"trustee lots." Most of the original squares remain and are surrounded by fine examples of buildings in the Georgian, Greek Revival, and Gothic styles.

All but one small shoreline area is protected by modern bulkheads, wharves, or rip rap. The exception is located near Station 75+500 where a brick-faced wharf constructed during the last quarter of the nineteenth century forms an alcove in the modern engineered shoreline. This area is used for small boat mooring.

4.9.5 Savannah River Civil War Cribs

Savannah Harbor and vicinity was the site of many war-time activities during the Civil War. Fortifications were built along the river, some of which remain today. Wooden cribs and pile dams were constructed in shallow areas to concentrate the flow of water. The remains of a few of those structures still exist. Impacts to these structures are not anticipated since the channel would be being deepened within the existing side slopes, with excavation of the side slopes occurring in only a few locations.

5 Forecast of Without-Project Conditions

This chapter presents future conditions concerning Savannah Harbor and related resources as they are projected to exist without Federal involvement in addressing the problems and opportunities identified in Chapter 3. Under future without-project conditions, the Federal channel at Savannah Harbor would remain at a depth of -42 feet MLLW. Planned improvements to major port facilities would become operational, which includes the expansion of the Panama Canal. In addition, new US east and Gulf coast container terminals will be constructed. Larger vessels will continue to enter the container ship fleet calling at the US east coast.

5.1 Panama Canal: Deepening Existing Locks (2010) and Expansion (2014)

Currently, the 39.4 foot controlling depth at the Panama Canal is the major constraint on the all-water route from Asia to the US East Coast. On October 22, 2006, Panamanian citizens overwhelmingly approved the proposed Panama Canal expansion plan through a national referendum. The Panama Canal expansion will provide for a maximum sailing draft of 50' (tropical freshwater) within a new set of locks. The width of the new locks will be 180 feet and the length 1,400 feet[3]. These dimensions were selected to accommodate 8,000 TEU vessels (approximately 48 ft sailing draft), which are considered the "right size" for the industry by the Panama Canal Administrator Mr. Alberto Aleman Zubieta [4]. The Panama Canal expansion project will be operational by 2014. Table 5-1 presents the maximum vessel dimensions for the existing and expanded Panama Canal.

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[3] See www.pan-canal.com for detailed information on the planned expansion.
[4] "Panama Canal Expansion will make Waterway a Shipping Hub" Nick Savvides, 23Oct06. Containerization International News Service. See www.ci-online.co.uk

Table 5-1: Panama Canal Maximum Vessel Dimensions

	Existing	Planned (2014)
Beam	32.3m (105.9 ft)	49m (160 ft)
Length	294.1m (964.6 ft)	366m (1,200ft)
Sailing Draft	12.0m (39.4 ft)	15m (50ft)

Source: www.pancanal.org

5.2 US East Coast and Gulf Coast Port Configurations and Capacities

Table 5-2 presents planned and proposed new container terminal facilities at the US east coast and US Gulf coasts. In 2008, an 800,000 annual TEU capacity container terminal opened in Mobile, AL.

Table 5-2: New, Planned, or Proposed Container Terminals U S East and Gulf Coasts

Year	Name	Location	TEU Capacity	Channel depth
2015[1]	Charleston Naval Base Terminals	Charleston, SC	1,400,000	-45 feet[2]
2015[3]	Bayport Container Terminal	Houston, TX	2,300,000	-45 feet
2016	Dames Point Hanjin Terminal	Jacksonville, FL	800,000	-45 feet[4]
2020	Craney Island Terminals	Norfolk, VA	1,500,000	-50 feet
2020[5]	Pelican Island Terminals	Galveston, TX	2,000,000	-40 feet

Notes:
[1] USACE permits approved but state permits challenged in court;
[2] Feasibility study underway to assess deepening
[3]The first 65 acres (out of 1,000 total) came into operation in 2007;
[4] Currently 40 feet but USACE has a feasibility study underway to assess at least 45 feet;
[5] Land is Port Authority property and MOU with Houston Port Authority withholds development until 2015

In addition to the new facility in Mobile and planned port facilities presented in the table, development of a new container terminal at Jasper County, South Carolina at the current dredged material disposal sites 14A and 14B (across from Elba Island) has been of interest to private developers and public agencies for a number of years; although, other sites have also been discussed. The potential for terminal development at Jasper County was re-kindled when the Governors of Georgia and South Carolina jointly issued a Term Sheet on March 12, 2007 for the purpose of increasing maritime port capacity. The Term Sheet requests the state legislatures to draft and ratify a bi-state compact between the two states which would create a bi-state Port Authority to "promote the development of a marine terminal"[5] at Jasper County.

The Term Sheet also identifies a number of actions which must take place so that the land at Jasper County can be made available for development of a marine terminal. These necessary actions include:

- The easements used by the Army Corps of Engineers for placement of dredged material from the Savannah Harbor navigation channel must be removed, released, or modified;
- Legislative appropriation by each state for 50% of the costs associated with acquiring replacement dredged material disposal sites; and
- Transfer of property ownership of disposal site from the Georgia DOT to the Bi-State Port Authority.

NOTE: For the Corps of Engineers to release its dredged material disposal easements, it must determine that the tract is no longer needed by the Government. For the Corps to reach that conclusion, it looks to the non-Federal sponsor of the Savannah Harbor Navigation Project (grantor of the easement) to inform the Corps how it intends to keep the Federal costs the same to maintain the navigation channel (the purpose for having the easement).

The planning process for a Jasper County Terminal is currently in the conceptual stage. In January 2008, the Georgia Department of Transportation entered into an Intergovernmental Agreement with the South Carolina State Ports Authority and the Georgia Ports Authority about developing a Jasper Ocean Terminal. The agreement discussed establishing a Joint Project Office (JPO) to conduct studies to determine the feasibility of and plan development of a container terminal in Jasper County. The agreement stated that although the final location of a Jasper terminal had not yet been identified, that GA DOT would transfer ownership of a specific 1400-acre tract to both port authorities, acting as 50% tenants in common. GA DOT was also to pursue release of the Corps dredged material disposal easements on that tract.

Later in 2008, a market feasibility analysis was conducted by a contractor working for the State of South Carolina to assess whether there would be a demand for future container handling services at a Jasper terminal. The market feasibility analysis was based on a projected 6.7% average annual growth in containerized trade for the hinterland that would be serviced by a Jasper terminal for the years 2008 through 2025 and a growth rate of 5.3% from 2025 through 2050. This hinterland is identical to the hinterland currently serviced by Garden City Terminal. The analysis projected that by 2020, the demand for container handling services will be greater than the container handling capacity at US east coast ports. The analysis assumes that a Jasper terminal would service 50% of the unmet demand for container handling services.

[5] Term Sheet dated 12 Mar 07

The analysis concluded that a Jasper terminal could begin servicing the projected unmet demand for container handling services in 2020 by developing a terminal with a 1.5 million TEU capacity. The analysis further concluded that expansion of Jasper terminal would keep pace with projected growth of unmet container handling demand up to a full build-out container handling capacity of 4.5 million TEUs in 2028.

In March 2011, the Joint Project Office (JPO) provided a status update. It stated that in 2009/2010, the JPO and its engineering consultant had coordinated with the Corps of Engineers for guidance on the permitting process and a dredged material management plan, finalized capacity and economic studies, and developed a Preliminary Planning & Development Services Report to guide development of the new terminal. The status update said that despite recent and planned investments to upgrade and expand facilities in Charleston and Savannah, both ports were expected to reach their maximum container handling capacity between 2025 and 2030. The JPO's goal is for a Jasper terminal to handle the additional containers that would move through the region beyond that point. They envision the new terminal would handle Post-Panamax ships up to 12,000 TEUs (50-foot depth and 158-foot width). The JPO indicated that it believed that the total cost of the project (terminal infrastructure, transportation corridors, permitting, but not channel deepening) – is expected to be in excess of $4 billion.

In 2012, the JPO estimated that Phase I of the terminal would become operational by 2025, with 3 berths, having a total capacity of 500,000 TEUs, turning basin, utility, road and rail access and supporting infrastructure on 1,500 acres in Jasper County, SC. Additional phases would be brought on line as needed to meet market demands. The terminal would eventually have 10 berths and a capacity of 7M TEUs. The JPO estimated that the terminal and connecting land transportation corridors would cost around $4 billion.

The JPO has begun the engineering and environmental studies that would be needed. When those studies are sufficiently complete, the JPO would apply for a Section 404 permit from the Corps of Engineers for the proposed construction. That application would provide the information needed for the regulatory agencies and the public to review the proposed project and evaluate its expected environmental and social effects. If those effects are determined to be acceptable and the proposal meets all environmental criteria, its construction would be permitted. The developers would then need to obtain the funding to perform the construction.

As understood at this point, the permit application would include the JPO's plan for compensating the Federal Government for the increased costs that the Corps would incur when it releases the sediment disposal easements on the property. The Corps has informed the JPO that it will release those easements if the Federal Government's costs are not increased (the Government is "made whole") and all environmental requirements are met. This possibly could be accomplished by providing a substitute confined dredged material containment facility or through reimbursement of the increased dredging and sediment disposal costs.

There is still much uncertainty associated with a future Jasper terminal. The engineering studies are not yet complete, so the costs to construct the facility and needed infrastructure are not yet fully identified. The environmental studies are not complete, so the environmental impacts from construction and operation of the terminal are unknown and an assessment of their acceptability is still speculative. Neither state has yet approved the interstate compact that would be required for them to jointly construct the terminal. A similar container-port development project at Cape Fear, NC was recently shelved due to the economic downturn and environmental opposition. The port expansion project at the former Charleston Navy Base has been extensively delayed due to concerns over environmental and local impacts. These present uncertainties preclude a new terminal in Jasper County from being an element in the Savannah Harbor Expansion Project without-project condition. However, plan formulation analyses for the Savannah Harbor Expansion Project include sensitivity analyses which explore the potential impacts to the Savannah Harbor Expansion Project under various Jasper County marine terminal scenarios.

5.3 Garden City Terminal Infrastructure and Capacity

Completion of the existing capital improvement plan will increase Garden City terminal's container throughput capacity to 6.5 million TEUs annually. At full build-out in 2020, according to the current master plan, the GCT will have 9,700 feet of berth and 560 net acres of container storage area so that facility productivities are projected to be:

- 700 TEUs per berth foot per year, and
- 11,607 TEUs per net container storage acre per year.

Some portions of the plan have already been implemented, as the berth length has been increased from 8,300 to 9,700 feet. The projected increase in throughput capacity will result from planned purchases of additional equipment, increased storage area and berth length, and operational modifications. Planned improvements include:

- Increased berth productivity, from about 280 to 700 TEU's per berth foot per year;
- Increased container yard size, from 407 to 560 net storage acres;
- Increased storage density for loaded containers resulting from a transition from the current hybrid RTG(Rubber Tired Gantry)/Top-Pick operating mode to a pure RTG operating mode;
- Reduced dwell times for loaded containers due to construction of an additional eight lane gate and expansion of an existing gate from 15 to 24 lanes; and
- Significant reduction of dwell time for empty containers, based on off-site storage and effective demurrage charges, which would discourage on-site storage.

