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SOUTH CAROLINA STATE PORTS AUTHORITY

FUTURE TERMINAL SITE ALTERNATIVES

Planning Committee Presentation
August 5, 1987

SOUTH CAROLINA STATE PORTS AUTHORITY

FUTURE TERMINAL SITE ALTERNATIVES

This study was undertaken by the Authority's staff in conjunction with the Facility Requirements Study performed by Cresap, McCormick and Paget. Its purpose was to identify potential locations for a new terminal in the Charleston area should the need for such a facility be proven by the CMP report.

The scope of the search centered on both banks of the Cooper River and on Charleston Harbor. Sites on the Wando and Ashley Rivers were excluded due to environmental, legal, and logistical constraints.

Although alternatives are limited by the presence of the U. S. Navy installations in Charleston and by private development along the waterfront, six potential sites were surfaced for review. Each of these is analyzed in detail on the following pages and shown on the attached map. The final page shows the distance of each site, along with existing terminals, from the open sea. Cost estimates are based on comparative data and include all structures and cranes, but exclude land acquisition.

The locations to be considered for future terminal development are:

- Site 1 Oil Terminals
- Site 2 Clouter Creek
- Site 3 Thomas Island
- Site 4 Daniel Island
- Site 5 Coal Tipple
- Site 6 Drum Island

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POTENTIAL TERMINAL SITE #1

Location: Oil Terminals - North Charleston

Size: 189.22 acres of high land; 11.74 acres of marsh

Description: The area is currently used for receipt, storage and distribution of bulk oil and petroleum products and for receipt of alumina for Alumax. Improvements to the property include oil storage tanks, maintenance shops, warehouses, offices, etc.

Available Infrastructure: The site is adjacent to the I-526 Expressway, has railroad access and all utilities available.

Terminal Capacity: Container storage area = 145 acres
Berth space = 4,200 linear feet
Acres per berth = 29 acres

Current Ownership: Hess, Marathon, Texaco, Shell, American Petrofina, David Maybank et al

Proposed Method of Acquisition: Purchase and/or condemnation; total 1985 county appraisal was \$25,967,000

Construction Time Requirement: 2 years to operation
5 years to completion

Estimated Construction Cost: \$119,663,000 or \$23,932,600/berth

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- PROS:
- Adjacent to new Mark Clark Expressway
 - Rail service available from CSX and Norfolk Southern
 - All utilities and fire protection available
 - Located on the Federal channel
 - Reasonably good soil conditions
- CONS:
- Difficulty and expense of acquisition
 - Elimination of all but two bulk oil terminals in Charleston
 - Elimination of Alumax's alumina receiving facility
 - Limited back-up area per berth
 - Separation of CFS and container storage areas
 - Destruction of one to two acres of marsh

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POTENTIAL TERMINAL SITE #2

Location: Clouter Creek

Size: 200 acres of high land; 131 acres of marsh

Description: The site currently is wooded with some farm land and contains about five houses; there is no channel.

Available Infrastructure: The site is about one mile from the I-526 interchange and has electricity available.

Terminal Capacity: Container storage area = 186 acres
Berth space = 6,400 linear feet
Acres per berth = 23.3 acres

Current Ownership: Various; largely property of heirs

Proposed Method of Acquisition: Purchase and/or condemnation

Construction Time Requirement: 3 years to operation
5 years to completion

Estimated Construction Cost: \$262,513,000 or \$32,814,125/berth

PROS: ● Close to new Mark Clark Expressway
● Mostly vacant land
● Good soil conditions
● Power available
● Would allow for good terminal layout

CONS: ● No sewer or water or fire protection available
● 8 miles to nearest rail service
● Not on the Federal channel; requires hazardous turn
● Requires clearing of 200 wooded acres and destruction of marsh
● Requires dealing with multiple owners and relocation of homes
● Limited back-up area per berth
● Would eliminate 19 acres of current dredge disposal area
● Requires major initial dredging and possibly significant maintenance dredging

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POTENTIAL TERMINAL SITE #3

Location: Thomas Island - Junction of Clouter & Beresford Creeks

Size: 240 acres of high land; 218 acres of marsh

Description: The site currently is wooded with some farm land and contains about five houses; soil conditions are poor, and there is no channel

Available Infrastructure: The site is about 1000 ft. from the I-526 interchange and has electricity available

Terminal Capacity: Container storage area = 225 acres
Berth space = 6,400 linear feet
Acres per berth = 28.1 acres

Current Ownership: Various

Proposed Method of Acquisition: Purchase and/or condemnation

Construction Time Requirement: 4 years to operation
6 years to completion

Estimated Construction Cost: \$403,891,000 or \$50,486,375/berth

PROS: ● Close to new Mark Clark Expressway
● Mostly vacant land
● Power available

CONS: ● No sewer or water or fire protection available
● 10 miles to nearest rail service, requiring a 1/2 mile trestle
● Poor soil conditions; elevation of only 0' - 10' MLW
● Not on the Federal channel
● Requires clearing of 200 wooded acres and destruction of marsh
● Requires dealing with multiple owners and relocation of homes
● Limited back-up area per berth
● Would eliminate 9 acres of current dredge disposal area
● Requires major initial dredging and possibly significant maintenance dredging
● Would provide a poor terminal layout

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POTENTIAL TERMINAL SITE #4

Location: Daniel Island - West side

Size: 800 acres of high land; 100 acres of marsh

Description: The site is on the Federal channel; a major portion is now farm land which had previously served as a dredge disposal area; the remaining portion is currently used for disposal; soil conditions are poor, and there are no buildings on the property; electricity is available

Available Infrastructure: None on site

Terminal Capacity: Container storage area = 414 acres
Berth space = 7,200 linear feet
Acres per berth = 46 acres

Current Ownership: Harry Frank Guggenheim Foundation

Proposed Method of Acquisition: Purchase and/or condemnation

Construction Time Requirement: 5 years to operation
10 years to completion

Estimated Construction Cost: \$422,348,000 or \$46,927,555/berth

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- PROS:
- About 4 miles to new Mark Clark Expressway
 - Mostly farm land with no structures
 - On the Federal channel
 - One owner with interest in port's presence
 - Ample back-up area per berth
 - Power available
 - Would allow for good terminal layout
- CONS:
- No sewer or water or fire protection available
 - 12.5 miles to nearest rail service, requiring one mile trestle
 - Poor soil conditions; old disposal area on marsh
 - Near Navy restricted area and degaussing facility
 - Requires destruction of 100 acres of marsh

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POTENTIAL TERMINAL SITE #5

Location: Coal Tipple Area

Size: 158 acres of high land; 197 acres of marsh; 20 acres of water

Description: The site is on the Federal channel; soil conditions are poor due to shredded waste land fill, marsh and water

Available Infrastructure: The site is one block from a city street, has railroad access and all utilities available

Terminal Capacity: Container storage area = 265 acres
Berth space = 6,895 linear feet
Acres per berth = 33.1 acres

Current Ownership: SCSPA, J. C. Long, & Seaboard Coastline Railroad

Proposed Method of Acquisition: Purchase and/or condemnation

Construction Time Requirement: 5 years to operation
10 years to completion

Estimated Construction Cost: \$365,780,000 or \$45,722,500/berth

- PROS:
- On the Federal channel
 - Rail service available from CSX and Norfolk Southern
 - All utilities and fire protection available
 - Approximately one mile to I-26 access
 - SCSPA presently owns 158 acres of the area
 - Mostly vacant land
 - Fair amount of back-up area per berth
 - Would allow for a fair terminal layout
- CONS:
- Would require vessels to make a very hazardous turn around north end of Drum Island
 - Poor soil conditions; water, marsh, old disposal area and landfill site on marsh
 - Destruction of 217 acres of marsh

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POTENTIAL TERMINAL SITE #6

Location: Drum Island

Size: 180 acres of disposal area; 35 acres of marsh

Description: The site is currently used for dredge material disposal;
it is on the Federal channel, but soil conditions are poor

Available Infrastructure: None

Terminal Capacity: Container storage area = 177.2 acres
Berth space = 4,800 linear feet
Acres per berth = 29.5 acres

Current Ownership: South Carolina State Ports Authority

Proposed Method of Acquisition: N/A

Construction Time Requirement: 7 years to operation
13 years to completion

Estimated Construction Cost: \$310,090,000 or \$51,681,666/berth

PROS: ● Land owned by the Authority
● On the Federal channel
● Vacant land

CONS: ● Would eliminate an active dredge disposal area
● Poor soil conditions
● No sewer, water, utilities or fire protection
● No rail or highway access
● Destruction of 35 acres of marsh and the bird rookery
● Possible interference with a new Cooper River bridge
● Would require docking of vessels close to the main spans of the Cooper River bridges

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FUTURE TERMINAL SITE ALTERNATIVES

---- CONCLUSIONS ----

After thorough review of the site alternatives, Daniel Island appears to offer the greatest potential for a future terminal location. The other sites are limited in size and do not allow the long term flexibility found in the Daniel Island property. While the cost of constructing the terminal is high it compares favorably with the alternatives when the capabilities of the resulting facility are considered.

The current site of the oil terminals in North Charleston provides a low cost option with the advantages of good intermodal connections, but acquisition of this property is unlikely. Also, this would provide only a small terminal with limited incremental capacity.

The sites on Clouter Creek and Thomas Island have as their major disadvantage limited access by container vessels. Extensive dredging would be required to make either accessible, and terminal size would still be limited.

The coal tipple property, while it has many inland transportation advantages, is a relatively small area with extremely poor soil conditions. Here too, there would be concerns regarding ease of vessel access to the berths.

Drum Island, already owned by the Authority, would be a high cost alternative due to its lack of access to land transportation. Terminal size would be limited and allow no expansion possibilities.

An optimal development schedule for a Daniel Island terminal should begin with acquisition of sufficient property to allow for expansion as market growth dictates. Two or three berths with back-up storage and a rail yard could be provided initially with future development of up to nine berths timed to meet cargo throughput requirements.

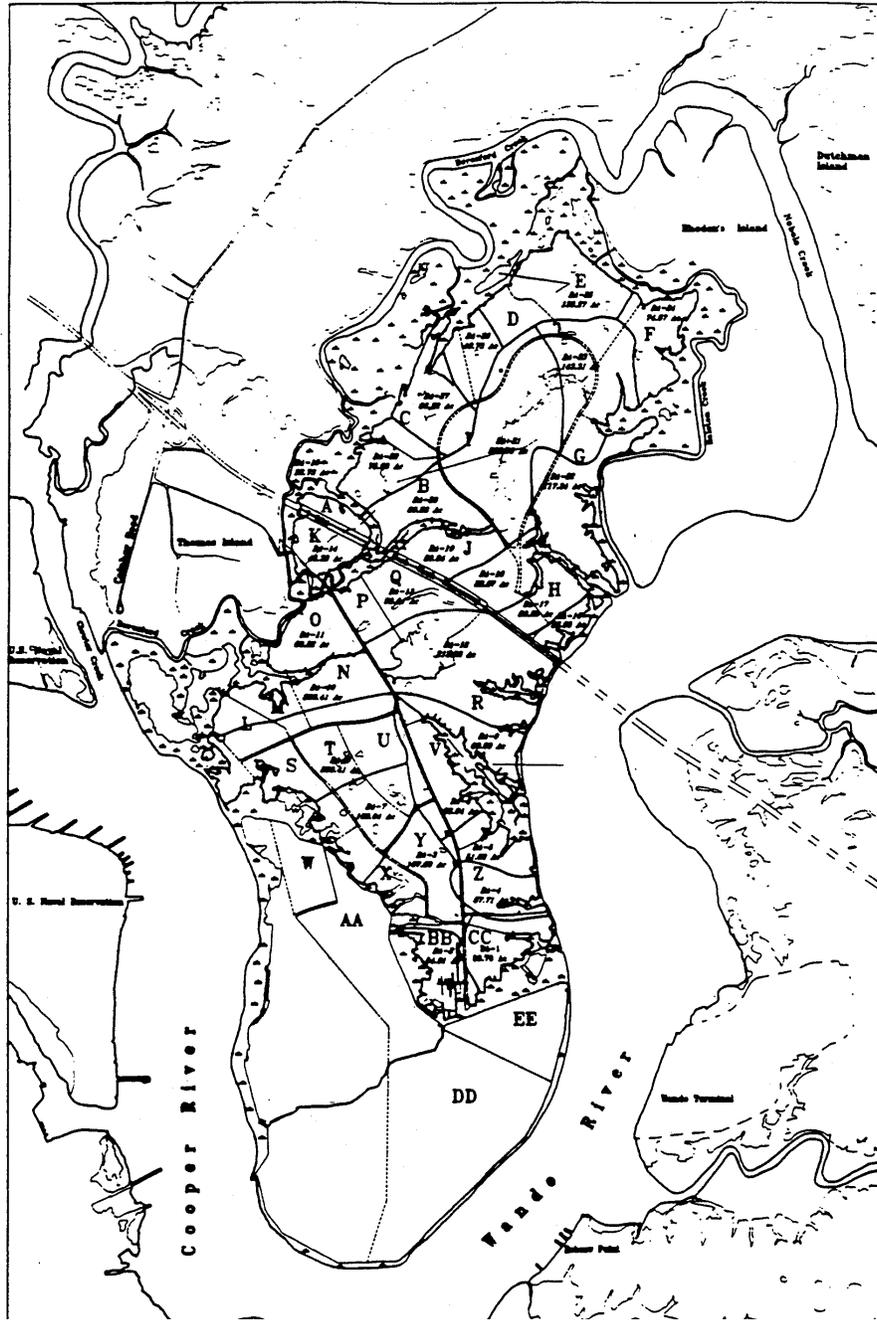
Although only five years would be required to get the initial facility into operation, early acquisition of the property should present the benefits of lower land acquisition costs, ample time to obtain necessary permits, and time for a slower, less capital intensive development of the property.

