Highway

No clearance problems exist within the port. The California United Terminal has six truck scales.

Unloading/Loading Positions

RAMPS

The port has no permanent rail or truck end ramps. Numerous locations can support offloading operations with temporary or portable end ramps.

DOCKS

Three covered storage buildings at the Piers D and E Terminal have truck-handling positions. The two container freight stations (CFSs) (Sea-Land and ITS) at the north end of pier J, and the two transit sheds along the south end of pier F are also good places to unload vans.

Boxcar operations can take place at all of the buildings above, except for the transit shed at the far west end of the Piers D and E Terminal, by berth 34. The port can concurrently unstuff about 70 boxcars.

Marshaling Areas

WITHIN PORT

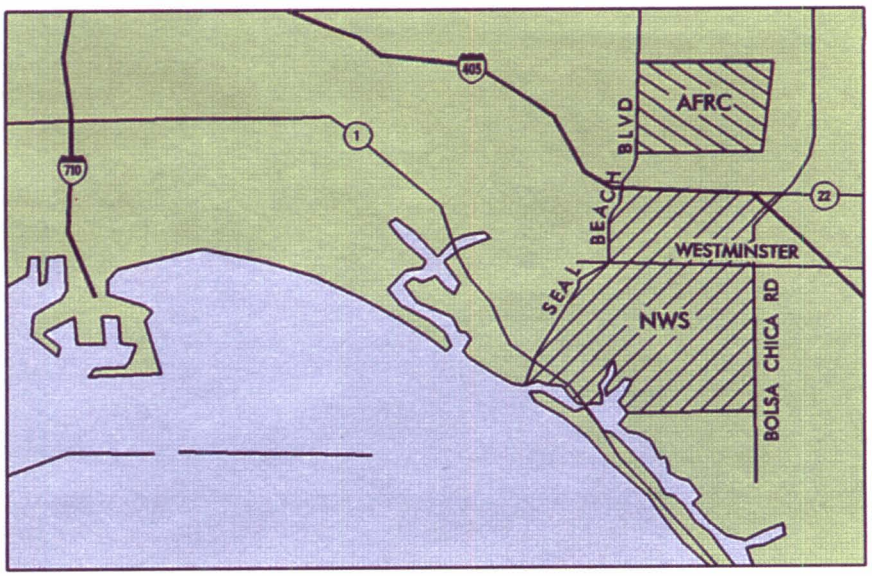
No marshaling areas are within the port area. All open areas within the port are required for staging of military or commercial cargo.

LOS ALAMITOS ARMED FORCES RESERVE CENTER

The Reserve Center is about 10 miles to the east of the port area. It has no rail access, but can provide at least 50 acres of marshaling area. It has a runway about 8,000 feet long, which was previously used by the Naval Air Station.

SEAL BEACH NAVAL WEAPONS STATION

The Naval Weapons Station is just south of the Reserve Center. It has rail access, but very little available open staging.

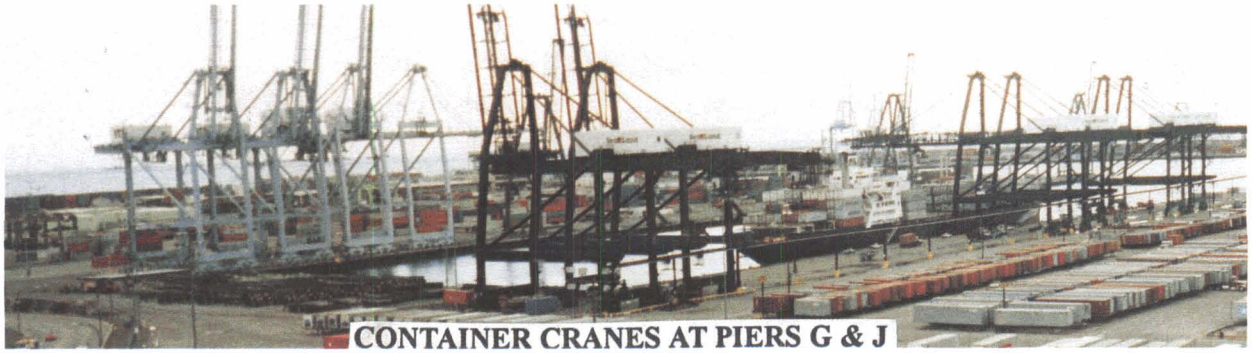


Potential Marshaling Areas

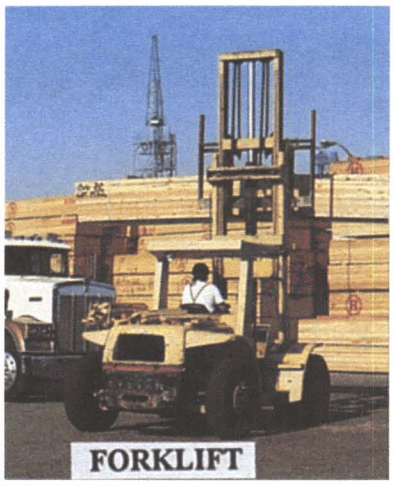
MATERIALS HANDLING EQUIPMENT (MHE)

The identified terminals have 30 container cranes. All of these cranes have a capacity of at least 40 tons. The Piers G and J Terminal has just over half of these cranes (17). The other 13 are about evenly distributed among the remaining 3 terminals.

Various tenants at the Port of Long Beach and the nearby Port of Los Angeles own transtainers and other MHE. Mobile cranes with capacities up to 150 tons are available from local stevedore companies. A 150-ton barge crane (shown below) is also available.



CONTAINER CRANES AT PIERS G & J



FORKLIFT

TRANSTAINER

CONTAINER HANDLER

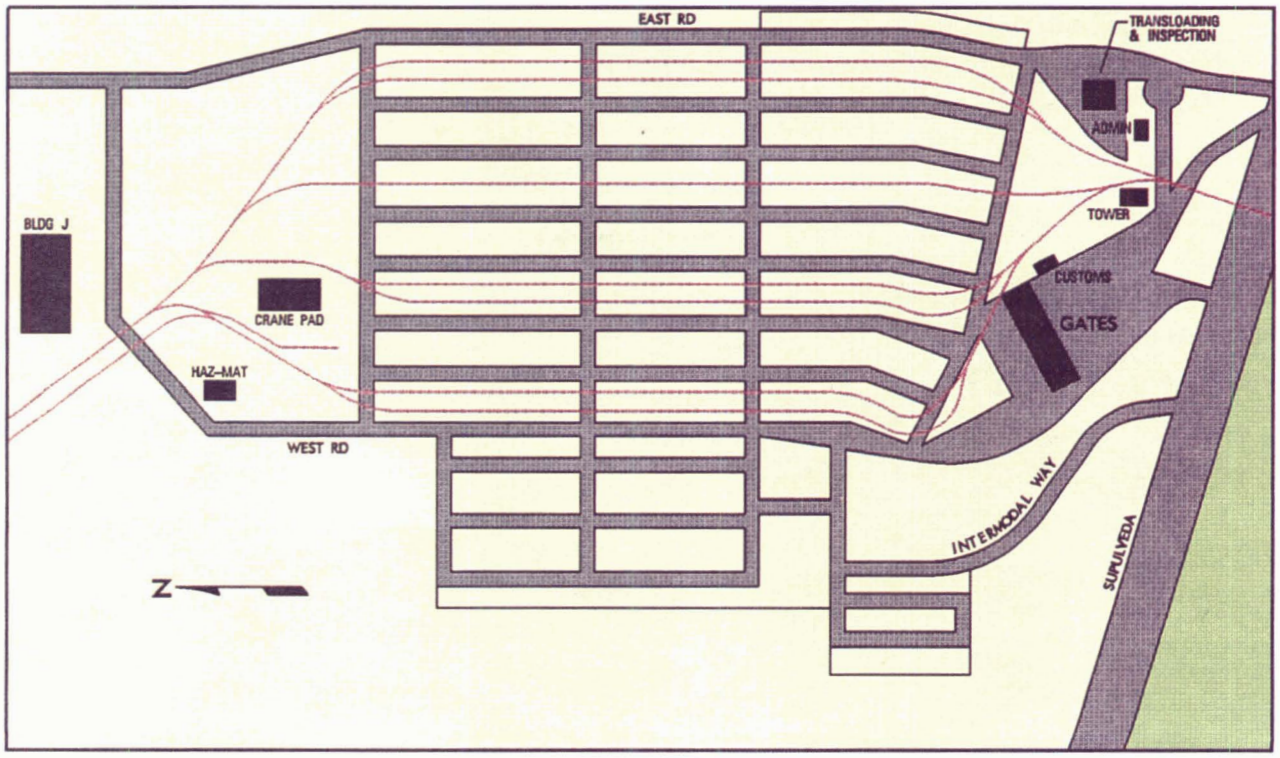
FLOATING CRANE

INTERMODAL FACILITIES

SF, UP, and CSX have intermodal facilities in the Los Angeles/Long Beach area. This report concentrates on another intermodal facility owned in part by both ports. The intermodal container transfer facility (ICTF) is 4 miles north of the port area, and is operated by SP. Frequent signs direct trucks to this modern facility.

CHARACTERISTICS OF THE ICTF

Storage	2,800 spots
Gate	8 inbound lanes with intercoms
MHE	8 transtainers 1 top pick
Throughput	1,400 lifts per day



ICTF Land-Use Map

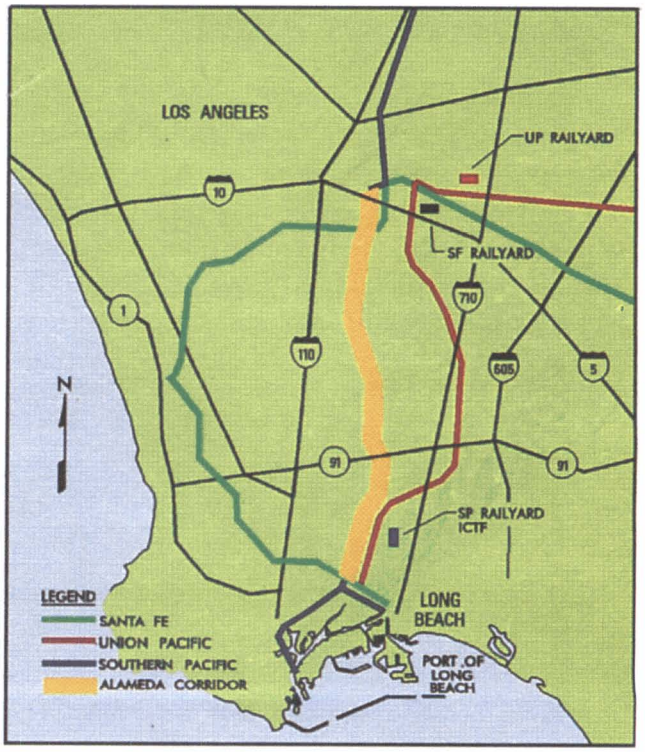
Entrance Gate (View from Control Tower)

Top Pick and Chassis

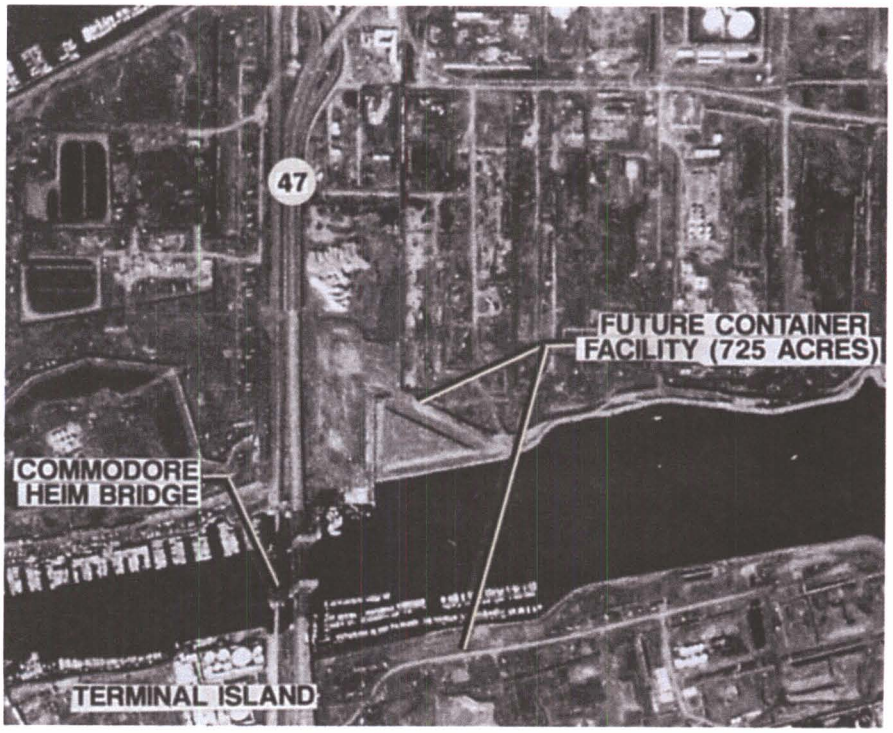
FUTURE DEVELOPMENT

The Ports of Los Angeles and Long Beach expect to jointly buy 20 miles of land from SP to develop an express transportation corridor for trucks and trains. The Alameda Corridor Project is expected to begin in 1994 and to take 6 years to complete. Once finished, the Alameda Corridor will reduce truck delays. This is because of the rerouting of trains, elimination of at-grade crossings, and widening of Alameda Street to six lanes. Trains will travel at higher speeds and be longer.

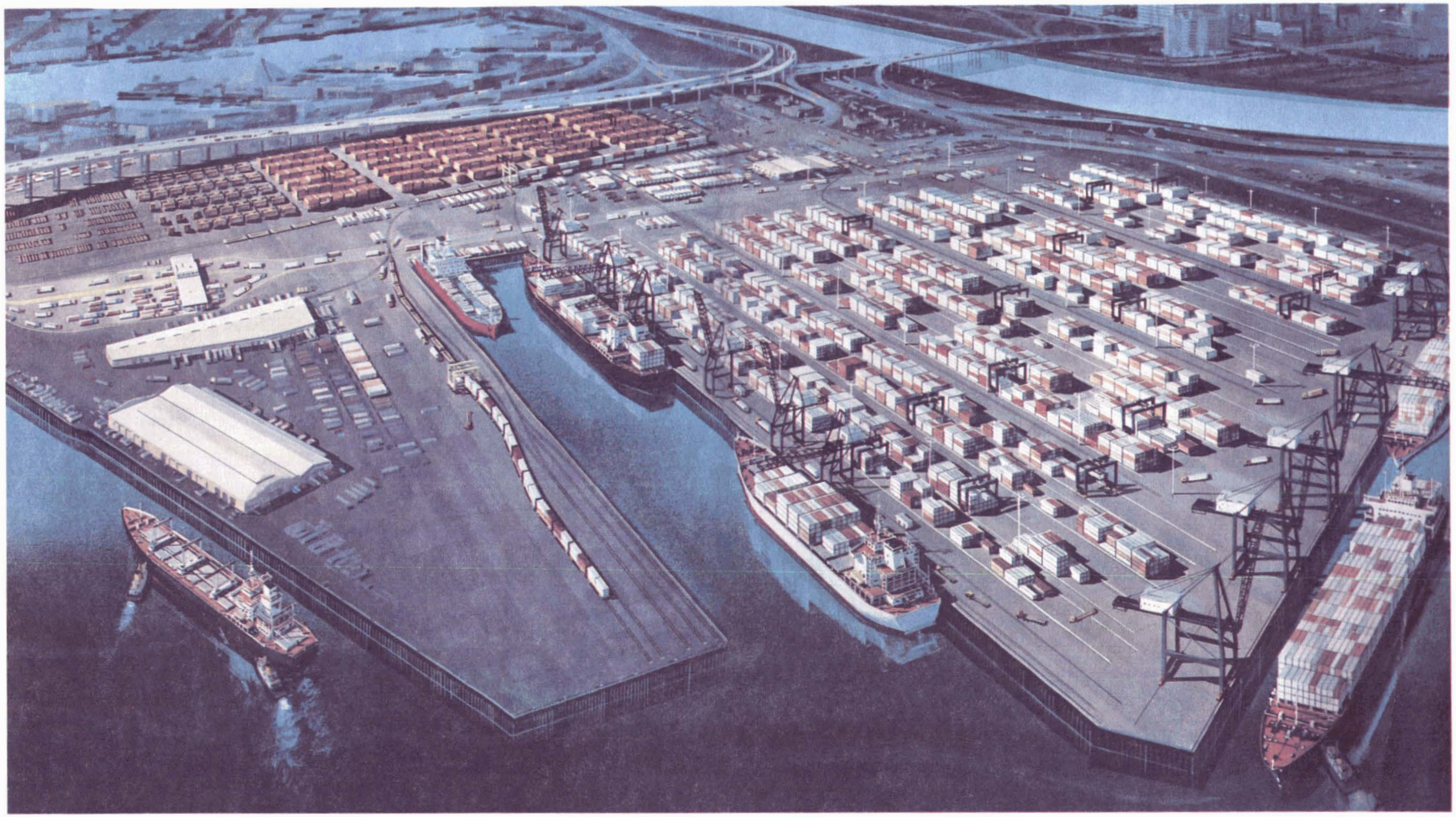
The Long Beach Port Authority bought land from UP on which to develop container facilities. This land could increase the container operations of the port by 35 percent.