Increased berth productivity is projected to result from a combination of increased volume of TEUs per call, due in part to larger vessels calling in the future and the assignment of four cranes per vessel. Currently, vessels are typically assigned two cranes. The increase to four cranes per vessels will be possible because Garden City Terminal plans to have a full complement of 33 cranes by 2020. Increased storage efficiency would be accomplished through a fleet of 169 rubber tire gantry cranes.

5.4 Containerized International Trade Projections

The with-project and the with-out project conditions use the same commodity forecast, which assumes no project-induced cargo under with-project conditions. All of the commodity projections used in this analysis were conducted at the world trade route level of detail (Table 5-3). The commodity forecast was developed through five distinct steps:

1. The baseline (year-2010) for the commodity forecast was calculated from 2005 – 2010 observed operations at Garden City Terminal.
2. Projected annual containerized commodity tonnage for the South Atlantic Region and for Savannah Harbor was estimated by a 2008 Global Insight Inc. (GI) modeling effort.
3. Results from an updated 2010 GI South Atlantic Region annual containerized commodity tonnage forecast were obtained. Savannah's proportion of South Atlantic trade identified in the 2008 forecast was applied to the 2010 South Atlantic Region forecast to obtain an Updated Savannah Harbor Forecast.
4. The year-to-year rates of change (growth rates) calculated from the Updated Savannah Harbor Forecast were applied to the calculated baseline (year-2010) to develop the Final Savannah Harbor Commodity Tonnage Forecast used in the analysis. Annual commodity tonnage for years beyond 2028 were projected by applying the average annual growth rate for the last five years of the growth rate projection (2023 – 2028) to each year from 2029 – 2065.
5. The number of projected Garden City Terminal loaded TEUs (Section 5.4.5 Commodity Forecast: Garden City Terminal TEUs) was calculated from the commodity tonnage forecast developed in Step 4 above, using historical average TEU weights identified in historical port data and PIERS data. An adjustment for empty containers was conducted to project the total annual number of Garden City Terminal TEUs. The commodity forecast was capped in 2030, which is the year maximum Garden City Terminal throughput was forecast to be achieved.

Since cargo movements and container vessel capacities are often expressed in TEUs and not tons, these tonnage forecasts were converted into their TEU equivalents. As previously mentioned, the weight of containers can vary widely by trade route and by haul direction. For example, major products destined for the Mediterranean are heavier pulp and kaolin clay whereas imports from the Far East involve lighter manufactured goods and textiles. For each service, the historical average weight per TEU was calculated and used for this conversion. Commodity forecast details are documented in Section 3.3 of the Economics Appendix.

The many container ship service routes that include Garden City Terminal exhibit unique characteristics such as cargo volume, cargo weight, ports of call, vessel types, mix of vessels, etc. The unique characteristics of each service route are due, in part, to the amount of containerized trade on that route; therefore, commodity forecasts were developed for each service route. These service routes are operated by many carriers and often overlap, such that multiple carriers are competing on the same service route. For this analysis, service routes were grouped by the world region that they serve. For example, there are a number of carrier services that call on various ports in the Far East (FE), transit the Panama Canal, proceed to ports along the east coast of the United States (ECUS), and then return to the Far East. Services that represent trade within this world area were grouped and entitled "FE (Panama) ECUS" according to the naming convention provided in Table 5-3:

Table 5-3: Savannah Harbor Container Ship Services

World Region	Acronym
East Coast United States (US) Africa	ECUS Africa
East Coast US Australia Pendulum (PEN)	ECUS AU PEN
East Coast US, West Coast and East Coast South America	ECUS WCSA-ECSA
East Coast US, Europe, Gulf of Mexico, PEN	ECUS EU GULF PEN
East Coast US, Mediterranean	ECUS MED
Far East, East Coast US, Europe Pendulum	FE ECUS EU PEN[6]
Far East, East Coast US, Mediterranean Pendulum	FE ECUS MED PEN
Far East, Panama Canal, East Coast US	FE (Panama) ECUS
Far East, Suez Canal, East Coast US	FE (SUEZ) ECUS
Round the World	RTW
Australia, East Coast US, Europe Pendulum	AU ECUS EU PEN

Figure 5-1 and Figure 5-2 are maps for the FE (Panama) ECUS and FE (SUEZ) ECUS services, respectively. These maps are provided as an example of the world areas covered by container ship services using the nomenclature identified in Table 5-3.

[6] "PEN" indicates a pendulum service. In the shipping world, a pendulum service generally involves a trans-oceanic string of ports structured as a continuous loop, much like a pendulum.

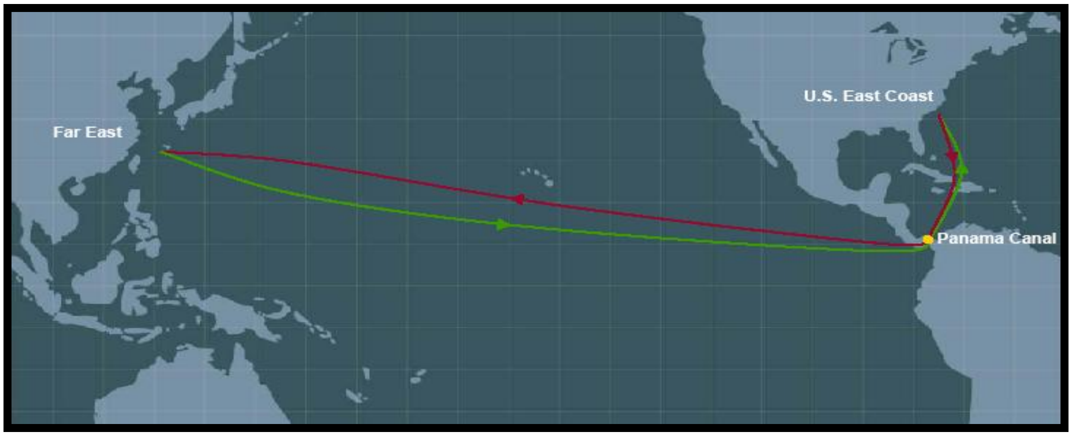


Figure 5-1: FE (Panama) ECUS Trade Map

As shown in Figure 5-1, the FE (Panama) ECUS service calls on Far East ports, crosses the Pacific Ocean, and transits the Panama Canal before calling on U.S. East Coast ports. After completing the vessel's ECUS port rotation, the ship returns to the Far East via the Panama Canal. Similarly, the FE (SUEZ) ECUS service calls on various ports in the Far East and Africa before transiting the Suez Canal and stopping at a Mediterranean port (Figure 5-2). After its Mediterranean port of call, the vessel crosses the Atlantic and calls on numerous East Coast U.S. ports before returning to the Far East by calling on many of the same ports visited during the first leg of its voyage.

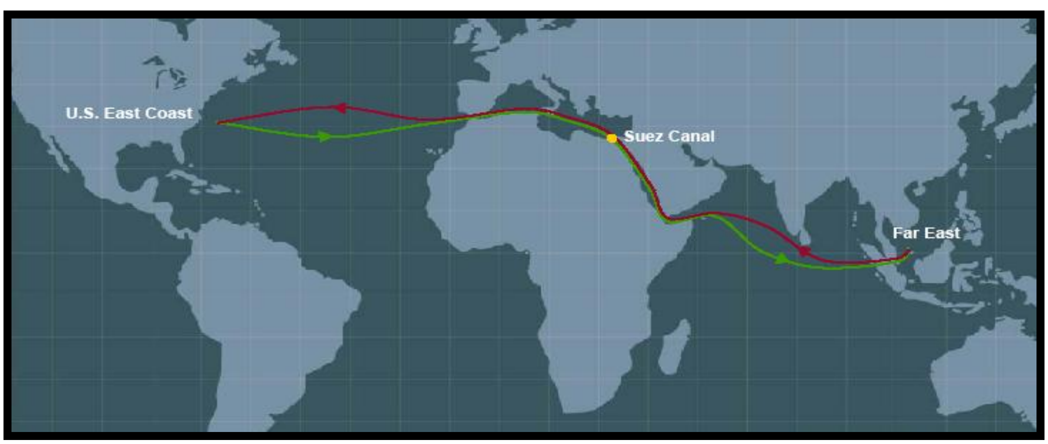


Figure 5-2: FE (SUEZ) ECUS Trade Map

Each service contains unique characteristics such as cargo volume, cargo weight, ports of call, vessel types, mix of vessels, etc. Commodity forecasts were developed for each service.

5.4.1 Commodity Forecast Baseline: Garden City Terminal

The commodity forecast baseline (Table 5-6) is based on a regression analysis of historical trade information from 2005 – 2010 (Tables 5-4 and 5-5). The 2005 – 2010 data capture both prosperous port years as well as the economic downturn which occurred in 2008-2009.

Table 5-4 presents historical containerized imports (metric tons), which moved through Savannah Harbor between 2005 and 2010, and the resulting calculated import baseline. Containerized imports grew from 5.3 million metric tons in 2005 to 7.3 million metric tons in 2010. Trade with Northeast Asia dominated Savannah's import market, followed by Southeast Asia and Northern Europe, respectively. Furniture has been the top import commodity since 2005 (in terms of TEU volume)[7]. Following furniture, Savannah's leading commodities include retail consumer goods; machinery, appliances and electronics; hardware and housewares; food; automotive; apparel; toys; minerals; and rugs, sheets, towels, and blankets.

[7] Georgia Ports Authority website –www.gaports.com

Table 5-4: Savannah Harbor Historical Containerized Import Tonnage

World Region	World Region Service	2005	2006	2007	2008	2009	2010	2010 Baseline
					(metric tons)			
Africa	ECUS AFRICA	16,857	1,406	-	-	-	-	3,044
Oceania	ECUS AU PEN	45,366	4,548	-	-	137,660	105,682	62,554
Oceania	AU ECUS EU PEN	4,953	175,523	310,910	426,778	66,878	84,803	228,208
ECSA/WCSA	ECUS WCSA-ECSA	131,720	226,075	379,351	364,290	233,909	270,875	318,004
N Europe	ECUS EU GULF PEN	19,546	114,500	145,366	55,173	148,582	464,815	317,883
MED	ECUS MED	281,827	310,637	324,140	200,750	263,771	303,187	269,491
NE Asia	FE ECUS EU PEN	800,447	733,373	767,942	1,309,812	1,033,754	700,211	700,211
NE Asia	FE ECUS MED PEN	613,603	598,308	516,637	557,397	427,819	544,873	484,938
NE Asia	FE (Panama) ECUS	2,608,255	2,723,926	3,266,646	2,837,208	2,247,652	2,277,866	2,277,866
NE Asia	RTW	185,344	233,667	139,354	-	315,103	793,893	502,729
SE Asia	FE (Suez) ECUS	593,443	676,684	1,309,872	1,511,875	1,133,068	1,737,311	1,681,126
Total		**5,301,363**	**5,798,647**	**7,160,219**	**7,263,284**	**6,008,197**	**7,283,516**	**6,846,053**

Source: GPA

Containerized exports grew from 7.4 million metric tons in 2005 to 11.8 million metric tons by 2010 (Table 5-5). As with imports, containerized trade with Northeast Asia dominated the Savannah Harbor's export market with just under one half of Savannah's exports destined for this world region. Savannah is one of the few ports in the U.S. in which its exports (expressed in metric tons) have historically exceeded its imports. However, since the cargo weight of exports are considerably higher than that of imports, the number of Savannah's TEU imports has exceeded the number of TEU exports.

