumed 2.6 million TEU size limit of the Jasper County facility. When this constraint comes into play, it is assumed that the additional

TEU's go to Garden City. Because of the assumed constraint, changes in the benefit-to-cost ratios are not necessarily proportional. Benefits and costs are adjusted to the first year of operation using the current Federal discount rate. The total first economic cost of constructing this channel increment is estimated to be $359,542,000, which includes $330,319,000 in total project cost and $27,223,000 in interest during construction. Incremental operation and maintenance costs are estimated to be $4,622,000. The findings of the Scenario Three evaluations are provided in Table 9.

Table 9
Incremental Analysis
Scenario Three - Mid Range Impact
Assumes Development of CDFs 14A/14B, 2.6 Million TEU Capacity

Scenario Three Detail Description	Average Annual Incremental Benefits	Average Annual Incremental Costs	B/C Ratio
Jasper Co. 2026, 75% Benefits to Garden City	$86,236,000	$19,658,000	4.39 -to-1
Jasper Co. 2026, 50% Benefits to Garden City	$57,491,000	$19,658,000	2.92 -to-1
Jasper Co. 2026, 25% Benefits to Garden City	$29,694,000	$19,658,000	1.51 -to-1

Environmental Impacts – As with Scenario Two, environmental effects do not occur linearly in the Savannah River estuary. Different resources would be impacted to varying degrees depending on the location of the proposed terminal. The site proposed in this scenario (CDFs 14A/14B) is further downstream than the site in Scenario 2, so fewer impacts would be expected to the freshwater portions of the estuary.

Mitigation costs for this scenario are based on a proportion of the total mitigation believed to be necessary to deepen from the ocean to the Garden City Terminal. For this scenario, those proportions are as follows, with these mitigation requirements being for the reach of the harbor between the Jasper County Terminal and the Garden City Terminal:

Dissolved Oxygen	100 %
Wetlands (salinity intrusion)	100 %
Shortnose sturgeon	100 %
Striped bass	100 %
Chlorides	100 %

These impacts do not include those that would result from construction of a new container terminal in Jasper County, improvements to the transportation system that would be required to serve the new terminal, or actions required to make the Federal Government whole to release the dredged sediment disposal easement on the property that would allow the site to be used for a terminal. Those impacts could be substantial, but they are outside the scope of this evaluation.

Summary and Conclusions

Under all scenarios, construction of the channel increment from a proposed Jasper County terminal to the Garden City terminal is well justified based on "systems benefits." The large terminal located at CDFs 12A & 12B actually would have less impact on incremental justification than the moderately sized terminal located at CDFs 14A & 14B, because the channel increment between CDFs 12A & 12B and Garden City is 2.84 miles shorter and the incremental_costs, including mitigation costs, to go from CDFs 12A & 12B to Garden City are much less than the costs to go from CDFs 14A & 14B to Garden City. Timing of construction will have little impact to justification because Garden City is forecast for 2030, four years after the projected construction of Jasper Ocean Terminal. As expected, the larger the distribution of benefits to Garden City, the greater is the economic justification for construction of the channel increment. Overall, justification of the channel increment between a Jasper County terminal and the Garden City terminal is not particularly sensitive to the development of a terminal at Jasper County.

Jasper County Terminal and the Without Project Condition

Issue

As part of the Planning Guidance Memorandum (PGM), Savannah District is including a list of steps/issues that must be completed/satisfied before a Jasper County terminal can be considered part of the Without Project Condition.

Project Status

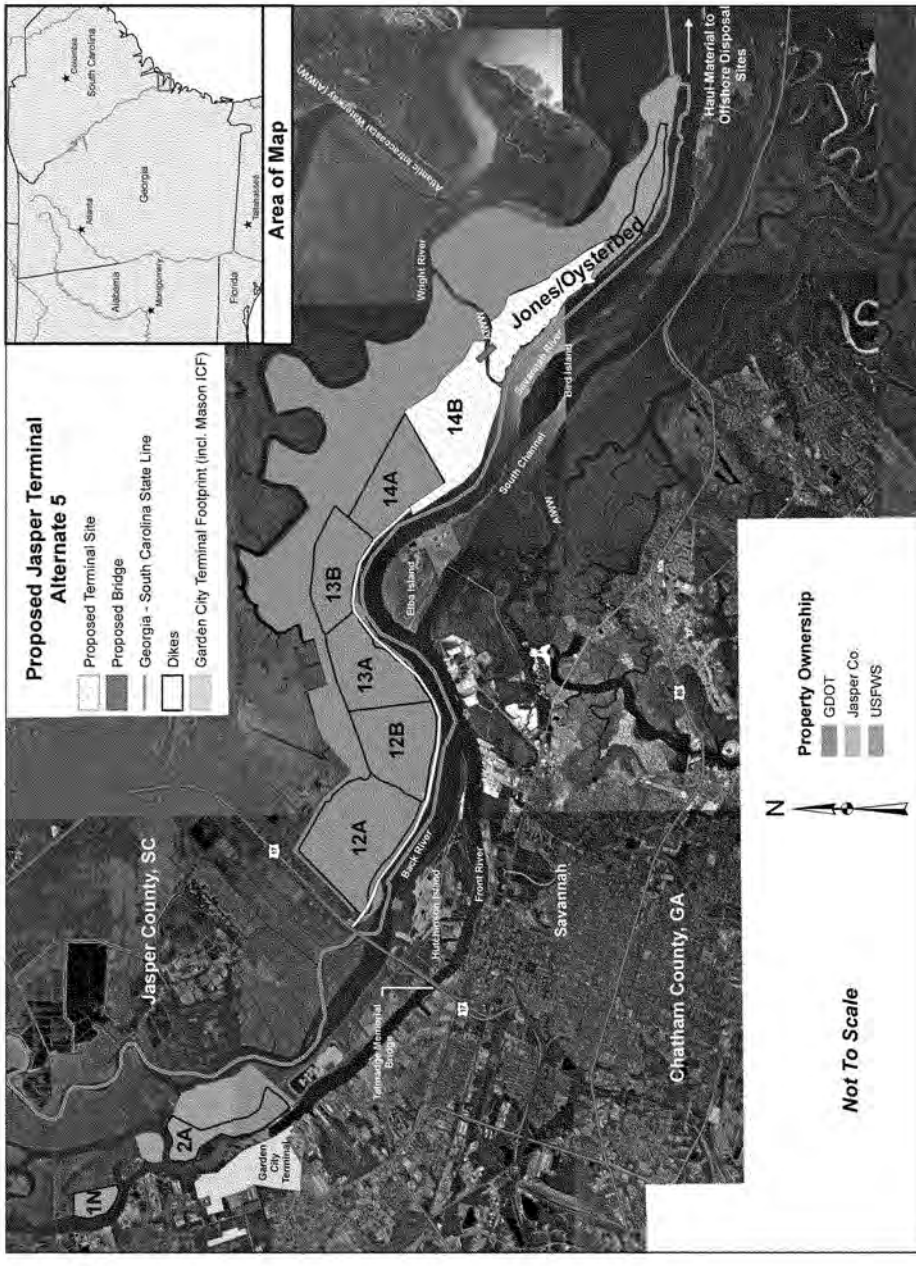
In March 2007, the Governors of Georgia and South Carolina signed a "term sheet" that directed both states to work together towards the creation of a Bi-State Port Authority and to drop all litigation regarding the underlying fee ownership of the potential Jasper County terminal site.

In January 2008, the Governors signed an Intergovernmental Agreement that established a "Joint Project Office" (JPO) to work toward development of a new terminal. The initial steps in that process includes (1) obtaining fee title ownership of the property from GA DOT, (2) engaging the US Army Corps of Engineers to release the dredged material disposal easements that exist on the property, and (3) securing the services of an A/E firm to assist in development of the site. The JPO held its first meeting in April 2008.

In July 2008, GDOT transferred fee title ownership of a 1,518-acre tract (that includes CDFs 14A and 14B) along the Savannah River to the State Ports Authority for Georgia and South Carolina. Those authorities now have joint and equal interest in the underlying fee title of that site. The reported intent is for the Ports Authority to eventually transfer ownership of the site to the Bi-State Port Authority, once that organization is established.

The JPO has engaged A/E firms to evaluate the need for and timing of additional container port capacity and to evaluate alternative container terminal locations along the river, each with its own set of advantages and constraints. The figure on the following page shows the firm's recommended location. In June 2008, another A/E firm concluded that the demand for US southeast container terminal capacity would exceed the supply of that capacity in 2023. Therefore, their proposed business plan calls for construction of a 1,500 acre terminal capable of supplying 1.5 million TEU capacity by 2023, followed by two additional similar construction phases in 2028 and 2033 to provide further capacity.

In November 2008, the JPO coordinated with the Savannah District to identify a scope of work to evaluate the issues and conduct the studies required for the Corps to release the disposal easements on the confined disposal facilities. That agreement has not yet been finalized.


Proposed Jasper Terminal Alternate 5
Proposed Terminal Site
Proposed Bridge
Georgia - South Carolina State Line
Dikes
Garden City Terminal Footprint (incl. Mason ICF)
Area of Map
Columbia
South Carolina
Atlanta
Georgia
Alabama
Montgomery
Florida
Tallahassee
Atlantic Intracoastal Waterway (AIWW)
Wright River
Jones/Oysterbed
AIWW
14B
14A
13B
13A
12B
12A
Elba Island
South Channel
Savannah River
Bird Island
AIWW
Haul Material to Offshore Disposal Sites
Jasper County, SC
1N
2A
Garden City Terminal
Talmadge Memorial Bridge
Black River
Hutchinson Island
Front River
Savannah
Chatham County, GA
Property Ownership
GDOT
Jasper Co.
USFWS
N
Not To Scale

Timelines for Construction of a Jasper County Terminal

In November 2007, Savannah District had prepared a timeline for the various steps that would be required to develop a terminal in Jasper County along the Savannah River (Table 10). The timeline took an optimistic view of the various tasks and the time required to accomplish them. The District recently updated that timeline, as shown below.

Table 10
Construction of a Jasper Ocean Terminal Potential Timelines

Task	Initial (Nov 2007)	Previous (Dec 2008)	Joint Project Office (JPO) Update (Mar 2011)
Governors sign Term Sheet describing intent and overall process to develop a Jasper County Terminal	Mar 2007 (Actual)	Mar 2007 (Actual)	Mar 2007 (Actual)
GA DOT requests Corps release, remove or modify easements for sediment disposal	Mar 2007 (Actual)	Mar 2007 (Actual)	Mar 2007 (Actual)
Governors appoint a Joint Task Force to form Bi-State Authority	Apr 2007 (Actual)	Apr 2007 (Actual)	Apr 2007 (Actual)
Ports Authorities acquire land from GA DOT	------	Jul 2008 (Actual)	Jul 2008 (Actual)
Corps funded by the JPO to review alternatives submitted by the JPO that could allow release of Real Estate easements	Oct 2007	Jan 2009	Jul 2010 (Actual)
JPO Prepares Final EIS, Economics, Design, Hydrodynamics	Nov 2008	Feb 2011	2015
Jasper Ocean Terminal Record of Decision	Dec 2008	Mar 2011	2018
JPO completes Design/Engineering (includes terminal, access roads, railroad)	Nov 2009	Feb 2013	2021
JPO applies for construction permits	Nov 2009	Feb 2013	2022
JPO obtains construction permits	Dec 2012	Mar 2015	2022
Corps releases Real Estate easements			2022
JPO awards construction contracts	Jun 2013	Sep 2016	2022
Begin construction	------	Oct 2016	2022
JPO completes construction of terminal, roads & rail	Jun 2016	Sep 2020	2024
Movement of 1st container across Jasper Ocean terminal	Jul 2016	Oct 2020	2025
Terminal at 500,000 TEU capacity	Jul 2017	------	
Terminal at 1,500,000 TEU capacity	------	Oct 2020	2026
Terminal at 3,000,000 TEU capacity	------	Oct 2024	2030
Terminal at 4,500,000 TEU capacity	------	Oct 2028	2034

Conclusion

In 2007, the Corps prepared an initial optimistic timeline for development of a terminal in Jasper County. Since that time the schedule has slipped several years. Substantial tasks are ahead, including the State legislatures' approval of a Bi-State Port Authority, Congressional approval of that authority, and completing studies that identify a way that the Corps' disposal easements can be released without adversely impacting present harbor maintenance operations. In addition, extensive engineering and environmental investigations must be conducted prior to receiving all the required construction permits and approvals.

Corps navigation project planning guidance (ER 1105-2-100, page E-41) requires that alternative harbor and channel improvements available to the transportation industry over the planning period be included in the without project condition. The guidance defines available improvements as "those in place and under construction at the time of the study and those authorized projects that can reasonably be expected to be in place over the planning period". In light of both the progress and the remaining steps ahead, the District believes that it should not consider a Jasper County Terminal as part of the Without Project Condition until the Bi-State Port Authority obtains permits to construct the facility and construction begins on the site. The earliest estimate of that occurrence is 2018, however there is no assurance that it would occur at all. That date is well past the 2012 timeframe when the final decisions are scheduled to be made on feasibility of the proposed Savannah Harbor Expansion Project.

Extension of Entrance Channel

Situation

In a meeting in October 2009, James Cameron, retired USCG, pointed out that NOAA Chart #11512 indicates some shallower shoals offshore of the area the Corps had surveyed in 1997. The Corps obtained and evaluated existing NOAA surveys and conducted a bathymetric survey in October 2009. The new information indicates that there are additional shoals offshore, beyond the end of the entrance channel as designed using the 1997 hydrographic surveys.

In response to this, the Corps evaluated alternative channel extensions in this area. The length of the extension would be dependent upon design channel depth and alignment. For the maximum case, a 48-foot authorized navigation project, the channel would be extended approximately 7 miles longer than the then-proposed bar channel extension along the present alignment. Alternate routes that would turn a portion of the bar channel to the south or to the north would be approximately 2 to 3 miles longer than then proposed alignment. Construction costs could be minimized by creating new fish habitat areas with the excavated sediments. These features would be created by normal operation of a hopper dredge (bottom dumping) which would deposit harvested sands in a designated area to create variations in elevation of the ocean floor.

Entrance Channel Extension Alternatives

Initial Alternative Development. The first step in developing alternative routes was to establish segments that could be used as building blocks to find the shortest route to deep water (i.e., the 50-ft contour). These segments are shown in Table 11, with each segment described in terms of stations, distance and direction. The table also defines the amount of material to be dredged to deepen that segment to the 50-ft depth and the 52-ft depth.

Table 11: Segments Developed for Alternate Route Creation

Segment	From		To		CY (-50 foot depth)	CY w/Overdepth (-52 foot depth)
S-00	-60+000B		-85+000B		935,779	1,948,936
S-01	-85+000B		-123+000B		1,074,437	2,183,091
S-02	-60+000B		-82+000B		1,036,516	2,106,041
S-03	-82+000B	E	17,600ft		652,584	1,200,919
S-04	-60+000B		-78+000B		858,715	1,788,435
S-05	-78+000B	S	19,200ft		1,665,428	2,836,327
S-06	-60+000B	S	33,250ft		4,008,595	5,548,307
S-07	-60+000B	E	42,100ft		5,765,123	7,741,124
S-08	-60+000B	SE	38,600ft		2,657,805	4,212,500
S-09	-38+000B	SE	53,800ft		14,687,190	19,827,700
S-10	-38+000B		-60+000B		2,174,030	3,261,728
S-11	-50+000B	SE	42,700ft		7,777,317	10,500,000

Development of Eight Alternative Routes. From the segments in Table 11, Savannah District developed a group of eight (8) alternative channel routes (the Engineering Appendix contains greater detail on the development of alternative routes as well as the selection process for the selection of the chosen route) as shown in Table 12 below. These routes were designed from the beginning of the current entrance channel (Station- 60+000B) out to the 50-ft contour. Route S-08 was developed as a result of input from the Savannah Bar Pilots.

Table 12: Route Description and Quantities

Route Description	Route	CY (-50)	w/Overdepth (-52)
Straight Line 60+000 to 123+000	S-01	2,010,216	4,132,027
60+00 to 82+000 S-3, then east to -50 mllw	S-03	1,689,100	3,306,960
60+000 to 78+000 S-5, then South to -50 mllw	S-05	2,524,143	4,624,762
60+000 on tract SE S-6 to -50 mllw	S-06	4,008,595	5,548,307
60+000 on Tract E S-7 to -50 mllw	S-07	5,765,123	7,741,124
60+000 on tract ESE S-8 to -50 mllw	S-08	2,657,805	4,212,500
38+000 on tract SE S-9 to -50 mllw	S-09	14,687,190	19,827,700
50+000 on tract SE S-11 to -50 mllw	S-11	7,777,317	10,500,000

Evaluation of Alternative Routes

Evaluation of Eight Original Route Alternatives. Evaluation of the original eight routes focused on projected new work dredging quantities and the costs to dispose of those materials. For the purpose of this preliminary cost assessment, $5.00 per cubic yard (CY) was used. This consisted of a $4.00/CY initial cost with a 25% contingency added. This cost was developed from dredging costs that had been previously prepared for the GRR by cost engineering. The dredging volumes in Table 13 include allowable over depth.

During the initial evaluation phase, based on new work dredged material quantities and the costs to remove them, 4 of the initial 8 routes were eliminated. The eight initial routes with their new work dredging costs are listed in Table 13.

Table 13: Route Costs for New Work Dredging

Route Description	Route	CY (-50)	w/Over depth CY (-52)	Dredging $/CY	Total Cost
60+00 to 82+000 S-3, then east to -50 mllw	S-03	1,689,100	3,306,960	$5.00	$16,534,800.00
Straight Line 60+000 to 123+000 S-1	S-01	2,010,216	4,132,027	$5.00	$20,660,135.00
60+000 on tract ESE S-8 to -50 mllw	S-08	2,657,805	4,212,500	$5.00	$21,062,500.00
60+000 to 78+000 S-5, then South to -50 mllw	S-05	2,524,143	4,624,762	$5.00	$23,123,810.00
60+000 on tract SE S-6 to -50 mllw	S-06	4,008,495	5,548,307	$5.00	$27,741,535.00
60+000 on tract E S-7 to - 50 mllw	S-07	5,765,123	7,741,124	$5.00	$38,705,620.00
50+000 on tract SE S-11 to -50 mllw	S-11	7,777,317	10,500,000	$5.00	$52,500,000.00
38+000 on tract SE S-9 to -50 mllw	S-09	14,687,190	19,827,700	$5.00	$99,138,500.00

After the initial evaluation of alternatives based on new work disposal costs, the PDT selected the four routes depicted in Table 14, for further evaluation. These include the following:

Straight line extension of originally proposed channel (S-01),
Northern extension of the channel (S-03),
Southern extension of the channel (S-05), and
Northern extension proposed by the Bar Pilots (S-08).

While only existing disposal sites were used in the initial analysis of alternative routes, it was apparent that due to the amount of sediment and the distance from existing sites that a new area would be desirable for the placement of excavated new work sediments, the deposition of which could provide a beneficial use in the form of a nearby enhancement to fish habitat.

Additional Disposal Requirements. Prior to the need to further extend the bar channel, disposal plans called for the new work dredged sediment from the originally proposed channel extension (Stations -57+000B to -85+000B) to be placed in Site 11. This site has a total capacity of 2.1 million cubic yards to -10 feet MLLW and is located below the mean lower low water contour (MLLW) in the nearshore area off Tybee Island. At a revised top elevation of -26 feet MLLW, the site would have a capacity of 700,000 cubic yards. This mound would provide a different habitat for fish than the adjacent ocean floor, thereby improving fish habitat in the area to a significant degree.

Table 14: Remaining Routes by Project Depth and Dredging Costs

			44-Ft Project		45-Ft Project		46-Ft Project		47-Ft Project		48-Ft Project	
Route	Description	Miles**	CY	Cost*	CY	Cost*	CY	Cost*	CY	Cost*	CY	Cost*
S-03	North Extension	7.5	489,081	$2,445,405	957,870	$1,689,100	1,689,100	$8,445,500	2,104,843	$10,523,215	3,306,960	$16,534,800
S-08	North Extension (Pilots)	7.2	1,534,125	$7,670,625	2,041,954	$10,209,770	2,657,805	$13,289,025	3,401,689	$17,008,445	4,212,500	$21,062,500
S-01	Straight Extension	11.9	677,707	$3,388,535	1,235,481	$6,177,405	2,010,216	$10,051,080	2,988,367	$14,941,835	4,132,027	$22,726,149
S-05	South Extension	6.9	1,120,930	$5,604,650	1,861,076	$9,305,380	2,524,143	$12,620,715	3,646,245	$18,231,225	4,624,762	$23,123,810

**Length in miles beyond the existing entrance channel (Station 60+000B)
*Cost - based on $5.00/CY for dredging the sediment and placing it in the designated disposal area

Entrance Channel Extension
Planning System of Accounts:

	Route S-01	Route S-03	Route S-05	Route S-08
1. PLAN DESCRIPTION	Straight Extension (Station -60+000B to -123+000B)	North Extension (Station -60+000B to -99+600B)	South Extension (Station -60+000B to -96+500B)	North Extension (Pilots) (Station -60+000B to -98+600)
2. IMPACT ASSESSMENT				
A. National Economic Development (NED				
(1) Project New Work Construction Cost	$25,677,382	$17,933,672	$24,306,563	$22,312,864
(2) Project New Work Annual Cost	$ 1,273,000	$ 889,100	$ 1,205,000	$ 1,106,200
(3) Annual O&M Costs	$ 110,744	$ 69,796	$ 64,212	$ 66,975
(4) Annual Shipping Costs	$ 2,069,529	$ 1,739,100	$ 2,069,529	$ 1,513,017
(5) Total Project Annual Costs	$ 3,453,273	$ 2,697,995	$ 3,338,741	$ 2,686,192
B. Environmental Quality				
(1) Water Quality Dredging	Adverse	Adverse	Adverse	Adverse
(2) Water Quality Disposal	Minor Adverse	Minor Adverse	Minor Adverse	Minor Adverse
(3) Threatened & Endangered Species	No Impact	No Impact	No Impact	No Impact
(4) Cultural Resources & Historic Properties	No Impact	No Impact	No Impact	No Impact
C. Regional Economic Development	No Impact	No Impact	No Impact	No Impact
D. Other Social Effects				
(1) Safety	No Impact	No Impact	No Impact	No Impact
3. PLAN EVALUATION				
A. Contribution to Planning Objectives				
(1) Efficiently gets ships to deep water (-50-ft contour)	Longest distance of the routes to get to -50-ft contour. Also a large number of shoals to dredge through.	The 2nd longest distance of the routes to get to -50-ft contour.	The 2nd shortest distance of the routes to get to -50-ft contour.	Other than Route S-01 the straightest route with the 2nd shortest distance of the routes to get to deep water.
(2) Provides optimum level of navigation efficiency	Yes, straight line course from the end of the current entrance channel to deep water.	No, contains one 27° turn at the end of the initial proposed entrance channel (-85+000B) before making a straight line course to deep water.	No, starts with a narrow passage within the -50-ft contour from the south and the route has two turns of greater than 27°.	Yes, has only one 13° turn in the channel extension.
(3) Minimized environmental impacts	Yes	No, has a possible impact on endangered species (right whale).	No, has a possible impact on endangered species (right whale).	Yes

	Route S-01	Route S-03	Route S-05	Route S0-8
B. Response to Planning Constraints				
(1) Financial capability of local sponsors to cost-share projects construction	The most expensive option, but local cost-share of $12,838,691 is within local capabilities, and has no impact on the local sponsor to cost – share in the construction.	The least costly of the four routes evaluated at a local cost-share of $8,966,836 and well within the local sponsors capability to cost-share in the construction.	The second most expensive option, but local cost-share of $12,153,282 is within local capabilities, and has no impact on the local sponsor to cost – share in the construction.	The second least expensive option, and the local cost-share of $11,156,432 is within the capability of the local sponsor to cost –share in the construction.
(2) Institutional Acceptability	The high cost of the route, as well as the distance, is not acceptable of the Savannah Bar Pilots.	The reasonable cost of the route makes it acceptable to the local sponsor; however, it may have greater impacts on the right whale.	The high cost of the route is not acceptable to the local sponsor, while the route with its narrow entrance and two turns is not acceptable of the Savannah Bar Pilots.	The reasonable initial construction cost of the route and its annual cost for the life of the project make it the choice of the local sponsor, while it is also the route favored by the Savannah Bar Pilots.
C. Response to Evaluation Criteria				
(1) Completeness	Yes	No, due potential concerns with endangered species (Right Whale).	No, due to potential concerns with endangered species (Right Whale).	Yes
(2) Effectiveness	Yes	Yes	Yes	Yes
(3) Efficiency	No, Route S-01 is the most expensive of the routes evaluated.	Yes	No, Route S-05 is the second most expensive route.	Yes, most cost effective plan, consistent with protecting the Nation's environment.
(4) Acceptability	No, the increased distance is unacceptable to the Savannah Bar Pilots.	No, due to potential concerns with endangered species (Right Whale).	No, the narrow approach channel and the number of turn is unacceptable to the Savannah Bar Pilots.	Yes

Results of Requirements Analysis

Based on estimated project construction costs, Route S-03 would be the least expensive (initial cost) for each of the project depths. However, when factors such as yearly O&M costs and shipping costs are included, Route S-08 is the least costly route for all project depths. The Savannah Harbor Pilots prefer Route S-08 because they believe it would provide a better, safer route operationally than Route S-03. Another important factor is potential impacts to the right whale (endangered species). The original entrance channel extension (the part of Route S-01 between Stations -60+000B and -85+000B) would have no impact on right whales. When comparing the two alignments, the originally proposed Route S-01 and Route S-08, there would be a negligible variation in channel construction or maintenance-related potential effects on right whales, as well as negligible effects resulting from deep-draft vessel use of the channel extension. Because of the turns involved with Routes S-03 and S-05, they may have an impact on right whales. The continuation of Route S-01 until it passes through the shoals is considered by the Savannah Harbor Pilots to be too long.

Selected Route

As a result of these analyses, Savannah District identified Route S-08 as the extension to the entrance channel. This selection depends on the expected successful completion of the following tasks that are either underway or soon to be initiated:

- Core borings in the proposed channel for analysis of the sediment, including grain size analysis and contaminants evaluation (bioassay), and
- Cultural Resources evaluation (side scan sonar and magnetometer)
- Hard-bottom surveys

It should be noted that use of Sites 11 and 12 as dredged material placement sites for sediments removed from the bar channel extension is no longer part of project plans. Use of Sites II and 12 has been removed from project plans at the request of GA DNR-CRD. All sediments dredged from the entrance channel will be placed in the ODMDS.

ADDENDUM A

EDITOR'S NOTE: Savannah District prepared this document in 2004/2005 to describe the plan formulation work that had been performed at that time. A public review of the report was conducted in May/June 2005. Because of the age of the document, some of the information it contains is now out of date -- descriptions of ongoing construction projects, for example – but the report has been included to inform the reader of the analyses that were performed and conclusions reached at that time. Those decisions are important in the overall study process. The District has reviewed the decisions described herein and believes they are still valid. In addition, Label "G" on Figure 1 should read "Disposal Sites 14A/B" to correspond with the discussion later in the document (pp. 72-76).

The table on the following page summarizes the measures that were considered, the conclusions reached in 2005 on those measures, and reviews those decisions to ensure they are still valid.

MEASURE	CONCLUSION IN 2005 REPORT	SUMMARY REASON IN 2005 REPORT	2012 ASSESSMENT
Non-Structural			
Reduce Underkeel Clearance Requirement	No improvement is possible	Savannah Underkeel Guidelines are consistent with other deep-water ports. Harbor Pilots do not believe they could operate safely with less clearance.	Concur. Detailed analysis includes present underkeel clearances.
Increase Efficiency of Landside Operations	No further action needed beyond W/O Project Condition	Would only consist of advancing already planned capital improvements to the Garden City Terminal	Concur. GPA continues to make capital investments to increase the terminal's throughput capacity.
Specialization / Optimization of Facilities	Not needed beyond W/O Project Condition	GPA has specialized the Garden City Terminal and is increasing the efficiencies in landside handling and storage. New berths and facilities are being developed to handle Post-Panamax container ships.	Concur. GPA continues to make capital investments to increase the terminal's throughput capacity.
Improve Traffic Management Practices	No additional measure would be helpful	Further coordination or a system to facilitate coordination would not be helpful	Concur. Pilots have not identified a system that would improve their operations.
Structural			
Minor Modifications			
Passing/ Meeting Areas	Include	Required with a larger design vessel to maintain the present level of service	Concur. Ship simulation studies confirmed the need for these measures.
Bend Wideners	Include	Ship Simulation Report identified areas where bend wideners would be needed to allow safe transit of the design vessel	Concur. Ship simulation studies confirmed the need for these measures.
Aids To Navigation	Include	Additional aids would not be helpful in the inner harbor; New aids would be required on an extension to the entrance channel	Concur. New aids would be placed to mark the extended entrance channel.
Vessel Traffic Coordination	Not include	Further coordination or a system to facilitate coordination would not be helpful	Concur. Pilots have not identified a system that would improve their operations.
Alternate Terminal Locations			
Garden City Terminal	Most cost effective site when harbor deepening and landside facility costs are considered	Presently a large functioning container terminal (infrastructure already in place); Planned expansions in terminal capacity would be part of Without Project Condition	Concur. GPA continues to increase the terminal's throughput capacity. Project costs are higher than previously predicted, but the dredging costs to this site are still much less than the costs of developing a new container terminal.
East Coast Terminal	Low Potential - Eliminated	Inadequate size; East-West landside transportation through City; Relocate existing operation	Concur. Site limitations still exist

Structural (Continued)			
Alternate Terminal Locations (Continued)			
Ocean Terminal	Low Potential - Eliminated	Inadequate size; High cost of renovation; Lack of dredging savings	Concur. Site limitations still exist.
Elba Island	Low Potential – Eliminated	Adjacent to LNG facility; Inadequate size; East-West landside transportation through City; Navigation safety issues	Concur. Site limitations still exist.
Blue Circle	Low Potential – Eliminated	Inadequate size; Lack of dredging savings; Difficult rail connection; Relocate existing operation	Concur. Site limitations still exist.
Brunswick	Low Potential – Eliminated	Distance from inland markets; High dredging costs	Concur. Site limitations still exist.
Disposal Area 12A	Medium Potential – Not Cost Effective	Need to develop rail connection; Loss of sediment storage capacity; Adverse environmental effects from access & replacement sediment storage capacity	Concur. Landside development costs are now expected to be $4-5B, greatly exceeding the costs to deepen to GCT.
Disposal Areas 14A/14B	Medium Potential – Not Cost Effective	Need to develop rail connection; Loss of sediment storage capacity; Adverse environmental effects from access & replacement sediment storage capacity	Concur. Landside development costs are now expected to be $4-5B, greatly exceeding the costs to deepen to GCT
Tybee Island National Wildlife Refuge	Medium Potential – Not Cost Effective	Need to develop rail/road connection; Adverse environmental effects from access and replacement sediment storage capacity; Potential Intracoastal waterway impacts	Concur. Landside development costs would be high, coupled with the costs for a bridge over the AIWW.
Alternate Facility Types			
Offshore Transshipment Facility	Low Potential – Eliminated	High development costs; Adverse environmental effects; High costs of double handling; Delays due to weather.	Concur. Development costs still expected to be high. Double handling still required.
Major Modifications			
River Straightening	Not include	Would not markedly increase the efficiency of vessel transits	Concur.
Harbor Deepening	Include	Deepen existing navigation project to reduce light loading and tidal delays	Concur. Vessels calling at the port continue to grow in size. Cargo levels have increased and are expected to continue to grow in the future.

Savannah Harbor Expansion Project

Formulation of Alternatives

General Re-evaluation Report

&

Environmental Impact Statement

US Army Corps
Of Engineers
Savannah District

March 2004
(Revised April 05)

SAVANNAH HARBOR EXPANSION PROJECT
FORMULATION OF ALTERNATIVES

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FEDERAL WATER RESOURCE OBJECTIVE

The objective of water and related land resources planning is to contribute to national economic development consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements.

COOPERATING AGENCY GOALS

1. Process related:
    - Determine the specific and differential incremental effects of each channel improvement alternative.
    - Identify and evaluate impacts on the human environment, including impacts on natural resources, economics, and societal considerations (jobs).
    - Contain studies that are conducted in a manner that leads to their technical acceptance by the scientific community.
    - Clearly identify all benefits and costs for the decision-makers.
    - Recognize that mitigation may be necessary for any or all of the identified impacts.
    - If needed, recommend specific actions that should be taken outside the context of the Expansion Project to improve the local environment and/or compensate for past harbor improvement projects. The report would identify the process and participants to accomplish those specific needed actions.
    - Be documented by a report that leads decision-makers to clear decisions on the project.
2. Outcome related:
    - Produce positive economic benefits for the port community and have beneficial environmental effects.
    - Include a mitigation plan that addresses unavoidable impacts to critical natural resources.
    - Include post-project monitoring to ensure that the expected levels of adverse impacts are not exceeded.
    - Be supported by most stakeholders.

IDENTIFYING PROBLEMS AND OPPORTUNITIES

Problems and opportunities statements will be framed in terms of the Federal objective and the specific study planning objectives. Problems and opportunities should be defined in a manner that does not preclude the consideration of all potential alternatives to solve the problems and achieve the opportunities.[1]

PROBLEM STATEMENTS:

1. Existing shippers are experiencing increased/ inflated operations costs due to light loading and tidal delays
2. Light loading and tidal delays will increase as present harbor users increase their annual tonnage and as larger, more efficient ships replace older, smaller ones.
3. Existing ships are experiencing problems associated with turning capabilities and overall maneuverability in certain reaches of the inner harbor.
4. The severity of problems associated with turning capabilities and overall maneuverability in certain reaches of the inner harbor will increase as vessel size increases.

OPPORTUNITIES

1. Beneficial placement of new work sediments (Tybee Island and other locations)
2. Development of new upper harbor disposal area with new work material
3. Reduce O&M annual dredging costs
4. Enhance the natural resources in the project area
5. Advance the understanding of the natural resources in the project area
6. Contribute to the preservation of historically significant resources in the project area
7. Contribute to other agencies environmental decision making resources through development of state of the art modeling tools
8. Reduce constraints of harbor pilot operating practices
9. Identify the accumulated environmental impacts from past harbor development and operation. When consistent with the USACE authorities and policies, include appropriate actions in the plan alternatives.

OBJECTIVES

Definition: Statements that describe the desired results of the planning process by solving the problems and taking advantage of the opportunities identified.[2]

1. Contribute to national economic development by minimizing costs of moving cargo through Savannah Harbor by reducing current and future tidal delays in an environmentally acceptable and sustainable manner.

[1] Planning Guidance Notebook, Para. 2-3.a.
[2] Planning Guidance Notebook, Para. 2-3.a. (4)

2. Include post-project monitoring and adaptive management to ensure that the expected levels of adverse impacts are not exceeded.
3. Reduce current and expected future tidal delays
4. Reduce the need to light load caused by channel depth constraints
5. Reduce the need to light load caused by operational constraints
6. Reduce the current and future impacts and problems associated with turning capabilities and overall maneuverability in certain reaches of the inner harbor.

NOTE: In the plan formulation and evaluation process, incorporate consideration of all identified opportunities while achieving the objectives listed above.

PROJECT CONSTRAINTS

Definition: Constraints are restrictions that limit the planning process. Plans should be formulated to meet the study objectives and to avoid violating the constraints.

1. Underkeel clearance requirements
   - Pilots current and anticipated future operating practices requires 4-feet underkeel clearance
2. Meeting and passing limitations
   - Pilots current and anticipated future operating practices limit meeting and passing in the navigation channel
3. Environmental restrictions on dredging
   - Bar – Sea Turtles, Whales
   - Inner Harbor – Striped Bass, Manatee
4. Proximity of navigation channel to the Savannah National Wildlife Refuge
5. Aquifer
6. Location of cultural resources (Ft. Jackson, Ft Pulaski)
7. Proximity of landside development
8. Coast Guard restrictions on vessel movements
   - LNG Tanker movement limitations on other vessel traffic
   - Transit speed and or wake limitations
9. Tier I Commitments
   - Commitment to GADNR that deepening will not adversely impact recovery of striped bass
   - Shortnose Sturgeon
   - Additional field studies
   - No net effect on Dissolved Oxygen (DO)
   - Refine Hydrodynamic and Salinity Model

INVENTORY & FORECASTING CONDITIONS

An inventory and forecast of critical resources (physical, demographic, economic, social, etc.) relevant to the problems and opportunities under consideration in the planning area. This information is used to further define and characterize the problems and opportunities. A quantitative and qualitative description of these resources is made, for both current and future conditions, and is used to define existing and future without-project conditions.

ITEMS TO INVENTORY AND FORECAST

1. Fleet
2. Commodities
3. Operation procedures
4. Landside capacities
   - Berth characteristics
   - Throughput capacity
   - Acreage
   - Crane capacity
5. Fishery resources in the harbor
   - Shortnose Sturgeon
   - Temporal and spatial distribution of estuarine dependent species
   - Striped Bass
   - Scaienid species
6. Wetlands vegetation in the upper harbor
7. Cultural resources
   - Ft Jackson
   - CSS Georgia
   - Ft Pulaski
   - Others
8. Socioeconomic Considerations
9. Features of existing navigation project
   - Channel
   - Continued use of the existing harbor, at authorized channel dimensions, with no improvements for navigation. Periodic O&M would continue as required.
   - Disposal areas
   - Turning basins
   - Sediment Control Works
10. Adjacent Properties and Structures (to include)
    - Roussakis Plaza
    - East Coast Terminal
    - Blue Circle Cement
    - International Paper
    - Fife and Clydesdale Plantation
11. Water Quality Conditions

- Salinity Distributions
- Chloride Distributions
- Dissolved Oxygen Distributions

12. Sediment Quality
    - Physical
    - Chemical
13. Freshwater Marsh Succession
14. Wetland Resource Utilization
15. Ocean shoreline and riverbank conditions
16. Floridan Aquifer

WITHOUT PROJECT CONDITIONS

Existing conditions are those at the time the study is conducted. The forecast of the future-without project conditions reflects the conditions expected during the period of analysis. The future without-project condition provides the basis from which alternative plans are formulated and impacts assessed.

1. Initial assumptions
2. Detailed description
    - Fleet
    - Commodities
    - Operation procedures
    - Landside capacities
    - Fishery resources
    - Wetlands vegetation in upper harbor
    - Cultural resources
    - Socioeconomic considerations

FORMULATION OF ALTERNATIVE PLANS

Alternative plans shall be formulated to identify specific ways to achieve planning objectives within constraints, so as to solve the problems and realize the opportunities that were identified in Step 1. An alternative plan consists of a system of structural and/or nonstructural measures, strategies, or programs formulated to meet, fully or partially, the identified study planning objectives subject to the planning constraints. An alternative plan is a set of one or more management measures functioning together to address one or more objectives.

POTENTIAL MANAGEMENT MEASURES

Management measures are the building blocks of alternative plans and are categorized as structural and nonstructural. Equal consideration must be given to these two categories of measures during the planning process.

1. Reduce current and future tidal delays
    (a) Non-Structural
        1. Timing/schedule (dealing with a single vessel only)
        2. Reduce under keel clearance requirement
        3. Increase efficiency of landside operations to decrease turn-around time
        4. Specialization/optimization of facilities
            - Modification of Garden City Terminal
            - Increase efficiency of landside operations to decrease turn-around time
        5. Improved traffic management practices (dealing with coordination of multiple vessel movements)
        6. Regional port (feeder hub as well)
    (b) Structural
        1. Deeper channel
        2. Alternate terminal locations
            - Offshore transshipment facility
            - Onshore terminal
        3. Straighter channel alignment
        4. Passing lanes
        5. Increased/Improved landside infrastructure

2. Maneuverability of existing vessels
    (a) Non-Structural
        1. Improved equipment
        2. Vessel design modifications
            - Thrusters
            - Power
        3. Tug assistance
        4. Pilot training

5. Aids to navigation
   - Portable GPS navigation system
   - Harbor based vessel control system
   - Range lights/radar reflectors
   - Fixed radar reflectors along channel
6. Real time environmental data
   - Real time tide data vs. predicted tide
   - Wind speed and direction
   - Current speed and direction
7. Other

(b) Structural
1. Bend wideners
2. Turning basins
3. Passing lanes
4. Straighten river/longer ranges

3. Reduce the need to light load caused by channel depth constraints

(a) Non-Structural
1. Timing/schedule (dealing with a single vessel only)
   - Reduce underkeel clearance requirement
   - Increase efficiency of landside operations to decrease turn-around time
2. Specialization / optimization of facilities
   - Modification of Garden City Terminal
     a. Increase efficiency of landside operations to decrease turn-around time
     b. Specialization / optimization of facilities
3. Improved traffic management practices (dealing with coordination of multiple vessel movements)
4. Regional port (feeder hub as well)

(b) Structural
1. Deeper channel
2. Alternate terminal locations
   (a) Georgia
      - East Coast Terminal
      - Ocean Terminal
      - Elba Island
      - Brunswick
      - Other
   (b) South Carolina
      - Disposal Area 12A proposed terminal
      - Disposal Areas 14A/14B proposed terminal location
      - Tybee Island National Wildlife Refuge
      - Other locations
3. Offshore transshipment facility

4. Onshore terminal
5. Straighter channel alignment
6. Passing lanes
7. Increased/Improved landside infrastructure

4 Reduce the need to light load caused by operational constraints
(a) Non-Structural
1. Timing/schedule (dealing with a single vessel only)
2. Reduce under keel clearance requirement
3. Increase efficiency of landside operations to decrease turn-around time
4. Specialization / optimization of facilities
5. Improved traffic management practices (dealing with coordination of multiple vessel movements)
6. Regional port (feeder hub as well)

(b) Structural
1. Deeper channel
2. Alternate terminal locations
   - Offshore transshipment facility
   - Onshore terminal
3. Straighter channel alignment
4. Passing lanes
5. Increased/Improved landside infrastructure
   - Create breakwaters

5. Reduce underkeel clearance requirement

PRELIMINARY ALTERNATIVES

1. Reduce underkeel clearance requirement
   - Real time environmental data

2. Modification of Garden City Terminal
   - Increase efficiency of landside operations to decrease turn-around time
   - Specialization / optimization of facilities

3. Alternative terminal locations
   a. Georgia
      - East Coast Terminal
      - Ocean Terminal
      - Elba Island
      - Brunswick
      - Other

   b. South Carolina
      - Other than Disposal Areas 14A/14B proposed terminal

- Disposal Areas 14A/14B proposed terminal location
- Tybee Island National Wildlife Refuge
- Other locations

4. Regional port

5. Offshore transshipment facility

6. Deepening existing 42 MLW navigation channel (to Station 103)
   - Alternative 44 (44' Deepening)
   - Alternative 46 (46' Deepening)
   - Alternative 48 (48' Deepening)

7. Improve existing 42 MLW navigation channel
   - Passing Lanes
   - Bend Wideners
   - Aids to navigation
   - Coordination of multiple vessel movements
   - Straighten river / Longer ranges

EVALUATION OF PRELIMINARY ALTERNATIVES

Savannah District conducted a conceptual-level evaluation of the preliminary alternatives identified in the previous section to determine whether they were likely to meet the problems and needs that this project is intending to address. We first examined the non-structural measures (underkeel clearance and modifications to the Garden City Terminal), then the alternative terminal locations, followed by the minor modifications passing areas, bend wideners, aids to navigation, vessel traffic coordination, and straightening of the river).

