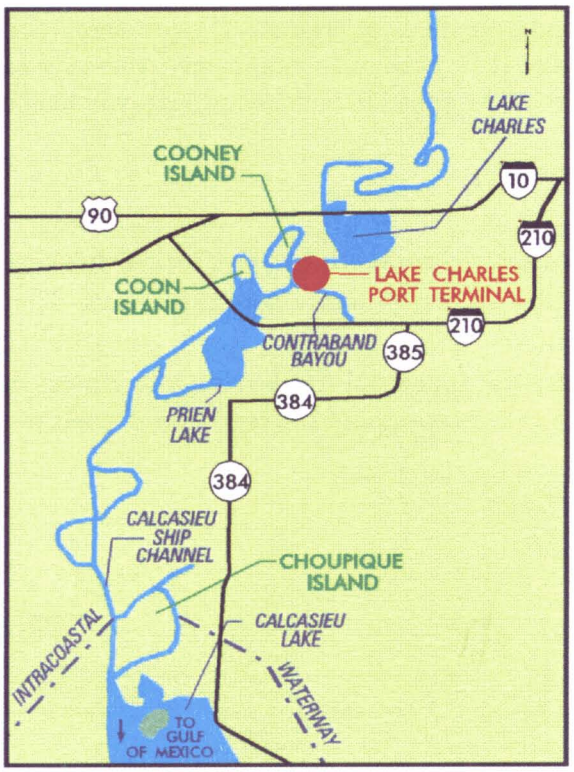
I. GENERAL DATA

TRANSPORTATION ACCESS

WATER

The Port of Lake Charles, in southwest Louisiana, is about 59 miles east of Beaumont, Texas, about 32 miles from the Gulf of Mexico, and is on the east side of the Calcasieu River. From the Gulf of Mexico, the approach is by way of the Calcasieu River Ship Channel.

From the Louisiana shoreline to the port, the channel is 400 feet wide and 40 feet deep at mean low water (MLW). A 1,200- foot turning basin is 5 miles south of the port. According to standard Navy operating procedures, ships do not normally turn in areas that are less than 1.5 times the length of the ship.



Water Access

The only bridge obstruction is for Interstate Route 210, about 1.5 miles south of the port. It has a vertical clearance of 135 feet above mean high water (MHW).

The Gulf Intercoastal Waterway intersects the ship channel 12 miles south of the port. This east/west waterway connects with the Mississippi River System in New Orleans through a series of locks.

HIGHWAY

Highway access, with at least a 16-foot vertical clearance, is available from Interstate Route 10, via the I-210 loop. From I-210, vehicles take Lake, Sallier, and Marine Streets to reach the port gates. Sallier and Lake Streets have four lanes, but Marine Street has only two lanes. Very little congestion exists along this 2.5-mile route from I-210.

All access gates to the port are on Marine Street. Trucks may access Main Gate at any time. Two auxiliary gates, north and south of Main Gate, are operational, as needed, to provide access to the port.

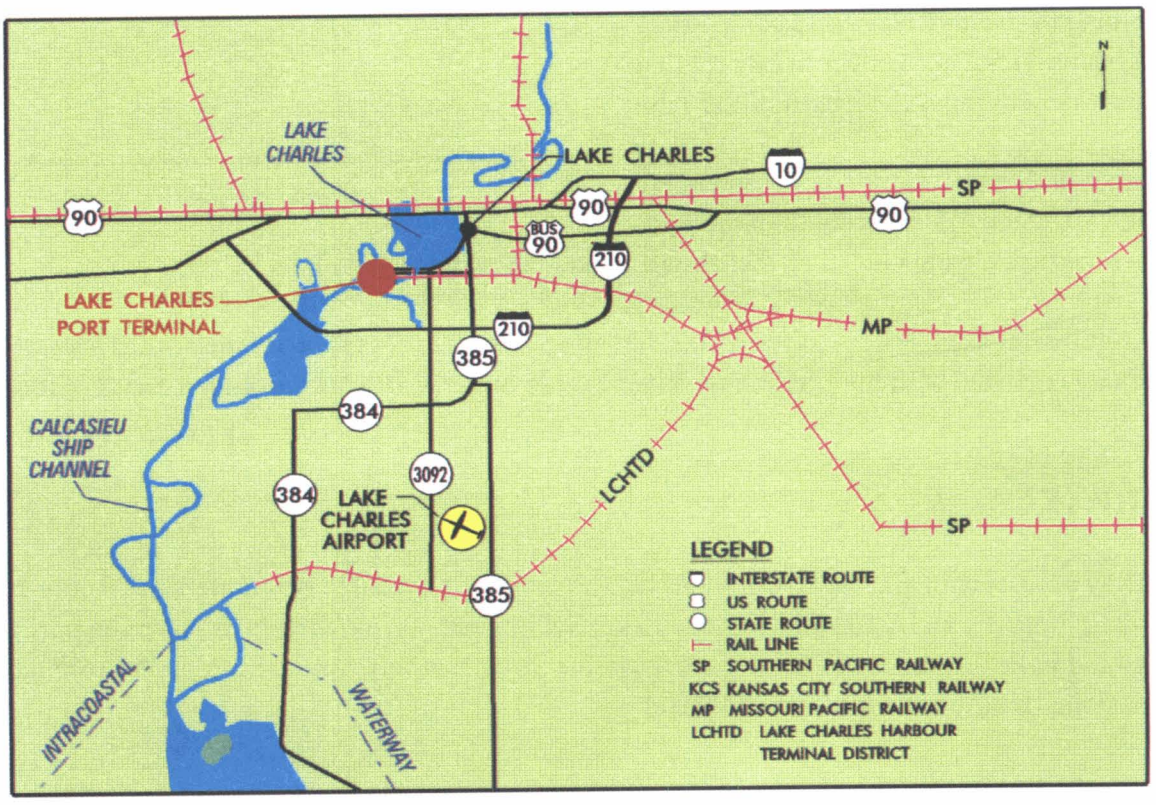
RAIL

The port owns and maintains its own track system. The 38 miles of track directly connect with the Union Pacific (UP) Railroad, which performs railcar switching services on port track as well as service to and from the port terminal. Two other railroads - the Kansas City Southern (KCS) and the Southern Pacific (SP) Railroad Companies - also provide rail service within the Lake Charles area. These railroads and the UP have reciprocal switching agreements. All carriers have railyards near the port.

AIRPORT

The nearest airport is the Lake Charles Municipal Airport. It is about 7 miles south of the Port of Lake Charles and has two commercial runways. The longest runway is 6,500 feet long and 150 feet wide.

Chennault Industrial Airpark is about 7 miles from the Port of Lake Charles. The concrete runway is 15,000 feet long and 200 feet wide. Details of this facility are in the marshaling section of this report.



Highway, Airport, and Rail Access

PORT FACILITIES

BERTHING

The Port of Lake Charles is a major breakbulk and bulk terminal consisting of 10 berths. Wharf construction is typically concrete decking with timber bulkheads. Lighting is sufficient for night operations.

Figure 1 is a land-use map of the main cargo terminal at the Port of Lake Charles. Figure 2 is an aerial view and includes a table identifying berth characteristics.

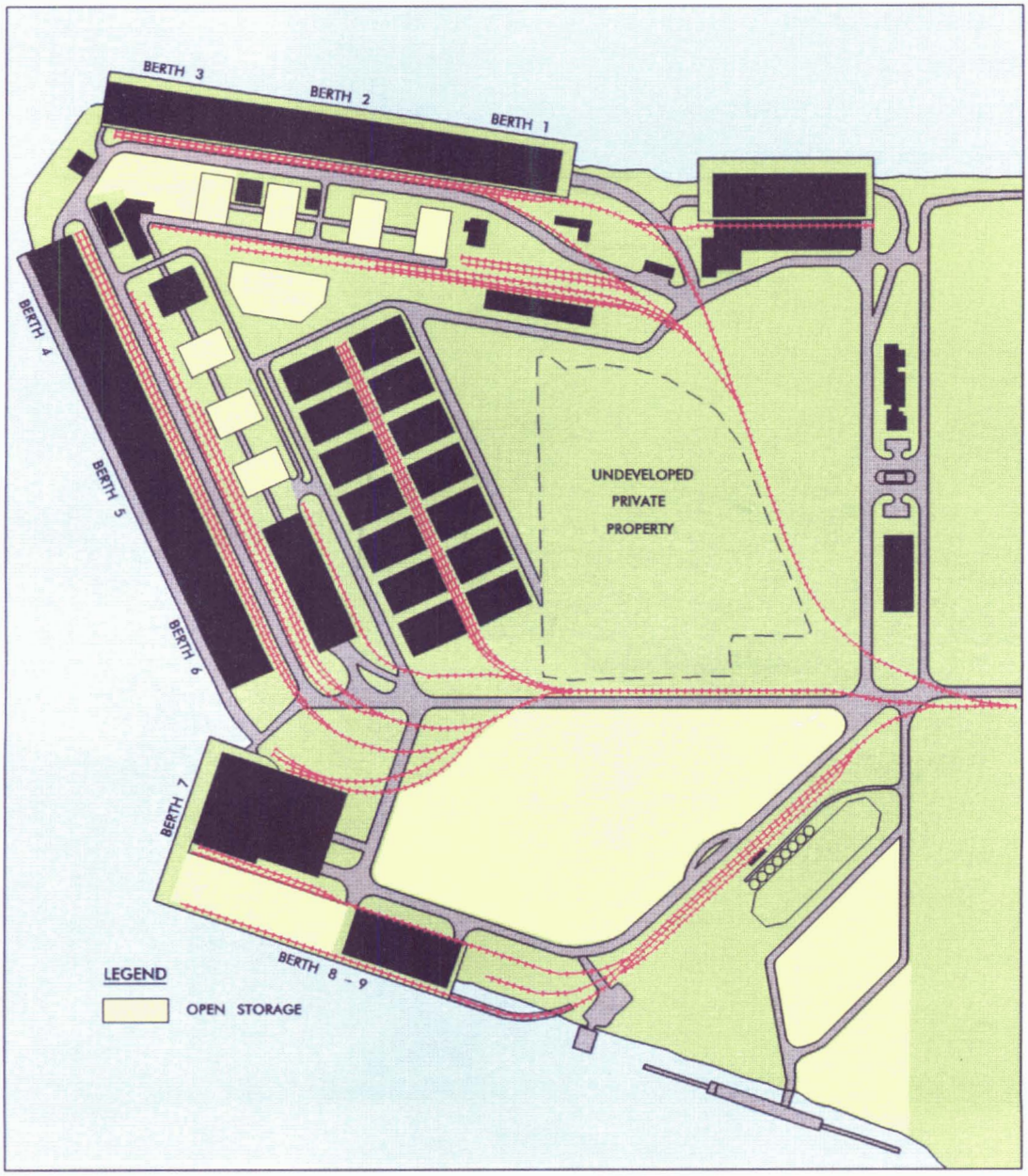


Figure 1. Land-use map.

BERTH CHARACTERISTICS

CHARACTERISTICS	BERTHS				
	1-3	4-6	7	8-9	15
Length (ft)	1,528	1,599	577	962	597
Depth alongside at MLW (ft)	35	35	35	35	35
Deck strength (psf)	500	500	850	500	1,100
Apron width (ft)	30	30	51	140	40
Apron height above MLW (ft)	14	14	14	14	16
Number of container cranes	0	0	0	0	0
Number of wharf cranes	0	0	0	0	0
Apron lighting	Yes	Yes	Yes	Yes	Yes
Straight-stern RORO facilities	No	No	No	No	No
Apron length served by rail (ft)	0	1,599	0	940	0

Figure 2. Port facilities.

The port also has a unique barge loading facility about 12 miles south of the port terminal on the Industrial Canal. The terminal has one berth, which is 200 feet long, with a depth of 14 feet MLW. The berth was designated to accommodate the Trailer Marine Transport fleet of nine ocean-going RORO barges, which operate weekly to San Juan, Ponce, and Mayaguez, Puerto Rico.

Trailer Marine Transport Barge Loading

STAGING

Open Staging

The Port of Lake Charles has about 1.9 acres of paved open staging (fig 1). This area is at berth 8 and usually stages palletized general cargo. Fifteen acres of limestone-covered area is behind transit shed 9. Two other areas each have 5 acres of grass-covered area.

Open Staging Areas (Berth 8)

Helicopters should ferry to the port early during the deployment and land on the apron at berth 8-9. Shed 9 can support shrink-wrapping and reduction operations. Helicopters should remain in the shed to clear the apron for the future staging of vehicles.

Covered Storage

Nine transit sheds provide 860,000 square feet of covered storage. Several inland sheds provide about 500,000 square feet of additional covered storage area. Most of this storage is in warehouses 1 through 14.

RAIL

Rail trackage links the railyards to the apron track transit sheds and port storage tracks. Apron tracks are along berths 8 and 9 (fig 1).

The port owns and maintains about 200,000 feet of track and can store about 700 railcars. Most of the track can support unloading and loading operations. Additional railyards in the local area provide about 130,000 feet of track.

Railyard (Warehouses 1-14)

HIGHWAY

Main Gate has two lanes for each direction of traffic. North and South Gates have one lane for each direction. All roads within the port are two laned and paved, with no clearance restrictions.

The port has one truck scale at the bulk facility east of berth 9.

Truck Scales

UNLOADING/LOADING POSITIONS

Ramps

The port has two permanent end ramps at berth 7. The port owns one portable end ramp. Other portable end ramps can be rented or constructed to greatly improve the circus-style loading capability.

Docks

All transit sheds and warehouses have truck-level docks, which permits about 30 trucks to unload.

Platform Level Tracks (Sheds 4-6)

Two parallel, platform-level tracks run behind berths 1-3, 4-6, and 8. Single platform-level tracks run behind berths 9 and 15. These platforms provide about 160 railcar handling positions.

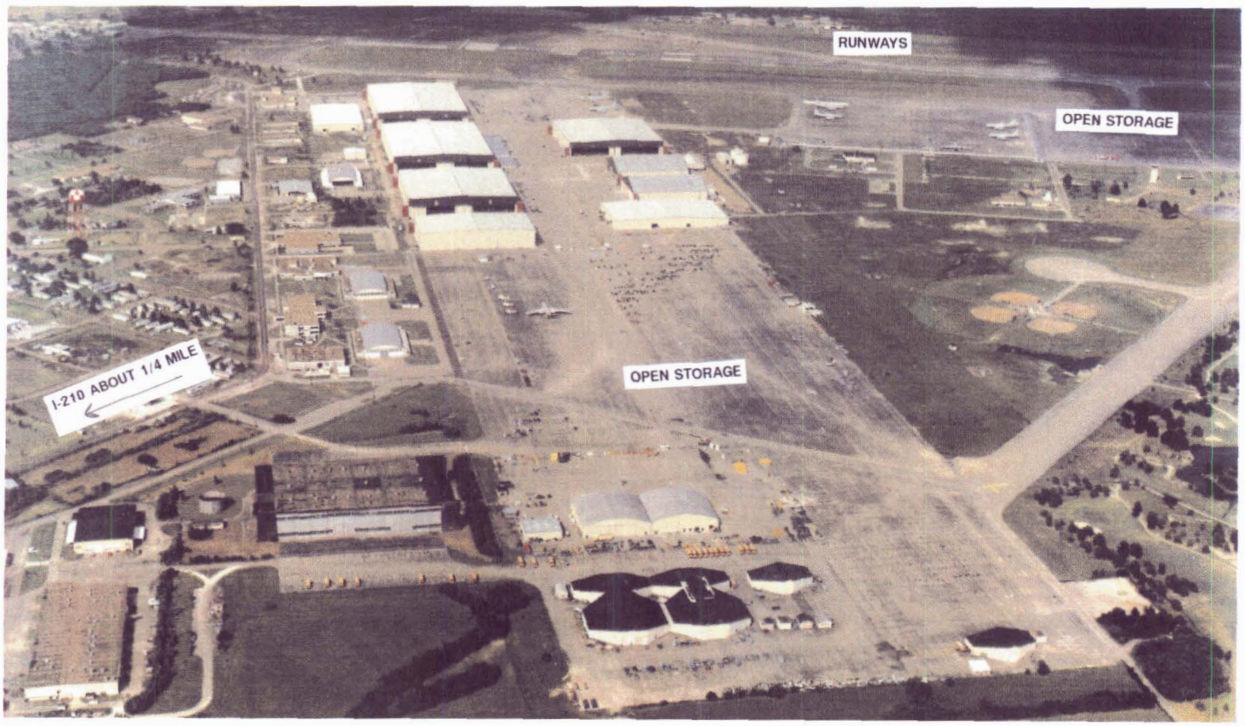
MARSHALING AREAS

Within Port

No marshaling areas are within the port. All the open area within the port is required for staging.

Outside Port

Chennault Industrial Airpark is about 7 miles to the east of the port of Lake Charles. Formerly a bomber base, this 1,000-acre area currently supports aircraft refurbishing and manufacturing activities. About 100 acres of paved, open area is available, but most of the 927,000 square feet of hangar space is leased. All utilities (electricity, drainage, potable water, and compressed air) are available. Seven-foot fencing and closed-circuit TV provide security.



Chennault Industrial Airpark (Eastward View)

The industrial park is bordered by rail lines on the east and south sides. No rail spurs are available to support end ramp offloading.

MATERIALS HANDLING EQUIPMENT (MHE)

The port does not own any cranes. Several mobile cranes, with capacities up to 150 tons, are available from local stevedore companies.

INTERMODAL FACILITIES

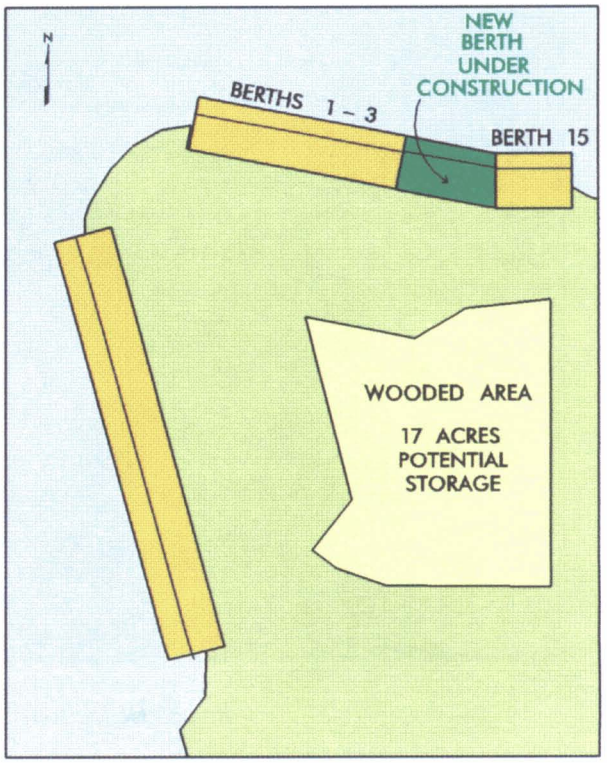
No intermodal operations are at the port or in the Lake Charles area. The nearest intermodal railyards are in Houston, Baton Rouge, and Alexandria. Each of these cities is 80 to 125 miles from the port.