From 2005 to 2010, wood pulp was the leading export commodity shipped from Savannah. In 2005 and 2006, clay was the next largest commodity group; however, by 2007, TEU volume for clay had fallen, placing it in fourth after paper and paperboard and food, a trend which continued through 2010. Other leading commodity exports during the 2005 to 2010 timeframe consisted of: retail consumer goods; chemicals; machinery, appliances and electronics; resins and rubber; automotive; fabrics including raw cotton; and other commodities.

Table 5-5: Historical Savannah Harbor Containerized Export Tonnage

World Region	World Region Service	2005	2006	2007	2008	2009	2010	2010 Baseline
		(metric tons)						
Africa	ECUS Africa	44,216	7,297	-	-	-	-	8,586
Oceania	ECUS AU PEN	112,681	12,018	-	-	392,018	438,094	253,538
Oceania	AU ECUS EU PEN	2,849	209,631	436,210	632,382	115,576	162,630	414,047
ECSA/WCSA	ECUS WCSA-ECSA	191,533	231,437	422,925	414,506	493,857	829,084	713,885
N Europe	ECUS EU GULF PEN	23,321	188,786	263,287	80,319	586,370	802,164	674,327
MED	ECUS MED	587,291	659,080	930,679	787,731	1,241,854	1,272,171	1,272,404
NE Asia	FE ECUS EU PEN	1,037,912	1,122,315	941,704	1,860,804	1,383,200	871,756	871,756
NE Asia	FE ECUS MED PEN	652,515	629,196	617,640	859,299	692,778	875,470	831,662
NE Asia	FE (Panama) ECUS	3,908,159	4,038,746	4,560,683	4,154,449	3,680,376	3,167,768	3,167,768
NE Asia	RTW	158,402	139,044	169,682	-	345,634	709,391	482,623
SE Asia	FE (Suez) ECUS	702,381	828,944	1,834,138	2,261,260	1,784,586	2,672,025	2,619,289
Total		**7,421,260**	**8,066,495**	**10,176,949**	**11,050,751**	**10,716,249**	**11,800,552**	**11,309,885**

Source: GPA

Table 5-6: Commodity Forecast Baseline (Year-2010) Tonnage

World Region	World Region Service	Imports	Exports
		(metric tons)	
Africa	ECUS Africa	3,044	8,586
Oceania	ECUS AU PEN	62,554	253,538
Oceania	AU ECUS EU PEN	228,208	414,047
ECSA/WCSA	ECUS WCSA-ECSA	318,004	713,885
N Europe	ECUS EU GULF PEN	317,883	674,327
MED	ECUS MED	269,491	1,272,404
NE Asia	FE ECUS EU PEN	700,211	871,756
NE Asia	FE ECUS MED PEN	484,938	831,662
NE Asia	FE (Panama) ECUS	2,277,866	3,167,768
NE Asia	RTW	502,729	482,623
SE Asia	FE (Suez) ECUS	1,681,126	2,619,289
Total		**6,846,053**	**11,309,885**

5.4.2 2008 Savannah Harbor Tonnage Forecast

In November 2008, containerized trade forecasts for Savannah Harbor were obtained from IHS Global Insight (GI). GI provides comprehensive economic and financial information on countries, regions and industries. When making global trade forecasts, GI employs macroeconomic models which contain all commodities that have physical volume. The commodities are then grouped into 77 categories derived from the International Standard Industrial Classification. GI tracks 54 major countries then groups the remaining world trade partners into 16 regions according to their geographic location. GI forecasts include 77 commodities among 70 countries or regions and include 270,000 trade flows.

Table 5-7 displays GI's import forecast for Savannah Harbor by world region over the period 2015 to 2028. The world region aggregate was developed by combining the tonnages from each country or region. Northeast Asia is projected to remain the major source of Savannah Harbor imports, growing from approximately 4.6 million metric tons in 2015 to 12.5 million in 2028. Southeast Asia is projected to remain in second place in terms of imported cargo tonnage going from 1.7 million metric tons of cargo in 2015 to 3.1 million in 2028.

Table 5-7: Global Insight's 2008 Savannah Harbor Containerized Trade Forecast – Imports (Metric Tons)

Service Region	2015	2020	2025	2026	2027	2028
Africa	30,729	35,155	42,498	43,417	45,647	46,661
East Coast South America	734,114	881,747	1,109,270	1,145,539	1,207,584	1,252,345
Mediterranean	1,237,171	1,444,858	1,732,464	1,769,677	1,842,109	1,896,237
Northeast Asia	6,460,416	8,271,695	10,761,609	11,229,087	11,934,618	12,466,810
Europe	911,307	1,076,378	1,284,336	1,319,408	1,376,644	1,416,841
Oceania	216,917	259,923	319,663	320,238	332,902	344,123
Southeast Asia	1,740,846	2,125,556	2,678,188	2,805,041	2,954,348	3,092,080
West Coast South America	210,839	242,562	304,335	310,491	325,478	337,886
Total Tonnage	**11,542,339**	**14,337,875**	**18,232,363**	**18,942,898**	**20,019,330**	**20,852,983**

Source: IHS Global Insight

Exports to the Northeast Asia region are forecast to total 8.2 million metric tons in 2015 and will grow to 11.2 million metric tons by 2028 (Table 5-8). Northeast Asia is forecast to receive nearly half of the exports shipped from Savannah Harbor. Southeast Asia and the Mediterranean are forecast to continue their relative importance in the overall commodity forecast, receiving approximately 3.3 million and 2.6 million metric tons, respectively, by 2028.

Table 5-8: Global Insight's 2008 Savannah Harbor Containerized Trade Forecast – Exports (Metric Tons)

Service Regions	2015	2020	2025	2026	2027	2028
Africa	191,997	224,634	253,220	261,651	268,826	275,806
East Coast South America	634,830	765,961	884,058	918,848	948,735	978,433
Mediterranean	1,995,832	2,262,243	2,470,427	2,540,529	2,595,571	2,645,603
Northeast Asia	8,229,779	9,222,053	10,431,617	10,619,153	10,886,165	11,150,995
Northern Europe	1,377,283	1,594,610	1,758,081	1,807,166	1,848,966	1,887,184
Oceania	466,315	551,593	635,367	654,845	674,433	693,632
Southeast Asia	2,311,052	2,692,970	3,022,767	3,109,093	3,196,722	3,266,979
West Coast South America	280,886	328,916	369,946	382,784	393,326	403,415
Total Export Tonnage	15,487,974	17,642,979	19,825,482	20,294,069	20,812,744	21,302,048

Source: IHS Global Insight

5.4.3 2010 Updated Savannah Harbor Tonnage Forecast

As previously mentioned, an Updated South Atlantic containerized trade forecast was obtained from GI during the fall of 2010. Since the GI forecast was for the South Atlantic region only, the relationship between the region and Savannah Harbor trade had to be established. It was assumed that for each forecast year, each respective Savannah world region route would comprise the same share of total South Atlantic commerce as had been assumed for each route in the 2008 forecast. For example, if in the original GI forecast, the ECUS MED world region route comprised 4% of imports forecast for the South Atlantic region in forecast year 2016, then in year 2016 of the updated forecast, it was assumed that the ECUS MED service would again comprise 4% of total South Atlantic imports. The same assumption was made for exports based upon each respective route's percent share, by year, in the 2008 export forecast.

Table 5-9 presents the Savannah Harbor tonnage forecast as calculated from the South Atlantic Region forecast. Table 5-10 presents the year-to-year rates of change (growth rates) calculated from the Updated Savannah Harbor Forecast, which were applied to the calculated baseline (year-2010) to develop the commodity tonnage forecast used in without and with-project condition transportation costs analyses.

Table 5-9: 2010 Savannah Harbor Import and Export Tonnage Forecast

	2010	2015	2017	2020	2025	2028
			(metric tons)			
Savannah Harbor Imports:						
ECUS Africa	18,064	23,988	22,547	27,658	33,996	37,790
ECUS AU PEN	6,217	8,050	8,482	9,722	12,157	13,250
AU ECUS EU PEN	124,544	161,280	169,916	194,774	243,556	265,448
ECUS WCSA-ECSA	519,133	737,651	717,136	884,562	1,130,811	1,287,894
ECUS EU GULF PEN	553,022	711,386	743,771	846,851	1,027,402	1,147,469
ECUS MED	716,602	965,763	974,452	1,136,756	1,385,880	1,535,721
FE ECUS EU PEN	588,462	861,347	912,171	1,111,511	1,470,334	1,724,456
FE ECUS MED PEN	431,702	631,893	669,178	815,416	1,078,652	1,265,079
FE (Panama) ECUS	2,289,050	3,350,541	3,548,238	4,323,648	5,719,427	6,707,935
RTW	136,201	199,361	211,124	257,261	340,312	399,129
FE (Suez) ECUS	983,708	1,358,943	1,386,919	1,672,302	2,142,410	2,504,209
Total Savannah Imports	**6,366,706**	**9,010,203**	**9,363,934**	**11,280,462**	**14,584,936**	**16,888,380**
Total South Atlantic Imports	**19,846,974**	**26,359,171**	**28,796,971**	**33,225,999**	**41,497,960**	**47,204,816**
	2010	**2015**	**2017**	**2020**	**2025**	**2028**
Savannah Harbor Exports:						
ECUS Africa	141,113	184,584	199,719	216,962	250,359	277,784
ECUS AU PEN	29,120	38,087	41,521	45,261	53,369	59,351
AU ECUS EU PEN	313,643	410,225	447,215	487,494	574,821	639,256
ECUS WCSA-ECSA	662,632	880,363	963,482	1,057,485	1,239,839	1,391,761
ECUS EU GULF PEN	1,065,229	1,324,110	1,469,546	1,540,151	1,738,221	1,900,722
ECUS MED	1,502,017	1,918,777	2,033,789	2,184,982	2,442,520	2,664,581
FE ECUS EU PEN	963,731	1,322,089	1,348,630	1,488,360	1,723,414	1,876,678
FE ECUS MED PEN	596,281	818,005	834,426	920,881	1,066,313	1,161,141
FE (Panama) ECUS	4,057,216	5,565,871	5,677,605	6,265,859	7,255,411	7,900,639
RTW	150,223	206,083	210,220	232,001	268,640	292,530
FE (Suez) ECUS	1,702,678	2,221,828	2,409,426	2,600,999	2,988,620	3,290,415
Total Savannah Exports	**11,183,884**	**14,890,022**	**15,635,579**	**17,040,435**	**19,601,526**	**21,454,860**
Total South Atlantic Exports	**22,513,608**	**29,902,537**	**31,873,150**	**35,137,493**	**41,134,349**	**45,109,858**

Table 5-10: Savannah Harbor Updated Tonnage Forecast Year-to-Year Rates of Change