NON-STRUCTURAL ALTERNATIVES

Tier II plan formulation has considered a wide variety of nonstructural measures to address navigation problems and opportunities in Savannah Harbor. Most of these measures were screened out due to technical or economic considerations. However, two nonstructural measures were carried forward for more detailed evaluation in this investigation: (1) reduce underkeel clearance requirements and (2) increase efficiency of landside operations to decrease turn-around time. Both of these measures could potentially reduce lightloading and/or tidal delay costs to vessels that are constrained by existing channel dimensions in Savannah Harbor.

1. Reduce underkeel clearance requirement.

Existing Conditions: Underkeel Clearance

Reducing underkeel requirements could potentially reduce lightloading and tidal delays experienced by commercial vessels calling at Savannah Harbor. If, as expected, design drafts of container ships continue to increase, lightloading and tidal delays could become increasingly prevalent during the 50-year period of analysis. Reductions of these problems would reduce transportation costs for commercial navigation through Savannah Harbor with consequent National Economic Development (NED) benefits.

Underkeel Guidelines of Port User's Workgroup

In 1996, a Port Users Workgroup was assembled to coordinate commercial navigation operations in Savannah Harbor. The Port Users Workgroup consisted of representatives of the SPA, GPA, shippers, terminal operators, towing companies, and other maritime industry professionals. Also included were the Corps, USCG, and other Federal agencies responsible for safe and efficient navigation on these waterways. The Workgroup discussed current underkeel and safe transit guidelines for the ports of Savannah and Brunswick. The intent of this cooperative partnership was to proactively implement proven guidelines and operating controls to promote marine safety and to prevent economic and environmental loss by not imposing overly restrictive government regulation and controls. As a result of this coordination, the Workgroup developed *Port of Savannah Minimal Underkeel Clearance Guidelines for Minimum Underkeel*

Clearances. The guidelines were adopted by parties to the Workgroup as minimum operational standards for vessels transiting Savannah Harbor. These guidelines may be modified in the future by a similar representative body of Savannah's port users. The purpose of the guidelines is to proactively prevent maritime accidents and casualties. They were also intended to remove ambiguity and inconsistency in the procedures necessary to ensure that commercial vessels do not ground during transit or while berthed at a Savannah facility.

The underkeel guidelines for commercial vessels are as follows. They are applicable to all vessels in excess of 1600 gross tons.

"The following minimum underkeel guidelines apply in all conditions of tide and weather.

1. *4 feet for transits in the navigation channel between the sea buoy, across the Savannah Bar, through Jones Island range, ACOE station -14, where the project depth of the channel increases 2 feet.*
2. *2 feet for transits between Jones Island range and the point in the navigation channel which is adjacent to the facility of destination.*
3. *When operating on waters outside the established navigation channel, and while moored at a facility pier, 1 foot for single-skin tank vessels greater than 5,000 gross tons and 6 inches for all other deep draft vessels. These guidelines are also applicable for vessels maneuvering outside the boundaries of the navigation channel."*

The underkeel clearance specified by the guidelines includes squat. Squat is the phenomenon whereby the ship's draft is increased in shallow water due to the hydrodynamic effects between the ship and the channel bottom causing an increase in draft. It effectively reduces the underkeel clearance in areas where clearance may be critical. It can also impair maneuverability. Squat is approximately proportional to the speed of the ship. Halving the speed reduces the squat effect by a factor of four. In general, squat effects typically commence in waters where the depth/draft ratio is less than four-to-one.

In addition to underkeel clearance, the guidelines identified the following operational responsibilities and controls necessary to meet these objectives.

- The guidelines request that the Corps conduct regular surveys of the navigation channel and provide reports of the channel condition to the pilots and all concerned parties. At a minimum interval of every 90 days, or within 30 days prior to the arrival of a deep draft vessel, terminal operators are asked to conduct soundings in their berths.
- A conference between a vessel's master and the appropriate pilot should occur prior to the vessel's inbound or outbound transit. This pre-transit conference allows pilots to discuss with vessel masters the transit route and any special risks that the transit may incur.

- If a vessel in transit, using "tidal lift" to assure its underkeel clearance should experience a steering failure or loss of power that requires the vessel to be anchored, it shall be assisted by tugs to a safe anchorage. This anchorage shall be either offshore or in the vicinity of a Savannah River range or facility that has depth sufficient to accommodate the vessel's draft. It is the responsibility of the vessel's agent and master to identify, in advance, the towing requirements necessary to ensure the aforementioned actions may take place in a timely manner.
- The SPA's Pilotage Regulations are the recognized standard for maximum deep draft of vessels crossing the Savannah Bar under normal weather and navigation channel conditions.
- If a vessel is using "tidal lift" to assure minimum underkeel clearance while moored at a facility, that vessel must have a contingency plan in place which provides the personnel necessary to move the vessel away from the facility prior to exceeding the clearance. Additional discussion on this subject is provided below.
- A waiver for any of the underkeel clearance guidelines may be applied for by sending a written request, with supporting documentation, to the Port User's Workgroup. In certain cases, a request for waiver may necessitate the specific approval of the USCG.

Discretion of Pilots

According to the Savannah Pilots Association, it is the pilot's decision whether conditions are adequate for a vessel to transit the river at a given time. The Savannah underkeel guidelines are minimum standards and are not intended to be limiting for pilots, operators, or owners that choose to require a higher degree of safety for their operations. It is also the owners/operators discretion to require that their vessels transit with underkeel clearance in excess of the minimum requirements established by the guidelines. For example, a major containership carrier line, P&O Nedlloyd, has a policy that underkeel clearance requirements for their vessels should equal 10% of the vessels' design drafts, which is more than four feet for the largest containerships calling at Savannah.

By riding the high tide up or down the river vessels that are depth-constrained by channel dimensions of Savannah Harbor can achieve additional underkeel clearance, allowing deeper loading of a given vessel or use of a larger vessel. The tradeoff is the additional time required to wait for a favorable tide (i.e., tidal delay), and any additional steaming time required to reach the dock when "drifting" the tide. As indicated above, the Pilotage Regulations of the SPA are the recognized standard for inbound and outbound transits for vessel that are depth-constrained. These regulations specify time windows in the tidal cycle when vessels of specific draft can initiate inbound/outbound transits (see Table 1). Vessels with operating drafts of 38 feet or less can transit the channel at any time, weather permitting. Vessels drawing up to 42 feet can transit the channel using tidal advantage consistent with the Pilotage Regulations.

Table 1
Pilotage Regulations of the
Savannah Pilots Association
(12/15/94)

Start		Deadlines
	Inbound	
LW + 3.0 hours	42'00"	HW – 1.0 hours
LW + 2.5 hours	41'00"	HW – .5 hours
LW + 1.5 hours	40"00"	HW
LW + 1.0 hours	39'00"	HW
LW---anytime	**38'00"**	**LW---anytime**
LW + 2.0 hours	39'00"	HW – 2.5 hours
LW + 2.5 hours	40'00"	HW – 2.0 hours
LW + 3.0 hours	41'00"	HW – 1.0 hours
LW + 3.0 hours	42'00"	HW – .5 hours
	Outbound	

LW = Low Water; HW=High Water
All Vessels GCT (General License)
Tides – Savannah River Entrance
Wind Factor – 0
Time Limits Subject To Change Due To Weather Conditions Or Low Powered Vessels Or Emergencies
FROM SAVANNAH RIVER TO TOWN
+ 1 hour - high water
+ 1-1/2 hours – low water

The pilots use every available means to safely transit the harbor. In pre-transit coordination, vessel masters provide the pilot with the characteristics and condition of their vessels, including: mean draft, trim and list, and speed/squat. In turn, pilots provide vessel masters with information about physical conditions in the harbor, including: tide, seas, wind conditions, facility depth, and transit depth. The pilots currently have real-time information about channel depths from National Oceanic and Atmospheric Administration (NOAA) tide gauges, which can be accessed by cell phone. The Corps and port facilities provide the pilots and vessel masters with up-to-date information on channel depths and berth depths, respectively. The pilots are also aware of areas subject to shoaling and the type of material accreted. Much of the substrate of the Savannah Harbor Federal channel is either hard sand or soft mud.

Commercial ships must keep up their speed to maintain steerage in the tidal currents, and squat can be significant at speeds typically maintained by vessels in the harbor. The underkeel guidelines assume the vessel has good maneuverability. At low water (LW), vessels with good maneuverability would have a 38-foot operating draft in the 42-foot channel. If the vessels have poor maneuverability, the pilots may require as much as five or six feet of clearance underkeel.

Without-Project Future Conditions: Underkeel Clearance

As expressed by Capt. Browne the Savannah pilots consider the Savannah underkeel guidelines to be the minimal underkeel clearance necessary to safely navigate Savannah Harbor and fully expect that the current underkeel clearance guidelines will prevail throughout the period of analysis. The Panamax container ships which call at Savannah can have lengths overall (LOA) of up to 950 feet. Post-Panamax ships are longer. The pilots consider the underkeel guidelines to be the absolute minimum for commercial vessels, given potential pitch and roll. As indicated above, it is the pilot's discretion at all times to delay in order to ensure additional clearance.

The Savannah underkeel guidelines are consistent with other deep-water ports in the United States. Specifically, the ports of New York – New Jersey, Delaware River, Norfolk – Hampton, and Los Angeles – Long Beach require a minimum of three feet underkeel in their harbors.

With-Project Conditions: Reduced Underkeel Clearance

The SPA is resolute in its defense of the Savannah Underkeel Guidelines. Although the guidelines indicate that modification is possible by the Port User's Workgroup or a similar body representative of the Savannah port community, the SPA cannot envision any circumstances under which those guidelines would be reduced.

Conclusion: Underkeel Clearance

At this time there is no potential for reduced underkeel clearance to address navigation problems and opportunities in Savannah Harbor. The underkeel clearance currently

stipulated by the guidelines does not offer any opportunity for reduction when vessel squat is included in the clearance calculation. In addition, the resolute opposition by the SPA on the basis of navigational safety indicates a lack of institutional support for this nonstructural measure. Based on coordination with GPA and USCG, the position of the Savannah Pilots Association is the most critical determinant of underkeel clearance in port operations in Savannah Harbor.

2. Modifications of Garden City Terminal (GCT).

As a nonstructural measure, modifications to Garden City Terminal would entail improvements to the container throughput capacity of the terminal, and would also be considered under the without-project conditions. The rationale for this particular nonstructural alternative is that increasing the efficiency of the terminal could potentially decrease the turn-around time for vessels calling at the terminal. Given the growth forecasts for containers moving through Savannah Harbor during the period of analysis, the decreased turn-around time could potentially reduce congestion and increase throughput in the port relative to the without-project conditions.

Specifically, it must be determined to what extent this nonstructural measure could address problems associated with channel dimensions which are insufficient to efficiently accommodate the fleet of container ships expected to call on Savannah during the period of analysis.

Existing Conditions: Facilities and Throughput Capacity

Garden City Terminal, which is a public terminal operated by GPA, is profiled in Table 1. At this terminal there are currently an average of approximately 16,000 picks (i.e., containers to/from a vessel) per week. During peak periods, there can be as many as 17,500 picks/week. This translates into approximately 830,000 picks/year (assuming a 365-day per year operation) and 1.5 million 20-foot equivalent units (TEUs) per year (assuming a 1.8 factor to account for the predominance of 40-foot boxes). In FY 2002, Garden City Terminal had 1,136,616 TEUs pass through this terminal. Garden City Terminal encompasses approximately 1,200 acres with 500 acres dedicated to container operations and storage. The remaining acreage is occupied by rail facilities, warehouses, tank farms, and buildings. At this time, all of the Garden City berths are maintained at 42 feet deep, consistent with the depth of the Savannah Harbor Federal channel

Table 2: Garden City Terminal Facilities
Cargo Handled: Containers, General Cargo, Ro/Ro, Project Cargo, and Liquid Bulk
Terminal Area: 1,120 acres
Container, RO/RO Berths Linear Feet: 7,726 Depth Alongside 42 ft. at mean low water Dock Height 15 ft. above mean low water Apron Width Up to 196 ft.
Liquid Bulk Berths Linear Feet: 682 Depth Alongside 36 ft. (10.9 m.) at mean low water Dock Height 15 ft. (4.5 m.) above mean low water Liquid Tank Farm 2.2 million barrel capacity
Container Cranes Total: 13 (2 super post-Panamax and 11 post-Panamax)
Equipment Rubber-Tired Gantries: (22) 45-st capacity Four-high loaded toplifts: (25) 67,400 lb. under spreader capacity; (7) 87,000 lb. under spreader capacity Three-high loaded toplifts (3) 87,000 lb. under spreader capacity Five-high empty stackers (6) 15,000 lb. capacity under spreader capacity Forklifts (43) 11,000 lb. - 52,000 lb. capacity with accessory attachments Over-height crane attachment (1) 45-st capacity spreader loader; (2) 56-st (50 lt) capacity spreader loader
Warehousing: Total 1,417,808 sq. ft., equipped with alongside rail/truck capabilities, includes 68,150 sq. ft. cold storage
Container Field Paved Area (acres) 405 Paved Area (hectares) 164 Parking Slots 12,345 TEU Stacking Slots 33,598
Rail Services: Norfolk Southern Railroad provides switching services; interchange and line haul services provided by Norfolk Southern Railroad and CSX Transportation. Newly-completed Mason Intermodal Container Transfer Facility (ICTF) is located adjacent to Garden City Terminal. ICTF spans over 150 acres. At final build-out, the ICTF will include 40,000 feet of lead track and 80 acres for container storage and marshaling. This facility now daily handles unit trains.

With its current facilities, Garden City Terminal currently has an annual throughput capacity of approximately 1.75 million TEUs. This capacity estimate is based on current container storage capacity at Garden City Terminal (500 acres of container storage with storage capacity of approximately 3,512 TEU's per acre per year).

Permits for construction of Container Berth 8 (CB-8) were received in November 2003. CB-8 will include approximately 2,100 linear feet of berthing space, and four high-speed super post-Panamax container cranes, and 80 acres of landside storage. As part of GPA's plans for development of CB-8, yard capacity will be augmented by an additional 75 acres of GPA-owned land south of Berths 7 and 8. It is anticipated that, of this area, 42 acres will be used for container storage; the remainder will be used for relocated gate operations and vehicle/trailer depots. Relocation of these activities will provide additional container storage near the terminal berths.

There are currently 2,500 to 3,000 TEU moves by rail per week through the Mason Intermodal Container Transfer Facility (ICTF). At this time, Norfolk Southern is the only railroad that operates from the ICTF. However, CSX is currently developing rail connection to this facility with completion expected in 2005-2006. Norfolk Southern provides service to Atlanta five days per week, effectively competing with truck transport. Norfolk Southern's access to ICTF is via the Foundation Lead track. Norfolk Southern currently loops eastward to its yard in Savannah and comes in the east side of ICTF. CSX and Norfolk Southern intend to construct connector rails from their tracks south of ICTF for more direct access to ICTF from the west side. Norfolk Southern owns Foundation Lead but is expected to reach agreement with CSX regarding their use of this track.

The ICTF can accommodate 8,000-foot unit trains. Through this facility, Norfolk Southern provides expedited, overnight rail service to Atlanta and offers users seamless 3-day delivery, or less, by rail to major American hubs in Chicago, Detroit, Dallas/Fort Worth, Memphis, Kansas City, St. Louis, Louisville, Houston, New Orleans, Mobile, as well as other key destinations throughout the United States. The Mason ICTF now handles daily unit trains.

Without-Project Conditions

GPA is making significant investments to maintain state-of-the-art container handling facilities at Garden City Terminal, and GPA is committed to providing the terminal facilities and landside infrastructure necessary to accommodate its future customer.

Facilities and Throughput Capacity

GPA's capital planning process will expand the throughput capacity of the terminal consistent with anticipated sizes and frequencies of container vessels calling at the terminal and with the expected volumes of containers to pass through the facility. GPA's capital planning horizon is 10 years. At this time, GPA anticipates that the volume of containers moving through Garden City Terminal will increase five to seven percent per year over the period of analysis. The capital planning process is designed to anticipate future commodity volumes with sufficient time to implement needed improvements to ensure that facility capacities always meet or exceed the total throughput needs of shippers utilizing this terminal.

Recent, ongoing, and planned improvements at Garden City Terminal include the installation in 2003 of two super post-Panamax cranes to augment the capacity of 11 post-Panamax cranes already in place. The development of the Mason ICTF, the ongoing realignment of container stacks to facilitate the faster movement of containers to/from ships and storage, and the pursuit of navigation improvements in Savannah Harbor.

At this time, GPA is pursuing increased efficiencies in landside handling and storage and new berths and facilities capable of handling post-Panamax container ships. In pursuit of increased efficiencies in container handling and storage, GPA intends to increase storage densities and thereby augment throughput capacity. GPA's goal is to increase storage utilization from the current level of 3,512 TEUs per acre per year to 5,500 TEUs per acre

per year. Achieving this level of storage utilization in the entire container operations would increase terminal capacity to 2,750,000 TEUs, not including additional capacity expected with CB-8. U.S. container ports typically handle 2,000 to 5,000 TEUs per acre per year. Consequently, the 5,500 per acre per year target is realistic with current technology.

Permits for construction of CB-8 have been obtained and development of these facilities has been initiated. CB-8 will add 2,100 linear feet of berth with 75 acres of yard, or approximately 0.04 acres (1,556 square feet) per linear foot of berth. The anticipated CB-8 yard area would be consistent with yard areas supporting existing container berths at Garden City Terminal. Currently, the container berths at Garden City are approximately 7,726 feet long with 405 acres of container yard, or approximately 0.05 acres (2,283 square feet) per linear foot of berth. If the 5,500 per acre per year storage utilization is applied to the CB-8 back area, implementation of CB-8 would augment terminal throughput by approximately 440,000 TEUs.

At this time, GPA does not have a precise date for achieving their target storage capacity 5,500 TEUs per acre per year. However, GPA is making ongoing improvements to storage capacity toward this goal. These improvements include: (1) continuing ongoing realignment of the container stacks to facilitate vessel loading/unloading, and (2) pavement work to increase the load-bearing capacity of container storage areas, allowing increased storage densities. The container stacks have been undergoing realignment from an orientation that was perpendicular to the dock, to an orientation that is parallel to the docks. Realignment and pavement work are taking place at Berths 1-5. Work on CB-1, CB-2 and CB-3 is complete. CB-4 and CB-5 are scheduled to occur in FY06 through FY10. Realignment has been completed on CB-6 and CB-7. These storage-related improvements could increase the terminal's throughput capacity to 2.0 million TEUs in the near future. No new equipment would be required to achieve this throughput capacity increase.

Toward the goal of 5,500 TEUs per acre per year, GPA is also increasing density and stacking heights for loaded and empty containers. This will open up more area for realignment. Currently containers at Garden City Terminal are stacked 4-high (loaded) and 5-high (empties). All of the handling equipment GPA has been purchasing can handle 5-high loaded and 7-high empties. However, GPA is not consistently stacking at these heights. The goal is to consistently stack 5-high (loaded) and 7-high (empties). GPA continues to budget for new equipment purchases through the end of their budgeting cycle – 2010.

Other actions to increase terminal capacity would entail incorporation of adjacent GPA properties into container operations. Additional storage capacity and terminal throughput capacity could be achieved by incorporating GPA-owned properties south and west of the terminal into terminal operations. The property associated with the anhydrous ammonia facilities south of Berth 7 should become available to GPA when the lease for this 16-acre property expires in December 2008. Incorporation of this acreage into terminal operations could occur in 2009. In a 2002 capacity analysis Moffett & Nichol estimated

incorporation of this property into terminal operations could increase annual throughput capacity by 75,000 TEUs. This addition to terminal throughput capacity would be consistent with the target storage utilization rate of 5,500 TEUs per acre per year.

The potential expansions of Garden City Terminal throughput capacity discussed above are summarized in Table 3. This table suggests the above measures, if implemented, could increase Garden City Terminal's capacity to 3.85 million TEUs per year.

TABLE 3
PLANNED AND EXPECTED MEASURES TO AUGMENT CAPACITY
GARDEN CITY TERMINAL

Improvements	Capacity Augmentation (TEUs)	Year
Current Throughput Capacity	1,750,000	2003
Increase Storage Utilization to 5,500 TEU per acre per year, Including: realigning stacks, improved pavement, increasing stack heights and densities	+ 1,000,000	Ongoing
Bring new berth (CB-8) on line	+ 440,000	2007
Incorporation of Anhydrous Ammonia Property at CB-7	+ 75,000	2008
Off-Site Storage of Long-Dwell Empties	+ 200,000	2015/2019
Incorporation of Garden City Triangle Property	+ 385,000	2015/2019
Total	3,850,000	

Table 4 presents container volumes in TEUs shipped annually through Garden City Terminal from Fiscal Year (FY) 1999 to 2003 (July to February). As indicated in this table, 1.5 million TEUs were shipped through this terminal in FY 2003. This suggests that Garden City Terminal is approaching its current throughput capacity of 1.75 million TEUs. It also explains why GPA is expanding capacity via development of CB-8 and increased storage efficiency.

TABLE 4
TEUs SHIPPED THROUGH
GARDEN CITY TERMINAL
1999-2003

Fiscal Year	TEUs Shipped Through Garden City Terminal	Annual Growth Rate (%)
1999	761,000	
2000	845,400	11%
2001	1,021,200	21%
2002	1,137,100	11%
2003	1,505,300	32%
	Average	19%

If a 5-percent growth rate is experienced for containers moving through the terminal, the 3.85 million TEU capacity in Table 3 could accommodate growth through 2023. If a 7-percent growth rate occurs, this capacity would be sufficient through 2017. As indicated in Table 3, there is some uncertainty about the timing of capacity expansion at Garden City Terminal. The most immediate capacity expansions will be achieved before the project's base year of 2010 through the ongoing realignment of container stacks and pavement work to allow higher stacking of loaded and empty boxes.

GPA has the last two measures shown in Table 3 in their Strategic Plan for the Garden City Terminal, but will not need to implement them until beyond the scope of their 5-year budgeting cycle, which presently extends to 2010. Based on a 5-percent growth rate, GPA would not need those two measures until 2019. With a 7-percent growth rate, GPA would need them in 2015. GPA presently owns the lands on which both measures would occur, so funding is the only factor that limits when these measures could be in place. GPA continuously monitors the throughput capacity of the terminal and actively manages the facilities to stay ahead of the volumes of TEUs expected to employ that capacity. Improvements are typically made so that the needed capacity is in place one-year prior to when it is actually needed. A one-year construction period would be adequate to implement these measures. Therefore, if implemented the same year, these measures would need to be included in GPA's 2017 budget, if a 5-percent growth rate occurs, or the 2013 budget if a 7-percent growth rate occurs. With GPA's 5-year budgeting cycle, these measures would be include in their budgets prepared in 2012 if a 5-percent growth rate occurs, or 2008 if a 7-percent growth rate occurs.

The last two measures shown in Table 3 would provide slightly more capacity than that required to accommodate the containers expected to be handled by the larger vessels that would use a deeper channel. Since GPA has already identified what measures it would take to provide that capacity, has acquired the land necessary to implement those measures, has identified when it would need to take further steps on those measures (beginning to budget for them), and has demonstrated a willingness and ability to make sufficient capacity improvements to stay ahead of the terminal throughput volume, Savannah District believes that GPA will implement these two measures even if harbor deepening does not occur.

Berth Utilization and Port Congestion

The viability of modifications to Garden City Terminal as a nonstructural measure depends in part on the level of current and future berth congestion. The premise of this measure is that if turn-around time for vessels could be decreased, there might be less berth congestion, allowing depth-constrained vessels greater opportunities to take advantage of the tides and transit the system more rapidly.

Garden City Terminal currently has a berth utilization of approximately 42 percent (based on a 24-hour operation, 365 days/year). Based on industry standards that typically describe 50 percent as full practical berth utilization, this level of berth utilization is approaching full utilization. A 2002 capacity analysis by Moffat & Nichol identified 30 percent capacity utilization as full utilization. However, according to GPA managers,

this relatively-low utilization rate was intended as a trigger point for development of additional berth capacity. Some berths are occupied more often than other berths depending on their locations relative to container stacks, as well as other considerations. Some shippers prefer to use specific berths because of the more direct access they provide to boxes slated for their ships. Garden City Terminal managers make every effort to accommodate the berth preferences of shippers. The need for additional berth space, as well as the increasing use of post-Panamax container ships, was the impetus for development of CB-8.

Berth utilization is typically calculated using the following formula:

Berth Utilization = [Time at Berth / Time Berth Available] x [(LOA + tie down) / Berth Length]

Container vessels calling at Garden City typically spend 8-12 hours at berth. The average container vessel arriving at Garden City is 965 feet in length overall (LOA). Container vessels arrive/depart Garden City Terminal at an average frequency of approximately 24 vessels per week.

GPA estimates that the addition of Container Berth 8 will reduce overall facility berth utilization by 6 percent to 37 percent. Depending on the vessels at dock, Berths 7 and 8 could accommodate up to three ships. The berth utilization at Garden City Terminal with the addition of CB-8 will still be relatively high. Berth congestion may require other measures during the period of analysis to increase berth capacity.

With-Project Conditions: Modification of Garden City Terminal

Based on discussions with GPA managers, modifications to Garden City Terminal as a non-structural measure would likely involve an acceleration of GPA's capital planning to create additional capacity to reduce turn-around time relative to without-project conditions. However, for several reasons the risks and rewards of accelerating the capital program would likely not be advantageous for GPA to pursue.

First, accelerating the capital program would be expensive. The goal of capital planning is to provide needed facilities when they are needed, not before or after. The financial investments required to significantly increase terminal throughput capacity are typically very large. If that equipment, which immediately begins to depreciate, is unutilized or underutilized, the costs would not be justifiable financially.

Second, even if such investments were made and berth utilization declined significantly, the rewards would be small. As discussed in the Tier I Economics Appendix, most of the draft-constrained container ships that enter/leave Savannah Harbor do so light-loaded. There is some riding of the tide by container ships for depth advantage, but in general liner services prefer to light-load rather than ride the tide due to their tight, multi-port schedules. The marginal benefit of deeper loading is not offset by the cost to customers of potentially slipping their service schedules. In addition, the increased availability of berths at Garden City would only affect a subset of depth-constrained vessels by marginally increasing their tidal window to transit the channel. It is also questionable

whether a minor reduction in time spent transiting the system would result in transportation time and cost savings for vessels calling at multiple ports, since they must maintain precise arrival / departure schedules at the prior and next ports of call.

The benefits of reduced turn-around time associated with facility improvements would likely not be offset by the financial cost of those improvements, particularly when they would be underutilized for a longer period of time than under without-project conditions.

Conclusion: Modification of the Garden City Terminal

Based on this investigation, the following conclusions can be drawn about modifications to Garden City Terminal as a non-structural measure. First, GPA is presently upgrading the facilities serving this terminal to increase its throughput capacity. Second, GPA has identified additional improvements that it would implement when needed. These improvements are expected to occur after the 2010 base year of the project. Third, there are likely to be some minor benefits associated with accelerating the capital planning process for the terminal. Fourth, these benefits will be difficult to measure in terms of time and expense. Fifth, the benefits are likely to be exceeded by the costs of implementing those improvements, since they would be underutilized for some period of time after they are in place. It should also be noted that, if there were any clear economic advantage to reduce turn-around time to increase tidal windows via measures to improve terminal capacity or efficiency, GPA would already be pursuing these actions, as they are already doing under without project conditions.

EVALUATION OF ALTERNATIVE TERMINAL LOCATIONS

The purpose of this investigation was to evaluate the potential for alternative terminal locations to address navigation problems and opportunities in Savannah Harbor. The evaluation of the alternative terminal locations is consistent with criteria established by Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (U.S. Water Resources Council, 1983) and the policies and procedures established by ER 1105-2-100, Planning Guidance Notebook, 22 Apr 2000. The evaluation of alternative terminal locations includes technical, economic, and environmental considerations.

Earlier Tier II plan formulation activities identified alternative terminal locations as having the potential to address navigation problems and opportunities in Savannah Harbor. The following alternative terminal locations were carried forward for more detailed evaluation in this phase of the investigation.

- Georgia
    - Garden City Terminal,
    - East Coast Terminal,
    - Ocean Terminal,
    - Elba Island,
    - Brunswick, and

  - Other locations.
- South Carolina
  - Disposal Area 12A,
  - Disposal Areas 14A/B,
  - Tybee Island National Wildlife Refuge (NWR), and
  - Other locations.

The earlier plan formulation activities also recognized the potential for an offshore transshipment facility to serve depth-constrained container ships calling at Savannah Harbor and potentially other South Atlantic ports, such as Jacksonville or Charleston. An examination of the feasibility of offshore transshipment facility is included in the array of alternative terminals considered in this section.

SCOPE OF THIS INVESTIGATION

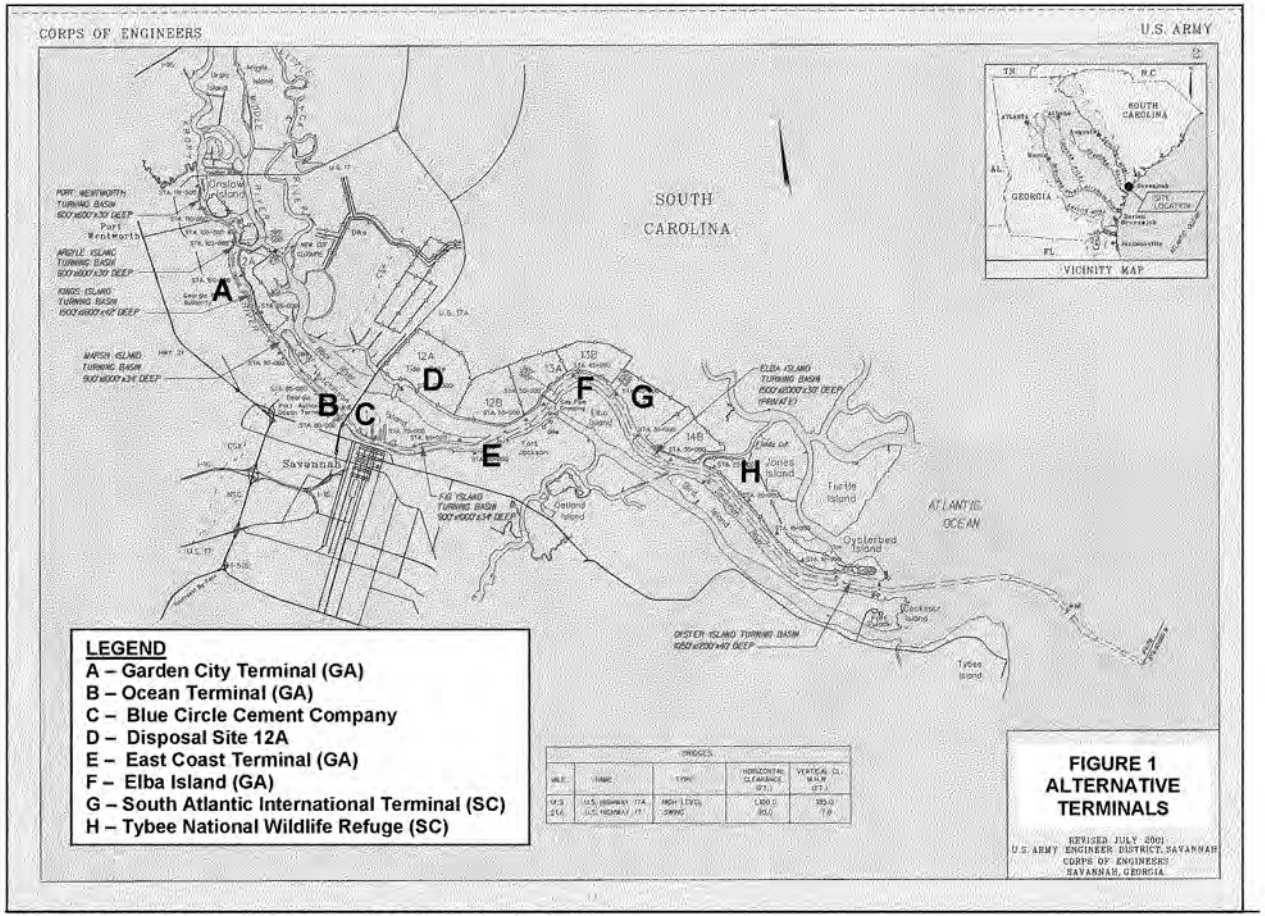
The Tier I Selected Plan consisted of deepening Savannah Harbor to 48-feet mean low water (MLW) from the Garden City Terminal to the sea. The premise for the alternative terminal locations is that they could be located downstream from the Georgia Port Authority's (GPA's) Garden City Terminal to reduce dredging costs and possible environmental impacts associated with saltwater intrusion. To address navigation problems and opportunities in Savannah Harbor, channel deepening would be implemented only as far as the single terminal that would serve the deeper vessels, but not beyond. If that terminal could be located closer to the ocean than the Garden City Terminal, perhaps the total economic and environmental costs would be less.

The concept is that no matter where the terminal serving the deeper-draft vessels is located, Savannah Harbor would have: (1) channel dimensions sufficient to accommodate fully loaded Post-Panamax (those with a beam greater than 106-feet) container ships, and (2) throughput capacity sufficient to accommodate the anticipated growth in the volume of containers expected over the period of analysis.

ALTERNATIVE CONTAINER TERMINALS

The alternative terminal locations considered in this investigation are illustrated in Figure 1, with the exception of the Colonel's Island terminal in Brunswick, Georgia. The locations considered include those identified early in Tier II plan formulation, as well as several others subsequently identified through coordination between Savannah District and GPA. As indicated in this figure, the terminals include: Garden City Terminal, Ocean Terminal, East Coast Terminal Company site, Elba Island, and Blue Circle Cement Company on the Georgia side of the Savannah River, and Disposal Area 12A, Disposal Sites 14A/B, and Tybee National Wildlife Refuge on the South Carolina side of the river.

Initial coordination between Savannah District and GPA identified Port Royal, South Carolina as an alternative terminal location. Port Royal is located approximately 10 miles north of Hilton Head Island along the Beaufort River. This site was eliminated from detailed investigation in this analysis due to geotechnical considerations. Savannah District's Engineering Division discovered that a freshwater aquifer lies close to the surface at Port Royal. This site was not carried forward for detailed investigation due to concerns that deepening the Beaufort River could result in saltwater intrusion into this important source of water supply.


CORPS OF ENGINEERS
U.S. ARMY
SOUTH CAROLINA
VICINITY MAP
SOUTH CAROLINA
GEORGIA
SITE LOCATION
Savannah
Jones Island
Turtle Island
Oysterbed Island
Oatland Island
Tybee Island
ATLANTIC OCEAN
A
B
C
D
E
F
G
H
LEGEND
A – Garden City Terminal (GA)
B – Ocean Terminal (GA)
C – Blue Circle Cement Company
D – Disposal Site 12A
E – East Coast Terminal (GA)
F – Elba Island (GA)
G – South Atlantic International Terminal (SC)
H – Tybee National Wildlife Refuge (SC)
FIGURE 1
ALTERNATIVE
TERMINALS
REVISED JULY 2001
U.S. ARMY ENGINEER DISTRICT, SAVANNAH
CORPS OF ENGINEERS
SAVANNAH, GEORGIA

ENVIRONMENTAL CONSIDERATIONS:

During the initial phases of Tier II, the Stakeholders Evaluation Group assisted the project in identifying other environmental issues that could be considered during Tier II. As a result of that and other input, the following issues are being considered during development of the GRR and Tier II EIS:

- Issues identified in Tier I as requiring further study:
  - Impacts to the wetlands from changes in salinity, particularly wetlands located in the Savannah National Wildlife Refuge
  - Impacts to the endangered shortnose sturgeon from changes in salinity and dissolved oxygen
  - Impacts to striped bass spawning and nursery habitat from changes in salinity and other factors
  - Impacts to the City of Savannah's water intake from changes in chloride levels
  - Impacts to dissolved oxygen levels
- Verification of the 3-Dimensional Hydrodynamic Model
- Salinity changes
- Dissolved oxygen
- Chloride levels
- Striped Bass
- Shortnose Sturgeon
- Freshwater Wetlands
- Salt Water Wetlands
- Tide Gate Restoration
- Cumulative Impacts from Previous Dredging
- Closing Middle River
- Fishery management Plans
- Anadromous Fish Populations
- Other Fish Species: Red Drum, American Shad, River Herring
- Essential Fish Habitat
- Endangered Species Act Compliance
- Management of Contaminated Sediments
- Beach Erosion
- Channel Slope Erosion
- Fort Pulaski Erosion
- Dissolved Oxygen/Fecal Coliform on Beaches
- Agitation Dredging
- Sand as a Resource
- Upstream Water Releases
- Project Economics
- US Army Corps of Engineers Section 1135 Restoration Study
- US Army Corps of Engineers Savannah River Comprehensive Study

- Bend Widener Impacts
- Fort Pulaski Impacts
- Dredged Material Disposal Capacity and Impacts
- Impacts on Adjacent South Carolina Properties
- Integration with COE Savannah River Basin Comprehensive Water Resource Management Study
- Tidal Amplitude
- Drinking Water Aquifer
- Ballast Water
- Cultural and Historic Resources
- CSS Georgia Impacts
- Old Fort Jackson Impacts
- Impacts on Adjacent Georgia Properties
- Environmental Justice
- Multiport Analysis
- Landside Infrastructure
- Alternate Methods to Improve Transportation Efficiencies
- Alternate Sites for Terminal Operations
- Consistency with Coastal Zone Management Plans

At this point in the process the study team believes that the following potential impacts have the potential to result in substantial mitigation costs to the proposed project:

- Direct impacts to wetlands along the river from construction activities.
- Secondary impacts to wetlands resulting from changes in salinity, particularly wetlands located near the Savannah National Wildlife Refuge.
- Impacts to the endangered shortnose sturgeon from changes in salinity and dissolved oxygen.
- Impacts to striped bass spawning and nursery habitat from changes in salinity and other factors.
- Impacts to the City of Savannah's industrial water intake from changes in chloride levels.
- Impacts to dissolved oxygen levels.
- Effects of increasing traffic volumes through the city.

Therefore to the extent possible, the scope of impacts expected to occur on these resources should be included while considering the likely feasibility of preliminary alternatives. Since the detailed studies that will identify the extent of the impacts to these resources are still underway, the study team decided to use the level of impacts identified during Tier I, since that would constitute the best information available at the time decisions need to be made.

Tier I estimated the extent of impacts expected if the navigation channel were deepened to the Garden City Terminal. Several resource agencies and members of the public have expressed a belief that impacts to natural resources would be less if the channel were not

deepened as far upstream. That is true to some extent. Based on the technical experience within the Savannah District, the following table was developed that displays the extent of impacts expected to the critical resources identified previously, when compared to the impacts identified if the channel were deepened to Garden City Terminal. As can be seen, fewer direct and secondary impacts are expected as the extent of construction is reduced to lower portions of the harbor.

TABLE 5
EXPECTED PERCENTAGE OF MITIGATION NECESSARY FOR ALTERNATIVE TERMINAL SITES WHEN COMPARED TO GARDEN CITY TERMINAL

Impact Category	Garden City Terminal	Ocean Terminal	Blue Circle Site	Disposal Area 12A	East Coast Terminal	Elba Island	Disposal Site 14A/14B	Tybee NWR
Chlorides at City's Industrial Water Intake	100	75	70	0	0	0	0	0
Dissolved Oxygen	100	75	70	20	20	0	0	0
Cultural/Historic	100	100	100	100	100	0	0	0
Direct Construction Impacts	100	75	70	65	55	30	25	10
Secondary Wetland Impacts	100	75	70	25	0	0	0	0
Shortnose Sturgeon Habitat	100	75	70	20	20	0	0	0
Striped Bass Habitat	100	100	100	0	0	0	0	0

However, those impacts do not include some impacts that would occur with specific alternative terminal site locations. Three sites that are considered are located within existing confined dredged material disposal facilities on the South Carolina Side of the river. That storage capacity would need to be restored to keep the government whole if those sites were no longer available for deposition of sediments excavated from the river. Both the tract size and its location are important when considering costs for sediment deposition. A standard terminal size was used to estimate development costs for such a facility, so the amount of land needed to replace lost sediment storage capacity is fairly straight forward. Loss of 375 acres from a disposal facility requires development of the same sized facility, at roughly the same location along the river, and at roughly the same distance from the navigation channel. Based on the extent of existing development along the river, no large tracts of undeveloped land appear to meet these requirements on the Georgia side. Therefore, this analysis assumed that land to replace the lost sediment storage capacity would be made available to extend the existing CDFs out into the marshes that lie along the northern side of those CDFs. This would result in impacts to an additional 375 acres of saltmarsh. The costs to mitigate for those losses are included in the evaluation of the alternate terminal locations at the same rate as for similar losses resulting from other projects.