FUTURE DEVELOPMENT

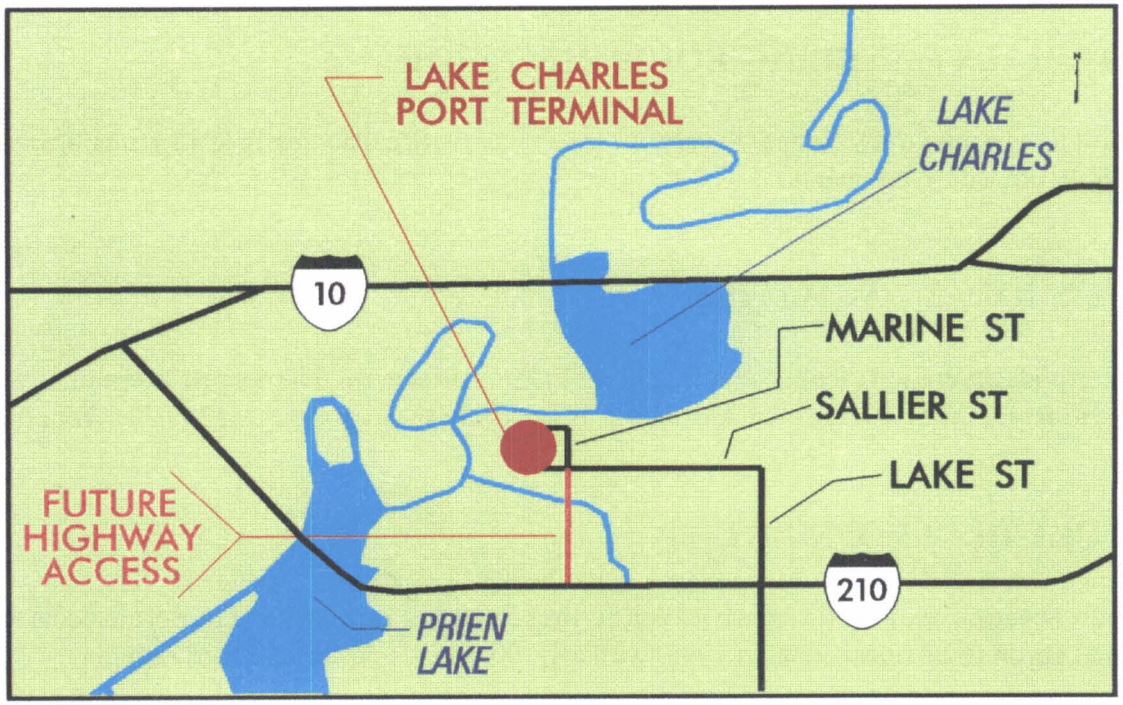
The port began developing the area between berths 15 and 1 in early 1993. The port expects the new shedded apron to be operational in 1995, with a 1,100 pounds per square foot rating.

The port expects to develop the 17-acre wooded area in the center of the port into additional, or open, storage. Clearing will not begin for several years. Once cleared, this area might provide additional staging area.

The port plans to develop a direct-access route to I-210. The plans include the construction of a new interchange on I-210 and a two-lane road from the interchange to the port. The construction of the interchange is scheduled for 1994.



Proposed Berth and Potential Storage

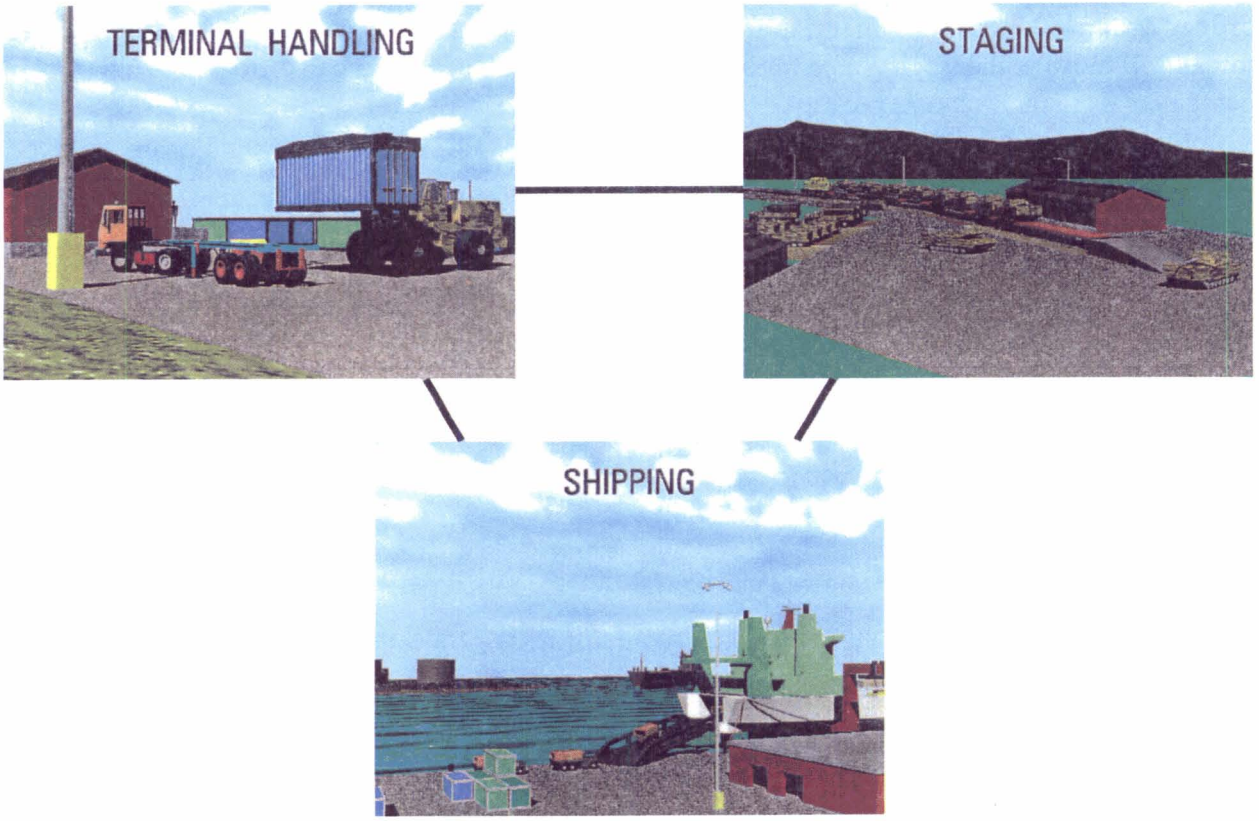


Proposed Highway Access

II. THROUGHPUT ANALYSIS

GENERAL

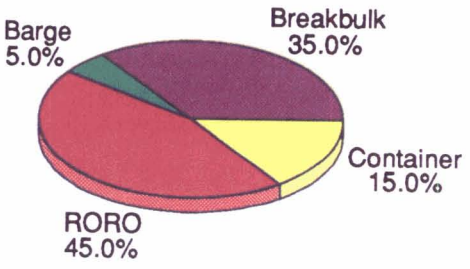
This section evaluates the theoretical throughput capability of the Port of Lake Charles using the port operational performance simulator (POPS) computer model. The model is based on a weak-link analysis in which each subsystem is analyzed separately and then compared to find the least capable subsystem. The weakest subsystem defines the maximum throughput capability of the terminal. The model yields throughput capability values for three subsystems - shipping, staging, and terminal processing/handling - in short tons (STON) per day.



Terminal Throughput Subsystems

The analysis assumes that 80 percent of the port facilities will support military deployments. Also, the ship mix is based on Desert Shield and Desert Storm statistics. We weighted the percentages to adjust for differences in cargo deadweights and expectations for future deployments.

SHIP MIX PERCENTAGES



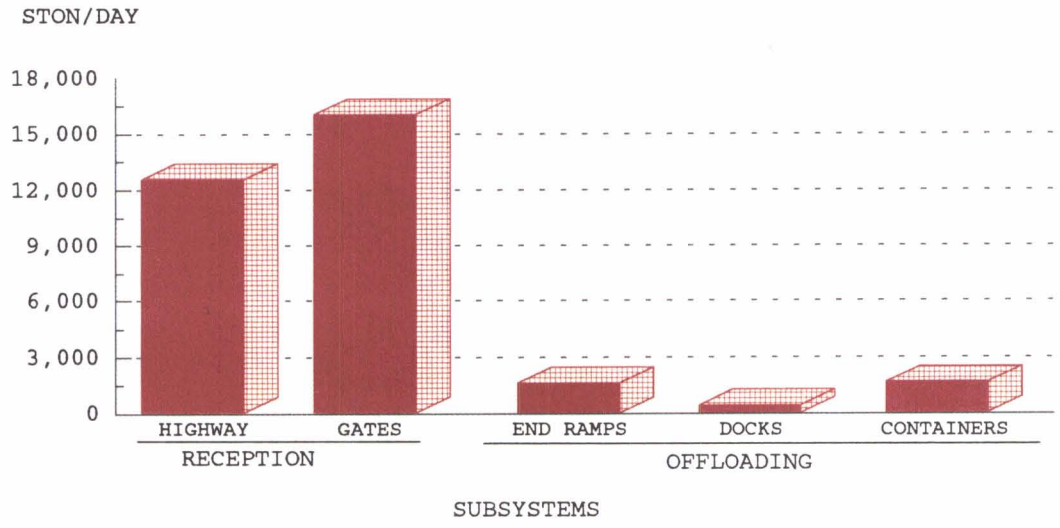
TERMINAL RECEPTION/ HANDLING

HIGHWAY

The port can open two gates, if necessary, to provide three gates for the military and commercial traffic entering the port. Trucks must use Sallier Street to access all gates. Two gates require further traveling on Marine Street (fig 1). All gates provide access to the staging areas. The road network in and out of the port, including the gate processing of vehicles, could handle more than 12,500 STON of equipment and supplies per day.

Roadable vehicles in convoys will process directly to the staging area. Vehicles on commercial or military flatbed trailers without integral ramps will offload at one of the transit shed truck docks. One dock, used as an end ramp, can offload 1,600 STON of rolling stock per day. Supplies in van semitrailers will proceed to the remaining 10 transit shed truck docks. These 10 truck docks can offload about 400 STON of van semitrailer-shipped material and equipment per day. Containers on trucks will move to the staging area for offloading. A container handler can offload 1,626 STON in containers from their chassis per day.

HIGHWAY RECEPTION/HANDLING CAPABILITY



RAIL

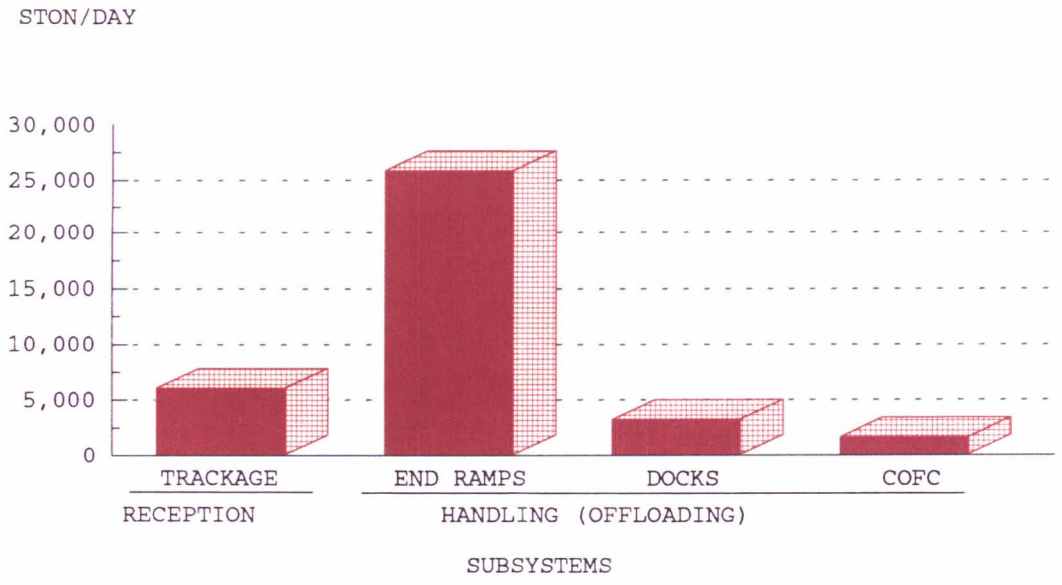
Rail reception at the port is very good. Three commercial carriers provide access to the port. Railyards within the port can store 700 railcars. Also, commercial railyards within a few miles of the port can store more than 2,000 additional railcars. The current rail service to the port is about three 50-railcar trains per day.

Vehicles on flatcars could offload at eight tracks within the port by using two permanent and six portable end ramps. Boxcars could offload at any of several transit sheds. This analysis allocated the tracks behind sheds 1-3 and 15 for boxcar operations. This arrangement could support about 80 flatcars and 32 boxcars. Containers could offload using a container handler.

POTENTIAL PORTABLE END RAMP LOCATIONS AND LENGTHS

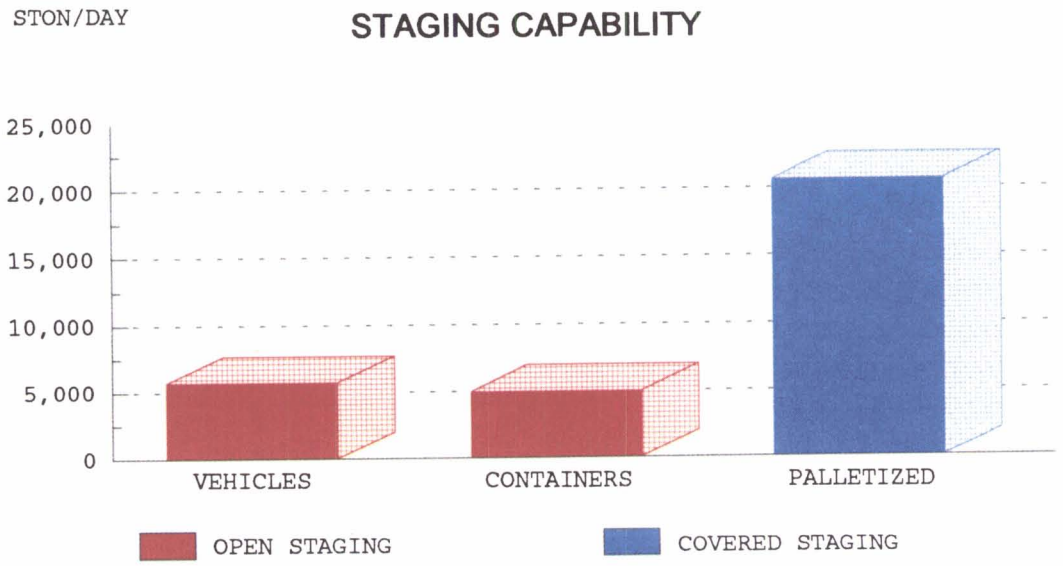
LOCATION	*NUMBER OF 89-FT RAILCARS*
Behind sheds 4-6 (2 ramps total)	16 each
Inland of warehouses, behind sheds 1-3	8
Between warehouses (3 ramps total)	8 each

RAIL RECEPTION/HANDLING CAPABILITY



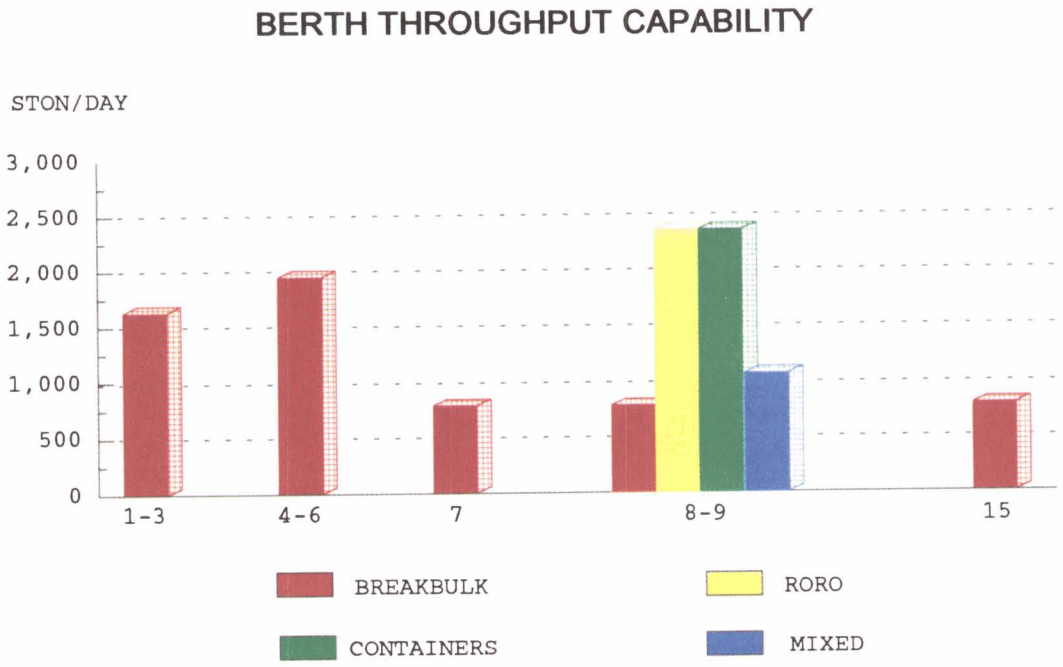
STAGING

The port has about 25 acres of open area to use for staging. It also about 1,360,000 square feet of covered storage.



SHIPPING

We identified the throughput capability per berth in STON per day for breakbulk, RORO, container, and mixed vessels. These results were based on various factors and included MHE used, loading, operational and berth usage rates, as well as berth/ship compatibility.



The berthing capabilities for various vessel types are shown in the table 1. The table also provides the limitations that can hinder shipping operations.

The type of ship preferred at each berth is based on the methodology described in appendix A. The evaluation is based on a snapshot view of the current physical characteristics of the berths and the MHE available. The evaluation gives no considerations to enhancements, such as equipment.

Berth 8-9 provides the largest throughput capacity for container and RORO vessels. This berth is the most compatible for all ship types. The only disadvantage of berth 8-9 is that it is too short to support more than one ship.

PERFERENCE BERTH SELECTION

LOADING TYPE	*BERTHS*				
	1-3	**4-6**	**7**	**8-9**	**15**
Breakbulk	3	1	4	2	5
RORO	-	-	-	-	-
Container	-	-	-	1	-

Note: Berths marked "-" are not recommended for these operations.