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TERMINAL SITE DISTANCES TO THE
OPEN SEA IN NAUTICAL MILES

* Union Pier	12.6
* Columbus Street	13.2
Drum Island	14.6
Daniel Island	16.0
Coal Tipple	16.0
* Wando	17.7
Thomas Island	17.8
Oil Terminals	18.6
* North Charleston	20.9
Clouter Creek	23.3

* Existing terminal sites.



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SOUTH CAROLINA STATE PORTS AUTHORITY
TERMINAL X LOCATION STUDY

SUMMARY OF MAJOR FINDINGS

June 19, 1991



SOUTH CAROLINA STATE PORTS AUTHORITY
TERMINAL X LOCATION STUDY

CRITICAL FACTORS

- 1. SITE CHARACTERISTICS**
- 2. HIGHWAY ACCESSIBILITY**
- 3. RAIL ACCESSIBILITY**
- 4. ENVIRONMENTAL CONCERNS**
- 5. NAVIGATIONAL ACCESSIBILITY**
- 6. DREDGING CONSIDERATIONS**
- 7. MARKETABILITY CONCERNS**
- 8. COST CONSIDERATIONS**

SITE CHARACTERISTICS

- **CARGO VOLUME PROJECTIONS INDICATE THE ULTIMATE NEED FOR AN EIGHT BERTH (8,000 FEET) FACILITY WITH 50 ACRES OF CONTAINER YARD PER BERTH.**
- **A TOTAL OF 700 TO 750 ACRES ARE NECESSARY TO PROVIDE FOR THE OPERATING AREA AND TERMINAL INFRASTRUCTURE SUCH AS INTERCHANGE LANES, CFS, MAINTENANCE FACILITIES, ETC.**
- **THE TERMINAL SHOULD HAVE MINIMUM ELEVATION OF 15 FEET AT BERTH FRONT.**
- **GEOTECHNICAL EVALUATIONS DONE BY WESTINGHOUSE ENVIRONMENTAL SHOW STABILIZATION OF SURFACE SOILS AND FOUNDATIONS FOR WHARF AND LANDSIDE STRUCTURES TO BE COSTLY FOR ALL SITES.**
- **SITES UNDER CONSIDERATION ARE ACTIVE OR FORMER DREDGE MATERIAL DISPOSAL AREAS; AND ADEQUATE BEARING STRATA IS GENERALLY ENCOUNTERED ONLY IN THE MINUS 40 TO MINUS 60 FOOT ELEVATION RANGE.**
- **CLOUTER ISLAND IS OWNED BY THE AUTHORITY AND THE NAVY, WHILE DANIEL ISLAND IS OWNED BY THE GUGGENHEIM FOUNDATION.**
- **CLOUTER ISLAND IS UNDER PERPETUAL EASEMENT TO THE CORPS OF ENGINEERS.**
- **THE NAVY ACQUIRED A 100 FOOT EASEMENT ALONG THE COOPER RIVER BANK OF DANIEL ISLAND TO BLOCK DEVELOPMENT OPPOSITE ITS FACILITIES.**
- **BERKELEY COUNTY WATER AND SEWER AUTHORITY HAS DEVELOPED A PLAN TO PROVIDE WATER AND SEWER SERVICES TO MEET THE REQUIREMENTS OF THE GUGGENHEIM FOUNDATION'S PROPOSED DEVELOPMENT OF DANIEL ISLAND.**

HIGHWAY ACCESSIBILITY

- CAINHOY ROAD IS CURRENTLY THE ONLY ACCESS TO THOMAS AND DANIEL ISLANDS FROM S.C. 41.
- THE ONLY I-526 INTERCHANGE NOW PLANNED WILL BE AT CAINHOY ROAD ON THOMAS ISLAND.
- A SECOND I-526 INTERCHANGE HAS BEEN PROPOSED ON DANIEL ISLAND; ENDORSED BY THE SCDHPT; APPROVAL RESTS WITH THE FHWA; NO FUNDING HAS BEEN ALLOCATED.
- PRELIMINARY PLANNING CALLS FOR THE TERMINAL ACCESS ROAD TO HAVE TWO LANES ON AN 80 FOOT RIGHT-OF-WAY; BRIDGES SHOULD BE DESIGNED AS FOUR LANES.
- CURRENT BRIDGE CLEARANCE REQUIREMENTS ARE FOR 65 FEET OVER CLOUTER CREEK; ANY LOW-LEVEL BRIDGE, WHETHER FIXED OR MOVABLE SPAN, WOULD REQUIRE APPROVAL FROM FEDERAL AND STATE AGENCIES.
- CONSTRUCTION COST ASSUMPTIONS (PER WILBUR SMITH ASSOCIATES):
 - TWO-LANE ASPHALT ROAD = \$100/LF
 - HIGH-LEVEL BRIDGE = \$65/SF
 - LOW-LEVEL FIXED BRIDGE = \$40/SF
 - LOW-LEVEL MOVABLE BRIDGE = \$400/SF

RAIL ACCESSIBILITY

- **THE EAST COOPER AND BERKELEY ROUTE OF CSX WHICH TERMINATES AT AMOCO IS THE CLOSEST TRACKAGE; THE DISTANCE TO NORTH CHARLESTON BY WAY OF CORDESVILLE IS OVER 40 MILES.**
- **WHILE A RAIL BRIDGE OVER THE COOPER RIVER PROVIDES THE SHORTEST ACCESS, OBJECTIONS FROM THE NAVY, OPERATING RESTRICTIONS, CLEARANCE REQUIREMENTS, AND COST MAKE THIS OPTION INFEASIBLE.**
- **COMPETITIVE ACCESS TO RAIL FACILITIES BY CSX AND NORFOLK SOUTHERN IS A NECESSITY.**
- **CONSTRUCTION COSTS WILL BE REDUCED BY COMBINING RAIL AND HIGHWAY RIGHTS-OF-WAY AND BRIDGES WHERE POSSIBLE.**
- **COST PER MILE OF TRACK IS ESTIMATED TO BE \$900 THOUSAND TO \$1 MILLION, PER S.C. PUBLIC RAILWAYS COMMISSION.**

ENVIRONMENTAL CONCERNS

- THE COOPER RIVER WATERFRONT IS GENERALLY OCCUPIED BY U.S. NAVAL OPERATIONS, INDUSTRIAL USERS, AND PRIVATE TERMINAL OPERATORS, AND ITS WATERS ARE CLASSIFIED SC.
- DEVELOPMENT ALONG THE LOWER WANDO RIVER IS GENERALLY RESIDENTIAL WITH THE EXCEPTION OF THE WANDO TERMINAL; WATER CLASSIFICATION IS SA TO THE NORTH AND SB IN FRONT OF THE TERMINAL.
- BECAUSE THE SITES ARE ALL PRESENT OR FORMER DREDGE DISPOSAL AREAS THE LAND HAS NO SIGNIFICANT ENVIRONMENTAL VALUE AND THERE IS LITTLE MARSH BETWEEN THE SITES AND THE NAVIGATION CHANNELS; HOWEVER, THE AMOUNT OF DREDGING TO BE DONE MAY RAISE ENVIRONMENTAL QUESTIONS.
- NAVY OBJECTS TO A TERMINAL OPPOSITE ITS FACILITIES FOR THREE REASONS:
 1. SECURITY THREAT POSED BY PRESENCE OF FOREIGN VESSELS AND CREW.
 2. INTERFERENCE WITH MAGNETIC SILENCING FACILITY OPERATIONS IN THE RESTRICTED AREA.
 3. POTENTIAL SAFETY HAZARD TO SHIPS MOORED IN THE VICINITY OF A TURNING BASIN.
- THE GUGGENHEIM FOUNDATION HAS PREPARED A DEVELOPMENT PLAN WHICH INCLUDES NO PORT TERMINAL OR INDUSTRIAL DEVELOPMENT ON DANIEL ISLAND.
- CITY OF CHARLESTON TOOK STEPS IN DECEMBER 1990 TO ANNEX DANIEL ISLAND AND INDICATED OPPOSITION TO A PORT FACILITY ON THE ISLAND; MORE RECENTLY THE CITY HAS MOVED TO EXCLUDE ANY INDUSTRIAL/PORT DEVELOPMENT THROUGH ZONING.
- THE AUTHORITY'S LEASE ON THE 700 PLUS ACRE DREDGE DISPOSAL SITE ON THE TIP OF DANIEL ISLAND EXPIRES JANUARY 1993.

NAVIGATIONAL ACCESSIBILITY

● **ANNUAL VESSEL COUNTS:**

TERMINAL	FY 1990	FY 1989
UNION PIER	127	121
COLUMBUS STREET	362	525
NORTH CHARLESTON	366	372
WANDO	361	362
TOTAL	1,216	1,380

● **LARGEST VESSELS NOW CALLING CHARLESTON:**

TERMINAL	LINE	LENGTH	BEAM
WANDO	MAERSK	965 FEET	106 FT
COLUMBUS STREET	SEA-LAND	950 FEET	106 FT
NORTH CHARLESTON	EVERGREEN	886 FEET	106 FT

- MARINE SAFETY INTERNATIONAL WAS HIRED TO ASSESS THE SUITABILITY OF ALTERNATE TERMINAL SITES AND MAKE RECOMMENDATIONS BASED ON THE RESULTS OF COMPUTERIZED SHIPHANDLING SIMULATIONS.
- THE CORPS OF ENGINEERS AND CHARLESTON PILOTS WERE BROUGHT IN DURING THE SPRING OF 1990 TO LOOK AT CHANNEL CONFIGURATIONS AND ACCESS TO ALTERNATE TERMINAL SITES.
- WATERWAYS EXPERIMENT STATION DID HYDRODYNAMIC MODELING STUDIES TO PROVIDE CURRENTS FOR THE MSI MODEL.
- IT WAS DETERMINED AT THE BEGINNING OF THE STUDY THAT THE WANDO SITE ON DANIEL ISLAND DID NOT REQUIRE SIMULATION DUE TO ITS DIRECT ACCESSIBILITY FROM THE SHIPPING CHANNEL.
- TWO SHIP MODELS WERE USED IN THE SIMULATION: THE SEA-LAND ECON SHIP NOW CALLING CST, AND A C10 CONTAINERSHIP USED BY APL (A POST-PANAMAX VESSEL MEASURING 903 FEET IN LENGTH WITH A 130 FOOT BEAM).