One of the proposed alternate terminal locations is the Tybee National Wildlife Refuge. A higher level of mitigation could be necessary to compensate for the land lost from that refuge, but those costs are not included in this analysis.

The costs to mitigate for environmental impacts are described in the assessment of each separate alternate terminal location. The costs of increasing traffic volumes through the City have not been quantified. The effects of such impacts are discussed in a qualitative manner, but the District concluded that quantification of those impacts was not necessary to reach a decision of the feasibility of the sites that would produce those effects.

ANALYTICAL ASSUMPTIONS

The assumptions that underlie this analysis are discussed below. They encompass: features and facilities of alternative terminals, port maneuvering costs, joint terminal operations, distribution effects of benefits associated with alternative terminals, benefits of channel deepening, construction and operating costs, and maintenance dredging.

Features and Facilities at Alternative Terminals

To address the navigation problems and opportunities in Savannah Harbor, an alternative terminal would need sufficient capacity to handle the volume of containers anticipated to be carried on depth-constrained container ships (i.e., those container ships that would require more depth than currently provided by the 42-foot Savannah Harbor channel). These ships are typically post-Panamax-class vessels that are consistent with the Design Vessel used in the Tier II EIS and GRR: the *Susan Maersk*, a 6,600 TEU post-Panamax class container ship launched in 1997 (beam: 140 feet, length overall 1,138 feet; design draft: 47.6 feet).

The volume of containers anticipated to be carried on depth-constrained vessels during the period of analysis is approximately 500,000 TEUs. However, based on coordination between Engineering Division of the Savannah District and GPA it was concluded that a new container terminal would need to be significantly larger to achieve economies of scale in facility development, equipment purchase, and terminal operations. To achieve economies of scale, the following mix of facilities and equipment would represent the minimum features for a new state-of-the-art container facility to be an effective and efficient terminal. This mix of facilities and equipment, which are consistent with industry standards, would provide approximately 1.5 million TEU throughput capacity.

- Two berths with an assumed length of 1,250 feet per berth,
- Each will need a minimum of three Super Post-Panamax cranes (with a 72-95 long ton rated capacity),
- Other handling equipment to include: seven Rubber Tired gantries, 10 Five-high loaded Top lifts (87,000 lbs.), and two Seven-high empty stackers (15,000 lbs.),
- 150 acres of container parking needed per berth, or 300 acres total, including: 90 acres for container storage, 15 acres of parking space for vehicle storage, 10 acres for service drives and buffer, and 35 acres for container handling marshalling yard for rail loading,

- Annual throughput capacity commensurate with these facilities would be approximately 1.5 million TEUs,
- Dedicated rail access with intermodal rail connection within 10 miles,
- Sufficient landside area for potential future expansion, and
- For existing terminals that would be modified to handle containers or more containers (e.g., Garden City Terminal, Ocean Terminal, East Coast Terminal, Brunswick's Colonel Island Terminal), 90 acres of container parking would be needed per berth. For these terminals, no additional area would be needed for vehicle storage, service drives, or rail container marshalling.
- For Greenfield sites additional requirements include: heavy duty access road(s), water and electrical service, railroad ties and foundation, water storage tank (100,000 gallons), an intermodal transfer station, and a wastewater treatment facility.

Joint Terminal Operations

It is assumed in this analysis that a new terminal would not eliminate the need for the continued operation of the Garden City Terminal. Instead, the new facility would supplement container handling capacity to help meet the growth in future demand. For this analysis, it was assumed that the new terminal(s) would handle depth-constrained container vessels, and Garden City Terminal would handle container ships that are not depth-constrained. It is also assumed that the new terminal would not result in underutilization of Garden City facilities and that costs of such inefficiencies would not be incurred.

Benefits of Channel Deepening

This investigation assumes that channel deepening to either a new container facility or to Garden City Terminal would result in equivalent NED marine transportation benefits by reducing or eliminating transportation costs associated with tidal delays and lightloading of vessels constrained by current channel depths. As noted above, the differences between the alternatives will primarily consist of site development costs, dredging costs, and environmental mitigation costs as shown in Table 6 on the next page.

Construction Costs vs. Operating Costs

For this screening of alternative plans, the emphasis of this investigation is on construction costs. It is assumed that the operations and maintenance costs for a new terminal and for Garden City Terminal would be commensurate in dollars per TEU moving through the terminals, since the facilities would have similar facilities and equipment.

Maintenance Dredging

In addition, according to the Tier I analysis, channel deepening in Savannah Harbor should not generate significant additional maintenance dredging requirements relative to Without Project conditions. Differences in landside transportation costs between the alternative terminals will be discussed.

TABLE 6 FACILITY COSTS, MITIGATION COSTS, DREDGING COSTS, AND TOTAL COSTS ALTERNATIVE TERMINALS				
Alternative Terminals	**Facility Costs**	**Mitigation Costs**	**Dredging Costs**	**Total Costs**
Garden City Terminal	$0	$113,100,000	$213,600,000	$326,700,000
Ocean Terminal	$249,900,000	$89,200,000	$211,600,000	$550,700,000
Blue Circle Site	$361,100,000	$83,000,000	$207,000,000	$651,100,000
Disposal Site 12A	$334,400,000	$25,800,000	$162,700,000	$522,900,000
East Coast Terminal	$370,400,000	$23,600,000	$178,900,000	$572,900,000
Elba Island	$285,400,000	$1,400,000	$136,500,000	$423,300,000
Disposal Site 14A/14B	$357,400,000	$1,400,000	$125,600,000	$484,400,000
Tybee NWR	$384,900,000	$1,600,000	$79,100,000	$465,600,000
Colonel's Island, Brunswick	$292,600,000	Not Calculated	$137,500,000	$430,100,000

GARDEN CITY TERMINAL

The largest container facility in Savannah Harbor is Containerport, located within GPA's Garden City Terminal. Due to its existing container operations and its role in the Tier I Selected Plan, Garden City Terminal in this analysis serves as the benchmark terminal to which the alternative terminals are compared. A profile of Garden City Terminal is contained in Table 2, above. An assessment of its potential to address the problems and opportunities of a depth-constrained Federal channel in Savannah Harbor begins below.

Garden City Terminal Site Profile and Initial Assessment

Garden City Terminal, is a public terminal operated by GPA. For an extensive site profile and initial assessment of this terminal please refer to the evaluation of non-structural alternatives; Modifications of Garden City Terminal, discussed earlier in this report. An aerial photo of Garden City Terminal is provided in Figure 2.

FIGURE 2
GARDEN CITY TERMINAL – AERIAL PHOTO

Cost of Modifying Garden City Terminal

The costs of modifying Garden City Terminal to achieve the additional throughput capacity of the 1.5 million TEUs assumed in this analysis are presented in Table 7. These costs were coordinated between Savannah District and GPA. The costs reflect existing container facilities at Garden City Terminal, such as the two super Post-Panamax container cranes currently in service. As indicated in this table, cost estimates include demolition of the building and storage tanks associated with the anhydrous ammonia facilities behind CB-7. The costs identified in Table 3 are ones that GPA plans to incur to increase the throughput capacity of Garden City Terminal over the near future. As presently-planned actions and expenditures, these would be part of the Without Project Condition and not a component of the cost of deepening to Garden City Terminal.

TABLE 7
ESTIMATED COSTS OF MODIFICATIONS
GARDEN CITY TERMINAL

Site Demolition				
Asphalt pavement	10,000	sy	$3.48	$34,820
Storage tanks	1,288,872	cf	$0.21	$266,842
Building Demolition	242,500	cf	$0.21	$50,206
Building Foundation Demo	629	cy	$64.93	$40,817
Site Improvement				
Container Parking area	83	ac		
Dock Includes: Concrete Deck & Beam, concrete steel reinforcement, pilings, handrail	1,700	lf	$14,300	$24,310,000
Fender system				
Crane Tracks on concrete ties (assume length = 1.25 x dock length)	2,125	lf	$181.63	$385,956
Heavy Duty Pavement for container traffic	83	ac	$300,000	$24,900,000
Equipment				
72-95 Ton Cranes	4	ea	$6,500,000	$26,000,000
Rubber tire gantries	6	ea	$1,300,000	$7,800,000
Five High loaded top lifts (87,000 lbs)	8		$350,000	$2,800,000
Jockey Trucks	5	ea	$39,120	$195,600
Flatbed Trucks	2	ea	$28,980	$57,960
Contingency	25%			$21,710,550
			Subtotal	$108,552,750
E&D / S&A	20%			$21,710,550
			TOTAL=	$130,263,299

Dredging Costs: Garden City Terminal

Costs to deepen Savannah Harbor to 48 feet MLW from the sea to Garden City Terminal are presented in Table 8. Quantities to be dredged and unit costs of dredging and disposal were estimated based on the Tier I analysis and dredged material management plans (DMMP) prepared by the Savannah District for maintenance of the Savannah Harbor Federal channel. Cost estimates for disposal area site work and erosion control for Garden City Terminal (and all of the alternative sites) were also developed using a combination of the Tier I cost estimates and cost sheets prepared for the Savannah Harbor DMMP. Also included are costs to deepen Kings Island Turning Basin.

Other dredging-related costs are included in Table 8. These costs are based on the Tier I Feasibility Report, escalated to 2003 dollars. Lands, easements, relocations, rights-of-way (LERRRD) are self-explanatory; other costs are explained below.

- Debris removal: along river bottom and river banks,
- Aids to navigation: consistent with U.S. Coast Guard coordination,
- Chloride mitigation: refers to the potential relocation of the City of Savannah water intake in the Savannah River, if chloride impacts from channel deepening exceed the City's contracted standards for chloride levels.
- Dissolved oxygen mitigation: refers to mitigation required if channel deepening reduces average summer dissolved oxygen levels in the Savannah River.
- Cultural/historic mitigation: refers to mitigation required to protect Old Fort Jackson and the *CSS Georgia*. Both resources are located at the junction of Back River and the Savannah River.
- Channel modification mitigation: refers to mitigation required for direct wetland impacts of channel deepening on the river banks. Ten acres would be affected by deepening to Garden City Terminal. Wetland mitigation costs are estimated at $26,000 per acre, including $6,000 for real estate costs and $20,000 for mitigation activities ($10,000/acre plus a 2:1 replacement ratio).
- Secondary wetland mitigation: refers to secondary impacts to wetlands resulting from saltwater intrusion into the Savannah National Wildlife Refuge upstream of Garden City Terminal. Adverse secondary effects of saltwater intrusion could degrade up to 722 acres of wetlands, potentially requiring mitigation at $26,000 per acre as above.
- Shortnose sturgeon mitigation: refers to actions taken to compensate for impacts to habitat of shortnose sturgeon.
- Striped bass impact avoidance: refers to actions taken to avoid adverse effects to habitat of striped bass.

TABLE 8
ESTIMATED COSTS OF CHANNEL DEEPENING (48 FEET MLW)
TO GARDEN CITY TERMINAL

Mobilization				$2,683,845
Dredging				
-85+000 to -60+000	2,616,000	cy	$3.87	$10,123,920
-60+000 to -38+500	4,163,000	cy	$2.69	$11,188,063
-38+500 to -14+000	5,155,000	cy	$2.04	$10,529,088
-14+000 to 0+000	2,071,000	cy	$2.26	$4,675,283
0+000 to 24+000	3,506,000	cy	$2.37	$8,291,690
24+000 to 40+000	3,824,000	cy	$4.89	$18,704,140
40+000 to 50+000	2,963,000	cy	$2.96	$8,759,369
50+000 to 70+000	3,874,000	cy	$2.63	$10,203,148
70+000 to 79+000	1,817,000	cy	$4.03	$7,324,781
79+000 to 97+750	2,962,000	cy	$5.27	$15,602,335
97+750 to 102+000	2,220,000	cy	$4.57	$10,142,625
102+000 to 103+000	303,000	cy	$4.84	$1,465,763
Dredging for turning basin	600,000	cy	$4.84	$2,902,500
Berth Dredging	150,000	cy	$4.84	$725,625
Disposal Area Site Work and Erosion Control				$19,075,000
Contingency	25%			$35,599,293
E&D / S&A	20%			$35,559,293
Subtotal				$213,595,764
Debris Removal	100%		$2,449,764	$2,449,764
Aids to Navigation	100%		$871,691	$871,691
Chloride Mitigation - relocate City of Sav. Water intake	100%		$49,450,000	$49,450,000
DO Mitigation	100%		$25,800,000	$25,800,000
Cult/Historic Mitigation	100%		$15,424,449	$15,424,449
Lands, Easements, Relocations, Rights-of-Way	100%		$2,349,198	$2,349,198
Channel Mod Mitigation	100%		$260,000	$260,000
Salinity Intrusion on Wetlands (722 acres)	100%		$18,772,000	$18,772,000
Shortnose Sturgeon Mitigation	100%		$1,375,500	$1,375,500
Striped Bass Impact Avoidance	100%		$2,000,000	$2,000,000
			TOTAL	$326,677,713

Other Considerations: Garden City Terminal

There are some environmental concerns associated with channel deepening to Garden City Terminal. These concerns were identified in the Tier 1 process and are being evaluated in more detail during Tier II. The major environmental issues identified in Tier 1 consist of the following:

- Chloride impacts on the City of Savannah water intake,

- Seasonal reduction in dissolved oxygen levels in the Savannah River
- Cultural and Historic impacts on Old Fort Jackson and the *CSS Georgia*,
- Direct loss or riverbank wetlands as a result of the channel construction activities,
- Salinity intrusion on wetlands in the Savannah Wildlife Refuge,
- Impacts on Shortnose Sturgeon habitat, and
- Impacts to striped bass habitat.

Overall Assessment: Garden City Terminal

Garden City Terminal is viable as an alternative terminal due to the existing container operations at this location. Costs to develop additional terminal capacity would be minimized by usage of terminal facilities and landside infrastructure already in place. Shortcomings of Garden City Terminal as an alternative terminal are the high costs of dredging to this upstream location and potential adverse environmental effects associated with dredging.

OCEAN TERMINAL

The potential for modifying Ocean Terminal to serve as a dedicated container facility is assessed below. It includes a profile of the site, estimation of the costs to modify the facility, a discussion of required landside transportation, an evaluation of benefits of modifying this facility, discussion of other factors involved in conversion of this facility, and an overall assessment of its ability to address navigation problems and opportunities in Savannah Harbor.

Ocean Terminal Site Profile and Initial Assessment

As indicated in Figure 1, Ocean Terminal is located on Bay Street in the City of Savannah, immediately west of the Talmadge Memorial Bridge. A profile of Ocean Terminal is provided in Table 9, and an aerial view is provided in Figure 3. This 208-acre terminal primarily handles break-bulk, roll-on/roll-off (RoRo), and project cargo. As part of its RoRo operations, this facility handles an incidental amount of containers, approximately 150 TEUs per week. However, container movements through Ocean terminal are declining due to reductions in container cargo handled by a major RoRo carrier.

As an initial assessment, Ocean Terminal, which is only 2.5 miles downstream of Garden City Terminal, would not likely generate large benefits in terms of dredging costs avoided. However, the proximity to Garden City Terminal might allow complementary development and operation of these terminals. The 208 acres of this terminal is significantly smaller than the 300 acres that is assumed necessary for a container terminal with two berths. However, Ocean Terminal has over 6,000 feet of berth space, existing rail facilities, and seemingly good road connections to highways for truck transport of containers.

Cost of Modifying Ocean Terminal

Savannah District coordinated with GPA to identify improvements that would be required to convert Ocean Terminal to a dedicated container facility. To ensure a fair comparison, the analysis of Ocean Terminal is equivalent in level of detail to that used to evaluate development of a new terminal downstream along the Savannah River. Based on this coordination, the following assumptions were made about requisite modifications to this terminal:

- The location of the existing docks is too close to the Federal channel to allow sufficient beam for post-Panamax container ships to berth at this terminal. Consequently, it was assumed that existing docks would be demolished and rebuilt, thereby avoiding realignment of the Federal channel.
- Maintain the current function of this facility. If possible, RoRo operations at Ocean Terminal would be continued. RoRo parking located adjacent to the dock would be demolished and rebuilt outside of the container storage area to prevent any accidental damage from container traffic. This would leave 140 acres available as a container yard.
- The load-bearing capacity of existing storage areas at this terminal would not be sufficient to support container operations. Consequently, the 140 acres of open storage would need to be demolished, strengthened, and repaved (at an approximate cost of $300,000 per acre).
- Buildings located adjacent to the dock to store materials will be demolished and rebuilt farther away from dock and outside of the container storage area.
- Although Ocean Terminal currently has rail service, it is assumed that a significant upgrade would be needed to serve a large container facility.

Container handling equipment is consistent with the assumptions listed above. These assumptions are incorporated into the costs estimates for converting Ocean Terminal into a dedicated container facility contained in Table 10. Estimation of the cost estimates for Ocean Terminal and for the other terminals considered in this investigation was initiated by Engineering Division of Savannah District.

As indicated in Table 10, it is estimated that conversion of Ocean Terminal to a container facility would cost approximately $250 million. Demolition costs, construction costs, and container handling equipment costs are included in this estimate.

In 2002, GPA contracted with Lockwood Greene to assess the feasibility of converting Ocean Terminal into a container facility. The study estimated the cost of conversion of Ocean Terminal to be $284 million. This estimate included the assumption that the docks would be demolished and set back (landward) to provide for additional berth width, thereby avoiding encroaching into the Federal channel or realigning the Federal channel.

TABLE 9
OCEAN TERMINAL FACILITIES

Cargo Handled: General Cargo, Containers, RoRo, and Project Cargo

Terminal Area: 208 acres

Berths
Berths Linear Feet: 6,674 total. [This total includes Slip 2, which is not practical for container vessels. The total usable berth length is 4,503 feet, with approximately 300 feet of additional distance across Slip 2 that could be closed off for wharf area.]
Depth Alongside Berths 1,2,12,13,18,19: 42 ft.; Berth 20 38 ft.
Dock Height 15 ft. at mean low water
Apron Width From 53 ft. to 200 ft.

Cranes
Gantry Cranes:
Kocks (Berths 12-20) 100-st capacity under main hook at a 65 ft. radius
Diamond (Berths 12-20) 50-st capacity under main hook at a 40 ft. radius
Diamond (Berths 1-2) 35-st capacity under main hook at a 40 ft. radius
Clyde (Berth 13) 175-st capacity under main hook at a 45 ft. radius
Container Cranes:
Kone (Berths 13-20) (1) 45-st capacity under spreader/56-st capacity
Link Belt Mobile Crane 45-st capacity with 100' boom

Equipment
Three-high loaded toplifts (3) 67,400 lb. capacity under spreader
Forklifts (51) 11,000-50,000 lb. capacity with accessory attachments
Clay Bagging Facility -Capacity: 25 tons per hour
Reefer Outlets Warehouse 2

Rail Services: Norfolk Southern Railroad provides switching services; interchange and line haul services provided by Norfolk Southern Railroad and CSX Transportation.

Warehousing: total 1,621,868 sq. ft.

Open Storage: 83 acres

Container Field Paved Area: 47 acres

FIGURE 3
OCEAN TERMINAL

Based on the findings of the Lockwood Greene study, GPA concluded that conversion of Ocean Terminal to a container facility would not be feasible at this time. The high costs of demolishing and reconstructing the docks, warehouses, and paved areas and the limited container storage area (140 acres) made modification of this terminal prohibitively expensive under current circumstances.

TABLE 10
ESTIMATED COSTS OF MODIFICATIONS
OCEAN TERMINAL

Site Demolition				
Asphalt pavement	822,800	sy	$3	$2,864,951
Building Demo (assume 18' high buildings)	42,168,568	cf	$0.21	$8,730,371
Building foundation removal	60,069	cy	$65	$3,900,515
Railroad track removal, ties and track	15,000	lf	$8.0	$120,692
Site Improvement				
Container Parking area	140	ac		
Heavy Duty Pavement for container traffic	140	ac	$300,000	$42,000,000
Dock Includes: Concrete Deck & Beam, concrete steel reinforcement, pilings, handrail, Fender system	2,500	lf	$21,300	$53,250,000
110 lb Railroad track w/ wooden ties and ballast		lf	$78	$0
110 lb Railroad track w/ concrete ties in container yard	5,000	lf	$182	$908,131
Administration Building	10,000	sf	$168	$1,675,102
storage building	20,000	sf	$10	$198,565
Equipment				
72-95 Ton Cranes	6	ea	$6,500,000	$39,000,000
Rubber tire gantries	7	ea	$1,300,000	$9,100,000
Five High loaded top lifts (87,000 lbs)	10	ea	$350,000	$3,500,000
Seven High empty stackers ((15,000 lbs)	2	ea	$200,000	$400,000
Jockey Trucks	20	ea	$39,120	$782,400
Flatbed Trucks	6	ea	$28,980	$173,880
Contingency	25%			$41,651,152
			Subtotal	$208,255,758
E&D / S&A	20%			$41,651,152
			TOTAL=	$249,906,910

Landside Transportation: Ocean Terminal

Ocean Terminal has good transportation access. However, Bay Street in Savannah is very congested, since it serves as an important east-west corridor through the city and the principal access of visitors to the Historic District. The additional truck traffic associated with a container facility of the size under consideration here would significantly exacerbate this congestion.

Regarding rail access to/from the site, currently only Norfolk Southern has access to Ocean Terminal. Development of a container port at Ocean Terminal that is served by only one railroad could be a competitive (cost) disadvantage for a container port. It is likely that some arrangements would need to be made to allow CSX to serve Ocean Terminal as well. It might be feasible to truck containers to/from the Mason Intermodal Container Transfer Facility (ICTF) at Garden City Terminal, since it is within the 10-mile drayage limit assumed as part of this analysis. However, if rail facilities at Ocean Terminal were not upgraded and used by the container operations, this would result in even more trucks using Bay Street.

Dredging Costs: Ocean Terminal

Dredging-related costs associated with Ocean Terminal are presented in Table 11. Since Ocean Terminal is 2.5 nautical miles downstream of Garden City Terminal, dredging costs would be less than those of Garden City Terminal. Other dredging-related costs shown in the last nine rows of Table 10 (from Debris Removal through Striped Bass Impact Avoidance) would also be expected to be less than for Garden City Terminal. Based on the distance downstream, it was assumed that most of these costs would be 75 percent of costs developed for Garden City Terminal in the Tier I analysis. Mitigation costs for cultural/historic impacts and channel modification would be expected to consistent with Garden City costs. Regarding cultural/historic costs, sites upstream of Old Fort Jackson and the *CSS Georgia* would require the full cost of mitigation.

A turning basin for Ocean Terminal required detailed investigation. The Savannah River is relatively narrow in this reach of the river. Construction of a turning basin consistent with the Tier I analysis (1,600 feet wide, 1,675 feet long, and 48 feet deep MLW) would require excavation of a portion of Hutchinson Island at very high cost. A preliminary cost analysis was conducted to compare these costs against deepening of the channel further upriver to existing turning basins, which would need to be modified to be consistent with the above Tier I specifications.

The nearest existing turning basin is Marsh Island Turning Basin, which has dimensions of: 900 feet wide, 1,000 feet long, and 34 feet deep. Marsh Island Turning Basin is approximately 1.9 miles upstream from Ocean Terminal on the north side of the channel. This turning basin is located adjacent to Hutchinson Island at the location of the International Paper aeration lagoon. The landward edge of the turning basin is approximately 150 feet from the shore, and the containment dike for the lagoon is approximately 125 feet beyond. According to the Tier I Feasibility Report, the width of the Kings Island Turning Basin, which is 1,600 feet long, would be expanded from 1,500 feet wide to 1,675 feet wide to accommodate the post-Panamax container ship that serves as the Design Vessel. There is insufficient room to expand the Marsh Island Turning Basin to dimensions sufficient to accommodate the Design Vessel without encroaching on the aeration lagoon and triggering the economic and environmental consequences of disturbing an active industrial waste treatment lagoon.

TABLE 11
ESTIMATED COSTS OF CHANNEL DEEPENING (48 FEET MLW)
TO OCEAN TERMINAL

Mobilization				$2,683,845
Dredging				
-85+000 to -60+000	2,616,000	cy	$3.87	$10,123,920
-60+000 to -38+500	4,163,000	cy	$2.69	$11,188,063
-38+500 to -14+000	5,155,000	cy	$2.04	$10,529,088
-14+000 to 0+000	2,071,000	cy	$2.26	$4,675,283
0+000 to 24+000	3,506,000	cy	$2.37	$8,291,690
24+000 to 40+000	3,824,000	cy	$4.89	$18,704,140
40+000 to 50+000	2,963,000	cy	$2.96	$8,759,369
50+000 to 70+000	3,874,000	cy	$2.63	$10,203,148
70+000 to 79+000	1,817,000	cy	$4.03	$7,324,781
79+000 to 97+750	473,920	cy	$5.27	$2,496,374
Dredging/Excavation of turning basin				$26,275,430
Berth Dredging	150,000	cy	$4.84	$725,625
Disposal Area Site Work and Erosion Control				$19,075,000
Contingency	25%			$35,263,938
E&D / S&A	20%			$35,263,938
Subtotal				$211,583,630
Debris Removal	75%		$2,449,764	$1,837,323
Aids to Navigation	75%		$871,691	$653,768
Chloride Mitigation - relocate water intake	75%		$49,450,000	$37,087,500
Dissolved Oxygen Mitigation	75%		$25,800,000	$19,350,000
Cultural/Historic Mitigation	100%		$15,424,449	$15,424,449
Lands, Easements, Relocations, Rights-of-Way	75%		$2,349,198	$1,761,898
Channel Modification Mitigation	75%		$260,000	$195,000
Salinity Intrusion on Wetlands (722 ac)	75%		$18,772,000	$14,079,000
Shortnose Sturgeon Mitigation	75%		$1,375,500	$1,031,625
Striped Bass Impact Avoidance	100%		$2,000,000	$2,000,000
			TOTAL	$305,004,194

The next turning basin upriver is Kings Island, located above Garden City Terminal approximately 2.8 nautical miles above Ocean Terminal. Deepening to Kings Island Turning Basin would result in dredging and related costs consistent with deepening to Garden City Terminal.

The costs of constructing a turning basin adjacent to Ocean Terminal were found to be cost-effective compared to deepening to Kings Island Turning Basin. The turning basin costs in Table 11 are associated with this location.

Overall Assessment: Ocean Terminal

Based on the high costs of renovating Ocean Terminal and the lack of any significant dredging savings relative to deepening to Garden City Terminal, it is concluded that conversion of Ocean Terminal to a container facility is not feasible at this time. The desirable aspects of such a conversion in terms of minimal environmental impacts and efficient access to landside transportation would be insufficient to outweigh the costs of facility renovation and channel dredging and the congestion related impacts on local area roadways.

BLUE CIRCLE CEMENT COMPANY

The potential for modifying Blue Circle Cement Company's site on Hutchinson Island to serve as a dedicated container facility is assessed below. As for the discussion of all the alternative facilities, the analysis includes a profile of the site, estimation of the costs to modify the facility, a discussion of required landside transportation infrastructure, an evaluation of benefits of modifying this facility, discussion of other factors involved in conversion of this facility, and an overall assessment of its ability to address navigation problems and opportunities in Savannah Harbor.

Blue Circle Cement Site Profile and Initial Assessment

As indicated in Figure 1, the Blue Circle Cement site is located on Hutchinson Island, immediately east of the Talmadge Memorial Bridge. Figure 5 provides a more detailed aerial view. Blue Circle Cement Company uses this facility for receipt of bulk cement. This facility has approximately 400 feet of berthing space and 36-foot depth MLW at berth. Landside facilities include four 12-inch, pneumatic pipelines extending from wharf via trestle (over approach from shore) to 16 concrete storage silos located in the rear of the site (north).

The polygon in Figure 5 provides visual scale for the aerial photo. This box represents the 300 acres that are would be necessary for development of a new container facility.

As an initial assessment of the viability of developing a container facility at this location, two characteristics of this site are evident. First, there may not be sufficient area for the purposes considered between the bridge (to the west), the Marine Trade Center (to the east), and the golf course (to the north). This issue alone might be sufficient to eliminate this site from further consideration. Second, landside transportation could be problematic, given the site's location on Hutchinson Island.

Costs Of Modifying Blue Circle Terminal

The costs required to construct a container terminal at the Blue Circle site are contained in Table 12. As indicated in this table, it is estimated that $361 million would be required to develop a container terminal at this site. It is anticipated that the facilities currently on this site would need to be demolished prior to construction of the container terminal. The terminal would require installation of the full set of facilities assumed above, and new docks would be needed. Other assumptions about this site include: a water storage tank

for fire protection, a package wastewater treatment facility, and approximately 50 acres (of 300) would require wetland mitigation.

To achieve the area required for development of a new container facility at the Blue Circle site, some or all of the adjacent property owned by Powell Dufferin Terminals, Inc. may be required. This adjacent site previously contained a liquid bulk terminal and tank farm, which was operated by Powell-Dufferin Oil. The site is currently used by TIC Construction Company. It is anticipated that properties to the north around the golf course and along the Back River will be converted to upscale residential developments. A new container terminal in this area may not be compatible with these uses, and nearby residential developments could raise acquisition costs.

The cost estimates in Table 12 do not include the replacement costs of Blue Circle Cement operations at another location. If a detailed evaluation of this site is to be conducted, these associated costs would need to be included.

FIGURE 5
BLUE CIRCLE CEMENT SITE

TABLE 12
ESTIMATED COSTS OF BLUE CIRCLE TERMINAL

Site Demolition				
Asphalt pavement	48,400	sy	$3	$148,636
Building Demo	745,342	cf	$0	$136,099
Building foundation removal	28,667	cy	$57	$1,641,759
Site Improvement				
Land purchase	375	ac	$100,000	$37,500,000
Heavy Duty Pavement for container traffic	300	ac	$300,000	$90,000,000
Administration Building	10,000	sf	$168	$1,675,102
storage building	20,000	sf	$10	$198,565
Building foundation	3,333	sy	$22	$73,717
110 lb Railroad track w/ wooden ties and ballast	8,000	lf	$78	$621,105
RR foundation	19,200	sy	$13	$257,664
110 lb Railroad track w/ concrete ties in container yard	20,000	lf	$182	$3,632,524
Electrical service to terminal	21,000	lf	$60	$1,260,000
Dock (includes: concrete deck & beam, concrete steel reinforcement, 18" square precast concrete piling, expn joint & misc const items, handrail, fender system)	2,500	lf	$14,300	$35,750,000
Crane Tracks on concrete ties(assume length = 1.25 x dock length)	3,125	lf	$182	$567,582
100,000 Gallon Water Storage Tank for fire protection	1	ea	$250,000	$250,000
Intermodal Transfer Station	1	ea	$5,304,817	$5,304,817
Wetlands Mitigation	60	ac	$26,000	$1,560,000
Wastewater Treatment Facility	1		$10,000,000	$10,000,000
Equipment				
72-95 Ton Cranes	6	ea	$6,500,000	$39,000,000
Rubber tire gantries	7	ea	$1,300,000	$9,100,000
Five High loaded top lifts (87,000 lbs)	10		$350,000	$3,500,000
Seven High empty stackers ((15,000 lbs)	2		$200,000	$400,000
Jockey Trucks	20	ea	$39,120	$782,400
Flatbed Trucks	6	ea	$28,980	$173,880
Contingency	25%			$60,178,462
			Subtotal	$300,892,313
E&D / S&A	20%			$60,178,462
			TOTAL	$361,070,775

It is assumed for all of the alternative sites that are located in industrial areas along the Savannah River (i.e., Blue Circle, East Coast, and Elba Island) that $100,000 is representative of real estate purchase costs per acre. This cost per acre is based on a sample of such properties using real estate property assessments of Chatham County. However, in areas that are undergoing upscale residential waterfront development, real estate could be significantly more expensive, approximately $150,000 to $200,000 per acre. The real estate acquisition costs for a new container facility could significantly increase over time as upscale residential development occupies more of the riverfront.

It is also assumed for those alternative sites that would require a new intermodal container transfer facility that 75 acres would be required. Consequently, land purchases in Table 12 contain 375 acres (i.e., 300 for the container terminal and 75 acres for the intermodal facility).

Based on aerial photos, U.S.G.S. quadrangle maps, and preliminary site reconnaissance, it is assumed that 50 acres of this site (i.e., 25 percent of the 300 acres) would be wetlands. As noted above, it is assumed that wetland mitigation activities (in addition to land purchases) would be approximately $20,000 per acre ($10,000/acre plus a 2:1 replacement ratio).

Landside Transportation: Blue Circle Terminal

Relative to Garden City Terminal, trucks coming to/from the Blue Circle site may have marginally better access to major highway routes to the northwest toward Macon and Atlanta and the rest of Savannah's economic hinterland. Truck traffic to/from a terminal at the Blue Circle site would have convenient access to Route 17 and Interstate 16. However, it is not expected that this would translate into significant savings in trucking costs.

In contrast, rail movements to/from the Blue Circle site would likely be at a significant disadvantage relative to Garden City Terminal's Mason ICTF. A Seaboard Coast Line (SCL, now CSX) rail line is located on Hutchinson Island and runs east-west along the northern edge of the red square in Figure 5. In 1899, a rail bridge across the Savannah River was constructed approximately 1.8 miles upstream of the Talmadge Bridge. The Blue Circle tracks tied into this bridge, which connected SCL's Savannah rail yard across the Savannah River with the main CSX tracks north of Ridgeland, a distance of approximately 27 miles (from Savannah to Ridgeland.

The Savannah River rail bridge no longer exists. The bridge suffered ship collisions in 1952, 1966, 1967, and 1971. In the 1971 collision, the south tower was struck and collapsed causing the main span to fall. Subsequently, the bridge was removed, and the existing railroad bridge across the Back River to Hutchinson Island was upgraded. As part of this work, the railroad installed 7.5 miles of new line to connect the former SCL line to the main CSX line approximately 2.5 miles northeast of Interstate 95's crossing of the Savannah River, near Hardeeville, South Carolina. This rail connection, was known as the Hardeeville Spur.

The result is that train access/egress from the Blue Circle site would be via the rail bridge from the island north across Back River. It is assumed that an intermodal rail facility would need to be located on the island, likely west of the bridge. The acreage needed for the facility would be in addition to the 300 acres needed for the terminal.

The former SCL rail route through Jasper County and the Hardeeville Spur were formally abandoned by CSX in 1997. In the late 1990s, the County considered purchasing the SCL corridor from CSX for a rails-to-trails project, and conducted preliminary negotiations toward this purchase. The County subsequently decided not to pursue the rails-to-trails project, apparently having concluded that the rail line could be an important resource for economic development. Although the line is not operational at this time, it could be re-activated if a container terminal was developed on the north side of the Savannah River, either on Hutchinson Island or in Jasper County. CSX continues to own this SCL corridor through Jasper County.

For Norfolk Southern, which sends unit trains from the Mason ICTF, a track-sharing arrangement with CSX would need to be reached. The potential for such an agreement is uncertain at this time. It is also conceivable that a rail connection would need to be made near Interstate 95 northwest of the City of Savannah to allow Norfolk Southern trains to turn to the west and northwest without going into the City of Savannah.

The Blue Circle site is approximately 8 miles from Garden City's Mason intermodal facility. Containers could conceivably be trucked to this facility, eliminating the need for rail access to the Blue Circle site. However, drayage costs would be very significant. Although drayage contracts are usually confidential, it is assumed that drayage rates for a 5 to 10 mile haul could be in the range of $100-125/dray for a one-way trip. Use of the Mason ICTF would create another set of problems by forcing large amounts of trucks onto local Savannah roadways, many of which are already congested.

Whatever the origin/destination, it is likely that rail service from the Blue Circle site would be somewhat less efficient than service to Garden City Terminal, assuming that the existing rail line to Hutchinson Island could be reactivated. However, these inefficiencies, manifested as time delays and increased costs, would be incurred for medium and long hauls, for which rail transport is the preferred mode of transport.

Dredging Costs: Blue Circle Terminal

Dredging-related costs associated with the Blue Circle site are presented in Table 13. The costs are similar to those of Ocean Terminal, which is located on the other side of the Talmadge Bridge on the south side of the Savannah River. As for Ocean Terminal, the costs of constructing a new turning basin are high due to required excavation of Hutchinson Island but less than dredging to King Island Turning Basin. As a result, it is assumed that a turning basin for Blue Circle Terminal would be the same as for Ocean Terminal, on the western side of the Talmadge Bridge adjacent to Ocean Terminal. Consequently, the costs of a turning basin in Table 13 are the same as in Table 11.

TABLE 13
ESTIMATED COSTS OF CHANNEL DEEPENING (48 FEET MLW)
TO BLUE CIRCLE TERMINAL

Mobilization				$2,683,845
Dredging				
-85+000 to -60+000	2,616,000	cy	$3.87	$10,123,920
-60+000 to -38+500	4,163,000	cy	$2.69	$11,188,063
-38+500 to -14+000	5,155,000	cy	$2.04	$10,529,088
-14+000 to 0+000	2,071,000	cy	$2.26	$4,675,283
0+000 to 24+000	3,506,000	cy	$2.37	$8,291,690
24+000 to 40+000	3,824,000	cy	$4.89	$18,704,140
40+000 to 50+000	2,963,000	cy	$2.96	$8,759,369
50+000 to 70+000	3,874,000	cy	$2.63	$10,203,148
70+000 to 79+000	1,817,000	cy	$4.03	$7,324,781
79+000 to 97+750 (Assume end of port located at station 79+000)	473920	cy	$5.27	$2,496,374
Dredging for turning basin				$26,275,430
Berth Dredging	600,000	cy	$4.03	$2,418,750
Disposal Area Site Work and Erosion Control				$14,310,309
Contingency	25%			$34,496,047
E&D / S&A	20%			$34,496,047
			Subtotal	$206,976,281
Debris Removal	70%		$2,449,764	$1,714,835
Aids to Navigation	70%		$823,038	$576,127
Chloride Mitigation - relocate water intake	70%		$46,690,000	$32,683,000
Dissolved Oxygen Mitigation	70%		$24,360,000	$17,052,000
Cultural/Historic Mitigation	100%		$14,563,550	$14,563,550
Lands, Easements, Relocations, Rights-of-Way	70%		$2,349,198	$1,644,438
Channel Modification Mitigation	70%		$260,000	$182,000
Salinity Intrusion on Wetlands (722 ac)	70%		$18,772,000	$13,140,400
Shortnose Sturgeon Mitigation	70%		$1,375,500	$962,850
Striped Bass Impact Avoidance	100%		$2,000,000	$2,000,000
			TOTAL	$291,495,480

Based on the distance downstream, it was assumed that most of the dredging-related costs in the bottom rows of Table 13 (Debris Removal to Striped Bass Impact Avoidance) would be 70 percent of costs developed for Garden City Terminal in the Tier I analysis. Mitigation costs for cultural/historic impacts and channel modification would be expected to consistent (i.e., 100 percent) with Garden City costs. Regarding cultural/historic costs, sites upstream of Old Fort Jackson and the *CSS Georgia* would require the full cost of mitigation.

Other Considerations: Blue Circle Terminal

Development of a container terminal at the Blue Circle site would appear to encroach on 60 acres of wetlands, for which mitigation would be required. The costs for such mitigation are included in Table 12. No other natural areas would be impacted by this

development. Since the site is presently an industrial facility, there is the potential for problems associated with hazardous, toxic, and radioactive wastes (HTRW).

A portion of the traffic from a container facility is generated by deliveries to and from distribution centers (DCs). Currently there are 12 DCs located in proximity to the GCT. Rates for draying containers to and from the DC's are based on an individual basis. Anything that would generate longer delivery times, such as longer dray distances, will affect the number of deliveries that can be made. As the number of deliveries per driver decreases, the cost per dray will increase. If the number of containers stays constant, more trucks will be required to handle the same number of containers, generating more traffic on the road. There is a potential to relocate the DC's to alleviate this cost, but it won't happen in the short term. Also, the DC's would be reluctant to pick up any additional cost, as would the shipping lines.

Overall Assessment: Blue Circle Terminal

The Blue Circle site has very limited potential as a container facility. It is unlikely there is sufficient space for facility operations and potential expansion. In addition, dredging savings relative to deepening to Garden City Terminal are limited by its upstream location.

DISPOSAL SITE 12A

The potential for developing a new container facility at Disposal Site 12A is assessed below. As for the discussion of all the alternative facilities, the analysis includes a profile of the site, estimation of the costs to modify the facility, a discussion of required landside transportation infrastructure, an evaluation of benefits of modifying this facility, discussion of other factors involved in conversion of this facility, and an overall assessment of its ability to address navigation problems and opportunities in Savannah Harbor.

Disposal Site 12A Profile and Initial Assessment

As indicated in Figure 1, Disposal Site 12A is located on the northern bank of the Back River, east of the tidal gate, in Jasper County, South Carolina. Figure 6 provides a more detailed aerial view of Disposal Site 12A. As for the Blue Circle site, the polygon in Figure 6 provides visual scale for the aerial photo, representing the 300 acres that are

FIGURE 6
DISPOSAL SITE 12A

assumed to be necessary for development of a new container facility.