TABLE 1
SUMMARY OF LAKE CHARLES BERTHING CAPABILITIES

VESSEL	BERTHS				
	1-3	4-6	7	8-9	15
Breakbulk					
C3-S-33a	3	3	1	1	1
C3-S-37c	2	3	1	1	1
C3-S-37d	2	3	1	1	1
C3-S-37a	2	3	1	1	1
C4-S-1a	2	2	1	1	1
C4-S-1qb and 1u	2	2	1	1	1
C4-S-58a	2	2	1	1	1
C4-S-65a	2	2	1	1	1
C4-S-66a	2	2	1	1	1
C4-S-69b	2	2	c	1	1
Seatrain					
GA and PR-class	2	2	1	1	1
Barge					
LASH C8-S-81b	1	1	c	1	c
LASH C9-S-81d	a	a	a,c	a	a,c
LASH lighter	10	11	4	6	4
SEABEE C8-S-82a	a	a	a,c	a	a,c
SEABEE barge	7	8	2	4	2
RORO					
Comet	d,o	d,o	d,o	d,i,j	d,o
C7-S-95a/Maine-class	b	b	b,c	1	b,c
Ponce-class	b,h	b,h	b,c,h	h	b,c,h
Great Land-class	b,h	b,h	b,c,h	h	b,c,h
Cygnus/Pilot-class	b	b	b,c	1	b,c
Meteor	d,o	d,o	d,o	d,i,j	d,o
AmEagle/Condor	b	b	b,c	i,j	b,c
MV Ambassador	d	d	d	d	d
FSS-class	b	b	b,c	1	b,c
Cape D-class	b	b	b,c	i,j	b,c
Cape H-class	a,b	a,b	a,b,c	a	a,b,c
Container					
C6-S-1w	2,e	2,e	c,e	1,e	c,e
C7-S-68e	2,e	2,e	c,e	1,e	c,e
C8-S-85c	1,e	1,e	c,e	1,e	c,e
Combination					
C5-S-78a	2,e	2,e	c,e	1,e	c,e
C5-S-37e	2,e	2,e	c,e	1,e	c,e

a = maximum vessel draft limited to berth depth
b = inadequate apron width
c = inadequate berth length
d = no straight stern-ramp facilities
e = no container-handling equipment
f = inadequate berth depth, adequate anchorage depth
g = inadequate channel depth
h = no shore-based ramps available
i = insufficient ramp clearance at low tide
j = insufficient ramp clearance at high tide
k = excessive ramp angle at low tide
m = excessive ramp angle at high tide
n = parallel ramp operation only
o = insufficient apron width for side-ramp operation

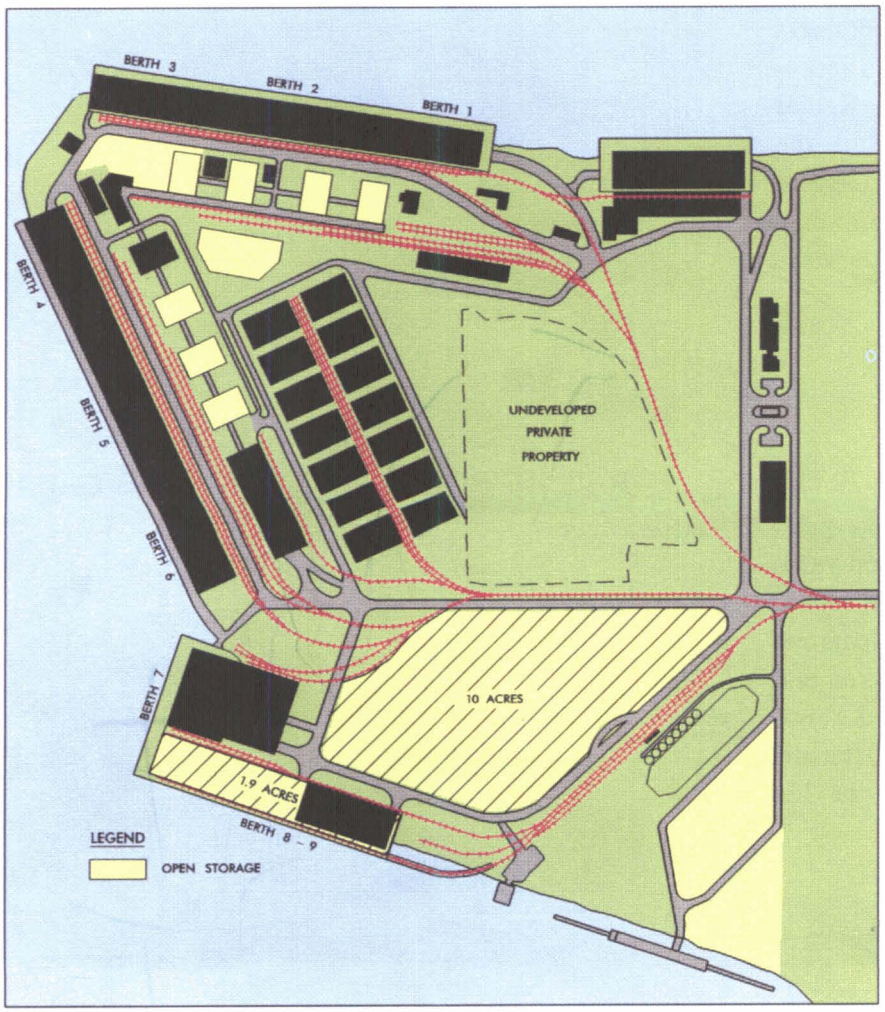
Note: Ramp clearance and ramp angle based on maximum vessel draft.

III. APPLICATION

GENERAL

This section of the report will evaluate the throughput capability of the port for deploying a notional mechanized infantry brigade on three FSS ships.

The *Planning Orders Digest*, issued by MARAD, does not include agreements for military use of the Port of Lake Charles. This analysis realistically considers what facilities would efficiently support military operations, in lieu of planning orders. Only berth 8-9 can support RORO operations. The staging for these these two berths can only support the loading of a single FSS. For these reasons, this report analyzes operations at berth 8-9 and considers the 15-acre limestone field for additional staging.



Facilities Used in This Analysis

REQUIREMENTS

The likely requirement for the Port of Lake Charles is to load a notional mechanized infantry brigade in 6 days. The brigade has to move about 2,600 vehicles and 220 containers. The movement of this equipment to the port will require 360 (60 per day) railcars, using the convoy/rail option. Under this option, about 1,220 (205 per day) roadable vehicles would be driven and about 775 (130 per day) would be towed.

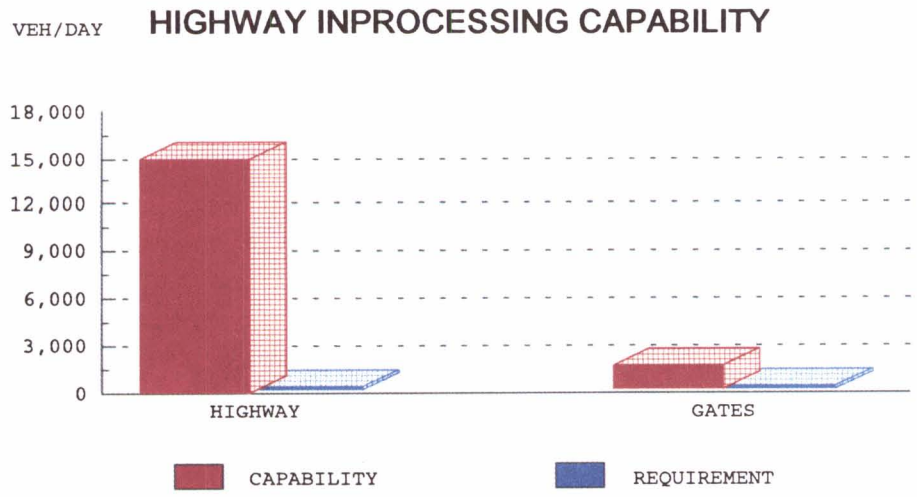
MECHANIZED INFANTRY BRIGADE DEPLOYMENT DATA

Total Equipment	
Volume	91,506 MTON
Weight	31,670 STON
Area	474,300 SQ FT
Vehicles	2,600
Containers (20 ft)	220

TERMINAL HANDLING

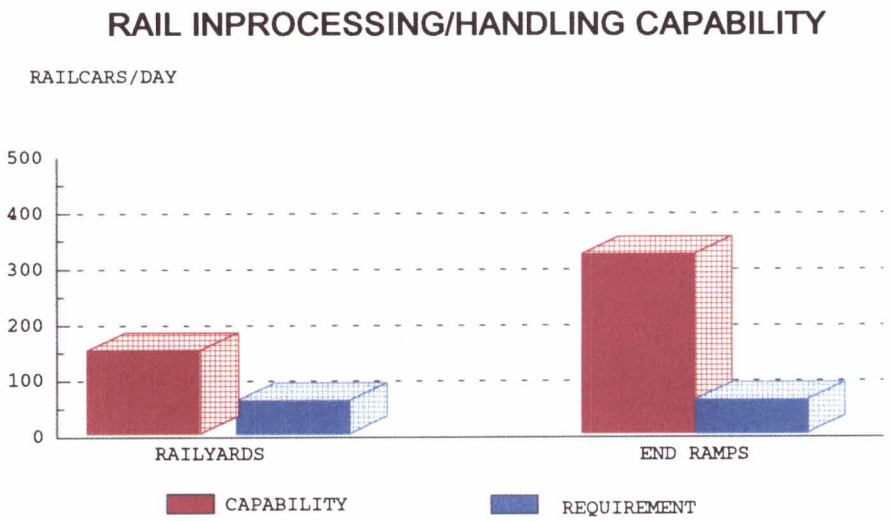
HIGHWAY

Vehicles and containers on chassis would access the port from the Sallier Street Gate. Both the access road and the gate can handle more than 1,500 vehicles per day.



RAIL

The classification yards within the port could receive 150 railcars per day. Also, 8 fixed and portable rail end ramps could offload 80 flatcars every 5 hours, or 320 per day.

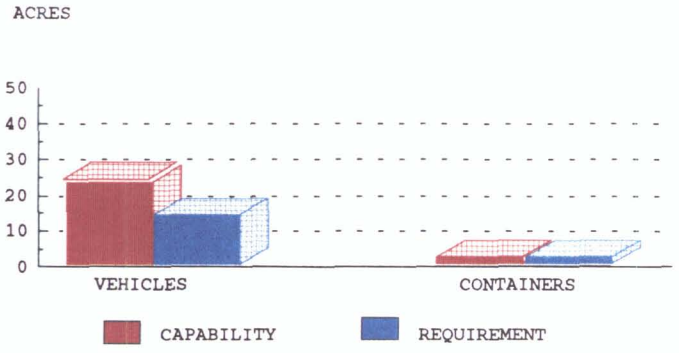


STAGING

This analysis assumes that current downsizing continues and that three FSS-sized ships will deploy an entire notional mechanized infantry brigade. One ship will depart every 2 days. Although an FSS cargo load can be staged on 10 acres, 16 acres are required for a sustained loading operation. Of these 16 acres, about 2 acres are required for staging the containers for each FSS.

About 25 acres of open storage area exist that could support military operations.

OPEN STAGING CAPABILITY



SHIPPING

Although this analysis assumes that only three FSS-sized ships can deploy the notional mechanized infantry brigade, the table below provides ship quantities for the current brigade size. The number of ships required depends on the shipping mix selected. The best ship mix would consist of about 3 FSSs.

UNIT MOVEMENT REQUIREMENTS
MECHANIZED BRIGADE

LOADING CONDITION/ SAMPLE SHIP MIX	*VESSEL TYPES*			
	FSS (RORO/COMB)	**CAPE H (RORO/COMB)**	**C3/C4 (BREAKBULK)**	**C6/C7/C8 (CONTAINER)**
Minimum Containerization				
All FSS*	3.33			
FSS and Cape H	2.22	1.00		
All Breakbulk			12.57	
Maximum Containerization				
FSS and Container	2.64			0.67
FSS, Cape H, and Container	1.54	1.00		0.67
Breakbulk and Container			9.86	0.67

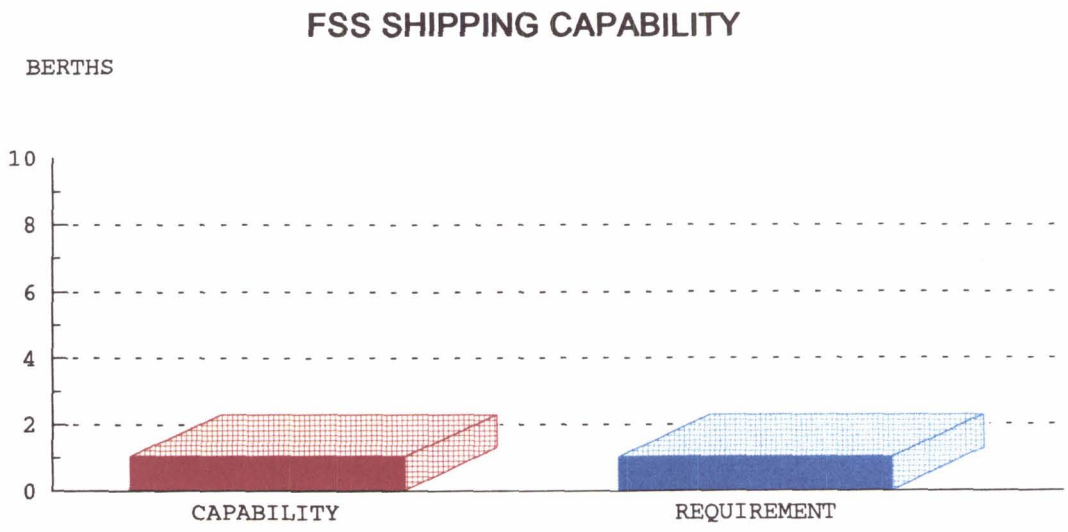
*Only 8 FSSs are available. Unit shipping requirements exceed the capacity of these 8 vessels. Other vessel types are required to make up the FSS shortfall (Cape H).

Legend:

RORO - roll on/roll off

FSS - fast sealift ship

Source: MTMCTEA Report OA 90-4f-22, Deployment Planning Guide, 91.



SUMMARY

The berthing restrictions of the FSS vessels limit the Port of Lake Charles to one FSS support system. The port receiving and staging capabilities can support FSS operations. The mechanized infantry brigade can deploy in the 6-day outloading period.

RECOMMENDATIONS

1. Designate only one brigade of equipment to deploy through the Port of Lake Charles, because of the berthing and staging limitations.

2. Designate berth 8-9, and 14 additional acres of staging, to support the one FSS system.

PORT OF MOBILE

MOBILE, ALABAMA

I. GENERAL DATA

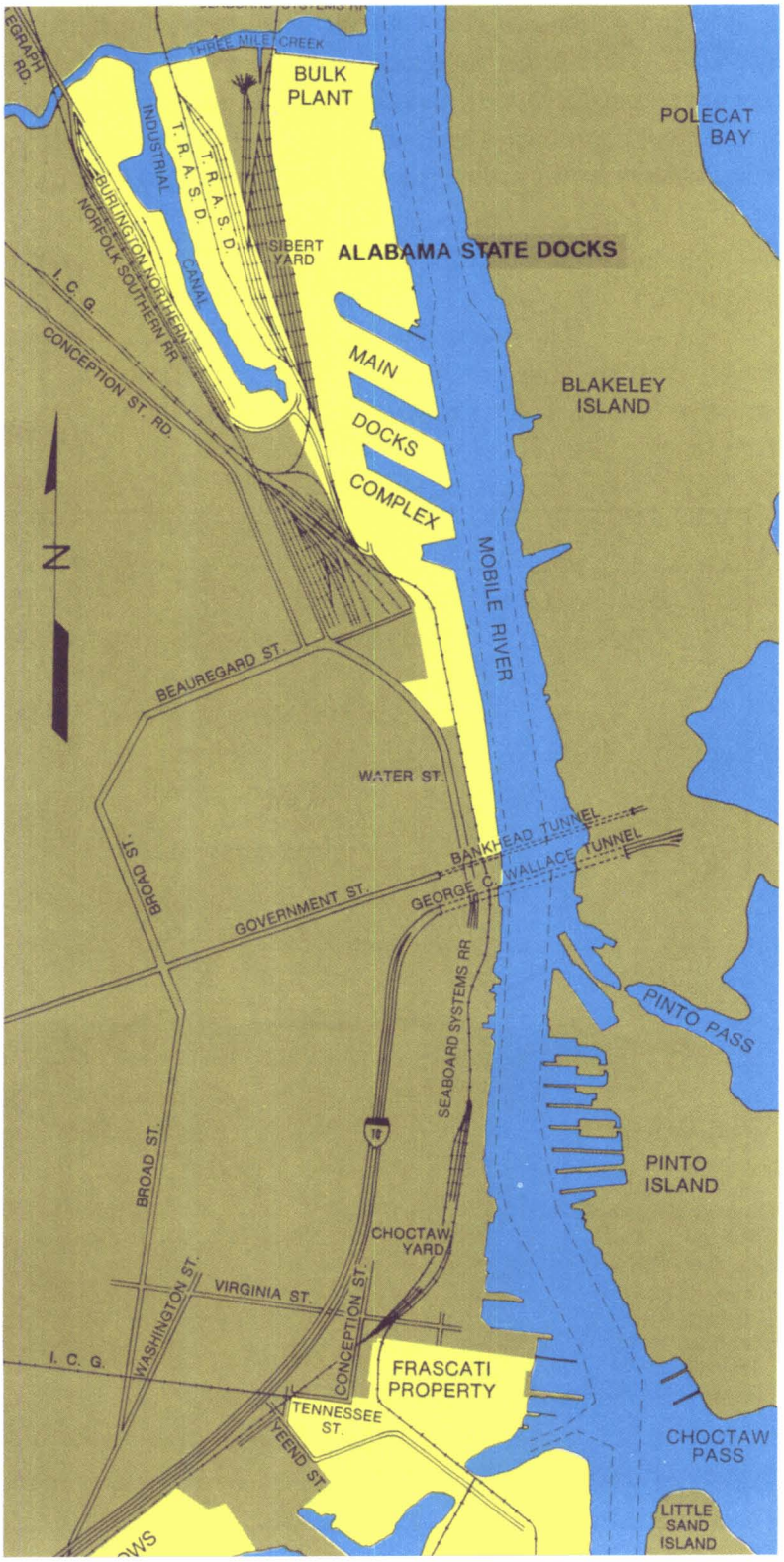
TRANSPORTATION ACCESS

WATER

The Port of Mobile, Alabama, is at the junction of the Mobile River and the head of Mobile Bay. The major port facility is the Alabama State Docks (ASD). This facility is along the last 5 miles of the Mobile River, mainly on the south bank. Mobile Bay is about 29 miles long and about 8 miles wide at its upper portion. The bay is separated from the Gulf of Mexico by Dauphin Island and the Mobile Point Peninsula. Between these two points of land is a 3-mile-wide access way into the bay.

Passage from the Gulf of Mexico to the Port of Mobile is via a series of ship channels. These channels vary from 40 to 42 feet deep and 400 to 775 feet wide.