NAVIGATIONAL ACCESSIBILITY (CONTINUED)

- **SIX CHARLESTON HARBOR PILOTS AND FOUR DOCKING PILOTS PARTICIPATED IN A TOTAL OF 120 SIMULATION RUNS TO DEVELOP THE STUDY RESULTS.**

- **MAJOR CONCLUSIONS COMING OUT OF THE NAVIGATION SIMULATION STUDY ARE:**
 - **LARGE CONTAINERSHIPS COULD, WITH SOME RESTRICTIONS, ACCESS ALL THREE OF THE ALTERNATE TERMINAL SITES.**
 - **THE DANIEL ISLAND SITE ON THE WANDO RIVER WOULD PROVIDE THE MOST UNRESTRICTED AND SAFEST ACCESS.**
 - **THE CLOUTER ISLAND SITE WOULD REQUIRE ONE-WAY TRAFFIC OF LARGE VESSELS FROM BELOW THE COOPER RIVER BRIDGES TO INSURE SAFE AND ROUTINE ACCESS.**
 - **THE DANIEL ISLAND SITE ON THE COOPER RIVER WOULD REQUIRE TUG SUPPORT FROM THE COOPER RIVER BRIDGES FOR THE SAFE AND ROUTINE ACCESS OF LARGE CONTAINERSHIPS.**
 - **RESTRICTIONS ARE ANTICIPATED AT THE CLOUTER CREEK SITE FOR SPECIFIC SHIPS; EVEN IN THE CASE OF ONE-WAY TRAFFIC.**
 - **MODIFICATIONS TO THE FEDERAL CHANNEL DESIGN MAY MITIGATE SOME ACCESS PROBLEMS.**
 - **CHANGES IN CURRENT PATTERNS AT MYERS BEND CAUSED BY NEW DREDGING MAY ADVERSELY EFFECT VESSEL TRAFFIC GOING TO TERMINALS FURTHER UP THE COOPER RIVER.**

DREDGING CONSIDERATIONS

● UPLAND DISPOSAL SITES IN CHARLESTON HARBOR:

DISPOSAL SITE	CONTAINED ACRES	OWNERSHIP/CONTROL
Morris Island	548	SCSPA
Drum Island	148	SCSPA
Daniel Island	676	SCSPA
Clouter Creek	1,496	30% SCSPA/70% Navy
Naval Weapons Station	300	Navy
Yellow House Creek	596	SCSPA/Navy
TOTAL	3,764	

- SCSPA OWNS THE MORRIS ISLAND, DRUM ISLAND, CLOUTER CREEK, AND YELLOW HOUSE CREEK SITES (1,741 CONTAINED ACRES). THE DANIEL ISLAND SITE (676 CONTAINED ACRES) IS LEASED UNTIL JANUARY 12, 1993.
- THE COOPER RIVER REDIVERSION PROJECT WAS PLACED IN OPERATION IN SEPTEMBER 1985 AND REDUCED THE FRESH WATER DISCHARGE RATE AT THE PINOPOLIS DAM FROM 15,600 CFS TO 4,500 CFS.
- BECAUSE OF THE RELATIONSHIP BETWEEN DISCHARGE AND SHOALING RATES IN CHARLESTON HARBOR, THE REDIVERSION PROJECT IS ULTIMATELY EXPECTED TO REDUCE SHOALING BY 70%.
- THE ESTIMATED ANNUAL DREDGING RATE FOR A FRESH WATER FLOW OF 15,600 CFS IS 9.2 MILLION CUBIC YARDS AND FOR 4,500 CFS IS 4.7 MILLION CUBIC YARDS.
- THE CHARLESTON HARBOR DEEPENING PROJECT AUTHORIZED IN 1986 IS 62% COMPLETE AND WILL MAINTAIN THE CHANNELS AT 40 FEET MEAN LOW WATER.
- THE PROJECT WHEN COMPLETE WILL INVOLVE DREDGING OF AN ESTIMATED 20 MILLION CUBIC YARDS OF MATERIAL AT A TOTAL COST OF APPROXIMATELY \$80 MILLION; THIS MATERIAL WILL BE DEPOSITED IN THE OCEAN DISPOSAL SITE.

DREDGING CONSIDERATIONS (CONTINUED)

- **THE CHARLESTON OCEAN DISPOSAL SITE IS AN 11 SQUARE MILE AREA AND WILL BE REDUCED TO A THREE SQUARE MILE AREA ONCE THE DEEPENING PROJECT IS COMPLETE PER EPA DESIGNATION.**
- **CURRENT BERTH MAINTENANCE DREDGING AT UNION PIER TERMINAL AND COLUMBUS STREET TERMINAL IS PERMITTED FOR OCEAN DISPOSAL; PLANS ARE TO HAVE WANDO MAINTENANCE PERMITTED FOR OCEAN DISPOSAL ALSO.**
- **INITIAL CONSTRUCTION DREDGING REQUIRED FOR A NEW TERMINAL SITE WOULD NECESSITATE OCEAN DISPOSAL DUE TO VOLUMES OF MATERIAL TO BE DREDGED.**
- **WATERWAYS EXPERIMENT STATION PERFORMED A PRELIMINARY EVALUATION OF POTENTIAL IMPACTS TO CHANNEL AND FACILITY SHOALING AND MAINTENANCE DREDGING REQUIREMENTS ASSOCIATED WITH DEVELOPMENT OF THE ALTERNATIVE COOPER RIVER TERMINAL SITES.**
- **EACH OF THE ALTERNATIVE LOCATIONS RESULTED IN INCREASING THE SHOALING VOLUME AND RATE, AND THEREFORE THE REQUIRED MAINTENANCE DREDGING REQUIREMENT.**
- **TOTAL SHOALING WAS PREDICTED TO INCREASE APPROXIMATELY 238% FOR A DANIEL ISLAND FACILITY CONDITION AND ABOUT 327% FOR THE CLOUTER CREEK FACILITY CONDITION. THE CLOUTER CREEK FACILITY WILL REQUIRE 72% MORE AREA TO BE MAINTAINED THAN THE DANIEL ISLAND FACILITY.**
- **CHARLESTON DISTRICT OFFICE OF THE CORPS CONDUCTED A LONG TERM MANAGEMENT STRATEGY TO DETERMINE FUTURE UPLAND DREDGE DISPOSAL SITE REQUIREMENTS IN CHARLESTON HARBOR. *THE BASIC CONCLUSION OF THE STUDY WAS THAT THE SCSPA MUST PROVIDE ACREAGE EQUIVALENT TO THAT AVAILABLE TODAY FOR THE NEXT 50 YEARS.***
- **COSTS OF INITIAL CONSTRUCTION AND MAINTENANCE DREDGING WILL BE DEPENDENT ON VOLUMES OF MATERIAL, DISTANCE TO OCEAN, AND TYPES OF EQUIPMENT TO BE USED.**

MARKETABILITY CONCERNS

- AN IMPORTANT PART OF A STEAMSHIP LINE'S DECISION ON TERMINAL LOCATION IS ITS TOTAL OPERATING COST AS WELL AS TRANSIT TIME, WITH OPERATIONS CONSTRAINTS BEING A MAJOR CONCERN.
- DISTANCES IN NAUTICAL MILES AND ESTIMATED SAILING TIMES FROM THE SEA BUOY, WHERE PILOTS BOARD THE VESSEL, TO EXISTING TERMINALS AND ALTERNATE SITES ARE:

TERMINALS/ALTERNATE SITES	DISTANCE	HOURS
COLUMBUS STREET	15	1.00
WANDO	17	1.25
NORTH CHARLESTON	22	2.25
CLOUTER ISLAND	22	2.25
DANIEL ISLAND - COOPER	18	1.75
DANIEL ISLAND - WANDO	17	1.25

- THE NAVIGATION STUDY SHOWED THAT LARGE CONTAINERSHIPS CAN ACCESS ALL SITES WITH CERTAIN CONDITIONS.
- THE NAVIGATION STUDY DETERMINED THAT SOME SHIP TRAFFIC RESTRICTIONS MIGHT BE NECESSARY BASED ON CURRENT CHANNEL DESIGN IF THE CLOUTER ISLAND SITE IS SELECTED (I.E., ONE-WAY TRAFFIC OF LARGE VESSELS, ADDITIONAL TUGS).
- USING TWO DIFFERENT SHIPS AND PUBLISHED TUG RATES, A COMPARISON OF SITES BASED ON TOTAL INBOUND AND OUTBOUND COSTS IS AS FOLLOWS:

TUG COST PER VESSEL CALL	EVERGREEN GX CLASS	SEA-LAND ATLANTIC CLASS
CLOUTER ISLAND	\$ 6,200	\$ 15,500
DANIEL ISLAND-COOPER	5,800	12,700
DANIEL ISLAND-WANDO	5,800	8,600

- THE HIGHER COST FOR THE SEA-LAND VESSEL REFLECTS ITS POOR HANDLING CHARACTERISTICS AND THE REQUIREMENT FOR MORE TUG ASSISTANCE.

MARKETABILITY CONCERNS (CONTINUED)

- **AS A COMPETITIVE COMPARISON, VESSELS IN SAVANNAH MUST TRAVEL 26 MILES TO GARDEN CITY TERMINAL WHICH REQUIRES ABOUT 3.5 HOURS DUE TO A NARROWER CHANNEL WHICH TRANSLATES INTO SLOWER SPEEDS.**
- **THE SEA-LAND VESSELS FORMERLY CALLED IN SAVANNAH WHEN OWNED BY U.S. LINES --- SHIP TRAFFIC WAS LIMITED TO ONE-WAY, THE VESSELS REQUIRED FOUR TUGS AND FOUR HOURS TO REACH THE TERMINAL.**

COST CONSIDERATIONS

● THE MAJOR COST ELEMENTS TO BE CONSIDERED ARE:

- TERMINAL CONSTRUCTION AND EQUIPMENT
- HIGHWAY AND RAIL ACCESS CONSTRUCTION
- DREDGING
- LAND ACQUISITION

● TERMINAL CONSTRUCTION AND EQUIPMENT COSTS:

- REGARDLESS OF TERMINAL LOCATION, A NUMBER OF COSTS WILL BE THE SAME, I.E., FINAL GRADING AND PAVEMENT, UTILITIES, STORMWATER MANAGEMENT, BUILDINGS, WHARF, INTERMODAL RAIL YARD, AND CRANES AND OTHER EQUIPMENT.
- HOWEVER, THE COSTS OF SOIL STABILIZATION AND FILLING AND ROUGH GRADING THE SITE WILL VARY GREATLY AMONG LOCATIONS.
- TERMINAL X WILL BE CONSTRUCTED IN PHASES AS DICTATED BY DEMAND. PHASE ONE WILL BE 2,000 FEET OF BERTH AND 120 ACRES OF CONTAINER YARD; AND ULTIMATE DEVELOPMENT INCLUDES 8,000 FEET OF BERTH AND A 400 ACRE CONTAINER YARD.
- ESTIMATED COSTS (MILLIONS):

DESCRIPTION	PHASE ONE	TOTAL
NON-SITE SPECIFIC	\$ 140	\$ 490
SITE SPECIFIC	\$ 52 - 63	\$ 174 - 210
TOTAL	\$ 192 - 203	\$ 664 - 700

● HIGHWAY AND RAIL ACCESS CONSTRUCTION COSTS:

- THE NEAREST HIGHWAY ACCESS FOR ALTERNATIVE TERMINAL SITES WILL BE THE I-526 INTERCHANGE AT CAINHOY ROAD ON THOMAS ISLAND --- APPROXIMATELY ONE MILE TO THE CLOUTER ISLAND SITE AND THREE MILES TO THE DANIEL ISLAND SITES.

COST CONSIDERATIONS (CONTINUED)

● HIGHWAY AND RAIL ACCESS CONSTRUCTION COSTS (CONTINUED):

- THE NEAREST RAIL ACCESS IS FROM THE EC&B ROUTE AT THE AMOCO PLANT --- APPROXIMATELY EIGHT MILES TO THE CLOUTER ISLAND SITE AND TWELVE MILES TO THE DANIEL ISLAND SITES.
- CLOUTER CREEK IS A NAVIGABLE WATERWAY REQUIRING A HIGH-LEVEL OR MOVABLE BRIDGE TO CROSS IT; THE EXISTENCE OF OTHER WETLANDS AND GENERALLY POOR SOIL CONDITIONS MAKE RAIL AND ROAD CONSTRUCTION DIFFICULT AND EXPENSIVE.
- ESTIMATED COSTS (MILLIONS):

ALTERNATE SITE	HIGHWAY	RAIL
CLOUTER ISLAND	\$ 9.2	\$ 20.4
DANIEL ISLAND	6.5	26.0

● DREDGING COSTS:

- THE CLOUTER ISLAND SITE REQUIRES THE DREDGING OF A NEW CHANNEL; BOTH SITES ON DANIEL ISLAND CAN BE ACCESSED FROM THE EXISTING FEDERAL CHANNEL BY NEW DREDGING.
- DREDGE MATERIAL VOLUMES USED IN ESTIMATING COSTS ARE:

CLOUTER ISLAND	14 MILLION CUBIC YARDS
DANIEL ISLAND - COOPER	8 MILLION CUBIC YARDS
DANIEL ISLAND - WANDO	7 MILLION CUBIC YARDS

- IT IS ASSUMED THAT ALL NEW DREDGE MATERIAL WILL BE DEPOSITED IN THE OCEAN DISPOSAL SITE.
- DREDGING RATES ARE ASSUMED TO BE \$3.75 PER CUBIC YARD FROM THE DANIEL ISLAND LOCATIONS AND \$4.25 PER CUBIC YARD FROM THE CLOUTER ISLAND LOCATION, BASED ON DISTANCE TO THE DISPOSAL SITE.
- ANNUAL MAINTENANCE DREDGING IS A FURTHER COST CONSIDERATION, AND IS ESTIMATED TO BE DOUBLE THE VOLUME AT THE CLOUTER ISLAND SITE..... \$1 TO 1.5 MILLION ADDITIONAL COST PER YEAR.