As an initial assessment, Disposal Site 12A would have the following assets and liabilities. First, the site appears to have sufficient room for the necessary port and landside facilities required for a container terminal. Second, all of the infrastructure would need to be brought to the site, including rail and road connections. Third, the Back River east of the tidal gate is not part of the Federal channel. This backwater area is intended to capture sediment. Consequently, project construction could be expensive. In addition, this backwater area could be subject to significant sediment accretion, resulting in significant increases in maintenance dredging costs.

Construction Costs: Disposal Site 12A

The cost estimated to construct a container terminal at Disposal Site 12A are contained in Table 14. As indicated in this table, it is estimated that $334 million would be required to develop a container terminal at this site. Since the site is undeveloped, a new container terminal would require new construction of all of the facilities assumed to be necessary for such a facility. It is assumed that an intermodal rail facility would need to be located onsite, since Garden City's intermodal terminal is beyond the 10-mile practical limit assumed in this analysis. As previously mentioned, 75 acres would be required for this facility. Consequently, land purchases in Table 14 contain 375 acres (i.e., 300 for the container terminal and 75 acres for the intermodal facility). Other assumptions about this site include: a water storage tank for fire protection and a package wastewater treatment facility.

It is also assumed for all of the alternative sites that are located in undeveloped areas along the Savannah River (i.e., Disposal Area 12A, Disposal Sites 14A/B, and Tybee National Wildlife Refuge) that $6,000 is representative of real estate purchase costs per acre. This cost per acre is based on a sample of such properties using real estate property assessments of Chatham County.

As indicated in Table 14, the Federal Government would need to be compensated for disposal capacity lost when this site is developed. It is assumed that this compensation would be in the form of replacement disposal capacity elsewhere (preferably nearby) along the river. The Compensation for Lost Disposal Capacity cost category includes 375 acres of replacement disposal capacity to compensate for capacity lost with development of the terminal and the intermodal facility. It is assumed that one-half of the new disposal capacity would be located in wetlands, which would require mitigation. Consequently, the $7.1 million cost estimate is based on: [(375 acres x $6,000 per acre) + (187.5 acres * $26,000 per acre for land/mitigation costs)].

Based on aerial photos, U.S.G.S. quadrangle maps, and preliminary site reconnaissance, it is assumed that two acres of wetland would be impacted by the transportation corridor (rail and road), assuming one-half of the corridor passes through wetlands. As noted above, it is assumed that wetland mitigation activities (in addition to land purchases) would be approximately $20,000 per acre ($10,000/acre plus a 2:1 replacement ratio).

TABLE 14
ESTIMATED COSTS OF DISPOSAL SITE 12A TERMINAL

Site Improvement				
Land purchase	375	ac	$6,000	$2,250,000
Heavy Duty Pavement for container traffic	300	ac	$300,000	$90,000,000
Heavy Duty Access Drive Pavement for container traffic	2.5	mi	$2,000,000	$5,000,000
8" PVC Water service from Hardeeville (10 miles)	52,800	lf	$13	$663,340
Administration Building	10,000	sf	$168	$1,675,102
storage building	20,000	sf	$10	$198,565
Building foundation	3,333	sy	$22	$73,717
110 lb Railroad track w/ wooden ties and ballast	26,000	lf	$78	$2,018,592
RR foundation	62,400	sy	$13	$837,408
110 lb Railroad track w/ concrete ties in container yard	20,000	lf	$182	$3,632,524
Railroad track bridge crossing	300	lf	$1,132	$339,488
Electrical service from Hardeeville, SC	71,280	lf	$60	$4,276,800
Dock (includes: concrete deck & beam, concrete steel reinforcement, 18" square precast concrete piling, expn joint & misc const items, handrail, fender system)	2,500	lf	$14,300	$35,750,000
Crane Tracks on concrete ties(assume length = 1.25 x dock length)	3,125	lf	$182	$567,582
Hwy 17 railroad & semi flyover				$3,299,524
100,000 Gallon Water Storage Tank for fire protection	1	ea	$250,000	$250,000
Intermodal Transfer Station	1	ea	$5,304,817	$5,304,817
Compensation for Lost Disposal Capacity				$7,125,000
Wetlands Mitigation	2	ac	$26,000	$63,030
Wastewater Treatment Facility	1		$10,000,000	$10,000,000
Equipment				
72-95 Ton Cranes	6	ea	$6,500,000	$39,000,000
Rubber tire gantries	7	ea	$1,300,000	$9,100,000
Five High loaded top lifts (87,000 lbs)	10		$350,000	$3,500,000
Seven High empty stackers ((15,000 lbs)	2		$200,000	$400,000
Jockey Trucks	20	ea	$39,120	$782,400
Flatbed Trucks	6	ea	$28,980	$173,880
Contingency	25%			$55,729,804
			Subtotal	$278,649,018
E&D / S&A	20%			$55,729,804
			TOTAL	$334,378,823

Landside Transportation: Disposal Site 12A

Truck traffic to/from this site would have access to Route 17 along an existing access road that connects with Route 17 approximately 1.25 miles north of Back River. Access to Interstate 16 would be approximately equivalent to Garden City Terminal. A heavy-duty access road would need to be built to accommodate truck traffic to/from the site. Approximately one-half of this access road would pass through wetlands, requiring significant foundation work and mitigation.

This facility would need to utilize the Hardeeville Spur to access the CSX system north of its intersection with Route 17. This would require approximately five miles of new track, much of it through wetlands. A rail bridge would be needed to cross Salt Water Creek approximately two miles north of Disposal Site 12A.

The rail issues would be the same as for the other sites north of Savannah River, as discussed above for the Blue Circle site, exacerbated by the additional travel time to reach the former SCL line and the Hardeeville Spur. Use of the Garden City intermodal terminal would not be practical, since it is more than 10 miles away.

Dredging Costs: Disposal Site 12A

Dredging-related costs associated with Disposal Site 12A are presented in Table 15. Dredging costs would include deepening Back River to access the terminal and construction of a turning basin in Back River near the site. As indicated in this table, dredging to 48 feet MLW from the sea to Disposal Site 12A would cost approximately $192 million.

Based on the distance downstream, it was assumed that most of the dredging-related costs in the bottom rows of Table 15 (Debris Removal to Striped Bass Impact Avoidance) would be 65 percent of costs developed for Garden City Terminal in the Tier I analysis. Mitigation costs for cultural/historic impacts and channel modification would be expected to consistent (i.e., 100 percent) with Garden City costs. Secondary effects of salinity intrusion on wetlands would be expected to be significantly less (25 percent).

TABLE 15
ESTIMATED COSTS OF CHANNEL DEEPENING (48 FEET MLW)
TO DISPOSAL SITE 12A TERMINAL

Mobilization				$2,683,845
Dredging				
-85+000 to -60+000	2,616,000	cy	$3.87	$10,123,920
-60+000 to -38+500	4,163,000	cy	$2.69	$11,188,063
-38+500 to -14+000	5,155,000	cy	$2.04	$10,529,088
-14+000 to 0+000	2,071,000	cy	$2.26	$4,675,283
0+000 to 24+000	3,506,000	cy	$2.37	$8,291,690
24+000 to 40+000	3,824,000	cy	$4.89	$18,704,140
40+000 to 50+000	2,963,000	cy	$2.96	$8,759,369
50+000 to 70+000 (Assume end of port located at station 60+000)	1,937,000	cy	$2.63	$5,101,574
Back River Dredging	3,000,000	cy	$2.37	$7,095,000
Dredging for turning basin	2,382,222	cy	$2.63	$6,274,178
Berth Dredging	600,000	cy	$4.03	$2,418,750
Disposal Area Site Work and Erosion Control				$12,652,407
Contingency	25%			$27,124,326
E&D / S&A	20%			$27,124,326
			Subtotal	$162,745,957
Debris Removal	65%		$2,449,764	$1,592,346
Aids to Navigation	75%		$871,691	$653,768
Chloride Mitigation - relocate water intake	0%		$49,450,000	$0
Dissolved Oxygen Mitigation	20%		$25,800,000	$5,160,000
Cultural/Historic Mitigation	100%		$15,424,449	$15,424,449
Lands, Easements, Relocations, Rights-of-Way	65%		$2,349,198	$1,526,978
Channel Modification Mitigation	65%		$260,000	$169,000
Salinity Intrusion on Wetlands (722 ac)	25%		$18,772,000	$4,693,000
Shortnose Sturgeon Mitigation	20%		$1,375,500	$275,100
Striped Bass Impact Avoidance	0%		$2,000,000	$0
			TOTAL	$192,240,599

Other Considerations: Disposal Site 12A

Development of a container terminal at Disposal Site 12A would not have significant environmental effects associated with the facility footprint, given its current use for disposal of dredged material. However, as discussed above, installation of a new marine terminal at this site would entail development of equivalent disposal capacity at another location. It is likely that this disposal capacity would be located in saltmarsh wetlands that lie along the north shore of the Savannah River. In addition, rail and road access to the site would likely traverse wetlands. This could require significant efforts in planning the rail route to avoid, minimize, and mitigate adverse environmental effects. Wetland mitigation costs for landside transportation corridors are included in Table 14.

Vessel traffic associated with a new terminal may increase tidal velocities in Back River, thereby reducing the effectiveness of the area as a sediment trap. The reduced effectiveness would increase the cost of removing that sediment from other portions of the harbor. In addition, deepening of Back River could increase salinity intrusion up Back River, resulting in adverse impacts to wetlands and fishery habitats. Costs of such secondary impacts have not been included in this analysis.

As discussed above, a portion of the traffic from a container facility is generated by deliveries to and from distribution centers. Anything that would generate longer delivery times, such as longer dray distances, will affect the number of deliveries that can be made. As the number of deliveries per driver decreases, the cost per dray could increase. If the number of containers stays constant, more trucks will be required to handle the same number of containers, generating more traffic on the road. Since Disposal Site 12A is approximately six miles downstream of Garden City Terminal, the drayage distance from this site would be at least that much more than the distance from Garden City Terminal.

Overall Assessment: Disposal Site 12A

Disposal Site 12A has potential as a site for a new container terminal. There is sufficient space for a terminal and highway access is relatively efficient. However, the costs of developing this facility would be more than twice the expected benefits, in terms of dredging costs avoided. In addition, environmental impacts associated with rail and road access to the site could be significant.

EAST COAST TERMINAL

The potential for modifying East Coast Terminal to serve as a dedicated container facility is assessed below. The analysis includes a profile of the site, estimation of the costs to modify the facility, a discussion of required landside transportation infrastructure, an evaluation of benefits of modifying this facility, discussion of other factors involved in conversion of this facility, and an overall assessment of its ability to address navigation problems and opportunities in Savannah Harbor.

East Coast Site Profile and Initial Assessment

As indicated in Figure 1, the East Coast Terminal site is located on the south bank of the Savannah River east of downtown Savannah, approximately 1.2 miles below the foot of Bull Street.

This site is operated by the East Coast Terminal Company. This marine terminal handles conventional and containerized general cargo, steel products, linerboard, and woodpulp; receipt of cement clinker, bauxite, gypsum, and liquid sulfur. Rail service to this terminal is provided by CSX. This marine terminal currently has 1,800 feet of berth space with berths that are 34 - 36 feet MLW. Approximately 28 acres of open storage area are located in the rear of the site.

Figure 7 provides a more detailed aerial view. The polygon in Figure 7, which illustrates the 300 acres assumed necessary for a new container terminal, provides visual scale for the aerial photo. As evident in this figure, to achieve 300 acres, the new terminal would need to incorporate adjacent properties, as well as the East Coast Terminal site.

As an initial assessment, East Coast Terminal would be more downstream than other terminals considered thus far. Consequently, its benefits in terms of dredging costs avoided would be larger. However, East Coast might be too small to serve as a container facility. In addition, landside transportation appears to present a problem for truck and rail movement of containers. The site is on the east side of the City of Savannah and the transportation connections are on the west side. Moving the containers through the city could be problematic.

Costs of Modifying East Coast Terminal

The costs estimated to construct a container terminal at the East Coast site are contained in Table 16. As indicated in this table, it is estimated that $370 million would be required to develop a 300-acre container terminal at this site. It is anticipated that much of this site would need to be demolished prior to construction of the container terminal. As in the case of the Blue Circle site, the associated costs of relocating current East Coast Terminal operations to another facility would need to be included in a detailed analysis of this site. The terminal would require the full array of container handling facilities described above, and it is assumed that the existing docks would be inadequate for the container facility under consideration in this investigation.

Based on aerial photos, U.S.G.S. quadrangle maps, and preliminary site reconnaissance, it is assumed that 100 acres of this site (i.e., one-third of the 300 acres) would be wetlands. As noted above, it is assumed that wetland mitigation activities would be approximately $26,000 per acre, including land purchased for mitigation at $6,000 per acre.

FIGURE 7
EAST COAST TERMINAL

TABLE 16
ESTIMATED COSTS OF EAST COAST TERMINAL

Site Demolition				
Asphalt pavement	121,000	sy	$3	$421,316
Building Demo	10,707,122	cf	$0	$2,216,749
Building foundation removal	22,409	cy	$65	$1,455,083
Railroad track removal, ties and track	8,000	lf	$8	$64,369
Site Improvement				
Land purchase	375	ac	$100,000	$37,500,000
Heavy Duty Pavement for container traffic	300	ac	$300,000	$90,000,000
Administration Building	10,000	sf	$168	$1,675,102
storage building	20,000	sf	$10	$198,565
Building foundation	3,333	sy	$22	$73,717
110 lb Railroad track w/ wooden ties and ballast	-	lf	$78	$0
110 lb Railroad track w/ concrete ties in container yard	20,000	lf	$182	$3,632,524
Dock (includes: concrete deck & beam, concrete steel reinforcement, 18" square precast concrete piling, expn joint & misc const items, handrail, fender system)	2,500	lf	$21,300	$53,250,000
Crane Tracks on concrete ties(assume length = 1.25 x dock length)	3,125	lf	$182	$567,582
100,000 Gallon Water Storage Tank for fire protection	1	ea	$250,000	$250,000
Upgrade of Intermodal Facilities				$2,652,409
Wetlands Mitigation	100		$26,000	$2,600,000
Equipment				
72-95 Ton Cranes	6	ea	$6,500,000	$39,000,000
Rubber tire gantries	7	ea	$1,300,000	$9,100,000
Five High loaded top lifts (87,000 lbs)	10		$350,000	$3,500,000
Seven High empty stackers ((15,000 lbs)	2		$200,000	$400,000
Jockey Trucks	20	ea	$39,120	$782,400
Flatbed Trucks	6	ea	$28,980	$173,880
Contingency	25%			$61,728,424
			Subtotal	$311,892,119
E&D / S&A	20%			$61,728,424
			TOTAL	$370,370,544

Landside Transportation: East Coast Terminal

Detailed examination of transportation issues in the City of Savannah suggest that development of a large container facility at East Coast Terminal would be problematic with respect to landside transportation of containers. Coordination with Metropolitan Planning Commission (MPC) identified several pertinent studies. In addition, MPC staff characterized east-west freight transportation issues in the City of Savannah. Among the studies identified by MPC staff was the *East-West Corridor Feasibility Study*, prepared by HNTB Corporation for MPC. This study was initiated in 1997 in order to assess and address capacity deficiencies in east-west travel through the City of Savannah. In particular, the study focused on Bay Street and on DeRenne Avenue as the principal east-west corridors through the city. Traffic counts by MPC along these corridors support the findings of this study that they are already operating well beyond their efficient carrying capacity. In 2002, some portions of DeRenne Avenue had average daily volumes in excess of 50,000 vehicles, and average daily volumes for Bay Street through the Historic District of downtown Savannah exceeded 25,000 vehicles.

As established by the *East-West Corridor Feasibility Study*, these volumes clog the major east-west corridors through Savannah. This congestion has adverse implications for residents in neighborhoods along these corridors, city residents, and residents in communities east of the city, including Tybee Island. Increased commuting times, reduced air quality, impeded hurricane evacuation (of areas east of the city), and impeded movement of commercial vehicles are among the adverse effects of this east-west congestion.

Trucks moving to/from East Coast Terminal (or other potential container terminals east of the City) would likely use DeRenne Avenue and the Truman Parkway, the north-south corridor on the eastern side of the city. Under existing conditions, terminal-related trucks would experience significant delays and would increase congestion significantly. Assuming that 15 percent of the containers are moved by rail with the remainder by truck (generally consistent with Garden City Terminal), a container facility with the capacity under consideration in this analysis (500,000 TEUs annually) would generate approximately 600 trucks per day.

The *East-West Corridor Feasibility Study* recommended that the following actions as important near-term relief measures: (1) construction of a new, limited-access, six-lane freeway along DeRenne Avenue and (2) reduction of Bay Street through the Historic District from four to two lanes. According to MPC staff, the proposed DeRenne Avenue freeway is a source of great controversy in the neighborhoods along its route. Local residents resent the noise implications, loss of neighborhood properties from road widening, and the physical division of the neighborhoods. It is doubtful whether such a project could be implemented at this time due to neighborhood opposition. The unrelieved congestion on DeRenne Avenue could make it impractical to reduce the width of Bay Street, as recommended. The result is that the east-west congestion problems in

Savannah are likely to continue, and according to MPC planners, they will be exacerbated by new development (planned or pending) east of the city.

As long-term measures, the *East-West Corridor Feasibility Study* identified two additional options to relieve east-west congestion in Savannah: (1) a Gwinnett Street tunnel or (2) a Bay Street bypass route consisting of a bridge to Hutchinson Island from the south bank of the Savannah River near the East Coast Terminal and a freeway along the island connecting with the Houlihan Bridge upstream of Garden City Terminal. These congestion relief measures are too uncertain for consideration in this analysis.

Dredging Costs: East Coast Terminal

Dredging-related costs associated with the East Coast Terminal are presented in Table 17. Costs in this table include deepening Fig Island Turning Basin, which has the following dimensions: 900 feet wide, 1,000 feet long, and 34 feet deep. This turning basin would need to be enlarged as well as deepened to be consistent with Kings Island Turning Basin, which would be 1,600 feet by 1,675 feet under the Tier I Selected Plan. As indicated in this table, dredging to 48 feet MLW from the sea to the East Coast Terminal site would cost approximately $203 million.

Based on the distance downstream, it was assumed that most of the dredging-related costs in the bottom rows of Table 17 (Debris Removal to Striped Bass Impact Avoidance) would be 55 percent of costs developed for Garden City Terminal in the Tier I analysis. Mitigation costs for cultural/historic impacts and channel modification would be expected to consistent (i.e., 100 percent) with Garden City costs. Secondary effects of salinity intrusion on wetlands would be expected to be drop to insignificance, and dissolved oxygen mitigation costs for East Coast Terminal would be expected to 20 percent of the costs of Garden City Terminal.

Other Considerations: East Coast Terminal

The East Coast Terminal site could be affected by the development of a Hutchinson Island bridge, as discussed in the preceding section. This bridge could significantly affect this site and/or landside transportation in this part of the City of Savannah. The outcome for this site could be positive in terms of transportation access, negative if some portion of the site is lost to the bridge or its approaches, or some combination.

As discussed above, a portion of the traffic from a container facility is generated by deliveries to and from distribution centers. Anything that would generate longer delivery times, such as longer dray distances, will affect the number of deliveries that can be made. As the number of deliveries per driver decreases, the cost per dray could increase. If the number of containers stays constant, more trucks will be required to handle the same number of containers, generating more traffic on the road. Since East Coast Terminal is approximately seven miles downstream of Garden City Terminal, the drayage distance from this site would be at least that much more than the distance from Garden City Terminal.

TABLE 17
ESTIMATED COSTS OF CHANNEL DEEPENING (48 FEET MLW)
TO EAST COAST TERMINAL

Mobilization				$2,683,845
-85+000 to -60+000	2,616,000	cy	$3.87	$10,123,920
-60+000 to -38+500	4,163,000	cy	$2.69	$11,188,063
-38+500 to -14+000	5,155,000	cy	$2.04	$10,529,088
-14+000 to 0+000	2,071,000	cy	$2.26	$4,675,283
0+000 to 24+000	3,506,000	cy	$2.37	$8,291,690
24+000 to 40+000	3,824,000	cy	$4.89	$18,704,140
40+000 to 50+000	2,963,000	cy	$2.96	$8,759,369
50+000 to 70+000	3,874,000	cy	$2.63	$10,203,148
Deepening Fig Island Turning Basin		cy	$2.63	$18,995,817
Berth Dredging	600,000	cy	$2.63	$1,580,250
Disposal Area Site Work and Erosion Control				$13,524,987
Dredging Contingency	25%			$29,814,899
E&D / S&A	20%			$29,814,899
Subtotal				$178,889,396
Debris Removal	55%		$2,449,764	$1,347,370
Aids to Navigation	55%		$871,691	$479,430
Chloride Mitigation - relocate water intake	0%		$49,450,000	$0
Dissolved Oxygen Mitigation	20%		$25,800,000	$5,160,000
Cultural/Historic Mitigation	100%		$15,424,449	$15,424,449
Lands, Easements, Relocations, Rights-of-Way	55%		$2,349,198	$1,292,059
Channel Modification Mitigation	55%		$260,000	$143,000
Salinity Intrusion on Wetlands (722 ac)	0%		$18,772,000	$0
Shortnose Sturgeon Mitigation	20%		$1,375,500	$275,100
Striped Bass Impact Avoidance	0%		$2,000,000	$0
			TOTAL	$203,010,803

Overall Assessment: East Coast Terminal

The East Coast Terminal site has little potential as a container terminal. The benefits from dredging costs avoided are significantly outweighed by the costs of developing this facility. In addition, the site is likely too small for long-term use as an efficient container terminal. Even if these issues were not of concern, difficulties in east-west landside transportation of containers through the city by truck or by rail would likely be sufficient to eliminate this site from further consideration.

The conclusion is that landside transportation would be problematic for a new container terminal east of the City, including East Coast Terminal and Elba Island (the next alternative location discussed). The assumed 1.5 million TEUs per year would generate tremendous volumes of truck traffic to/from these terminals. According to MPC staff, rail movement of a significant portion of these containers would likely generate significant neighborhood opposition. The CSX rail line to areas east of the city, including the East Coast Terminal passes through residential neighborhoods in Savannah. This line is active, but according to MPC staff a dramatic increase in traffic could stimulate opposition from trackside neighborhoods.

ELBA ISLAND TERMINAL

The feasibility of developing a new container facility on Elba Island is assessed below. As for the discussion of all the alternative facilities, the analysis includes a profile of the site, estimation of the costs to modify the facility, a discussion of required landside transportation infrastructure, an evaluation of benefits of modifying this facility, discussion of other factors involved in conversion of this facility, and an overall assessment of its ability to address navigation problems and opportunities in Savannah Harbor.

Elba Island Site Profile and Initial Assessment

As indicated in Figure 1, Elba Island is located approximately half way between Garden City Terminal and the sea. Figure 8 provides a more detailed aerial view. The polygon in Figure 8 provides visual scale for the aerial photo, representing the 300 acres that are assumed to be necessary for development of a new container facility.

Elba Island is owned by Southern Gas which operates a liquefied natural gas (LNG) facility on the northeastern portion of the island. The facility has a marine terminal for receipt of LNG tankers. There is approximately 1,255 feet of berth space, maintained at a depth of 39 feet MLW. Adjacent to the terminal is a privately-maintained turning basin constructed by Southern Gas for its LNG ships. The remainder of the island, shown in Figure 8, serves as an active dredged material disposal site that Southern Gas uses for its maintenance dredging of the LNG berths and of the turning basin. Elba Island is accessed by a service road which includes a bridge over South Channel. There is currently no rail service to the island.

FIGURE 8
ELBA ISLAND

The LNG facility on Elba Island was re-activated in 2001, after being mothballed since 1982. As part of its re-activation, Southern Gas re-dredged the facility berths and the turning basin. Based on the re-activation of the facility, the planned expansion of the facility in 2005, and the rising importation of LNG, Southern Gas is likely to be operating the Elba Island facility for the foreseeable future.

As an initial assessment, Elba Island is far enough downstream of Garden City Terminal to generate significant savings in dredging costs avoided. In addition, there appears to be sufficient space on the island for a container facility consistent with the above assumptions. However, there does not appear to be much opportunity for future expansion. Although there is no rail service to the island, it is conceivable that a rail terminal could be developed on the south side of South Channel with convenient drayage. The previously mentioned difficulties of moving containers east-west through the City of Savannah would apply to an Elba Island container terminal.

Construction Costs: Elba Island Terminal

The costs required to construct a container terminal on Elba Island are contained in Table 18. As indicated in this table, it is estimated that $285 million would be required to develop a container terminal at this site. It is assumed that the container terminal site would not adversely affect the LNG terminal. It is assumed that an intermodal rail facility would need to be located on the south shore of South Channel. Trucks would access the site via the existing service road and bridge. However, significant improvements to this road and bridge would likely be necessary to accommodate the volume of truck traffic associated with a new container terminal; these costs are uncertain at this time and are not included in Table 18. Other assumptions about this site include: a water storage tank for fire protection and approximately 50 acres (of 300) would require wetland mitigation. It is assumed that City of Savannah's President Street Municipal Wastewater Treatment Plant would service a new terminal at Elba Island.

Based on aerial photos, U.S.G.S. quadrangle maps, and preliminary site reconnaissance, it is assumed that 50 acres of this site (i.e., one-sixth of the 300 acres) would be wetlands. As noted above, it is assumed that wetland mitigation activities (in addition to land purchases) would be approximately $20,000 per acre ($10,000/acre plus a 2:1 replacement ratio).

Landside Transportation: Elba Island Terminal

A container terminal on Elba Island would face the same landside transportation difficulties that face East Coast Terminal. Congestion on the east-west corridors through Savannah are severe and likely to worsen. Truck and rail transport of large volumes of containers to/from an Elba Island terminal could encounter significant community opposition in neighborhoods along those routes. The landside transportation problems associated with developing this site would likely greatly diminish if, separate from this project, a tunnel under downtown or a new bridge and bypass were constructed across the Savannah River, as discussed in the *East-West Corridor Feasibility Study*. Measures to reduce the rail problems are not readily foreseeable for this area and that - if true, operation of a terminal based solely on truck transit of the containers would greatly limit its potential efficiency and cost effectiveness.

As discussed above, a portion of the traffic from a container facility is generated by deliveries to and from distribution centers. Anything that would generate longer delivery times, such as longer dray distances, will affect the number of deliveries that can be made. As the number of deliveries per driver decreases, the cost per dray could increase. If the number of containers stays constant, more trucks will be required to handle the same number of containers, generating more traffic on the road. Since Elba Island is approximately 11 miles downstream of Garden City Terminal, the drayage distance from this site would be at least that much more than the distance from Garden City Terminal.

TABLE 18
ESTIMATED COSTS OF ELBA ISLAND TERMINAL

Site Improvement				
Land purchase	375		$6,000	$2,250,000
Heavy Duty Pavement for container traffic	300	ac	$300,000	$90,000,000
Administration Building	10,000	sf	$168	$1,675,102
storage building	20,000	sf	$10	$198,565
Building foundation	3,333	sy	$22	$73,717
110 lb Railroad track w/ wooden ties and ballast	-	lf	$78	$0
RR bed prep	-	lf		$0
110 lb Railroad track w/ concrete ties in container yard	-	lf	$182	$0
Electrical service to terminal	21,000	lf	$60	$1,260,000
Dock (includes: concrete deck & beam, concrete steel reinforcement, 18" square precast concrete piling, expn joint & misc const items, handrail, fender system)	2,500	lf	$14,300	$35,750,000
Crane Tracks on concrete ties(assume length = 1.25 x dock length)	3,125	lf	$182	$567,582
100,000 Gallon Water Storage Tank for fire protection	1	ea	$250,000	$250,000
Intermodal Transfer Station	1	ea	$5,304,817	$5,304,817
Wetlands Mitigation	50	ac	$26,000	$1,300,000
Equipment				
72-95 Ton Cranes	6	ea	$6,500,000	$39,000,000
Rubber tire gantries	7	ea	$1,300,000	$9,100,000
Five High loaded top lifts (87,000 lbs)	10		$350,000	$3,500,000
Seven High empty stackers ((15,000 lbs)	2		$200,000	$400,000
Jockey Trucks	20	ea	$39,120	$782,400
Flatbed Trucks	6	ea	$28,980	$173,880
Contingency	25%			$47,571,516
			Subtotal	$237,857,579
E&D / S&A	20%			$47,571,516
			TOTAL	$285,479,094

Dredging Costs: Elba Island Terminal

Dredging-related costs associated with the Elba Island site are presented in Table 19. As indicated in this table, dredging to 48 feet MLW from the sea to Elba Island would cost approximately $138 million.

TABLE 19
ESTIMATED COSTS OF CHANNEL DEEPENING (48 FEET MLW)
TO ELBA ISLAND TERMINAL

Mobilization				$2,683,845
-85+000 to -60+000	2,616,000	cy	$3.87	$10,123,920
-60+000 to -38+500	4,163,000	cy	$2.69	$11,188,063
-38+500 to -14+000	5,155,000	cy	$2.04	$10,529,088
-14+000 to 0+000	2,071,000	cy	$2.26	$4,675,283
0+000 to 24+000	3,506,000	cy	$2.37	$8,291,690
24+000 to 40+000	3,824,000	cy	$4.89	$18,704,140
40+000 to 50+000 (Assume end of port located at station 45+000)	2,963,000	cy	$2.96	$8,759,369
Dredging for turning basin	992,593	cy	$2.96	$2,934,352
Berth Dredging	600,000	cy	$2.96	$1,773,750
Disposal Area Site Work and Erosion Control				$11,343,537
Contingency	25%			$22,751,759
E&D / S&A	20%			$22,751,759
Subtotal				$136,510,553
Debris Removal	30%		$2,449,764	$734,929
Aids to Navigation	30%		$871,691	$261,507
Chloride Mitigation - relocate water intake	0%		$49,450,000	$0
Dissolved Oxygen Mitigation	0%		$25,800,000	$0
Cultural/Historic Mitigation	0%		$15,424,449	$0
Lands, Easements, Relocations, Rights-of-Way	30%		$2,349,198	$704,759
Channel Modification Mitigation	30%		$260,000	$78,000
Salinity Intrusion on Wetlands (722 ac)	0%		$18,772,000	$0
Shortnose Sturgeon Mitigation	0%		$1,375,500	$0
Striped Bass Impact Avoidance	0%		$2,000,000	$0
			TOTAL	$138,289,749

Based on the distance downstream, it was assumed that most of the dredging-related costs in the bottom rows of Table 19 (Debris Removal to Striped Bass Impact Avoidance) would be 30 percent of costs developed for Garden City Terminal in the Tier I analysis. Mitigation costs for cultural/historic impacts would be insignificant, since the Elba Island site is downstream of Old Fort Jackson and the *CSS Georgia*. Dissolved oxygen mitigation , shortnose sturgeon mitigation, and striped bass impact avoidance would not be necessary for this site.

Other Considerations: Elba Island Terminal

At Elba Island the Federal channel makes a sharp turn. This bend constitutes a challenge for commercial navigation. According to the Savannah Pilots, the pilots actively avoid passing commercial ships at this location. Consequently, a container facility on the undeveloped portion of the island might not be a safe location for a marine terminal if berthing areas would be located on or near the bend. This assumes that the LNG terminal would not be involved in development of a container facility. As stated above, it is likely that the LNG period would operate through the 50-year period of analysis.

A new terminal at Elba Island would fall into the current "blast zone" for the LNG facility. This raises the issue of whether Elba Island is a practical or safe location for a container terminal given the activities on the adjoining LNG facility. In addition, the Coast Guard regulates movements of LNG vessels in the harbor and movements of other vessels when LNG vessels are in transit. Specifically, movements of LNG tankers require a regulated navigation area (RNA) that extends from Fort Jackson (upriver from the LNG terminal) downstream to the channel entrance offshore (i.e., the Savannah River Channel Entrance Sea Buoy). Currently, when LNG ships are transiting the channel, vessels greater than 1,600 gross tons are prohibited from operating in the RNA without express permission of the USCG Captain of the Port. A revision to this RNA has been proposed by USCG. The proposed rulemaking [33 CFR Part 165] would allow vessels greater than 1,600 gross tons to operate in the RNA when LNG tankers are transiting Savannah Harbor, provided that a separation distance of two nautical miles is maintained. Under both current and proposed navigational rules, movements of LNG vessels could significantly constrain marine operations at an Elba Island container terminal.

The loss of sediment placement capacity that would result from use of the Elba Island disposal site would necessitate procurement of disposal capacity elsewhere along the river. It is assumed that the Georgia Department of Transportation and the Corps would allow Southern Energy to place their dredged material into contained disposal facilities (CDFs) on the north side of the river. The additional pumping costs and/or costs of constructing additional storage capacity have not been included in this analysis.

Overall Assessment: Elba Island Terminal

Elba Island has little potential as a container facility. The costs significantly exceed the benefits from avoided dredging costs. In addition, landside transportation would pose a significant challenge to the viability of this terminal, as for East Coast Terminal. Lastly, safe navigation practices may not allow location of a marine terminal at this sharp bend in the Savannah River.

DISPOSAL SITES 14A/B

The feasibility of developing a new container facility at Disposal Sites 14A/B in Jasper County, South Carolina is assessed on the next page. As for the discussion of all the alternative facilities, the analysis includes a profile of the site, estimation of the costs to modify the facility, a discussion of required landside transportation infrastructure, an evaluation of benefits of modifying this facility, discussion of other factors involved in

conversion of this facility, and an overall assessment of its ability to address navigation problems and opportunities in Savannah Harbor.

Disposal Sites 14A/B Profile and Initial Assessment

As indicated in Figure 1, the Disposal Sites 14A/B is located in Jasper County, South Carolina downstream of Elba Island. Figure 9 provides a more detailed aerial view. As with the other sites, the polygon in Figure 9 provides visual scale for the aerial photo. This box represents the 300 acres that are assumed to be necessary for development of a new container facility. This site is currently a dredged material disposal site operated by the Corps.

The consideration of the Disposal Sites 14A/B in this investigation is distinct from the South Atlantic International Terminal proposal being forwarded by Stevedoring Services of America (SSA). The SSA proposal, which would include some portions of Disposal Sites 14A/B, would occupy 500 acres and is expected to cost more than $400 million. This proposal is currently embroiled in a legal and political controversy. Legal issues concern the attempted condemnation of the site by Jasper County and lease to SSA for terminal development. Political issues include a lack of support by the State of Georgia or shipping interests in Charleston. This analysis is not evaluating the SSA proposal. Instead, it is evaluating Disposal Sites 14A/B for potential placement of a container facility that is commensurate with the other facilities being considered in this investigation.

As an initial assessment, Disposal Sites 14A/B are located toward the mouth of the Savannah River and would therefore generate significant benefits in terms of avoided dredging costs. There is also ample room for the terminal and its potential expansion.

Construction Costs: Disposal Sites 14A/B

The costs required to construct a container terminal at Disposal Sites 14A/B are contained in Table 20. As indicated in this table, it is estimated that $357 million would be required to develop a container terminal at this location.

As with Disposal Site 12A, the Compensation for Lost Disposal Capacity cost category includes 375 acres of replacement disposal capacity to compensate for capacity lost with development of the terminal and the intermodal facility. As for Disposal Site 12A it is assumed that one-half of the new disposal capacity would be located in wetlands, which would require mitigation.

Based on aerial photos, U.S.G.S. quadrangle maps, and preliminary site reconnaissance, it is assumed that 61 acres of this site (i.e., 50 percent of the landside transportation corridor and the intermodal facility) would be wetlands. As previously mentioned, it is assumed that a new intermodal container transfer facility that 75 acres would be required for this terminal. Consequently, land purchases in Table 20 contain 375 acres (i.e., 300 for the container terminal and 75 acres for the intermodal facility). As noted above, it is also assumed that wetland mitigation activities (in addition to land purchases) would be approximately $20,000 per acre ($10,000/acre plus a 2:1 replacement ratio).

FIGURE 9
DISPOSAL SITES 14A/B

TABLE 20
ESTIMATED COSTS OF TERMINAL AT DISPOSAL SITES 14A/B

Site Improvement				
Land purchase	375	ac	$6,000	$2,250,000
Access drive Heavy Duty Pavement for container traffic	47	ac	$300,000	$14,100,000
Heavy Duty Pavement for container traffic	300	ac	$300,000	$90,000,000
8" PVC Water service from Hardeeville (10 miles)	52,800	lf	$13	$663,340
Administration Building	10,000	sf	$168	$1,675,102
storage building	20,000	sf	$10	$198,565
Building foundation	3,333	sy	$22	$73,717
110 lb Railroad track w/ wooden ties and ballast	48,000	lf	$78	$3,726,630
RR bed foundation	117,333	sy	$13	$1,574,609
110 lb Railroad track w/ concrete ties in container yard	20,000	lf	$182	$3,632,524
Railroad track bridge crossing	300	lf	$1,132	$339,488
Electrical service from Hardeeville, SC	79,200	lf	$60	$4,752,000
Dock (includes: concrete deck & beam, concrete steel reinforcement, 18" square precast concrete piling, expn joint & misc const items, handrail, fender system)	2,500	lf	$14,300	$35,750,000
Crane Tracks on concrete ties(assume length = 1.25 x dock length)	3,125	lf	$182	$567,582
Hwy 17 railroad & semi flyover				$3,299,524
100,000 Gallon Water Storage Tank for fire protection	1	ea	$250,000	$250,000
Intermodal Transfer Station	1	ea	$5,304,817	$5,304,817
Compensation for Lost Disposal Capacity				$7,125,000
Wetlands Mitigation	24	ac	$26,000	$611,000
Wastewater Treatment Facility	1		$10,000,000	$10,000,000
Equipment				
72-95 Ton Cranes	6	ea	$6,500,000	$39,000,000
Rubber tire gantries	7	ea	$1,300,000	$9,100,000
Five High loaded top lifts (87,000 lbs)	10		$350,000	$3,500,000
Seven High empty stackers (15,000 lbs)	2		$200,000	$400,000
Jockey Trucks	20	ea	$39,120	$782,400
Flatbed Trucks	6	ea	$28,980	$173,880
Contingency	25%			$59,559,795
			Subtotal	$297,798,793
E&D / S&A	20%			$59,559,795
			TOTAL	$357,358,767

As for Disposal Site 12A, the Federal Government would need to be compensated for disposal capacity lost when this site is developed. It is assumed that this compensation would be in the form of replacement disposal capacity elsewhere along the river. The Compensation for Lost Disposal Capacity cost category includes 375 acres of replacement disposal capacity. It also includes wetland mitigation for one-half of that area that is assumed to be wetlands.

Landside Transportation: Disposal Sites 14A/B

A container facility at Disposal Sites 14A/B would have similar landside issues as the other terminals considered that are on the north side of the Savannah River. In particular, there could be significant environmental impacts and consequent mitigation costs associated with road and rail access to the terminal.

Dredging Costs: Disposal Sites 14A/B

Dredging-related costs associated with Disposal Sites 14A/B are presented in Table 21. As indicated in this table, dredging to 48 feet MLW from the sea to Disposal Sites 14A/B would cost approximately $127 million. It is assumed that ships calling at the Disposal Sites 14A/B container facility would use the Elba Island turning basin constructed by Southern Gas to serve the LNG marine terminal.

Based on the distance downstream, it was assumed that most of the dredging-related costs in the bottom rows of Table 21 (Debris Removal to Striped Bass Impact Avoidance) would be 25 percent of costs developed for Garden City Terminal in the Tier I analysis. Chloride mitigation, dissolved oxygen mitigation, cultural/historic mitigation, lands, easements, relocations, rights-of-way, channel modification mitigation, and salinity intrusion on wetlands would not be necessary.

Other Considerations: Disposal Sites 14A/B

Environmental considerations associated with Disposal Sites 14A/B include potential wetlands disturbances associated with rail and road access routes. The use of the site as a dredged material disposal site minimizes direct wetlands impacts. However, the lost dredged material disposal capacity would need to be replaced elsewhere along the river, preferably in the lower reaches of the river, which are currently served by the impacted disposal areas. Replacement of that capacity through expansion of the CDFs to the north into existing saltmarsh would result in extensive secondary wetland impacts which would need to be mitigated.

As discussed above, a portion of the traffic from a container facility is generated by deliveries to and from distribution centers. Anything that would generate longer delivery times, such as longer dray distances, will affect the number of deliveries that can be made. As the number of deliveries per driver decreases, the cost per dray could increase. If the number of containers stays constant, more trucks will be required to handle the same number of containers, generating more traffic on the road. Since Disposal Sites 14A/B are approximately 11 miles downstream of Garden City Terminal, the drayage distance from this site would be at least that much more than the distance from Garden City Terminal.

TABLE 21
ESTIMATED COSTS OF CHANNEL DEEPENING (48 FEET MLW)
TO TERMINAL AT DISPOSAL SITES 14A/B

Mobilization			$2,683,845
-85+000 to -60+000	2,616,000 cy	$3.87	$10,123,920
-60+000 to -38+500	4,163,000 cy	$2.69	$11,188,063
-38+500 to -14+000	5,155,000 cy	$2.04	$10,529,088
-14+000 to 0+000	2,071,000 cy	$2.26	$4,675,283
0+000 to 24+000	3,506,000 cy	$2.37	$8,291,690
24+000 to 40+000	3,824,000 cy	$4.89	$18,704,140
40+000 to 50+000 (Assume end of port located at station 42+000)	592,600 cy	$2.96	$1,751,874
Dredging for turning basin	992,593 cy	$2.96	$2,934,352
Berth Dredging	600,000 cy	$2.96	$1,773,750
Disposal Area Site Work and Erosion Control			$11,081,763
Contingency	25%		$20,934,442
E&D / S&A	20%		$20,934,442
Subtotal			$125,606,650
Debris Removal	25%	$2,449,764	$612,441
Aids to Navigation	25%	$871,691	$217,923
Chloride Mitigation - relocate water intake	0%	$49,450,000	$0
Dissolved Oxygen Mitigation	0%	$25,800,000	$0
Cultural/Historic Mitigation	0%	$15,424,449	$0
Lands, Easements, Relocations, Rights-of-Way	25%	$2,349,198	$587,299
Channel Modification Mitigation	25%	$260,000	$65,000
Salinity Intrusion on Wetlands (722 ac)	0%	$18,772,000	$0
Shortnose Sturgeon Mitigation	0%	$1,375,500	$0
Striped Bass Impact Avoidance	0%	$2,000,000	$0
		TOTAL	$127,089,313

Overall Assessment: Disposal Sites 14A/B

Disposal Sites 14A/B have potential as a container facility. Although the location of this facility would be sufficiently downstream to generate significant benefits in terms of avoided dredging costs, the costs of facility development are substantially in excess of dredging costs avoided. However, the potential for extensive secondary wetland impacts could be a significant factor in the ultimate feasibility of this site.