Proposed Alameda Corridor

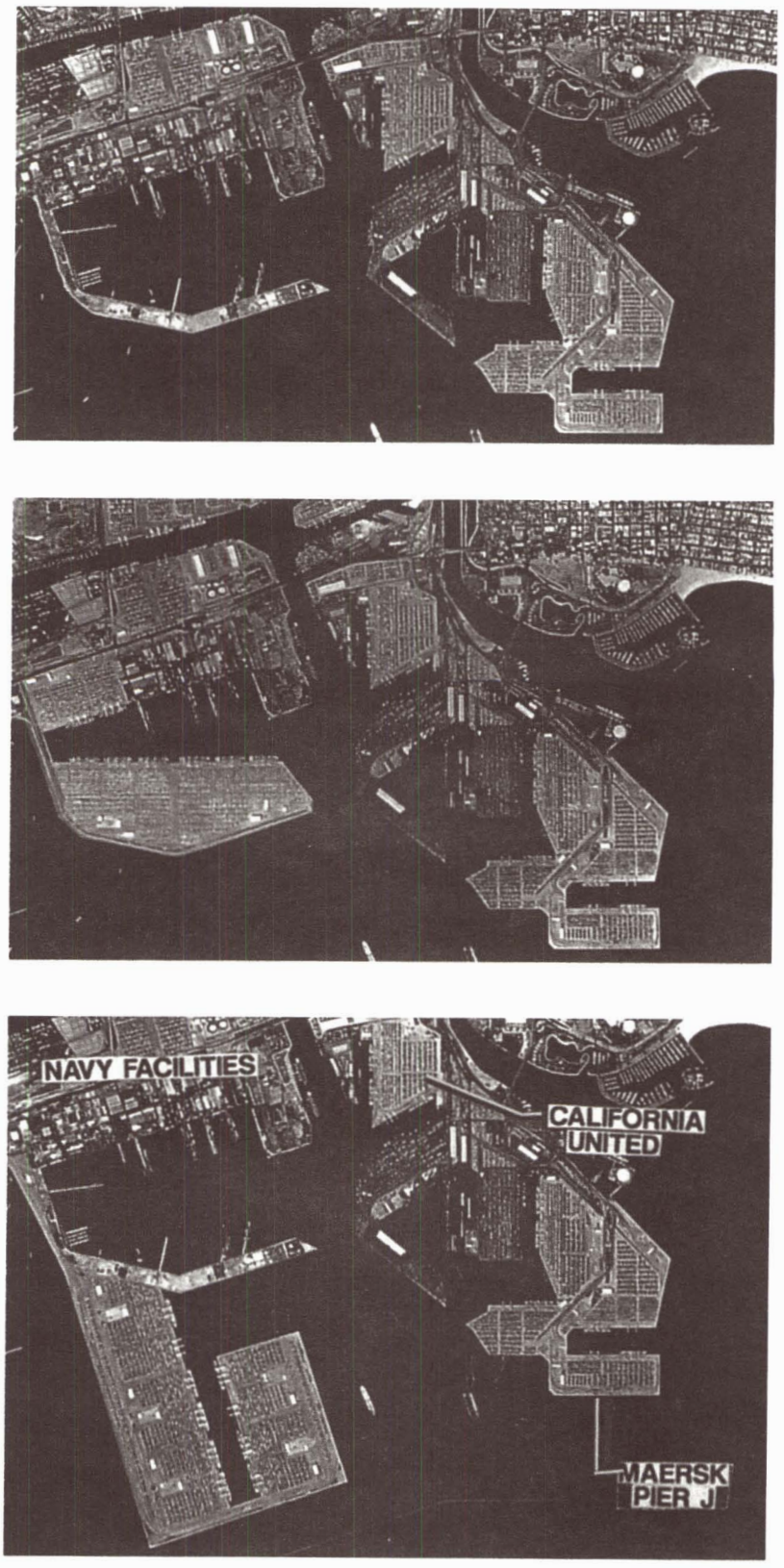


Future Container Facility at Terminal Island



Planned Development of the California United Terminal

The Port of Long Beach plans to expand existing facilities with dredge spoils. Depending on funding and land availability, the port will eventually look like one of the configurations shown at the right.

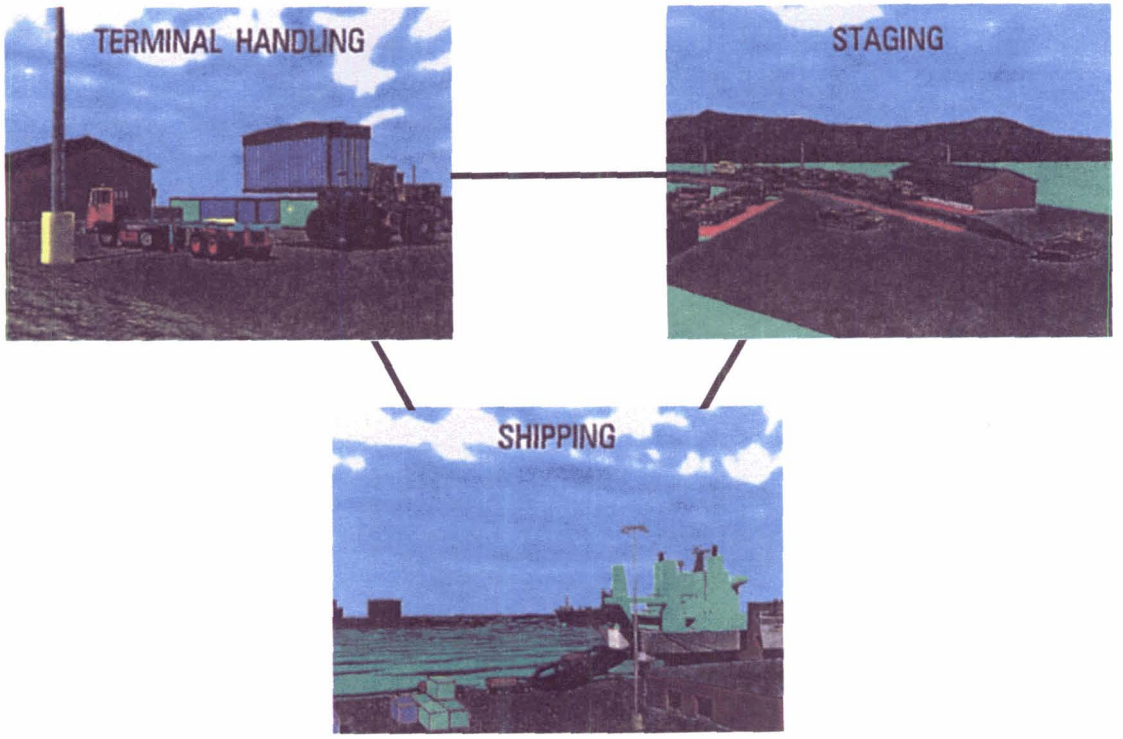


Possible Future Port Configurations at Long Beach

II. THROUGHPUT ANALYSIS

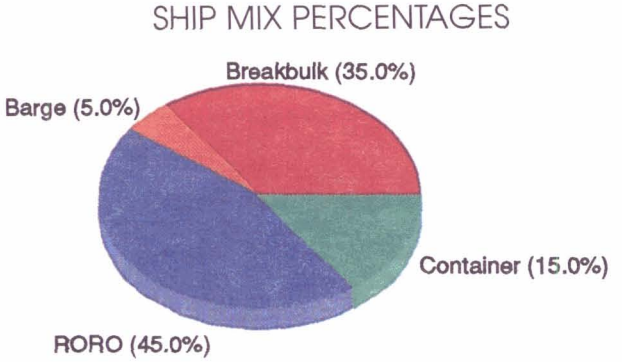
GENERAL

This section evaluates the throughput capability of the Port of Long Beach, using the port operational performance simulator 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) and measurement tons (MTON) 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.



RECEPTION/HANDLING

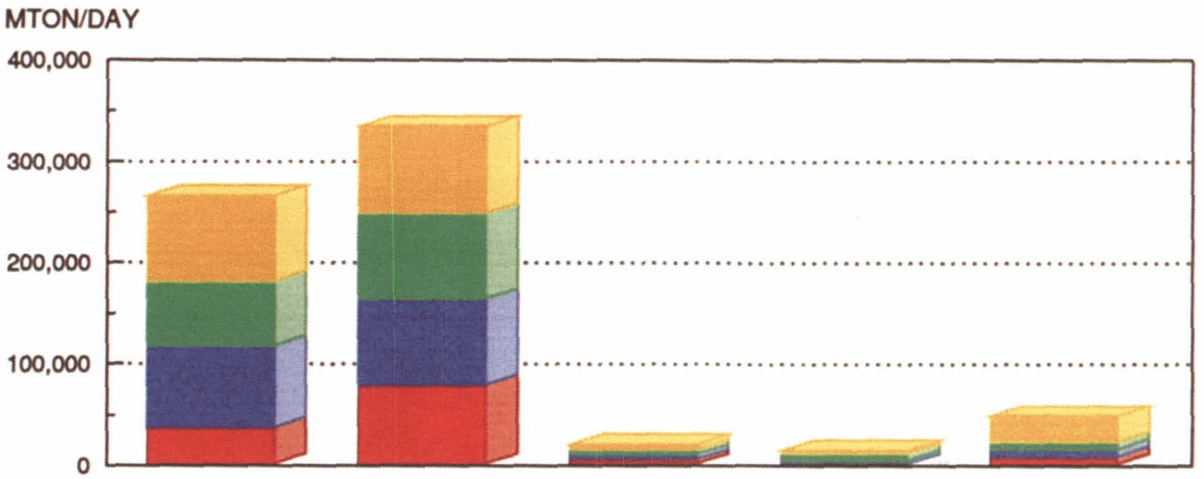
Highway

I-710 and California Route 47 provide access to the port. Each terminal has a designated entrance for trucks. The road network in and out of the terminals limits the highway reception to 265,000 MTON of equipment and supplies per day.

Roadable vehicles in convoys will process directly to the staging areas. Vehicles on commercial or military flatbed trailers without integral ramps will offload at portable ramps. The port has no permanent truck end ramps. However, our analysis assumes one portable ramp at each terminal. These ramps could offload about 19,000 MTON from flatbed trailers per day.

Supplies in van semitrailers will proceed to the 139 van-handling positions. These docks can offload about 13,500 MTON of van semitrailer-shipped material per day. Containers on chassis will move to the staging areas and offload by cranes. A container handler at each terminal can offload about 3,750 MTON of cargo from chassis per day.

HIGHWAY RECEPTION/HANDLING CAPABILITY



SUBSYSTEMS	HIGHWAY	GATES	END RAMPS*	DOCKS	CONTAINERS
PIER C	35,900	78,000	4,800	0	7,200
PIERS D AND E	80,700	85,000	4,800	3,600	7,600
PIER F	63,800	85,000	4,800	7,200	7,600
PIERS G AND J	84,100	85,000	4,800	2,700	25,000

*4 ramps are assumed available.

Rail

Rail reception at the port is fair, with three major railroad companies accessing the Long Beach area. Port-owned railyards at or near the terminals can hold about 400 railcars. Pier C is the only terminal without rail service.

This analysis assumes the ports or units can rent, build, or provide eight portable rail end ramps. It also assumes one container handler will operate at each terminal. Boxcars can offload at all terminals, except for pier C. The port has 72 boxcar-handling positions.

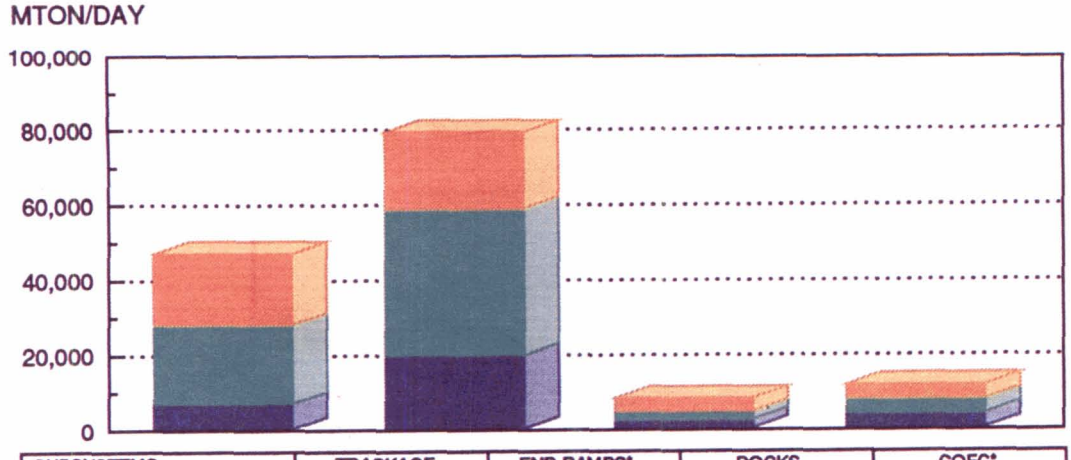
RAIL DELIVERY

TERMINAL	TRAIN LENGTH	TRAINS PER DAY
Piers D&E	60	1
Pier F	60	3
Piers G&J	60	3

PORTABLE END RAMP LOCATIONS AND LENGTHS

LOCATION	RAILCARS	NUMBER OF POSITIONS
Piers D&E	10	2
Pier F	10	4
Piers G&J	20	2

RAIL RECEPTION/HANDLING CAPABILITY



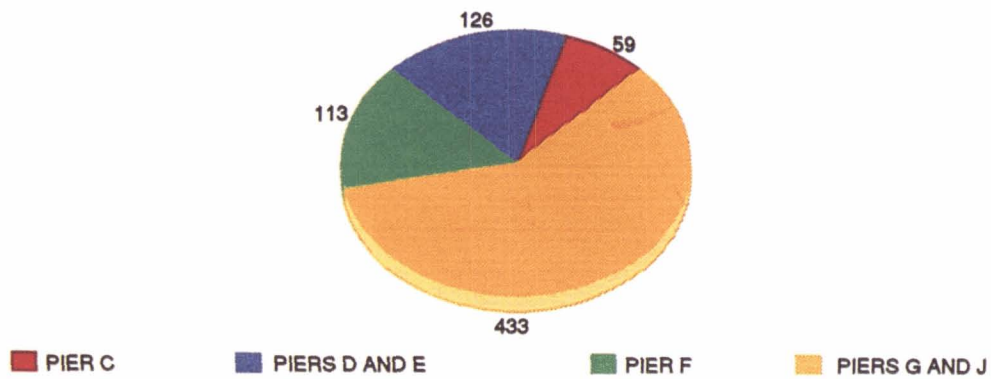
SUBSYSTEMS	TRACKAGE	END RAMPS*	DOCKS	COFC*
PIERS D AND E	6,700	19,500	2,200	3,800
PIER F	21,000	39,100	2,200	3,800
PIERS G AND J	19,000	20,300	3,500	3,800

*Assumes 8 portable rail ramps and 3 container handlers are provided.