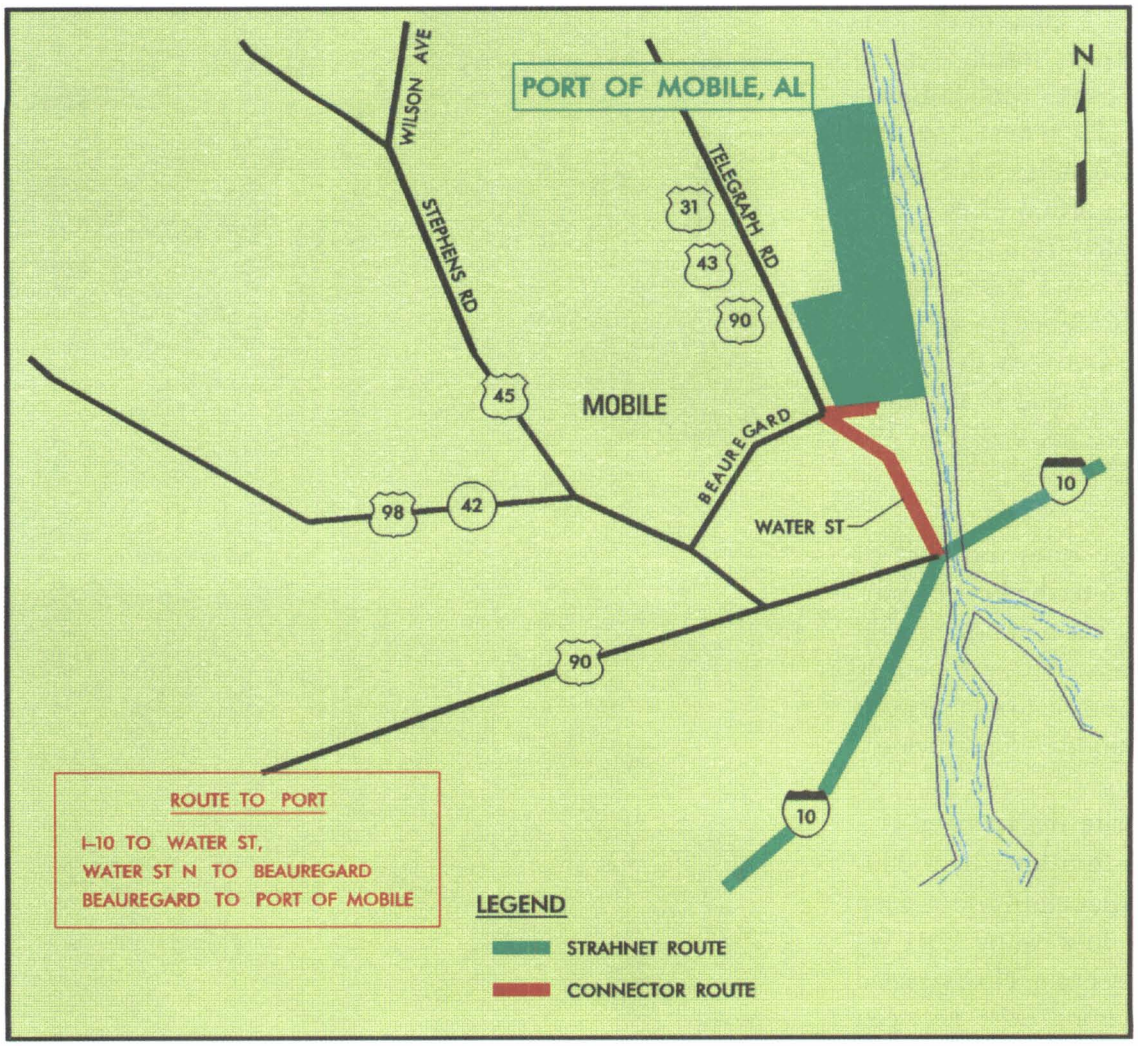
Opposite the terminal is a 2,500-foot-long by 1,000-foot-wide and 40-foot-deep mean low water (MLW) turning basin. No overhead restrictions exist between the Port of Mobile and the Gulf of Mexico.



Water Access to ASD

HIGHWAY

Access to a number of interstate and US routes to and from the ASD is excellent. Interstate Routes 10 and 65 and US Routes 31, 43, 45, 90, and 98 are all near the terminal. Port entry from these routes is by way of Water Street to Beauregard Street and Beauregard Street to the main gate. Beauregard Street has a raised flyover above the railroad tracks, so traffic flow to the port is not impeded by rail movements. The highways leading into the port have a vertical clearance restriction of 14 feet 6 inches. The highway network around the port area has heavy traffic congestion during peak hours.

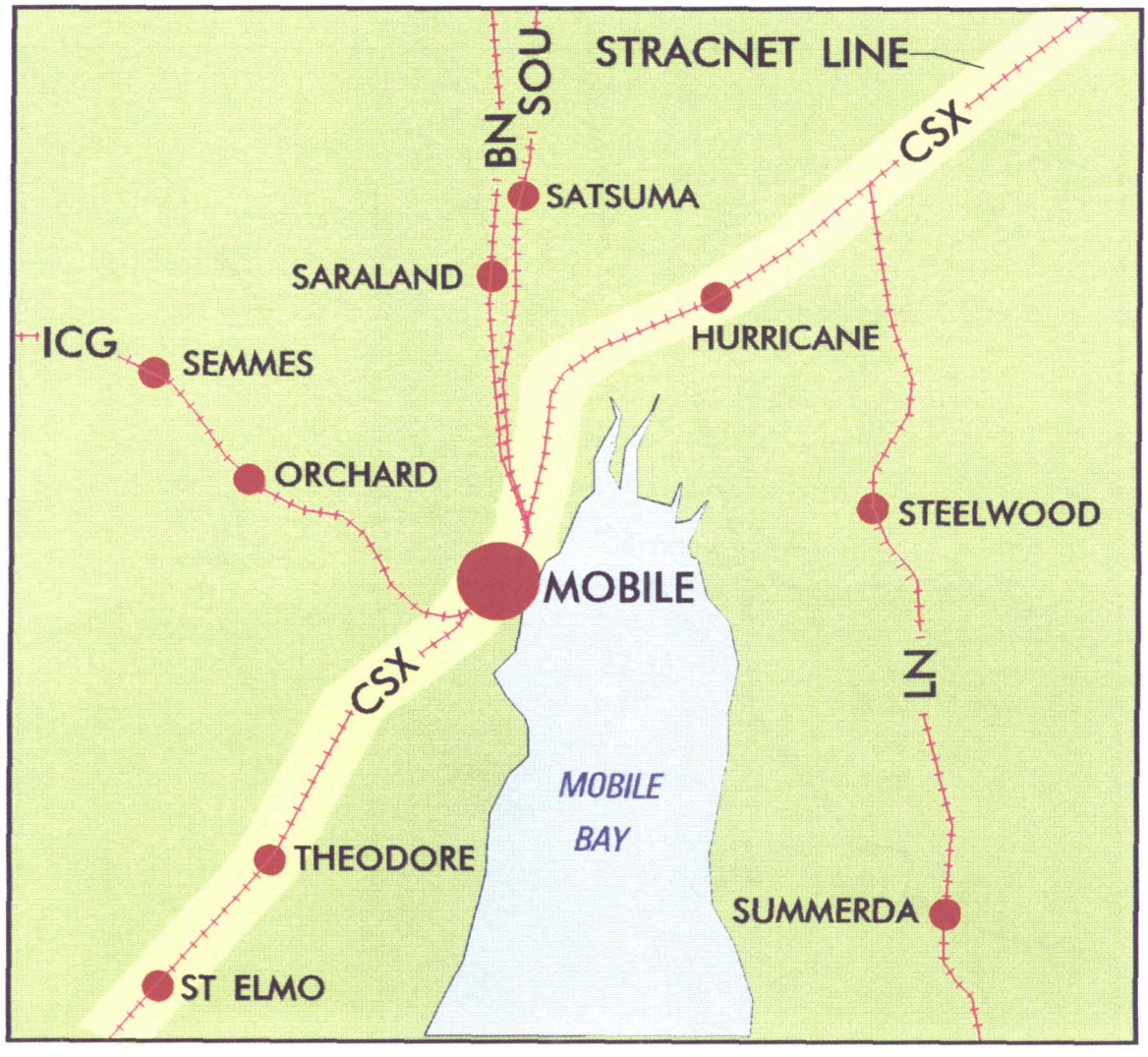


Highway Access

RAIL

Four railroad companies provide one track each to the Port of Mobile. These are the Burlington Northern (BN), CSX, Illinois Central, and Norfolk Southern. The tracks are active and in good condition. All four rail lines have clearance restrictions of 40 feet in the vertical direction and 22 feet in the horizontal direction. Each of the railroads has a regional railyard less than one-half mile from the port. The capacity of the railyards ranges from 1,025 to 1,800 89-foot railcars (1,600 to 2,800 60-foot railcars). The port operates four railyards. They are the Joint Interchange (Terminal Yard), Main Yard (A, B, C), McDuffie Terminal, and Frascati Yard. The capacity of these yards ranges from 300 to 1,300 railcars.

The ASD terminal railway handles all rail movements and switching within the port complex. It offers shipside service and is responsible for switching cars from the four major railroads to various State dock facilities.

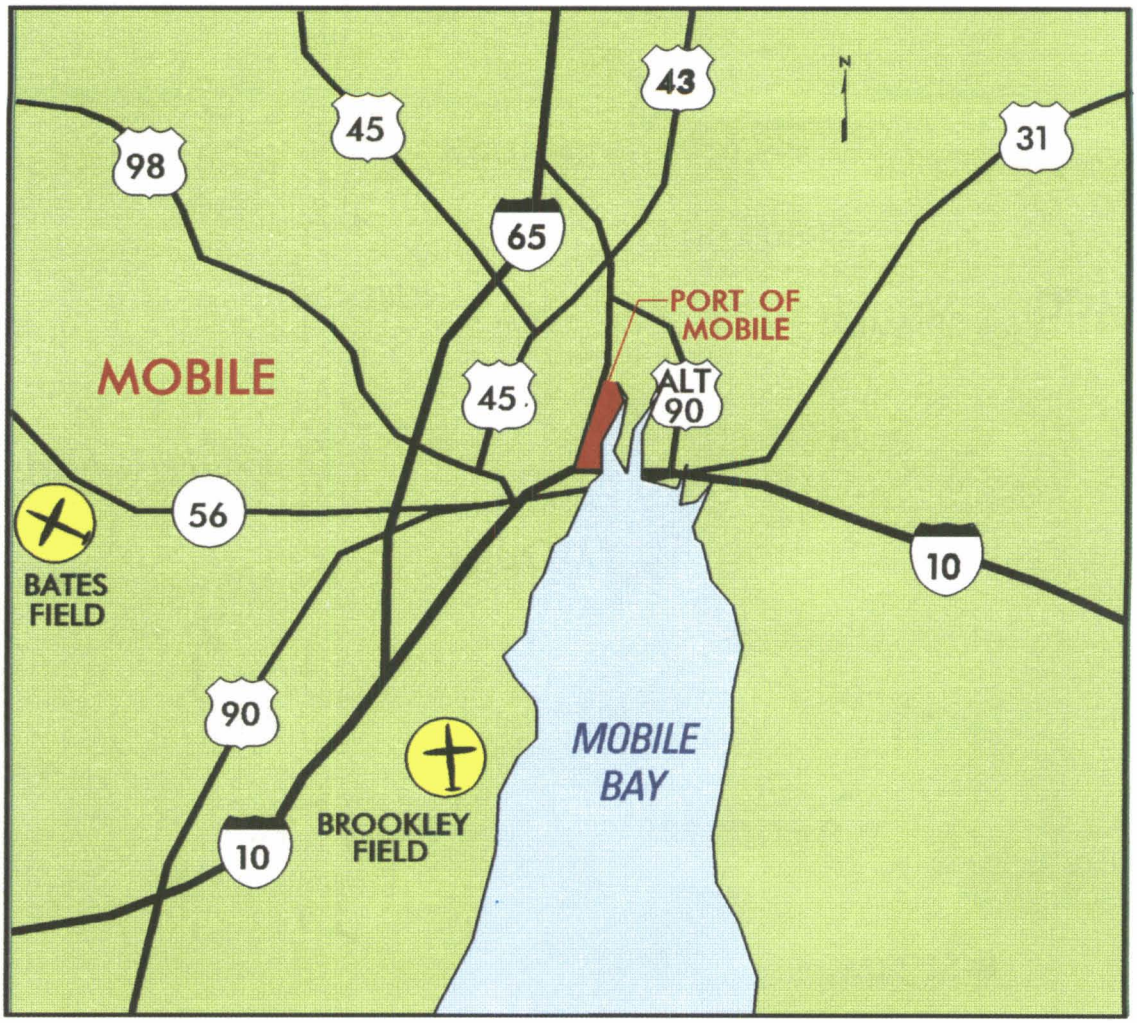


Rail Access

AIR

Two airports serve the Port of Mobile: the Mobile Municipal and the Brookley Industrial Complex and Airport. The Mobile Municipal Airport, or Bates Field, is on Airport Boulevard, about 12 miles west of the port. Bates Field has three runways. The dimensions of the runways are 4,354 by 150 feet, 4,988 by 150 feet, and 8,527 by 150 feet.

The Brookley Industrial Complex and Airport, or Brookley Field, is 5 miles south of the Port of Mobile. The complex has two main runways and numerous taxiways. The dimensions of these runways are 9,600 by 200 feet, and 8,600 by 150 feet. Brookley Field is a complete transportation complex with direct interstate connections and two railroads.



Highway and Air Access

PORT FACILITIES

BERTHING

The ASD is a multicargo marine complex comprising a marginal wharf and wide piers. The wharf and piers provide 26 general cargo berths.

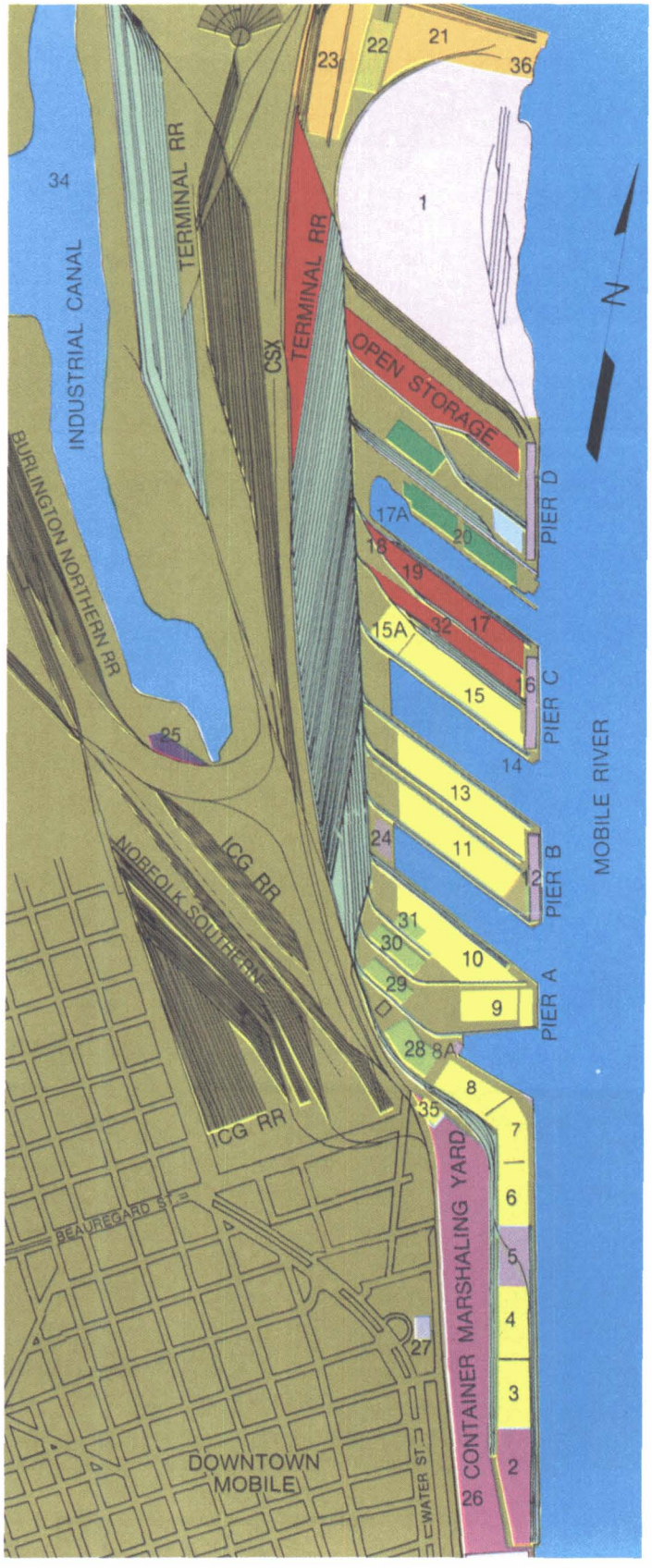
Berths 2 through 8 are along the marginal wharf. Berths 2 through 7 provide about 3,540 feet of continuous berthing space. Berths 2 and 5 are open, while berths 3, 4, and 6 through 8 have 30-foot-wide aprons. Depth alongside the berths averages 34 feet MLW, and deck strength is 1,000 pounds per square foot.

Piers A through C range in length from 570 to 1,610 feet. Apron width varies from 42 feet to open. Depth alongside the piers ranges from 27 to 38 feet MLW, and deck strength ranges from 500 to 1,500 pounds per square foot.

In general, wharf and pier construction consists of concrete pile and beams and cross wall-supported concrete decking. The concrete decks front steel, sheet pile, bulkheads and have concrete-surfaced solid fill. All berths are fronted with a timber fendering system.

All berths are well lit for night operations. Gantry and mobile crane assets serve the terminal.

Figures 1 and 2 are aerial views of the port and include a table identifying berth characteristics.