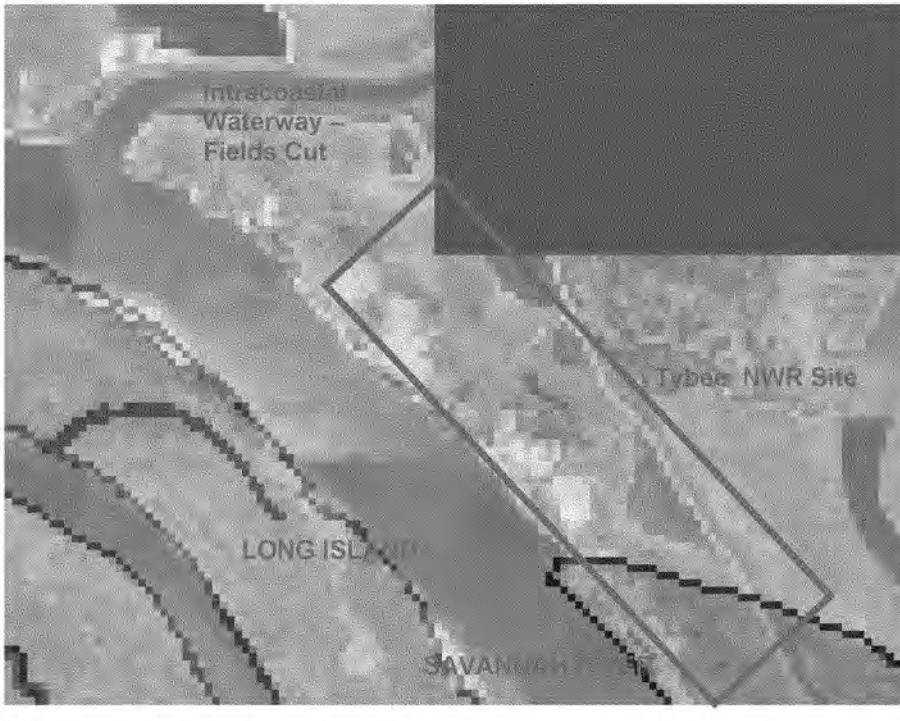
TYBEE NATIONAL WILDLIFE REFUGE

The feasibility of developing a new container facility in Tybee National Wildlife Refuge in Jasper County, South Carolina is assessed below. As for the discussion of all the alternative facilities, the analysis includes a profile of the site, estimation of the costs to modify the facility, a discussion of required landside transportation infrastructure, an evaluation of benefits of modifying this facility, discussion of other factors involved in conversion of this facility, and an overall assessment of its ability to address navigation problems and opportunities in Savannah Harbor.

Tybee National Wildlife Refuge Site Profile and Initial Assessment

As indicated in Figure 1, the Tybee NWR site is located in Jasper County, South Carolina approximately four miles upstream of mouth of the Savannah River. Figure 10 provides a more detailed aerial view. As for the other sites discussed above, the polygon in Figure 10 provides visual scale for the aerial photo. This box represents the 300 acres that are assumed to be necessary for development of a new container facility. It is assumed for this investigation that the Tybee NWR container facility would straddle the border between the wildlife refuge and the Corps' dredged material disposal facility (Jones/Oysterbed Island Disposal Area), with 50 percent of the facility footprint in each of these areas.

FIGURE 10
TYBEE NWR SITE



As an initial assessment, the Tybee NWR would have similar assets and liabilities as Disposal Sites 14A/B discussed above. There would be ample room for the terminal and its potential expansion. There would be significant benefits from avoided dredging costs by its location close to the mouth of the river. One challenge for the Tybee NWR site would be the need to cross the Fields Cut portion of the Intracoastal Waterway.

Construction Costs: Tybee NWR Terminal

The costs required to construct a container terminal at the Tybee NWR site are contained in Table 22. As indicated in this table, it is estimated that $385 million would be required to develop a container terminal at this site. Train access/egress from the Tybee NWR site would be via the Hardeeville Spur; road access would be via Route 17. It is assumed that an intermodal rail facility would need to be located near the site west of Fields Cut to avoid the expense of a rail bridge over the Intracoastal Waterway. As previously mentioned, it is assumed that a new intermodal container transfer facility that 75 acres would be required for this terminal. Consequently, land purchases in Table 20 contain 375 acres (i.e., 300 for the container terminal and 75 acres for the intermodal facility). Other assumptions about this site include: a water storage tank for fire protection and a package wastewater treatment facility.

As for Disposal Site 12A and Disposal Sites 14A/B, the Federal Government would need to be compensated for disposal capacity lost when this site is developed. It is assumed that this compensation would be in the form of replacement disposal capacity elsewhere along the river. As mentioned previously, it is assumed in the Compensation for Lost Disposal Capacity cost category that one-half of the site would be located in the Jones/Oysterbed Island Disposal Area. Since the compensatory disposal capacity would likely be located somewhere in the Tybee NWR, a 2:1 ratio of mitigation to loss was used for this site. Consequently, the $6.0 million cost estimate is based on: [(187.5 acres x $6,000 per acre) + (93.75 acres x 2:1 ratio x $26,000 per acre for land/mitigation costs)]. Based on aerial photos, U.S.G.S. quadrangle maps, and preliminary site reconnaissance, it is assumed that 51 acres of wetland would be impacted by the transportation corridor (rail and road), assuming one-half of the corridor passes through wetlands. As noted above, it is assumed that wetland mitigation activities (in addition to land purchases) would be approximately $20,000 per acre ($10,000/acre plus a 2:1 replacement ratio).

Landside Transportation: Tybee NWR Terminal

The need to cross Fields Cut could be a significant issue for this site. For the Norfolk to Miami section of this waterway, the U.S. Coast Guard (USCG) requires that all bridges provide 65 feet of vertical clearance. This would make the bridge expensive.

TABLE 22
ESTIMATED COSTS OF TYBEE NWR TERMINAL

Site Improvement				
Land purchase	375		$6,000	$2,250,000
Heavy Duty Pavement for container traffic	300	ac	$300,000	$90,000,000
Heavy Duty Access Drive Pavement for container traffic	101	ac	$300,000	$30,440,771
8" PVC Water service from Hardeeville (10 miles)	52,800	lf	$13	$663,340
Administration Building	10,000	sf	$168	$1,675,102
storage building	20,000	sf	$10	$198,565
Building foundation	3,333	sy	$22	$73,717
110 lb Railroad track w/ wooden ties and ballast	48,000	lf	$78	$3,726,630
RR foundation	117,333	sy	$13	$1,574,609
110 lb Railroad track w/ concrete ties in container yard	20,000	lf	$182	$3,632,524
Railroad track bridge crossing	300	lf	$1,132	$339,488
Electrical service from Hardeeville, SC	131,700	lf	$60	$7,902,000
Dock (includes: concrete deck & beam, concrete steel reinforcement, 18" square precast concrete piling, expn joint & misc const items, handrail, fender system)	2,500	lf	$14,300	$35,750,000
Crane Tracks on concrete ties(assume length = 1.25 x dock length)	3,125	lf	$182	$567,582
Hwy 17 railroad & semi flyover				$3,299,524
Bridge over Fields Cut				$3,299,524
100,000 Gallon Water Storage Tank for fire protection	1	ea	$250,000	$250,000
Intermodal Transfer Station	1	ea	$5,304,817	$5,304,817
Compensation for Lost Disposal Capacity				$6,000,000
Wetlands Mitigation	51	ac	$26,000	$1,319,100
Wastewater Treatment Facility	1		$10,000,000	$10,000,000
Equipment				
72-95 Ton Cranes	6	ea	$6,500,000	$39,000,000
Rubber tire gantries	7	ea	$1,300,000	$9,100,000
Five High loaded top lifts (87,000 lbs)	10		$350,000	$3,500,000
Seven High empty stackers ((15,000 lbs)	2		$200,000	$400,000
Jockey Trucks	20	ea	$39,120	$782,400
Flatbed Trucks	6	ea	$28,980	$173,880
Contingency	25%			$64,151,237
			Subtotal	$320,756,186
E&D / S&A	20%			$64,151,237
			TOTAL	$384,907,423

Dredging Costs: Tybee NWR Terminal

Dredging-related costs associated with the Tybee NWR site are presented in Table 23. As indicated in this table, dredging to 48 feet MLW from the sea to the Tybee NWR Terminal site would cost approximately $80 million.

Based on the distance downstream, it was assumed that most of the dredging-related costs in the bottom rows of Table 23 (Debris Removal to Striped Bass Impact Avoidance) would be 10 percent of costs developed for Garden City Terminal in the Tier I analysis. Channel modification mitigation costs for the Tybee NWR site would also be expected to 10 percent of Garden City costs. Chloride mitigation, dissolved oxygen mitigation, cultural/historic mitigation, lands, easements, relocations, rights-of-way, channel modification mitigation, and salinity intrusion on wetlands would not be necessary.

Other Considerations: Tybee NWR Terminal

A Tybee NWR container terminal would have adverse impacts on the wildlife refuge, assuming that one-half of the facility would located within the refuge. In addition, truck and rail access routes would likely impact wetlands. These impacts would need to be carefully designed to avoid, minimize, and mitigate wetland impacts.

As discussed above, a portion of the traffic from a container facility is generated by deliveries to and from distribution centers. Anything that would generate longer delivery times, such as longer dray distances, will affect the number of deliveries that can be made. As the number of deliveries per driver decreases, the cost per dray could increase. If the number of containers stays constant, more trucks will be required to handle the same number of containers, generating more traffic on the road. Since the Tybee NWR site is approximately 15 miles downstream of Garden City Terminal, the drayage distance from this site would be at least that much more than the distance from Garden City Terminal.

These adverse environmental effects on the refuge would under most circumstances be sufficient to preclude this site from further investigation. However, U.S. Fish and Wildlife Service has concerns about the effects of the Tier I Selected Plan (i.e., 48-foot MLW channel deepening to Garden City Terminal) on the Savannah National Wildlife Refuge and offered the Tybee NWR site for consideration in order to limit environmental impacts in the upper harbor.

As with Disposal Site 12A and Disposal Sites 14A/B, the loss of dredged material disposal capacity would need to be compensated elsewhere along the river, preferably in the same reach as this site. A plan for such compensation and the costs for such an action, have been included in this evaluation.

TABLE 23
ESTIMATED COSTS OF CHANNEL DEEPENING (48 FEET MLW)
TO TYBEE NWR TERMINAL

Mobilization			$2,683,845
-85+000 to -60+000	2,616,000 cy	$3.87	$10,123,920
-60+000 to -38+500	4,163,000 cy	$2.69	$11,188,063
-38+500 to -14+000	5,155,000 cy	$2.04	$10,529,088
-14+000 to 0+000	2,071,000 cy	$2.26	$4,675,283
0+000 to 24+000 (Assume end of port located at station 4+000)	584,333 cy	$2.37	$1,381,948
Dredging for turning basin	1,250,000 cy	$2.37	$2,956,250
Berth Dredging	600,000 cy	$2.37	$1,419,000
Disposal Area Site Work and Erosion Control			$7,765,960
Contingency	25%		$13,180,839
E&D / S&A	20%		$13,180,839
Subtotal			$79,085,034
Debris Removal	10%	$2,449,764	$244,976
Aids to Navigation	10%	$871,691	$87,169
Chloride Mitigation - relocate water intake	0%	$49,450,000	$0
Dissolved Oxygen Mitigation	0%	$25,800,000	$0
Cultural/Historic Mitigation	0%	$15,424,449	$0
Lands, Easements, Relocations, Rights-of-Way	10%	$2,349,198	$234,920
Channel Modification Mitigation	10%	$260,000	$26,000
Salinity Intrusion on Wetlands (722 ac)	0%	$18,772,000	$0
Shortnose Sturgeon Mitigation	0%	$1,375,500	$0
Striped Bass Impact Avoidance	0%	$2,000,000	$0
		TOTAL	$79,678,099

Other potential impacts would be lights from the facility adversely affecting sea turtles. This site is near the Atlantic beaches which are nesting grounds for sea turtles. The turtles can be disoriented by lights from shore. A large container terminal approximately two and one-half miles away could have adverse effects in this regard.

Overall Assessment: Tybee NWR Terminal

The Tybee NWR has limited potential as a container facility. Although the location of this facility would be sufficiently downstream to generate significant benefits in terms of avoided dredging costs, the costs of facility development are substantially in excess of dredging costs avoided. Finally, the environmental effects of a Tybee NWR container terminal would severely diminish the feasibility of this site.

COLONEL'S ISLAND, BRUNSWICK

Based on coordination between Savannah District and GPA, Colonel's Island was identified as having the greatest potential among the Brunswick marine terminals for development of a container terminal commensurate in channel depth and throughput capacity with the alternative Savannah River terminals discussed above. The feasibility of developing a new container facility at Colonel's Island in Brunswick is assessed below. The analysis of Colonel's Island includes a profile of the site, estimation of the costs to modify the facility, an evaluation of benefits of modifying this facility, discussion of other factors involved in conversion of this facility, and an overall assessment of its ability to address navigation problems and opportunities in Savannah Harbor.

Colonel's Island Site Profile and Initial Assessment

Figure 11 provides an aerial view of the Colonel's Island facility. As for the other sites discussed above, the polygon in Figure 11 provides visual scale for the aerial photo. This box represents the 300 acres that are assumed to be necessary for development of a new container facility consistent with the above facility parameters.

The existing Colonel's Island marine terminal is approximately 1,700 acres. It is served by a Federal navigation channel that is 400 feet wide with a depth of 30 feet MLW. Deepening of the Federal channel to 36 feet MLW has been authorized and is presently under construction. This marine terminal primarily handles bulk agricultural commodities and RoRo cargo. The existing Colonel's Island facility has three berths with lengths of 550, 750, and 550 feet. The terminal is located three miles from Interstate 95, and rail service is provided by CSX and Norfolk Southern Railroad.

As an initial assessment, a new container facility at Brunswick, which is approximately 80 miles from Savannah, may be of little help in addressing navigation problems and opportunities in Savannah Harbor. As evident in Figure 11, there appears to be sufficient space for a container terminal at Colonel's Island, but much of the site consists of wetlands. In the past, the Georgia Department of Natural Resources has strongly discouraged GPA from developing that site because of those wetlands. Mitigation costs would need to be included if this site were developed. Such costs are not included in this analysis. In addition, the existence of only a 36-foot channel (yet to be constructed) would likely result in significant cost disadvantages relative to alternative Savannah terminals given the assumed need to deepen to 48 feet MLW.

FIGURE 11
COLONEL'S ISLAND

Cost Of Modifying Colonel's Island Terminal

The estimated costs to construct a container terminal at Colonel's Island is contained in Table 24. As indicated in this table, it is estimated that $304 million would be required to develop a container terminal at this site. It is assumed that a new intermodal facility would be required. As previously mentioned, 75 acres would be required for this facility. Consequently, land purchases in Table 24 contain 375 acres (i.e., 300 for the container terminal and 75 acres for the intermodal facility). It is also assumed that all of this acreage would be wetlands (based on aerial photo interpretation) and that wetlands impacts would require mitigation at $20,000 per acre ($10,000/acre plus a 2:1 replacement ratio).

TABLE 24
ESTIMATED COSTS OF COLONEL'S ISLAND TERMINAL
BRUNSWICK, GA

Site Improvement				
Land purchase	375		$6,000	$2,250,000
Heavy Duty Pavement for container traffic	300	ac	$300,000	$90,000,000
Administration Building	20,000	sf	$168	$3,350,203
storage building	50,000	sf	$10	$496,414
110 lb Railroad track w/ wooden ties and ballast	10,000	lf	$78	$776,381
110 lb Railroad track w/ concrete ties in container yard	20,000	lf	$182	$3,632,524
Dock Includes items listed below:	2,500	lf	$14,300	$35,750,000
Crane Tracks on concrete ties(assume length = 1.25 x dock length)	3,125	lf	$182	$567,582
Intermodal Transfer Station	1	ea	$5,304,817	$5,304,817
Disposal Area Site Work and Erosion Control	0			
Wetlands Mitigation	375		$20,000	$7,500,000
Equipment				
72-95 Ton Cranes	6	ea	$6,500,000	$39,000,000
Rubber tire gantries	7	ea	$1,300,000	$9,100,000
Five High loaded top lifts (87,000 lbs)	10		$350,000	$3,500,000
Seven High empty stackers ((15,000 lbs)	2		$200,000	$400,000
Jockey Trucks	20	ea	$39,120	$782,400
Flatbed Trucks	6	ea	$28,980	$173,880
Contingency	25%			$50,646,050
			Subtotal	$253,230,251
E&D / S&A	20%			$50,646,050
			TOTAL	$303,876,301

Dredging Costs: Colonel's Island Terminal

Dredging-related costs associated with the Colonel's Island site are presented in Table 25. As indicated in this table, dredging to 48 feet MLW from the sea to Colonel's Island would cost approximately $138 million. According to recent discussions with Hydraulics Branch of Savannah District, the ongoing deepening of the Brunswick channel to 36 feet MLW is proving to be significantly more expensive than expected, due to the amount of rock encountered in the channel substrate. Consequently, the dredging estimates in Table 25 are likely to be unrealistically low for the same reason. As more geotechnical information about the Brunswick channel substrate becomes available, dredging costs in Table 25 will require adjustment.

TABLE 25
ESTIMATED COSTS OF CHANNEL DEEPENING (48 FEET MLW)
TO COLONEL'S ISLAND TERMINAL
BRUNSWICK, GA

Mobilization			$2,496,600
Dredging by Reach			
-6+250 to 19+000	**9,912,963** cy	$3.47	$34,410,868
19+000 to 32+500	5,300,000 cy	$3.50	$18,559,275
32+500 to 34+000	588,889 cy	$3.77	$2,217,549
34+000 to 46+350	4,848,519 cy	$5.11	$24,753,869
Dredge South Brunswick River	2,748,148 cy	$3.14	$8,619,154
Berth Dredging	200,000 cy	$3.14	$627,270
Contingency	25%		$22,921,147
		Subtotal	$114,605,733
E&D / S&A (dredging only)	20%		$22,921,147
		TOTAL	$137,526,879

Other Considerations: Colonel's Island Terminal

In 2002, GPA commissioned Booz, Allen, and Hamilton to prepare a strategic plan for the Port of Brunswick. This plan noted that cargo volumes of forest products shipped through Brunswick have been declining. These commodities, which were previously shipped primarily as break-bulk cargo, are increasingly being shipped in containers through Savannah, rather than Brunswick. Booz, Allen, and Hamilton estimated that the container hinterland of Brunswick would generate approximately 70,000-75,000 TEUs per year. Brunswick was expected to capture only a small portion of this volume (20-30 percent). The analysis indicated that Brunswick could develop a small, specialized niche in container services but could not be competitive in liner service with the major South Atlantic ports, including Savannah, Charleston, and Jacksonville. The reason cited was channel depth constraints resulting from rock in the channel substrate. The strategic plan did not consider Brunswick to be viable even for container barge feeder service to the major South Atlantic ports, noting that trucking would be more cost-effective for the distances involved.

The Booz, Allen, Hamilton study concluded that the container hinterland for Brunswick is too small to support a major container facility. This analysis studied the potential of Brunswick as an adjunct to Savannah, rather than a replacement. However, Savannah is approximately 60 miles closer to Atlanta and other more-distant inland origin/destinations.

Overall Assessment: Colonel's Island Terminal

Colonel's Island and the Port of Brunswick have little potential for development of a major container facility such as considered in this investigation. The port is not well situated to serve customers currently served by Savannah. In addition, the cost of deepening the channel appears to be prohibitive.

OFFSHORE TRANSSHIPMENT FACILITY

The investigation also evaluated an offshore container transshipment terminal. The premise of such a facility is that depth-constrained container ships would utilize the offshore terminal to load/unload either to: (1) the extent necessary to transit the channel upstream (i.e., lightering the vessel offshore) or (2) fully pick up and discharge cargo destined for the inland port thereby avoiding the transit altogether. As part of the operation of an offshore terminal, it is assumed that barges or non-depth-constrained ships would provide feeder service from the terminal to local or regional ports.

Development of an offshore terminal would allow Savannah to serve the largest container ships and avoid the full costs of channel deepening to Garden City Terminal. The feasibility for an offshore transshipment facility is assessed below. The discussion differs from those of the alternative landside terminals, since the design and operation of such a facility is very speculative at this time. The analysis includes discussions of: conceptual design and profile of the facility, costs and benefits, other considerations, and an overall assessment of its ability to address navigation problems and opportunities in Savannah Harbor.

As part of this investigation extensive coordination was conducted with proponents of Seahub, a conceptual offshore terminal that has evolved from Department of Defense (DOD) research into floating offshore military bases. As discussed below, some engineering feasibility investigations were conducted as part of this research. However, the research focused on military applications of offshore platforms. Costs were not developed. The costs or viability for a commercial container transshipment operation are unknown at this time.

As discussed below, research into an offshore transshipment terminal raises more questions than answers. However, based on work done to date on Seahub and current operations of landside transshipment terminals, an assessment of an offshore facility can be made.

Larger Ships and Increasing Interest in Transshipment

As larger container ships have been adopted for liner services, the larger loads and deeper drafts of these vessels has stimulated interest in and development of transshipment terminals. The concept of transshipment facility is a hub-and-spokes system, where transshipment facilities serve as regional hubs with feeder services by ship, barge, and landside transport to regional ports.

Transshipment activity is on the rise. In 1980 approximately 12 percent of worldwide container movements underwent transshipment. In 2002, 23 percent were transshipped. This trend is expected to continue as increasingly large container ships continue to be of interest to liner services, as evidenced by anticipation in the container industry that 10,000 to 15,000-TEU Malaccamax vessels may be in world service in the foreseeable future.

The adoption of larger container ships has been driven by pursuit of economies of scale, particularly over long trade routes. However, there is a trade-off with transshipment in the additional cost required to handle and store the transshipped containers, the time required for transshipment, and the potential for delays in making connections with feeder services.

Conceptual Design and Operations: Offshore Transshipment Facility

As part of this investigation, a literature search was conducted into container transshipment terminals. Several transshipment terminals are in operation around the world including Freeport, Bahamas; Kaohsiung, Taiwan; Aden, Yemen; Salalah, Oman, Singapore, and Manzanillo, Panama. To some extent, Garden City Terminal currently serves as a transshipment facility, with container barge fed services to regional (South Atlantic) ports moving containers to/from this central collection point served by the major container lines. In the Booz, Allen, Hamilton strategic plan for the Port of Brunswick discussed above, coastwise container barge service was considered more efficient than trucking for distances in excess of 300 miles.

At this time, all transshipment terminals are land-based. There are no offshore container transshipment terminals such as considered in this investigation for Savannah. Consequently, there is not a template upon which to base the design for an offshore container transshipment terminal at Savannah or to estimate the costs, benefits, and other effects. Following are discussions of the parameters for design and operation of an offshore container transshipment terminal at Savannah.

Regional or Local Scale?

Based on the limited experience with container transshipment terminals around the world, the geographic location of a transshipment terminal is a critical determinant of its success. Whether a Savannah facility would serve just the Port of Savannah or other South Atlantic ports would shape its design in terms of physical size and throughput capacity and its operation. The development of a regional offshore terminal would require cooperative planning between the South Atlantic ports, which are typically locked into a competitive struggle to serve overlapping economic hinterlands. For an offshore transshipment facility to address navigation problems and opportunities in Savannah Harbor, it is assumed that it would serve depth-constrained container ships with an annual throughput capacity of approximately 1.5 million TEUs.

Another issue of scale is the amount of container storage required on the offshore facility. Even if most containers were moved to/from ships to barges, some facility storage would

be required as part of repositioning operations. The load bearing capacity of an offshore facility and the surface area would be critical cost parameters.

Floating or Fixed?

As part of this investigation, several coastal/offshore engineering experts were consulted about the feasibility of an offshore container transshipment facility. The engineering challenges of an offshore terminal are significant. The most immediate challenge would be how to load/unload container ships in an offshore environment. In an unprotected berth, the movement of a ship in this wave environment would be problematic in terms of loading/unloading. Container transfers to/from vessels would be inefficient, potentially dangerous, and under certain wave conditions, impossible (see discussion below). If the transshipment platform was also moving (as for a floating platform), these difficulties become much more challenging, suggesting a fixed platform or artificial island would be required.

According to one offshore engineering expert, the wave uplift on a fixed crane platform would exceed engineering capabilities, and a platform would need to be at least 100 feet above sea level. A floating "tension leg" platform, which remains at a constant elevation due to the tension, might be suitable. Another option would be an artificial island. Feasibility studies are being conducted on an offshore container platform in Apra Harbor, Guam. The platform being studied is a tension leg design. This platform would be protected from wave action by a breakwater.

Whether the terminal is floating or fixed, the technical feasibility of offshore transshipment of containers is uncertain at this time. As part of this DOD research into Seahub, some simulation studies were conducted into the challenges of cargo transfer to/from a floating transshipment facility. Results were not conclusive.

The U.S. Navy performs Logistics Over-the-Shore (LOTS) operations where transport ships are offloaded at anchor in deep water. LOTS operations are part of amphibious capabilities, allowing for cargo movement in areas where ports are not available. LOTS operations handle containers, RoRo, and break-bulk cargo. Navy safety guidelines prohibit LOTS operations during strong winds and high seas, as defined by the Beaufort Scale for sea state. Adverse weather conditions during cargo handling greatly increase the danger to personnel and equipment through loss of control of the cranes and excessive relative movement between the container ship and lightering vessels. Operations are prohibited at Beaufort Scale Sea State of three (3) which describes wind speeds between 7 and 10 knots and "large wavelets with some breaking crests."

Safety limitations to offshore military cargo handling will also be inherent to commercial offshore cargo handling. Although the types of ships and lightering vessels may differ in size and capability between military and commercial operations, the limiting factor for safe cargo handling operations will always depend on the condition of the sea and prevailing weather. Landside commercial operations are also not immune from weather conditions. For example, Super Post-Panamax container cranes must be shut down when winds exceed 40 miles per hour.

The National Oceanographic and Atmospheric Administration (NOAA) maintains a network of weather sea buoys along the eastern seaboard of the continental U.S. The sea buoy that is located near to the mouth of the Savannah River is buoy number 41008. This buoy measures and records ocean currents, atmospheric pressure, water temperature, wind speed, wave height and wave period. Buoy 41008 is located 40 nautical miles Southeast from Savannah, Georgia at a mean water depth of 60 feet. Historic data trends recorded by buoy 41008 shows the average sea swell and wind speed that can be expected off the coast of Georgia.

- The average monthly wind speed is approximately 10 knots with a 5 knot mean deviation from standard; the wind speed measured range is from light and variable (zero knots) to over 45 knots of average speed during the peak hurricane month of September.
- The average monthly significant wave height is approximately 3 feet with a one-and-a-half foot mean deviation from standard; the significant wave height measured range is from less than one-foot to approximately 19 feet during the peak hurricane month of September.
- The average monthly wave period at buoy 41008 is approximately 5 seconds with a one-second mean deviation from standard; the wave period measured range is from 3 seconds to approximately 13 seconds during the month of December.

As evident in the buoy data, the average monthly conditions of the sea and wind are at the upper limit or exceed the maximum conditions for safe offshore cargo handling operations as defined by the Navy for its LOTS operations. If average conditions are at the upper limit of operation tolerances, the facility would be inoperable under many weather conditions. This would be a significant shortcoming from the perspective of container liner services which are schedule-driven and have little tolerance for significant delays at any port along their rotation.

Storage Requirements

If container transshipment was directly from ship to ship or ship to barge, a platform could be constructed similar to an offshore oil drilling facility. However, it is unlikely that the need for some storage capacity could be entirely avoided. Repositioning requirements would dictate that some storage capacity would be required.

Costs and Benefits: Offshore Transshipment Facility

Based on the above considerations, it is likely that an offshore transshipment facility would require an artificial island and some sort of breakwater. It is also likely that a regional facility would be most economical, allowing several different ports to share the capital costs of constructing this facility. Constructing an artificial island in 50 to 60 feet of water would be technically feasible, but the costs would be enormous. It is unlikely that use of dredged material would be permitted, which raises the question of where the material would come from at any kind of affordable cost.

In addition, the environmental effects of such a facility constructed in the coastal zone could be prohibitive. Offshore islands would require mitigation, as they would cover the sea bottom. A floating facility may also require mitigation, as its large size would likely

shade a substantial acreage of ocean bottom. If the permitting requirements for an offshore dredged material disposal site are an indication, the requirements for construction of an offshore transshipment facility are likely to be lengthy, difficult, and uncertain in their final result. National Marine Fisheries Service and Environmental Protection Agency policies militate heavily against any covering of the sea bottom, which typically cannot be mitigated.

Coastal/offshore engineering experts were consulted about the potential costs of an offshore transshipment facility, either platform or artificial island. As noted above, there was no template for which to estimate costs, and no conclusions about costs could be made. The Seahub proponents did not have cost estimates for a floating or fixed facility. At this point in their undertaking, they are trying to develop sufficient interest in an offshore container transshipment facility to undertake the feasibility studies that would generate cost estimates.

Conclusions about costs and benefits can be made by considering the costs of double handling during transshipment. Currently, GPA's rate structure for Garden City Terminal operations includes charges to re-stow containers, such as would be required at minimum for an offshore platform to transfer containers between mother ships and feeder vessels. Cell-to-cell transfers are $15 per container, and cell-to-dock-to-cell transfers are $30.00 per container. Although rates and costs are not equivalent, it can be assumed that the rates are representative of handling costs (crane and labor) associated with transfers of containers. If 1.5 million TEUs were transferred at the cell-to-dock-to-cell rate ($30.00/container), this would translate into $22.5 million in additional handling costs per year, with a present value of $375 million (50 years at prevailing Federal discount rate 5 5/8 percent). The additional handling costs alone exceed deepening costs to Garden City Terminal. Consequently, the economic feasibility of an offshore transshipment terminal are in doubt even before the costs of the facility are included.

It is unlikely that a deep-water facility would result in larger vessels calling at Savannah, since the other ports on the U.S. east coast rotations are depth-constrained. There are currently no predictions that Malaccamax-class container ships would call at U.S. east coast ports. In fact, the 8,000-TEU vessels currently under construction are not expected to call at east coast ports in the foreseeable future.

Other Considerations: Offshore Transshipment Facility

A variety of uncertainties surround the concept of an offshore terminal besides the issues of cost, down time due to weather and sea conditions, and environmental effects discussed above. In particular, the hazards posed by hurricanes could be particularly challenging in terms of design and operations. One asset of an offshore terminal that warrants attention is that this terminal could promote homeland security by allowing offshore inspection of containers before entering the country. For these reasons, it does not appear that an offshore transshipment facility meets the test of engineering feasibility and is not, at this stage of its development, a proven technology that could form the basis of a reliable plan.

Overall Assessment: Offshore Transshipment Facility

Based on interviews conducted around the port as part of this investigation, the prevailing view by members of the port community to the concept of an offshore transshipment facility is that it is a concept whose time has not yet arrived. The major problem of transshipment is that it introduces added transfer, storage, and transaction costs and times which often exceed the cost and time saving introduced by faster, larger container and feeder vessels. The major problem with an offshore facility would be the enormous development cost and potential delays associated with weather. Liner services have shown repeatedly that they would rather travel lightloaded than incur significant scheduling delays waiting for tides or fair weather.

EVALUATION OF PROPOSED ALTERNATIVE TERMINAL SITES.

GENERAL DISCUSSION:

Tier II plan formulation activities identified alternative terminal locations as having the potential to address navigation problems and opportunities in Savannah Harbor. The following alternative terminal locations were carried forward for more detailed evaluation in this phase of investigation.

Garden City Terminal
Ocean Terminal
Blue Circle Site
Disposal Area 12A
East Coast Terminal
Elba Island Site
Disposal Area 14A/14B
Tybee NWR
Colonel's Island

The main goal for an alternative terminal location is that it be located closer to the ocean than the Georgia Port Authority's (GPA's) Garden City Terminal to reduce dredging costs and possible environmental impacts associated with saltwater intrusion. To address navigation problems and opportunities in Savannah Harbor, channel deepening would be implemented only as far as a single terminal that would serve the deeper vessels, but not beyond. If that terminal could be located closer to the ocean than Garden City Terminal, perhaps the total economic and environmental costs could be less.

Once the list of alternative terminal sites was completed; costs for facilities, environmental mitigation, and dredging were developed for each of the sites. The costs were developed in order to put all of the sites on an equal basis. At the same time the costs were being developed, the team established a methodology by which the sites would be screened. Four categories were established. These were: (1) safety/social problems, (2) transportation problems, (3) environmental problems, and (4) economic cost of infrastructure. Of these categories, the first two were considered major problems. The definitions for these categories are:

Safety/social problems: Location of a terminal at this site would expose it to dangers above those encountered in the daily operation of a terminal. The development of a terminal at this location would cause major problems due to land use conflicts.

Transportation problems: Location of a terminal is at this site would negatively affect traffic patterns within the City of Savannah according to the Savannah East-West Corridor Feasibility Study.

Environmental problems: Location of a terminal at this site would cause secondary environmental impacts above and beyond those already being considered as part of the environmental mitigation problems. This raises a question of efficiency versus environmental acceptability.

Economic cost of infrastructure: The location of a terminal at a greenfield site, as opposed to one that already pre-exists, requires that the site be developed from scratch. This increases the cost of this alternative due to the need to develop basic infrastructure (roads, electricity, water and sewage, etc.).

The screening process involved running two screens based on the major problem areas. The first screen was run to weed out sites with safety and/or social problems. The second screen was to weed out the remaining sites with transportation problems. The results of this screening are shown in Table 26 and summarized as follows:

- The Elba Island and Blue Circle sites were eliminated in the first screening due to major safety/social problems.
- The Ocean Terminal, the East Coast terminal and the Colonel's Island sites were screened out in the second round due to transportation problems. The selection of sites located east of the City of Savannah - East Coast Terminal and Elba Island Site, would require that rail and truck traffic pass through the center of the City on its way to the inland sites served by the Port. As stated in the Savannah East-West Corridor Feasibility Study, completed in 2002, none of the major roads in their present condition could support this amount of traffic.
- Of the remaining sites, Disposal Site 12A and Disposal Site 14A/14B are located entirely on dredged sediment placement sites, while the Tybee NWR site is located half on a sediment placement site and half in a National Wildlife Refuge. These sites were carried forward for further investigation since there wasn't a major safety hazard at any of these sites, nor was there a major impact to transportation in the City of Savannah. While these sites made it to the next level, there are still several questions that need to be answered such as whether the soils at these sites could support a container terminal and the environmental impacts brought about by the requirement for replacement of lost sediment storage capacity.

Sensitivity of assumptions:

When developing the requirements for alternative terminal sites it was important to achieve economies of scale in facility development, equipment purchase, and terminal

operations. This included a 300-acre size requirement for the terminals and the ability to have throughput of 1.5M TEUs, rather than the minimum capacity of 500,000 TEUs required to obtain the economic benefits of a deeper channel. At some of the Alternative Terminal Sites, the 300-acre minimal size was unable to be met, but they would still be able to handle a minimum of 500,000 TEUs, so under the completeness category they were given a "Yes" designation. Recent real estate sales ($400,000 to $450,000/acre) in areas where the purchase of land would be required to bring the terminal up to adequate size indicate that land costs may be considerably higher than those used in calculating construction costs. However, for the purpose of this evaluation we left the land costs at the lower value ($6 - $100,000/acre). Construction costs also did not include the costs of buying out an existing business, they only included the costs of developing the site into a container port.

TABLE 26 SUMMARY OF SCREENING OF ALTERNATIVE SITES				
Site	**Major Safety/Social Problem**	**Transportation Problems**	**Environmental Problems**	**Economic costs of Infrastructure**
Garden City Terminal			Mitigation Req't = 100%	Infrastructure already in place.
Ocean Terminal		Additional truck traffic on Bay St., already a congested area.	Mitigation Req't = 75%	Demolition of facilities already on-site in order to make it acceptable for a container port. Available area too small to meet minimal footprint.
Blue Circle Site	New terminal in area would be incompatible with Chatham County land use plan.		Mitigation Req't = 70%	Demolition of facilities already on-site in order to make it acceptable for a container port. Cost of obtaining land required for minimal facility.
Disposal Area 12A			Mitigation Req't = 65% Replacement for 375 acres of disposal area lost for terminal development.	All infrastructure would have to be brought on site including rail and road connections, water and electricity.
East Cost Terminal		Location East of the City, creates major east-west transportation problem.	Mitigation Req't = 55%	Demolition of facilities already on-site in order to make it acceptable for a container port. Cost of obtaining land required for minimal facility.
Elba Island	Terminal would fall under "Blast Zone" for LNG Terminal.	Location East of the City, creates major east-west transportation problem.	Mitigation Req't = 30%	
Disposal Areas 14 A/B			Mitigation Req't = 25% Replacement for 375 acres of disposal area lost for terminal development.	All infrastructure would have to be brought on site including rail and road connections, water and electricity.
Tybee NWR			Mitigation Req't = 10% Replacement for 375 acres of disposal area lost for terminal development. A National Wildlife Refuge.	All infrastructure would have to be brought on site including rail and road connections, water and electricity.
Colonel's Island		Container services could not be made competitive in liner service with other South Atlantic ports.	Georgia DNR has strongly discouraged GPA from further developing this site due to the predominance of wetlands.	

Environmental Mitigation Costs:

Mitigation costs were developed for each proposed terminal location, as described previously. In general, the level of impact is expected to be less if the channel improvement does not occur as far upstream.

The mitigation costs were described for each alternate terminal location, but are summarized in this section. The mitigation costs were put into the following categories and are shown by site in Table 27:

- Chloride mitigation: Refers to the potential relocation of the City of Savannah water intake in the Savannah River if chloride impacts from channel deepening exceed the City's contracted standards for chlorine levels. The cost for this measure was the same as that used in the Tier I report for this feature.

- Dissolved oxygen mitigation: Refers to mitigation if channel deepening reduces average summer dissolved oxygen levels in the Savannah River. The cost for this measure was the same as that used in the Tier I report for this feature.

- Cultural/Historic mitigation: Refers to mitigation to protect Old Fort Jackson and the *CSS Georgia*. Both resources are located at the junction of Back River and the Savannah River. The cost for this measure was the same as that used in the Tier I report for this feature.

- Channel modification mitigation: Refers to mitigation for direct wetland impacts of channel deepening on the river banks. Ten acres would be affected by deepening to Garden City Terminal. Wetland mitigation costs are estimated at $32,000 per acre, including $6,000 for real estate costs and $20,000 for mitigation activities ($10,000/acres plus a 2:1 replacement ratio),

- Secondary wetland mitigation: Refers to secondary impacts to wetlands resulting from saltwater intrusion into brackish or freshwater marshes located upstream of Garden City Terminal. Adverse secondary effects of saltwater intrusion could degrade up to 722 acres of wetlands, potentially requiring mitigation at $32,000 per acre as above.

- Shortnose sturgeon mitigation: Refers to actions taken to avoid adverse effects to habitat of the shortnose sturgeon. The cost for this measure was the same as that used in the Tier I report for this feature.

- Striped bass impact avoidance: Refers to actions taken to avoid adverse effects to habitat of the striped bass. The cost for this measure was the same as that used in the Tier I report for this feature.

- Site Development: Wetlands Mitigation: The number of acres of wetlands affected on the 375-acre site designated for the alternative terminal.

Using the information just described, the team then evaluated the extent to which each of the alternative terminal locations met the four criteria contained in the Principles and Guidelines for alternative plans. Those criteria are described below using the definitions contained in P&G:

- **Completeness** – The extent to which a given alternative plan provides and accounts for all necessary investments or other actions to ensure the realization of the planned effects. This may require relating the plans to other types of public and private plans if the other plans are crucial to realization of the contributions to the objective.

- **Effectiveness** – The extent to which an alternative plan alleviates the specific problems and achieves the specified opportunities.

- **Efficiency** – The extent to which an alternative plan is the most cost effective means of alleviating the specified problems and realizing the specified opportunities, consistent with protecting the Nation's environment.

- **Acceptability** – The workability and viability of the alternative plan with respect to acceptance by State and local entities and the public and compatibility with existing laws, regulations, and public policies.

The alternative terminal locations met the Principles and Guidelines criteria as follows:

Garden City Terminal:

Completeness – Yes.
Effectiveness – Yes.
Efficiency – Yes. Although there may be some questions with regard to environmental effects.
Acceptability – Yes. GPA is already in the process of doing things that will allow the port to meet the requirements for future traffic without having to deepen.

Ocean Terminal:

Completeness – Yes.
Effectiveness – Yes. While it is not 300 aces, it can still handle the 500,000 TEUs as required.
Efficiency – No, because of the increased traffic and the cost of additional land to make the site adequate. Renovation costs for this site are rather high.
Acceptability – Marginal. It is questionable whether the public will accept the additional traffic created by the movement of additional trucks through that are of the City.