STAGING

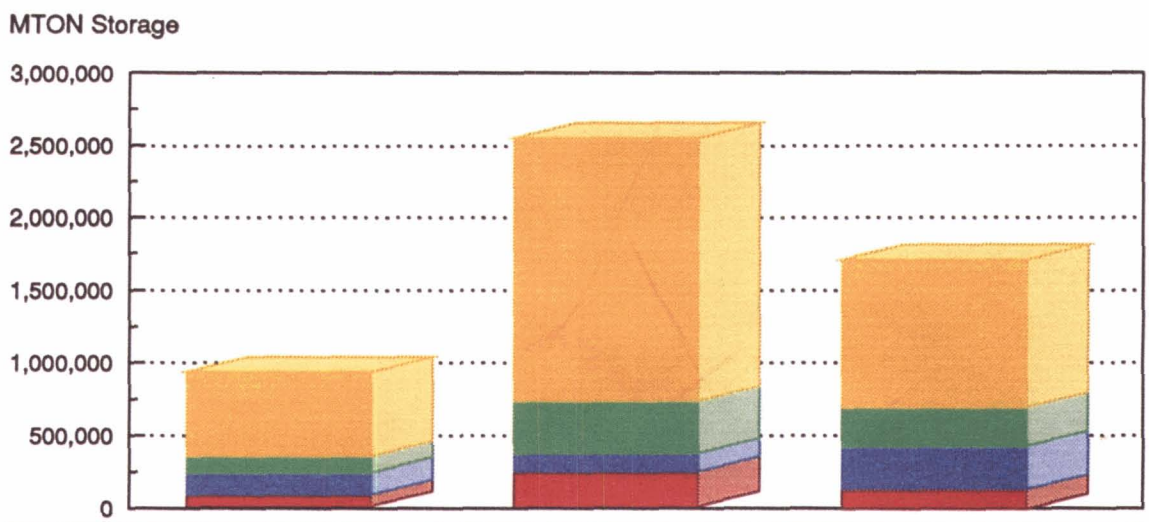
The terminals have about 730 acres of open paved staging. Most of it is at piers G and J. The terminals also have about 780,000 square feet of covered storage.

OPEN STAGING ACREAGE



The terminals can perform operations on roll-on/roll-off (RORO), container, or breakbulk ships. The cargo mix depends on the anticipated vessel type. For example, cargo will be containerized if a container ship is planned. The chart below provides the staging capability for the cargo for each of these vessel types. If a combination ship is expected, then a portion of each involved capability should be assumed.

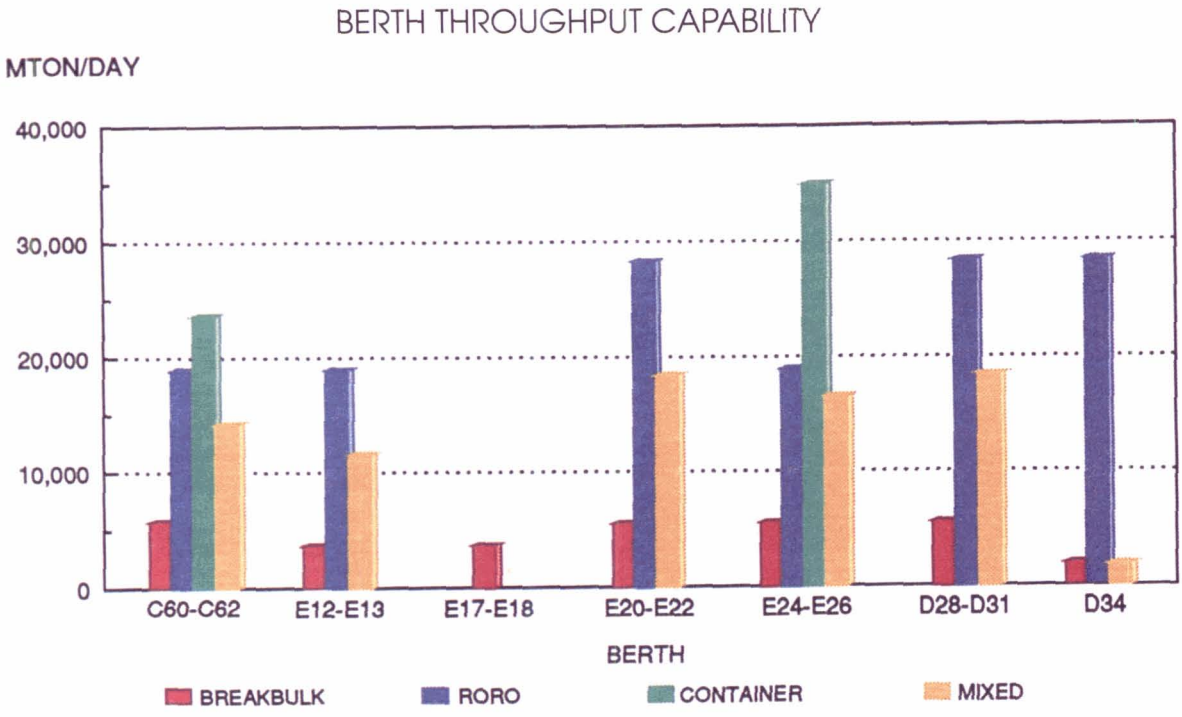
OPEN STAGING CAPABILITY

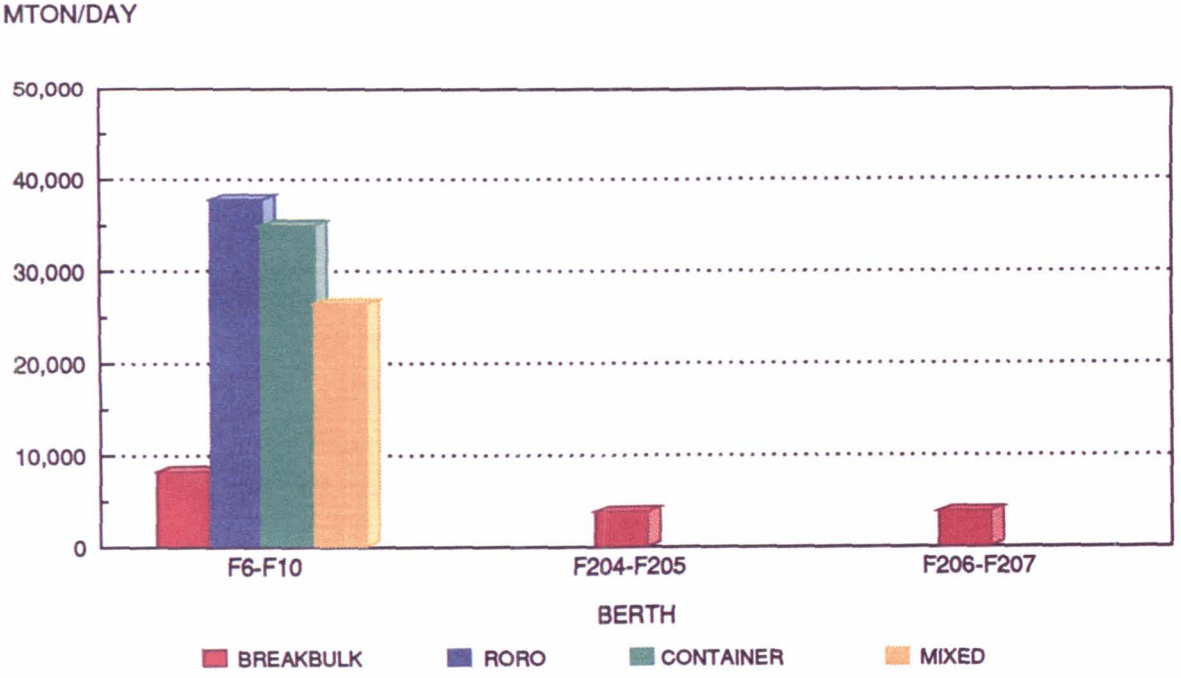


TERMINALS	RORO	CONTAINERS	BREAKBULK
PIER C	77,200	241,900	136,200
PIERS D AND E	153,400	123,200	294,300
PIER F	113,900	359,500	265,300
PIERS G AND J	574,500	1,814,100	1,012,900

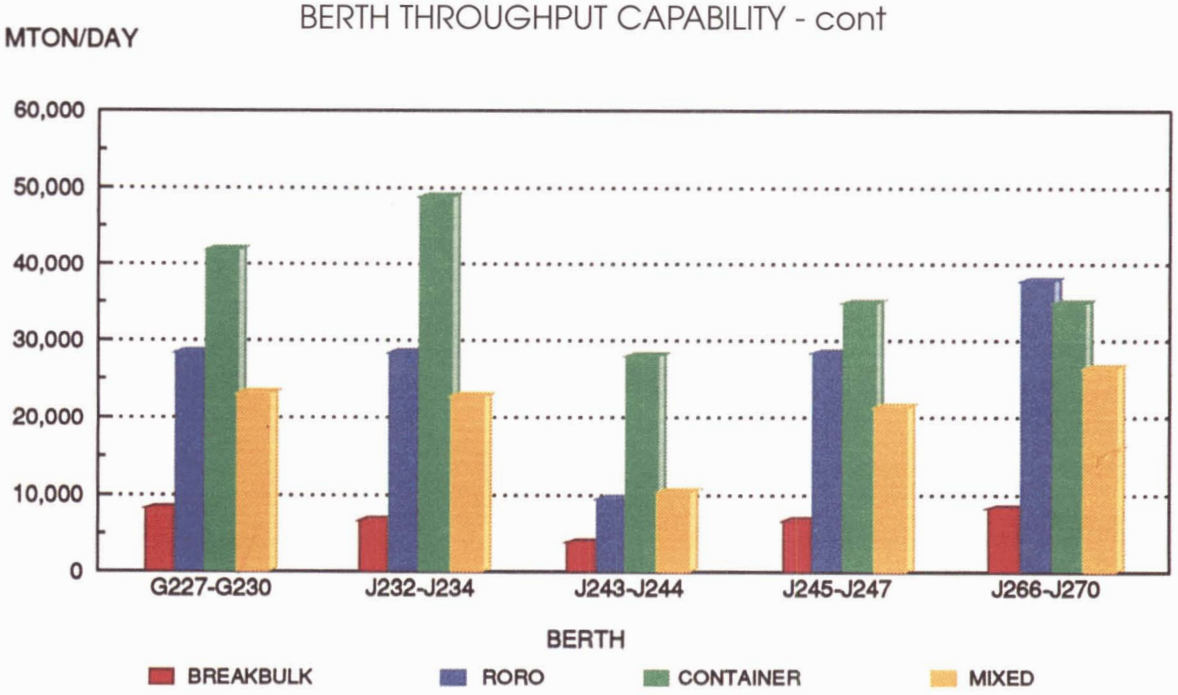
SHIPPING

Throughputs for each berth are shown below. They are based on various factors, including MHE used, loading, operational, and berth utilization rates, as well as berth/ship compatibility.





BERTH THROUGHPUT CAPABILITY - cont



CONVERSION FACTORS

Breakbulk	.4	STON per MTON
RORO	.25	STON per MTON
Containers	.4	STON per MTON

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

Considering the three ship types, berth J232-J234 is the best berth for military operations, because of its length, apron height, and cranes. The water depth may limit the draft of some ships.

Table 1 shows the berth/ship compatibility for various types of vessels. The table indicates for each type of ship the number of vessels each berth can accommodate. The table also provides the limitations that can hinder shipping operations.

PREFERENCE BERTH SELECTION

BERTH	BB	RORO	CONT
C60-C62	8	7	8
E12-E13	9	11	-
E17-E18	14	-	-
E20-E22	15	7	-
E24-E26	4	7	6
D28-D31	13	1	-
D34	12	-	-
F6-F10	6	7	2
F204-F205	10	-	-
F206-F207	10	-	-
G227-G230	2	4	2
J232-J234	1	2	1
J243-J244	7	4	7
J245-J247	4	4	5
J266-J270	3	2	4

TABLE 1
SUMMARY OF LONG BEACH PIER C TERMINAL BERTHING CAPABILITIES

VESSEL	BERTHS C60-C62
Breakbulk	
C3-S-33a	3
C3-S-37c	3
C3-S-37d	3
C3-S-38a	3
C4-S-1a	3
C4-S-1qb and 1u	3
C4-S-58a	3
C4-S-65a	3
C4-S-66a	3
C4-S-69b	2
Seatrain	
GA and PR-class	3
Barge	
LASH C8-S-81b	2
LASH C9-S-81d	1
LASH lighter	12
SEABEE C8-S-82a	2
SEABEE barge	9
RORO	
Comet	d,i,j
C7-S-95a/Maine-class	2
Ponce-class	h
Great Land-class	h
Cygnus/Pilot-class	2
Meteor	d,i,j
AmEagle/Condor	i,j
MV Ambassador	d
FSS-class	1,i
Cape D-class	i,j
Cape H-class	2,i
Container	
C6-S-1w	2
C7-S-68e	2
C8-S-85c	2
Combination	
C5-S-78a	2
C5-S-37e	2

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.
( ) indicates vessels assigned by analyst.

TABLE 1 - cont
SUMMARY OF LONG BEACH PIERS D AND E TERMINAL BERTHING CAPABILITIES

VESSEL	BERTHS					
	E12-E13	E17-E18	E20-E22	E24-E26	D28-D31	D34
Breakbulk						
C3-S-33a	2	2	3	3	3	1
C3-S-37c	2	2	3	3	3	1
C3-S-37d	2	2	3	3	3	1
C3-S-38a	2	2	3	3	3	1
C4-S-1a	2	2	3	3	3	1
C4-S-1qb and 1u	2	2	3	3	3	1
C4-S-58a	2	2	3	3	3	1
C4-S-65a	2	2	3	3	3	1
C4-S-66a	2	2	3	3	3	1
C4-S-69b	2	1	3	3	3	1
Seatrain						
GA and PR-class	2	2	3	3	3	1
Barge						
LASH C8-S-81b	1	1	2	2	2	1
LASH C9-S-81d	1	1	2	2	2	1
LASH lighter	8	8	14	13	14	6
SEABEE C8-S-82a	1	1	2	2	2	1
SEABEE barge	6	6	10	9	9	4
RORO						
Comet	i,j	d,i,j	d,i,j	d,i,j	3,d,i	d,o
C7-S-95a/Maine-class	b	i,j	2,i	2	2	b
Ponce-class	b,h	h	h	h	h	b,h
Great Land-class	b,h	h	h	h	h	b,h
Cygnus/Pilot-class	b	i,j	3,i	2	3	b
Meteor	i,j	d,i,j	d,i,j	d,i,j	d,i,j	d,o
AmEagle/Condor	b	i,j	i,j	i,j	3,i	b
MV Ambassador	2,i	d	d	d	d	d
FSS-class	b	i,j	2,i	1,i	2	b,c
Cape D-class	b	i,j	i,j	i,j	2,i	b
Cape H-class	b	i,j	2,i	2,i	2	b
Container						
C6-S-1w	1,e	1,e	2,e	2	2,e	1,e
C7-S-68e	1,e	1,e	2,e	2	2,e	1,e
C8-S-85c	1,e	1,e	2,e	2	2,e	1,e
Combination						
C5-S-78a	1,e	1,e	3,e	3	3,e	1,e
C5-S-37e	1,e	1,e	3,e	3	3,e	1,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.