Land-Use Map

BERTH CHARACTERISTICS OF STATE DOCKS

CHARACTERISTICS	BERTHS					
	2	3-4	5	6-7	8	A South
Length (ft)	898	1,006	499	1,138	584	570
Depth alongside at MLW (ft)	32	35	34	34	37	37
Deck strength (psf)	1,000	1,000	1,000	1,000	1,000	1,000
Apron width (ft)	Open	30	Open	30	30	74
Apron height above MLW (ft)	11	11	11	11	11	11
Number of container cranes	1	0	0	0	0	0
Apron lighting	Yes	Yes	Yes	Yes	Yes	Yes
Straight-stern RORO facilities	No	No	No	No	Yes	No
Apron length served by rail (ft)	800	1,000	499	0	0	500

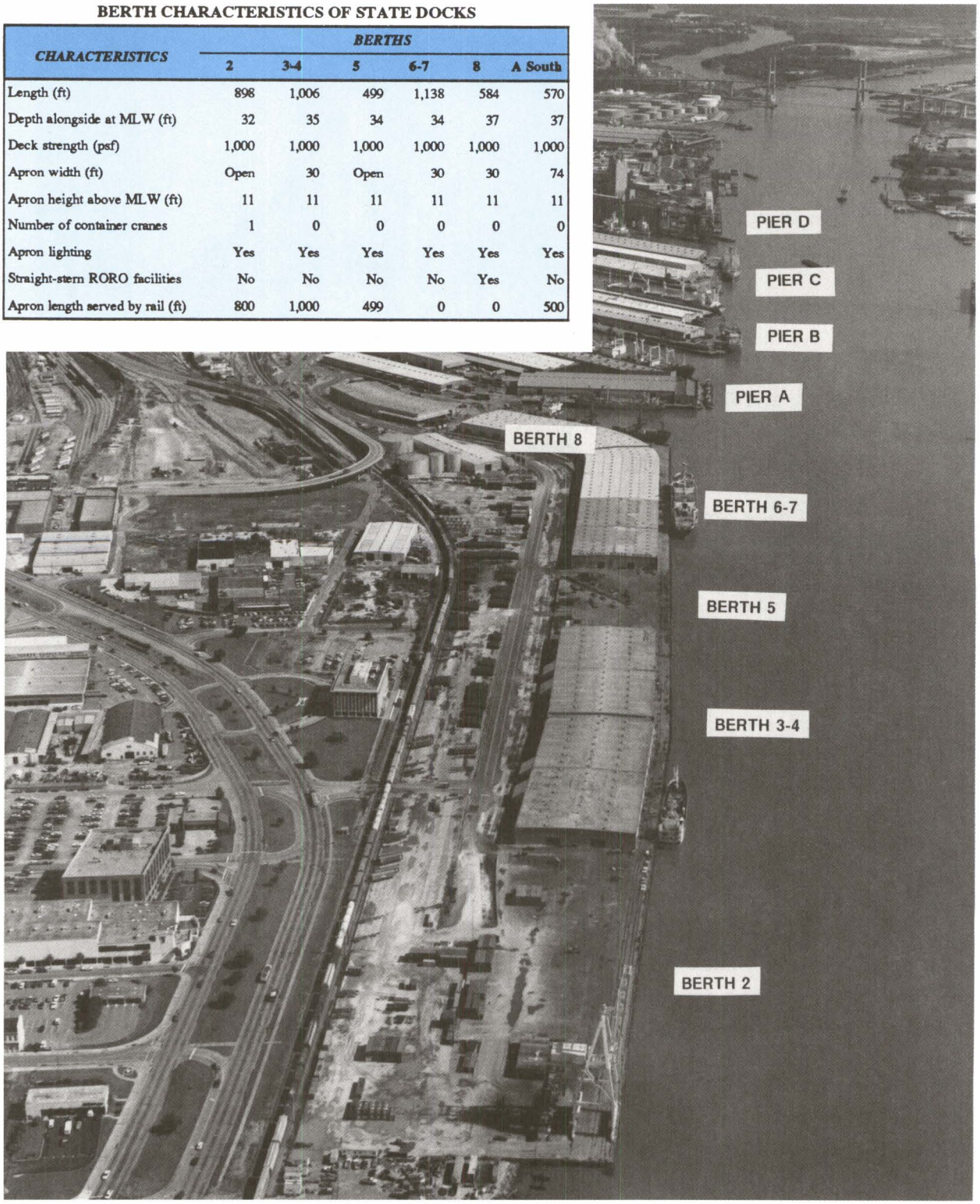
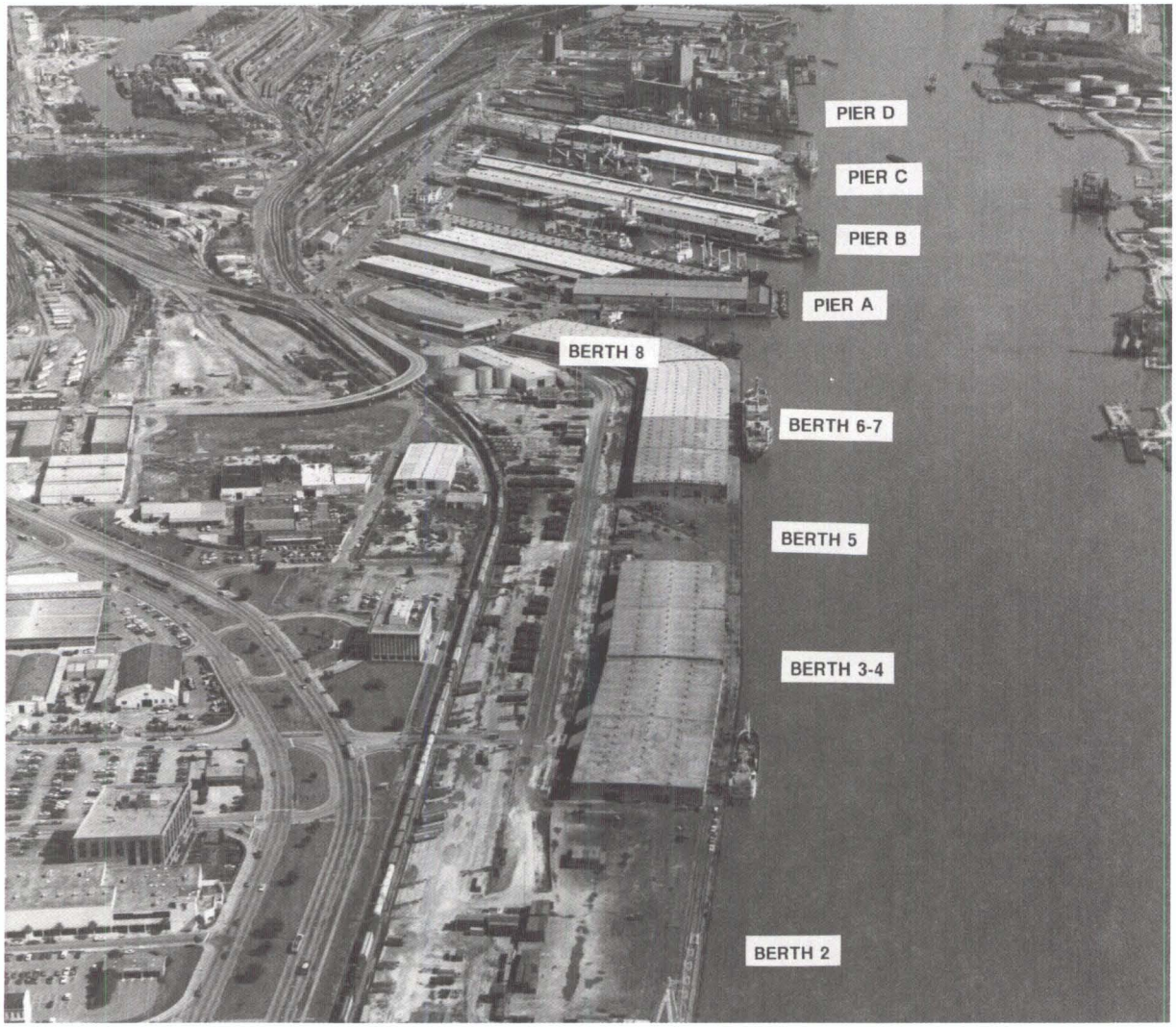


Figure 1. Berths 2-8 and pier A.



BERTH CHARACTERISTICS OF STATE DOCKS

CHARACTERISTICS	BERTHS											
	A1North	A2-3 No	A1North	B2-3 So	B North	B Face	C South	C Face	Blakely	C1North	C2North	C3North
Length (ft)	477	1,025	525	1,007	1,610	650	1,532	820	650	540	463	408
Depth alongside at MLW (ft)	28	35	27	35	38	28	37	36	33	33	35	37
Deck strength (psf)	500	500	500	500	500	500	500	1,500	500	500	500	1,500
Apron width (ft)	42	42	100	100	42	Open	80	Open	100	Open	Open	Open
Apron height above MLW (ft)	11	11	11	11	11	11	11	11	11	11	11	11
Number of container cranes	0	0	0	0	0	0	0	0	0	0	0	0
Number of wharf cranes	0	0	0	0	0	0	0	0	0	0	0	0
Apron lighting	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Straight-stern RORO facilities	No	No	No	No	No	No	No	No	No	No	No	No
Apron length served by rail (ft)	477	1,000	525	1,000	1,500	0	1,500	400	0	500	463	408

Figure 2. Piers A, B, and C.

STAGING

Open Staging

The Port of Mobile has about 38 acres of paved open storage. One of the single, largest areas is the container marshaling area behind berths 2 through 7. This area has 22 acres of paved, lit, open storage. The open storage is mainly used for containers, lumber, steel, military equipment, rolling stock, rubber, and general cargo. At the west end of pier north C is a 142,500-square-foot open area, with lights, that can be used for helicopter operations. The port has also used the northwest corner of the International Trade Center parking lot for helicopter operations. The International Trade Center parking lot was used primarily for ASD officials during sightseeing tours of the port.

Open Staging Areas

Covered Staging

The Port of Mobile has 13 transit sheds/warehouses that provide 1,774,000 square feet of covered storage.

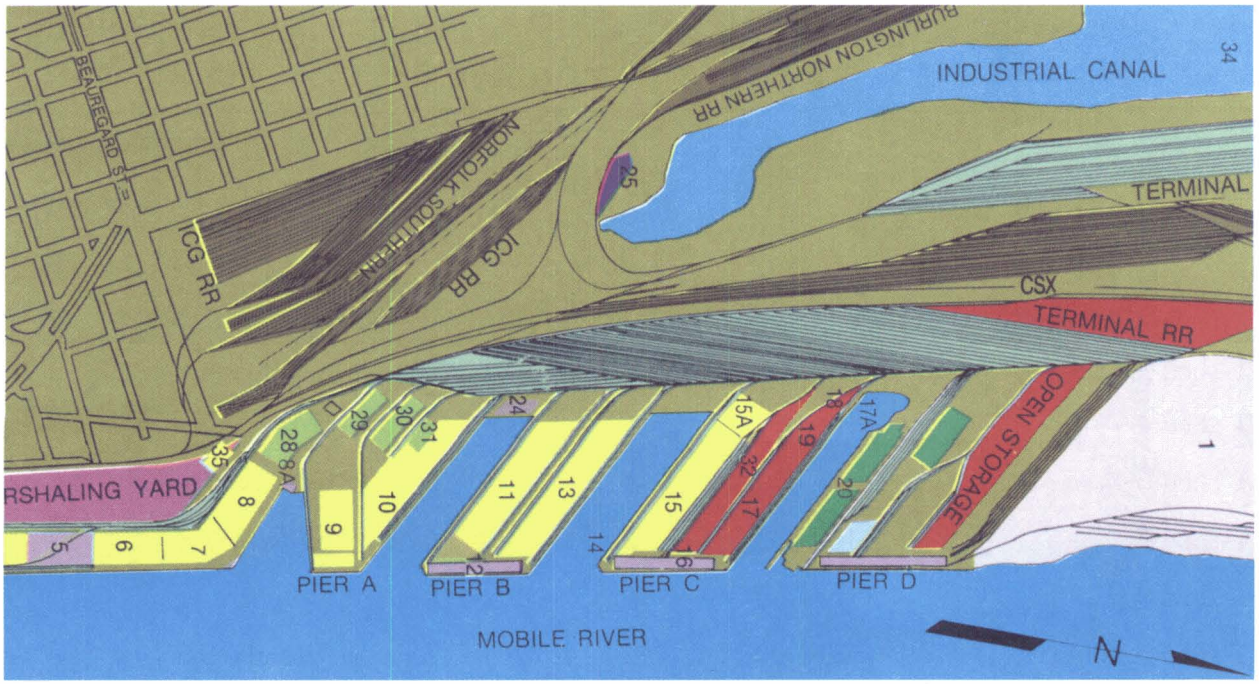
COVERED STORAGE

STORAGE FACILITY DESIGNATION	*FLOOR AREA (sq ft)*	*NUMBER OF UNLOADING POSITIONS (NONCURRENT USE)**		*CURRENT USE*
		TRUCKS	*RAILCARS*	
T-shed 3	100,000	6	11	Plywood
T-shed 4	100,000	6	11	Wood pulp
T-shed 6	100,000	8	6	Plywood
T-shed 7	100,000	2	10	Wood pulp
T-shed 8	68,000	6	8	Lumber
T-shed A south	100,000	2	7	Wood pulp
T-shed A north	153,000	4	12	Lumber/general cargo
T-shed B south	172,000	4	30	Lumber/general cargo
T-shed B north	280,000	6	30	Lumber/general cargo
T-shed C south	360,000	6	36	Lumber/general cargo
Blakeley Island warehouse	153,000	4	7	Lumber/general cargo
Warehouse C/A	50,000	4	7	General cargo
Unit 19	38,000	0	0	Lumber

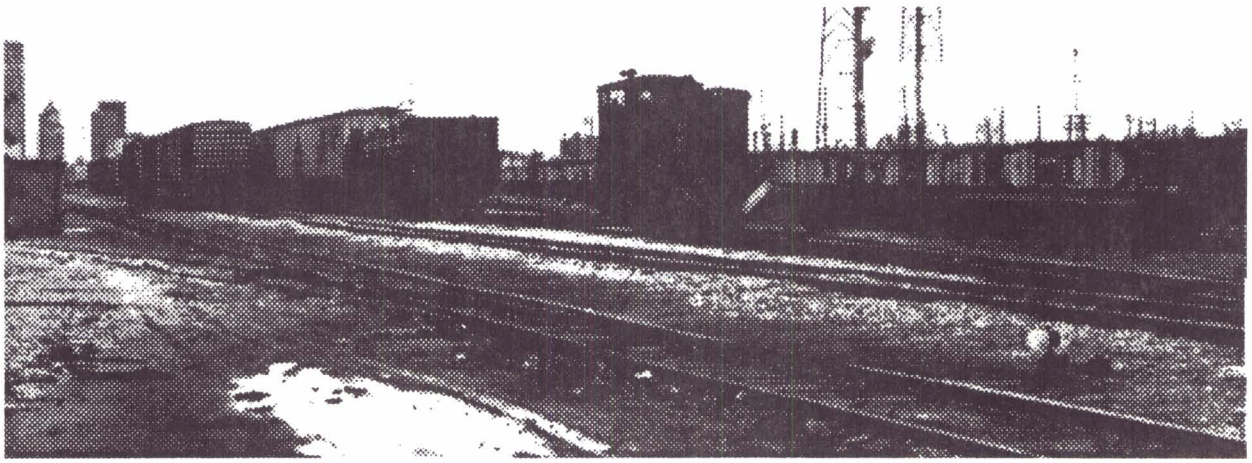
*As stated in the Port of Mobile survey.

RAIL

An extensive rail network serves the terminal. More than 75 miles of track serve the berths, transit sheds, warehouses, and other port facilities. The port operates its own fleet of 8 diesel engines and 550 boxcars. Railcar switching and movement within the terminal and joint interchange yard are accomplished with Alabama State Docks Terminal Railway engines. All berths and piers, except berths 6 through 8, river B, and Blakeley have apron trackage.



Rail Network on and Adjacent to Terminal



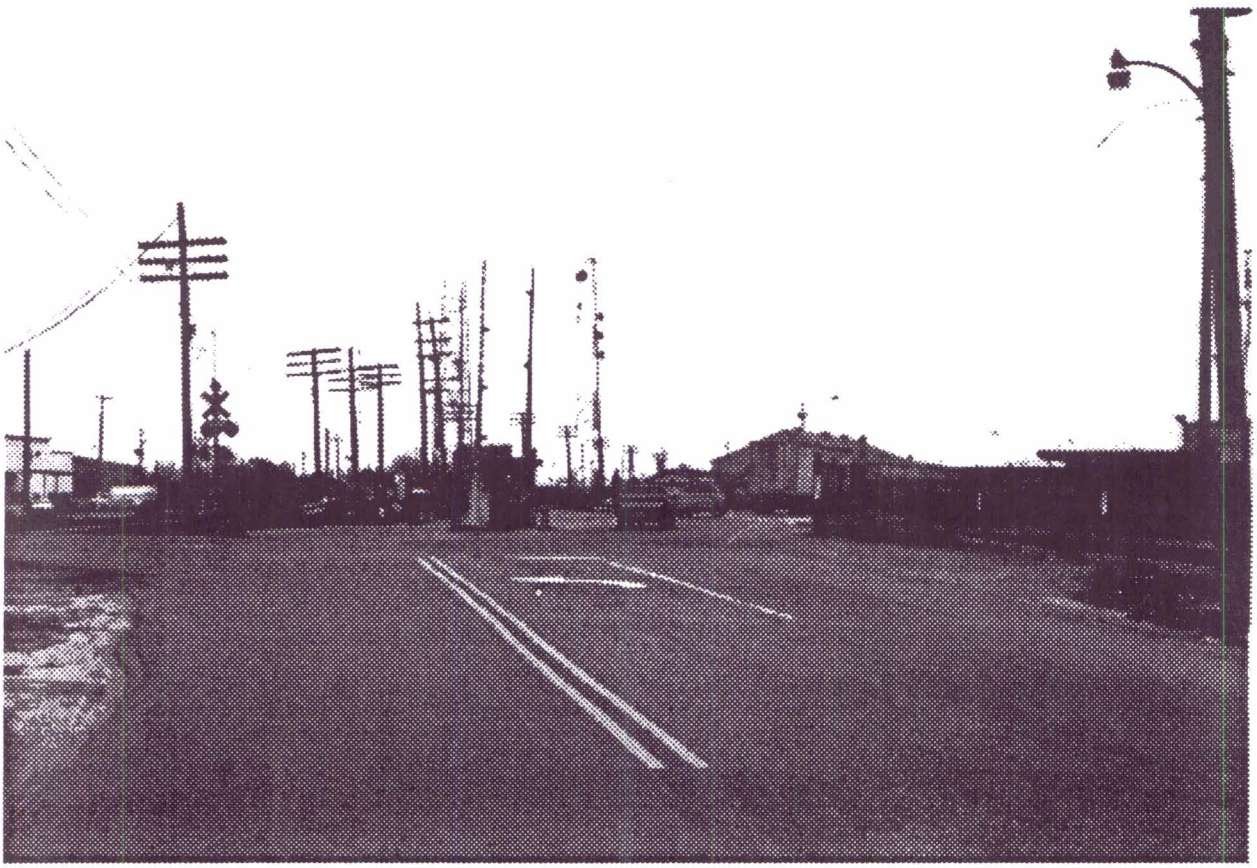
ASD Railyard Locomotive

HIGHWAY

All commercial trucks report to the Alabama State Docks Control Terminal. This terminal is west of the port. After processing, trucks proceed to the main gate. Prior arrangements with ASD can preclude the need for reporting to the control terminal. The main gate has two entry and two exit lanes and is controlled 24 hours a day. Two other gates, Sealand and St. Anthony Street, are available on an as-needed basis.

The Port of Mobile has truck scales available at the grain elevator near pier D. The port uses these scales for weighing shipments of grain. These scales are available for weighing other items if the grain elevator area is not busy.

No clearance restrictions are on the major roads within the port.



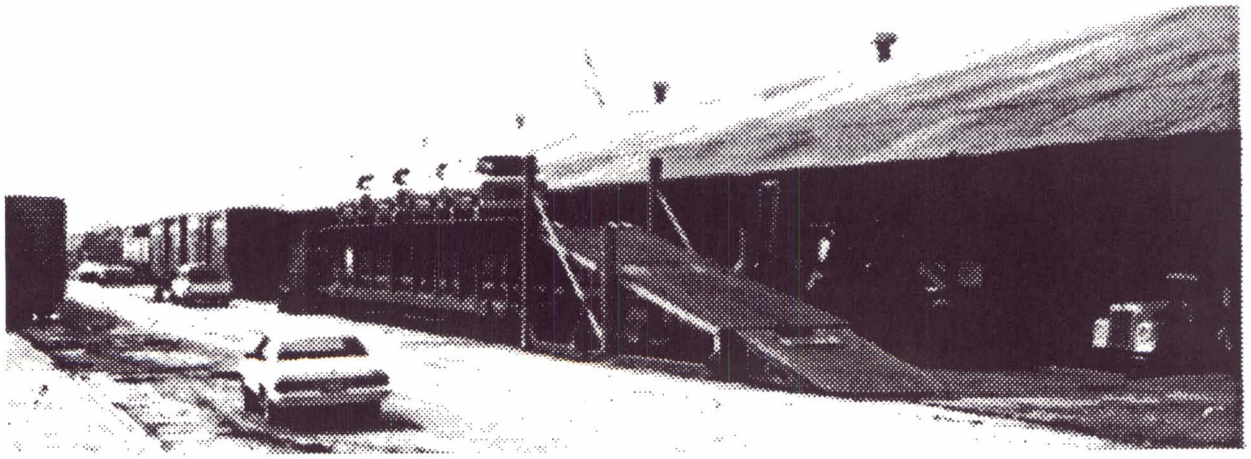
Main Gate

UNLOADING/LOADING POSITIONS

Ramps

Berths 5 and south C west end each have a concrete rail end ramp. The port also has two portable, steel, rail end ramps. These end ramps can be positioned throughout the terminal.