COST CONSIDERATIONS (CONTINUED)

● LAND ACQUISITION COSTS:

- THE COST OF OBTAINING HIGHWAY AND RAIL RIGHTS-OF-WAY AS WELL AS TERMINAL PROPERTY AND REPLACEMENT OF DREDGE DISPOSAL AREAS MUST BE CONSIDERED.
- ALL TERMINAL SITES ARE BASED ON 750 ACRES.
- THE NAVY'S 100 FOOT EASEMENT ALONG THE COOPER RIVER BANK OF DANIEL ISLAND COULD INTERFERE WITH SITE ACQUISITION.
- THE CORP'S PERPETUAL EASEMENT ON THE CLOUTER ISLAND SITE FOR DREDGE DISPOSAL COULD INTERFERE WITH ACQUISITION.
- ESTIMATED ACREAGE TO BE ACQUIRED:

ALTERNATIVE SITE	HIGH-WAY	RAIL	TER-MINAL	DREDGE DISPOSAL	TOTAL
CLOUTER ISLAND	10	100	300	450	860
DANIEL ISL-COOPER	30	150	750	100	1,030
DANIEL ISL-WANDO	30	150	750	650	1,580

- AN ESTIMATED AVERAGE PRICE OF \$60,000 PER ACRE IS ASSUMED FOR RIGHT-OF-WAY ACQUISITION WHILE \$10,000 PER ACRE IS USED FOR TERMINAL AND DISPOSAL AREAS.

● OTHER UNKNOWN COSTS:

- ACCESS TO NECESSARY UTILITIES?
- PERMITTING PROCESS?
- MITIGATION FOR WETLANDS ENCROACHMENT?

SOUTH CAROLINA STATE PORTS AUTHORITY
TERMINAL X LOCATION STUDY

	SITE CHARACTERISTICS	HIGHWAY ACCESSIBILITY	RAIL ACCESSIBILITY	ENVIRONMENTAL CONCERNS
CLOUTER ISLAND	<ul style="list-style-type: none"> ● MOSTLY OWNED BY SCSPA ● AMPLE BACKUP ACRES PER BERTH ● ELEVATION AROUND 10 FEET ● DIVIDED TERMINAL OPERATION ● DREDGE DISPOSAL SITE/POOR SOIL QUALITY ● MUST ACQUIRE PROPERTY FROM NAVY 	<ul style="list-style-type: none"> ● CLOSE TO I-526 INTERCHANGE ON THOMAS ISLAND ● REQUIRES BRIDGE OVER CLOUTER CREEK ● ESTIMATE \$8.0 TO \$11.5 MILLION FOR ROAD AND BRIDGE CONSTRUCTION 	<ul style="list-style-type: none"> ● CLOSEST TO EXISTING TRACKAGE AT AMOCO (8 MILES) ● REQUIRES BRIDGE OVER CLOUTER CREEK ● CURRENTLY NO COMPETITIVE ACCESS (CSX & NS) ● ESTIMATE \$1 TO \$2 MILLION PER MILE CONSTRUCTION COST 	<ul style="list-style-type: none"> ● OPPOSITE NORTH CHARLESTON TERMINAL AND INDUSTRIAL USERS ● MINIMAL MARSH FRINGE ● LAND HAS NO SIGNIFICANT ENVIRONMENTAL VALUE ● MAY LIMIT NAVIGATION ON CLOUTER CREEK
DANIEL ISLAND - COOPER	<ul style="list-style-type: none"> ● OPTIMAL TERMINAL LAYOUT ● AMPLE BACKUP ACRES FOR BERTH ● ELEVATION AROUND 20 FEET ● OWNED BY GUGGENHEIMS ● 100' NAVY EASEMENT ALONG SHORE ● FORMER DREDGE DISPOSAL SITE/ POOR SOIL QUALITY 	<ul style="list-style-type: none"> ● ESTIMATE \$6.5 MILLION FOR ROAD AND BRIDGE CONSTRUCTION ● REQUIRES BRIDGE OVER BERESFORD CREEK ● GREATER DISTANCE FROM I-526 ● MAY REQUIRE PARTICIPATION IN COST OF SECOND I-526 INTERCHANGE 	<ul style="list-style-type: none"> ● REQUIRES 1-MILE TRESTLE & BRIDGE ● 12.5 MILES TO TRACKAGE AT AMOCO ● CURRENTLY NO COMPETITIVE ACCESS (CSX & NS) ● ESTIMATE \$1 TO \$2 MILLION PER MILE CONSTRUCTION COST 	<ul style="list-style-type: none"> ● OPPOSITE INDUSTRIAL USERS ● MINIMAL MARSH FRINGE ● LAND HAS NO SIGNIFICANT ENVIRONMENTAL VALUE ● OPPOSITE PROPOSED NAVY SEAWOLF SUB LOCATION ● OBJECTIONS FROM OWNERS, CITY, NAVY, AND ENVIRONMENTAL GROUPS
DANIEL ISLAND - WANDO	<ul style="list-style-type: none"> ● OPTIMAL TERMINAL LAYOUT ● AMPLE BACKUP ACRES PER BERTH ● ELEVATION AROUND 20 FEET ● OWNED BY GUGGENHEIMS ● DREDGE DISPOSAL SITE/POOR SOIL QUALITY 	<ul style="list-style-type: none"> ● ESTIMATE \$6.5 MILLION FOR ROAD AND BRIDGE CONSTRUCTION ● REQUIRES BRIDGE OVER BERESFORD CREEK ● GREATER DISTANCE FROM I-526 ● MAY REQUIRE PARTICIPATION IN COST OF SECOND I-526 INTERCHANGE 	<ul style="list-style-type: none"> ● REQUIRES 1-MILE TRESTLE & BRIDGE ● 12.5 MILES TO TRACKAGE AT AMOCO ● CURRENTLY NO COMPETITIVE ACCESS (CSX & NS) ● ESTIMATE \$1 TO \$2 MILLION PER MILE CONSTRUCTION COST 	<ul style="list-style-type: none"> ● OPPOSITE WANDO TERMINAL ● MINIMAL MARSH FRINGE ● LAND HAS NO SIGNIFICANT ENVIRONMENTAL VALUE ● OPPOSITE RESIDENTIAL AREA ● OBJECTIONS FROM OWNERS, CITY, RESIDENTIAL AND ENVIRONMENTAL GROUPS

SOUTH CAROLINA STATE PORTS AUTHORITY
TERMINAL X LOCATION STUDY

	NAVIGATIONAL ACCESSIBILITY	DREDGING CONSIDERATIONS	MARKETABILITY CONCERNS	COST CONSIDERATIONS												
CLOUTER ISLAND	<ul style="list-style-type: none"> ● SHARED USE OF NCT TURNING BASIN ● FURTHEST FROM OPEN SEA ● REQUIRES TRANSIT UNDER NEW BRIDGE ● ADDED CONGESTION IN COOPER RIVER ● LARGER SHIPS NOT CURRENTLY NAVIGATING UPPER COOPER RIVER ● INC. NEED FOR TRAFFIC COORDINATION ● LIMITATIONS OF ONE-WAY SHIP TRAFFIC & REQUIRES ADDITIONAL TUGS 	<ul style="list-style-type: none"> ● SHARED USE OF TURNING BASIN ● CORPS HAS PERPETUAL EASEMENT FOR DISPOSAL ● REQUIRES DREDGING NEW CHANNEL ● REQUIRES DISPOSAL SITE REPLMNT. ● ESTIMATE 14 MILLION CUBIC YARDS OF INITIAL DREDGING ● ANNUAL MAINTENANCE OF 700,000 TO 1 MILLION CUBIC YARDS 	<ul style="list-style-type: none"> ● WILL BE A MODERN, STATE-OF-THE-ART FACILITY ● NO FURTHER FROM THE OPEN SEA THAN THE EXISTING NC TERMINAL ● SAILING RESTRICTIONS FOR LARGER VESSELS ● FURTHEST SITE FROM THE OPEN SEA ● ADDITIONAL TUG ASSISTANCE WILL BE REQUIRED 	<table style="width: 100%; border-collapse: collapse;"> <tr> <td></td> <td style="text-align: right;">COST (MILLIONS)</td> </tr> <tr> <td>TERMINAL (PHASE ONE = \$201)</td> <td style="text-align: right;">\$ 697</td> </tr> <tr> <td>HIGHWAY AND RAIL</td> <td style="text-align: right;">30</td> </tr> <tr> <td>DREDGING</td> <td style="text-align: right;">60</td> </tr> <tr> <td>LAND ACQUISITION</td> <td style="text-align: right;">14</td> </tr> <tr> <td>TOTAL</td> <td style="text-align: right;"><u>\$ 801</u></td> </tr> </table>		COST (MILLIONS)	TERMINAL (PHASE ONE = \$201)	\$ 697	HIGHWAY AND RAIL	30	DREDGING	60	LAND ACQUISITION	14	TOTAL	<u>\$ 801</u>
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SOUTH CAROLINA STATE PORTS AUTHORITY
TERMINAL X LOCATION STUDY

Cost Considerations

May 22, 1991



**SOUTH CAROLINA STATE PORTS AUTHORITY
TERMINAL X LOCATION STUDY**

CRITICAL FACTORS

- **SITE AVAILABILITY**
 - 700 to 750 Acres Required
 - 3 Site Alternatives
- **SITE CHARACTERISTICS**
 - Soil Conditions
 - Elevation
 - Construction Requirements
- **LAND ACCESSIBILITY**
 - Highway
 - Rail
- **NAVIGATIONAL SAFETY**
 - Vessel Access
 - Impact on Other Shipping Activity
- **DREDGING CONSIDERATIONS**
 - Initial Construction
 - Maintenance Requirements
 - Impact on Disposal Sites
- **INFRASTRUCTURE AVAILABLE**
 - Electricity and Gas
 - Water and Sewer
- **ENVIRONMENTAL CONCERNS**
 - Marsh Impacts
 - Neighborhood Issues
- **MARKETABILITY CONCERNS**
 - Steamship Line Requirements
- **COST CONSIDERATIONS**

**SOUTH CAROLINA STATE PORTS AUTHORITY
TERMINAL X LOCATION STUDY**

COST CONSIDERATIONS

● **THE MAJOR COST ELEMENTS TO BE CONSIDERED ARE:**

- **TERMINAL CONSTRUCTION AND EQUIPMENT**
- **HIGHWAY AND RAIL ACCESS CONSTRUCTION**
- **DREDGING**
- **LAND ACQUISITION**

● **TERMINAL CONSTRUCTION AND EQUIPMENT COSTS:**

- **REGARDLESS OF TERMINAL LOCATION, A NUMBER OF COSTS WILL BE THE SAME, I.E., FINAL GRADING AND PAVEMENT, UTILITIES, STORMWATER MANAGEMENT, BUILDINGS, WHARF, INTERMODAL RAIL YARD, AND CRANES AND OTHER EQUIPMENT.**
- **HOWEVER, THE COSTS OF BERTH DREDGING, SOIL STABILIZATION, AND FILLING AND ROUGH GRADING THE SITE WILL VARY GREATLY AMONG LOCATIONS.**
- **TERMINAL X WILL BE CONSTRUCTED IN PHASES AS DICTATED BY DEMAND. PHASE ONE WILL BE 2,000 FEET OF BERTH AND 120 ACRES OF CONTAINER YARD; AND ULTIMATE DEVELOPMENT INCLUDES 8,000 FEET OF BERTH AND A 400 ACRE CONTAINER YARD.**
- **ESTIMATED COSTS (MILLIONS):**

DESCRIPTION	PHASE ONE	TOTAL
NON-SITE SPECIFIC	\$ 140	\$ 490
SITE SPECIFIC	\$ 52 - 63	\$ 174 - 210
TOTAL	\$ 192 - 203	\$ 664 - 700

● **HIGHWAY AND RAIL ACCESS CONSTRUCTION COSTS:**

- **THE NEAREST HIGHWAY ACCESS FOR ALTERNATIVE TERMINAL SITES WILL BE THE I-526 INTERCHANGE AT CAINHOY ROAD ON THOMAS ISLAND --- APPROXIMATELY ONE MILE TO THE CLOUTER ISLAND SITE AND THREE MILES TO THE DANIEL ISLAND SITES.**
- **THE NEAREST RAIL ACCESS IS FROM THE EC&B ROUTE AT THE AMOCO PLANT --- APPROXIMATELY EIGHT MILES TO THE CLOUTER ISLAND SITE AND TWELVE MILES TO THE DANIEL ISLAND SITES.**

**SOUTH CAROLINA STATE PORTS AUTHORITY
TERMINAL X LOCATION STUDY**

COST CONSIDERATIONS (CONTINUED)

● **HIGHWAY AND RAIL ACCESS CONSTRUCTION COSTS (CONTINUED):**

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**SOUTH CAROLINA STATE PORTS AUTHORITY
TERMINAL X LOCATION STUDY**

COST CONSIDERATIONS (CONTINUED)

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● **OTHER UNKNOWN COSTS:**

- ACCESS TO NECESSARY UTILITIES?
- PERMITTING PROCESS?
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SOUTH CAROLINA STATE PORTS AUTHORITY
TERMINAL X LOCATION STUDY

ALTERNATIVE SITES	COST CONSIDERATIONS														
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SOUTH CAROLINA STATE PORTS AUTHORITY
TERMINAL X LOCATION STUDY