TABLE 1 - cont
SUMMARY OF PIER F TERMINAL BERTHING CAPABILITIES

VESSEL	BERTHS		
	F6-F10	F204-F205	F206-F207
Breakbulk			
C3-S-33a	5	2	2
C3-S-37c	5	2	2
C3-S-37d	5	2	2
C3-S-38a	5	2	2
C4-S-1a	4	2	2
C4-S-1qb and 1u	4	2	2
C4-S-58a	4	2	2
C4-S-65a	4	2	2
C4-S-66a	4	2	2
C4-S-69b	4	2	1
Seatrain			
GA and PR-class	4	2	2
Barge			
LASH C8-S-81b	3	1	1
LASH C9-S-81d	3	a	a
LASH lighter	20	9	8
SEABEE C8-S-82a	3	a	a
SEABEE barge	14	6	6
RORO			
Comet	d,i,j	d,o	d,o
C7-S-95a/Maine-class	3	b	b
Ponce-class	h	b,h	b,h
Great Land-class	h	b,h	b,h
Cygnus/Pilot-class	4	b	b
Meteor	d,i,j	d,o	d,o
AmEagle/Condor	i,j	b	b
MV Ambassador	d	d	d
FSS-class	2,i	b	b
Cape D-class	i,j	b	b
Cape H-class	3,i	a,b	a,b
Container			
C6-S-1w	4	1,e	1,e
C7-S-68e	3	1,e	1,e
C8-S-85c	3	1,e	1,e
Combination			
C5-S-78a	4	2,e	1,e
C5-S-37e	4	2,e	1,e

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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.

TABLE 1 - cont
SUMMARY OF LONG BEACH PIERS G AND J TERMINAL BERTHING CAPABILITIES

VESSEL	BERTHS				
	G227-G230	J232-J234	J243-J244	J245-J247	J266-J270
Breakbulk					
C3-S-33a	5	4	2	4	5
C3-S-37c	5	4	2	4	5
C3-S-37d	5	4	2	4	5
C3-S-38a	5	4	2	4	5
C4-S-1a	4	3	2	3	4
C4-S-1qb and 1u	4	3	2	3	4
C4-S-58a	4	3	2	3	4
C4-S-65a	4	3	2	3	4
C4-S-66a	4	4	2	3	4
C4-S-69b	4	3	1	3	4
Seatrain					
GA and PR-class	4	3	2	3	4
Barge					
LASH C8-S-81b	3	2	1	2	3
LASH C9-S-81d	2	a	1	a	2
LASH lighter	18	16	8	15	19
SEABEE C8-S-82a	2	a	1	a	2
SEABEE barge	13	11	6	10	13
RORO					
Comet	d,i,j	i,j	d,i,j	d,i,j	i,j
C7-S-95a/Maine-class	3,i	3,i	1,i	2,i	3
Ponce-class	h	h	h	h	h
Great Land-class	h	h	h	h	h
Cygnus/Pilot-class	3,i	3,i	1,i	3,i	4
Meteor	d,i,j	i,j	d,i,j	d,i,j	i,j
AmEagle/Condor	i,j	i,j	i,j	i,j	i,j
MV Ambassador	d	3	d	d	4
FSS-class	2,i	2,i	1,i	2,i	2
Cape D-class	i,j	i,j	i,j	i,j	i,j
Cape H-class	3,i	2,i	1,i	2,i	3
Container					
C6-S-1w	3	3	1	3	3
C7-S-68e	3	3	1	2	3
C8-S-85c	3	2	1	2	3
Combination					
C5-S-78a	4	3	1	3	4
C5-S-37e	4	3	1	3	4

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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.

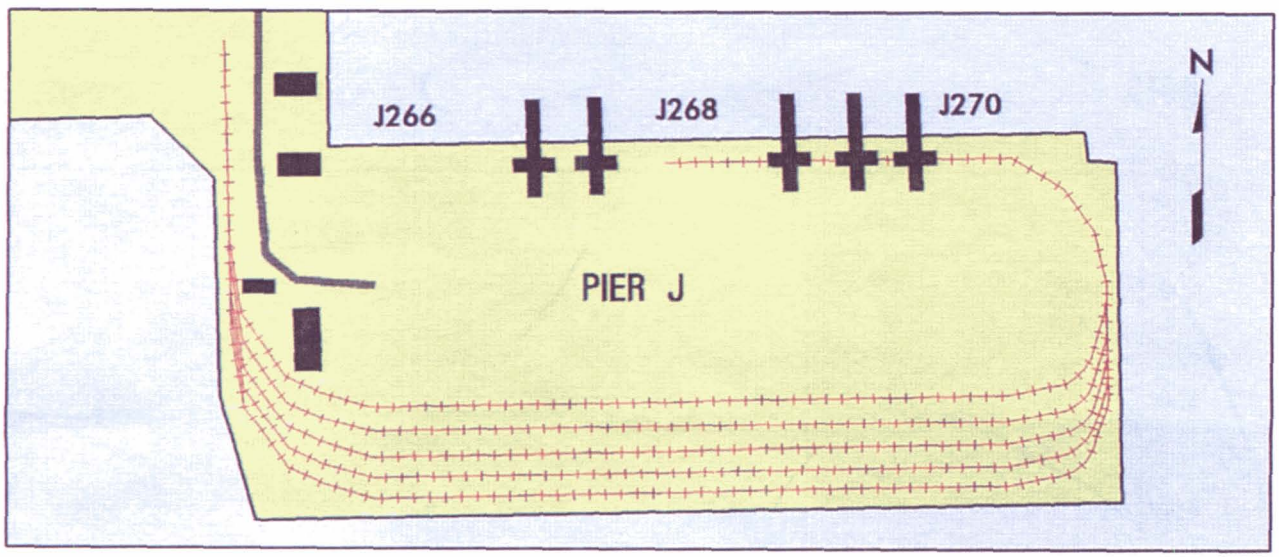
III. APPLICATION

GENERAL

This section of the report will evaluate the throughput capability of the port for deploying a notional mechanized infantry division, chiefly using fast sealift ships (FSS).

Specific planning requirements in response to a military deployment are outlined in the *Port Planning Orders* issued by MARAD. The Port of Long Beach must be prepared to grant priority use of Maersk Marine Terminals, pier J, berths 266, 268, and 270; 15 acres of open storage; about 12,000 square feet of covered storage; and about 300 square feet of office space with receptacles/connections for telephones and computers.

2,700 FT BERTH
15 OPEN ACRES
12,000 COVERED FT^2



NOTE:
FIGURES ARE NOT TO SCALE

Facilities in the *Planning Orders Digest*

REQUIREMENTS

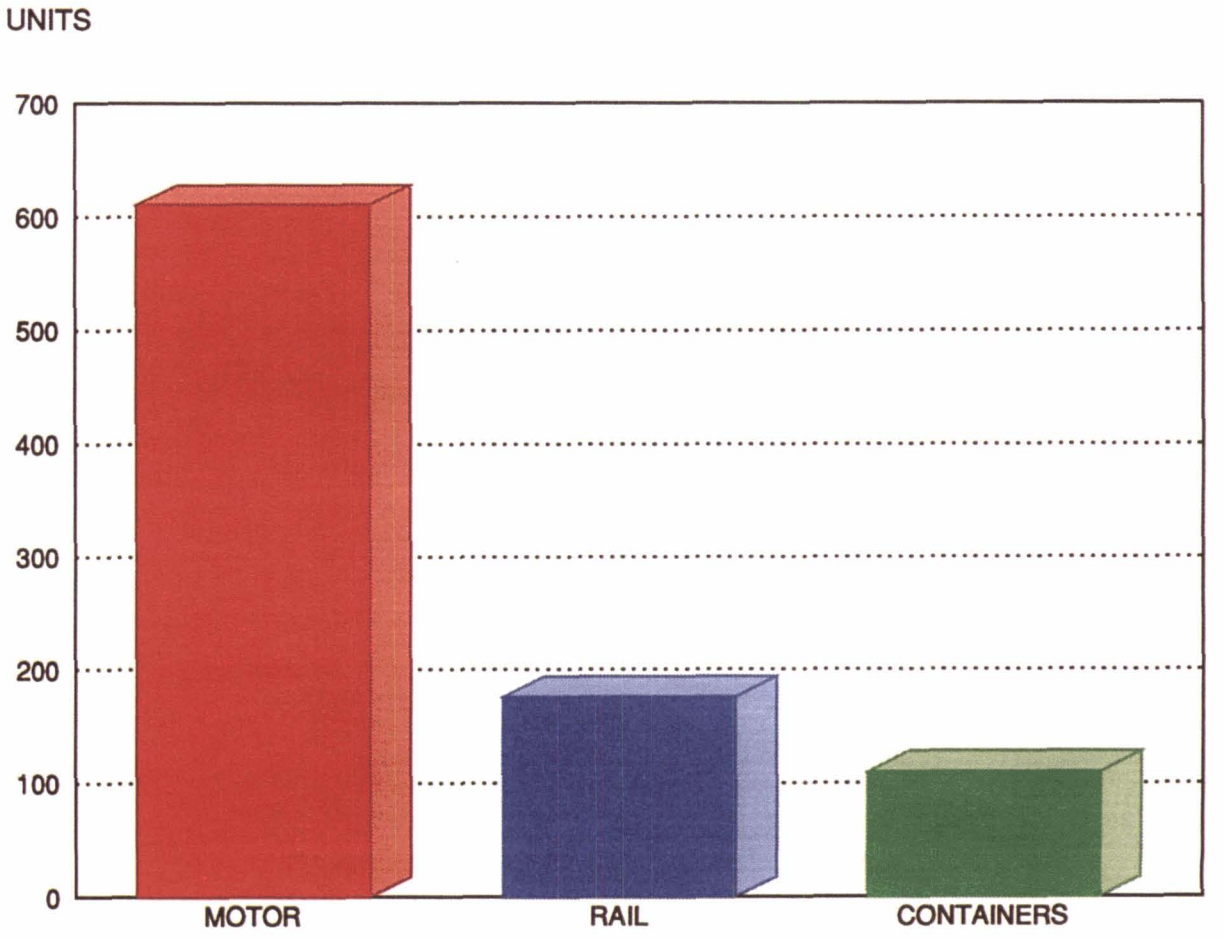
This report assumes that the facilities expected in the upcoming *Planning Orders Digest* will be used for military operations. Although not clearly specified in the planning orders, this report assumes two 2,000-foot rail spurs inland of berth J266-J270 will also be used.

The likely requirement for the Port of Long Beach is to deploy a notional mechanized infantry division in 6 days of reception and throughput. The division has to move about 7,800 vehicles and 660 containers. The movement to the port will require 1,055 (176 per day) railcars, using the convoy/rail option. Under this option, about 3,650 (610 per day) roadable vehicles would be driven and about 2,320 (387 per day) would be towed.

MECHANIZED INFANTRY DIVISION DEPLOYMENT DATA

Total Equipment	
Volume	274,518 MTON
Weight	95,010 STON
Area	1,422,844 SQ FT
Vehicles	7,800
Containers	660

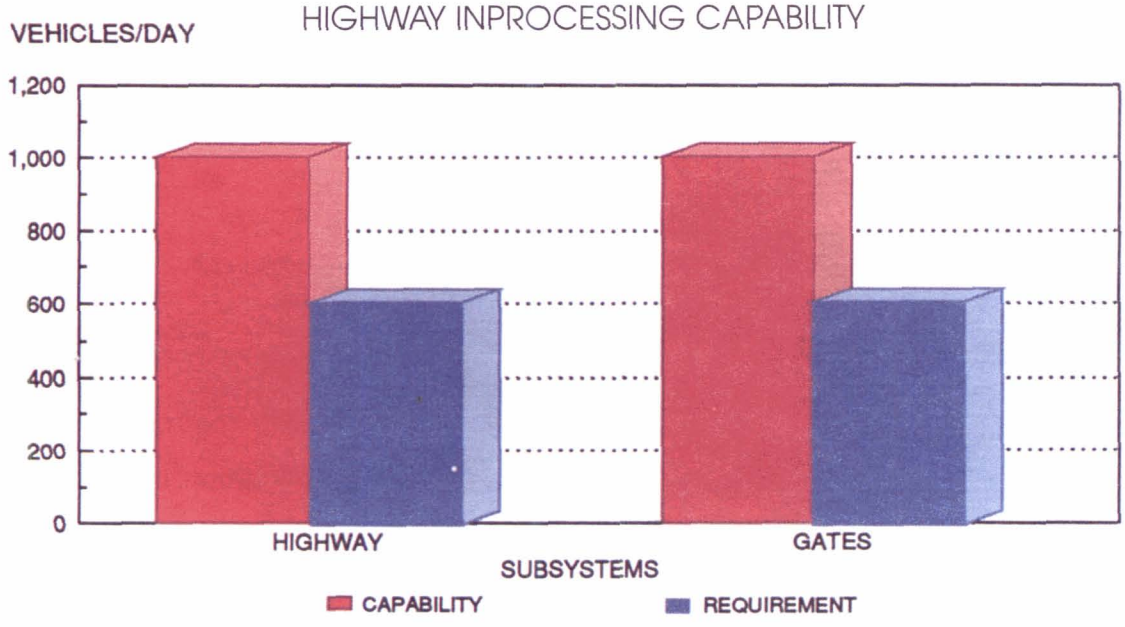
DAILY REQUIREMENTS



TERMINAL HANDLING

Highway

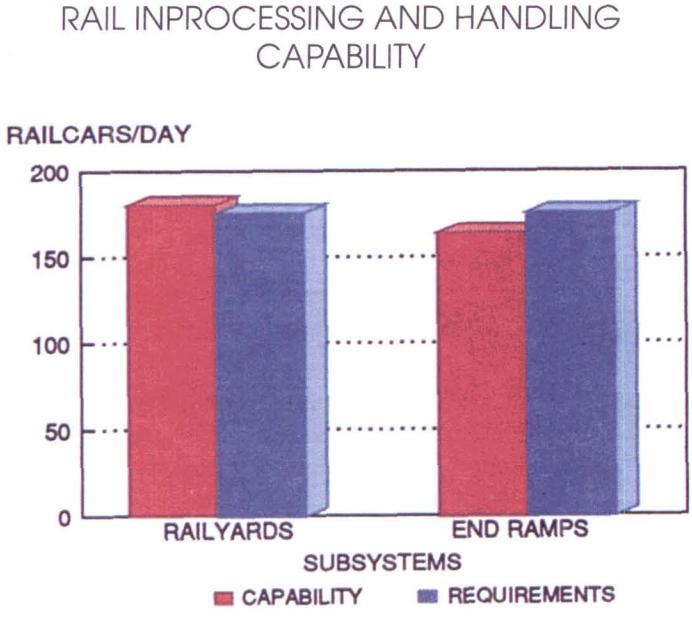
Vehicles and containers on chassis would access the Piers G and J Terminal through the five-lane gate on Harbor Scenic Drive. Both the access road and the gate can handle more than 1,000 vehicles per day.



Rail

The Piers G and J Terminal can receive 180 railcars per day. Two portable rail end ramps placed along the 2,000-foot railyard at the south side of the terminal could only offload about 164 railcars of military equipment per day. This is within the capability of the rail reception of the facility, but is not sufficient to meet the offloading requirement.