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Rate of Change - Imports																		
Africa	11%	1%	4%	4%	10%	-2%	-4%	13%	3%	6%	5%	3%	1%	7%	5%	3%	6%	3%
Oceania	9%	3%	4%	5%	6%	3%	3%	5%	4%	5%	5%	3%	5%	3%	8%	1%	4%	4%
ECSA&WCSA	8%	6%	4%	7%	12%	-2%	-1%	11%	5%	6%	8%	2%	5%	4%	6%	3%	6%	4%
Europe	5%	6%	5%	4%	6%	2%	2%	5%	4%	4%	5%	2%	4%	4%	5%	3%	5%	3%
Mediterranean	7%	6%	4%	5%	8%	0%	1%	7%	4%	5%	6%	2%	5%	3%	5%	3%	4%	3%
Northeast Asia	8%	9%	8%	6%	9%	3%	3%	8%	6%	6%	7%	4%	5%	5%	7%	5%	7%	5%
Southeast Asia	6%	7%	6%	5%	9%	1%	1%	8%	5%	6%	6%	4%	5%	5%	5%	5%	6%	5%
Rate of Change - Exports																		
Africa	9%	5%	7%	4%	3%	4%	4%	2%	2%	4%	4%	2%	2%	4%	2%	4%	3%	3%
Oceania	9%	5%	7%	4%	3%	4%	5%	2%	3%	4%	3%	3%	3%	4%	3%	4%	4%	3%
ECSA&WCSA	9%	5%	8%	4%	3%	5%	5%	2%	3%	4%	4%	3%	3%	4%	3%	4%	4%	4%
Europe	8%	4%	8%	2%	1%	5%	6%	0%	2%	3%	2%	3%	1%	4%	2%	3%	3%	3%
Mediterranean	8%	5%	7%	3%	3%	3%	3%	2%	2%	4%	3%	2%	2%	3%	2%	3%	3%	3%
Northeast Asia	6%	7%	6%	5%	8%	-1%	3%	4%	3%	3%	6%	0%	3%	3%	4%	2%	3%	3%
Southeast Asia	8%	5%	7%	4%	3%	4%	4%	2%	3%	3%	3%	3%	2%	4%	3%	3%	3%	3%

5.4.4 Final Savannah Harbor Commodity Tonnage Forecast

The world region year-to-year rates of change calculated from the 2010 Updated Savannah Harbor Forecast were applied to the calculated year-2010 baseline to develop the Final Savannah Harbor Commodity Forecast. Note, port capacity was forecast to be reached in 2030; therefore, the long term forecast was constrained at that point. It is forecast that Northeast Asian trade will continue to dominate Savannah Harbor imports (Table 5-11) over the forecast period, growing from approximately 4 million metric tons in the 2010 baseline to just under 13 million metric tons in 2030. Imports from Southeast Asia will likewise grow from 1.7 million metric tons to 4.7 million metric tons in 2030.

Table 5-11: SHEP Containerized Trade Forecast - Import Metric Tons

World Region	SHEP Services	2010 Baseline	2015	2017	2020	2025	2030[8]
Africa	ECUS AFRICA	3,044	4,042	3,799	4,660	5,728	6,972
Oceania	ECUS AU PEN	62,554	81,005	85,343	97,828	122,330	143,580
Oceania	AU ECUS EU PEN	228,208	295,519	311,345	356,893	446,277	523,802
ECSA	ECUS WCSA-ECSA	318,004	451,862	439,295	541,855	692,699	865,792
N Europe	ECUS EU GULF PEN	317,883	408,912	427,527	486,779	590,561	712,110
MED	ECUS MED	269,491	363,192	366,460	427,497	521,184	620,286
NE Asia	FE ECUS EU PEN	700,211	1,024,916	1,085,391	1,322,585	1,749,548	2,291,526
NE Asia	FE ECUS MED PEN	484,938	709,816	751,698	915,970	1,211,667	1,587,020
NE Asia	FE (Panama) ECUS	2,277,866	3,334,170	3,530,901	4,302,522	5,691,481	7,454,598
NE Asia	RTW	502,729	735,857	779,276	949,575	1,256,120	1,645,244
SE Asia	FE (SUEZ) ECUS	1,681,126	2,322,391	2,370,200	2,857,911	3,661,311	4,748,979
Total Imports		**6,846,053**	**9,731,681**	**10,151,235**	**12,264,074**	**15,948,907**	**20,599,909**

The forecast method used for imports was repeated in developing Savannah Harbor export projections. Exports to Northeast Asia are forecast to grow from 5.4 million metric tons in 2010 to 11.1 million metric tons in 2030. As with imports, the FE (Panama) ECUS world region service is forecast to lead all other Savannah Harbor services in total trade volume. (Table 5-12).

Table 5-12: Savannah Harbor Containerized Trade Forecast - Export Metric Tons

World Region	SHEP Services	2010 Baseline	2015	2017	2020	2025	2030[9]
Africa	ECUS AFRICA	8,586	11,231	12,151	13,200	15,232	18,054
Oceania	ECUS AU PEN	253,538	331,611	361,513	394,073	464,665	554,566
Oceania	AU ECUS EU PEN	414,047	541,547	590,379	643,551	758,833	905,648
ECSA	ECUS WCSA-ECSA	713,885	948,457	1,038,005	1,139,279	1,335,738	1,612,215
NEurope	ECUS EU GULF PEN	674,327	838,207	930,273	974,968	1,100,353	1,276,659
MED	ECUS MED	1,272,404	1,625,454	1,722,883	1,850,964	2,069,132	2,380,355
NE Asia	FE ECUS EU PEN	871,756	1,195,915	1,219,922	1,346,318	1,558,939	1,799,535
NE Asia	FE ECUS MED PEN	831,662	1,140,912	1,163,815	1,284,397	1,487,239	1,716,770
NE Asia	FE (Panama) ECUS	3,167,768	4,345,685	4,432,924	4,892,217	5,664,833	6,539,108
NE Asia	RTW	482,623	662,084	675,375	745,351	863,062	996,262
SE Asia	FE (SUEZ) ECUS	2,619,289	3,417,916	3,706,505	4,001,209	4,597,500	5,389,006
Total Imports		**11,309,885**	**15,059,018**	**15,853,747**	**17,285,528**	**19,915,526**	**23,188,179**

[8] Year when port capacity is reached.
[9] Year when port capacity is reached.

5.4.5 Commodity Forecast: Garden City Terminal TEUs

Garden City Terminal throughput capacity is expressed in TEUs; therefore, projected tonnages were converted into their loaded TEU equivalents. For each service, the historical average weight per TEU was calculated and used for this conversion. Table 5-13 presents the average weights, which were derived from historical data provided by the GPA and from PIERS data.

Garden City Terminal throughput capacity includes empty and loaded containers. The historical percent of empty containers was used to forecast the future number of empty containers moving through Savannah Harbor.

Table 5-13: Container Box Weight by Service

Route	Metric Tons per TEU			
	Imports	Exports	Percent Empties Imports	Percent Empties Exports
ECUS-AU-PEN	10.98	8.67	62.11%	3.94%
AU-ECUS-EU-PEN	10.73	8.94	62.11%	3.94%
ECUS-WCSA-ECSA	10.10	10.14	76.62%	14.84%
ECUS-EU-GULF-FE-PEN	8.77	9.64	34.55%	7.31%
ECUS-MED	9.67	10.56	81.64%	8.11%
FE-ECUS-EU-PEN	7.12	9.83	15.31%	13.01%
FE-ECUS-MED-PEN	6.37	10.54	7.61%	29.74%
FE-(Panama)-ECUS	5.78	10.84	7.88%	56.53%
RTW	6.65	10.58	9.62%	99.45%
FE-(SEUZ)-ECUS	7.76	10.08	18.28%	27.18%

Table 5-14 shows the resulting TEU forecast for Savannah Harbor and Garden City Terminal.

Table 5-14: TEU Forecast for Selected Years

Year	Loaded Export TEUs	Loaded Import TEUs	Total Loaded TEUs[10]	Total Exports (loaded and empty)	Total Imports (loaded and empty)	Total TEUs[11]
2010	1,101,836	983,434	2,085,270	1,446,361	1,158,350	2,604,711
2017	1,544,968	1,470,981	3,015,949	2,028,305	1,722,487	3,750,792
2020	1,683,960	1,780,666	3,464,626	2,214,037	2,082,314	4,296,351
2025	1,940,501	2,324,044	4,264,545	2,552,885	2,710,699	5,263,584
2030	2,260,378	3,013,260	5,273,638	2,970,714	3,503,311	6,474,025

5.5 International Container Ship Fleet

The world fleet forecast and the Savannah Harbor fleet forecast focus on container ships as these vessels comprise nearly the entire population of large vessels calling on the Savannah Harbor that would benefit from channel deepening.

5.5.1 World Fleet

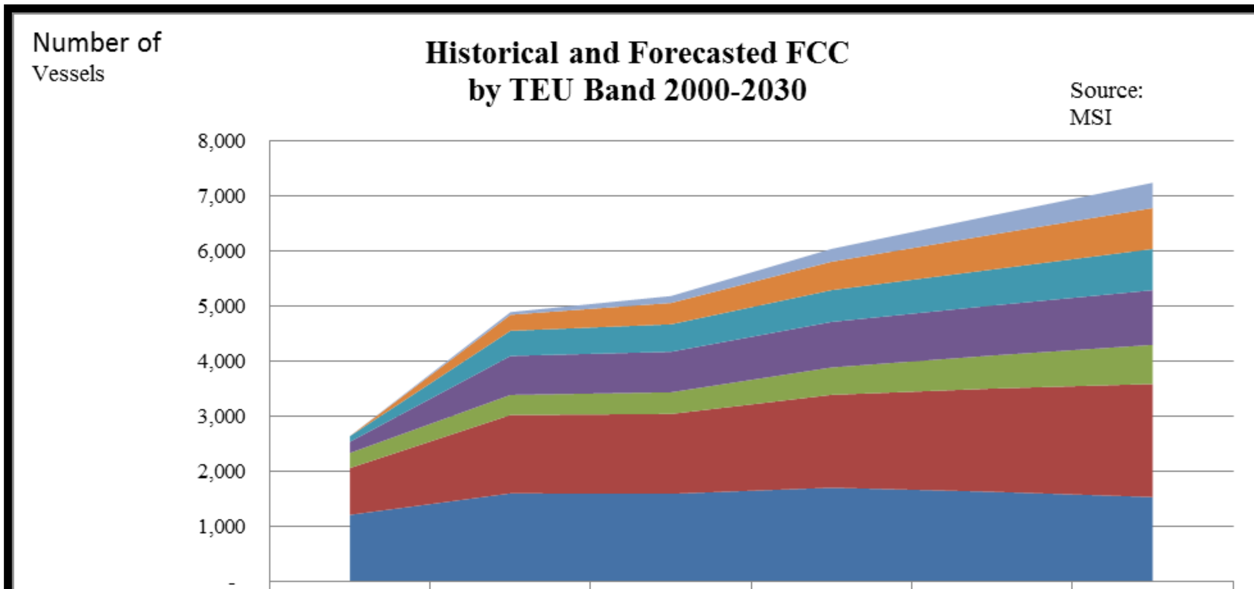
Maritime Strategies International, Limited (MSI) provided information related to the existing and forecast future world fleet of container vessels. MSI is a firm that specializes in vessel forecasting for each shipping sector and provides financial advice to ship owners, shipyards, brokers, investors, insurers, and equipment providers. In the course of analyzing the existing world fleet, MSI categorized the existing fleet into classes by design draft, vessel beam, and by haul (combined beam and draft).