Marketability Concerns

May 22, 1991



**SOUTH CAROLINA STATE PORTS AUTHORITY
TERMINAL X LOCATION STUDY**

CRITICAL FACTORS

● **SITE AVAILABILITY**

- 700 to 750 Acres Required
- 3 Site Alternatives

● **SITE CHARACTERISTICS**

- Soil Conditions
- Elevation
- Construction Requirements

● **LAND ACCESSIBILITY**

- Highway
- Rail

● **NAVIGATIONAL SAFETY**

- Vessel Access
- Impact on Other Shipping Activity

● **DREDGING CONSIDERATIONS**

- Initial Construction
- Maintenance Requirements
- Impact on Disposal Sites

● **INFRASTRUCTURE AVAILABLE**

- Electricity and Gas
- Water and Sewer

● **ENVIRONMENTAL CONCERNS**

- Marsh Impacts
- Neighborhood Issues

● **MARKETABILITY CONCERNS**

- Steamship Line Requirements

● **COST CONSIDERATIONS**

**SOUTH CAROLINA STATE PORTS AUTHORITY
 TERMINAL X LOCATION STUDY**

MARKETABILITY CONCERNS

- AN IMPORTANT PART OF A STEAMSHIP LINE'S DECISION ON TERMINAL LOCATION IS ITS TOTAL OPERATING COST AS WELL AS TRANSIT TIME, WITH OPERATIONS CONSTRAINTS BEING A MAJOR CONCERN.
- DISTANCES IN NAUTICAL MILES AND ESTIMATED SAILING TIMES FROM THE SEA BUOY, WHERE PILOTS BOARD THE VESSEL, TO EXISTING TERMINALS AND ALTERNATE SITES ARE:

TERMINALS/ALTERNATE SITES	DISTANCE	HOURS
COLUMBUS STREET	15	1.00
WANDO	17	1.25
NORTH CHARLESTON	22	2.25
CLOUTER ISLAND	22	2.25
DANIEL ISLAND - COOPER	18	1.75
DANIEL ISLAND - WANDO	17	1.25

- THE NAVIGATION STUDY SHOWED THAT LARGE CONTAINERSHIPS CAN ACCESS ALL SITES.
- THE NAVIGATION STUDY DETERMINED THAT SOME SHIP TRAFFIC RESTRICTIONS MIGHT BE NECESSARY BASED ON CURRENT CHANNEL DESIGN IF THE CLOUTER ISLAND SITE IS SELECTED (I.E., ONE WAY TRAFFIC OF LARGE VESSELS, ADDITIONAL TUGS).
- USING TWO DIFFERENT SHIPS AND PUBLISHED TUG RATES, A COMPARISON OF SITES BASED ON TOTAL INBOUND AND OUTBOUND COSTS IS AS FOLLOWS:

TUG COST PER VESSEL CALL	EVERGREEN GX CLASS	SEALAND ATLANTIC CLASS
CLOUTER ISLAND	\$ 6,200	\$ 15,500
DANIEL ISLAND-COOPER	5,800	12,700
DANIEL ISLAND-WANDO	5,800	8,600

**SOUTH CAROLINA STATE PORTS AUTHORITY
TERMINAL X LOCATION STUDY**

MARKETABILITY CONCERNS (CONTINUED)

- **THE HIGHER COST FOR THE SEALAND VESSEL REFLECTS ITS POOR HANDLING CHARACTERISTICS AND THE REQUIREMENT FOR MORE TUG ASSISTANCE.**
- **AS A COMPETITIVE COMPARISON, VESSELS IN SAVANNAH MUST TRAVEL 26 MILES TO GARDEN CITY TERMINAL WHICH REQUIRES ABOUT 3.5 HOURS DUE TO A NARROWER CHANNEL WHICH TRANSLATES INTO SLOWER SPEEDS.**
- **THE SEALAND VESSELS FORMERLY CALLED IN SAVANNAH WHEN OWNED BY U.S.LINES --- SHIP TRAFFIC WAS LIMITED TO ONE WAY, THE VESSELS REQUIRED 4 TUGS AND 4 HOURS TO REACH THE TERMINAL.**

**SOUTH CAROLINA STATE PORTS AUTHORITY
 TERMINAL X LOCATION STUDY**

ALTERNATIVE SITES	MARKETABILITY CONCERNS
CLOUTER ISLAND	<ul style="list-style-type: none"> • WILL BE A MODERN, STATE-OF-THE -ART FACILITY • NO FURTHER FROM THE OPEN SEA THAN THE EXISTING NC TERMINAL • SAILING RESTRICTIONS FOR LARGER VESSELS • FURTHEST SITE FROM THE OPEN SEA • ADDITIONAL TUG ASSISTANCE MAY BE REQUIRED
DANIEL ISLAND - COOPER	<ul style="list-style-type: none"> • WILL BE A MODERN, STATE-OF-THE -ART FACILITY • RELATIVELY CLOSE TO THE OPEN SEA • REQUIRES MANEUVERING VESSELS AROUND ADDITIONAL TURNS IN THE RIVER • ADDITIONAL TUG ASSISTANCE MAY BE REQUIRED FOR SOME VESSELS
DANIEL ISLAND - WANDO	<ul style="list-style-type: none"> • WILL BE A MODERN STATE-OF-THE -ART FACILITY • THE CLOSEST AND MOST ACCESSIBLE SITE TO THE OPEN SEA • FEWER TUGS REQUIRED FOR MOST VESSELS

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SOUTH CAROLINA STATE PORTS AUTHORITY
TERMINAL X LOCATION STUDY

Dredging Considerations

March 13, 1991



**SOUTH CAROLINA STATE PORTS AUTHORITY
TERMINAL X LOCATION STUDY**

CRITICAL FACTORS

● **SITE AVAILABILITY**

- 700 to 750 Acres Required
- 3 Site Alternatives

▶ ● **DREDGING CONSIDERATIONS**

- Initial Construction
- Maintenance Requirements
- Impact on Disposal Sites

● **SITE CHARACTERISTICS**

- Soil Conditions
- Elevation
- Construction Requirements

● **INFRASTRUCTURE AVAILABLE**

- Electricity and Gas
- Water and Sewer

● **LAND ACCESSIBILITY**

- Highway
- Rail

● **ENVIRONMENTAL CONCERNS**

- Marsh Impacts
- Neighborhood Issues

● **NAVIGATIONAL SAFETY**

- Vessel Access
- Impact on Other Shipping Activity

● **MARKETABILITY**

- Steamship Line Requirements

● **COST**

**SOUTH CAROLINA STATE PORTS AUTHORITY
TERMINAL X LOCATION STUDY**

DREDGING CONSIDERATIONS

• **UPLAND DISPOSAL SITES IN CHARLESTON HARBOR:**

DISPOSAL SITE	CONTAINED ACRES	OWNERSHIP/CONTROL
Morris Island	548	SCSPA
Drum Island	148	SCSPA
Daniel Island	676	SCSPA
Clouter Creek	1,496	30% SCSPA/70% Navy
Naval Weapons Station	300	Navy
Yellow House Creek	596	SCSPA/Navy
TOTAL	3,764	

- SCSPA OWNS THE MORRIS ISLAND, DRUM ISLAND, CLOUTER CREEK, AND YELLOW HOUSE CREEK SITES (1,741 CONTAINED ACRES). THE DANIEL ISLAND SITE (676 CONTAINED ACRES) IS LEASED UNTIL JANUARY 12, 1993.
- THE COOPER RIVER REDIVERSION PROJECT WAS PLACED IN OPERATION IN SEPTEMBER 1985 AND REDUCED THE FRESH WATER DISCHARGE RATE AT THE PINOPOLIS DAM FROM 15,600 CFS TO 4,500 CFS.
- BECAUSE OF THE RELATIONSHIP BETWEEN DISCHARGE AND SHOALING RATES IN CHARLESTON HARBOR, THE REDIVERSION PROJECT IS ULTIMATELY EXPECTED TO REDUCE SHOALING BY 70%.
- THE ESTIMATED ANNUAL DREDGING RATE FOR A FRESH WATER FLOW OF 15,600 CFS IS 9.2 MILLION CUBIC YARDS AND FOR 4,500 CFS IS 4.7 MILLION CUBIC YARDS.
- THE CHARLESTON HARBOR DEEPENING PROJECT AUTHORIZED IN 1986 IS 62% COMPLETE AND WILL MAINTAIN THE CHANNELS AT 40 FEET MEAN LOW WATER.
- THE PROJECT WHEN COMPLETE WILL INVOLVE DREDGING OF AN ESTIMATED 20 MILLION CUBIC YARDS OF MATERIAL AT A TOTAL COST OF APPROXIMATELY \$80 MILLION; THIS MATERIAL WILL BE DEPOSITED IN THE OCEAN DISPOSAL SITE.

**SOUTH CAROLINA STATE PORTS AUTHORITY
TERMINAL X LOCATION STUDY**

DREDGING CONSIDERATIONS (continued)

- **THE CHARLESTON OCEAN DISPOSAL SITE IS AN 11 SQUARE MILE AREA AND WILL BE REDUCED TO A 3 SQUARE MILE AREA ONCE THE DEEPENING PROJECT IS COMPLETE PER EPA DESIGNATION.**
- **CURRENT BERTH MAINTENANCE DREDGING AT UNION PIER TERMINAL AND COLUMBUS STREET TERMINAL IS PERMITTED FOR OCEAN DISPOSAL; PLANS ARE TO HAVE WANDO MAINTENANCE PERMITTED FOR OCEAN DISPOSAL ALSO.**
- **INITIAL CONSTRUCTION DREDGING REQUIRED FOR A NEW TERMINAL SITE WOULD NECESSITATE OCEAN DISPOSAL DUE TO VOLUMES OF MATERIAL TO BE DREDGED.**
- **WATERWAYS EXPERIMENT STATION PERFORMED A PRELIMINARY EVALUATION OF POTENTIAL IMPACTS TO CHANNEL AND FACILITY SHOALING AND MAINTENANCE DREDGING REQUIREMENTS ASSOCIATED WITH DEVELOPMENT OF THE ALTERNATIVE COOPER RIVER TERMINAL SITES.**
- **EACH OF THE ALTERNATIVE LOCATIONS RESULTED IN INCREASING THE SHOALING VOLUME AND RATE, AND THEREFORE THE REQUIRED**

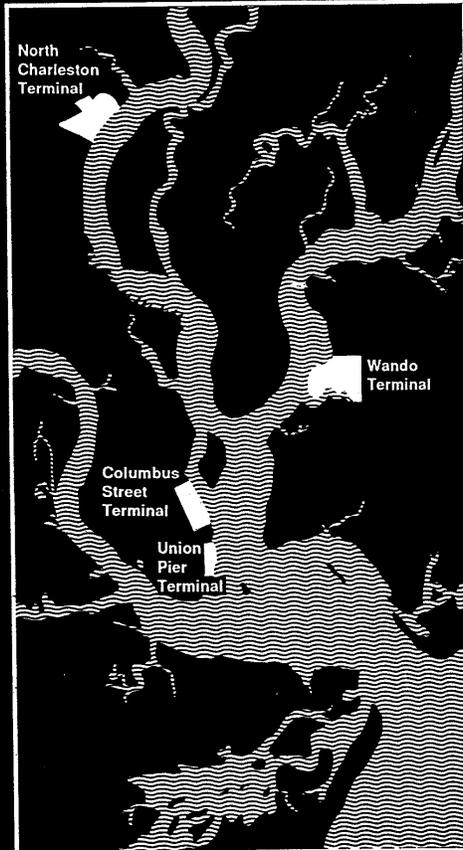
**SOUTH CAROLINA STATE PORTS AUTHORITY
 TERMINAL X LOCATION STUDY**

ALTERNATIVE SITES	DREDGING CONSIDERATIONS
CLOUTER ISLAND	<ul style="list-style-type: none"> • SHARED USE OF TURNING BASIN • CORPS HAS PERPETUAL EASEMENT FOR DISPOSAL • REQUIRES DREDGING NEW CHANNEL • REQUIRES DISPOSAL SITE REPLMNT. • ESTIMATE 13 TO 14 MILLION CUBIC YARDS OF INITIAL DREDGING • ANNUAL MAINTENANCE OF 700,000 TO 1 MILLION CUBIC YARDS
DANIEL ISLAND - COOPER	<ul style="list-style-type: none"> • ON FEDERAL CHANNEL • MINOR EFFECT ON EXISTING DISPOSAL AREAS • ESTIMATE 7.5 MILLION CUBIC YARDS OF INITIAL DREDGING • ANNUAL MAINTENANCE OF 350,000 TO 500,000 CUBIC YARDS
DANIEL ISLAND - WANDO	<ul style="list-style-type: none"> • ON FEDERAL CHANNEL • SHARED USE OF TURNING BASIN • REQUIRES DISPOSAL SITE REPLACEMENT • ESTIMATE 6.5 MILLION CUBIC YARDS OF INITIAL DREDGING • ANNUAL MAINTENANCE OF 350,000 TO 500,000 CUBIC YARDS

C103353.00/D2

Terminal X Conceptual Planning Study

October 1991



Submitted to



South Carolina State
Ports Authority

Submitted by



HARRIS
Frederic R. Harris, Inc.