TABLE 27
Mitigation Costs by Category

Mitgation Category	Garden City Terminal	Ocean Terminal	Blue Circle Site	Disposal Area 12A	East Coast Terminal	Elba Island Site	Disposal Area 14A/14B	Tybee NWR
Chloride Mitigation	$49,450,000.00	$37,087,500.00	$32,683,000.00	$0.00	$0.00	$0.00	$0.00	$0.00
DO Mitigation	$25,800,000.00	$19,350,000.00	$17,052,000.00	$5,160,000.00	$5,160,000.00	$0.00	$0.00	$0.00
Cult/Historic Mitigation	$15,424,449.00	$15,424,449.00	$15,424,449.00	$15,424,449.00	$15,424,449.00	$0.00	$0.00	$0.00
Channel Modification Mitigation	$260,000.00	$195,000.00	$182,000.00	$169,000.00	$143,000.00	$78,000.00	$65,000.00	$26,000.00
Secondary Wetland Mitigation (722 Ac)	$18,772,000.00	$14,079,000.00	$13,140,400.00	$4,693,000.00	$0.00	$0.00	$0.00	$0.00
Shortnose Sturgeon Mitigation	$1,375,500.00	$1,031,625.00	$962,850.00	$275,100.00	$275,100.00	$0.00	$0.00	$0.00
Striped Base Impact Avoidance	$2,000,000.00	$2,000,000.00	$2,000,000.00	$0.00	$0.00	$0.00	$0.00	$0.00
Site Develoment: Wetlands Mitigation	$0.00	$0.00	$1,560,000.00	$52,000.00	$2,600,000.00	$1,300,000.00	$624,000.00	$1,326,000.00
Total Cost for Mitigation	$113,081,949.00	$89,167,574.00	$83,004,699.00	$25,773,549.00	$23,602,549.00	$1,378,000.00	$1,391,000.00	$1,612,000.00

Blue Circle:

Completeness – Marginal, because of the size of the site and the surrounding land use. You would need to purchase land for the terminal from the Golf Club.

Effectiveness – Yes, because you could establish a terminal with a capacity of 500,000 TEUs at the site.

Efficiency – No, because of the high cost of renovating the site (tear down old facilities) in order to establish a container facility.

Acceptability – No, because of land issues, the acceptability of having a container terminal on a golf course or in the area of an exclusive development.

Disposal Site 12A:

Completeness – Yes. However, there is a question as to whether a dredged sediment placement site will have the necessary soil strength to support the needed infrastructure for a terminal. This would also apply to the Disposal Site 14A/14B, and the Tybee NWR Site.

Effectiveness – Yes, a new terminal could be constructed at the site to move the required number of TEUs.

Efficiency – No, because of the cost to build a terminal at the site and to bring in the necessary transportation requirements. The increased impact to the environment with the requirement to provide replacement sediment storage capacity when the surrounding area is marsh.

Acceptability – No. Not acceptable from the point of view of the environment and the transportation costs (road and rail access to the site). Easement held by the Corps of Engineers/GADOT.

East Coast:

Completeness – Marginal based the acreage available to the terminal.

Effectiveness – Marginal because the area is too small to handle the required container traffic.

Efficiency – No, because of the additional land costs to bring up the area to the minimally-acceptable size and the cost of turning the facility into a container port.

Acceptability – No, because traffic to and from the terminal, both rail and truck would, would have to pass through the city to access inland areas served by the port.

Elba Island:

Completeness – No, the terminal berths would be on a dangerous bend in the River which would affect navigation. The lack of affordable road and rail access.

Effectiveness – No, because of its location with respect to the channel and safety questions with regard to its co-location with the LNG Terminal.

Efficiency – No, because of transportation costs.

Acceptability – No, because of the increased transportation costs, the location of the berths with respect to the channel, and the fact that the terminal would be in the blast zone for the LNG Terminal, a navigation safety problem.

Disposal Area 14A/14B:

Completeness – Yes, same as Disposal Area 12A.
Effectiveness – Yes, same as Disposal Area 12A.
Efficiency – No, same as Disposal Area 12A.
Acceptability – No, same as Disposal Area 12A.

Tybee NWR:

Completeness – Yes, same as Disposal Area 12A.
Effectiveness – Yes, same as Disposal Area 12A.
Efficiency – No, because of the cost to build a terminal at the site and to bring in the necessary transportation requirements. Environmental effects because of the requirement to obtain a replacement disposal area when all of the surrounding area is marsh. Also is a National Wildlife Refuge.
Acceptability – No, not acceptable from the point of view of the environment and the transportation costs. Development of a National Wildlife Refuge includes consideration of an the apparent tradeoff between the Savannah NWR and the Tybee NWR.

Colonel's Island:

Completeness – Yes.
Effectiveness – Marginal, because of the distances involved with respect to the port and the inland customers it serves.
Efficiency – No, because the entire property is wetland: the cost of dredging - unknown at this time - may be prohibitive; and transportation costs.
Acceptability – No, it is unacceptable to Ga. DNR because of the wetlands involved.

Offshore Transport Facility:

Completeness – No, because of the size of the structure required to handle the proposed 500,000 TEUs, and its establishment in an open ocean environment. While there is one such facility in a closed harbor (Hong Kong), and oil rigs exist in the Gulf of Mexico (too small), this is too experimental for this project.
Effectiveness – No, while it would alleviate some problems it would cause more than it would solve. The environmental variables, i.e., the minimal wave environment, under which such a facility could operate is on the low end; therefore most of the time the facility would be unable to operate.
Efficiency – No, the costs for a facility to handle the required TEU's would be exorbitant, and the facility would only be able to operate less than 24% of the time.
Acceptability – No, because the cost to build and the operating conditions under which the facility could operate would make it unacceptable.

Summary:

Table 28 contains a summary of the extent to which the alternative terminal sites meet the Principle and Guidelines criteria for alternative plans.

TABLE 28
Evaluation of Alternative Terminal Sites

Site	Completeness	Effectiveness	Efficiency	Acceptability
Garden City	Yes	Yes	Yes	Yes
Ocean Terminal	Yes	Yes	No	Marginal
Blue Circle	Marginal	Yes	No	No
DA 12A	Yes	Yes	No	No
East Coast	Marginal	Marginal	No	No
Elba Island	No	No	No	No
DA 14A/14B	Yes	Yes	No	No
Tybee NWR	Yes	Yes	No	No
Colonel's Island	Yes	Marginal	No	No
Offshore	No	No	No	No

Conclusion:

Table 29 on the next page contains a summary of the assessment of the alternative terminal sites. Based on the factors described in the analysis and highlighted in the table, the team rated the overall rating of the sites as a potential deep-draft container terminal. The Garden City Terminal was the only one that received a ranking of HIGH. The team gave three sites a MEDIUM ranking, while six sites - which had been screened out because of major problems - were judged as having a LOW potential. The extent to which the sites could meet the criteria for an alternative plan was heavily considered in this assessment.

The four sites that were judged as having either a MEDIUM or HIGH potential as a terminal were then compared just on their economics. Table 30 shows that comparison. The cost of the next most economically efficient alternative was 45 percent more than the lowest cost site. Therefore, only the lowest cost site (Garden City Terminal) will be considered in the detailed evaluations.

TABLE 29 SUMMARY ASSESSMENT OF ALTERNATIVE TERMINALS

	Screening Result	Positive Features	Negative Features	Overall Potential
Garden City Terminal	In	- Ongoing Container Operation - Access to Rail and Highway - Sufficient area	- Distance upstream - Associated dredging costs and potential environmental impacts	High
Ocean Terminal	Out	- Close to Garden City - Access to Rail and Highway	- Inadequate size - High cost of renovation - Lack of dredging savings	Low
Blue Circle Site	Out	- Highway access	- Inadequate size - Lack of dredging savings - Difficult rail connection - Relocate existing operation	Low
Disposal Area 12A	In	- Sufficient area - Highway access	- Need to develop rail connection - Loss of sediment storage capacity - Environmental effects: access & replacement sediment storage capacity	Medium
East Coast Terminal	Out	- Rail access	- Inadequate size - East-west landside transport - Relocate existing operation	Low
Elba Island	Out	- Sufficient area - Downstream location	- Adjacent to LNG facility - Inadequate size - East-west landside transport - Navigation safety issues	Low
Disposal Areas 14A/14B	In	- Sufficient area - Downstream location	- Need to develop rail/road connection - Loss of sediment storage capacity - Environmental effects: access & replacement sediment storage capacity	Medium
Tybee NWR	In	- Sufficient area - Downstream location	- Need to develop rail/road connection - Environmental effects: site, access, replacement sediment storage capacity - Potential Intracoastal waterway impacts	Medium
Colonel Island, Brunswick	Out	- Sufficient area	- Distance from inland markets - High dredging costs	Low
Offshore Terminal	Out	- Potential for regional service - No channel deepening	- High costs of facility - Environmental effects - High costs of double handling - Delays due to weather	Low

TABLE 30 Evaluation of Higher Ranked Alternative Terminal Sites ($20K/acre Mitigation)				
Site	**Initial Construction Costs**	**Mitigation Cost**	**Total Cost**	**Incremental Cost (Percentage)**
Garden City Terminal	$213,600,000	$113,100,000	$326,700,000	
Tybee NWR	$464,000,000	$1,600,000	$465,600,000	43
DA 14A/14B	$483,000,000	$1,400,000	$484,400,000	48
DA 12A	$497,100,000	$25,800,000	$522,900,000	53

Sensitivity Tests:

A. To examine the sensitivity of the plan formulation conclusions to wetland mitigation costs, we evaluated the effects of raising the wetland mitigation from $20,000 per acre to $100,000 per acre. The results of this increase can be seen in Table 31. The increase did not alter the rankings of the top sites, but it did narrow the cost difference between the alternate sites. However, since the cost difference would still be 23-percent, the team felt that detailed studies were not likely to eliminate that large a differential, so the likelihood of the next best site becoming less expensive than the presently identified lowest cost site was remote. Therefore, the team again agreed that deepening only to the lowest cost site – the Garden City Terminal – be evaluated in detail.

TABLE 31 Evaluation of Higher Ranked Alternative Terminal Sites ($100K/acre Mitigation)				
Site	**Initial Construction Costs**	**Mitigation Cost**	**Total Cost**	**Incremental Cost (Percentage)**
Garden City Terminal	$213,600,000	$167,200,000	$380,800,000	
Tybee NWR	$464,000,000	$5,200,000	$469,200,000	23
DA 14A/14B	$483,000,000	$2,650,000	$485,650,000	28
DA 12A	$497,100,000	$68,600,000	$565,700,000	46

B. All three MEDIUM rated alternative terminal sites (Tybee NWR, DA 12A, and DA 14A/14B) are CDFs or -- in the case of the Tybee NWR -- contain a major part of a CDF. This being the case, the sediment storage capacity that would be lost if those sites were used as terminals would need to be replaced elsewhere along the river. Replacement in the lower reaches of the river very close to the existing site is preferred to keep pumping costs the same. Replacement of that capacity through expansion of the CDFs to the north into existing saltmarsh may be the easiest to construct, but would result in extensive secondary wetland impacts which would need to be mitigated. To avoid these extensive secondary impacts, the U.S. Fish and Wildlife Service requested that we consider taking the O&M sediments to the ODMDS, instead of putting them in the CDF. Two previous studies in Savannah Harbor compared the cost of normal dredging and deposition operations to that of ocean disposal for the same reach and sediments. Based on that information and using our most recent costs for O&M dredging, we developed the cost estimates shown in Table 32. These costs are planning-level estimates useful for sensitivity analyses and screening of scenarios.

TABLE 32
Dredging Costs: CDF vs. Ocean Disposal

Confined Disposal Facility	Annual Dredge Volume (CY)	Cost/CY	Annual Cost	Difference CDF vs. Ocean	Capitalized Cost
DA 12A					
To CDF	1,510,000	$3.87	$ 5,843,700		
To Ocean	1,510,000	$8.82	$13,318,200	$ 7,474,500	$124,263,563
DA 14A/14B					
To CDF	2,228,500	$3.87	$ 8,624,295		
To Ocean	2,228,500	$8.82	$19,655,370	$11,031,075	$183,391,622
Tybee NWR					
To CDF	619,500	$3.87	$ 2,397,465		
To Ocean	619,500	$8.82	$ 5,463,990	$ 3,066,525	$ 50,980,978

To best evaluate the information in this table, one should compare the capitalized costs for ocean placement shown in the last column with the mitigation costs (shown below from Table 30) that are expected from re-establishing sediment storage capacity near the existing CDF.

Confined Disposal Facility	Total Mitigation Costs
DA 12A	$32,900,000
DA 14A/14B	$ 7,800,000
Tybee NWR	$ 7,300,000

Conclusion: The capitalized costs of transporting O&M sediments to the ocean far exceed the costs of keeping the existing CDF functioning and replacing sediment storage capacity that would be lost if portions of those sites were taken and used for a new terminal. Therefore, the total costs for developing a new terminal at an existing CDF would be even higher if the CDF were unavailable for use and the O&M sediments were transported offshore.

MINOR MODIFICATIONS

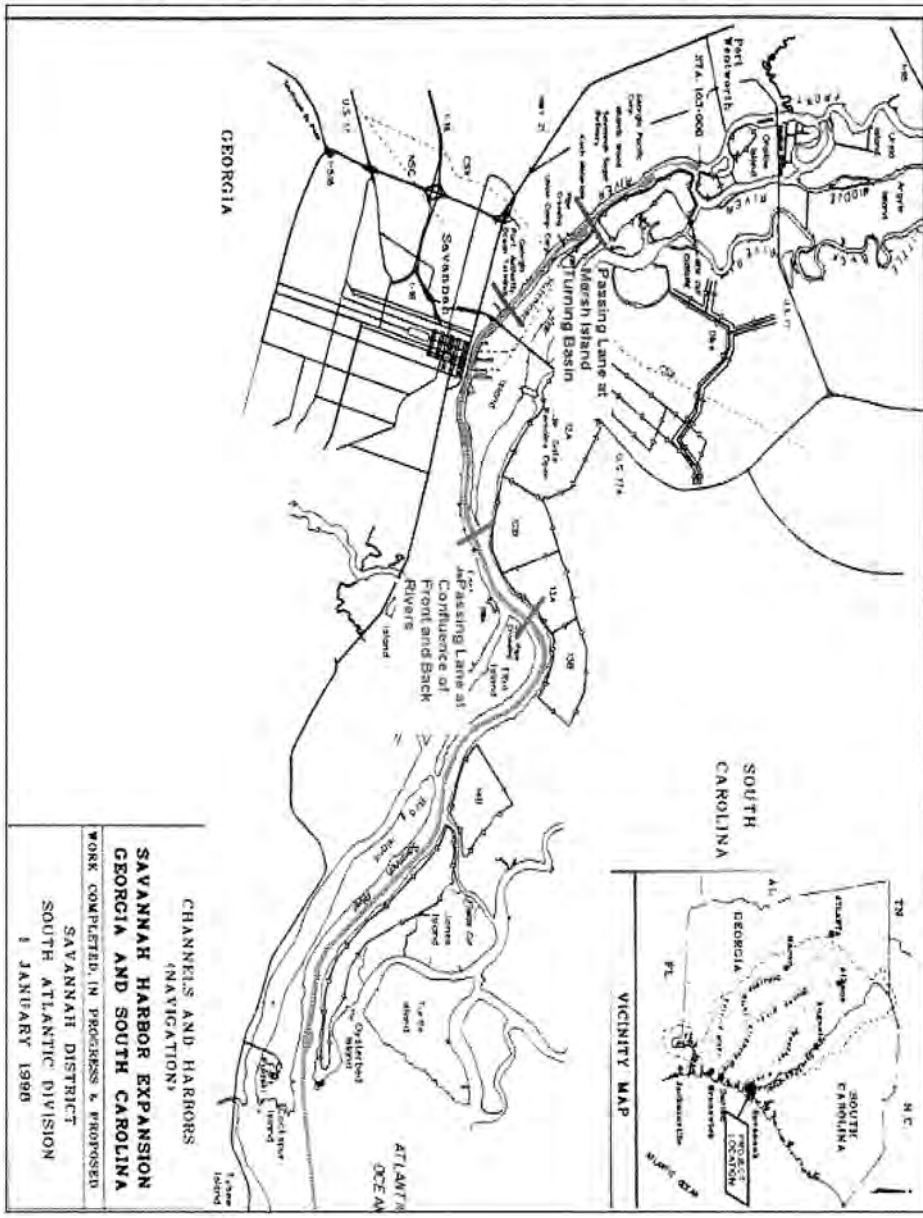
PASSING AREAS

The current design of the Savannah Harbor navigation channel (500-foot minimum width) does not provide sufficient width to accommodate two-way traffic of post-Panamax vessels at any time in the tidal cycle. With the channel design being considered in this Expansion Project, the width of the deeper channel would only be 450-feet, so the situation would become more of a problem. According to the Harbor Pilots, it is necessary to have fifty feet of clearance between the edge of the navigation channel and the container vessel and one hundred and fifty feet of clearance (the width of another post Panamax vessel) between passing vessels. Adding the width of the vessels and the required clearance shows a minimum required channel width of 514 feet (50+132+150+132+50). The addition of an appropriately sized passing area (a widening of the navigation channel to 600 feet for approximately 6,000 feet) would allow two post-Panamax vessels to pass, as well as the passing of a post-Panamax and Panamax vessel. The addition of a smaller passing area could allow passing of a post-Panamax and Panamax vessel, but would not facilitate the passing of two post-Panamax vessels in the harbor.

Design trends for the World fleet show a continued growth in the size of individual container vessels over time. The increase in the proportion of these larger vessels in the world fleet and the probability of some of these larger vessels calling on the harbor in the future suggests the need to examine a mid-harbor passing area. Future design of the harbor needs to support the fleet that is expected to call at the harbor. If it doesn't, when large ships start calling at the port on a regular basis there could be safety concerns or traffic delays.

The two potential sites suggested for placement of the proposed passing area are the Marsh Island Range which is above the Talmadge Bridge and near the Marsh Island turning basin and the Old Fort Jackson Range at the confluence of the Front and Back Rivers over the current site of the CSS Georgia. Proposed passing area sites are indicated in Figure 12. It should be noted that those markings exhibited in Figure 12; indicating proposed passing areas are not intended to suggest the width or length of the passing area, but are presented only as a general reference for potential location.

Figure 12 - Proposed Site Locations for Harbor Passing Lanes



After reviewing trends in the World Fleet and harbor requirements for maintaining the level of service, the study team decided to locate the passing area in the Old Fort Jackson Range, over the current site of the CSS Georgia. That site was selected, because siting one in the Marsh Island Range could result in impacts to the north bank of the river and require real estate acquisition.

BEND WIDENERS:

Ship Simulation studies were performed using the Design Vessel, *Susan Maersk*. This vessel is a 6,600 TEU, post-Panamax class container ship launched in 1997. It has a beam of 140 feet, a length overall 1,138 feet, and a design draft: 47.6 feet. Several bend wideners necessary to the transit of the Design Vessel were included in the design of the 48-foot channel. The Ship Simulation Report identified nine areas where bend wideners will be needed to allow safe transit of that sized vessel. Therefore, bend wideners will be included in the final channel designs that undergo detailed analyses.

AIDS TO NAVIGATION:

According to the Harbor Pilots, additional navigation aid improvements such as buoys and/or navigation markers would not be helpful given the present condition of the harbor and the current configuration of existing navigation aids. They mark the channel and where you are in it, but would not improve the efficiency of cargo movement through the harbor. Therefore this minor modification will not be included as a component of the final channel designs.

VESSEL TRAFFIC COORDINATION:

It was stated that the movement of vessels within the harbor system are coordinated by the Harbor Pilots (achieved mostly thru hand held communication and a queuing system) and as such, no further coordination or system to facilitate coordination would be helpful given current or expected conditions in the harbor. Therefore, this minor modification will not be included as a component of the final channel designs.

STRAIGHTENING OF THE RIVER:

The Harbor Pilots did not identify any portion of the channel where straightening would markedly increase the efficiency of transit. Additionally, Savannah District design staff did not identify a specific area that imposes an undue degree of difficulty in vessel handling necessitating a major straightening of the river. Therefore, this minor modification will not be included as a component of the final channel designs.

DEVELOPMENT OF DETAILED PLANS

The study team reviewed the information developed on non-structural measures (underkeel clearance and modifications to the Garden City Terminal), alternative terminal locations, offshore transshipment facility, and minor modifications passing areas, bend wideners, aids to navigation, vessel traffic coordination, and straightening of the river). Although the conclusions for those evaluations were included at the end of each separate section, they are summarized here to aid the reader in understanding the rationale for the decisions that the team reached.

Modifications to the underkeel clearances used in the harbor will not be pursued as a means of increasing vessel transit efficiency because the Harbor Pilots do not believe they could operate safely with less clearance. The guidelines used by the Pilots comply with channel design and safety criteria, so there is no need to pursue this feature further.

GPA regularly improves the facilities at the Garden City Terminal, increasing its container throughput capacity. The Ports Authority has several improvements in various stages of planning and indicates it will continue to add to the capacity of that facility as the traffic levels increase. Based on the schedule of improvements already identified and actions the Ports Authority has taken to allow it to expand the capacity of the site even further in the future, Savannah District believes that additional improvements at Garden City Terminal are not warranted as part of this project.

Based on the assessment of the alternate terminal locations, the Garden City Terminal is the most economically feasible location to which a channel deepening should be considered. Although dredging costs would be lower to most of the other sites considered, the total costs including both dredging and site development costs would be higher. All the other locations would be more costly methods of serving the expected growth in container volumes. In addition, the expected reduction in environmental impacts with the alternate locations is less than some probably envisioned, when all the effects of developing the alternate site are included.

A passing area should be included in the final plans. This feature is needed to address the effects that ships the size of the design vessel will have on traffic movements in the interior portion of Savannah Harbor. The entrance channel is wide enough to accommodate the larger vessels. When Post-panamax vessels call on Savannah regularly, they will likely have an adverse effect on the movement of other vessels transiting the harbor. That effect will be more pronounced with the effective narrowing of the proposed deeper channel. The Harbor Pilots identified the locations of two passing areas that they would like to see in place in the interior portion of the harbor. However, one of those sites is in a constructed reach of the river. Adding a passing area in that reach would result in the taking of developed land on the northern side of the river, so the team deleted further consideration of that location due to the expected high implementation costs. However, a passing area in the other location – near the junction of Front and Back Rivers – will be included as a component of the final channel designs.

Channel design criteria indicate the need to include bend wideners to accommodate the larger design vessel. This need was supported by the Ship Simulation Study. Therefore, the nine bend wideners identified as being needed for safe transit of that sized vessel in that study will be included as features of the final channel designs.

No new navigation aids were deemed to be needed to enhance the efficiency of vessel transits through the harbor. However, the detailed deign of the deeper channel will include an analysis of whether additional buoys or range makers will be needed to make the deeper channel, and whether the existing aids need to be moved to accommodate the new channel.

Neither vessel traffic coordination nor major straightening of the river were found to be needed, so they will not be included in the final channel design.

No channel modifications features were identified as being needed at this time to enhance Homeland Security. Inbound vessels are presently required to provide 96-hour advance notice, including a manifest of the cargo and crew. The Harbor Pilots already board the vessels offshore, before the vessels reach the coastline. So a separate boarding area is not considered needed. Therefore, the final channel design will not contain any features to enhance Homeland Security.

An important factor in the Tier I channel design was the concept of leaving the existing side slopes untouched as the channel is deepened. In this approach, the side slopes are continued further down toward the center of the river. The deeper channel is then narrower than the existing 500-foot navigation channel at low water. This approach was used before to minimize the taking of additional (valuable) land along the riverbank. The team agreed that this approach was valid and should be followed in the Tier II channel design. Therefore, the final Tier II channel design will include continuation of the side slopes toward the center of the river, resulting in a 16-foot narrowing of the channel with each 2-foot of depth added.

All vessels presently calling at the Garden City Terminal presently use the Kings Island Turning Basin. It is the largest turning basin in the harbor and is located at the upstream end of the Garden City Terminal. That turning basin would need to be deepened to accommodate the larger vessels using the deeper navigation channel. To safely serve vessels the size of the Design Vessel, the turning basin would also have to be expanded to 1,600 feet long by 1,600 feet wide. This expansion and deepening will be included in the final channel design.

The team agreed to continue the Project's existing advance maintenance features. An analysis would be conducted during the detailed studies to determine the effects of a deeper channel on the sedimentation in the river, but the starting point would be a continuation of the existing advance maintenance features, but at a lower elevation.

The Sediment Basin is a component of the Sediment Control Works of Savannah Harbor. The Basin is a quiescent area that collects sediments at a relatively high rate. The location of the Basin adjacent to large confined dredged sediment placement facilities allows for sediments to be removed from that location at a lower cost than elsewhere in the harbor. Although originally designed to be at a depth equal to the navigation channel, the Basin was not deepened as part of the 1993/1994 harbor deepening and it is now 4-feet shallower than the authorized navigation channel. That perched condition – being above the floor of the main river, along which many of the sediments are moved – is believed to have reduced the sediment trapping efficiency of that structure. After conducting a conceptual level assessment of the effects of further channel deepening, the team agreed to leave the Sediment Basin at its present depth and not deepen that facility as part of this project. The detailed studies will include a more in-depth analysis of the effects of a higher perched basin. Any expected increases in yearly channel maintenance costs will be included in the economic analysis of the proposed alternatives.

The Tier I design included one berth at the Garden City Terminal that would accommodate the larger vessels needing the deeper channel. For the Tier II design, the team agreed that two berths should be deepened to serve ships using the deeper channel. Those berths would be Container Berth 7 and Container Berth 8. Both are constructed (or being constructed) to accommodate a channel of greater than 48 feet of depth, so no modifications to those berths would be required for this project.

DESCRIPTION OF DETAILED PLANS

As a summary, the following alternative plans will be examined in detail.

PLAN A - NO ACTION.

In this plan, no improvements would be made to the existing Savannah Harbor Federal Navigation Project. The navigation channel would remain at its presently authorized 42-foot depth in the inner harbor and 44-foot depth in the entrance channel. This plan will serve as the basis for comparison of the expected project impacts. It will comprise the environmental and economic conditions that are expected to occur over the 50-year period of analysis. The analysis will include an identification of the type and volume of commodities that are expected to pass through Savannah Harbor if no harbor improvements are implemented. The size and number of vessels that will transport those commodities through the harbor will be identified. Expected changes in the environmental setting will also be identified.

PLAN B – CHANNEL DEEPENING

This plan will include several levels of harbor deepening so that an incremental analysis can be performed, as well as an overall determination of the justification of this proposed action. The plan will include several scales, ranging from a 44-foot to a 48-foot channel depth. The analyses will first be conducted on the following plans:

Plan B-44	A 2-foot channel deepening
Plan B-46	A 4-foot channel deepening
Plan B-48	A 6-foot channel deepening

A final interim depth will then be analyzed to allow identification of the NED plan, assuming the benefits peak before reaching the 48-foot depth. That plan will tentatively be identified as Plan B-4X.

The final channel deepening plans will have the following components:

- **Channel Length:** From the ocean to Station 103+500, plus an upstream transition.
-
- **Channel Width:** Maintain existing side slopes. The bottom width for a 48-foot channel would be 450-feet.

- **Channel Depth**: Channel depth will be looked at in 2-foot increments to 48-feet.
  Plan B-44
  Plan B-46
  Plan B-48

  Plan B-4X – One interim depth

- **Berth(s):** Container Berth 7 and Container Berth 8.

- **Turning Basins:** Deepen and enlarge Kings Island Turning Basin to 1,600-feet x 1,600-feet.

- **Bend Wideners:** Use the nine bend wideners identified in the Ship Simulation Study. Two locations have wideners on both sides of the river.

- **Advance Maintenance:** Continue the existing advance maintenance features.

GENERAL RE-EVALUATION REPORT
APPENDIX E: QUALITY CONTROL

SAVANNAH HARBOR EXPANSION PROJECT

Chatham County, Georgia and Jasper County, South Carolina

January 2012

US Army Corps of Engineers
Savannah District
South Atlantic Division

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QUALITY CONTROL PLAN

SAVANNAH HARBOR EXPANSION PROJECT

WRDA 1999 POST-AUTHORIZATION GENERAL REEVALUATION REPORT AND TIER II ENVIRONMENTAL IMPACT STATEMENT

1. INTRODUCTION

This Quality Control (QC) plan provides the process, methods, and technical review activities for the Savannah Harbor Expansion project, Georgia and South Carolina, General Reevaluation Report (GRR) and Tier II Environmental Impact Statement (EIS). The procedures that will be employed to insure quality products and compliance with all technical and policy requirements throughout the development of the GRR and Tier II EIS are described in this QC plan. This QC plan was previously updated in February 2006. Since that time, the Water Resources Development Act of 2007 (WRDA 2007) was passed, and EC 1165-2-209 (Civil Works Review Policy) was signed. Accordingly, the plan has been updated again to address the requirements of WRDA 2007 and EC 1165-2-209.

2. AUTHORITY AND GUIDANCE

This QC plan has been accomplished in accordance with the following:

- **A.** DR 5-1-2, CESAS-PM, 20 May 02, subject: Management – Quality Management Plan.
- **B.** ER 5-1-11, CECS, 17 Aug 01, subject: USACE Business Process.
- **C.** ER 1105-2-100, CECW-P, 22 Apr 00, subject: Planning Guidance Notebook.
- **D.** ER 1110-1-12, 1 Jun 93, subject: Quality Management.
- **E.** AR 5-1, 15 Mar 02, subject: Total Army Quality Management.
- **F.** Interim Draft ER (unnumbered), CEMP/CECW, 13 Apr 00, subject: Quality Management.
- **G.** EC 1165-2-203, CECW-A, 15 Oct 96, Water Resources Policies and Authorities Technical and Policy Compliance Review (historical purposes only).
- **H.** CECW-A Policy Memorandum No. 2, 6 Apr 95, subject: Civil Works Decision Document Review Policy Guidance.
- **I.** CECG/AASA (CW) Joint Memorandum, 31 Mar 95, subject: Technical Review Process.
- **J.** Quality Control Concepts Rev2.doc dated 22 Apr 05.
- **K.** EC 1105-2-407, CECW-CP, 31 May 2005, Planning Models Improvement Program: Model Certification.

L. EC 1105-2-408, CECW-CP, 31 May 2005, Peer Review of Decision Document.
M. ER 1105-2-100, CECW-CP, 20 Nov 2007, subject: Appendix H Policy Compliance Review and Approval of Decision Documents.
N. Water Resources Development Act of 2007.
O. EC 1165-2-209, Civil Works Review Policy, 31 January 2010.

3. QUALITY CONTROL OVERVIEW

A. Responsibility. The Savannah District (the District) is responsible and accountable for the quality of its projects and products. Accordingly, the District shall maintain a Quality Control Manager (QCM) that will continually monitor study activities to insure that the requirements of this Quality Control Plan are met. Additionally, South Atlantic Division personnel will monitor the QC activities involved with this study as a part of its Quality Assurance (QA) commitment.

B. Objectives. The objectives of this quality control plan are to:

- Provide quality technical products by providing an effective, comprehensive technical review of work or work products used as a basis for decision making.
- Verify that functional, legal, safety, health, and environmental requirements are met.
- Achieve cost-effective solutions consistent with product requirements.
- Obtain process efficiency by integrating technical review throughout product development.
- Resolution of document issues and concerns.
- Assure accountability for the technical quality of the products.
- Avoid start-overs and redesign.
- Provide continued development of District technical expertise.
- Achieve a seamless review process that includes early identification and resolution of both technical and policy issues.

4. QUALITY CONTROL CONCEPTS

A. General Concepts

1. In accordance with EC 1165-2-209, an Agency Technical Review (ATR) will be conducted by a team developed in collaboration with the Deep Draft Navigation Planning Center of Expertise. ATR will be conducted on a variety of specific reports, and the draft decision document (GRR/EIS Report).

All appendices and supporting reference documents will undergo an internal review in the District at the time they are completed. Quality checks of completed products will be performed by staff responsible for the work, supervisors, team leaders, and senior staff. Among the supporting reference documents are the reports of specific analyses, either

conducted by USACE personnel or outside contractors, which will be used in the plan evaluation and selection process by the PDT. Examples of these documents include:

- Aquifer Analysis Report
- Environmental Fluid Dynamic Computer Code (EFDC) and Water Quality Analysis Simulation Program (WASP) model calibration reports
- Sediment Quality Analysis Report
- Sedimentation and Dredged Material Management Plan (DMMP)
- Economic Analyses Report

2. Management of the ATR process will be provided by the National Deep Draft Navigation Planning Center of Expertise (DDNPCX).

3. A number of Independent Technical Reviews (ITR) and External Peer Reviews (EPR) were accomplished for supporting study documents prior to the signing of EC 1105-2-410 and EC 1165-2-209. These reviews were conducted by subject matter 'experts' who were not involved in the study development. The Project Review Plan (RP) that contains a matrix listing these supporting documents is provided on the Savannah District web site.

4. The ATR will be a formal process with documentation of reviewer comments, documentation of responses to the comments, and documentation of the resolution of each comment. Provisions for documentation will include:

a) The goal to resolve each comment to the satisfaction of the reviewer. For each comment, the reviewer should provide a basis for the comment, whether it is from law or policy, and an indication of the significance of the comment. For each comment, the reviewer should also provide some specific action that needs to be accomplished to satisfy or resolve the comment. Each comment that is resolved should contain a definitive statement of acceptance by the reviewer.

b) Only the reviewer can withdraw or cancel a comment.

c) A complete record of the interactions, from comment to resolution, will be maintained. This will be accomplished by the use of DrChecks software for the ATR. The use of the DrChecks software is intended to provide an efficient means of assuring proper documentation of the review process. The use of the DrChecks software will also be used the IEPR.

5. Dispute Resolution. The ATR Lead, who must be from outside South Atlantic Division (SAD), will identify any outstanding disagreements between members of the PDT and the ATR team. Any technical disagreements that cannot be resolved by the parties within a reasonable amount of time will be brought to the attention of the appropriate functional chief in the District (i.e. Chief, Planning Division, Chief, Engineering Division, etc.) to facilitate resolution. The functional chief is responsible for making the final decision on the disagreement. The functional chief may consult with other resources as appropriate, including knowledgeable experts from the Corps Labs, SAD or Headquarters, U.S. Army Corps of Engineers (HQUSACE), which may serve as

an unbiased sounding board. Major policy issues may be forwarded to HQUSACE for resolution, with proper coordination with SAD.
6. Technical and Policy Issue Resolution. Issues involving technical or policy interpretation will be brought to the attention of the chief of the responsible functional element for resolution. In some cases, the chief of the responsible functional element may hold an Issue Resolution Conference (IRC) to resolve major policy or technical issues. SAD and HQUSACE personnel may be requested to participate in the IRC.

B. Measures

Specific measures will be utilized, in addition to the overall quality control provided through chain-of-command review and supervisory guidance, to evaluate progress and ensure compliance with current policy and procedures.

1. Overall Progress. The overall progress of the study effort will be measured through several means including Planning Division, Programs and Project Management Division, and the Project Study Plan (PSP) that includes work plans, study schedules, and budget milestones. The PSP will be reviewed on a monthly basis to identify any changes to the resources designated for any portion of the study. Any changes will be analyzed for their impact upon other critical functions as well as the completion date of the project. Significant changes will be elevated to higher administrative levels to coordinate impacts and ensure minimal effect on the study.

2. Project Review Board. Progress reports will be made monthly to the District Project Review Board (PRB). Early decisions on competing resources and priorities will be addressed in this forum as well as upward reporting to SAD and HQUSACE via normal PRB procedures.

3. Project Delivery Team Meetings. The PDT is an organized multi-agency, multi-disciplinary group, consisting at least of the affected functional elements in the district. Under team management, the Project Manager (PM) will coordinate with the other functional managers and technical staff on the PDT. The PM will ensure that the study accomplishes the established goals at the anticipated rate, and that all items of the study schedule are accomplished.

4. Issue Resolution Conferences. Review meetings and conferences will be held to maintain continuous support and guidance from higher review levels within USACE. Two specific issue resolution conferences (IRCs) are expected to be conducted. Other IRCs will be held as needed. Meetings and conferences will utilize the most cost effective methods including, but not limited to, televideo conferences, teleconferences, or face-to-face meetings.

5. Technical Review Conferences. A Technical Review Conference (TRC) will be held to review ongoing studies and ensure that future studies are on-track. The primary purpose of the TRC is to resolve issues, which will affect schedules and costs for the remaining study period. Field investigations and design studies conducted prior to the

conference will be reviewed for appropriateness and progress. Guidance on the TRC is contained in "Engineering and Design for Civil Works Projects," ER 1110-2-1150, dated 31 Mar 94. Meetings and conferences will also utilize the most cost effective methods including, but not limited to, televideo conferences, teleconferences, or face-to-face meetings.

6. General Reevaluation Scoping Meeting. The General Reevaluation Scoping Meeting (GRSM) will be convened early in the study to provide feedback to the PDT from SAD, HQUSACE, and the Office of the Assistant Secretary of the Army for Civil Works (ASA-CW). In addition, appropriate Federal and non-Federal agencies shall be invited to participate in the GRSM. This meeting is to ensure that the general reevaluation studies are tailored to meet specific objectives, and focus the General Reevaluation Study on key alternatives, to further define the depth of analysis required and to refine study/project constraints. Accordingly, the PSP may require revision to document changes agreed to at the GRSM. The revised PSP will then form the basis for subsequent conduct and review of the GRR/EIS.

7. Alternative Formulation Briefing. The Alternative Formulation Briefing (AFB) will be used to provide feedback to the PDT from SAD, HQUSACE, and ASA-CW. In addition, appropriate Federal and non-Federal agencies shall be invited to participate in the AFB. The AFB will be scheduled when the PDT has identified a selected plan and is prepared to present the formulation and evaluation of alternatives. The Washington level participants will seek to confirm that the plan formulation and selection process, the tentative identified preferred plan, and definition of Federal and non- Federal responsibilities, conform to current policy guidance. The goal is to identify and resolve any policy concerns that would otherwise delay or preclude approval of the draft report.

8. Feasibility Review Conference. The Feasibility Review Conference (FRC) is scheduled to be held just prior to release of the draft report to the public. This conference, however, may be waived if no major issues are identified in the AFB.

5. REVIEW

Reviews will be accomplished to assure conformance with Corps technical requirements through the application of the ATR and IEPR processes. Careful coordination and integration of planning, economics, environmental, and plan formulation with engineering, real estate, and technical considerations during this phase are imperative. Review will focus on compliance with established policy, principles, and procedures using clearly justified and valid assumptions. It includes the verification of assumptions, methods, procedures, and materials used in analyses based on the level of data obtained, alternatives evaluated, appropriateness of data used, functionality of the product and verifies the reasonableness of the results including whether the product meets the project needs consistent with law and existing policy and engineering and scientific principles.

In accordance with EC 1105-2-209 dated 31 January 2010, the ATR team will also focus on those planning models being used in the project development that are not certified. Through coordination with the District, the DDNPCX will conduct an ATR on the non-certified planning models and provide "certification for use" in the study. The ATR review of certified models will insure that their application in the studies and analysis are appropriately applied.

A. Agency Technical Review

As defined in EC 1165-2-209, ATR is a critical examination by a qualified person or team not involved in the day-to-day production of a technical product, ensuring the continued independence of reviewers. The purpose is to confirm that technical work was done in accordance with clearly established professional principles, practices, codes and criteria. It will involve participation by experts within the Corps, other agencies, universities and consultants.

1. Agency Technical Review Team (ATR)

The DDNPCX (Center) will manage the ATR process. The Center will form an ATR team from qualified individuals in corresponding specialties within SAD, other USACE districts, and Corps laboratories that might include contracted and/or private consultants. Selection of the appropriate individual to review a specific decision document, report, and/or study will be made by the ATR in coordination with the DDNPCX based upon cost, timeliness, technical capabilities, and project need from one of the following resources:

a) The "Within District" alternative identifies a reviewer through the lead functional chief. This alternative will use existing senior technical staff that perform other technical work but are not involved in the technical products under review. Generally, reviewers will not be selected from the District that prepared the product under review, except in unusual circumstances when no qualified reviewers are available from other sources.

b) The "Other Districts within the Division" alternative involves review work by personnel in one of the other four SAD districts (excluding Savannah District). These districts are the most familiar with navigation within the Southeast United States.

c) The "Other Districts outside the Division" alternative involves review by personnel in a USACE district outside of SAD. This alternative may be necessary when workloads at other districts within SAD preclude their taking on additional work effort and/or in order to obtain specialized expertise not available at SAD districts.

d) The "Contracted and/or Consultant" alternative would utilize outside expertise, other Federal and/or State agencies, academia and individuals. This alternative may be obtained via a Savannah District contract or via a contract through another USACE district.

2. The objectives of the Agency Technical Review are as follows:

a) Insure quality technical products by providing an effective, comprehensive technical review as a basis for decision-making.

b) Verify that functional, legal, safety, health and environmental requirements are met.

c) Achieve cost effective solutions.

d) Obtain process efficiency by integrating technical review throughout product development.

e) Document issues, concerns and their resolution.

f) Assure accountability for the technical quality of the product.

g) Minimize lost effort and redesign.

h) Provide continued development of Corps technical expertise.

i) Achieve a seamless review process that includes early identification and resolution of both technical and policy issues.