MSI's forecasting technique begins with performing a detailed review of the current world fleet and how it is deployed on the trade routes of the world. Forecasting of the world fleet was made possible through MSI's proprietary Container Shipping Planning Service (CSPS) model, which applies historical and forecasted time series data from 1980 to 2030 for:

- Macroeconomic and trade variables;
- Global container trade and movements in TEU lifts by region;
- Sector-specific fleet dynamics;
- Sector-specific supply/demand balances;
- Time-charter rates and vessel operating costs;
- Freight rates; and
- New-building, second-hand (by age) and scrap prices for standard sizes.

[10] Calculated as the sum of Columns 2 and 3
[11] Calculated as the sum of Columns 5 and 6

Based on data for deliveries, scrapping, and the existing 2010 fleet, MSI projected the world fleet for the end of each forecast year (Figure 5-3).



	2000	2011	2015	2020	2025	2030
12 k TEU +	-	47	124	232	348	458
7.6 k to 12 k TEU	-	291	388	515	632	742
5.2 k to 7.6 k TEU	104	456	498	577	654	747
3.9 k to 5.2 k TEU	203	707	735	826	905	991
2.9 k to 3.9 k TEU	272	364	393	497	600	708
1.3 k to 2.9 k TEU	850	1,420	1,446	1,684	1,869	2,051
0.1 k to 1.3k TEU	1,214	1,604	1,596	1,706	1,633	1,537

Figure 5-3: Projected World Container Fleet by TEU Capacity

5.5.2 Savannah Harbor Fleet

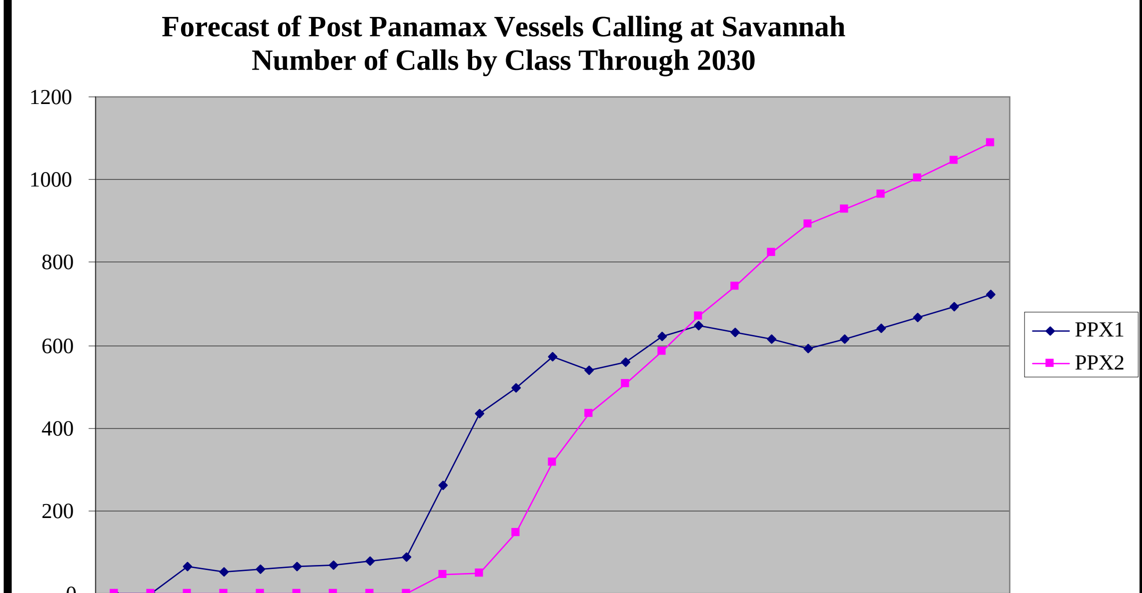
The Lloyd's Shipping Economist (LSE) is an annual publication that details the fleet deployment on most containership service routes. The report details the number of vessels deployed on each service by TEU-band. MSI had access to these publications since 2000, and used those as an indicator of deployment for the year prior to publication.

MSI used LR Fairplay data to calculate the average vessel size within the LSE size bands for each year. This capacity estimate was used to estimate the nominal capacity deployed on each route. For the purpose of this study all the services calling North American ports were aggregated. The capacity deployed on each trade route was compared to the annual container volumes for the US using a simple regression technique. The fit showed a very high R-squared of 94 percent against the observed data. This close relationship demonstrates how capacity is adjusted by operators to match demand.

Similarly, MSI preformed an analysis of port throughput at Savannah. TEU capacity of vessels calling at Savannah in each of the years between 1998 and 2008 was compared to TEUs at Savannah. Again, the R-squared value is very high at 98 percent, confirming that forecasted trade volumes could be used to forecast capacity deployed on services calling at Savannah in the future.

There is a strong relationship between the economic condition of a port and its total nominal vessel capacity. As an economy grows, exports from the port often increase (from the increased output) or demand for imports increase (from increased consumer purchasing power). Vessel deployment decisions respond accordingly to satisfy this increased level of trade. MSI examined the empirical relationship between the nominal capacity of the fleet calling Savannah and the historical tonnages moving through Savannah and found the variables to be nearly perfectly correlated, having an R-squared value of 0.978. This statistical relationship was then applied to the forecasted tonnages in order to estimate future nominal TEU vessel capacity calling Savannah. As the tonnage in Savannah grows over time, the nominal TEU vessel capacity, i.e., the total number of available container slots, grows linearly. Capacity is adjusted by operators to match demand. Once the forecasted nominal TEU vessel capacity at Savannah was determined, the future containers were allocated to various vessel classes (PPX, PX and SPX). The allocation to vessel classes was based on MSI's examination of historical shares, current trends in vessel design and orders and the world wide redeployment of vessels affected by the expansion of the Panama Canal.

The number of calls at Savannah by vessel class was estimated by dividing the estimated nominal capacity for each TEU band by the average vessel capacity for that TEU band. Post-Panamax vessels were represented by TEU bands 5.2 k to 7.6 k (PPX1) and 7.6 k to 12 k (PPX2). In the forecast of Post-Panamax vessels through the year 2030 (Figure 5-4) the larger, Generation 2 Post Panamax vessel becomes the more dominant type of vessel calling at Savannah from the year 2021 onward. It was apparent that most services would be receiving Post-Panamax vessels, particularly once the Panama Canal expansion is completed in 2014.



	1998	1999	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
PPX1	0	0	66	51	57	64	66	77	89	262	436	498	571	538	559	623	649	632	613	592	616	641	667	695	723
PPX2	0	0	0	0	0	0	0	0	0	45	49	146	317	436	507	585	669	743	823	891	927	965	1005	1046	1089

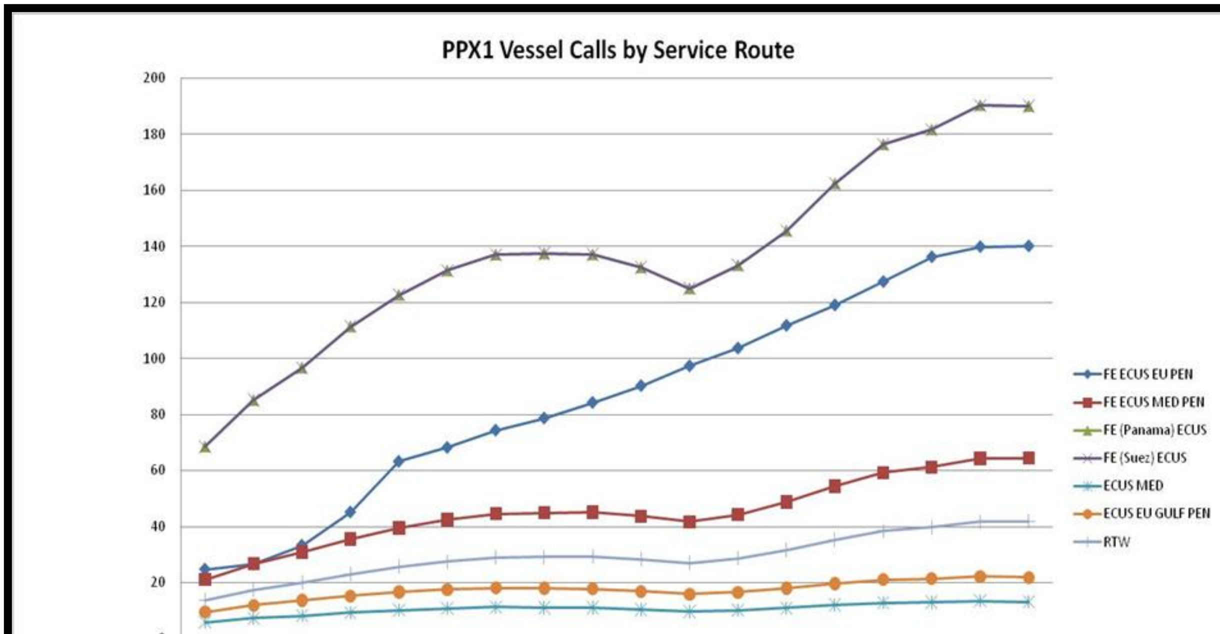
Figure 5-4: Projected Post Panamax Vessel Calls at Savannah

Once the number of Post-Panamax vessel calls was determined, these calls were then allocated to specific Savannah trade routes (Table 5-15 and Figures 5-5 and 5-6). The share for each route was based on the historical averages from 2005 to 2007 and indexed over time by the route specific growth rates reflected in the commodity forecast. Some trade routes, particularly those originating from the Far East, would receive a larger allocation of vessels to meet the high demand. Other trade routes such as the AU ECUS EU PEN, ECUS AU PEN, and ECUS WCSA ECSA do not expect any Post Panamax vessels to deploy at all throughout the study period. A large portion of cargo was projected to be moved on smaller, Sub-Panamax vessels; therefore, Sub-Panamax vessels were excluded from the transportation cost savings analysis. The fleet forecast assumed vessels behaving in an unconstrained channel (by channel depth)[12].

[12] When developing their forecast of fleet calling at North American ports, MSI assumed that ports around the world would make the necessary adjustments to satisfy the demand/capacity.