Frederic R. Harris, Inc.
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October 30, 1991

Mr. Bernard S. Groseclose, Jr.
Director of Planning and Development
South Carolina State Ports Authority
176 Concord Street
Charleston, South Carolina 29401

Subject: Terminal X Conceptual Planning Study
Project Report

Dear Mr. Groseclose:

Frederic R. Harris, Inc. (FRH) is pleased to submit to the South Carolina State Ports Authority (SCSPA) six copies of the Terminal X Conceptual Planning Study Report. This report focuses on the definition of the primary terminal needs, the development of a schematic facility layout, and the calculation of total acreage requirements for Terminal X considering the market growth projected for the Port of Charleston until 2015.

We thank the SCSPA for the opportunity to assist in the conceptual planning of Terminal X. If you have any questions regarding this material, please contact me.

Very truly yours,

FREDERIC R. HARRIS, INC.

W. Patrick Ragan
Project Manager

Enclosure

60 years of engineering service worldwide

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Executive Summary



HARRIS

Frederic R. Harris, Inc.

EXECUTIVE SUMMARY

The South Carolina State Ports Authority (SCSPA) requested Frederic R. Harris (FRH) to provide technical assistance in the conceptual planning of Charleston's fourth container terminal, referred to as Terminal X. This facility will potentially be a large, high throughput, state-of-the-art facility which will serve the future containerized cargo needs of the Port of Charleston for approximately the next 25 years. The purpose of this study is to conceptually quantify the terminal infrastructure requirements, prepare a schematic site plan for the facility, and calculate the total acreage requirements of the facility.

Market projections to guide this study were supplied by the SCSPA. These projections reveal the continued growth of container volumes in the Port of Charleston. From 1991 to 2015, cargo tonnage is projected to increase from 6,373,849 to 18,506,053 short tons. As a result of these forecasts and the anticipated capacity of existing terminals, including planned improvements, the requirements for Terminal X were developed.

In the development of the requirements for Terminal X, planning criteria were used which are representative of current and possible future operating conditions in the Port of Charleston. Current operating data was collected/supplied where possible, and certain assumptions were made where necessary. The operating conditions which were the focus of this effort dealt with the future makeup of container volumes, the utilization of terminal components as well as the productivity and efficiency by which cargo moves through the facility.

The development of a layout for Terminal X was performed in a schematic manner in order to illustrate the acreage requirements for the terminal as well as to present a possible layout of the terminal without consideration of the site configuration. The layout developed for the terminal was largely defined by the determined berth requirement of 8,000 feet, the degree of grounded yard operations which was limited to approximately 20 percent, and the proposed phasing plan for terminal development. The layout was developed considering anticipated design criteria for the handling of larger vessels, containers, and cargo volumes. As a result, overall parking space, aisle and roadway sizing was increased to reflect these factors. Since the facility is anticipated to be developed in 2,000 foot berth segments, the location and expansion potential of the support facilities became an important consideration.

As a result of the development of the facility requirements and the schematic layout for Terminal X, the overall terminal acreage requirements were calculated. Table A summarizes the acreage requirements.

TABLE A

TERMINAL X ACREAGE REQUIREMENTS

<u>Component</u>	<u>Acreage</u>
Wharf	49
Container Yard	481
Support Facilities ¹	<u>137</u>
Subtotal	667
Buffer ²	100
Storm Water Mgmt. ²	<u>80</u>
TOTAL	847

¹Includes rail facility.

²Figures provided by SCSPA.

Table A reveals an acreage requirement for Terminal X of 847 acres, including anticipated buffer and storm water management areas. As the site plan for the facility progresses from a schematic, to a more conceptual, and finally to a detailed plan, acreage requirements may require adjustment. This will be caused by two primary factors; first, the configuration of the terminal to the land area selected for development, and secondly, the development of more detailed physical and operating plans for the terminal.

**Section 1
Market Forecasts**



HARRIS

Frederic R. Harris, Inc.

SECTION 1 MARKET FORECASTS

Over the last several years, the Port of Charleston has experienced explosive growth in container tonnage resulting in the emergence of the Port as the second largest container handling port on the East Coast. After a review of the tonnage projections for Charleston it becomes apparent that continued solid growth in container volumes for the Port is anticipated. This forms the basis for the development of Terminal X as the container terminal to carry the Port of Charleston into the 21st century.

The base market forecast used for this study was supplied by the SCSPA. This forecast, prepared by DRI/TBS World Sea Trade Service (DRI/TBS), shows container tonnage increasing from 6,373,849 short tons in 1990 to 18,506,053 short tons in 2015. This forecast was initially prepared through 2010 and was extended through 2015 for the purposes of this study. Table 1-1 presents the DRI/TBS forecast in addition to the following for the years 1991 through 2015:

- A Modified tonnage projection which adjusts the growth rate from 1996 to 2015 from 4.3 to 5.5 percent to reflect a larger amount of Southeast Asian cargo moving via the Suez Canal to the East Coast than anticipated in the DRI/TBS projection.
- A Midpoint projection which averages the tonnage growth of the DRI/TBS and the Modified forecasts between 1996 and 2015.
- The required phased terminal capacity to accommodate the DRI/TBS and the Midpoint projections.

The Midpoint projection has been selected as the basis for the development of Terminal X. Figure 1-1 graphically presents the information contained in Table 1-1. It must be mentioned that the terminal capacity presented in Table 1-1 is the expected capacity for the existing terminals, with planned improvements, plus Terminal X. It becomes evident that the Midpoint projection after 2013 is expected to exceed overall Charleston terminal capacity.

Table 1-1

South Carolina State Ports Authority
 Container Tonnage Projection
 (Short Tons)

<u>Year</u>	<u>DRI/TBS Projection</u>	<u>Capacity</u>	<u>Modified Projection</u>	<u>Midpoint Projection (from 1995)</u>	<u>Capacity</u>
1990	6,373,849	7,000,000	6,373,849	6,373,849	7,000,000
1991	6,667,046	7,000,000	6,667,046	6,667,046	7,000,000
1992	6,987,064	7,132,000	6,987,064	6,987,064	7,132,000
1993	7,322,443	7,582,000	7,322,443	7,322,443	7,582,000
1994	7,644,631	8,032,000	7,644,631	7,644,631	8,032,000
1995	7,950,416	8,707,000	7,950,416	7,950,416	8,707,000
1996	8,268,433	8,707,000	8,387,689	8,328,061	8,707,000
1997	8,623,975	8,707,000	8,849,012	8,736,493	8,707,000
1998	8,943,062	11,261,295	9,335,707	9,139,385	11,261,295
1999	9,336,557	11,261,295	9,849,171	9,592,864	11,261,295
2000	9,747,366	11,261,295	10,390,876	10,069,121	11,261,295
2001	10,176,250	11,261,295	10,962,374	10,569,312	11,261,295
2002	10,624,005	11,261,295	11,565,304	11,094,655	11,261,295
2003	11,091,461	11,261,295	12,201,396	11,646,429	13,815,590
2004	11,579,485	13,815,590	12,872,473	12,225,979	13,815,590
2005	12,088,983	13,815,590	13,580,459	12,834,721	13,815,590
2006	12,620,898	13,815,590	14,327,384	13,474,141	13,815,590
2007	13,176,217	13,815,590	15,115,390	14,145,804	16,369,885
2008	13,755,971	13,815,590	15,946,737	14,851,354	16,369,885
2009	14,361,234	16,369,885	16,823,807	15,592,521	16,369,885
2010	14,993,128	16,369,885	17,749,117	16,371,122	16,369,885
2011	15,637,833	16,369,885	18,725,318	17,181,575	16,369,885
2012	16,310,259	16,369,885	19,755,211	18,032,735	18,924,180
2013	17,011,600	18,924,180	20,841,747	18,926,674	18,924,180
2014	17,743,099	18,924,180	21,988,043	19,865,571	18,924,180
2015	18,506,053	18,924,180	23,197,386	20,851,719	18,924,180

Notes:

DRI/TBS projection: 4.5 % from 1990 to 1995, 4.3 % from 1996 to 2015

Modified projection: 4.5 % from 1990 to 1995, 5.5 % from 1996 to 2015

Sources:

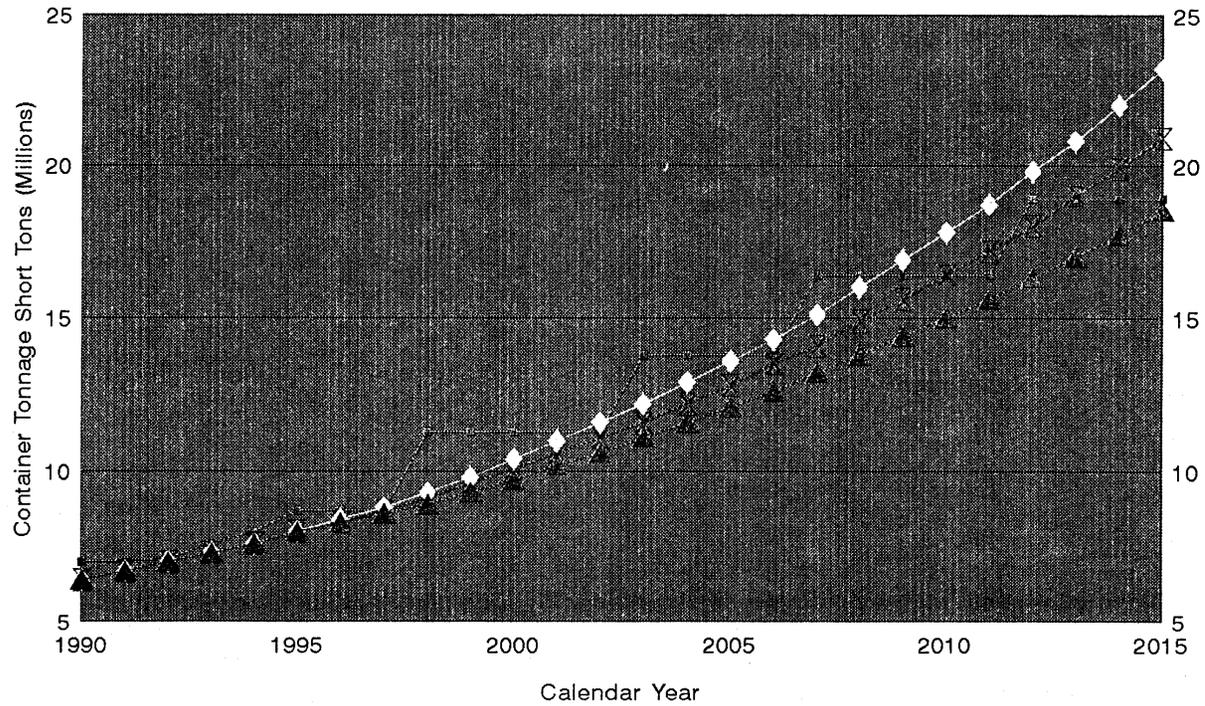
DRI/TBS, 1990

Frederic R. Harris, Inc., 1991



South Carolina State Ports Authority Container Tonnage Projection

Figure 1-1



▲ DRI/TBS Projection ◆ Modified Projection ✕ Midpoint Projection ◻ Capacity

Source: DRI/TBS, 1990
Frederic R. Harris, Inc., 1991

**Section 2
Facility Requirements**



Frederic R. Harris, Inc.

SECTION 2 FACILITY REQUIREMENTS

2.1 Guiding Parameters

The development of facility requirements for Terminal X is a function of the relationship between the market forecasts, explained in the previous section, and the capacity of existing facilities in the Port of Charleston. As the market for container cargo in the Port expands, capacity becomes utilized, and the need for additional capacity develops. In the development of facility requirements for Terminal X, the capacity of the existing facilities in Charleston was considered inclusive of planned capacity additions over the next few years. Table 2-1 presents, for the Port of Charleston, the current and future projected container tonnage compared to the current and future projected terminal requirements for the years 1991, 1997, and 2013.

TABLE 2-1
PORT OF CHARLESTON
CONTAINER TONNAGE VS. TERMINAL REQUIREMENTS

	<u>1991</u>	<u>Year</u> <u>1997</u>	<u>2013</u>
<u>Volume</u>			
Tons	6,667,046	8,736,493	18,926,674
TEU's	865,850	1,134,609	2,458,010
Units	541,156	709,131	1,536,256
<u>Facilities</u>			
Berth (feet)	6,700	8,000	16,000
Container Yard (acres)	340	415	900
Cranes	15	17	33
# of Terminals	3	3	4

As Table 2-1 illustrates container tonnage is expected to more than double between 1997 and 2013, and terminal requirements are expected to double over the same period. The facilities shown for 1997 reflect the anticipated improvements to existing terminals, and the facilities shown in 2013 include the anticipated size of Terminal X.