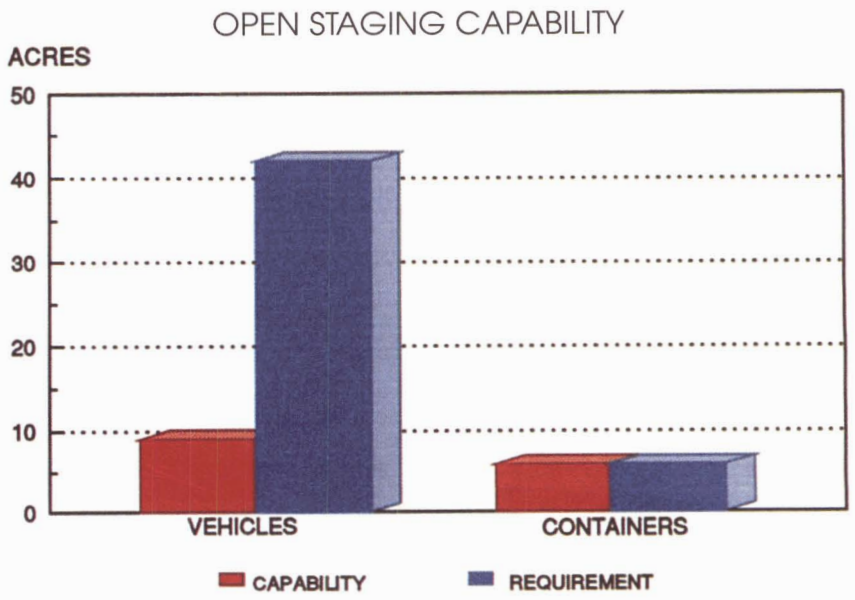
Operations on a third track of the railyard would produce sufficient offloading capability, but might create excessive congestion in the area. Timbers or other provisions are required to allow vehicles to cross tracks.



A possible solution would be to deploy more equipment by highway and less by rail.

STAGING

This analysis assumes that current downsizing continues and that nine FSS-sized ships will deploy an entire notional mechanized infantry division. Three ships will depart every 2 days. Because of this, the staging requirement is to support three sustained loading operations. Although an FSS load of cargo can be staged and loaded on 10 acres, 16 acres are required for sustained loading operations. Of these 16 acres, about 2 acres are required for staging the 73 containers for each FSS. The three simultaneous shiploading operations will require 48 acres of open staging, of which about 6 acres are dedicated to containers. The facilities analyzed in this report only include 15 acres of open storage. This does not meet the requirement of 48 acres.



SHIPPING

Although this analysis assumes that nine FSS-sized ships can deploy the notional mechanized infantry division, the table below provides ship quantities for the current division size. The number of ships required depends on the ship mix selected. The best ship mix would consist of all eight FSS ships, plus two Cape H RORO ships.

UNIT MOVEMENT REQUIREMENTS
MECHANIZED DIVISION

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*	8.00	1.90		
FSS and Cape H	6.64	3.00		
All Breakbulk			37.70	
Maximum Containerization				
FSS and Container	7.90			2.00
FSS, Cape H, and Container	4.62	3.00		2.00
Breakbulk and Container			29.58	2.00

*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).

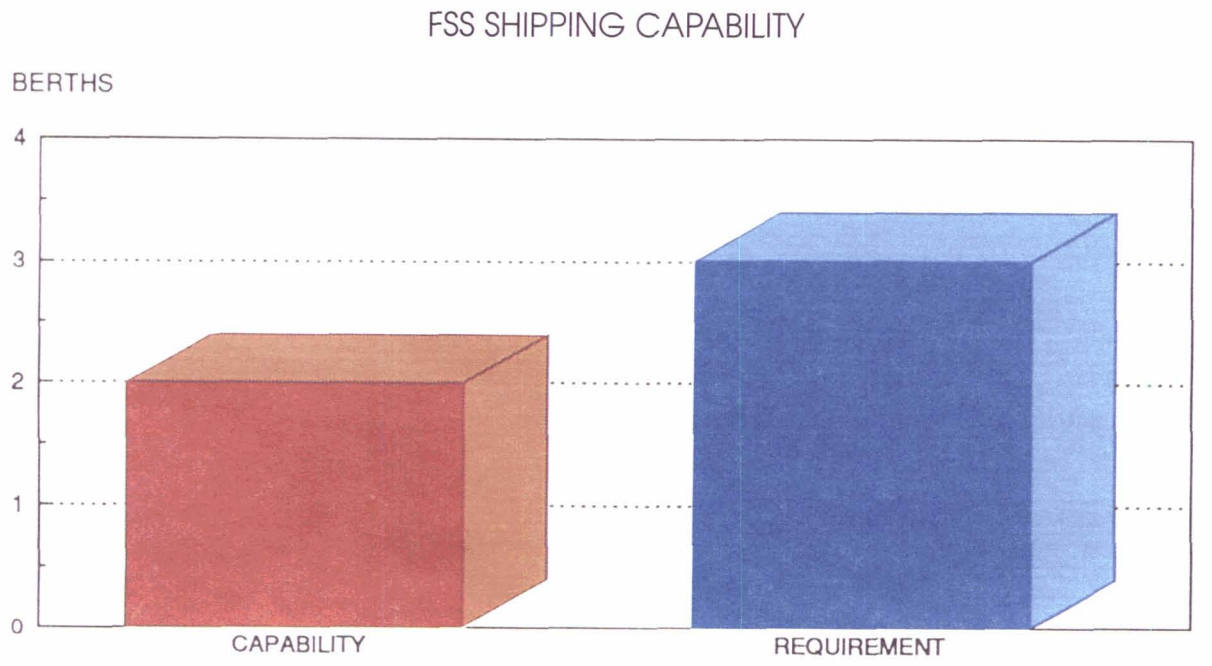
Legend:

RORO - roll on/roll off

FSS - fast sealift ship

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

Berth J266-J270 can berth two FSS. The requirement to deploy the division requires the berthing capabilities for three FSS. The capability does not satisfy the requirement.



SUMMARY

The facilities expected in the upcoming *Planning Orders Digest* are not adequate to support the deployment of a division using the Army Strategic Mobility Program (ASMP) timelines.

RECOMMENDATION

Supporting the requirement requires additional rail offloading capability, open staging, and berthing for an FSS. We recommend negotiating for the use of facilities at the Piers D and E Terminal, in addition to those expected in the upcoming *Planning Orders Digest.* Berth D28-D31, one 1,000-foot rail spur, and 23 acres would provide the additional facilities to support the requirement.

LOS ANGELES

PORT OF LOS ANGELES

LOS ANGELES, CALIFORNIA

I. GENERAL DATA

Altogether, the Port of Los Angeles has 28 miles of wharfage and 6.5 square miles (4,100 acres) of land. It handles more containers and cargo value than any other port in the United States. Of the 36 cargo handling terminals, 10 routinely handle containers. This report covers these container facilities and other facilities that are applicable to military operations. Passenger and bulk terminals are not included because they are not easily adapted to support military operations.

TRANSPORTATION ACCESS

WATER

Access to the port is through the Los Angels Gate opening of the 12-mile-long breakwater that separates the San Pedro Bay from the Pacific Ocean. Once in the protected waters, ships can weigh anchor or continue on to berth. After passing through the breakwater, ships traverse the San Pedro Bay to all terminals. Channel depths are at least 45 feet deep at mean low water (MLW) and 400 feet wide.

The harbor consists of an outer and an inner harbor. The outer harbor shoreline consists mainly of San Pedro and Terminal Island. Wilmington borders entirely on the inner harbor. The inner harbor has a total water area of about 950 acres. It consists of a series of channels, basins, slips, and a centrally located turning basin. The Los Angeles Main Channel extends northwest from the San Pedro breakwater for about 1 mile, then north to a turning basin. From the turning basin, a channel extends to West Basin. Extending northeasterly from the turning basin, Main Channel joins East Basin.

The mean tidal range in Los Angeles Harbor is 3.8 feet. The range between mean lower low water and mean higher high water is about 5.4 feet.

Ships need only clear the Vincent Thomas Bridge at California 47 to access the terminals. The bridge is at least 165 feet above mean high water (MHW). Ships may turn in the 1,350- by 1,650-foot turning basin just inland of this bridge.

OVERHEAD OBSTRUCTIONS

Name of Obstruction	Distance from Breakwater (miles)	Clearance (ft MHW)		Name of Channel Spanned
		Horizontal	Vertical	
Vincent Thomas Fixed Bridge	3.0	1,150	185 (center)	Main Channel
Commodore Heim Lift Bridge	4.5	180	162	Cherritos Channel
Overhead Cables	5 (about)		155	Cherritos Channel

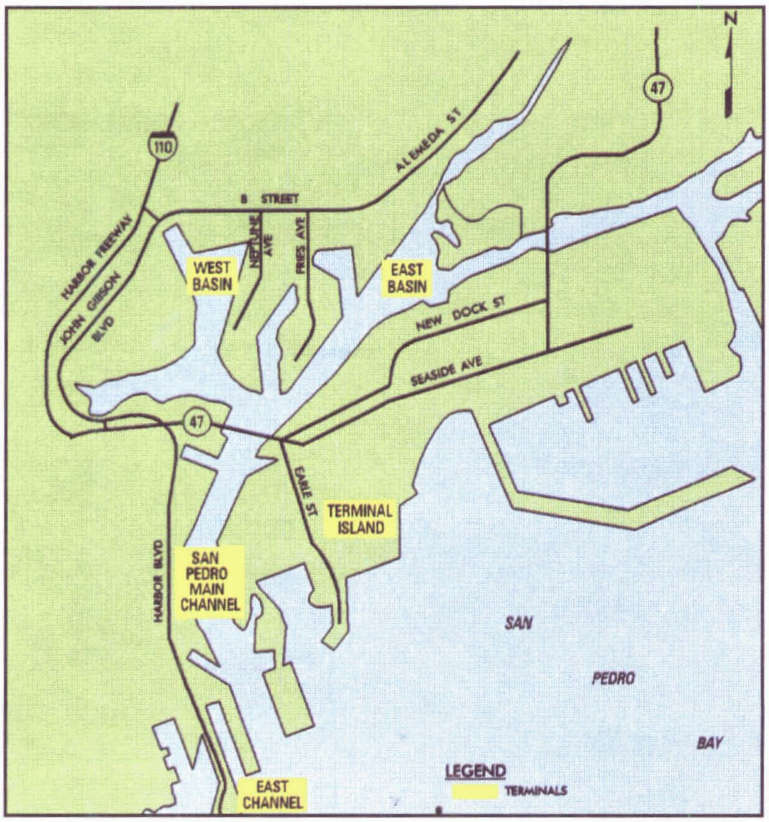
Water Access

HIGHWAY

The Port of Los Angeles is in a heavily populated region. Anticipate traffic congestion when using any route named in this report. Berths within East Channel and those along San Pedro Main Channel on the San Pedro side connect to Harbor Boulevard. Harbor Boulevard then connects to State Highway 47, which intersects with Interstate 110 (I-110) (Harbor Freeway). The distance from Harbor Boulevard along State Highway 47 to I-110 is less than 1 mile.

The berths within West and East Basins access B Street. B Street travels west, then turns southwest and becomes John S. Gibson Boulevard. Continuing southwest about 1 mile, John S. Gibson Boulevard ends upon accessing I-110.

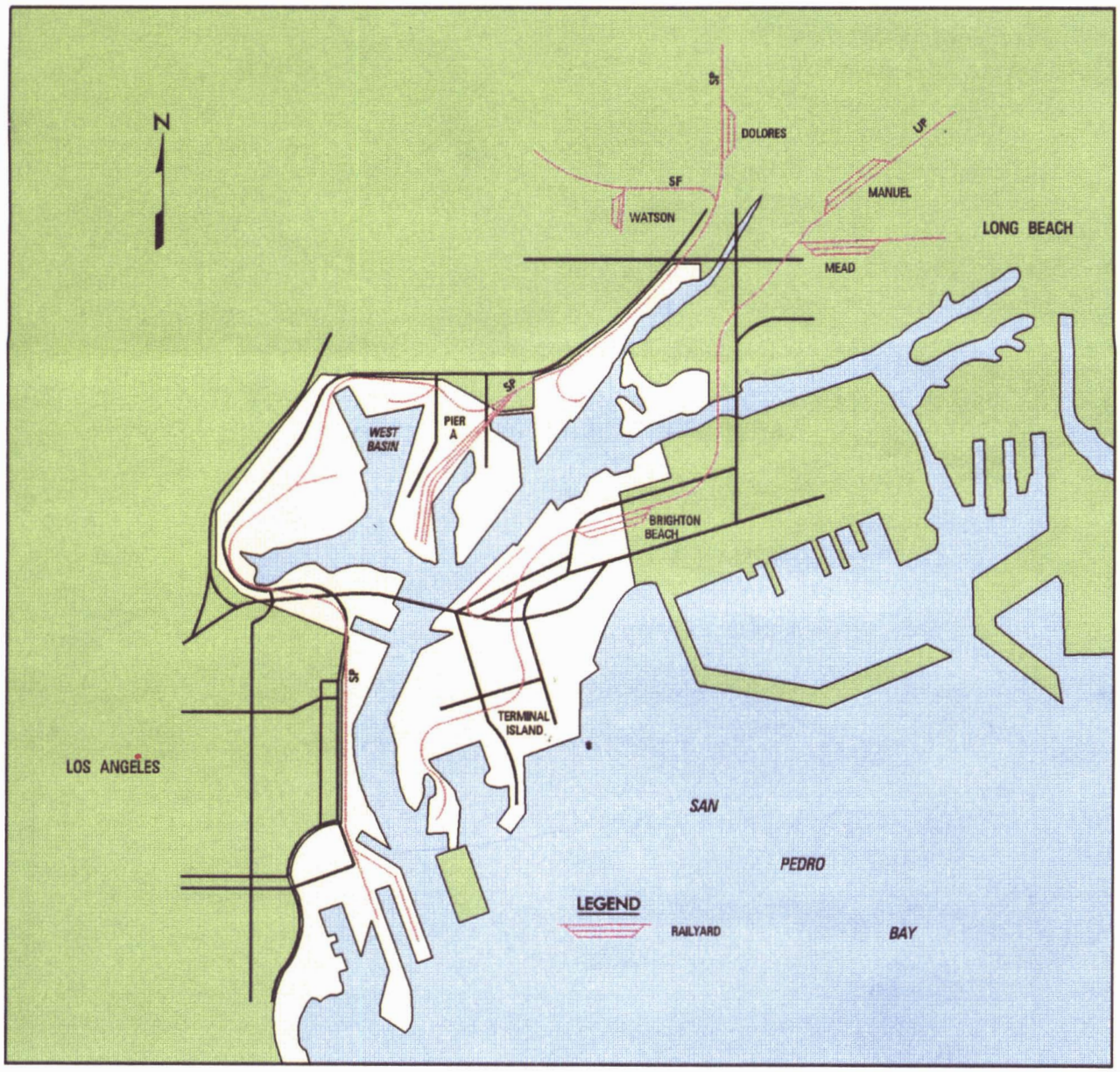
Neptune and Fries Avenues both join B Street at their northern ends. Neptune Avenue serves berths along the east side of West Basin.



Gate to Los Angeles Indies Terminal

RAIL

The three major rail companies that serve the Los Angeles area are the Sante Fe (SF), Southern Pacific (SP), and Union Pacific (UP). The Harbor Belt Line performs switching. The railyards within 5 miles of the ports have storage capacity for more than 1,100 railcars. The nearby Port of Long Beach has additional rail storage yards. Information on those railyards is in the Port of Long Beach report.