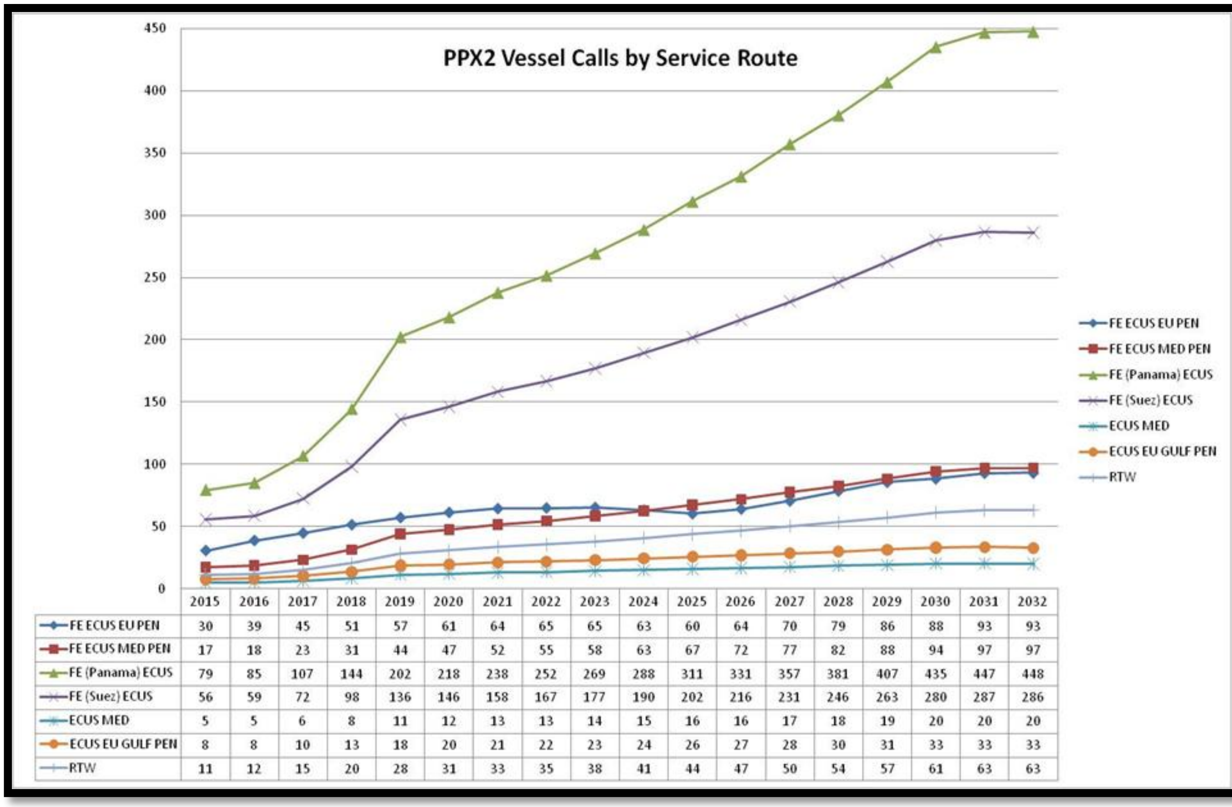
Table 5-15: Route Percent Share of Panamax and Post-Panamax Vessel Tonnage

SHEP Services	2015	2020	2025	2030	2032
FE ECUS EU PEN	12.4%	12.6%	12.8%	12.9%	12.9%
FE ECUS MED PEN	8.6%	8.7%	8.8%	8.9%	8.9%
FE (Panama) ECUS	39.5%	40.2%	40.8%	41.1%	41.3%
FE (Suez) ECUS	27.8%	27.0%	26.5%	26.4%	26.3%
ECUS MED	2.4%	2.2%	2.1%	1.9%	1.8%
ECUS EU GULF PEN	3.9%	3.6%	3.4%	3.1%	3.0%
RTW	5.6%	5.7%	5.7%	5.8%	5.8%
Total	**100%**	**100%**	**100%**	**100%**	**100%**



	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
FE ECUS EU PEN	25	27	33	45	63	68	74	79	84	90	97	104	112	119	127	136	140	140
FE ECUS MED PEN	21	27	31	36	40	42	45	45	45	44	42	44	49	54	59	61	64	64
FE (Panama) ECUS	69	85	97	111	123	131	137	137	137	132	125	133	146	162	176	182	190	190
FE (Suez) ECUS	69	85	97	111	123	131	137	137	137	132	125	133	146	162	176	182	190	190
ECUS MED	6	7	8	9	10	11	11	11	11	10	10	10	11	12	13	13	13	13
ECUS EU GULF PEN	10	12	14	15	17	18	18	18	18	17	16	17	18	20	21	21	22	22
RTW	14	17	20	23	26	28	29	29	29	28	27	29	32	35	38	40	42	42

Figure 5-5: Savannah Harbor First Generation Post-Panamax Vessel Calls by Service Route



	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
FE ECUS EU PEN	30	39	45	51	57	61	64	65	65	63	60	64	70	79	86	88	93	93
FE ECUS MED PEN	17	18	23	31	44	47	52	55	58	63	67	72	77	82	88	94	97	97
FE (Panama) ECUS	79	85	107	144	202	218	238	252	269	288	311	331	357	381	407	435	447	448
FE (Suez) ECUS	56	59	72	98	136	146	158	167	177	190	202	216	231	246	263	280	287	286
ECUS MED	5	5	6	8	11	12	13	13	14	15	16	16	17	18	19	20	20	20
ECUS EU GULF PEN	8	8	10	13	18	20	21	22	23	24	26	27	28	30	31	33	33	33
RTW	11	12	15	20	28	31	33	35	38	41	44	47	50	54	57	61	63	63

Figure 5-6: Savannah Harbor Second Generation Post-Panamax Vessel Calls by Service Route

5.5.3 Load Factor Analysis

The economic efficiencies of channel deepening and the projected deployment of Panamax and Post-Panamax vessels to Savannah Harbor are based on a Load Factor Analysis model (LFA). The LFA estimates the allocation of vessel space (and dead weight tonnage) to various vessel capacity attributes. The end result of the LFA is a projection of the amount of cargo loaded on the vessel and its operating draft. LFA results affect vessel costs, which in turn affect projected vessel deployments and the projected fleet mix calling at Garden City Terminal.

The LFA is based on estimates of the following attributes for each vessel class by trade route:

- Ballast stored;
- Bunkerage and fuel storage;
- Number of empty containers;
- Number of unused (vacant) container slots;
- Cargo weights calibrated so that projected vessel drafts would not exceed an estimation of the vessel's "maximum practical draft" on more than 15% of trips; and
- Empty container weight.

The LFA estimation calculations are as follows. For a given sailing draft, a calculation using vessel specific Tons per Inch Immersion (TPI) was made to determine capacity utilization at that sailing draft, i.e., how much space of the vessel was occupied by cargo, stores and other items having weight. This capacity utilized figure (metric tons) is then allocated to several factors based on the estimates assigned to the attributes listed above. An estimate of ballast weight is accounted for on a variable scale. Empty container weight (carriage weight) is accounted for by applying a historical percentage of empty containers for each vessel on a particular trade route. Container (lading) weight is accounted for, and finally the cargo itself. The remainder is the empty space on the vessel.

Table 5-16 depicts a LFA capacity allocation for a PPX2 vessel weighing a total of 107,000 DWT and with a design draft of 47.6 feet. The table reveals how LFA allocates capacity for the vessel at various operating drafts. There is no differentiation between in-bound and out-bound allocations because cargo weights have been calibrated. Vessel capacity is assigned to ballast, cargo, allocation for operations, weight of containers (empty and laden), and unallocated capacity. As this vessel loads more fully, its sailing draft increases. The amount of available deadweight tonnage decreases as cargo tonnage and carriage increase. Weight for operations and crew are fairly uniform whereas ballast weight rises slowly until it achieves a maximum allocation at about 12,500 DWT.

Table 5-16: Example Load Factor Analysis Capacity Allocation – 107,000 DWT Vessel

Draft	37	38	39	40	41	42	43	44	45	46	47	47.6
Variable Ballast	9,046	9,518	9,990	10,462	10,934	11,406	11,879	11,998	11,998	11,998	11,998	11,998
Cargo (Laden) Carriage Tonnage	10,371	11,038	11,706	12,373	13,040	13,707	14,375	15,042	15,709	16,377	16,504	16,504
Carriage Tonnage for Empty Containers	607	646	685	724	763	802	841	880	919	958	965	965
Allowance for Operations	11,463	11,463	11,463	11,463	11,463	11,463	11,463	11,463	11,463	11,463	11,463	11,463
Cargo (Laden) Tonnage	38,269	40,731	43,194	45,656	48,118	50,581	53,043	55,505	57,968	60,430	60,900	60,900
DWT Remaining	38,592	34,952	31,311	27,670	24,029	20,388	16,748	13,459	10,291	7,122	6,517	6,517
Total →	108,348	108,348	108,348	108,348	108,348	108,348	108,348	108,348	108,348	108,348	108,348	108,348

Vessel capacity allocations similar to the allocations presented in Table 5-16 are estimated for each vessel class and for each trade route. Capacity allocations are assumed constant throughout the period of analysis. The combination of assumptions and calculations used in the LFA are the determining factors for vessel deployment and vessel drafts used in the Transportation Cost Savings Model.

The results of the LFA provide maximum practicable sailing drafts by type of vessel, trade route and channel depth (Table 5-17). Although the LFA results can vary significantly for similar sized vessels on different routes, all vessels on all routes, including the largest ones, reach their maximum practicable sailing draft with a 47-foot channel. In other words, incremental increases in channel depth from -42 feet to -47 feet result in reallocation of vessel DWT from non-cargo-related capacity to cargo-related capacity. At a channel depth of -47 feet, all of the vessel's available space and dead weight tonnage has been allocated, therefore; deepening to depths greater than -47 feet is projected to have no impact on future vessel loading or operating drafts.

Table 5-17: Projected Maximum Vessel Drafts: Savannah Harbor

World Region Service	Vessel Class	Sailing Draft (feet)					
		42	44	45	46	47	48
FE SUEZ ECUS	PX	40.51	40.51	40.51	40.51	40.51	40.51
	PPX1	42.80	44.80	45.40	45.40	45.40	45.40
	PPX2	42.70	44.70	45.70	46.70	46.94	46.94
ECUS MED	PX	43.00	44.02	44.02	44.02	44.02	44.02
	PPX1	42.80	44.80	45.80	46.05	46.05	46.05
	PPX2	42.70	44.70	45.70	46.70	47.64	47.64
FE (Panama)	PX	39.20	39.20	39.20	39.20	39.20	39.20
ECUS	PPX1	42.80	43.91	43.91	43.91	43.91	43.91
	PPX2	42.70	44.70	45.35	45.35	45.35	45.35
FE ECUS EU PEN	PX	39.90	39.90	39.90	39.90	39.90	39.90
	PPX1	42.80	44.71	44.71	44.71	44.71	44.71
	PPX2	42.70	44.70	45.70	46.20	46.20	46.20
FE ECUS MED	PX	40.90	40.90	40.90	40.90	40.90	40.90
PEN	PPX1	42.80	44.80	45.80	45.84	45.84	45.84
	PPX2	42.70	44.70	45.70	46.70	47.41	47.41
RTW	PX	42.42	42.42	42.42	42.42	42.42	42.42
	PPX1	42.80	44.80	45.80	46.05	46.05	46.05
	PPX2	42.70	44.70	45.70	46.70	47.64	47.64
ECUS EU GULF	PX	43.00	43.21	43.21	43.21	43.21	43.21
PEN	PPX1	42.80	44.80	45.80	46.05	46.05	46.05
	PPX2	42.70	44.70	45.70	46.70	47.64	47.64

Vessel deployments to Garden City Terminal were based on cargo capacities estimated by the LFA and unit cost estimates. Carriers were assumed to follow the cost advantage indicated by the unit cost analysis when making their deployments on every route except the FE (Panama) ECUS. For the FE (Panama) ECUS route service, both the PPX1 and the PPX2 vessel classes are already more efficient than the Panamax class vessels. Also, given the inherent uncertainty in the unit cost analysis, the PPX1 and PPX2 vessel classes can be considered identical in terms of economic efficiency. Based on unit cost alone, it may be that both PPX1 and PPX2 vessels will be deployed on this route at the existing project depth of 42 feet (i.e., following Panama Canal expansion).