The port has about six end ramps available for unloading trucks and truck-tractor/semitrailer combinations.



Portable Rail End Ramp

Docks

All of the transit sheds and warehouses, except unit 19, have rear platform-level rail tracks. Because the Port of Mobile is readily able to specialize in handling cargo requiring covered storage, at least 300 to 350 rail loading positions are available for boxcars.

The Port of Mobile reports that about 58 truck docks could be made available at one time for van offloading operations.

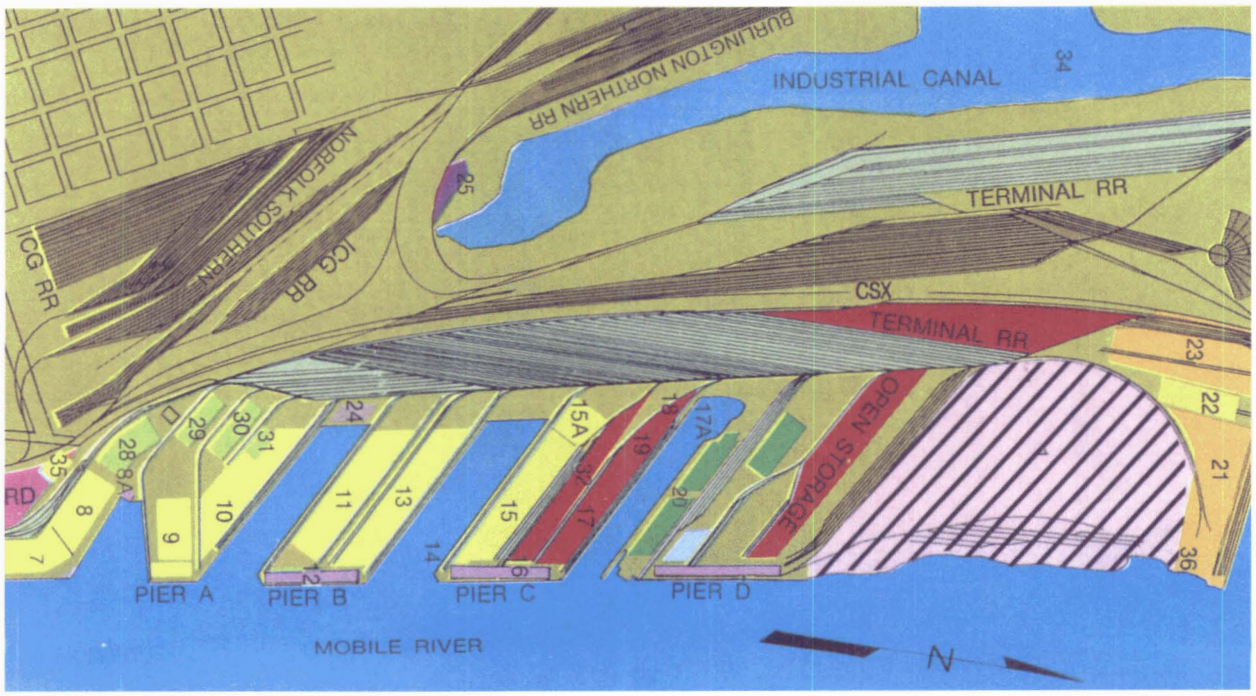
Platform-Level Rail Tracks

MARSHALING AREAS

Two sites could serve as marshaling areas for the ASD. These include the abandoned Aluminum Company of America Complex (ALCOA) and the Mobile Municipal Auditorium.

The ALCOA complex is within the terminal, north of pier D. The complex offers a large, paved parking area and several empty buildings.

The Mobile Municipal Auditorium is about 1 mile from the terminal. It has a 13-acre paved, well lighted, fenced parking lot.



MARSHALING AREAS

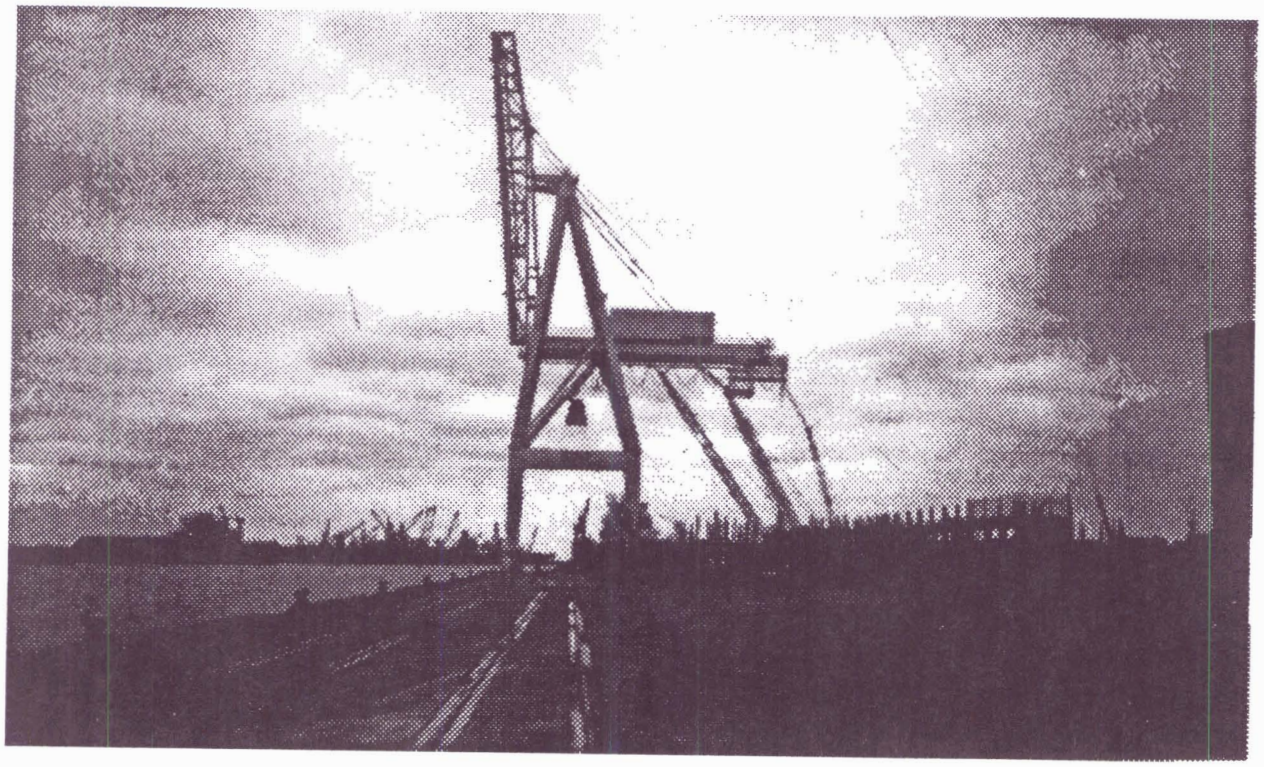
Potential Marshaling Areas

MATERIALS HANDLING EQUIPMENT (MHE)

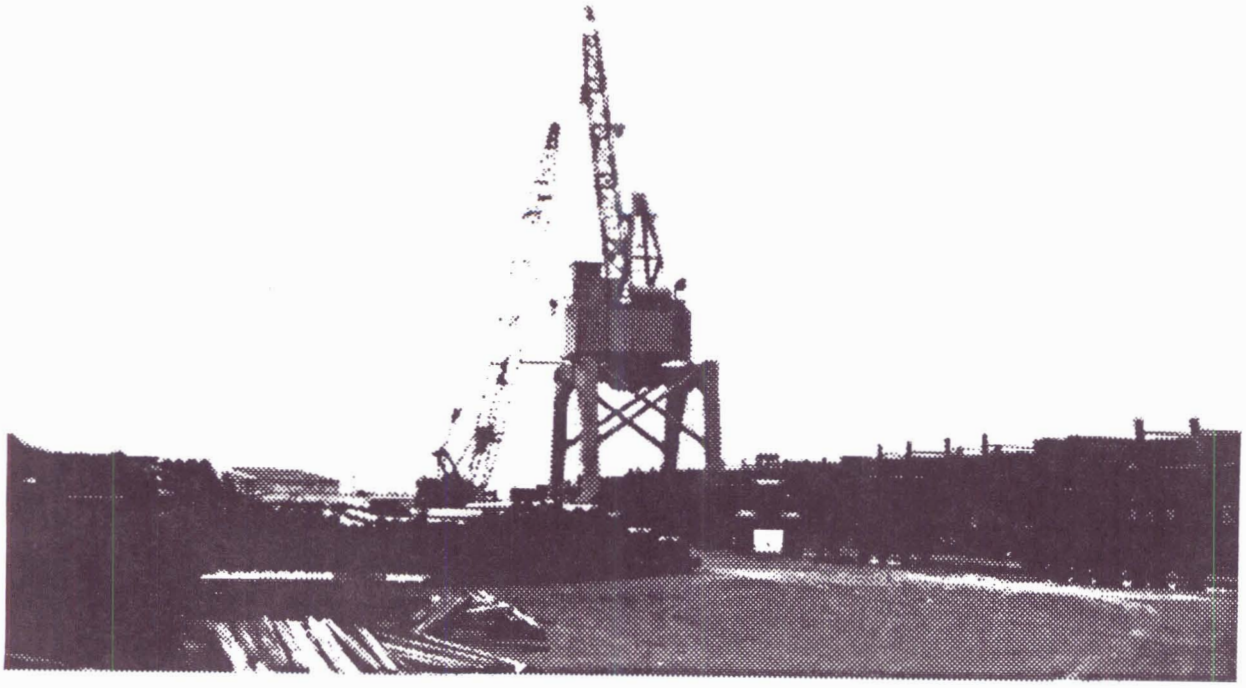
The port has about 15 types of cranes to move cargo around the facility. Additional cargo handling resources, including heavy-lift equipment, can be readily acquired from any of the stevedoring companies serving the Port of Mobile. Mobile and floating cranes range in capacity from 200 to 500 tons.

MATERIALS HANDLING EQUIPMENT (MHE)

TYPE OF EQUIPMENT	*CAPACITY (STON)*	*QUANTITY*
Container crane	45	1
Wharf crane	45	1
Mobile crane	35	1
Mobile crane	40	1
Mobile crane	60	1
Mobile crane	70	1
Mobile crane	90	1
Mobile crane	100	1
Mobile crane	140	1
Mobile crane	160	1
Floating crane	25	1
Floating crane	80	1
Gantry crane	50	2
Gantry crane	22.5	1
Container lift	35	1
Container lift	40	1
Container lift	46.6	1
Forklift	1.5-35	258



Container Crane

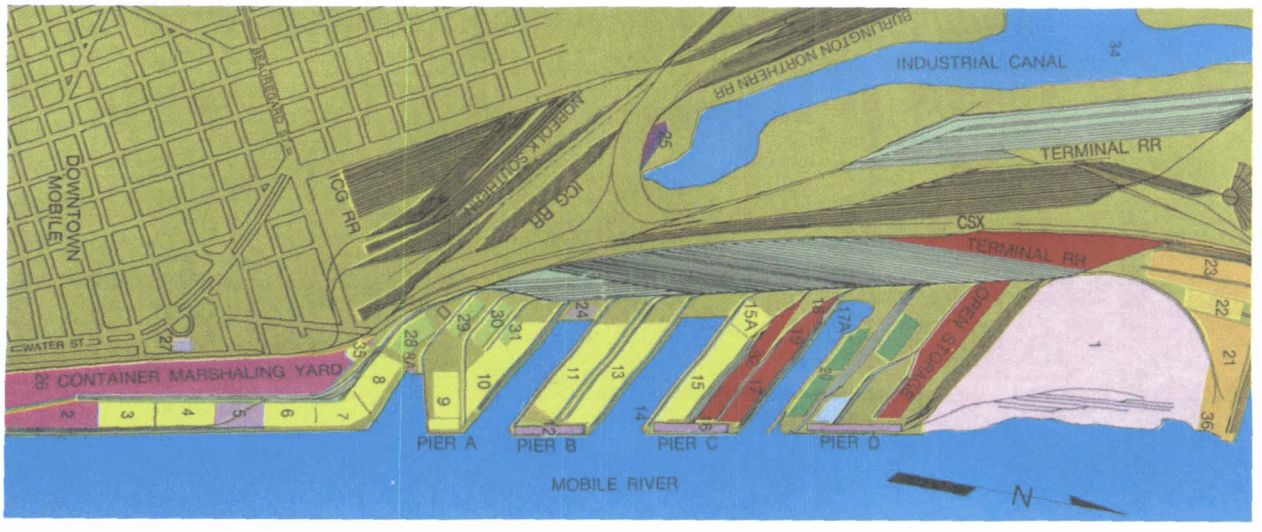


Wharf and Mobile Cranes

INTERMODAL FACILITIES

GENERAL

The two railroad companies that operate truck/railcar intermodal facilities in the Mobile area are CSX and BN.



Local Rail Intermodal Facility Locations

BN

The BN intermodal facility is at 701 Telegraph Road. The intermodal yard is situated on 7 acres, with the capability to stage about 175 40-foot truck chassis. Transfer operations are conducted on one track, which can provide a total of twenty-five 89-foot flatcar spots. Container loading operations are conducted using one side loader. BN routinely handles trailers-on-flatcars and double-stacked containers on flatcars. The normal hours of operation are from 0800 to 1700 hours. One portable end ramp is available for circus-style loading of military equipment. The current activity level is about 60 lifts per day. BN replaced the old lift equipment with new equipment as of the end of March 1993. The number of lifts per day is expected to dramatically increase.

CSX

The CSX operates the largest intermodal facility in the Mobile area. This facility is at the end of Industrial Canal Road. This intermodal yard has a parking lot capable of staging 175 40-foot chassis. The yard routinely handles trailers on flatcars and containers on flatcars and is equipped to perform double-stacked container operations. Transfer of containers is conducted on one track, which can handle a total of twenty 89-foot flatcars. The facility performs loading and unloading operations with two gantry cranes. No end ramp is available for circus-style loading of military equipment. Normal hours of operation are from 0700 to 2300 hours weekdays and 0700 to 1500 hours on the weekends. This facility has a capability of about 130 lifts per day.

Intermodal Facility Transtainer

FUTURE DEVELOPMENT

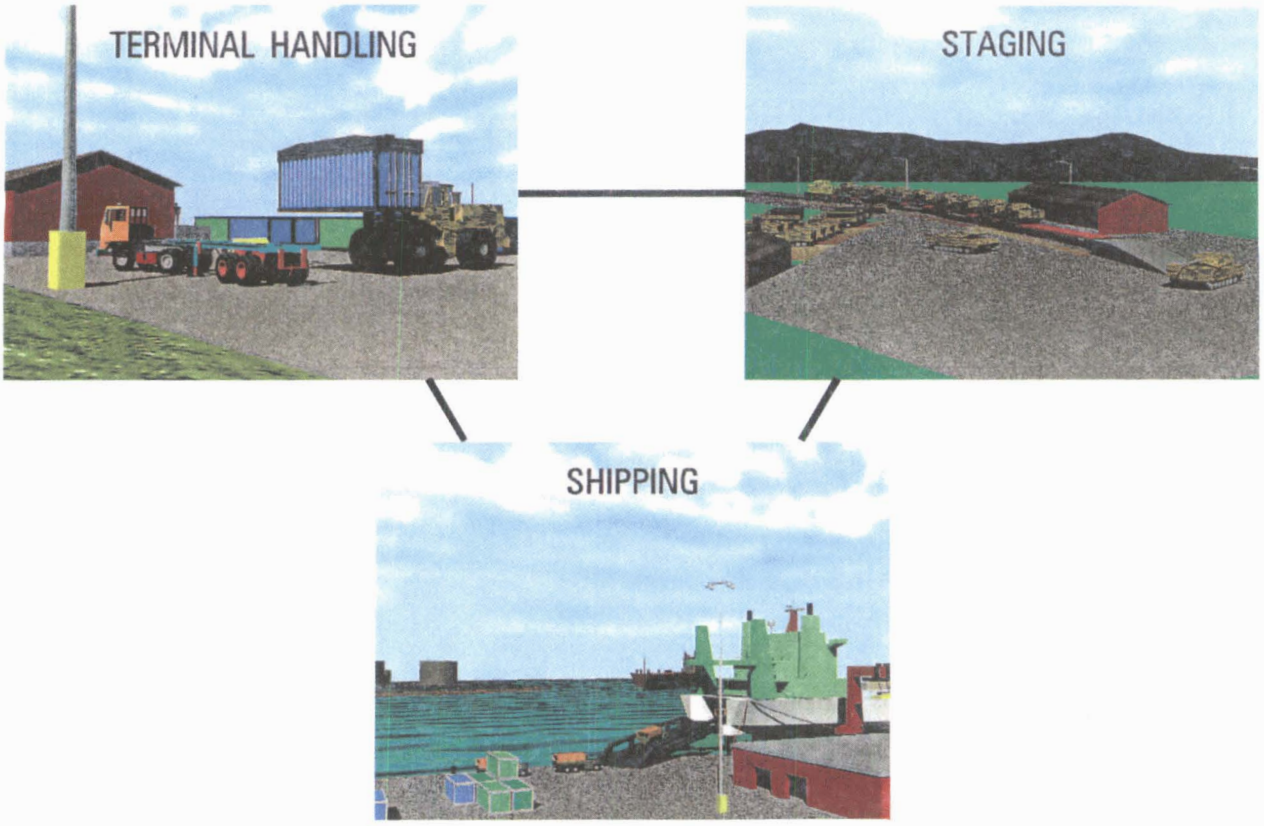
The Port of Mobile intends to construct a new ship berth (berth E) north of the grain elevator and pier D (refer to fig 1). This berth will be a "river end" (berth facing the river) berth, used for the loading of general cargo.

The port has plans for the construction of a new extension to Interstate 65. The proposed route for this extension comes within 1 mile of the Port of Mobile.

II. THROUGHPUT ANALYSIS

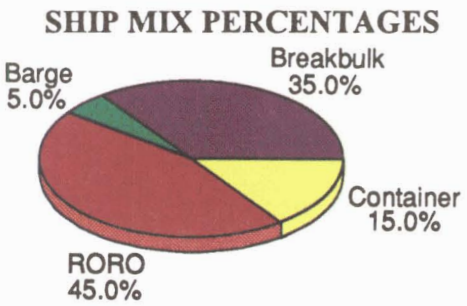
GENERAL

We evaluated the theoretical throughput capability of the Port of Mobile by using the port operational performance simulator (POPS) computer model. The POPS model is based on a weak-link analysis in which each subsystem is analyzed separately and then compared to find the least-capable subsystem. The weakest subsystem defines the maximum throughput capability of the terminal. The model yields throughput capability values for three subsystems - shipping, staging, and terminal processing/ handling - in short tons (STON) and measurement tons (MTON) per day.