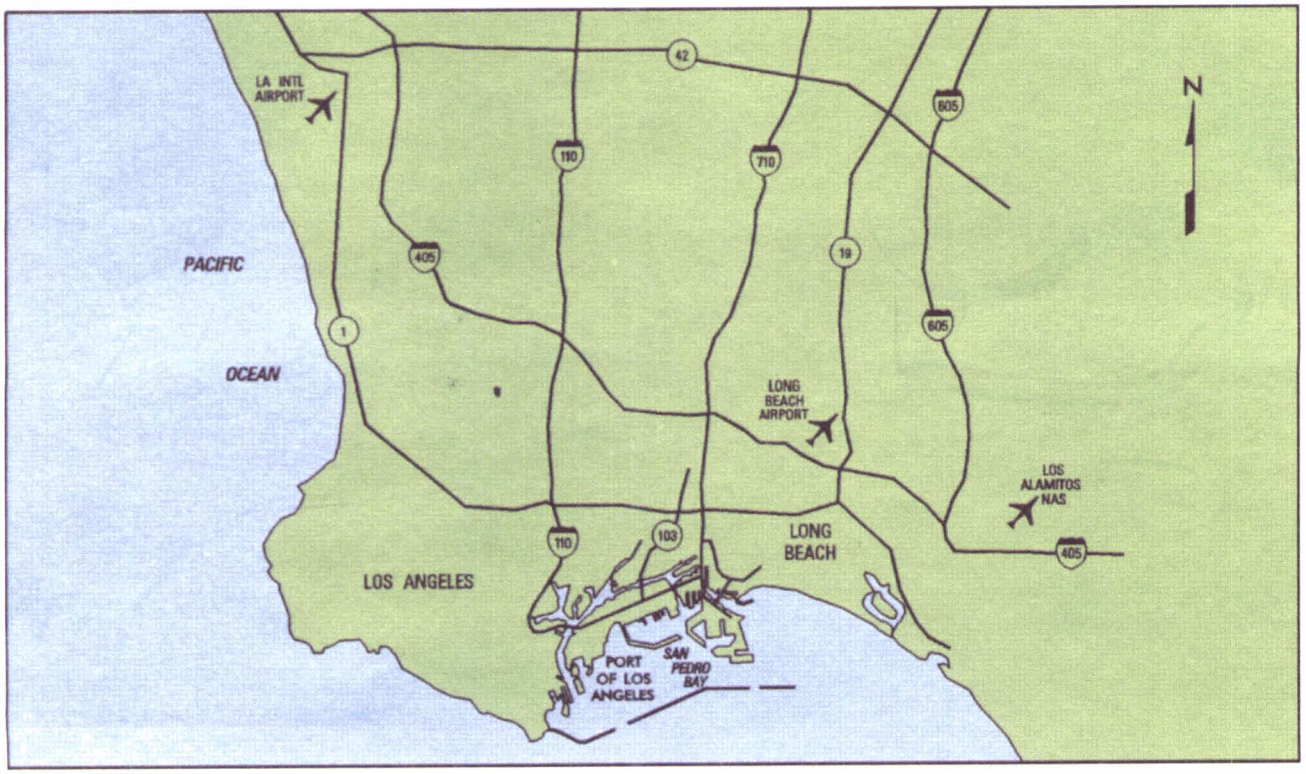
Rail Access

AIRPORTS

Several airports of various sizes and capabilities are within 30 miles of the terminals. The largest commercial airports are Los Angeles International and Long Beach Municipal. The nearest military airfield is at the Armed Forces Reserve Center at Los Alamitos.

MAJOR AIRPORTS NEAR THE PORTS OF LOS ANGELES AND LONG BEACH

	Los Angeles International Airport	Long Beach Muncipal Airport	Los Alamitos Naval Air Station
Main Runway:			
Length	12,000 ft	10,000 ft	8,000 ft
Width	150 ft	150 ft	200 ft



Air Access

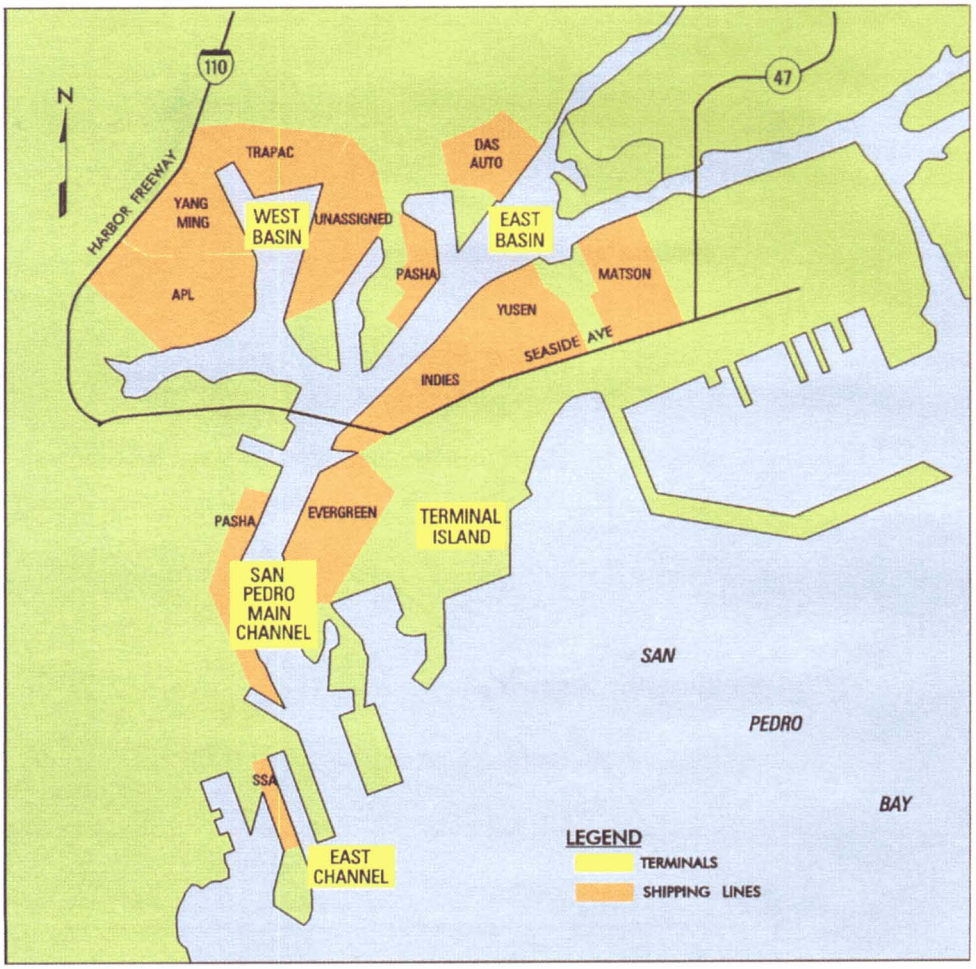
PORT FACILITIES

Berthing

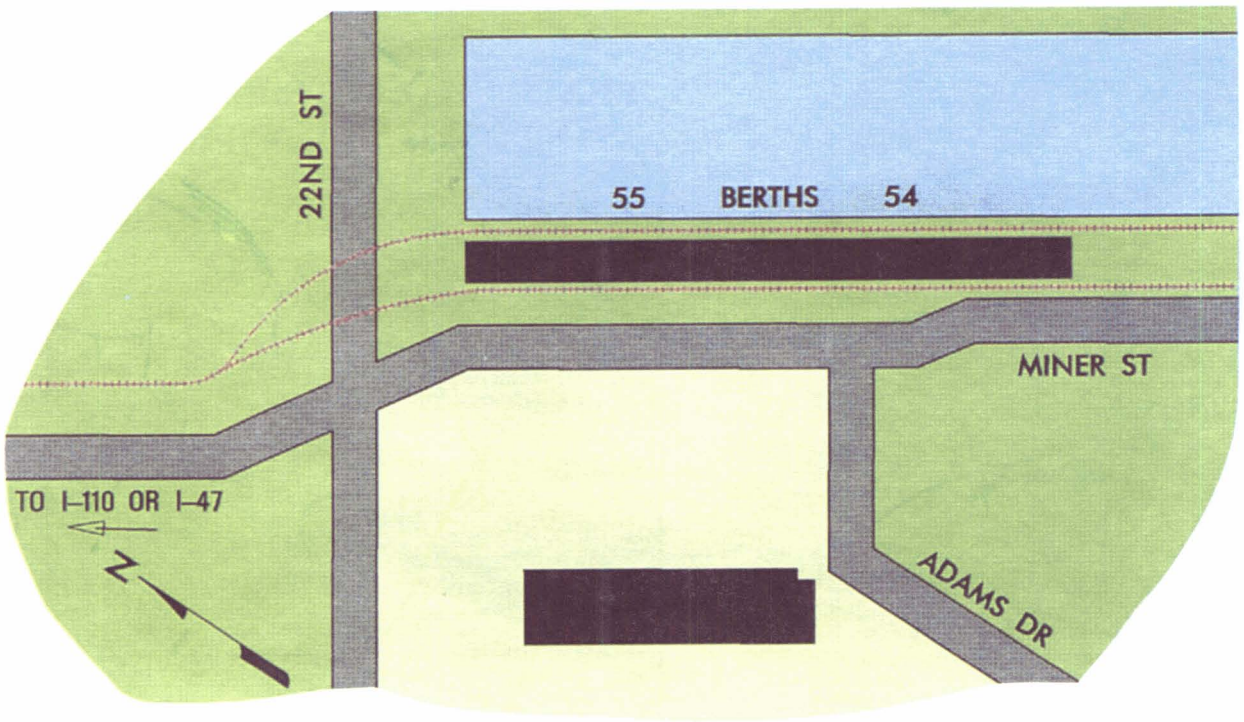
This report covers five areas of the port. Each area is considered a terminal, although each may involve several shipping lines. These terminals are East Channel, San Pedro Main Channel, West Basin, East Basin, and Terminal Island. Most of these terminals are mainly container facilities. Some terminals have transit sheds to support conventional breakbulk cargo. The San Pedro Main Channel and the East Basin Terminals are equipped for RORO operations of import vehicles.

Pier construction is generally concrete piles, fronting a sheet-steel or concrete bulkhead. Fendering is timber or rubber, and the surface is generally asphalt. All terminals have lighting for night operations.

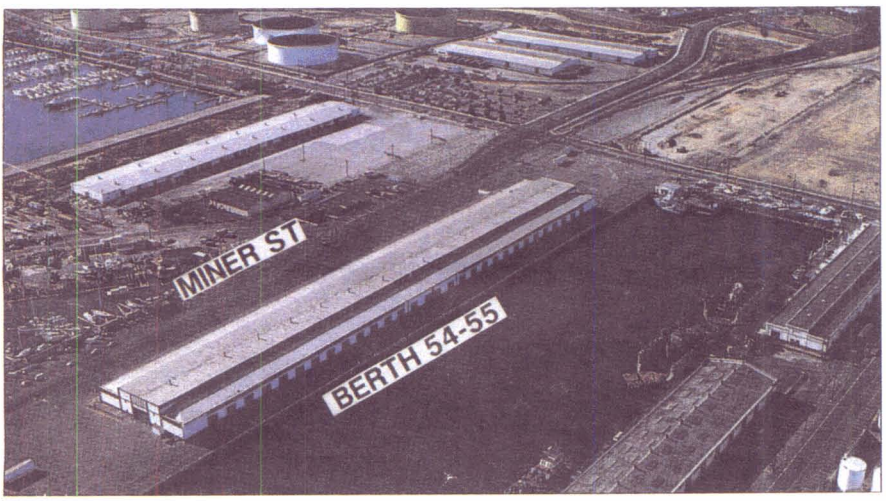
Land-use maps and aerial views of the selected terminals follow. Also included are tables identifying the berth characteristics.



Location of Designated Terminals and Associated Shipping Lines



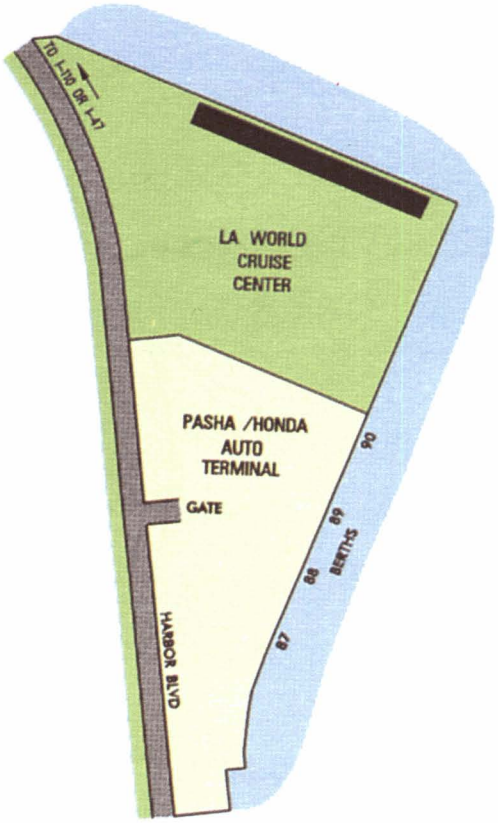
East Channel Terminal



East Channel Terminal
(Westward View)

BERTH CHARACTERISTICS OF EAST CHANNEL

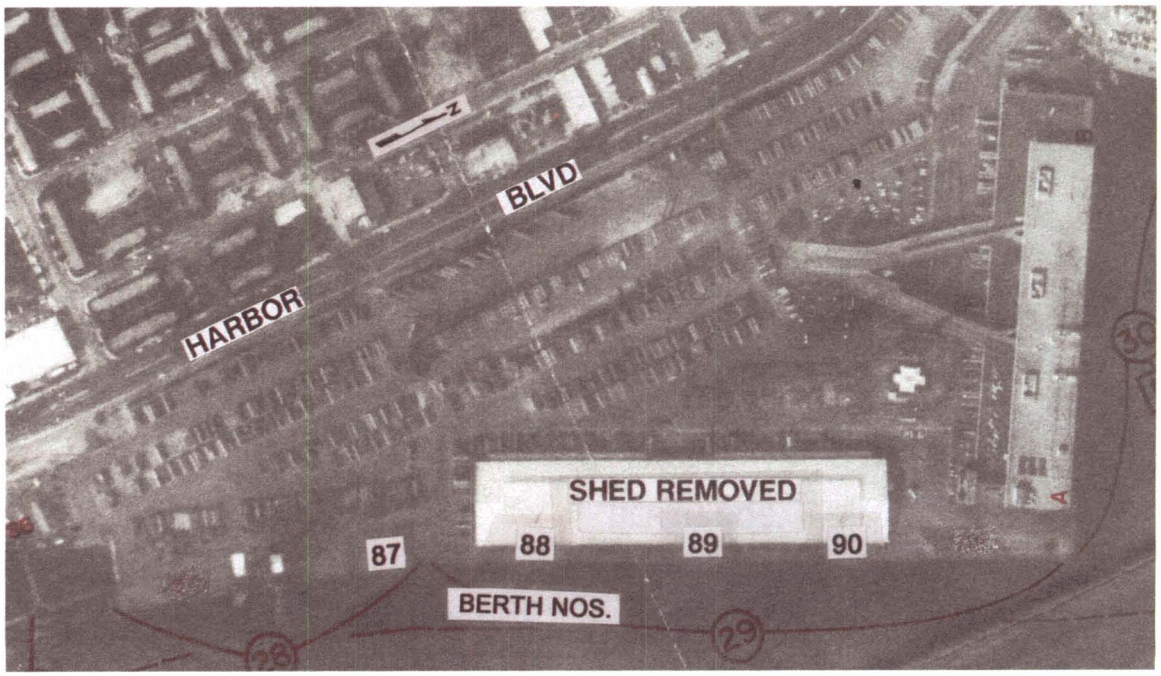
CHARACTERISTICS	*BERTH 54-55*
Length (ft)	1,400
Depth along side at MLW (ft)	35
Deck strength (psf)	500
Apron width (ft)	47
Apron height above MLW (ft)	12
Number of container cranes	0
Number of wharf cranes	0
Apron lighting	Yes
Straight-stern RORO facilities	No
Apron length served by rail (ft)	1,400