It was concluded from an analysis of recent trends that the PPX2 vessels would likely be deployed first to ports when their economic advantage became clearly superior to rather than equal to a PPX1 vessel. Given these considerations, this analysis assumed that the PPX2 vessels would be deployed on the FE (Panama) ECUS route service at a 44-foot project depth and deeper. Based on the unit cost analysis (Table 5-18), the unit cost for that route drops from $2.04 to $1.82 for the PPX2 vessel; in other words, it is at that point where the greater depth allows the larger vessel to load more fully, thus reducing the overall transportation cost. For the ECUS MED route, the switch to

PPX2 vessels should not take place until the channel depth reaches 46 feet. For project depths of 45 feet and lower, unit costs are minimized using PPX1 vessels.

Table 5-18: Estimated Vessel Unit Costs

World Region Route	Vessel Classes	Channel Depths (feet)					
		42	44	45	46	47	48
FE (Suez) ECUS	PX MPD	$ 2.31	$ 2.31	$ 2.31	$ 2.31	$ 2.31	$ 2.31
	PPX1 MPD	$ 2.02	$ 1.85	$ 1.81	$ 1.81	$ 1.81	$ 1.81
	PPX2 MPD	$ 2.04	$ 1.87	$ 1.80	$ 1.73	$ 1.72	$ 1.72
ECUS MED	PX MPD	$ 2.07	$ 1.99	$ 1.99	$ 1.99	$ 1.99	$ 1.99
	PPX1 MPD	$ 2.02	$ 1.85	$ 1.78	$ 1.76	$ 1.76	$ 1.76
	PPX2 MPD	$ 2.04	$ 1.87	$ 1.80	$ 1.73	$ 1.67	$ 1.67
FE (Panama) ECUS	PX MPD	$ 2.46	$ 2.46	$ 2.46	$ 2.46	$ 2.46	$ 2.46
	PPX1 MPD	$ 2.02	$ 1.92	$ 1.92	$ 1.92	$ 1.92	$ 1.92
	PPX2 MPD	$ 2.04	$ 1.87	$ 1.82	$ 1.82	$ 1.82	$ 1.82
FE ECUS EU PEN	PX MPD	$ 2.38	$ 2.38	$ 2.38	$ 2.38	$ 2.38	$ 2.38
	PPX1 MPD	$ 2.02	$ 1.86	$ 1.86	$ 1.86	$ 1.86	$ 1.86
	PPX2 MPD	$ 2.04	$ 1.87	$ 1.80	$ 1.76	$ 1.76	$ 1.76
FE ECUS MED PEN	PX MPD	$ 2.27	$ 2.27	$ 2.27	$ 2.27	$ 2.27	$ 2.27
	PPX1 MPD	$ 2.02	$ 1.85	$ 1.78	$ 1.78	$ 1.78	$ 1.78
	PPX2 MPD	$ 2.04	$ 1.87	$ 1.80	$ 1.73	$ 1.69	$ 1.69
RTW	PX MPD	$ 2.07	$ 2.00	$ 2.00	$ 2.00	$ 2.00	$ 2.00
	PPX1 MPD	$ 2.02	$ 1.85	$ 1.78	$ 1.76	$ 1.76	$ 1.76
	PPX2 MPD	$ 2.04	$ 1.87	$ 1.80	$ 1.73	$ 1.67	$ 1.67
ECUS EU GULF PEN	PX MPD	$ 2.07	$ 2.06	$ 2.06	$ 2.06	$ 2.06	$ 2.06
	PPX1 MPD	$ 2.02	$ 1.85	$ 1.78	$ 1.76	$ 1.76	$ 1.76
	PPX2 MPD	$ 2.04	$ 1.87	$ 1.80	$ 1.73	$ 1.67	$ 1.67

The final consideration in the deployment scenario was determining the number of PPX2 vessels to replace the PPX1 vessels. It was assumed that a replacement ratio of 140% for PPX2 vessels replacing PPX1 vessels would be used. In other words, as PPX2 vessels are deployed (given the economic incentive of reducing unit costs), the number of PPX1 vessel calls would be reduced by 140 percent of the number of added PPX2 vessel calls.

5.5.4 Savannah Harbor Fleet Projections

Table 5-19 shows the final PPX vessel call forecast for the FE (Panama) ECUS route service. It depicts how at the 42-foot channel depth (the without project condition), the forecasted calls for PPX1 and PPX2 vessels are all PPX1 calls. Beyond 42 feet, the calls are divided between the two classes as indicated by MSI's unconstrained forecast of vessel calls. For this particular route, PPX2 deploy to their full allocation at 44 feet. The vessels could load a little deeper in a 45-foot channel and the Transportation Cost Savings Model picks that up and calculates a "deepening" benefit using the same number of trips but more Savannah cargo. Table 5-20 shows the vessel calls for the ECUS Med service, and Table 5-21 shows the projected vessel calls for the FE (Suez) ECUS service. Similar projections are made for each route.

Table 5-19: Projected FE (Panama) ECUS Vessel Calls: Garden City Terminal

Vessel Class – Project Depth	2017	2020	2025	2030
PPX1-42	153	349	410	587
PPX2-42	40	109	156	218
PPX1-44	97	196	192	282
PPX2-44	79	218	311	435
PPX1-45	97	196	192	282
PPX2-45	79	218	311	435
PPX1-46	97	196	192	282
PPX2-46	79	218	311	435
PPX1-47	97	196	192	282
PPX2-47	79	218	311	435
PPX1-48	97	196	192	282
PPX2-48	79	218	311	435

Table 5-20: Projected ECUS MED Vessel Calls: Garden City Terminal

Vessel Class – Project Depth	2017	2020	2025	2030
PPX1-42	13	19	21	27
PPX2-42	3	6	8	10
PPX1-44	8	11	10	13
PPX2-44	6	12	16	20
PPX1-45	8	11	10	13
PPX2-45	6	12	16	20
PPX1-46	8	11	10	13
PPX2-46	6	12	16	20
PPX1-47	8	11	10	13
PPX2-47	6	12	16	20
PPX1-48	8	11	10	13
PPX2-48	6	12	16	20

Table 5-21: Projected FE (Suez) ECUS Vessel Calls: Garden City Terminal

Vessel Class – Project Depth	2017	2020	2025	2030
PPX1-42	147	234	266	368
PPX2-42	36	73	101	137
PPX1-44	97	122	124	165
PPX2-44	72	137	200	255
PPX1-45	97	118	120	160
PPX2-45	72	132	192	246
PPX1-46	97	116	117	156
PPX2-46	72	129	188	241
PPX1-47	97	116	115	154
PPX2-47	72	129	188	238
PPX1-48	97	116	115	154
PPX2-48	72	129	188	238

Table 5-22 presents the total forecasted vessel calls by vessel size class, channel depth, and year. This vessel call projection is used in the Transportation Cost Saving Model and the Tide delay and Congestion model.

Table 5-22: Total Projected Vessel Calls: Garden City Terminal

42-Foot Depth	2017	2020	2025	2030
SPX	497	593	758	947
PX	1,196	778	1,122	1,196
PPX1	479	866	1,006	1,421
PPX2	120	271	382	527
Total	**2,292**	**2,509**	**3,267**	**4,092**

44-Foot Depth	2017	2020	2025	2030
SPX	497	593	758	947
PX	1,135	700	992	1,067
PPX1	312	478	471	672
PPX2	239	533	761	1,035
Total	**2,183**	**2,304**	**2,982**	**3,720**

45-Foot Depth	2017	2020	2025	2030
SPX	497	593	758	947
PX	1,109	671	952	1,007
PPX1	312	474	467	666
PPX2	239	527	753	1,027
Total	**2,157**	**2,265**	**2,930**	**3,647**

46-Foot Depth	2017	2020	2025	2030
SPX	497	593	758	947
PX	1,096	658	932	982
PPX1	312	471	465	662
PPX2	239	524	749	1,021
Total	**2,144**	**2,247**	**2,903**	**3,613**

47-Foot Depth	2017	2020	2025	2030
SPX	497	593	758	947
PX	1,092	649	924	975
PPX1	312	471	462	661
PPX2	239	524	749	1,018
Total	**2,140**	**2,238**	**2,892**	**3,601**

48-Foot Depth	2017	2020	2025	2030
SPX	497	593	758	947
PX	1,092	649	924	975
PPX1	312	471	462	661
PPX2	239	524	749	1,018
Total	**2,140**	**2,238**	**2,892**	**3,601**

5.6 Without-project Conditions: Socio-Economic Profile

Table 5-23 presents the projected population growth for the five Georgia counties and two South Carolina counties in the local area around Savannah Harbor. Population growth for the local area is projected to be somewhat higher than the national average (1.09% average annual local growth vs. 0.83 average annual national growth). The population estimates for the City of Savannah are included in the Chatham County values.

Projected employment figures for the Georgia Counties are presented in Table 5-24. In general, projections for the five Georgia counties are consistent with a trend identified for all Georgia coastal counties, which is lower future employment in construction and manufacturing and high future employment in retail and services (Georgia Institute of Technology, 2006). Employment projections for the South Carolina counties are included in the South Carolina Department of Commerce projections for the Low Country Workforce Development Area. These projections indicate an employment increase of 14.64% for the workforce development area from 2004 through 2014. The ten-year average annual employment growth rate for the workforce development area is 1.38%.