In the development of facility requirements for Terminal X it was assumed the terminal would be operated and managed as a common user facility similar to the other terminals in Charleston with no dedicated facilities. This is important due to the fact that dedicated

facilities generally inflate overall terminal requirements. By assuming a common user facility, overall facility requirements are minimized. However, due to the anticipated large size of the terminal, some dedicated facilities are probable due to the need for effective management and control of overall terminal operations.

2.2 Development Criteria

The development of terminal requirements for Terminal X requires the use of planning criteria which are representative of current operating and possible future operating conditions in the Port of Charleston. For the purposes of this study, current operating data for the Port was collected/supplied where possible, and certain assumptions were made relative to future operating conditions in the Port. The operating conditions which were the focus of this effort dealt with the makeup of container volumes, the utilization of certain terminal components as well as the productivity and efficiency by which cargo moves through the facility.

In the development of the assumptions guiding this analysis, FRH generally used its experience with the container industry as well as its previous experience in studying the three existing container facilities in Charleston. In addition, the SCSPA was requested, and did validate certain critical assumptions which had to be made in order to develop the terminal requirements. A list of the key development criteria used in the development of the terminal requirements for Terminal X are presented in Table 2-2. Several of these criteria reflect changed operating conditions expected in the port by the year 2013.

TABLE 2-2

TERMINAL X REQUIREMENTS DEFINITION
KEY PLANNING CRITERIA

Annual Shore Crane Operating Hours (per crane)	2,500	Hours
Crane Productivity in MPH (moves per hour)	32.0	MPH
Tons of Cargo per TEU (average)	7.7	Short Tons
Ratio of TEU's to Containers	1.6	
Ratio of Crane Moves to Crane Loads	1.3	
Ratio of Gate Moves to Crane Moves	1.5	
Container Dwell Time (average)	9.4	Days
Container Yard Peaking and Circulation Factors	10.0	Percent Each
Rail Movement as Percentage of Berth Throughput	10.0	Percent
LCL Cargo as Percentage of Berth Throughput	2.0	Percent

These criteria form the basis by which the facility requirements for Terminal X were developed. A more complete list of planning criteria and assumptions used in this study are enclosed in Appendix A. In this appendix, the criteria and assumptions listed reflect operating conditions today as well as conditions expected in the year 2015.

2.3 Facility Requirements

The development of facility requirements for Terminal X is a function of defining what cargo volume the facility is expected to accommodate and sizing each terminal component to effectively handle the cargo volumes generated. Each operating component has a quantifiable capacity limit which is established by its physical and operating characteristics and by the characteristics of the trades served by the terminal. Since the components comprise a system, each component must be properly "sized" so as to complement the capacity of the others. The component with the least capacity establishes the capacity of the whole system, that is the terminal itself.

In the case of Terminal X, the sizing of the terminal components is all relative to the peak anticipated demand for each terminal component. While the cargo volumes themselves generally require a base number of cranes and berthing space, the peaking of vessel activities in the container terminal operating business dictate that facility requirements must be able to accommodate the expected peaking of vessel calls in a given week. This normally results in an increased size or amount of terminal components than is necessary under a more uniform operation where vessel peaking is minimal.

In the Port of Charleston today, there is a significant amount of vessel peaking which results in increased size or amount of terminal components. This situation is exaggerated because container terminal assets are separated between three terminals. With the development of Terminal X into one large facility some economies of scale are expected due to the concentration of terminal components in one facility. This situation is especially important in the area of crane and berth requirements. For this reason, the existing peaking factors for berth and crane requirements which exist today have been reduced in anticipation of better asset utilization and higher productivity levels. Table 2-3 below summarizes the key facility requirements for Terminal X.

TABLE 2-3

TERMINAL X FACILITY REQUIREMENTS

<u>Facilities</u>	<u>Requirements</u>
Berth	8,000 Feet
Cranes	16 Units
Container Yard Parking Spaces	24,750 Spaces
Gate Facility	
- Pre-check Lanes	17 Lanes
- Container Interchange Lanes	40 Lanes
- Roadability Lanes	17 Lanes
Warehouse	60,000 Square Feet
Rail Facility Trackage	8,500 Feet
Terminal Administration Building	40,000 Square Feet
Marine Buildings (3)	9,600 Square Feet
Equipment Maintenance Compound	7 Acres

A discussion of the development of certain facility components is presented below:

2.3.1 Berth and Crane

Terminal X will require approximately 8,000 feet of vessel berthing space and 16 container gantry cranes by Year 2015 in order to accommodate the cargo throughput as well as the level of peaking activity projected for the facility. This estimate is based on the current characteristics of the trade and operations at the Port today and some conservative assumptions regarding the changes likely to occur as a result of Charleston's cargo growth.

Specifically, it is anticipated that the number of vessel calls will increase to about 2,400 per annum from an estimated volume of approximately 1,100 in 1991 with more than half of these vessels likely to use Terminal X. The average number of moves per vessel call is also expected to rise from approximately 448 to 650 moves. The resultant increase in vessel time at berth is expected to be tempered somewhat, however, by a projected 15 percent increase in the Port's current stevedoring production rate of 28 moves per hour. The average time at berth will still rise, however, increasing from the current average of 17 hours per vessel call to an estimated 21 hours. Additionally, the length of vessels calling the Port is expected to increase from an average of 800 to 900 feet.

With the concentration of terminal facilities into one large terminal, some economies of scale are expected which should result in better utilization of berth and crane assets. This is especially true for crane assets which are expected to experience an increase from 1,180 to 2,500 annual operating hours each. As a result, peaking factors which exist today for the berth and cranes are expected to decrease from a factor of 2.0 today to a factor of 1.6 by 2015.

2.3.2 Container Yard

The amount of container storage space that will have to be provided at Terminal X will be determined largely by container dwell time, container stacking height and volume, of course. From a sample of the container inventory which exists today in Charleston, the weighted average dwell time was found to be 9.4 days. Applying this average to the container throughput at Terminal X, and assuming a ten percent peak in storage demands and the need to provide an additional ten percent of space for circulation purposes, 24,750 container storage spaces will be required at Terminal X in 2015.

2.3.3 Gate Facility

The anticipated volume of truck traffic expected to require processing through Terminal X is based on a factor of 1.5 gate transactions for each vessel move. This results in approximately 4,820 gate transactions per day. The estimation of the number of container pre-check, interchange, and roadability lanes as well as the amount of queuing space required for Terminal X to accommodate this volume is very conceptual. The actual

number of lanes required at the terminal will depend on the procedures instituted, the resultant processing time and truck arrival patterns. In the absence of details regarding those factors, it is assumed that Terminal X will have a gate operation similar to the two-step process currently in favor at recently-built marine terminals in the United States. This system consists of a pre-check procedure conducted via telephone or microphone, which is followed by a container/chassis inspection. Drivers remain in their vehicles during the entire process and the processing time for both steps is estimated to take two and three minutes, respectively. On the basis of these processing rates, an average of 4,820 moves per day, and 10 percent of the daily volume arriving before the terminal opens, 17 pre-check lanes and 40 interchange lanes will be required at Terminal X. The size of the Roadability facility, 17 lanes, is based on 15 percent of the outbound volume requiring service and an average service time of 10 minutes.

2.3.4 Warehouse

The warehouse is a relatively small facility, consistent with the low volume of less-than-container-load (LCL) cargo that is projected for the Terminal and the assumptions regarding the characteristics of LCL cargo at Charleston. Specifically, those assumptions are that LCL cargo will have an average density of 30 pounds per cubic foot, will be stacked an average of five feet high, will have an average dwell time of 4.5 days, and will have a 15 percent peak in storage demand. On the basis of these factors, the projected LCL volume will require 36,000 square feet of net storage space. Since only 60 percent or so of warehouse floor space is actually used for storage, the rest being devoted to aiseways, offices, etc., a 60,000 square-foot warehouse is needed.

2.3.5 Rail Facility

The space required for the rail facility was determined, on a worst case basis, by assuming that 90 foot conventional rail cars will be used to serve Terminal X. Rail movements are estimated to be 10 percent of terminal volume or 60,000 moves per year. Assuming a 15 percent peaking in volume, there will be 378 moves on peak days. By further assuming four rail moves per car, 95 rail cars will be required to handle the peak day volume. If the rail tracks are expected to achieve only one turn per day, and if 90 percent of rail track length is useable, 8,500 feet of trackage is required for the Terminal X rail facility.

Assumes only one train per day.

2.3.6 Maintenance Facility

The estimated size of this facility is based on the assumption that only routine rolling stock maintenance will be performed on the terminal. To serve these purposes, a maintenance compound of approximately seven acres, consisting of an 20,000 square foot building, 23 double repair bays, and parking for 150 terminal vehicles (tractors, pick-up trucks), and out of service containers/chassis is provided. The roadability facility is connected to the maintenance compound for the purposes of continuity. The crane maintenance requirements, shown along the first row of container parking, are purely estimates.

2.3.7 Administration Buildings

The requirements for the administration building as well as for the marine buildings are also purely estimates at this time. The administration building is estimated to be a 40,000 square foot two story structure which can accommodate approximately 250 people, including gate operations staff.

Section 3
Layout Development



Frederic R. Harris, Inc.

SECTION 3 LAYOUT DEVELOPMENT

3.1 Design Criteria

Since Terminal X is expected to be the container facility which will carry Charleston into the 21st Century, it is important to use basic design criteria, in the development of conceptual terminal layouts, which considers the use of larger vessels, larger containers, and larger volumes of container throughput. The trend in new vessel buildings is, like containers, towards larger units. With ships that require over 1,000 feet of berth, the use of five or more container cranes, and a minimum of 25 terminal tractors for stevedoring operations, traffic congestion is a concern for terminal operators. The layout of Terminal X is designed to facilitate traffic flow. The Terminal has a 100-foot-wide crane rail gauge and 150-foot spacing between the landside crane rails, and the first row of container or chassis storage. This will enhance circulation for traffic associated with stevedoring operations. Container storage is laid out parallel to the berth in order to achieve a circular traffic pattern. In addition to the 70-foot spacing of the aisles between the parking rows and the 65-foot cross aisles, the terminal has a network of 96-foot wide thoroughfares to permit the concentration of high truck volumes. Table 3-1 presents a listing of the key design criteria used in the development of the layout for Terminal X.

TABLE 3-1

TERMINAL X LAYOUT DEVELOPMENT
DESIGN CRITERIA

<u>Item</u>	<u>Dimension</u>
Crane Rail Gauge	100 Feet
Buffer Area Between Quay and Container Yard	150 Feet
Aisle Spacing	
- Parallel to Berth (Typical)	70 Feet
- Perpendicular to Berth (Typical)	65 Feet
- Major Thoroughfares	96 Feet
Wheeled Parking Spaces	
- Length	45 Feet
- Width	10 Feet
Grounded Parking Spaces	
- Length (Includes spacing)	47 Feet
- Width (Includes spacing)	9.5 Feet
- RTG Span (Centerline)	74 Feet
- Stacking Density (Ave. container height)	2.5

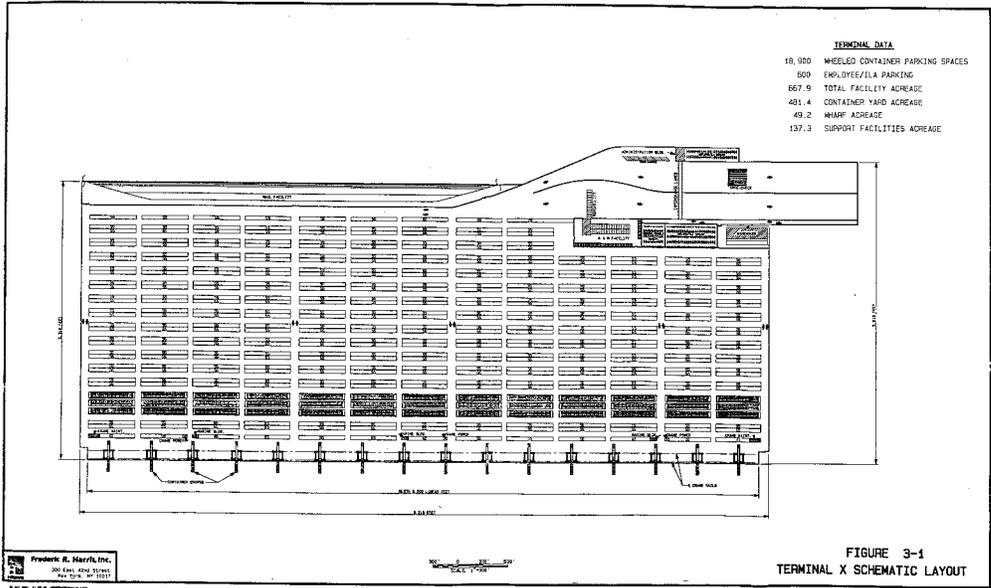
A schematic layout was developed for Terminal X as part of this study. It must be mentioned that the development of the layout was performed without any knowledge of possible restrictions caused by the shape or use of the immediate backup land area or the possible location of roadways and rail leads. Therefore, the configuration of the berth and yard areas and the location of the support facilities in the layout assumes an optimum site configuration and reasonable facility rail and road access and egress will exist.