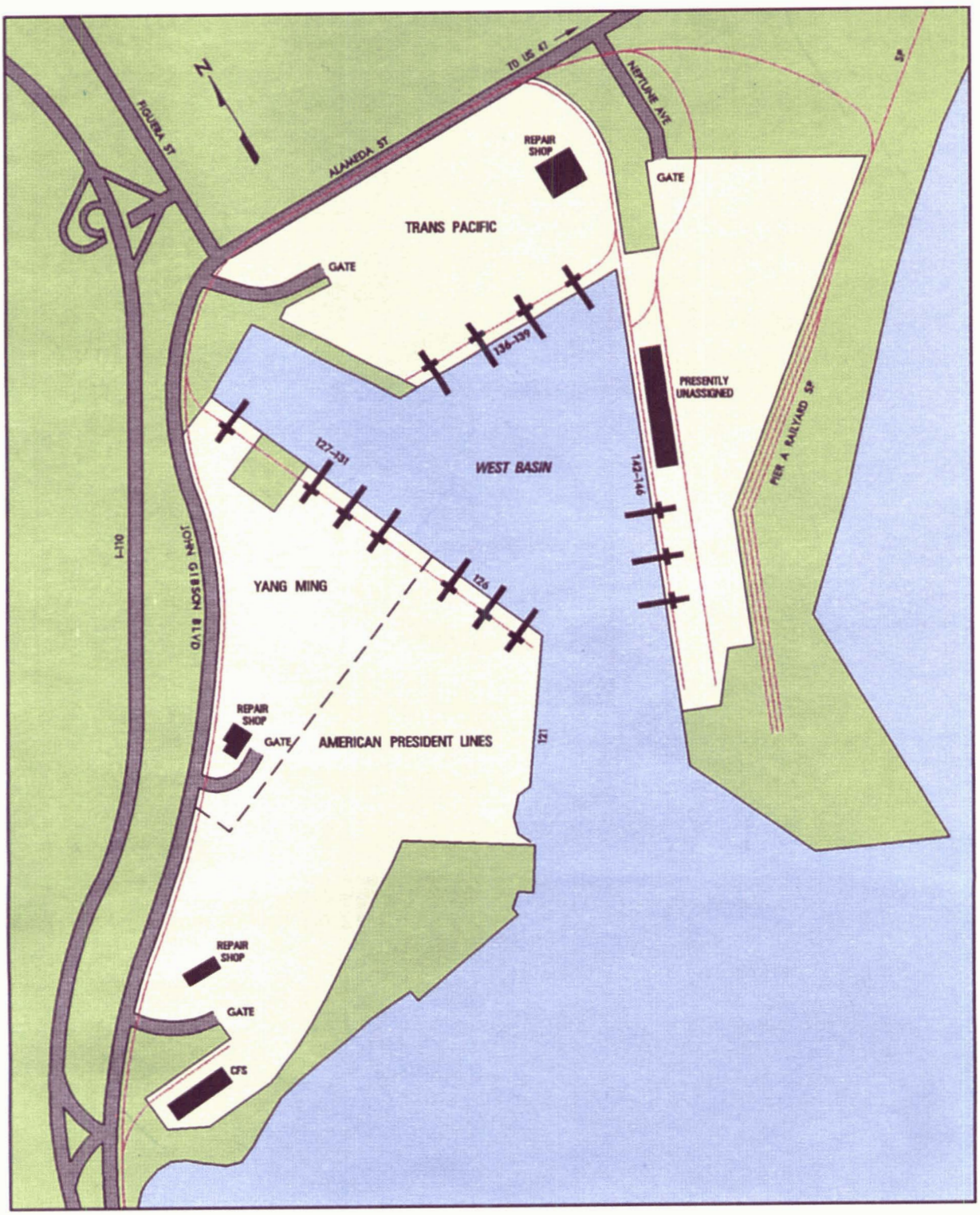
Pasha Terminal

BERTH CHARACTERISTICS OF SAN PEDRO MAIN CHANNEL

	BERTHS
CHARACTERISTICS	***87-90***
Length (ft)	1,600
Depth alongside at MLW (ft)	40
Deck strength (psf)	800
Apron Width (ft)	Open
Apron height above MLW (ft)	15
Number of container cranes	0
Number of wharf cranes	0
Apron lighting	Yes
Straight-stern RORO facilities	No
Apron length served by rail (ft)	0



San Pedro Main Channel Terminal (Westward View)



West Basin Terminal

BERTH CHARACTERISTICS OF APL TERMINAL

	BERTHS	
CHARACTERISTICS	***121***	***126***
Length	959	1,037
Depth alongside at MLW (ft)	45	45
Deck strength (psf)	1,000	1,000
Apron width (ft)	Open	Open
Apron height above MLW (ft)	15	15
Number of container cranes	2	3
Number of wharf cranes	0	0
Apron lighting	Yes	Yes
Straight-stern RORO facilities	No	No
Apron length served by rail (ft)	0	0

APL Terminal (Westward View)

BERTH CHARACTERISTICS OF YANG MING TERMINAL

CHARACTERISTICS	*BERTH* 127-131
Length (ft)	1,000
Depth alongside at MLW (ft)	35
Deck strength (psf)	800
Apron width (ft)	Open
Apron height above MLW (ft)	15
Number of container cranes	4
Number of wharf cranes	0
Apron lighting	Yes
Straight-stern RORO facilities	No
Apron length served by rail (ft)	1,000

Yang Ming Terminal (Westward View)

BERTH CHARACTERISTICS OF BERTH 142-146 TERMINAL

	BERTH
CHARACTERISTICS	142-146
Length (ft)	2,961
Depth alongside at MLW (ft)	40
Deck strength (psf)	800
Apron width (ft)	Open
Apron height above MLW (ft)	15
Number of container cranes	3
Number of wharf cranes	0
Apron lighting	Yes
Straight-stern RORO facilities	No
Apron length served by rail (ft)	2,961

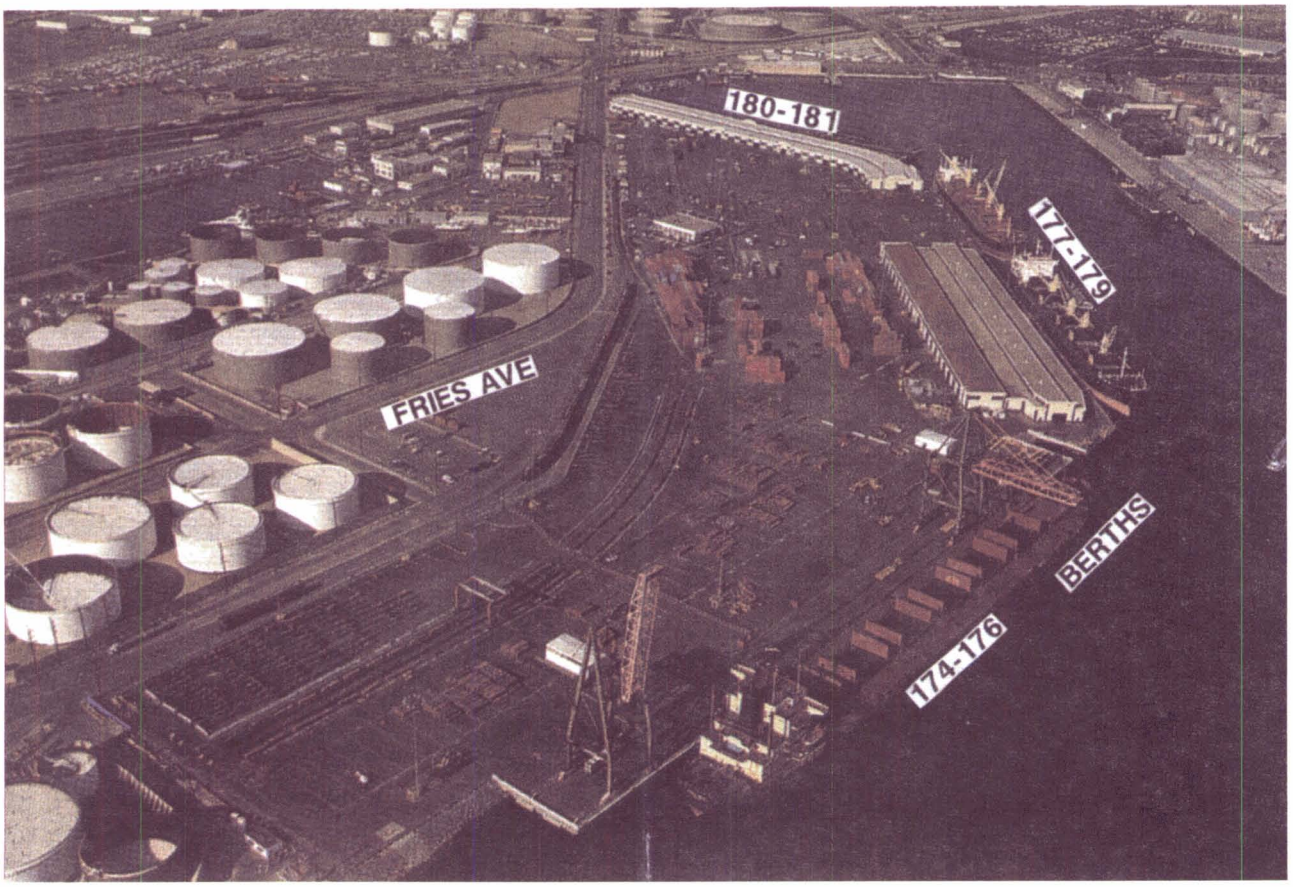
Berth 142-146 Terminal (Northward View)

BERTH CHARACTERISTICS OF TRANS PACIFIC TERMINAL

CHARACTERISTICS	*BERTH 136-139*
Length (ft)	1,000
Depth alongside at MLW (ft)	45
Deck strength (psf)	1,000
Apron width (ft)	Open
Apron height above MLW (ft)	15
Number of container cranes	4
Number of wharf cranes	0
Apron lighting	Yes
Straight-stern RORO facilities	No
Apron length served by rail (ft)	1,800

Trans Pacific Terminal (Northward View)

East Basin Terminal



Pasha Maritime Services Terminal (Northward View)

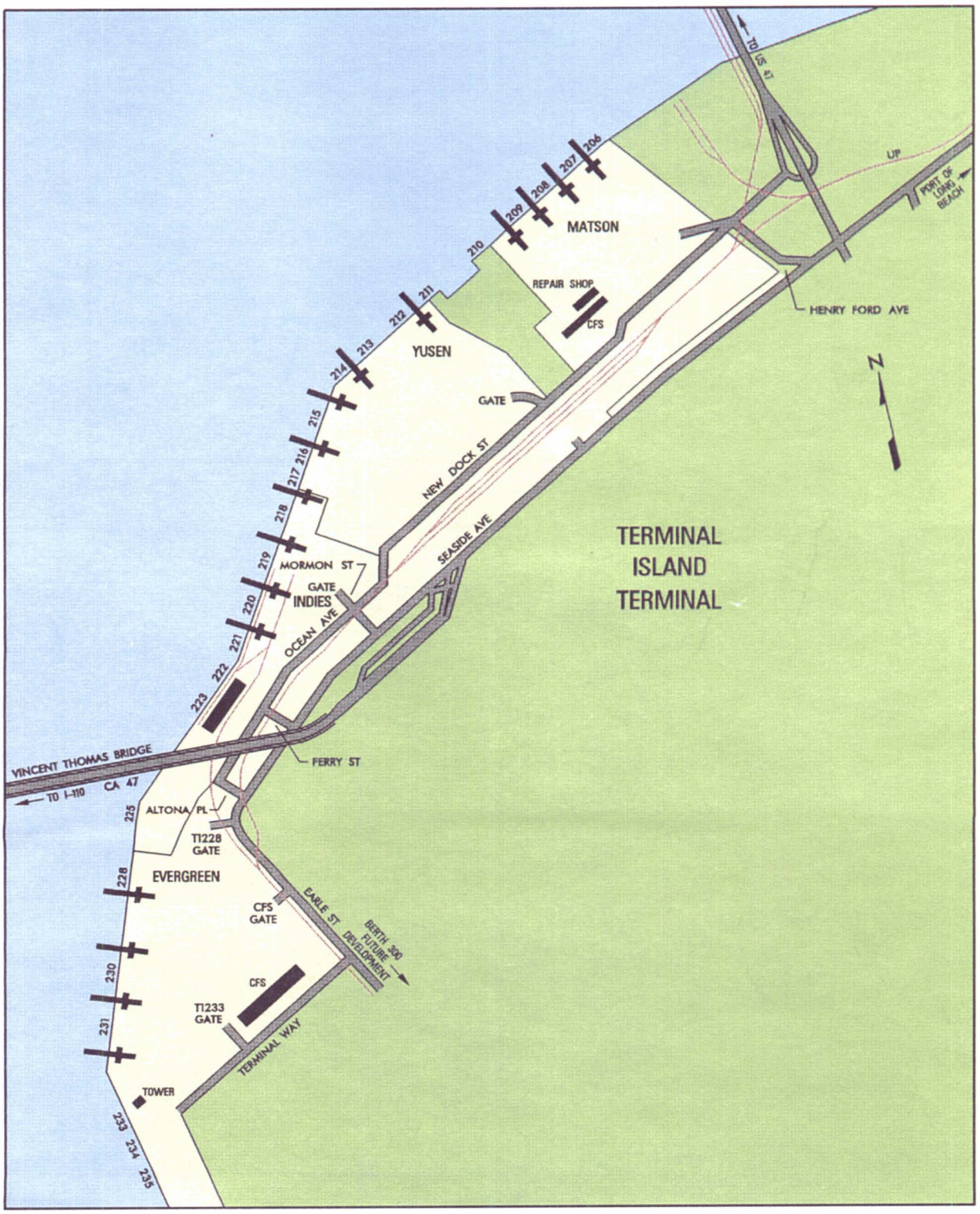
BERTH CHARACTERISTICS OF PASHA MARITIME SERVICES TERMINAL

	BERTHS		
CHARACTERISTICS	***174-176***	***177-179***	***180-181***
Length (ft)	1,312	1,420	925
Depth alongside at MLW (ft)	35	35	35
Deck strength (psf)	1,000	400	400
Apron width (ft)	Open	34	30
Apron height above MLW (ft)	15	15	15
Number of container cranes	2	0	0
Number of wharf cranes	0	0	0
Apron lighting	Yes	Yes	Yes
Straight-stern RORO facilities	No	No	No
Apron length served by rail (ft)	0	0	0

Distribution and Auto Service Terminal (South/East View)

BERTH CHARACTERISTICS OF DISTRIBUTION AND AUTO SERVICE TERMINAL

CHARACTERISTICS	*BERTH 195-198*
Length (ft)	1,500
Depth alongside at MLW (ft)	40
Deck strength (psf)	500
Apron width (ft)	Open
Apron height above MLW (ft)	15
Number of container cranes	0
Number of wharf cranes	0
Apron lighting	Yes
Straight-stern RORO facilities	No
Apron length served by rail (ft)	0



Terminal Island Terminal

BERTH CHARACTERISTICS OF MATSON TERMINAL

CHARACTERISTICS	*BERTH 206-209*
Length (ft)	2,000
Depth alongside at MLW (ft)	40
Deck strength (psf)	800
Apron width (ft)	Open
Apron height above MLW (ft)	15
Number of container cranes	5
Number of wharf cranes	0
Apron lighting	Yes
Straight-stern RORO facilities	No
Apron length served by rail (ft)	0