3. Documentation

a) Technical Review Comments

b) Technical Review Responses

c) Technical Review Annotations

d) Statement of Technical and Legal Review

4. Team Formation and In-progress Review Process

a) The ATR will be coordinated by the DDNPCX (the Center). The Center will appoint an ATR Lead to manage and direct the ATR. A technical reviewer will be assigned for each discipline involved in the study, such as Engineering, Economics, Plan Formulation, Environmental, etc.

b) The ATR team will be provided the Project Review Plan (RP) and this Quality Control Plan (QCP). They will document any concerns in writing and provide them to the ATR Lead.

c) The ATR Lead will consolidate the concerns and provides them to the Project Manager (PM). The consolidated documented concerns/comments are then distributed to all of the PDT members.

d) The PDT will develop responses to the concerns/comments and provide them to the PDT leader, who will in turn provide them to the ATR Lead. An initial technical review teleconference will be held between the ATR team and the PDT to discuss the comments and develop responses. The PM will document the proceedings of the technical review teleconference in a memorandum for record (MFR) that incorporates the comments and responses.

e) The PM will distribute the MFR to all meeting attendees, their supervisors and the remainder of the PDT. The PM will then file the MFR to document the technical review process. The DDNPCX will look for opportunities to use the DrChecks online software to document the proceedings.

f) During the ATR should uncertainty or concerns involving the documentation result, a teleconference between the ATR and the PDT will be conducted by the PM in coordination with the Center. The teleconference will seek to discuss and resolve the concerns and develop responses. The PM will document the proceedings of the teleconference in an MFR that will be distributed to those involved and the vertical team (the vertical team includes the district, MSC, and HQUSACE).

g) If the ATR team and the PDT are unable to resolve any concern the Center will immediately initiate the dispute resolution process described in ER 1110-2-12 or ER 1105-2-100, Appendix H.

h) Once all issues are resolved, the PM will prepare and distribute a MFR to all meeting attendees, their supervisors, and the vertical team. The PM will file the MFR to document the resolution of the concerns and the technical review process.

5. ATR of the Draft Report

a) The PM will deliver the draft report (GRR\Tier II EIS and supporting documents) to the ATR team via file transfer program (FTP) in a timely manner, allowing at least two weeks for review.

b) Each member of the ATR team is encouraged to read the entire draft report and focus review on their respective disciplines.

c) Once the review of the draft report is complete, the ATR team members will post their comments in DrChecks review software. The PDT will evaluate the ATR comments and place their responses in DrChecks. Comments should be limited to those that are required to ensure adequacy of the product. The four key parts of a quality review comment will include:

(i) The review concern – identify the product's information deficiency or incorrect application of policy, guidance, or procedures;
(ii) The basis for the concern – cite the appropriate law, policy, guidance, or procedure that has not be properly followed;
(iii) The significance of the concern – indicate the importance of the concern with regard to its potential impact on the plan selection, recommended plan components, efficiency (cost), effectiveness (function/outputs), implementation responsibilities, safety, Federal interest, or public acceptability; and
(iv) The probable specific action needed to resolve the concern – identify the action(s) that the reporting officers must take to resolve the concern.

d) In some situations, especially addressing incomplete or unclear information, comments may seek clarification in order to then assess whether further specific concerns may exist.

e) The ATR documentation in DrChecks will include the text of each ATR concern, the PDT response, a brief summary of the pertinent points in any discussion, including any vertical team coordination, and the agreed upon resolution. If an ATR concern cannot be satisfactorily resolved between the ATR team and the PDT, it will be elevated to the vertical team for further resolution in accordance with the policy issue resolution process described in either ER 1110-2-12 or ER 1105-2-100, Appendix H, as appropriate. Unresolved concerns can be closed in DrChecks with a notation that the concern has been elevated to the vertical team for resolution.

f) At the conclusion of the ATR, the ATR Lead will prepare and provide to the DDNPCX a Review Report summarizing the review. Review Reports will be considered an integral part of the ATR documentation and shall:

- Identify the document(s) reviewed and the purpose of the review;
- Disclose the names of the reviewers, their organizational affiliations, and include a short paragraph on both the credentials and relevant experiences of each reviewer;
- Include the charge to the reviewers;
- Describe the nature of their review and their findings and conclusions;
- Identify and summarize each unresolved issue (if any); and
- Include a verbatim copy of each reviewer's comments (either with or without specific attributions), or represent the views of the group as a whole, including any disparate and dissenting views.

g). The DDNPCX will prepare a Statement of Technical Review certifying that the ATR has been completed and that the issues raised by the ATR team have been resolved (or elevated to the vertical team). The Statement of Technical Review will be submitted to Savannah District prior to the District Commander signing the draft report. The Savannah District Office of Counsel will sign the Certification of Legal Review.

B. Independent External Peer Review

IEPR will be conducted on the entire final draft decision document (Draft GRR/EIS) including the supporting documents. This review will be conducted by a team assembled by the DDNPCX through an Outside Eligible Organization (OEO).

6. External Peer Review

As required by EC 1165-2-209, External Peer Review (IEPR) of the draft report (GRR\Tier II EIS and all supporting documentation) will be conducted.

IEPR Process. The DDNPCX will manage the IEPR process. The DDNPCX will engage an Outside Eligible Organization (OEO) to conduct the IEPR, and assess the output of the review panel selected to perform the IEPR. The OEO will develop a work plan to describe, in detail, the process that will be used to identify and select the IEPR panel, conduct the review, and prepare the IEPR report. The OEO will select the reviewers who will be recognized national experts in their disciplines drawn from academia, the private sector, as well as other federal and state agencies. These reviewers may not be current employees of USACE, but must be familiar with USACE policies and guidance.

Potential candidates for the IEPR panel will be recruited, screened for availability, interest, and technical experience in defined areas of expertise. Ultimately, seven (7) experts will be selected for the final IEPR panel using predetermined criteria related to technical expertise and credentials, relevance to the major disciplines involved in development of the GRR/EIS, and overall balance. A link to an FTP site will be used to provide reviewers with electronic copies of the study documents to be reviewed. Sufficient time will be allocated so that the documents could be read thoroughly. Reviewers will provide written comment; however, individual review comments will not be publicly attributed to a specific reviewer. The OEO will read all comments provided by the review panel and assess them for pertinence, validity and applicability. The OEO in conjunction with the review panel will consolidate the comments before they are placed in DrChecks.

Appropriate individuals from the PDT will evaluate the comments and provide written responses in Dr. Checks. Concurrences with review comments will be noted. When provision of additional information is suggested by the panel, that information will be developed by the PDT, and a notation of where the information will be placed in the study documentation will be placed in DrChecks.

Where the PDT member does not concur with a panel comment, they will provide an explanation of why they do not concur. The OEO and the DDNPCX will make a reasonable attempt to resolve any outstanding issues. If an IEPR concern cannot be satisfactorily resolved between the Panel and the PDT, it will be elevated to the vertical team for further resolution in accordance with the policy issue resolution process described in either ER 1110-2-12 or ER 1105-2-100, Appendix H.

(1) Documentation of IEPR. DrChecks review software will be used to document IEPR comments and aid in the preparation of the IEPR Review Report. Comments should address the adequacy and acceptability of the economic, engineering and environmental methods, models, and analyses used. IEPR comments should generally include the same four key parts as described for ATR comments. The OEO will be responsible for compiling and entering comments into DrChecks. The OEO shall prepare and deliver to the DDNPCX an IEPR Review Report that will accompany the IEPR Final Report for the project. The Final Report shall:

a) Disclose the names of the reviewers, their organizational affiliations, and include a short paragraph on both the credentials and relevant experiences of each reviewer;

b) Include the charge to the reviewers;

c) Describe the nature of their review and their findings and conclusions; and

d) Include a copy of the consolidated review comments (either with or without specific attributions), or represent the views of the group as a whole, including any disparate and dissenting views.

The final IEPR Review Report will be submitted by the OEO no later than 60 calendar days following the start of the public comment period for the draft Savannah Harbor Expansion General Re-evaluation Report and Tier II EIS. The report will be considered and documentation prepared on how issues were resolved or will be resolved. The recommendations and responses will be presented to the Civil Works Review Board by the District Commander with an IEPR panel member or OEO representative participating, preferably in person. The review documentation and certification will be provided to the PM by the DDNPCX for posting on the District's web site.

Savannah District, with assistance from the DDNPCX, shall prepare a written proposed response to the report, detailing any actions undertaken or to be undertaken in response to the report, and the reasons those actions are believed to satisfy the key concerns stated in the review report (if applicable). The proposed response will be coordinated with the MSC District Support Teams and HQUSACE to ensure consistency with law, policy, project guidance, ongoing policy and legal compliance review, and other USACE or National considerations.

(2) IEPR Schedule - The implementation schedule for the IEPR is provided below:

IEPR Implementation Schedule

ACTION	DATE
Complete subcontracts for panel members	19 Jul 2010
Submit Draft Charge (combine with Draft Work Plan – Task 1)	19 Jul 2010
USACE provides comments on draft charge	21 Jul 2010
Submit Final Charge (combined with Final Work Plan – Task 1)	22 Jul 2010
USACE approves Final Charge	22 Jul 2010
USACE/OEO Kick-off Meeting	23 Jul 2010
Review documents sent to panel members	23 Jul 2010
OEO/panel Orientation Meeting	30 Aug 2010
Panel members initiate their review	7 Sep 2010
Convene panel review teleconference	21 Sep 2010
External panel members provide draft final panel comments to OEO	30 Sep 2010
Submit Final IEPR Report	8 Oct 2010
Input final panel comments in DrChecks, Battelle provides final panel comment response template to USACE	15 Oct 2010
USACE PDT provides draft Evaluator responses and clarifying questions to OEO	22 Oct 2010
Final Panel Comment Teleconference between OEO, IEPR team, and PDT to discuss final panel comments, draft responses and clarifying questions	29 Oct 2010
USACE inputs final Evaluator responses in DrChecks	5 Nov 2010
OEO inputs BackCheck responses in DrChecks	12 Nov 2010
OEO submits pdf printout of DrChecks project file	15 Nov 2010
Project Closeout	**22 Jan 2010**

Model Certification/Approval. EC 1105-2-407 requires certification (for Corps models) or approval (for non-Corps models) of planning models used for all planning activities. The EC defines planning models as any models and analytical tools that planners use to define water resource management problems and opportunities, to formulate potential alternatives to address the problems and take advantage of the opportunities to evaluate potential effects of alternatives and to support decision-making. The EC does not cover engineering models used in planning. Engineering software is being address under the Engineering and Construction (E&C) Science and Engineering Technology (SET) initiative. Until an appropriate process that documents the quality of commonly used engineering software is developed through the SET initiative, engineering activities in support of planning studies shall proceed as in the past. The responsible use of well-known and proven USACE developed and commercial engineering software will continue and the professional practice of documenting the application of the software and modeling results will be followed.

C. Public Participation

A complete public participation plan has been developed by Savannah District and is available on the district website.

6. PARTICIPATION BY NON-FEDERAL INTEREST

The Georgia Ports Authority as well as three Federal Cooperating Agencies involved in the Savannah Harbor Expansion Project shall provide input to be used to monitor the quality and process during study development. The PDT shall consider their feedback as a quality indicator.

7. ENDORSEMENTS BY THE OFFICE CHIEFS

I certify that the study and review process required to be performed under my responsibility has been completed and the technical work is in accord with Corps regulations, standard report requirements, and customer expectations.

District Commander	Date
Chief, Programs and Project Management Division	Date
Chief, Planning and Environmental Division	Date
Chief, Engineering Division	Date
District Counsel	Date
Chief, Operations Division	Date
Chief, Contracting Division	Date
Chief, Real Estate Division	Date

DEPARTMENT OF THE ARMY
MOBILE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 2288
MOBILE, ALABAMA 36628-0001

REPLY TO
ATTENTION OF:

CESAM-PD-D (1105-2-40a) 13 January 2012

MEMORANDUM FOR MR. JASON OKANE, (CESAS-PM)

SUBJECT: Certification of Completion of Agency Technical Review (ATR), Savannah Harbor Expansion Project, Deep-Draft Navigation Final General Reevaluation Report and Draft Tier II Environmental Impact Statement

1. In accordance with EC 1165-2-209, "Civil Works Review Policy," dated 31 January 2010, ATR of the Savannah Harbor Expansion Project, Deep-Draft Navigation Final General Reevaluation Report and Draft Tier II Environmental Impact Statement has been executed through the Deep Draft Navigation Planning Center of Expertise (DDNPCX).

3. We concur that ATR of the study report documents has been completed and certified. All outstanding issues have been addressed and satisfied. The DDNPCX point of contact is Mr. Johnny Grandison, CESAM-PD-D, (251)-694-3804.

Encls

BERNARD E. MOSEBY
Technical Director
Deep Draft Navigation Planning Center
Expertise

CF:
CESAS-PM/GARRETT

COMPLETION OF AGENCY TECHNICAL REVIEW
SAVANNAH HARBOR EXPANSION PROJECT, DEEP-DRAFT NAVIGATION FINAL GENERAL REEVALUATION REPORT and DRAFT TIER II ENVIRONMENTAL IMPACT STATEMENT

CHATHAM COUNTY, GEORGIA, AND JASPER COUNTY, SOUTH CAROLINA

January 2012

The Agency Technical Review (ATR) has been completed for the Savannah Harbor Expansion Project, Deep-Draft Navigation Final General Reevaluation Report and ~~Draft Tier II~~ Environmental Impact Statement. The ATR was conducted as defined in the project's Review Plan to comply with the requirements of EC 1165-2-209.

A panel of eight reviewers was established by the Deep Draft Navigation Planning Center of Expertise (DDNPCX), the Review Management Organization (RMO) that managed the conduct of this review. The ATR was initiated on 19 December 2011 and was completed on 6 January 2012.

During the ATR, compliance with established policy principles and procedures, utilizing justified and valid assumptions, was verified. This included review of: assumptions, methods, procedures, and material used in analyses, alternatives evaluated, the appropriateness of data used and level obtained, and reasonableness of the results, including whether the product meets the customer's needs consistent with law and existing U.S. Army Corps of Engineers (Corps) policy. The ATR also assessed the District Quality Control (DQC) documentation and made the determination that the DQC activities employed appear to be appropriate and effective. All comments resulting from the ATR have been evaluated and responded to by the Savannah District Project Delivery Team (PDT) and comments have been back-checked by the ATR team (ATRT). There are no open comments. A complete copy of the ATR report and a copy of the final comment report from Dr. Checks are enclosed.

We certify that the ATR of the Savannah Harbor Expansion Project General Reevaluation Report and ~~Draft Tier II~~ Environmental Impact Statement was performed as required by EC 1165-2-209.

WILLEY.SHERIDAN.S.1369416304

Sheridan S. Willey
ATR Team Lead
CESWG-PE-PL

Date

18 January 2012

Jason Okane
Project Manager
CESAS-PM-C

Date

GRANDISON.JOHN NY.L.1230718772

Johnny Grandison
Review Management Organization
Representative DDNPCX

Date

CERTIFICATION OF AGENCY TECHNICAL REVIEW

There are no remaining open comments, and all concerns resulting from the ATR of the project have been fully resolved.

SIMMONS.GORDON.L.1126450962 Digitally signed by SIMMONS.GORDON.L.1126450962 DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USA, cn=SIMMONS.GORDON.L.1126450962 Date: 2012.01.18 08:59:27 -05'00'

Gordy L. Simmons
Chief, Engineering Division
CESAS-EN

Date

BAILEY.WILLIAM.G.1228755563 Digitally signed by BAILEY.WILLIAM.G.1228755563 DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USA, cn=BAILEY.WILLIAM.G.1228755563 Date: 2012.01.17 10:08:34 -05'00'

Bill Bailey
Chief, Planning Division
CESAS-PD

Date

COMPLETION OF AGENCY TECHNICAL REVIEW
Savannah Harbor Expansion Project, Deep-Draft Navigation Final General Reevaluation Report (GRR) and Draft Tier II Environmental Impact Statement (EIS)

Chatham County, Georgia, and Jasper County, South Carolina

January 2012

1. Scope and Purpose of Review. The purpose of this eport is to document one phase of review, Agency Technical Review (ATR), for the subject study. The review was conducted for the United States Army Corps of Engineers, Savannah District. The primary point of contact for Savannah District (the District) was Jason Okane, Project Manager, CESAS-PM-C. The Agency Technical Review Team (ATRT) was lead by Ms. Sheridan Willey, CESWG. The Deep Draft Navigation Planning Center of Expertise (DDNPCX) was the Review Management Organization (RMO) for this ATR.

This review phase follows report revisions subsequent to the December 2011 draft final report package. That package contained versions of the GRR and EIS dated December 2011.

Review documents included:

- Final GRR and EIS documents (titles above),
- GRR Appendix A – Economics
- GRR Appendix B – Real Estate
- GRR Appendix C – Engineering Investigations
- GRR Appendix D – Plan Formulation
- GRR Appendix E – Quality Control
- EIS Appendices A-H

2. References. This review report was prepared in response to Engineer Circular (EC) 1165-2-209 dated 31 January 2010, Water Resources Policies and Authorities, Civil Works Review Policy.

3. Project Description. Savannah Harbor is a deep draft navigation harbor located on the South Atlantic U.S. coast, 75 statute miles south of Charleston Harbor, South Carolina, and 120 miles north of Jacksonville Harbor, Florida. The harbor comprises the lower 21.3 miles of the Savannah River (which, with certain of its tributaries, forms the boundary between Georgia and South Carolina along its entire length of 313 miles) and 11.4 miles of channel across the bar to the Atlantic Ocean.

Within the harbor limits, the Savannah River is generally divided into two channels by a series of islands. From the Atlantic Ocean to River Mile 10 where the river converges, the harbor is separated into South and North Channels. Within this area, the navigation channel is maintained in the North Channel. After divergence of the river into Front and Back Rivers at River Mile 11, the navigation channel is maintained in Front River and passes by the business district of the City of Savannah. The navigation channel is maintained in Front River to the upper limits of the harbor at River Mile 21.3. The Atlantic Intracoastal Waterway (AIWW) crosses the navigation channel approximately 5.5 miles upstream of the entrance to the harbor. The Savannah River Below Augusta Project, which is a shallow draft navigation channel authorized for 9 feet deep

and 90 feet wide, extends upstream from the harbor (River Mile 21.3) to River Mile 202.6 at Augusta, Georgia.

The currently authorized deep draft navigation channel is 44 feet deep and 600 feet wide from deep water in the ocean (mile 11.4B) to the channel between the jetties (mile 2.6B), thence 42 feet deep and 500 feet wide to the harbor entrance (River Mile 0.0). From mile 0.0 to the upstream end of the Kings Island Turning Basin (River Mile 19.5) the channel is 42 feet deep and 500 feet wide. The channel is 36 feet deep and 400 feet wide from mile 19.5 to the upstream end of the Argyle Island Turning Basin (River Mile 19.9). The upper end of the harbor from River Mile 19.9 to its upstream limit at River Mile 21.3 is maintained at 30 feet deep and 200 feet wide.

Garden City Terminal is the Georgia Ports Authority-operated container terminal at Savannah Harbor and is currently the second largest container port on the US east coast and the fourth largest in the Nation. However, Savannah Harbor also currently has the shallowest controlling depth for a major port. Although the 42-foot controlling depth and 38-foot unrestricted access depth at Savannah Harbor is similar to current constraints at the Panama Canal (39 feet), the Panama Canal Expansion Project will be fully operational by 2014, which will allow passage for vessels with up to 50 feet of draft. The Georgia Ports Authority has planned and funded improvements at Garden City Terminal to coincide with the Panama Canal Expansion Project. With these improvements in place, this terminal will be the largest single container handling facility in the Nation with more than 1,200 acres of terminal space, 9,000 feet of berth, 33 post-Panamax size cranes, and two on-site intermodal transfer facilities serviced by two major rail lines. The facility, at full build out, will have a throughput capacity of 6.5 million Twenty-Foot Equivalent Units (TEUs).

Navigation improvements at Savannah Harbor present the opportunity to reduce future waterborne transportation costs and to enhance efficiency in international trade associated with larger, more efficient vessels, Garden City Terminal infrastructure improvements, and Savannah Harbor landside transportation infrastructure improvements.

4. Required Disciplines for Technical Review:

Plan Formulation: Team member should have extensive experience in the Corps planning process and be knowledgeable of Corps policies and guidelines. He or she should be familiar with deep-draft navigation projects.

Geotechnical: Team members will have extensive experience in deep-draft navigation and general navigation feature design, pre- and post-construction evaluation, and rehabilitation. A certified professional engineer is strongly recommended.

Hydrology and Hydraulics: Team members should be an expert in the field of hydrodynamics and how changes to existing channels will impact water movement through a system and what affects these impacts will have.

Cost Estimating: Team member will be familiar with cost estimating for similar projects in MII. Review includes construction schedules and contingencies for any document requiring Congressional authorization. The team member will be a Certified Cost Technician, a Certified

Cost Consultant, or a Certified Cost Engineer. As the Cost Engineering Center of Expertise, Walla Walla District will assign this team member as part of a separate effort coordinated by the ATR or IEPR team lead in conjunction with the geographic district's project manager.

Economics: Team member will have extensive experience in deep-draft navigation projects and have a thorough understanding of planning formulation and evaluation methodologies and techniques, including the application of models such as HarborSym. The member should also be familiar with forms of multi-port analysis and regional economics.

Environmental – NEPA: The reviewer should have a strong background in the environmental methodologies and application of habitat evaluation and alternative assessment related to the project region; as well as an in depth understanding or environmental laws and regulations related to NEPA documentation.

Real Estate: The reviewer should have knowledge in operations of deep-draft navigation projects.

Operations: The reviewer should have knowledge in reviewing RE Plans for feasibility studies relating to deep-draft navigation.

5. Review Team:

Plan Formulation – Sheri Willey, CESWG-PE-PL – 409-766-3917, sheridan.s.willey@usace.army.mil. Sheri Willey, P.E. is a civil works water resources planner/ civil engineer in the Galveston District's Planning and Environmental Branch. She is Regional Technical Specialist for Water Resources for the District. She is responsible for the development of decision documents used by Congress to authorize the implementation of civil works projects. To develop those reports she has lead study teams in the evaluation of problems and needs, selection of alternative evaluation methodologies, the analysis of findings of a multidisciplinary team that lead to conclusions and recommendations, and oversight of overall team documentation. As RTS for Plan Formulation, she has been responsible for coordinating with the different PCX's throughout the country for ATR on Galveston District projects as well as part of team performing reviews for other districts.

Environmental – Larry Parson, CESAM-PD-EC – 251-690-3139, larry.e.parson@usace.army.mil, Larry Parson is a Physical Scientist with the Mobile District, Planning and Environmental Division, Coastal Environment Team. He is a coastal environmental study manager with responsibilities for managing and conducting investigations involving oceanography, coastal processes, marine ecology, water quality, sediment analysis, and other matters related to environmental assessment and restoration. He closely coordinates and partners with various agencies to determine appropriate environmental measures for obtaining state Water Quality Certifications (WQC), Coastal Zone Consistency (CZC) determinations and all associated environmental compliances for O&M, CAP, and military projects. He has extensive knowledge and experience in the NEPA process for the formulation of Environmental Impact Statements (EIS), Environmental Assessments (EA), 404(b)(1)Water Quality Reports, and coordinating with support agencies for Threatened and Endangered Species, Critical Habitat, and Essential Fish Habitat. Mr. Parson is also the lead for the District's Regional Sediment Management (RSM) implementation strategy, which utilizes a regional

management approach for more effective sediment disposal methods, beneficial use, and environmental restoration.

Geo-Technical, Christopher Mark Green, CESAM-EN-GG - 251-690-3435, christopher.m.green@usace.army.mil, Christopher Mark Green is a Geotechnical Engineer in the Geotechnical Section of the Mobile District. He has been with the Mobile District for over 4 years. He is the primary Geotechnical Engineer for several civil and military projects. Currently, he is the PAE for Bayou Caddy, which includes armoring and repairing damaged Geotubes on the Mississippi Gulf Coast near Bay St. Louis. He has assisted with the Triple Barrel Project, Ophelia Disposal Area Repair and various projects associated with the Mississippi Coastal Improvements Program. He has also been involved with several inspections and certifications of levees and emergency levee repairs.

Cost Engineering – James Neubauer, CENWW-EC-X - 509 527-7332 James.G.Neubauer@usace.army.mil, Mr. James Neubauer GS-13 Technical Cost Engineering Lead for the Cost Engineering District of Expertise (DX) for Civil Works located in Walla Walla, WA: For 12 years he was a civil and military cost engineer (Lead Estimator - Albuquerque, CH/Cost - Europe, Lead Estimator - Walla Walla). He has 11 years civil works construction experience (Wyoming, Europe, Walla Walla), and 5 years military and civil PM (Europe and Albuquerque). He has provided ATR on several projects with cost estimates greater than $1Billion. He is presently the Cost DX ATR Coordinator. Licensed Civil PE. Certified Cost Engineer. PM1 Certification.

Hydraulics and Hydrology, J. Greg Miller, CESAM-EN-HH - 251-690-3115, John.g.miller@usace.army.mil, Mr. Miller is currently assigned as Lead Project Engineer for Civil Works within Mobile District Engineering Division. His experience includes over 34 years in hydraulic design and project engineering for navigation improvement, hurricane and storm damage reduction, environmental restoration, and flood damage reduction project purposes. He has performed numerous technical reviews for other districts on projects related to navigation improvements, including Jacksonville Harbor (Mile Point) Feasibility Study, Charleston Harbor GRR, Jacksonville Harbor Phase 2 Dredging P&S, Savannah Harbor Expansion AFB Documentation, and Texas City Channel LRR.

Real Estate - Russell W. Blount III, CESAM-RE-P - 251-694-3675, Russell.w.blountiii@usace.army.mil, Russell Blount is currently a Realty Specialist and Lead Real Estate Planner for Mobile District, Real Estate Division for both military and civil works projects. His responsibilities include planning and implementing major land acquisition/ relocation projects, oversight of Division title contracts, PCS Real Estate claims approvals and regional specialist for Agency Technical Review (ATR) assignments. Blount has 8 years of private sector experience in the title insurance and real estate industries. He holds a BS and MPA from the University of South Alabama.

Operations – Nathan Lovelace, CESAM-OP - 251-694-3713, Nathan.d.lovelace@usace.army.mil, Nathan Lovelace currently serves as the Dredge Material Project Manager in the Mobile District for the development of beneficial uses of dredge material, including District Champion for the inland and coastal regional sediment management program. Coupled with his new duties as Dredge Material Project Manager, Nathan has 11 years of extensive field project engineer experience along coastal Alabama and Mississippi, dredging

deep and shallow draft Federal channels. In addition to channel dredging, other civil works experiences include lead field engineer for a 27-mile beach restoration project, several wetland creation projects, coastal shore protection projects and several Mississippi Coastal Improvement Program projects. He has also spent the past several years developing and refining the Quality Assurance/Control and safety efforts relating to coastal dredging and earthwork. He is considered a Subject Matter Expert for construction and maintenance of upland disposal areas and marsh creations along the coast.

Economics - Naomi Fraenkel, CENAN - 917-790-8615, Naomi.R.Fraenkel@usace.army.mil
Naomi Fraenkel, FE, AICP, is an economist in New York District where she specializes in planning for navigation projects and economics of large-scale environmental restoration efforts.

6. Charge To Reviewers. The review team was charged with the detailed review of the study documentation, both directly and indirectly related to their field of expertise. The team was encouraged to review all documents in the submission package and verify overall consistency of the report information among disciplines. This ATR is to ensure that technical analyses meet the requirements of technical regulations, and ensure policy compliance. The review should also ensure that appropriate problems and opportunities are addressed; confirm that a reasonable array of solutions are considered; confirm that an appropriate solution is recommended; assure that appropriate costs, schedules, and risks are presented; confirm the recommended solution warrants Federal participation; is in accord with policies; can be implemented in accordance with environmental laws and statutes; and has a sponsor willing and able to fulfill the non-Federal responsibilities; and ensure that the decision document appropriately represents the views of the Corps of Engineers, the Army, and the President. Accordingly, the review should:

- Identify, examine, and comment upon assumptions that underlie analyses (i.e. public safety, economic, engineering, environmental, and others)
- Evaluate the appropriateness of models selected for use in evaluations, the application of data within those models, and the interpretation of and conclusions drawn from model results.
- Bring important issues to the attention of decision makers.

Review Criteria for ATR:

- Products were reviewed for compliance with guidance, including Engineering Regulations, Engineering Circulars, Engineering Manuals, Engineering Technical Letters, Engineering Construction Bulletins, Policy Guidance Letters, implementation guidance, project guidance memoranda, and other formal guidance memoranda issued by HQUSACE.
- Approved waivers should have been obtained from HQUSACE for any deviations from USACE guidance and documented in the review materials.

Key Review Considerations:

- The project meets the customer's scope, intent and quality objectives as defined in the PMP.
- Formulation and evaluation of alternatives are consistent with applicable regulations and guidance.

- Concepts and project costs are valid.
- The recommended alternative is feasible and will be safe, functional, constructible, environmentally sustainable, within the Federal interest, and economically justified according to policy.
- All relevant engineering and scientific disciplines have been effectively integrated.
- Appropriate computer models and methods of analysis were used and basic assumptions are valid and used for the intended purpose.
- The source, amount, and level of detail of the data used in the analysis are appropriate for the complexity of the project.
- The project complies with accepted practice within USACE.
- Content is sufficiently complete for the current phase of the project and provides an adequate basis for future development effort.
- Project documentation is appropriate and adequate for the project phase.

Additional considerations for Decision Documents:

- Recognizing that the quality of each decision document has a direct and immediate impact on the credibility of the Corps of Engineers and the Department of the Army, ATR on decision documents should address the basic communication aspects of the documents.
- The main decision document and appendices should form an integrated and consistent product.
- As an initial guide, the ATR team should consider the Project Study Issue Checklist in Exhibit H-2, Appendix H, ER 1105-2-100, which includes many of the more frequent and sensitive policy areas encountered in studies.
- Composition of Technical Comments (DrChecks):
- Comments should follow a four part structure, composed of the following:
    - A clear statement of the ATRT concern.
    - The basis for the concern (often a reference to guidance).
    - The significance of the concern.
    - A suggested action that would resolve the concern.
- General guidance or suggestions by the ATRT for future PDT consideration are acceptable as a technical comment. However, the commenter should indicate that "a PDT evaluation of 'noted' will be sufficient".

Coordination of Editorial Comments:

- Editorial comments about errors, such as spelling, composition, missing or erroneous table or graphic references, or about writing or documentation suggestions were noted by the ATRT and provided to the ATR lead for coordination with the PDT study manager or project manager.

Coordination of reviewer questions was directed through the review team lead and the project manager, who coordinated the questions with the appropriate project delivery team member(s).

7. Findings and Conclusions. Review was completed and responses to all comments have been provided. A total of 47 comments were submitted during this review. The attached DrChecks report details all of the comments and the status of the review.

8. Significant and/or Unresolved Issues. All ATR issues have been addressed; all comments resulting from the ATR have been evaluated and responded to by the Savannah District PDT and comments have been back-checked by the ATR team.

9. Lessons Learned. The review materials were well organized. No basic improvements were identified for the review package or the review process.

10. Dr. Checks Report. The DrChecks report of comments and responses is attached as Enclosure 1. A signed certification statement from each of the ATR team members is retained by the Team Lead, the DDNPCX, and a copy has been provided to Savannah District.

WILLEY.SHERIDAN.S.1369416304 Digitally signed by WILLEY.SHERIDAN.S.1369416304 DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USA, cn=WILLEY.SHERIDAN.S.1369416304 Date: 2012.01.17 08:03:03 -06'00'

Sheridan S. Willey
Regional Technical Specialist for Water Resources Plan Formulation
Galveston District
Southwestern Division

Enclosure 1

ATR COMMENTS AND RESPONSES

Comment Report: All Comments
Project: Savannah Harbor ATR
Review: SHEP- Final Agency Technical Review (ATR)
Displaying 47 comments for the criteria specified in this report.

Id	Discipline	Section/Figure	Page Number	Line Number
4334756	Real Estate	n/a	n/a	n/a

This comprehensive RE Appendix (12 December 2011 version) does not require any significant changes as all requirements have been met. Minor revisions have been identified which are attached hereto. The RE Appendix is well written and conforms to the ER for water resource projects. In addition, this document adequately identifies a reasonable acquisition plan and legitimate cost estimates for potential project authorization.

(Attachment: Draft RE Appendix 12 Dec 2011[1 - ATR Review Comments].pdf)

Submitted By: Russell Blount (251-694-3675). Submitted On: 15-Dec-11

1-0	Evaluation **Concurred** All recommended revisions with the exception of 1 (pg 19 line 23) have been incorporated into the report. Submitted By: John S. Hinely (912-652-5207) Submitted On: 16-Dec-11
1-1	Backcheck Recommendation **Close Comment** All RE comments closed. Submitted By: Russell Blount (251-694-3675) Submitted On: 19-Dec-11
	Current Comment Status: Comment Closed

4344646	Environmental	Problems and Needs	GRR - Executive Summary - Page 2	n/a

Twenty-foot Equivalent Unit should be written with acronymn the first time.

Submitted By: Larry Parson ((251) 690-3139). Submitted On: 21-Dec-11

1-0	Evaluation **Concurred** Concur with the comment. This has been corrected in the GRR. Submitted By: Margarett McIntosh (912-652-5320) Submitted On: 22-Dec-11
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Larry Parson ((251) 690-3139) Submitted On: 22-Dec-11
	Current Comment Status: Comment Closed

4344674	Environmental	Figure 9-1 Mitigation Option	GRR -	n/a

The deepening depths in the figure are in meters. Suggest adding the conversion to feet in parentheses along side.

Submitted By: Larry Parson ((251) 690-3139). Submitted On: 21-Dec-11

1-0	Evaluation **Concurred** Concur with the comment. This information has been added to the GRR. Submitted By: Margarett McIntosh (912-652-5320) Submitted On: 22-Dec-11
1-1	Backcheck Recommendation **Close Comment** Closed without comment.

	Submitted By: Larry Parson ((251) 690-3139) Submitted On: 22-Dec-11			
	Current Comment Status: Comment Closed			
4344699	Environmental	5.7.2 - Sea Level Rise	GRR	n/a
For the sea level rise elevations, it would be helpful to also present in feet. This is later used to determine future sea levels which are presented in feet. Submitted By: Larry Parson ((251) 690-3139). Submitted On: 21-Dec-11				
1-0	Evaluation **Concurred** Concur. This information has been added to the GRR. Submitted By: Margarett McIntosh (912-652-5320) Submitted On: 22-Dec-11			
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Larry Parson ((251) 690-3139) Submitted On: 22-Dec-11			
	Current Comment Status: Comment Closed			
4344713	Environmental	Page 160	GRR	n/a
Also include units of feet for the sea level rise numbers of 25 or 50 cm. Submitted By: Larry Parson ((251) 690-3139). Submitted On: 21-Dec-11				
1-0	Evaluation **Concurred** Concur. This information, 25 cm (9.84 inches) and 50 cm (19.69 inches) has been added to the GRR. Submitted By: Margarett McIntosh (912-652-5320) Submitted On: 22-Dec-11			
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Larry Parson ((251) 690-3139) Submitted On: 22-Dec-11			
	Current Comment Status: Comment Closed			
4344725	Environmental	n/a'	EIS - Section 1 - page 3 - Last paragraph	n/a
When discussing the public information meeting held Dec. 15, 2011. Should that be 2010? Submitted By: Larry Parson ((251) 690-3139). Submitted On: 21-Dec-11				
1-0	Evaluation **Concurred** The EIS has been revised. Submitted By: Margarett McIntosh (912-652-5320) Submitted On: 22-Dec-11			
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Larry Parson ((251) 690-3139) Submitted On: 22-Dec-11			
	Current Comment Status: Comment Closed			
4344757	Environmental	n/a'	EIS - General comment on Tables and Figures.	n/a

Many times tables and figures are sited as the following tables or figures or the tables or figures below. All tables and figures should be specically sited in the text, especially when it is referring to a series of table or figures. An example would be for page 4-26 when referring to Figures 4-6 - 4-14. ... are shown in Figures 4-6 through 4-14 below. This should be consistent throughout the document.

Submitted By: Larry Parson ((251) 690-3139). Submitted On: 21-Dec-11

1-0	Evaluation **Non-concurred** The District believes the text adequately directs the reader to the appropriate tables and figures. Submitted By: Margarett McIntosh (912-652-5320) Submitted On: 22-Dec-11
1-1	Backcheck Recommendation **Close Comment** The comment regarding specific siting of tables and figures in the text at various locations in the EIS was a recommendation and is a matter of writing style. It has no bearing on the technical content of the EIS and quality of the work. If the authors feel that the text adequately directs the reader to the appropriate tables and figures, this reviewer is OK with that. Submitted By: Larry Parson ((251) 690-3139) Submitted On: 22-Dec-11
	Current Comment Status: Comment Closed

4344780	Environmental	n/a'	Page 3-24 - 1st complete paragraph	n/a

States that additional environmental clearances would have to be obtained for use of maintenance sediment in this manner. If the situation arises, who would be responsible for obtaining the clearances?

Submitted By: Larry Parson ((251) 690-3139). Submitted On: 21-Dec-11

1-0	Evaluation **Concurred** The sentence has been revised to reflect the Corps would have to obtain the additional environmental approvals. Submitted By: Margarett McIntosh (912-652-5320) Submitted On: 22-Dec-11
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Larry Parson ((251) 690-3139) Submitted On: 22-Dec-11
	Current Comment Status: Comment Closed

4344802	Environmental	n/a'	Page 3-28, Figure 3-9	n/a

Provide a label at the top of the column or note at the bottom the significance of the cadmium included in the table. This also occurs in Table 4-4.

Submitted By: Larry Parson ((251) 690-3139). Submitted On: 21-Dec-11

1-0	Evaluation **Concurred** The table has been revised. Table 3-9 was intended to show dredging quantities for the selected plan, and Table 4-4 shows the dredging quantities by reach. Cadmium wsa deleted from both of these tables since is has not been discussed at this point in the document. Submitted By: Margarett McIntosh (912-652-5320) Submitted On: 22-Dec-11
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Larry Parson ((251) 690-3139) Submitted On: 22-Dec-11
	Current Comment Status: Comment Closed

4344841	Environmental	n/a'	Page 4-59 - last sentence.	n/a

Reference to Table 4-9. Should be changed to 4-10.

Submitted By: Larry Parson ((251) 690-3139). Submitted On: 21-Dec-11

1-0	Evaluation **Concurred** The EIS has been revised to reflect the correct Table #. Submitted By: Margarett McIntosh (912-652-5320) Submitted On: 22-Dec-11
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Larry Parson ((251) 690-3139) Submitted On: 22-Dec-11
	Current Comment Status: Comment Closed

4344845	Environmental	Table 4-14	Page 4-66	n/a

Table 4-14 not referenced in text. Looks like a reference to 4-1 was mis-labled and should be 4-14.

Submitted By: Larry Parson ((251) 690-3139). Submitted On: 21-Dec-11

1-0	Evaluation **Concurred** The text has been revised. Submitted By: Margarett McIntosh (912-652-5320) Submitted On: 22-Dec-11
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Larry Parson ((251) 690-3139) Submitted On: 22-Dec-11
	Current Comment Status: Comment Closed

4344854	Environmental	Table 4-14	Page 5-10	n/a

Sea level rise distances should also be expressed both in metric and english units.

Submitted By: Larry Parson ((251) 690-3139). Submitted On: 21-Dec-11

1-0	Evaluation **Concurred** The EIS has been revised to include inches. Submitted By: Margarett McIntosh (912-652-5320) Submitted On: 22-Dec-11
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Larry Parson ((251) 690-3139) Submitted On: 22-Dec-11
	Current Comment Status: Comment Closed

4344860	Environmental	Section 5.02.13 - Disinfection Byproduct Formation	n/a	n/a

(Document Reference: 1st sentence)

Chlorine in mis-spelled.

Submitted By: Larry Parson ((251) 690-3139). Submitted On: 21-Dec-11

1-0	Evaluation **Concurred** The spelling has been corrected. Submitted By: Margarett McIntosh (912-652-5320) Submitted On: 22-Dec-11
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Larry Parson ((251) 690-3139) Submitted On: 22-Dec-11
	Current Comment Status: Comment Closed

4344865	Environmental	Section 5.02.3	n/a	n/a

(Document Reference: 1st sentence)

Cloride concentration unit should be consistent. Mostly throughout the document it's shown as mg/l but in a few places it's shown as mg/L.

Submitted By: Larry Parson ((251) 690-3139). Submitted On: 21-Dec-11

1-0	Evaluation **Concurred** The concentrations discussed have been revised to show measurements in mg/l. Submitted By: Margarett McIntosh (912-652-5320) Submitted On: 22-Dec-11
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Larry Parson ((251) 690-3139) Submitted On: 22-Dec-11
	Current Comment Status: Comment Closed

4345795	Cost Engineering	n/a'	n/a	n/a

(Document Reference: Cost and Schedule Risk Analysis)

1. The risk analysis comments are based upon total project baseline. A previous March 2011 risk analysis was performed resulting in a 25% contingency at an 80% confidence of successful completion. The added project scope is proportionately small to overall baseline; therefore, any % change to the previous contingency value should be minimal. If a large change in contingency is determined, it implies a significant error in one of the models. During the course of District QC and risk modeling update, several errors were corrected but were insignificant to outcome, resulting in a 25% contingency at the 80% confidence level.

Submitted By: Jim Neubauer (509-527-7332). Submitted On: 21-Dec-11

1-0	Evaluation **Concurred** New Risk Register and Cost Model are dated December 23, 2011. Submitted By: John Caldwell (910-251-4586) Submitted On: 23-Dec-11
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Jim Neubauer (509-527-7332) Submitted On: 27-Dec-11
	Current Comment Status: Comment Closed

4345796	Cost Engineering	n/a'	n/a	n/a

(Document Reference: Cost and Schedule Risk Analysis)

2. Risk Register: Knowing that this project scope and related risks have undergone numerous changes, ensure the risk register is current in concerns and risk levels. There may be a mix between the iterations.