Terminal Throughput Subsystems

The analysis assumed that 80 percent of the port facilities will support the military deployment. Also, the ship mix is based on Desert Shield and Desert Storm statistics. We weighted the percentages to adjust for differences in cargo deadweights and expectations for future deployments.



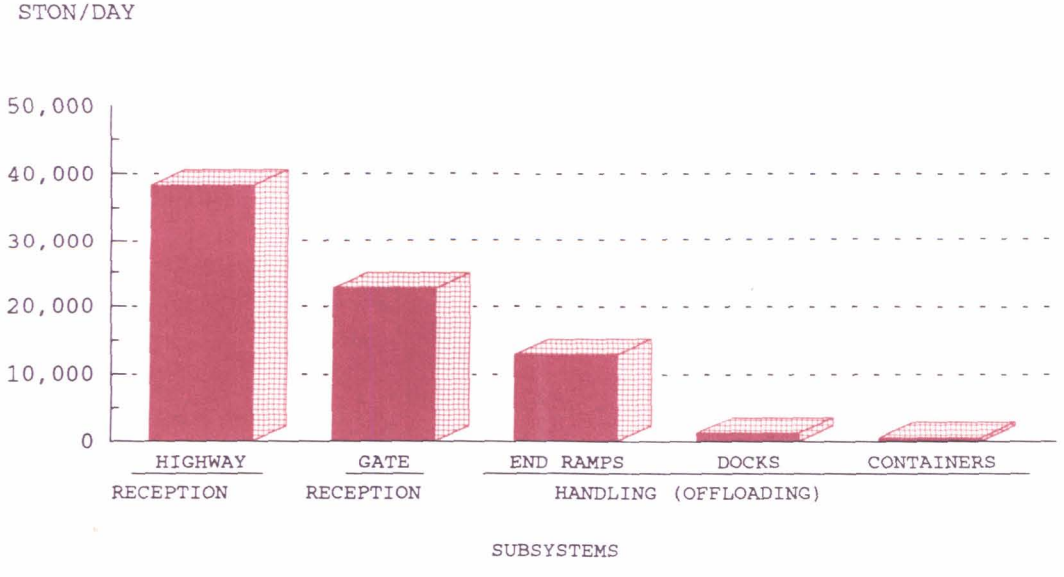
TERMINAL RECEPTION/HANDLING

HIGHWAY

Interstate Routes 10 and 65, Water Street, and Beauregard Street all provide good access to the port. Entrance to the port is provided through the main gate off Beauregard Street. Two other gates are available if they are needed. The port roadways provide access to staging and pier areas from the main gate. The road network in and out of the port, including the gate processing of vehicles, could handle about 22,600 STON of equipment and supplies per day.

Roadable vehicles in convoys will process directly to staging areas. Vehicles on commercial or military flatbed trailers that do not have means for unloading vehicles can offload at six end-ramp areas. Based on the assumption a deploying unit uses 5 end ramps, the end ramps could offload about 12,800 STON per day. Supplies in van semitrailers will proceed to the transit shed docks for offloading. These facilities provide about 58 handling positions. Use of all these positions will provide an offloading capability of about 1,230 STON of cargo per day at these facilities. Containers on trucks can move to staging areas to be offloaded, or directly to the container loading pier. The container handling facility could offload 530 STON of cargo per day.

HIGHWAY RECEPTION/HANDLING CAPABILITY

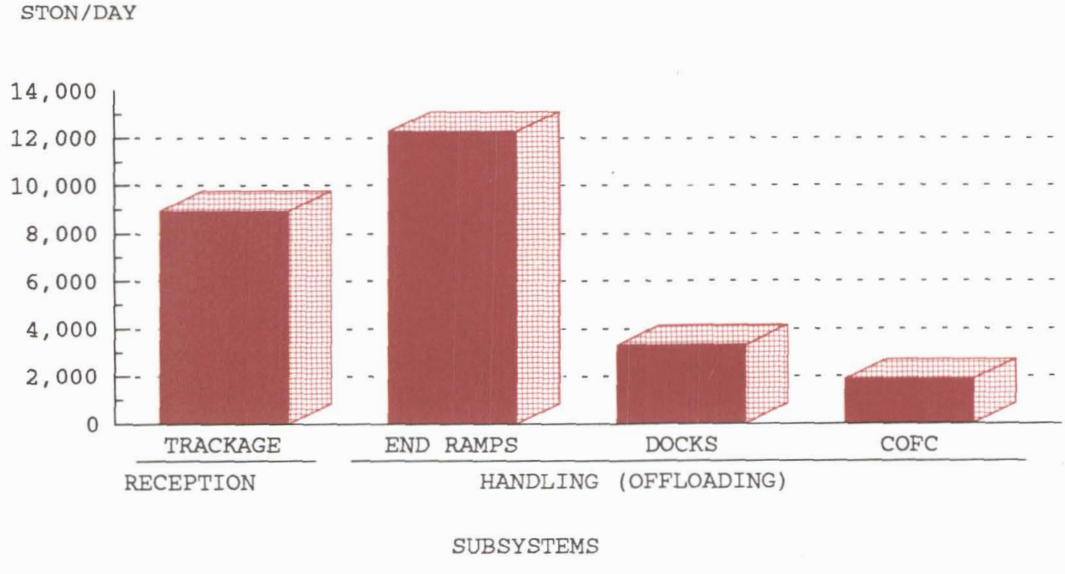


RAIL

Rail reception at the port is very good. Four commercial carriers provide access to the port. Railyards within the port could store more than 2,300 railcars. Also, commercial railyards within one-half mile of the port could store more than 5,425 additional railcars. The port states that they could handle from 60 to 80 railcars per 8-hour period (180 to 240 railcars in a 24-hour period).

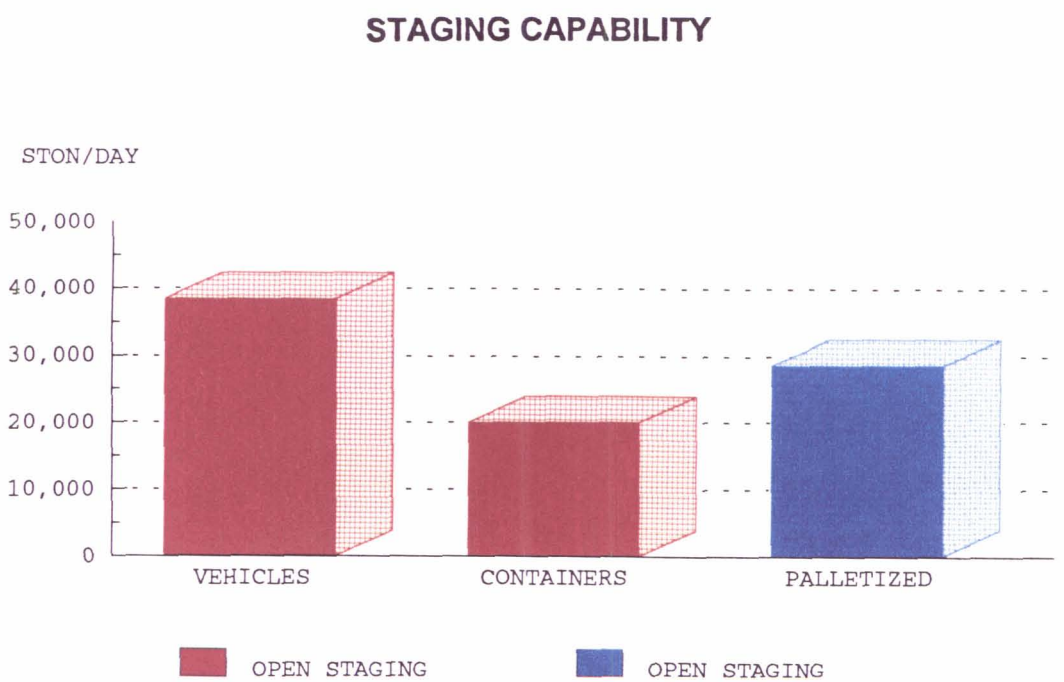
Vehicles on flatcars could be offloaded at four locations within the port by using two permanent and two portable end ramps. The potential location for the use of portable end ramps is on the terminal yard marginal tracks, near berth north C. The longest spur can accommodate about 21 to 25 railcars. Boxcars could be offloaded at the transit sheds, where 300 to 350 rail handling positions are available. Containers would be offloaded at the container handling facility.

RAIL RECEPTION/HANDLING CAPABILITY



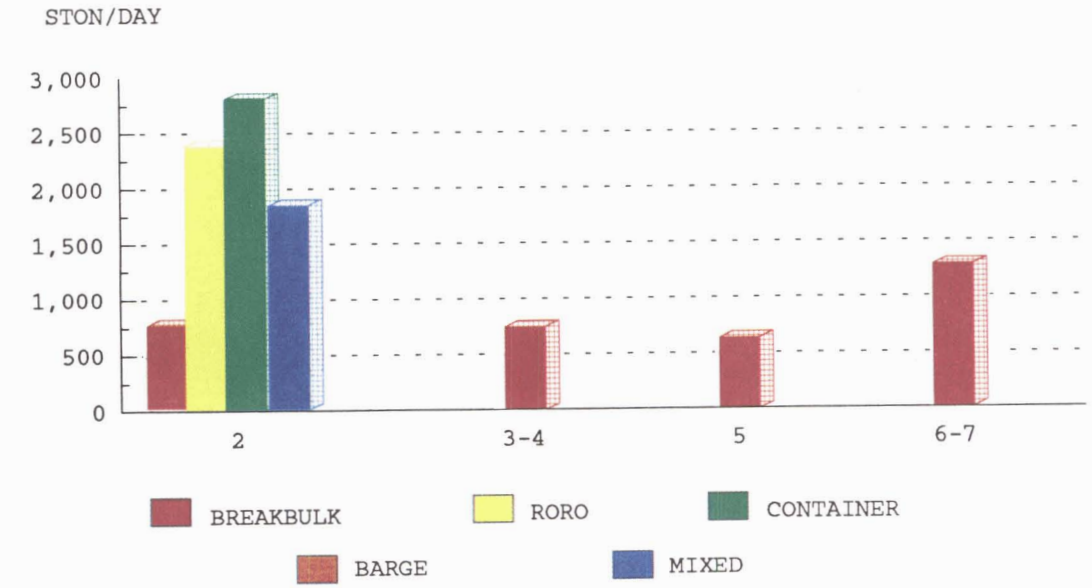
STAGING

The port has about 37 acres of open storage for vehicles and/or containers. This staging area has a capability to store about 31,100 STON of breakbulk cargo and 7,230 STON of rolling stock (38,330 STON total). Container storage capability is about 20,000 STON. Also, about 1,774,000 square feet of covered storage provides protection for about 28,400 STON of palletized cargo.



SHIPPING

Figure 3 shows the throughput capability per berth in STON per day for breakbulk, RORO, container, and mixed vessels. These results were based on various factors, including MHE utilized, loading, operational, and berth utilization rates, as well as berth/ship compatibility.



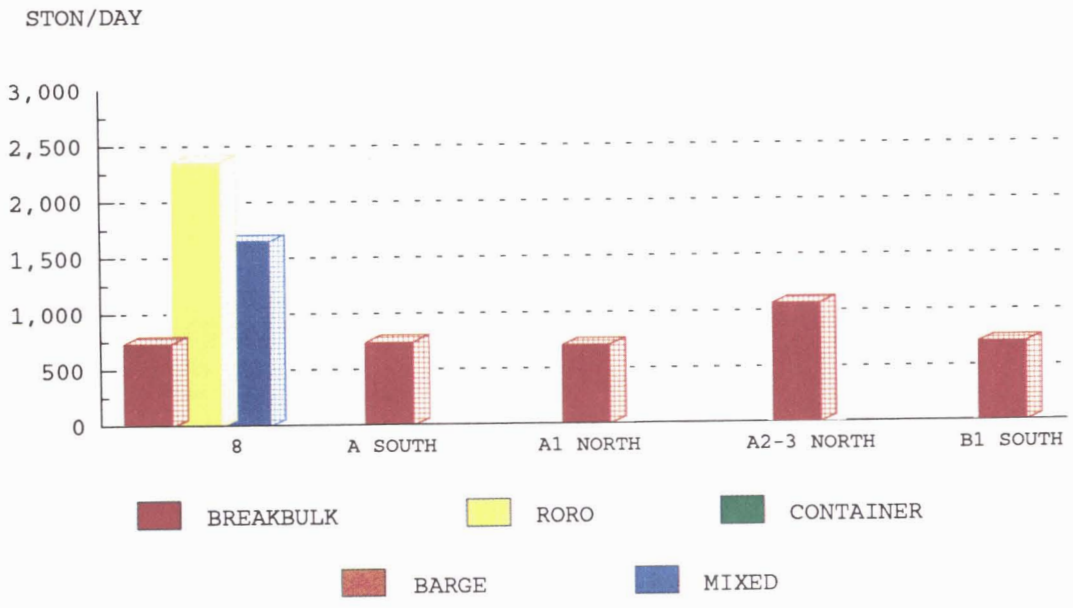
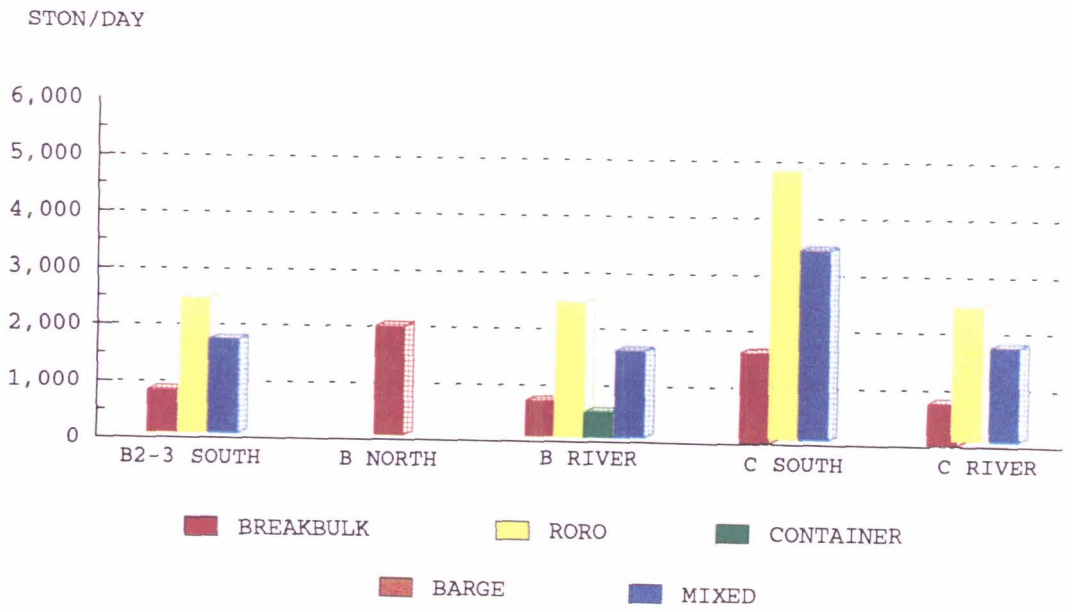


Figure 3. Berth throughput capability.



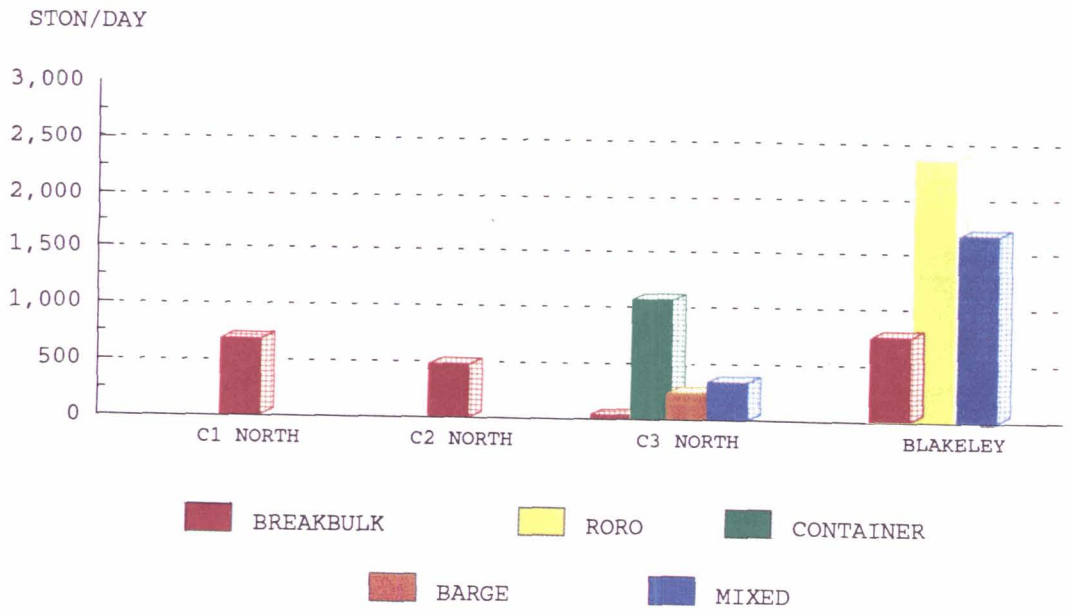


Figure 3. Continued.

The berthing capabilities for various vessel types is shown in table 1. The table indicates, for each type of ship, the number of vessels that can be accommodated at each berth. It also provides the limitations that can hinder shipping operations.

The type of ship preferred at each berth is based on methodology that compares the characteristics of the ship berth to a list of ideal factors required to support the different ship mixes. The evaluation takes into consideration the current physical characteristics and MHE available for a berth. This evaluation gives no considerations for enhancements, such as equipment.

Berth 2 provides the largest throughput capability for RORO, container, and barge operations. Overall, it is the most compatible berth for all ship types. B 2-3 south and C south also have good overall capability. C south could be used for breakbulk and RORO operations. C north (includes berths 1 through 3) provides a good alternative for container operations. The C north berth capability would increase with dredging of C 1 and C 2 north.

PREFERENCE BERTH SELECTION

	BERTHS					
LOADING TYPES	***2***	***3-4***	***5***	***6-7***	***8***	***A South***
Breakbulk	4	1	11	8	11	7
RORO	1	-	4	-	12	8
Container	1	5	6	9	-	-
Barge	1	4	8	14	14	2
NOTE: Berths marked with "-" are not recommended for these operations.						

	BERTHS			
LOADING TYPE	***A1 North***	***A2-3 North***	***B1 South***	***B2-3 South***
Breakbulk	-	5	-	3
RORO	-	-	-	3
Container	-	7	-	3
Barge	10	10	6	2
NOTE: Berths marked with "-" are not recommended for these operations.				