Enclosed is Figure 3.1 which depicts the schematic layout for Terminal X. The terminal's length is fixed by the specification of a berth of 8,000 feet. Operating efficiency dictates that container storage should be provided directly upland of the berths, hence the long, somewhat narrow configuration of the terminal. The arrangement of the other facilities on the terminal; the gate, warehouse and rail facility are arranged to consider the phased development of the facility.

3.2 Terminal Development Phasing

The anticipated size of Terminal X will require the facility to be developed in phases. According to information received from the SCSPA, the conceptual phasing plan is to develop the facility in 2,000 foot berth segments. In view of the schematic layout, the phasing of the facility is a very important issue, especially considering the location and expansion of the terminal support facilities (gate, maintenance, rail, warehouse) required to support a full 8,000 foot berth development. The initial location of the support facilities to support the first 2,000 foot berth segment will be critical. The location of these facilities must allow for expansion as volume grows, allow for adequate traffic flow, and provide adequate container yard space behind each berth.

In the development of the schematic layout for Terminal X, these issues were considered to the extent possible. It was assumed that the initial development of Terminal X would be from the right side of the layout proceeding to the left with each 2,000 foot berth segment. Therefore, it seemed essential to locate the primary terminal support facilities behind the initial berth development. However, it may be more advantageous to develop multiple support facilities (gates, maintenance areas, administration buildings, and possibly warehouses) due to the large size of the terminal. This could be caused by shipping line preferences, management requirements, operating requirements, and site considerations. Therefore, the phasing plan and the optimum location and configuration of the facility including the support facilities will be significantly affected by the site eventually selected for Terminal X.



SECTION 4 ACREAGE REQUIREMENTS

4.1 Required Acreage

In addition to the definition of facility requirements and the development of optimum layouts for Terminal X, the remaining primary objective of this study is to calculate and compare the overall acreage requirements for the terminal. As shown in the terminal layout (Figures 3-1) the total terminal acreage has been calculated and specified for the three main terminal areas; the wharf, the container yard, and the support facilities. When additional acreage requirements (as specified by the SCSPA) are added to the layout, for buffer area and storm water management, the total acreage requirements for Terminal X total 847 acres. Table 4-1 summarizes the acreage requirements for Terminal X.

TABLE 4-1

TERMINAL X ACREAGE REQUIREMENTS

<u>Component</u>	<u>Acreage</u>
Wharf	49
Container Yard	485
Support Facilities ¹	<u>137</u>
Subtotal	667
Buffer ²	100
Storm Water Mgmt. ²	<u>80</u>
TOTAL	847

¹Includes rail facility.

²Figures provided by SCSPA.

As the site plan for the facility progresses from a schematic, to a more conceptual, and finally to a detailed plan, acreage requirements may require adjustment. This will be caused by two primary factors; first, the configuration of the terminal to the site area selected for development, and secondly, the development of more detailed physical and operating plans for the terminal.

4.2 Terminal Component Location and Utilization

In the development of Terminal X, it is envisioned the facility will have centralized in one location all the terminal requirements necessary to operate efficiently and to provide competitive container facilities in the market area served. Alternative development concepts of Terminal X could involve the location of certain terminal components away from the intended site in order to minimize space requirements for the terminal as well as to locate these components on less expensive land. The terminal components which could qualify for relocation include the rail facility, equipment maintenance activities, and a portion of the container yard to handle empty/surplus equipment.

While this is a possible development concept, it is not recommended for several reasons. First, while decentralized terminal components may lessen land requirements along the waterfront and allow the development of terminal components on cheaper land, this alternative generally results in higher operating costs and a deterioration of service levels. Secondly, the management of a large and complex terminal operation is facilitated by the centralized location of terminal components. Thirdly, the competition from neighboring ports for container cargo in Charleston's market area is certain to intensify. Considering the competitive advantage which the Port of Charleston has developed over the years, it is prudent for the SCSPA to develop Terminal X in a centralized location in order to maintain its competitive position over the long term.

In addition, alternative operating philosophies could minimize acreage requirements for Terminal X especially in the yard area by adopting a more grounded yard operation. While this would minimize required yard acreage, it would more than likely increase operating costs, possibly reduce overall terminal productivity, and possibly place Charleston in an uncompetitive position by requiring more container grounding than its shipping line customers prefer. The layout developed for Terminal X reflects approximately a 20 percent grounded yard operation which is considered a realistic level based upon the needs and desires of the shipping line users. In the design of Terminal X, the provision for additional grounding is recommended in case it is required in the future.

Appendices



Frederic R. Harris, Inc.

APPENDIX A

**TERMINAL X REQUIREMENTS DEFINITION
PLANNING CRITERIA**

**TERMINAL X
REQUIREMENTS DEFINITION
DEVELOPMENT CRITERIA**

		YEAR	
		<u>1991</u>	<u>2015</u>
1.0	CARGO		
	• Tons of cargo per TEU (short tons)	7.7	7.7
	• Ratio of TEU's to containers	1.6	1.6
	• Ratio of container lifts to loads	1.3	1.3
2.0	BERTH		
	• Number of vessel calls (annually)	1,080	2,400
	• Average berth time per call (hours)	17	21
	• Average moves per berth hour	27	30
	• Maximum practical utilization (%)	50	50
	• Ratio of peak to average demand	2	1.6
	• Average vessel length (ft.)	800	900
3.0	CRANES		
	• Productivity (moves per hour)	28	32
	• Average moves per call	448	653
	• Operating hours (per crane)	1,180	2,500
	• Ratio of peak to average demand	2.1	1.6
4.0	CONTAINER YARD		
	• Average dwell time (days)	9.4	9.4
	• Circulation factor (%)	10	10
	• Average stacking height	2.5	2.5
	• Inventory peaking factor (%)	10	10
5.0	GATE FACILITY		
	• Ratio of gate moves to berth moves	1.5	1.5
	• Facility in operation		
	- Days per year	244	244
	- Hours per day	10	10
	• Roadability usage (% of transactions)	15	15
	• Service time		
	- Pre-check (mins.)	2	2
	- Inspection (mins.)	3	3
	- Roadability (mins.)	10	10

		YEAR	
		<u>1991</u>	<u>2015</u>
6.0	RAIL FACILITY		
	• Type of rail car	Conv.	Conv.
	• Facility in operation		
	- Days per year	244	244
	• Rail car utilization (%)	100	100
	• Ratio of peak to average demand	1.15	1.15
7.0	WAREHOUSE		
	• LCL cargo volume (% of total volume)	2	2
	• Average cargo density (lbs./cft.)	30	30
	• Average cargo stacking height (ft.)	5	5
	• Average cargo dwell time (days)	4.5	4.5
	• Floor space utilization (%)	60	60
	• Ratio of peak to average demand	1.5	1.5

APPENDIX B

TERMINAL X SCHEMATIC LAYOUT

C103353.001P2

CONCEPTUAL COST ESTIMATE
CONTAINER PORT
LOWER SAVANNAH RIVER

PRESENT COST
(\$M)

TERMINAL :

Land - 742 Acres - Purchase and replace dredge disposal area (1484 acres total)	15
Dredging - allowance	20
Soil Stabilization - 500A	175
Wharf - 3000LF	30
Rail	1
Final Grade and Pave - 300A	40
Buildings	15
Utilities	20
Storm Water Management	4
subtotal	<u>320</u>

MISCELLANEOUS :

Equipment	40
Environmental, Engineering, Legal - 6%	20
Contingency - 10%	32
subtotal	<u>92</u>
TOTAL	<u><u>412</u></u>

SOUTH CAROLINA STATE PORTS AUTHORITY
MEMORANDUM

TO: Mr. Joe T. Bryant
FROM: Bernard S. Groseclose, Jr.
SUBJECT: Port Infrastructure Costs

DATE: September 5, 1990

With regard to the potential cost of building a port on the Savannah River in Jasper County, I have assembled some infrastructure cost data.

Bob Parham at the PRC estimated that rail access to a location like Clouter Creek would cost \$400,000 - \$500,000 per mile to construct, based on the stability of soils in that area and the need for pilings. A per mile cost of \$300,000 - \$350,000 would be fairly standard if soil conditions were better. Both of these estimates include the cost of acquiring right-of-ways.

Jim Decker of Wilbur Smith Associates provided some estimates of highway costs. A two-lane asphalt road designed for handling heavy truck traffic is estimated to cost \$100 per linear foot. This does not include additional costs for bridges and right-of-way acquisition. For an eighty-foot right-of-way, it would be necessary to acquire approximately 10 acres for each mile of road at market value which should be comparatively low in Jasper County. All this assumes of course that soil conditions are fairly good and that bridges and pilings are not required.

Conservative cost estimates are as follows:

<u>Railroad (10 miles)</u>		
($\$500,000 \times 10$)	=	<u>\$5,000,000</u> construction & right-of-way
<u>Railway (10 miles)</u>		
($\$100 \times 5280 \times 10$)	=	\$5,280,000 construction
+ ($\$30,000 \times 10 \times 10$)	=	3,000,000 right-of-way
		<u>\$8,280,000</u>

To be more realistic, for every mile of marsh that must be bridged, at least an additional \$10,000,000 will be added to the cost of the roadway. What a deal for Jasper County!



BSGjr/jl

cc: Mr. R. W. Bowers

CONTAINER TERMINAL
WITH
3000-FOOT WHARF
AND
200 -ACRE CONTAINER YARD

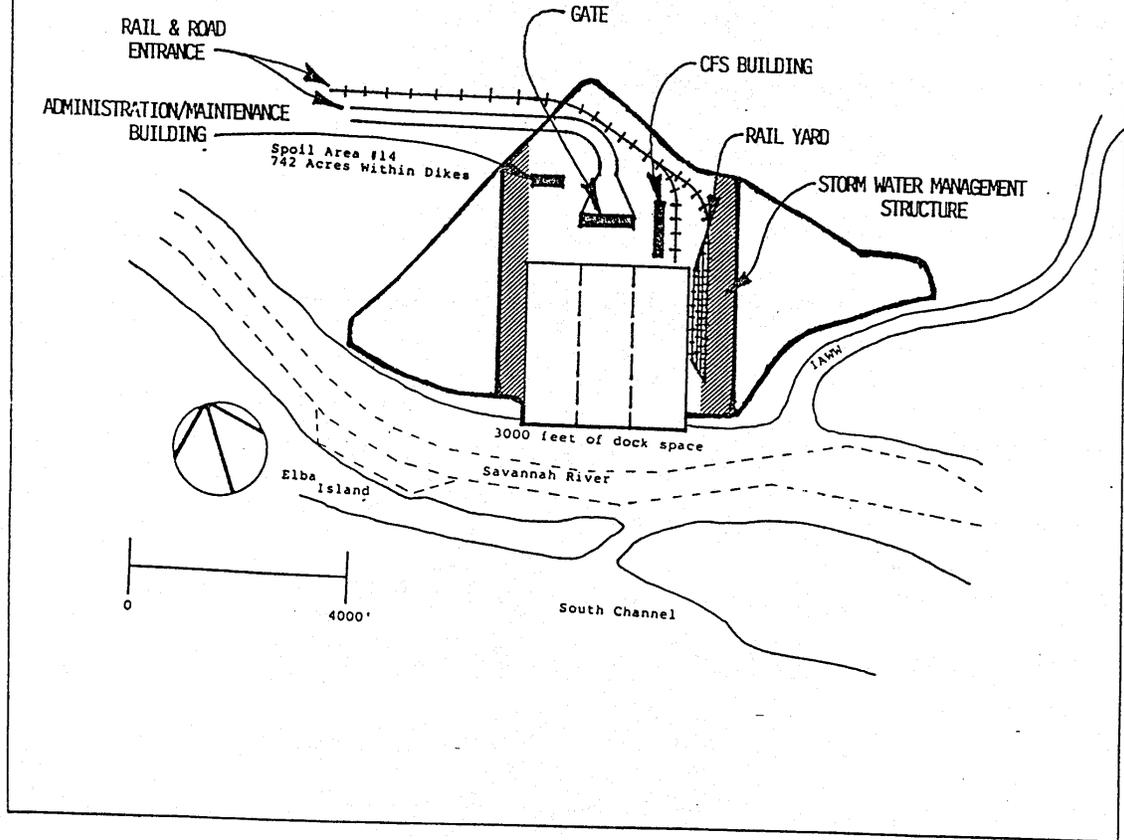


Figure 25. Basic port facility, Site 5, Lower Savannah River.

LOWER SAVANNAH RIVER SPECIAL AREA MANAGEMENT PLAN