Submitted By: Jim Neubauer (509-527-7332). Submitted On: 21-Dec-11

1-0	Evaluation **Concurred** New Risk Register and Cost Model are dated December 23, 2011. Submitted By: John Caldwell (910-251-4586) Submitted On: 23-Dec-11
1-1	Backcheck Recommendation **Close Comment** Noted items reworked with deletions, additions, and improved discussions. Submitted By: Jim Neubauer (509-527-7332) Submitted On: 27-Dec-11
	Current Comment Status: Comment Closed

4345797	Cost Engineering	n/a'	n/a	n/a

(Document Reference: Cost and Schedule Risk Analysis)

3. Risk Register: The project is comprised of significant dredging and non-dredging work. The risk model was constructed with that in mind; however, it is unclear whether the risks indicated in the risk register relate to dredging, non-dredging, or both. The non-dredging costs are significant and modeled somewhat differently. Highly recommend another column be added in the risk register (new column B) that defines whether the risk relates to dredging, non-dredging, or both. That clarification should then track to the risk model.

Submitted By: Jim Neubauer (509-527-7332). Submitted On: 21-Dec-11

1-0	Evaluation **Concurred** Column added and ID # now corresponds with Cost Model dated December 23, 2011. Submitted By: John Caldwell (910-251-4586) Submitted On: 23-Dec-11
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Jim Neubauer (509-527-7332) Submitted On: 27-Dec-11
	Current Comment Status: Comment Closed

4345799	Cost Engineering	n/a'	n/a	n/a

(Document Reference: Cost & Schedule Risk Analysis)

4. Risk Register: The Discussions and Concerns column does not clearly support the conclusions, the "WHY" for choosing levels of Likelihood and Impact. Better discussion is warranted. The logic should flow from left to right resulting in a documented Risk Level. A good example is I-36 – Acquisition Strategy. This is typically a high risk but conclusions are unclear.

Submitted By: Jim Neubauer (509-527-7332). Submitted On: 21-Dec-11

1-0	Evaluation **Concurred** Additional information added and clarified in new Risk Register dated December 23, 2011. Submitted By: John Caldwell (910-251-4586) Submitted On: 23-Dec-11

1-1	Backcheck Recommendation **Close Comment** Improvements noted. Submitted By: Jim Neubauer (509-527-7332) Submitted On: 27-Dec-11
	Current Comment Status: Comment Closed

4345801	Cost Engineering	n/a'	n/a	n/a

(Document Reference: Cost & Schedule Risk Analysis)

5. Risk Register: There are several instances where the Likelihood and Impact choices to not marry to the Risk Level as presented in the risk matrix at the top of the screen. For example, I-1 reads as a Moderate risk in the matrix, but Risk Level says Low, implying it was not modeled. Risk I-6 indicates Likely and Significant, yet Risk Level indicates Low Risk. Recheck logic and ensure any Moderate and High risks are correctly included in the risk model.

Submitted By: Jim Neubauer (509-527-7332). Submitted On: 21-Dec-11

1-0	Evaluation **Concurred** Corrections made to Risk Register and information added and clarified in new Risk Register dated December 23, 2011. Submitted By: John Caldwell (910-251-4586) Submitted On: 23-Dec-11
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Jim Neubauer (509-527-7332) Submitted On: 27-Dec-11
	Current Comment Status: Comment Closed

4345802	Cost Engineering	n/a'	n/a	n/a

(Document Reference: Cost & Schedule Risk Analysis)

6. Risk Model: There are a number of Non-Dredging risks that are modeled, but not clearly identified in the risk register. Good examples are the two most recently added scopes: Fish Passage and Water Impoundment. I agree they should be modeled, but describe the risks in the register. For example, on the Impoundment the greater risks are related to Pump Station and Activated Carbon scope and parametric estimates. The other estimated cost items appear fairly conservative. The end result is a risk modeled for those specific concerns.

Submitted By: Jim Neubauer (509-527-7332). Submitted On: 21-Dec-11

1-0	Evaluation **Concurred** Item 41 added to risk register to explain how risks for impoundment and fish passage were addressed. Additional information added and clarified in new Risk Register dated December 23, 2011. Submitted By: John Caldwell (910-251-4586) Submitted On: 23-Dec-11
1-1	Backcheck Recommendation **Close Comment** Concern addressed under Risk ID I-18 and ID I-41. Submitted By: Jim Neubauer (509-527-7332) Submitted On: 27-Dec-11
	Current Comment Status: Comment Closed

4345803	Cost Engineering	n/a'	n/a	n/a

(Document Reference: Cost & Schedule Risk Analysis)

7. Risk Model: Variance Distribution: Somewhere, discussions should present the reasoning for the variances chosen for the model. For example: On the fish passage, it is unclear what is driving the variance between $21M and $28M. Was it

acquisition strategy, bid competition, scope change potential, construction mods...a combination of all?

Submitted By: Jim Neubauer (509-527-7332). Submitted On: 21-Dec-11

1-0	Evaluation **Concurred** Item 41 added to risk register to explain how risks for impoundment and fish passage were addressed. Submitted By: John Caldwell (910-251-4586) Submitted On: 23-Dec-11
1-1	Backcheck Recommendation **Close Comment** Worked w/ SAW estimator for better discussion of Item 41. Revisions are now considered sufficient. Submitted By: Jim Neubauer (509-527-7332) Submitted On: 27-Dec-11
	Current Comment Status: Comment Closed

4345804	Cost Engineering	n/a'	n/a	n/a

(Document Reference: Cost & Schedule Risk Analysis)

8. Risk Model: Explain how schedule risks were factored into the study.

Submitted By: Jim Neubauer (509-527-7332). Submitted On: 21-Dec-11

1-0	Evaluation **Concurred** Item 41 added to risk register to explain how risks for Non-Dredge and Dredge schedules were addressed, plus Item I-30 and I-36 specifically address schedule and acquisition. Submitted By: John Caldwell (910-251-4586) Submitted On: 23-Dec-11
1-1	Backcheck Recommendation **Close Comment** Confirm that potential schedule growth is located within the risk model. Submitted By: Jim Neubauer (509-527-7332) Submitted On: 03-Jan-12
	Current Comment Status: Comment Closed

4345805	Cost Engineering	n/a'	n/a	n/a

(Document Reference: Cost & Schedule Risk Analysis)

9. Contract Acquisition and Construction Mods & Claims: These are common risks of high potential impact. It is unclear how these were addressed within the model.

Submitted By: Jim Neubauer (509-527-7332). Submitted On: 21-Dec-11

1-0	Evaluation **Concurred** Item 41 added to risk register to explain how risks for Non-Dredge and Dredge schedules were addressed, plus Item I-30 and I-36 specifically address schedule and acquisition. Submitted By: John Caldwell (910-251-4586) Submitted On: 23-Dec-11
1-1	Backcheck Recommendation **Close Comment** Item 41 addresses mods, claims, residual unknown-unknowns. Submitted By: Jim Neubauer (509-527-7332) Submitted On: 27-Dec-11
	Current Comment Status: Comment Closed

4345807	Cost Engineering	n/a'	n/a	n/a

(Document Reference: Cost & Schedule Risk Analysis)

10. Risk Model - Forecast 1: Explain the negative sensitivity for the O&M Material (Bank).

Submitted By: Jim Neubauer (509-527-7332). Submitted On: 21-Dec-11

1-0	Evaluation **Concurred** The negative sensitivity only identifies the Magnitude of how the O&M affects costs. It does not mean a negative cost occurrence. Most specifically it will add additional costs. Narrative will highlight the meaning in write up for Cost Risk. Submitted By: John Caldwell (910-251-4586) Submitted On: 23-Dec-11
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Jim Neubauer (509-527-7332) Submitted On: 27-Dec-11
	Current Comment Status: Comment Closed

4345808	Cost Engineering	n/a'	n/a	n/a

(Document Reference: Cost & Schedule Risk Analysis)

11. Risk Report – Executive Summary: Second paragraph could more clearly state that the $483M excludes contingency and that the $123M is a value added onto the $483M for a total of $607M at an 80% confidence for successful execution.

Submitted By: Jim Neubauer (509-527-7332). Submitted On: 21-Dec-11

1-0	Evaluation **Concurred** Concur – will try to add additional wording. Submitted By: John Caldwell (910-251-4586) Submitted On: 23-Dec-11
1-1	Backcheck Recommendation **Close Comment** Additional working to clarify base cost plus contingency value for a total Baseline w/ Contingency that matches the table ES-1. Submitted By: Jim Neubauer (509-527-7332) Submitted On: 03-Jan-12
	Current Comment Status: Comment Closed

4345811	Cost Engineering	n/a'	n/a	n/a

(Document Reference: Cost & Schedule Risk Analysis)

12. Risk Report – Executive Summary: Findings and Recommendation should be strengthened with more discussion on potential risk mitigations.

Submitted By: Jim Neubauer (509-527-7332). Submitted On: 21-Dec-11

1-0	Evaluation **Concurred** Concur – but probably need more discussion with reviewer after Executive Summary finalized. Submitted By: John Caldwell (910-251-4586) Submitted On: 23-Dec-11
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Jim Neubauer (509-527-7332) Submitted On: 03-Jan-12
	Current Comment Status: Comment Closed

4345812	Cost Engineering	n/a'	n/a	n/a

(Document Reference: Cost & Schedule Risk Analysis)

13. Risk Report: Risk Register updates will result in a report revision based on the above comments.

Submitted By: Jim Neubauer (509-527-7332). Submitted On: 21-Dec-11

1-0	Evaluation **Concurred** Document will be revised and submitted asap. Submitted By: John Caldwell (910-251-4586) Submitted On: 23-Dec-11
1-1	Backcheck Recommendation **Close Comment** Risk Register updates made and reviewed twice. Submitted By: Jim Neubauer (509-527-7332) Submitted On: 03-Jan-12
	Current Comment Status: Comment Closed

4346552	Design Team Leader	n/a'	Appendix C, General	n/a

The charge to reviewers for this ATR included suggestion to focus on changes since the July, 2011 version of the report. Those changes applicable to Appendix C generally include additional evaluation of chloride impacts, design modification (relocation) of fish passage structure at New Savannah Bluff L&D, additional dissolved oxygen impact and mitigation modeling assessment, and updates to project costs. It appears applicable sections of the current version of the appendix address these changes.

Submitted By: J. Greg Miller (251-690-3115). Submitted On: 22-Dec-11

1-0	Evaluation **Concurred** No changes necessary. Submitted By: Laura Williams (9126525268) Submitted On: 28-Dec-11
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: J. Greg Miller (251-690-3115) Submitted On: 29-Dec-11
	Current Comment Status: Comment Closed

4346557	Design Team Leader	n/a'	Appendix C, General	n/a

The ATR charge for this review included suggestion to verify that previous review comments have been addressed. Reference previous Appendix C-related ATR comment ID nos. 4080797, 4083021, 4085432, 4087443, 4087681, 4182293, and 4182306. Applicable sections of the current version of the appendix appear to be consistent with evaluations of these comments.

Submitted By: J. Greg Miller (251-690-3115). Submitted On: 22-Dec-11

1-0	Evaluation **Concurred** No changes necessary. Submitted By: Laura Williams (9126525268) Submitted On: 28-Dec-11
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: J. Greg Miller (251-690-3115) Submitted On: 29-Dec-11
	Current Comment Status: Comment Closed

4346562	Design Team Leader	n/a'	Appendix C, Sec. 1.0, 6th paragraph	n/a

The appendix generally appears to follow applicable policy guidance as specifically contained in Appendix C of ER 1110-2-1150, Paragraph 7 of ER 1110-2-1404, and Paragraph 7.c of ER 1110-2-1403.

Submitted By: J. Greg Miller (251-690-3115). Submitted On: 22-Dec-11

1-0	Evaluation **Concurred** No changes necessary. Submitted By: Laura Williams (9126525268) Submitted On: 28-Dec-11
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: J. Greg Miller (251-690-3115) Submitted On: 29-Dec-11
	Current Comment Status: Comment Closed

4346566	Hydraulics	n/a'	Appendix C, Sec. 1.2, 2nd paragraph	n/a

Total length of the proposed 47-foot channel appears to be more nearly 38.0 miles based on stationing from -97+680 to 103+000 (200,680 feet/5,280 feet/mile). Also, the increased channel length from the offshore extension appears to be more nearly 7.1 miles based on stationing from -60+000 to -97+680 (37,680 feet/5,280 feet/mile).

Submitted By: J. Greg Miller (251-690-3115). Submitted On: 22-Dec-11

1-0	Evaluation **Concurred** The text has been revised to reflect the correct channel lengths. "The total length of the SHEP navigation channel is 38.0 miles. This length is an increase of 7.1 miles from the currently authorized navigation channel due to the extension of the offshore entrance channel." Submitted By: Laura Williams (9126525268) Submitted On: 28-Dec-11
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: J. Greg Miller (251-690-3115) Submitted On: 29-Dec-11
	Current Comment Status: Comment Closed

4346569	Hydraulics	n/a'	Appendix C, Sec. 3.2	n/a

Text refers to six turning basins, but Table 3.2-1 lists five basins.

Submitted By: J. Greg Miller (251-690-3115). Submitted On: 22-Dec-11

1-0	Evaluation **Concurred** Text has been revised to read: "Five authorized turning basins, shown in Table 3.2-1, are located within the reaches proposed for deepening." Submitted By: Laura Williams (9126525268) Submitted On: 28-Dec-11
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: J. Greg Miller (251-690-3115) Submitted On: 29-Dec-11
	Current Comment Status: Comment Closed

4346574	Hydraulics	n/a'	Appendix C, Table	n/a

			6.3.4.1-1	

Appears stationing in this table should be negative. Also appears stationing for Route S-03 should begin at -60+000.

Submitted By: J. Greg Miller (251-690-3115). Submitted On: 22-Dec-11

1-0	Evaluation **Concurred** Stationing in the table has been revised. Submitted By: Laura Williams (9126525268) Submitted On: 28-Dec-11
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: J. Greg Miller (251-690-3115) Submitted On: 29-Dec-11
	Current Comment Status: Comment Closed

4346579	Hydraulics	n/a'	Appendix C, Table 6.3.4.3-1	n/a

Appears the "B" shown for all stationing in this table should be removed, along with that shown in the last sentence of the paragraph preceding the table.

Submitted By: J. Greg Miller (251-690-3115). Submitted On: 22-Dec-11

1-0	Evaluation **Concurred** The "B" has been removed. Channel stationing across the bar to the ocean is shown with a negative sign only. Submitted By: Laura Williams (9126525268) Submitted On: 28-Dec-11
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: J. Greg Miller (251-690-3115) Submitted On: 29-Dec-11
	Current Comment Status: Comment Closed

4346591	Hydraulics	n/a'	Appendix C, Sec. 7.2	n/a

Last paragraph refers to EC 1105-2-407, which has expired. As indicated elsewhere in this appendix (e.g., Sec. 7.0), it appears some documentation is provided in the Engineering Investigations Supplemental Materials regarding support of engineering models used for the project. The appendix should include discussion regarding approval of all models used in accordance with Enterprise Standard (ES)-08101, Software Validation for the Hydrology, Hydraulics, and Coastal Community of Practice.

Submitted By: J. Greg Miller (251-690-3115). Submitted On: 22-Dec-11

1-0	Evaluation **Concurred** Reference to EC 1105-2-407 in Section 7.2 of the Engineering Appendix has been removed. Also, Section 1.4 Model Certification is being added to the Engineering Appendix to include discussion of the various models used for SHEP and their approval status in accordance with the Enterprise Standard (ES)-08101. Submitted By: Laura Williams (9126525268) Submitted On: 30-Dec-11
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: J. Greg Miller (251-690-3115) Submitted On: 03-Jan-12
	Current Comment Status: Comment Closed

4346597	Hydraulics	n/a'	Appendix C, Sec. 7.5.2.2	n/a

Second paragraph refers to EC 1165-2-211 for sea-level change considerations. That guidance has been superseded by EC 1165-2-212. The appendix should be updated accordingly.

Submitted By: J. Greg Miller (251-690-3115). Submitted On: 22-Dec-11

1-0	Evaluation **Concurred** The sea level rise analysis has been updated to incorporate the latest guidance, EC 1165-2-212. Submitted By: Laura Williams (9126525268) Submitted On: 29-Dec-11
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: J. Greg Miller (251-690-3115) Submitted On: 03-Jan-12
	Current Comment Status: Comment Closed

4346604	Design Team Leader	n/a'	Appendix C, Sec. 8.1.1	n/a

Guidance used for sizing riprap and steel associated with mitigation structures should be stated.

Submitted By: J. Greg Miller (251-690-3115). Submitted On: 22-Dec-11

1-0	Evaluation **Concurred** Section 1.0 of the Engineering Appendix lists the USACE guidance used in the study and has been revised to include the references used for the mitigation design. Specifically, EM 1110-2-1100, Coastal Engineering Manual; EM 1110-2-2504, Design of Sheet Pile Walls; and EM 1110-2-1601, Hydraulic Design of Flood Control Channels. Submitted By: Laura Williams (9126525268) Submitted On: 29-Dec-11
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: J. Greg Miller (251-690-3115) Submitted On: 03-Jan-12
	Current Comment Status: Comment Closed

4346610	Operations	n/a'	Appendix C, Table 12.4-2	n/a

Projected annual maintenance volume for range -98+600 to -57+000 is 124,000 cy, but Table 12.3-2 shows the volume as 21,580 cy. Discrepancy should be resolved.

Submitted By: J. Greg Miller (251-690-3115). Submitted On: 22-Dec-11

Revised 22-Dec-11.

1-0	Evaluation **Concurred** Table 12.3-2 is correct. Table 12.4-2 has been corrected. Submitted By: Carol Abercrombie (912-652-5514) Submitted On: 03-Jan-12
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: J. Greg Miller (251-690-3115) Submitted On: 04-Jan-12
	Current Comment Status: Comment Closed

4346614	Engineering Support	n/a'	Appendix C, Attachment 1, Plates 8, 9, and 15	n/a

Areas designated as passing lanes should be changed to meeting areas as discussed in SEC 6.3.3.

Submitted By: J. Greg Miller (251-690-3115). Submitted On: 22-Dec-11

1-0	Evaluation **Concurred** Drawings have been corrected to change "passing lanes" to "meeting areas" Submitted By: Carol Abercrombie (912-652-5514) Submitted On: 03-Jan-12
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: J. Greg Miller (251-690-3115) Submitted On: 04-Jan-12
	Current Comment Status: Comment Closed

4349825	Planning - Plan Formulation	Section 10.3	n/a	n/a

In 10.3 Alternative Plan Costs in the 1st paragraph, last sentence states that "Recommended Plan costs are also presented in FY 2012 dollars with discounting conducted at the current FY 2012 discount rate (4.00%) in Table 11-2." Table 11-2 does not appear to present the FY 2012 costs for the recommended plan. Table 11-2 shows "Meeting Area Average Annual Equivalent Net Benefits". Table 11-1 shows "Economic Analysis of Alternative Deepening Plans" However, these costs do not match those in paragraph 10.3 and may be the FY 11 costs. I had difficulty in finding a table anywhere in the report that shows the benefit-to-cost ratio calculations for the recommended plan in the updated FY2012 costs.

Submitted By: Sheri Willey (409 766-3917). Submitted On: 27-Dec-11

1-0	Evaluation **Concurred** The sentence identifying Table 11-2 has been deleted. There is no table showing benefits and costs in FY 2012 dollars. Chapter 11.4 does present the benefits, costs and BCR in FY12 doolars using the FY12 discount rate for the selected plan only. Submitted By: Jerry Diamantides (401 861 0084) Submitted On: 04-Jan-12
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Sheri Willey (409 766-3917) Submitted On: 04-Jan-12
	Current Comment Status: Comment Closed

4349862	Economics	n/a'	n/a	n/a

Present VOC's on a per TEU basis. (New comment text to read: Page 146 describes vessel operating costs and, likely in response to prior comments (see 4096112), limits the VOC's used to three types of which appropriately smooth the economic inconsistencies presented in recent Corps publications. That said, the VOC's used here in table 111 are difficult to reconcile as the operating costs on a per TEU basis are not presented (only dead weight tonnage costs are given and the actual Panamax, PPX1, and PPX2 vessels are not specified). This table should be extended to show per TEU VOC's.)

Submitted By: naomi fraenkel (917-790-8615). Submitted On: 27-Dec-11

1-0	Evaluation **Concurred** Concur. The table will be extended to show VOC's per TEU by vessel class. Submitted By: Bernard Moseby (251 694-3884) Submitted On: 05-Jan-12
1-1	Backcheck Recommendation **Open Comment**

	This comment will be closed when new text addressing it is presented. Submitted By: naomi fraenkel (917-790-8615) Submitted On: 05-Jan-12
1-2	Backcheck Recommendation **Open Comment** Here is the information that you requested. Below is Table 111 extended to show the vessel operating cost per TEU using the FY2010 VOCs to update benefits to FY2012 price levels. VOC's are shown for the same vessel class plus values for the PPX2 103,800 DWT vessel that replaced the 86,100 PPX2 in the FY2012 update so that the typical vessel used in the HarborSym benefit estimation is the same typical vessel used in the TCSM benefit estimation. In Harbor Vessel Operating Cost TEU Cost per Hour Vessel DWT TEU FY12 VOC Per Hour 100% capacity 80% Capacity 60% Capacity Panamax 65,000 4,720 $2,296 $0.486 $0.608 $0.811 PPX1 74,100 6,185 $2,774 $0.449 $0.561 $0.748 PPX2 86,100 7,200 $3,080 $0.428 $0.535 $0.713 PPX2 103,800 8,670 $3,516 $0.406 $0.507 $0.676 Submitted By: Bernard Moseby (251 694-3884) Submitted On: 12-Jan-12 (Attachment: Vessel_cost_compare_FY08-10-mod-01122012.xlsx)
1-3	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: naomi fraenkel (917-790-8615) Submitted On: 12-Jan-12
	Current Comment Status: Comment Closed

4350800	Geotechnical	n/a'	n/a	n/a

	Regarding the Raw Water Intake Impoundment: To create the impoundment soil will be excavated from the site and compacted to create an embankment? Do we have enough geotechnical data to conclude that the in situ soil will be suitable for construction? Submitted By: Christopher Green (251-690-3435). Submitted On: 27-Dec-11
1-0	Evaluation **Concurred** A preliminary Geotechnical Evaluation was prepared by the A/E and has been added to the Supplemental Materials of the Engineering Appendix. Based on a geotechnical report from an adjacent parcel within the Trade Park, it was determined that a significant portion of the impoundment could be excavated into the ground. Cost estimates were made using conservative assumptions. Additional geotechnical testing will be conducted during final project design. Submitted By: Carol Abercrombie (912-652-5514) Submitted On: 03-Jan-12
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Christopher Green (251-690-3435) Submitted On: 04-Jan-12
	Current Comment Status: Comment Closed

4350856	Geotechnical	8.2.4 Chloride Impacts to Savannah's....	176	n/a

	Fourth paragraph down on page 176, first sentence, the word "chlorine" is missing the "L" Submitted By: Christopher Green (251-690-3435). Submitted On: 27-Dec-11
1-0	Evaluation **Concurred** spelling has been corrected Submitted By: Carol Abercrombie (912-652-5514) Submitted On: 03-Jan-12
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Christopher Green (251-690-3435) Submitted On: 04-Jan-12

	Current Comment Status: Comment Closed			
4352425	Geotechnical	4.8.2 Water Resources	page 80 of GRR	n/a
On page 80 of the GRR, third paragraph, fourth sentence "possess" is missing the last "S". Submitted By: Christopher Green (251-690-3435). Submitted On: 28-Dec-11				
1-0	Evaluation **Concurred** change made as requested Submitted By: Jerry Diamantides (401 861 0084) Submitted On: 04-Jan-12			
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Christopher Green (251-690-3435) Submitted On: 04-Jan-12			
	Current Comment Status: Comment Closed			
4357184	Navigation	table 1-2 and table 1-3	n/a	n/a
Sediment removal depths have not been corrected as stated in the back check. Submitted By: Nathan Lovelace (251.957.6019). Submitted On: 03-Jan-12				
1-0	Evaluation **Concurred** revisions made as attached Submitted By: Carol Abercrombie (912-652-5514) Submitted On: 05-Jan-12 (Attachment: GRR tables 1-2 and 1-3 05Jan12.docx)			
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Nathan Lovelace (251.957.6019) Submitted On: 06-Jan-12			
	Current Comment Status: Comment Closed			
4357189	Navigation	Fig 1-8	n/a	n/a
DA 13B still not labeled as stated in the back check.. Submitted By: Nathan Lovelace (251.957.6019). Submitted On: 03-Jan-12				
1-0	Evaluation **Concurred** Figure 1-8 has been revised as requested Submitted By: Jerry Diamantides (401 861 0084) Submitted On: 05-Jan-12			
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Nathan Lovelace (251.957.6019) Submitted On: 06-Jan-12			
	Current Comment Status: Comment Closed			
4357201	Navigation	n/a'	n/a	n/a
No new comments for version of final DQC and ATR posted Dec 2011. Need to go back to Sept 13 comment 1 and 2 of the				

9 Submitted By: Nathan Lovelace (251.957.6019). Submitted On: 03-Jan-12	
1-0	Evaluation **Concurred** Sep 13 comments have been addressed. Submitted By: Carol Abercrombie (912-652-5514) Submitted On: 05-Jan-12
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Nathan Lovelace (251.957.6019) Submitted On: 06-Jan-12
	Current Comment Status: Comment Closed

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SAS – SAVANNAH HARBOR EXPANSION PROJECT
USACE- SAVANNAH DISTRICT

COST ENGINEERING DX - TPCS ATR CERTIFICATION UPDATE

The Savannah Harbor Expansion Project for Savannah District has undergone a successful Cost Agency Technical Review (ATR), performed by the Walla Walla Cost DX ATR representatives. The Cost ATR included an updated study of the project scope, report, cost estimates, schedules, escalation, and risk-based contingencies in accordance with ER 1110-2-1150 Engineering and Design for Civil Works Projects and ER 1110-2-1302 Civil Works Cost Engineering.

As of 5 January 2012, the Walla Walla District, Cost Engineering Directory of Expertise (DX) for Civil Works, certifies the estimated total project cost for the NED Plan 47' depth:

FY 2013 Price Level:	$640,899,000
Fully Funded Amount:	$688,118,000

It remains the responsibility of the District to correctly reflect these cost values within the Final Report and to implement effective project controls and implementation procedures.

5 Jan 2012
Date

Kim C. Callan, PE, CCE, PM1
Chief, Cost Engineering
Walla Walla District

****** TOTAL PROJECT COST SUMMARY ******

PROJECT: **Savannah Harbor Expansion GRR - Tentative NED Plan - 47-FT DESIGN DEPTH**
LOCATION: **Savannah, Georgia**

DISTRICT: Savannah District
POC: CHIEF, COST ENGINEERING,
PREPARED: 12/12/2011

This Estimate reflects the scope and schedule in report: GENERAL RE-EVALUATION REPORT

	OCTOBER 1, 2010 PRICE LEVEL					Program Year (Budget EC): 2013 Effective Price Level Date: 1 OCT 12				FULLY FUNDED PROJECT ESTIMATE				
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	BASE COST TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	FIRST COST TOTAL ($K)	($K)		COST ($K)	CNTG ($K)	FULL ($K)
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
06	FISH & WILDLIFE FACILITIES	$169,835	$42,459	25%	$212,294	4.7%	$177,750	$44,439	$222,195			$184,397	$46,099	$230,497
12	NAVIGATION PORTS & HARBORS	$207,023	$51,756	25%	$258,779	8.1%	$223,834	$55,959	$279,793			$234,085	$58,521	$292,606
18	CULTURAL RESOURCE PRESERVATION	$11,132	$2,783	25%	$13,915	5.7%	$11,771	$2,943	$14,713			$12,017	$3,004	$15,022
	CONSTRUCTION ESTIMATE TOTALS:	$387,990	$96,998		$484,988	6.5%	$413,361	$103,340	$516,701			$430,499	$107,625	$538,124
01	LANDS AND DAMAGES	$14,885	$3,721	25%	$18,606	4.7%	$15,578	$3,895	$19,474			$15,642	$3,910	$19,552
30	PLANNING, ENGINEERING & DESIGN	$21,806	$5,452	25%	$27,258	3.6%	$22,592	$5,648	$28,241			$23,675	$5,919	$29,593
31	CONSTRUCTION MANAGEMENT	$59,057	$14,764	25%	$73,821	3.6%	$61,187	$15,297	$76,484			$80,678	$20,170	$100,848
	PROJECT COST TOTALS:	$483,738	$120,935	25%	$604,673	6.0%	$512,719	$128,180	$640,899			$550,494	$137,624	$688,118

CHIEF, COST ENGINEERING,

PROJECT MANAGER,

CHIEF, REAL ESTATE,

CHIEF, PLANNING,

CHIEF, ENGINEERING,

CHIEF, OPERATIONS,

CHIEF, CONSTRUCTION

CHIEF, CONTRACTING,

CHIEF, PM-PB

CHIEF, DPM,

ESTIMATED FEDERAL COST:	70%	**$481,683**
ESTIMATED NON-FEDERAL COST:	30%	**$206,435**
ESTIMATED TOTAL PROJECT COST:		**$688,118**

ESTIMATED TOTAL PROJECT O&M costs for 50 years **$3,907,450**
Beginning NOV 2016 and includes 25% contingency
ESTIMATED TOTAL PROJECT O&M costs INREASE for 50 years **$506,826**
Beginning NOV 2016 and includes 25% contingency

**** TOTAL PROJECT COST SUMMARY ****

**** CONTRACT COST SUMMARY ****

PROJECT: Savannah Harbor Expansion GRR - Tentative NED Plan - 47-FT DESIGN DEPTH
LOCATION: Savannah, Georgia
This Estimate reflects the scope and schedule in report; GENERAL RE-EVALUATION REPORT

DISTRICT: Savannah District
POC: CHIEF, COST ENGINEERING,
PREPARED: 12/12/2011

MAJOR FEATURES - REAL ESTATE, DISSOLVED O2, PRE-MONITORING, CSS GEORGIA, DIKES 14A &14B, & STRIPED BASS MITIGATION

Estimate Prepared: 9-Dec-11
Effective Price Level: 1-Oct-10

Program Year (Budget EC): 2013
Effective Price Level Date: 1 OCT 12

WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	FULLY FUNDED PROJECT ESTIMATE Mid-Point Date	ESC (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	B	C	D	E	F	G	H	I	J	P	L	M	N	O
	PHASE I													
06	FISH & WILDLIFE FACILITIES	$75,433	$19,858	25%	$99,291	4.7%	$83,139	$20,784	$103,922	2014Q3	2.5%	$85,242	$21,310	$106,552
	-Dissolved O2 system and Water Storage													
12	NAVIGATION PORTS & HARBORS	$9,500	$2,375	25%	$11,875	8.1%	$10,271	$2,568	$12,839	2014Q1	1.7%	$10,442	$2,611	$13,053
	-Raise Dikes 14A and 14B													
18	CULTURAL RESOURCE PRESERVATION	$11,132	$2,783	25%	$13,915	5.7%	$11,771	$2,943	$14,713	2014Q2	2.1%	$12,017	$3,004	$15,022
	CONSTRUCTION ESTIMATE TOTALS:	$100,065	$25,016	25%	$125,081		$105,180	$26,295	$131,475			$107,701	$26,925	$134,627
01	LANDS AND DAMAGES	$14,885	$3,721	25%	$18,606	4.7%	$15,579	$3,895	$19,474	2013Q2	0.4%	$15,642	$3,910	$19,552
30	PLANNING, ENGINEERING & DESIGN													
	PED	$6,268	$1,567	25%	$7,835	3.6%	$6,494	$1,624	$8,118	2013Q2	0.7%	$6,541	$1,635	$8,176
31	CONSTRUCTION MANAGEMENT													
	Construction Mgt, Monitoring, EDC,etc	$6,110	$1,528	25%	$7,638	3.6%	$6,330	$1,583	$7,913	2014Q2	5.1%	$6,653	$1,663	$8,317
	CONTRACT COST TOTALS:	$127,328	$31,832		$159,160		$133,583	$33,396	$166,979			$136,537	$34,134	$170,671

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**** TOTAL PROJECT COST SUMMARY ****

**** CONTRACT COST SUMMARY ****

PROJECT: Savannah Harbor Expansion GRR - Tentative NED Plan - 47 FT DESIGN DEPTH
LOCATION: Savannah, Georgia
This Estimate reflects the scope and schedule in report: GENERAL RE-EVALUATION REPORT

DISTRICT: Savannah District
POC: CHIEF, COST ENGINEERING

PREPARED: 12/12/2011

MAJOR FEATURES - Western McCoy's Cut, Diversion Channel, Close Rifle Cut, Deepen McCoy's Cut, Navigation AIDS, & DREDGE OUTER BAR

Estimate Prepared: 9-Dec-11
Effective Price Level: 1-Oct-10

Program Year (Budget EC): 2013
Effective Price Level Date: 1-OCT 12

WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	FULLY FUNDED PROJECT ESTIMATE Mid-Point Date	ESC (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	B	C	D	E	F	G	H	I	J	P	L	M	N	O
	PHASE 2													
06	FISH & WILDLIFE FACILITIES	$18,103	$4,528	25%	$22,629	4.7%	$18,947	$4,737	$23,684	2015Q1	3.4%	$19,500	$4,897	$24,487
	--McCoy's Cut, Riffle Cut & Nav Aids													
12	NAVIGATION PORTS & HARBORS	$73,480	$18,370	25%	$91,850	8.1%	$79,447	$19,862	$99,309	2015Q2	3.8%	$82,491	$20,623	$103,114
	--Dredge Outer Harbor													
18	CULTURAL RESOURCE PRESERVATION													
	CONSTRUCTION ESTIMATE TOTALS:	$91,583	$22,896	25%	$114,479		$98,394	$24,599	$122,993			$102,081	$25,520	$127,601
01	LANDS AND DAMAGES													
30	PLANNING, ENGINEERING & DESIGN													
	PED	$6,269	$1,567	25%	$7,836	3.6%	$6,495	$1,624	$8,119	2013Q4	2.9%	$6,684	$1,671	$8,355
31	CONSTRUCTION MANAGEMENT													
	Construction Mgt, Monitoring, EDC,etc	$7,584	$1,896	25%	$9,480	3.6%	$7,858	$1,964	$9,822	2015Q2	9.4%	$8,596	$2,149	$10,745
	CONTRACT COST TOTALS:	$105,436	$26,359		$131,795		$112,747	$28,187	$140,934			$117,361	$29,340	$146,701

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****** TOTAL PROJECT COST SUMMARY ******

Printed:1/5/2012
Page 4 of 6

PROJECT: Savannah Harbor Expansion GRR - Tentative NED Plan - 47-FT DESIGN DEPTH
LOCATION: Savannah, Georgia
This Estimate reflects the scope and schedule in report; GENERAL RE-EVALUATION REPORT

DISTRICT: Savannah District
POC: CHIEF, COST ENGINEERING,

PREPARED: 12/12/2011

MAJOR FEATURES - Dredge INNER HARBOR, Tidegate & Embankment, Rock Sill Back River, Fill Broad Berm, Fish Passage, Salt Marsh 1-S, Monitor & Dike Raises.

Estimate Prepared: 9-Dec-11
Effective Price Level: 1-Oct-10

Program Year (Budget EC) 2013
Effective Price Level Date: 1 OCT 12

WBS NUMBER A	Civil Works Feature & Sub-Feature Description B	COST ($K) C	CNTG ($K) D	CNTG (%) E	TOTAL ($K) F	ESC (%) G	COST ($K) H	CNTG ($K) I	TOTAL ($K) J	FULLY FUNDED PROJECT ESTIMATE Mid-Point Date P	ESC (%) L	COST ($K) M	CNTG ($K) N	FULL ($K) O
	PHASE 3													
06	FISH & WILDLIFE FACILITIES --Tidegate, Rock Sill, Broad Berm, Fish Passage, and Salt Marsh Island 1-S	$72,299	$18,075	25%	$90,374	4.7%	$75,671	$18,918	$94,589	2016Q1	5.1%	$79,586	$19,891	$99,457
12	NAVIGATION PORTS & HARBORS --Dredge Inner Harbor	$117,429	$29,357	25%	$146,786	8.1%	$126,865	$31,741	$158,706	2016Q1	5.1%	$133,509	$33,375	$166,874
18	CULTURAL RESOURCE PRESERVATION													
	CONSTRUCTION ESTIMATE TOTALS:	$189,728	$47,432	25%	$237,160		$202,636	$50,659	$253,295			$213,095	$53,266	$266,332
01	LANDS AND DAMAGES													
30	PLANNING, ENGINEERING & DESIGN PED	$6,269	$1,567	25%	$7,836	3.5%	$6,495	$1,624	$8,119	2014Q2	5.1%	$6,827	$1,707	$8,533
31	CONSTRUCTION MANAGEMENT Construction Mgt, Monitoring, EDC,etc	$7,584	$1,896	25%	$9,480	3.6%	$7,858	$1,964	$9,822	2016Q1	12.7%	$8,854	$2,214	$11,068
	CONTRACT COST TOTALS:	$203,581	$50,895		**$254,476**		$216,988	$54,247	$271,235			$228,746	$57,187	**$285,933**

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**** TOTAL PROJECT COST SUMMARY ****

**** CONTRACT COST SUMMARY ****

PROJECT: Savannah Harbor Expansion GRR - Tentative NED Plan - 47-FT DESIGN DEPTH
LOCATION: Savannah, Georgia
This Estimate reflects the scope and schedule in report: GENERAL RE-EVALUATION REPORT

DISTRICT: Savannah District
POC: CHIEF, COST ENGINEERING

PREPARED: 12/12/2011

MAJOR FEATURES - RESTORE DIKE CAPACITY, POST CONSTRUCTION MONITORING AND ADAPTIVE MGT AFTER CONSTRUCTION

Estimate Prepared: 9-Dec-11
Effective Price Level: 1-Oct-10

Program Year (Budget EC): 2013
Effective Price Level Date: 1 OCT 12

WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	FULLY FUNDED PROJECT ESTIMATE Mid-Point Date	ESC (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	B	C	D	E	F	G	H	I	J	P	L	M	N	O
	PHASE 4													
06	FISH & WILDLIFE FACILITIES													
12	NAVIGATION PORTS & HARBORS													
	-Dike Raises	$6,614	$1,654	25%	$8,268	8.1%	$7,151	$1,788	$8,939	2017Q1	7.0%	$7,652	$1,913	$9,565
18	CULTURAL RESOURCE PRESERVATION													
	CONSTRUCTION ESTIMATE TOTALS:	$6,614	$1,654		**8,268**		$7,151	$1,788	$8,939			$7,652	$1,913	$9,565
01	LANDS AND DAMAGES													
30	PLANNING, ENGINEERING & DESIGN													
	PED	$2,500	$625	25%	$3,125	3.6%	$2,590	$648	$3,238	2014Q2	5.1%	$2,722	$681	$3,403
31	CONSTRUCTION MANAGEMENT													
	Post Monitoring & Adaptive Mgt	$34,279	$8,570	25%	$42,849	3.6%	$35,515	$8,879	$44,394	2022Q3	41.5%	$50,267	$12,567	$62,834
	CONTRACT COST TOTALS:	$43,393	$10,848		**$54,241**		$45,257	$11,314	$56,571			$60,641	$15,160	**$75,801**

**** TOTAL PROJECT COST SUMMARY ****

**** CONTRACT COST SUMMARY ****

PROJECT: Savannah Harbor Expansion GRR - Tentative NED Plan - 47-FT DESIGN DEPTH
LOCATION: Savannah, Georgia
This Estimate reflects the scope and schedule in report: GENERAL RE-EVALUATION REPORT
MAJOR FEATURES - ADAPTIVE MGT & MONITOR AFTER ADAPTIVE MGT

DISTRICT: Savannah District
POC: CHIEF, COST ENGINEERING,

PREPARED: 12/12/2011

Estimate Prepared: 9-Dec-11
Effective Price Level: 1-Oct-10

Program Year (Budget EC): 2013
Effective Price Level Date: 1 OCT 12

WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	FULLY FUNDED PROJECT ESTIMATE Mid-Point Date	ESC (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	B	C	D	E	F	G	H	I	J	P	L	M	N	O
	PHASE 5													
06	FISH & WILDLIFE FACILITIES													
12	NAVIGATION PORTS & HARBORS													
18	CULTURAL RESOURCE PRESERVATION													
	CONSTRUCTION ESTIMATE TOTALS:													
01	LANDS AND DAMAGES													
30	PLANNING, ENGINEERING & DESIGN													
	PED	$500	$125	25%	$625	3.6%	$518	$130	$648	2026Q2	74.0%	$901	$225	$1,126
31	CONSTRUCTION MANAGEMENT													
	Adaptive Mgt & Monitoring	$3,500	$875	25%	$4,375	3.6%	$3,626	$907	$4,533	2026Q2	74.0%	$6,308	$1,577	$7,885
	CONTRACT COST TOTALS:	$4,000	$1,000		$5,000		$4,144	$1,036	$5,180			$7,209	$1,802	**$9,012**

Filename: TPCS_DECEMBER_30_2011_47FT IGN CHECKrevJAN4_2012.xlsx
TPCS

DEPARTMENT OF THE ARMY
SAVANNAH DISTRICT, CORPS OF ENGINEERS
100 W. OGLETHORPE AVENUE
SAVANNAH, GEORGIA 31401-3640

REPLY TO
ATTENTION OF:

13 January 2012

Office of Counsel

CERTIFICATION OF LEGAL REVIEW

The Savannah Harbor Expansion Project (SHEP) Final Environmental Impact Statement and General Re-Evaluation Report, dated January 2012, and the proposed draft SHEP Chief's Report and Record of Decision, have been reviewed by the Office of Counsel, Savannah District, and are approved as legally sufficient.

Terry G. Peters
District Counsel

FOR CONTINUATION OF HOUSE DOCUMENT 112-153

**SAVANNAH HARBOR EXPANSION PROJECT
CHATMAN CO., GEORGIA & JASPER CO., S. CAROLINA:
FINAL GENERAL RE-EVALUATION REPORT AND
ENVIRONMENTAL IMPACT STATEMENT**

SEE PART 10