Table 5-23: Local Area Population Projections

	2005	2030	25 Year Increase	Average Annual Increase
Bryan County, GA	30,520	45,986	50.67%	1.65%
Bulloch County, GA	65,445	82,111	25.47%	0.91%
Chatham County, GA	248,084	307,472	23.94%	0.86%
Effingham County, GA	47,032	79,935	69.96%	2.14%
Liberty County, GA	70,237	89,163	26.95%	0.96%
Beaufort County, SC	137,814	209,680	52.15%	1.69%
Jasper County, SC	21,452	29,180	36.02%	1.24%
Total 7-County Area	461,318	604,667	31.07%	1.09%
City of Savannah[1]	140,598	174,256	23.94%	0.86%

[1] Chatham County, GA

Sources: Georgia Coast 2030: Population Projections for the 10-County Coastal Region, Georgia Institute of Technology, Sept. 2006 and South Carolina Department of Commerce

Table 5-24: Local Area Employment Projections

	2000	2030	30 Year Increase	Average Annual Increase
Bryan County	7,000	13,500	92.86%	2.21%
Bulloch County	27,600	43,000	55.80%	1.49%
Chatham County	156,000	202,000	29.49%	0.87%
Effingham County	10,100	15,000	48.51%	1.33%
Liberty County	33,400	46,300	38.62%	1.09%
Total 5-County Area	234,100	319,800	36.31%	1.05%

Source: Georgia Coast 2030: Population Projections for the 10-County Coastal Region, Georgia

Institute of Technology, Sept. 2006

The Georgia Ports Authority identifies south eastern, south central, and north central states as their primary hinterland (Table 5-25). Historically, more than half of Garden City Terminal trade includes these states. Population projections provided by the US Census Bureau indicate that south eastern and south central state populations are projected to grow faster than the national average. Although north central state populations are projected to grow more slowly than the national average, Savannah Harbor's primary hinterland is projected to grow faster than the national average.

Table 5-25: Savannah Harbor Market Area Population Projections (2005 – 2030)

	2005	2030	25 Year Increase	Average Annual Increase
Total US	295,507,134	363,584,435	23.04%	0.83%
North Central[1]	28,877,479	31,228,171	8.14%	0.31%
South Central[2]	36,359,249	48,213,920	32.60%	1.14%
South East[3]	52,785,522	73,427,202	39.10%	1.33%
SH Market Area	118,022,250	152,869,293	29.53%	1.04%

[1] North Central States = IL, IN, KY, and MO
[2] South Central States = AR, KS, LA, OK, and TX
[3] South East States = AL, FL, GA, MS, NC, SC, and TN
Source: US Census Bureau, Population Division, Interim State Population Projections, 2005

5.7 Without-project Conditions: Environmental Resources

Overall, future without-project environmental conditions in the study area are projected to be very similar to existing conditions. There are four major influencing factors which will largely determine future without-project environmental conditions in the study area. These three factors include:

- Population growth and associated development;
- Sea-level rise;
- Federal, state, and local regulation; and
- Environmental management.

The influence of each of these factors on future without-project environmental conditions is discussed below.

5.7.1 Population Growth and Associated Development

Although strong population growth is projected to continue for the southeastern states, growth for the Savannah Metropolitan Statistical Area is projected to continue at approximately 1% annually (Savannah Chamber of Commerce, 2007). Urban and tourism-related waterfront development along the Savannah River is replacing some former water dependent industrial uses. Further development of the study area's water-borne transportation infrastructure is projected for the near future, which is driven largely by growth in the Port's hinterland. Expansion of the Elba Island LNG facility will increase LNG vessel traffic by as much as 80%. Planned port facility infrastructure improvements at the Garden City Terminal will increase TEU capacity to 6.5 million TEUs before 2020; although, the projected TEU volume will be less than half that amount in 2020. Under without-project conditions, vessel traffic at Garden City Terminals is expected to approximately double by 2024.

The residential and industrial development will convert more lands from natural areas to developed sites. Jasper County, South Carolina and the western portion of Chatham County and Effingham County, Georgia have experienced the most growth in recent years. Future population growth was presented in Table 5-23. One particular area that will likely develop is along the South Carolina boundary of the Savannah National Wildlife Refuge, in Jasper County. Topographic surveys have been prepared, and the land has been put on the market. Those lands currently serve as unofficial natural buffers to the Wildlife Refuge.

5.7.2 Sea-level rise

NOAA maintains a gage at Fort Pulaski that has collected data on sea level for over 70 years. Based on that data, the historic sea level change trend at Savannah is a rise of 2.98 mm/year (0.12 inches/year). That rate is a combination of the global sea-level rise and local vertical land movement. Numerous analyses have been conducted and reports prepared on the potential for larger changes in sea level and overall climate change in the future as a result of greenhouse gases and other variables. Most studies agree that the effects will differ by location, but the scientific opinions vary substantially on what those changes may be for a given location.

For this analysis, Savannah District believes that the most likely future condition at Savannah is a continuation of the historic trend (low rate) that has been measured at this location for over 70 years. If that rate continues for the 50-year period of analysis, the sea level would be ½ foot higher in Savannah in 2065 than it is at present. The Corps is required to consider other rates of sea-level rise in its evaluations (intermediate and high rates). Those rates would result in an increase in a sea level of up to 2.3 feet higher by 2065. As sea level rises in Savannah Harbor, the amount of tidal freshwater marsh is expected to decrease. The Cooperating Agencies believe the Corps should perform its basic evaluation of the proposed project using the present elevation of sea level. They also requested the Corps evaluate two other scenarios: a 25- and 50-cm (0.8- and 1.6-feet) rise by 2065. The EIS contains the information on the effects of the proposed alternatives under those three scenarios. The Cooperating Agencies also believe that the Corps should mitigate for wetland impacts expected to occur at the time of construction, instead of using an average condition expected to occur over the life of the project. In November 2011, the Office of the Assistant Secretary of the Army for Civil Works (OASA (CW)) concurred that this project should mitigate for wetland impacts expected to occur at the time of construction.

If the historic rate observed over the last 70+ years at Savannah has also occurred since the City was founded in 1733, the sea level would have been 2.8 feet lower when it was founded than it is at present. It would also have been roughly 1.5 feet lower than today during the 1860s when much of the present-day surrounding marsh was managed for rice production, which requires freshwater to flood the fields.

If the historic rate continues for the 50-year period of analysis for this project, the ½ foot higher sea level in Savannah in 2065 would have marginal impacts on marshes in the estuary. The Corps' analyses indicate that tidal freshwater marshes could be reduced by approximately 370 acres if the historic rate of sea-level rise continues to 2065. Higher amounts of sea-level rise could greatly alter marshes in the estuary. The tidal freshwater marsh would be the most affected, since it is generally bounded by bottomland hardwoods and cannot migrate upriver. If a higher rate occurs, the Savannah estuary could experience a significant loss of the remaining tidal freshwater marsh.

Sea-level rise would also affect other natural resources in the estuary, since it would change salinity levels. Fish species such as the endangered Shortnose sturgeon may lose some of their existing habitats if salinity levels increase too much. Chloride levels at the City of Savannah's water intake would also be expected to rise as saline ocean waters move further up the estuary. At some point, the City could find the river water unacceptable for the industries that it serves that desire low chloride levels in their makeup water. At that point, either the City or the industries would have to treat the makeup water or the industries would experience higher maintenance costs for their boilers.

Section 7.5.2.2 of the Engineering Appendix describes the results of the detailed analyses that the Corps performed concerning various sea-level rise scenarios. Section 12 of this document also addresses the effects of possible changes in sea level.

5.7.3 Environmental Regulations

Occurring concurrently with increases in population, urban development, and waterborne commerce will be a continuation of current environmental regulations, restoration efforts, and management which will bring about improvements in some aspects of future environmental conditions. Federal and state environmental regulations are expected to continue the pursuit of improved air and water quality. The study area is projected to remain an "Attainment Area" based on existing emission levels and low projected growth, even though regulations are expected to become more stringent. Future water quality in the Savannah River is expected to improve due to new dissolved oxygen Total Maximum Daily Load (TMDL) regulations, which are currently under development. The National Marine Fisheries Service is expected to continue developing marine traffic regulations that would improve the safety of marine mammals and sea turtles. Other than the new TMDL regulations, there are no major planned or foreseen regulatory changes which will significantly alter existing environmental conditions.

5.7.4 Environmental Management

Current environmental restoration and management efforts also are expected to continue under without-project conditions. The Savannah Harbor LTMS (1996) identifies numerous structural and operational management measures, which are being implemented to maintain environmental quality in the system. The LTMS also identifies restoration measures which have been constructed and are currently maintained (Section 2 Prior Studies, Reports, and Projects). In addition to the LTMS, the Savannah Harbor DMMP identifies future without-project dredging volumes and schedules, dredging methods, beneficial uses, and dredged material placement plans. All of the environmental management and restoration actions prescribed in the LTMS and DMMP are expected to continue under without-project conditions.

Environmental management and restoration measures identified in the LTMS and DMMP, which are expected to continue under without-project conditions, include the following.

- Rotational use of confined disposal areas to improve migratory bird and shorebird habitat;
- Nesting island construction and maintenance to improve bird habitat;
- Maintenance of preferred habitat characteristics, such as non-vegetated island areas;
- Wetland restoration and creation;
- Operation of water control structures within the Savannah National Wildlife Refuge in order to maintain and improve migratory waterfowl habitat; and
- Beneficial use of dredged materials for indirect beach nourishment.

In addition, maintenance of sediment traps and advance maintenance dredging of navigation channels is expected to continue.

Continued improvement is expected in the Striped bass population in the Savannah River estuary. The states of Georgia and South Carolina recently reopened this recreational fishery. Analyses indicate that this species has resumed limited natural spawning in the estuary. The population of Shortnose sturgeon within the estuary is expected to remain stable at low numbers of individuals.

5.8 Without-Project Conditions: Study Area Cultural Resources

No significant changes to the Savannah National Historic Landmark District or to Old Fort Jackson are projected under without-project conditions. Shoreline erosion at Fort Pulaski National Monument is projected to continue at observed rates, as identified in Section 4.9.2. Under future without-project conditions, the wreck of CSS *Georgia* will remain on the northern bank of the navigation channel. Maintenance of the channel width would continue to be restricted in that location to avoid impacting the wreck.

6 Formulation of Alternative Plans

Plan formulation is the process of building plans that meet planning objectives and avoid planning constraints. Once the study's objectives and constraints have been identified, many professional disciplines are required to use their knowledge, experience, and judgment to define the combination of management measures that comprise different alternative plans. These plans are then developed in sufficient detail so that a realistic evaluation and comparison of the plan's contributions to the planning objectives and other effects can be identified, measured, and considered.

Plan formulation has been conducted for this study with a focus on contributing to NED with consideration of all effects, beneficial or adverse, to each of the four evaluation accounts identified in the Principles and Guidelines (1983), which are National Economic Development, Environmental Quality, Regional Economic Development, and Other Social Effects. This chapter walks the reader through the development of alternative plans for the Savannah Harbor Expansion Study.

6.1 Planning Goals

Goals are the broad, over-arching purposes for a study. They may be developed from a variety of sources, and given to a study team prior to beginning their tasks. They may be defined by the non-Federal partner or any other stakeholder, and will be unique to each study. The P&G, described in Chapter 1, presents the Federal objective as "…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." Generally, the planning goals are the objectives of some organization higher up in the hierarchy. Likewise, the Federal objective is also known as the NED goal to its water resource agencies like the Corps. Therefore, the primary planning goal for this study is to recommend a navigation plan for the Savannah River channel that contributes to the national economic development consistent with protecting the nation's environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements."

The cooperating agencies (USEPA, USFWS, and NMFS) also collaborated on the development of a set of goals related to the planning process and project-related outcomes. These goals are consistent with the Cooperating Agency Vision Statement (see Plan Formulation Appendix), and are listed below.

<u>Cooperating Agency Process Related Goals:</u>

- Determine the specific and differential incremental effects of each channel improvement alternative;