PREFERENCE BERTH SELECTION

LOADING TYPES	BERTHS				
	B North	*B River*	*C South*	*C River*	*Blakeley*
Breakbulk	5	16	1	8	10
RORO	-	11	1	5	9
Container	7	-	3	10	-
Barge	10	18	4	13	9
NOTE: Berths marked with "-" are not recommended for these operations.					

LOADING TYPE	BERTHS		
	C North 1	*C North 2*	*C North 3*
Breakbulk	14	15	13
RORO	10	7	5
Container	12	11	2
Barge	16	16	6
NOTE: Berths marked with "-" are not recommended for these operations.			

TABLE 1
SUMMARY OF STATE DOCKS BERTHING CAPABILITIES

VESSEL	BERTHS								
	2	3-4	5	6-7	8	A South	A1 North	A2-3 N	B1 South
Breakbulk									
C3-S-33a	1	1	1	2	1	1	a,c	2	a
C3-S-37c	1	1	1	2	1	1	a,c	1	a
C3-S-37d	1	1	1	2	1	1	a,c	1	a
C3-S-37a	1	1	1	2	1	1	(1)	1	a
C4-S-1a	1	1	(1)	1	1	1	a,c	1	a,c
C4-S-1qb and 1u	1	1	(1)	1	1	1	a,c	1	a,c
C4-S-58a	1	1	(1)	1	1	c	a,c	1	a,c
C4-S-65a	1	1	(1)	1	1	1	a,c	1	a,c
C4-S-66a	a	1	(1)	2	1	1	a,c	1	a,c
C4-S-69b	1	1	(1)	1	1	c	a,c	1	a,c
Seatrain									
GA and PR-class	1	1	(1)	1	1	1	(1)	1	(1)
Barge									
LASH C8-S-81b	a,f	1	a,c,f	a,f	c	c	a,c,f	1	a,c,f
LASH C9-S-81d	a	a	a,c	a	a,c	a,c	a,c	a	a,c
LASH lighter	6	7	3	8	4	4	3	7	3
SEABEE C8-S-82a	a	a	a,c	a	a,c	a,c	a,c	a	a,c
SEABEE barge	4	5	2	5	2	2	2	5	2
RORO									
Comet	d,i,j	d,o	d,i,j	d,o	i,j	d,o	c,d,o	d,o	d,i,j
C7-S-95a/Maine-class	a	b	(1)	b	b,c	c	a,b,c	b	a,c
Ponce-class	h	b,h	c,h	b,h	b,c,h	b,c,h	b,c,h	b,h	a,c,h
Great Land-class	h	b,h	c,h	b,h	b,c,h	b,c,h	b,c,h	b,h	a,c,h
Cygnus/Pilot-class	1	b	(1)	b	b,c	c	b,c	b	a,c
Meteor	d,i,j	d,o	c,d	d,o	i,j	d,o	a,c,d,o	d,o	a,c,d
AmEagle/Condor	i,j	b	(1)	b	b,c	c	a,b,c	b	a,c
MV Ambassador	d	d	c,d	d	1	d	c,d	d	c,d
FSS-class	a,c	b	(1)	b	b,c	c	a,b,c	b	a,c
Cape D-class	a	b	(1)	b	b,c	c	a,b,c	b	a,c
Cape H-class	a	a,b	a,c	a,b	b,c	c	a,b,c	a,b	a,c
Container									
C6-S-1w	1	1,e	(1),e	1,e	c,e	c,e	a,c,e	1,e	a,c,e
C7-S-68e	1	1,e	(1),e	1,e	c,e	c,e	a,c,e	1,e	a,c,e
C8-S-85c	a	1,e	(1),e	1,e	c,e	c,e	a,c,e	1,e	a,c,e
Combination									
C5-S-78a	a	1,e	(1),e	1,e	c,e	c,e	a,c,e	1,e	a,c,e
C5-S-37e	1	1,e	(1),e	1,e	c,e	c,e	a,c,e	1,e	a,c,e

a = maximum vessel draft limited to berth depth
b = inadequate apron width
c = inadequate berth length
d = no straight stern-ramp facilities
e = no container-handling equipment
f = inadequate berth depth, adequate anchorage depth
g = inadequate channel depth
h = no-shored based ramps available
i = insufficient ramp clearance at low tide
j = insufficient ramp clearance at high tide
k = excessive ramp angle at low tide
m = excessive ramp angle at high tide
n = parallel ramp operation only
o = insufficient apron width for side-ramp operation

Note: Ramp clearance and ramp angle based on maximum vessel draft.
( ) indicates vessels assigned by analyst

TABLE 1 - CONTINUED

VESSEL	BERTHS								
	B2-3 S	B North	B Face	C South	C Face	Blakely	C1 North	C2 North	C3 North
Breakbulk									
C3-S-33a	1	3	a	3	1	1	1	(1)	(1)
C3-S-37c	1	3	a	2	1	1	1	(1)	(1)
C3-S-37d	1	3	a	2	1	1	1	(1)	(1)
C3-S-37a	1	3	1	2	1	1	1	(1)	(1)
C4-S-1a	1	2	a	2	1	1	(1)	(1)	(1)
C4-S-1qb and 1u	1	2	a	2	1	1	(1)	(1)	(1)
C4-S-58a	1	2	a	2	1	1	(1)	(1)	(1)
C4-S-65a	1	2	a	2	1	1	(1)	(1)	(1)
C4-S-66a	1	2	a	2	1	1	1	(1)	(1)
C4-S-69b	1	2	a	2	1	1	(1)	(1)	(1)
Seatrain									
GA and PR-class	1	2	1	2	1	1	(1)	(1)	(1)
Barge									
LASH C8-S-81b	1	1	a,c,f	1	1	a,c,f	a,c,f	(1)	(1)
LASH C9-S-81d	a	1	a,c	a	a,c	a,c	a,c	a,c	a,c
LASH lighter	7	11	4	10	5	4	3	3	2
SEABEE C8-S-82a	a	a	a,c	a	a,c	a,c	a,c	a,c	a,c
SEABEE barge	5	8	3	7	4	3	2	2	2
RORO									
Comet	d,i,j	d,o	d,i,j	d,i,j	d,i,j	d,i,j	d,i,j	c,d	c,d
C7-S-95a/Maine-class	1	b	a,c	2	1	a,c	a,c	(1)	(1)
Ponce-class	h	b,h	c,h	b,h	h	c,h	c,h	c,h	c,h
Great Land-class	h	b,h	c,h	b,h	h	c,h	c,h	c,h	c,h
Cygnus/Pilot-class	1	b	1	2	1	1	(1)	(1)	(1)
Meteor	d,i,j	d,o	a,d	d,i,j	d,i,j	d,i,j	d,i,j	c,d	c,d
AmEagle/Condor	i,j	b	a	i,j	i,j	i,j	(1)	(1)	(1)
MV Ambassador	d	d	d	d	d	d	c,d	c,d	c,d
FSS-class	1,n	b	a,c	1,n	c	a,c	a,c	(1)	(1)
Cape D-class	i,j	b	a,c	i,j	i,j	c	(1)	(1)	(1)
Cape H-class	a	b	a,c	1	1	a,c	a,c	a,c	(1)
Container									
C6-S-1w	1,e	2,e	a,c,e	2,e	1,e	c,e	(1),e	(1),e	(1),e
C7-S-68e	1,e	2,e	a,c,e	2,e	1,e	c,e	(1),e	(1),e	(1),e
C8-S-85c	1,e	1,e	a,c,e	1,e	c,e	c,e	(1),e	(1),e	(1),e
Combination									
C5-S-78a	1,e	2,e	a,e	2,e	1,e	a,e	a,c,e	(1),e	(1),e
C5-S-37e	1,e	2,e	a,e	2,e	1,e	1,e	(1),e	(1),e	(1),e

a = maximum vessel draft limited to berth depth
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Note: Ramp clearance and ramp angle based on maximum vessel draft.
( ) indicates vessels assigned by analyst

III. APPLICATION

GENERAL

We will evaluate the port's throughput capability for deploying a notional separate armored brigade primarily on FSS vessels. The *Planning Orders Digest*, issued by MARAD, does not include agreements for military use of the Port of Mobile. This study considers the facilities that would efficiently support military operations in lieu of planning orders. The port states that all of the port facilities (entire docks and open storage) could be made available to the military. The Military Traffic Management Command (MTMC) maintains a detachment at the Port of Mobile for coordinating military movements.

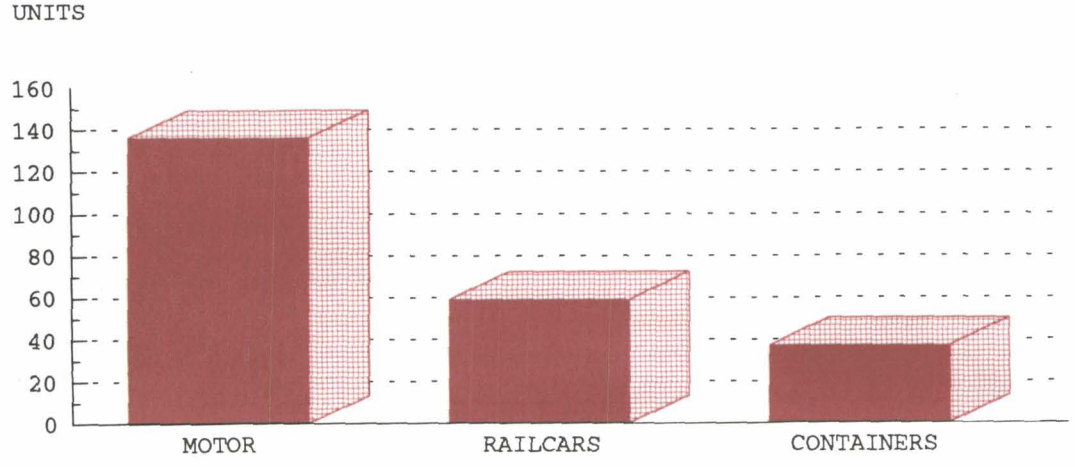
REQUIREMENTS

The likely requirement for the Port of Mobile is to deploy a notional separate armored brigade in 6 days. The division has to move about 1,755 vehicles and 220 containers. This movement to the port will require 353 (59 per day) railcars, using a convoy/rail option. Under this option, about 815 (136 per day) roadable vehicles would be driven and about 435 (73 per day) would be towed.

SEPARATE ARMORED BRIGADE DEPLOYMENT DATA

Total Equipment	
Volume	63,329 MTON
Weight	25,352 STON
Area	321,786 SQ FT
Vehicles	1,755
Containers	220

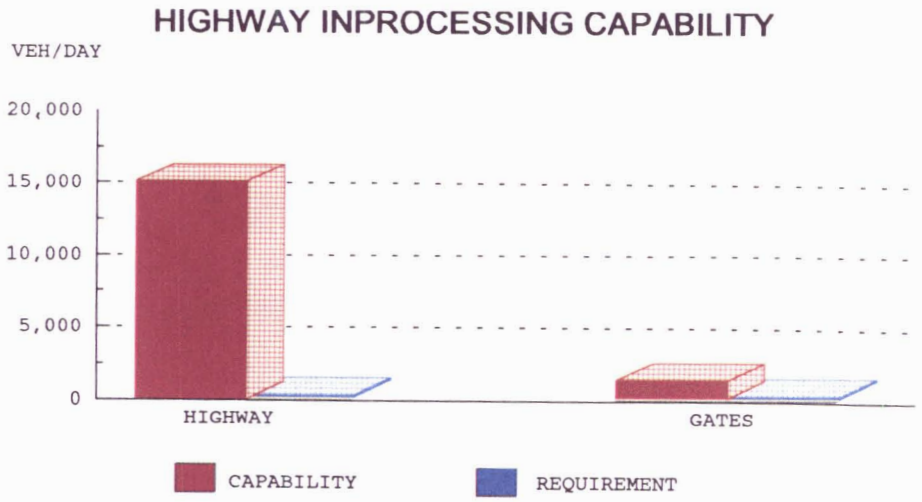
DAILY REQUIREMENTS



TERMINAL HANDLING

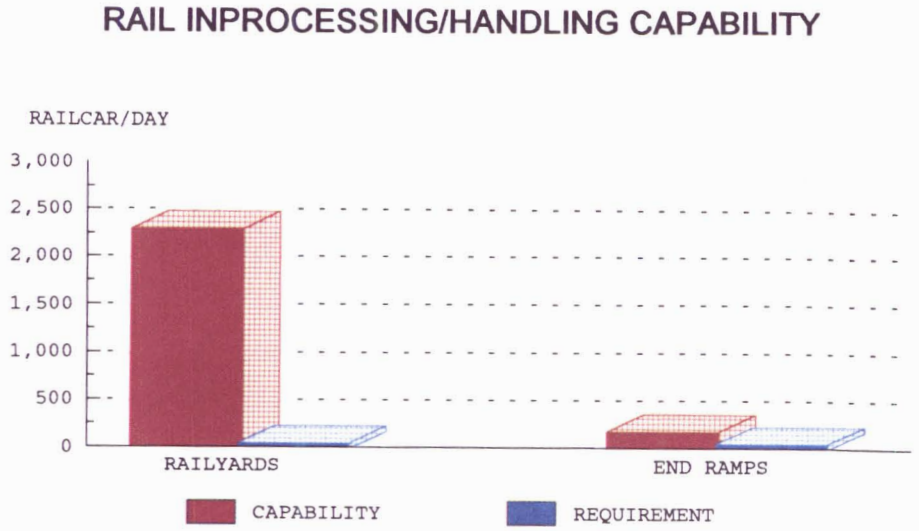
HIGHWAY

Vehicles would access the port through the main gate. With use of only the main gate, the access roads and gates processing subsystems could handle more than 1,200 vehicles per day.



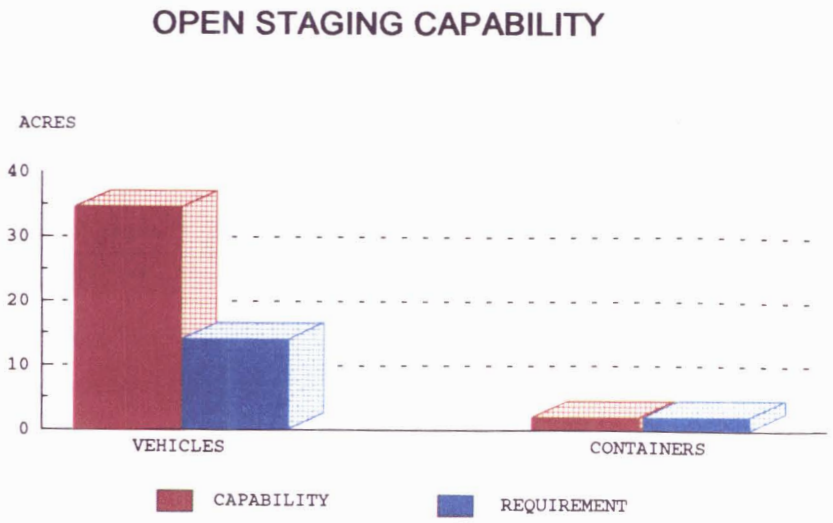
RAIL

The terminal yard within the port could easily handle more than 2,300 railcars per day. Also, the four ramp offloading locations could offload about 46 railcars every 5 hours, or more than 184 railcars per day.



STAGING

The port has about 37 acres of open paved storage. We estimate that the Port of Mobile needs at least 16 acres (14 acres for vehicles and 2 acres for containers) of open staging to support the sustained loading of a one FSS vessel berth system.



SHIPPING

The number of ships needed to load this requirement depends on the ship mix selected. The best ship mix would require three FSS vessels and one Cape H RORO ship. Potential port facilities for berthing an FSS ship are berths 2, 5, river C, and north C 3. Although the Port of Mobile has four potential FSS berths, inadequate berth depth limits FSS operations to the north C 3 pier berth. The inadequate berth depth is attributable to heavy silting of the Mobile River and Port of Mobile. The Tennessee-Tombigbee inland waterway contributes heavily to the silting problem. The depth of berth river C is adequate for a Cape H RORO ship.

UNIT MOVEMENT REQUIREMENTS
ARMORED BRIGADE

LOADING CONDITION/ SAMPLE SHIP MIX	*VESSEL TYPES*			
	FSS (RORO/COMB)	**CAPE H (RORO/COMB)**	**C3/C4 (BREAKBULK)**	**C6/C7/C8 (CONTAINER)**
Minimum Containerization				
All FSS*	2.67	0.64		
FSS and Cape H	2.23	1.00		
All Breakbulk			12.63	
Maximum Containerization				
FSS and Container	2.65			0.67
FSS, Cape H, and Container	1.56	1.00		0.67
Breakbulk and Container			9.87	0.67

*Only 8 FSSs are available. Unit shipping requirements exceed the capacity of these 8 vessels. Other vessel types are required to make up the FSS shortfall (Cape H).

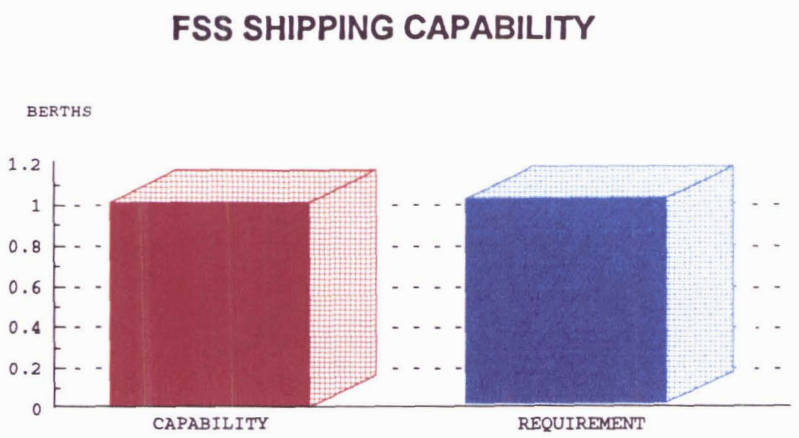
Legend:

RORO - roll on/roll off

FSS - fast sealift ship

Source: MTMCTEA Report OA 90-4f-22, Deployment Planning Guide, 91.

Based on 2 days to load a ship, a separate armored brigade can outload within the 6-day requirement. The Port of Mobile can enhance its capability to outload military units by maintaining adequate depths at berths 2, 5, and river C (37 feet for an FSS ship).



SUMMARY

The berthing restrictions of the FSS vessels limit the Port of Mobile to one FSS vessel support system. This will still meet the requirement for supporting the deployment of one separate armored brigade. However, the Port of Mobile can enhance its outloading capability by maintaining a berth depth of at least 37 feet in selected berths to support FSS vessels.

The shipping subsystem is the constraining factor in the throughput capability for the Port of Mobile.

Currently, berth 2 is the best all-around berth for outloading.

RECOMMENDATIONS

1. Use berth north C for an FSS and river C for a RORO in deployment operations, provided the port can maintain berth depths of 37 feet for FSS vessels and 36 feet for a Cape H RORO ship. Berth 2 could serve as an alternate; however, the ship berth depth must increase to 37 feet to support FSS vessels at maximum draft.

2. The Port of Mobile maintain a ship berth depth of at least 37 feet at berths 2, 5, river C, and north C.

PORT OF NEW ORLEANS

NEW ORLEANS, LOUISIANA