Matson Terminal (Southward View)

BERTH CHARACTERISTICS OF YUSEN TERMINAL

	BERTHS	
CHARACTERISTICS	*212-214*	*215-216*
Length (ft)	1,200	800
Depth alongside at MLW (ft)	45	45
Deck strength (psf)	1,000	1,000
Apron width (ft)	Open	Open
Apron height above MLW (ft)	15	15
Number of container cranes	2	2
Number of wharf cranes	0	0
Apron lighting	Yes	Yes
Straight-stern RORO facilities	No	No
Apron length served by rail (ft)	0	0

Yusen Terminal (Southward View)

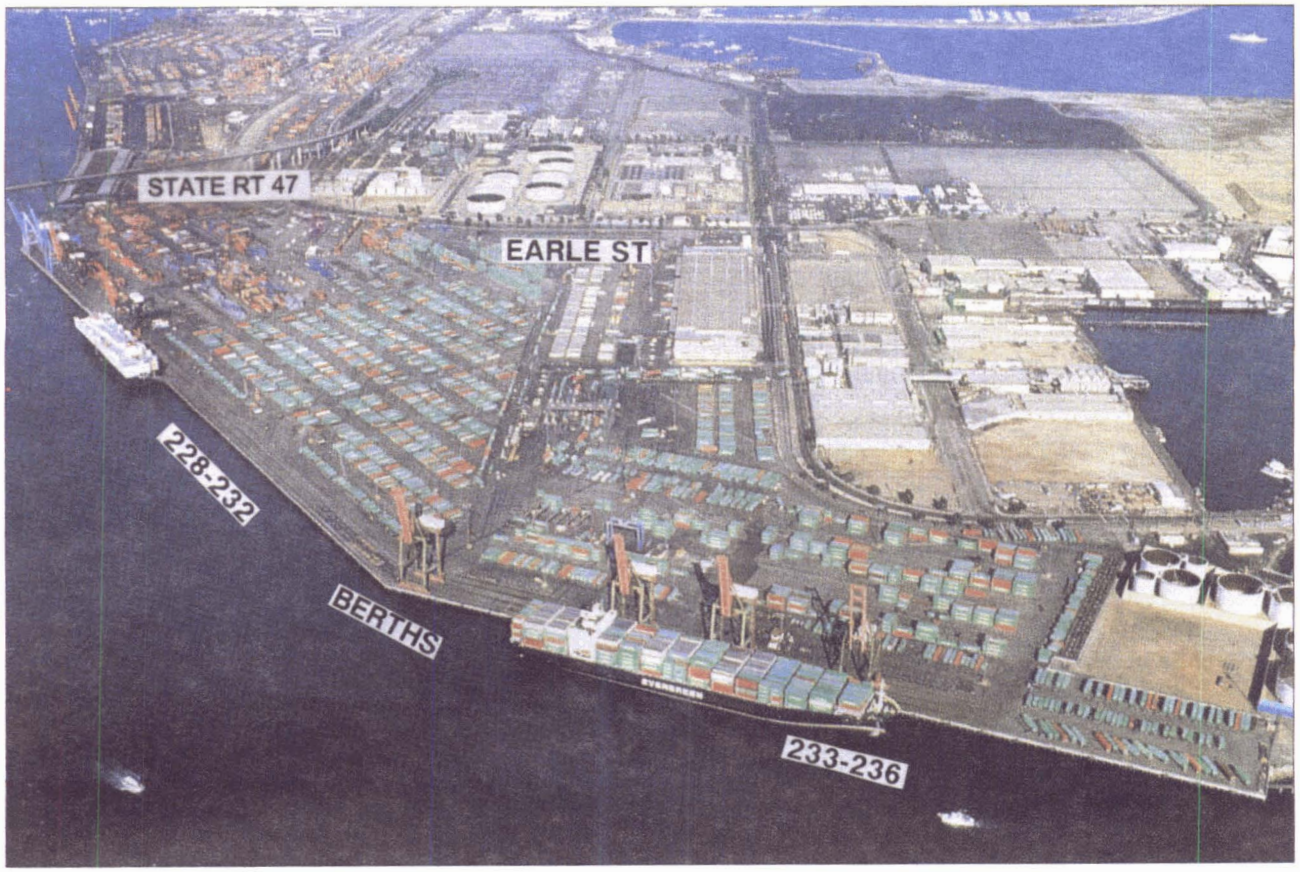
BERTH CHARACTERISTICS OF INDIES TERMINAL

	BERTHS		
CHARACTERISTICS	*217-221*	*222-224*	*227*
Length (ft)	900	900	200
Depth alongside at MLW (ft)	45	45	45
Deck strength (psf)	1,000	1,000	1,000
Apron width (ft)	Open	47	Open
Apron height above MLW (ft)	15	15	15
Number of container cranes	4	0	0
Number of wharf cranes	0	0	0
Apron lighting	Yes	Yes	Yes
Straight-stern RORO facilities	No	No	No
Apron length served by rail (ft)	600	900	0

Indies Terminal (Eastward View)

BERTH CHARACTERISTICS OF EVERGREEN TERMINAL

	BERTHS	
CHARACTERISTICS	***228-232***	***233-236***
Length (ft)	2,564	1,436
Depth alongside at MLW (ft)	45	37
Deck strength (psf)	1,000	1,000
Apron width (ft)	Open	Open
Apron height above MLW (ft)	15	15
Number of container cranes	3	2
Number of wharf cranes	0	0
Apron lighting	Yes	Yes
Straight-stern RORO facilities	No	No
Apron length served by rail (ft)	0	0



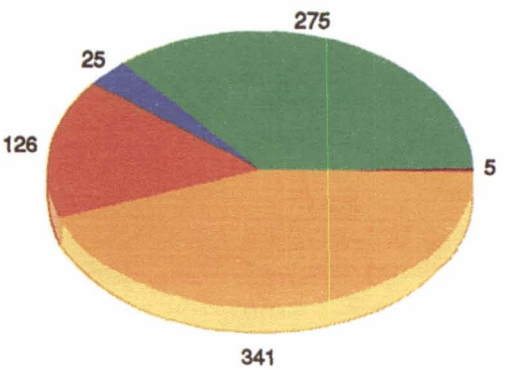
Evergreen Terminal (Eastward View)

Staging

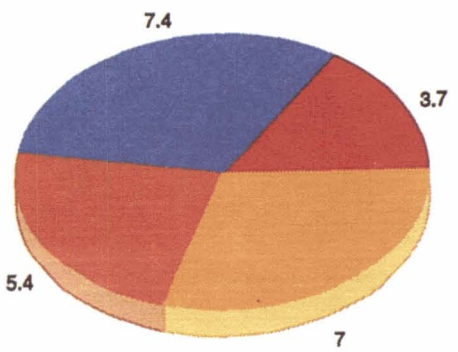
a. ***Open Staging***. The terminals in this report have a total of 770 acres of paved open staging. Open staging is used for containers and import vehicles.

b. ***Covered Staging***. This report covers six covered staging buildings that total more than a million square feet of staging area. Other buildings are set up for manufacturing or repair operations, and would not support military operations.

OPENING STAGING (ACRES)



COVERED STAGING (ACRES)



Covered Storage and Apron Track at Indies Terminal
Berth 222 (Southward View)

Rail

Rail trackage links the railyards to the port's apron tracks, transit sheds, and storage tracks.

The Harbor Belt Line, UP, and SP have railyards adjacent to or near the terminals in this report. These yards can store about 1,000 89-foot railcars. The Harbor Belt Line owns most of this capacity.

Ramps. The port has no permanent rail or truck end ramps. The auto import facilities, however, have at least two rail-mounted bilevel ramps, and three portable bilevel ramps. These ramps will not support heavier military vehicles. Numerous locations are available that could support offloading with temporary or portable end ramps.

Docks. All together, the terminals have 77 truck and 36 boxcar handling positions.

Marshaling Areas

Within Port. No marshaling areas exist. All open areas within the terminals are required for staging military or commercial cargo.

Los Alamitos Armed Forces Reserve Center. The Reserve Center is about 12 miles to the east of the port area. It has no rail access but can provide at least 50 acres of marshaling area. It has a runway about 8,000 feet long, which was previously used by the Naval Air Station.

The Seal Beach Naval Weapons Station, a few miles south of the Reserve Center, has rail access.

MATERIAL HANDLING EQUIPMENT

The terminals have a total of 36 container cranes. These container cranes are all at the West Basin and Terminal Island Terminals. All have a capacity of at least 40 tons. Various shipping and rental companies in the area own transtainers and other MHE. Mobile cranes with capacities up to 150 tons are available from local stevedore companies. A 150-ton floating crane is also available.

Floating Barge Crane

Container Cranes at APL (Berths 122 & 126)

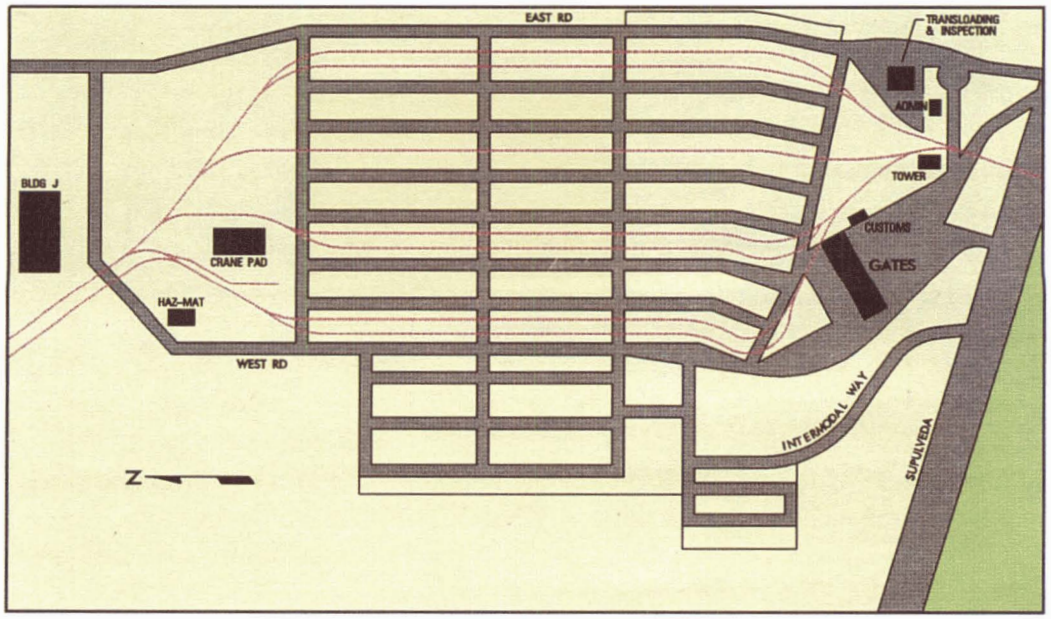
Yusen's Vertical Chassis Racks

INTERMODAL FACILITIES

SF, UP, and CSX have intermodal facilities in the Los Angeles area. However, this report concentrates on the intermodal facility owned in part by the Port of Los Angeles. The Intermodal Container Transfer Facility (ICTF) is 4 miles north of the port area, and is operated by SP. Frequent signs direct trucks to this modern facility.

CHARACTERISTICS OF THE ICTF

Storage	2,800 spaces
Gate	8 inbound lanes with intercoms
MHE	8 transtainers
	1 top pick
Throughput	1,400 lifts/day



ICTF Land-Use Map

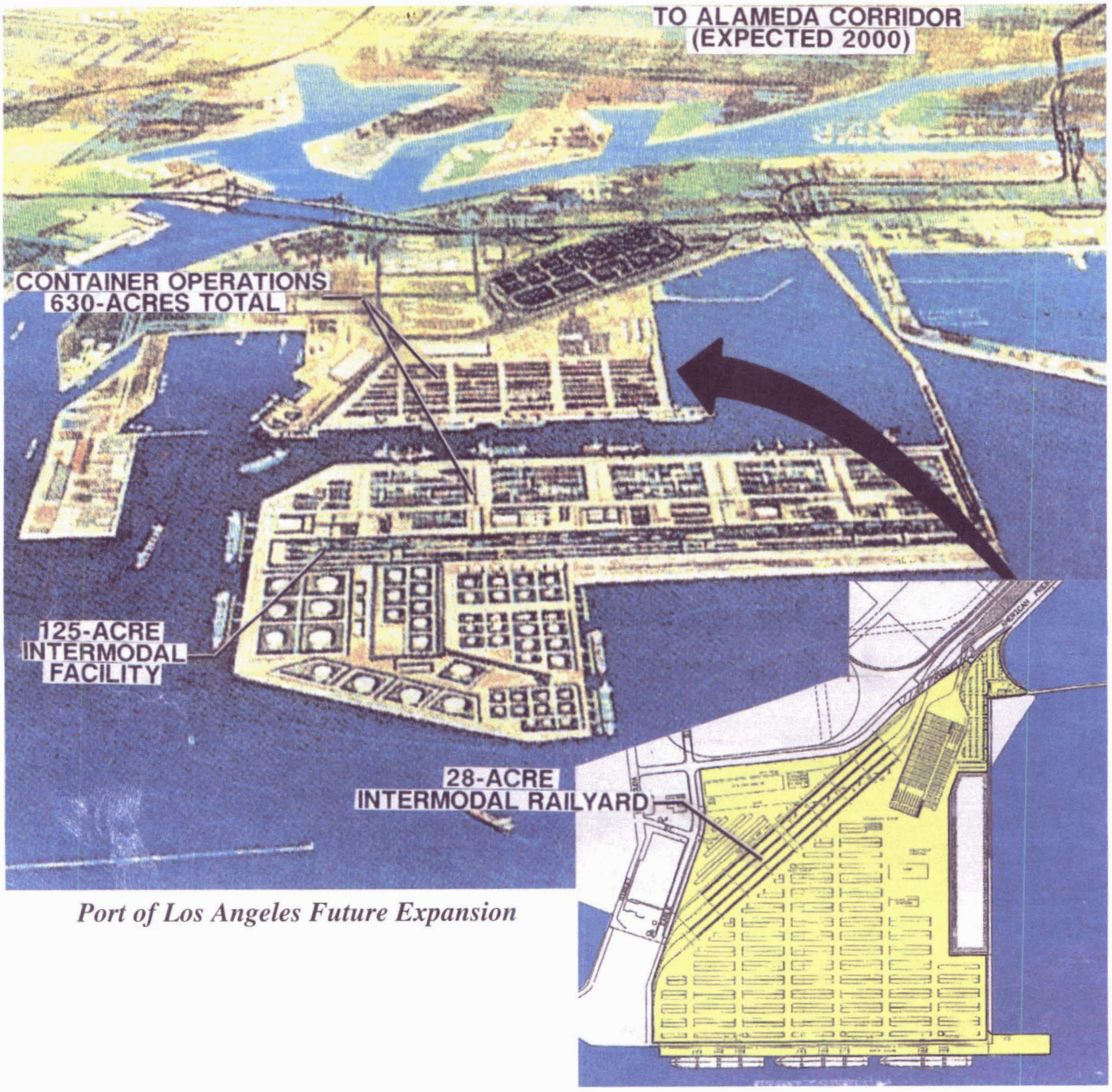
View of Entrance Gate from Control Tower

Top Pick and Chassis

FUTURE DEVELOPMENT

Future development includes developing about 800 acres of the port using dredge spoils.

Also, the Ports of Los Angeles and Long Beach expect to jointly buy 20 miles of land from SP to develop an express transportation corridor for trucks and trains. When finished, the Alameda Corridor will reduce truck delays. This is because of rerouting trains, eliminating at-grade crossings, and widening Alameda Street to six lanes. Trains will have more railcars and will travel at higher speeds.



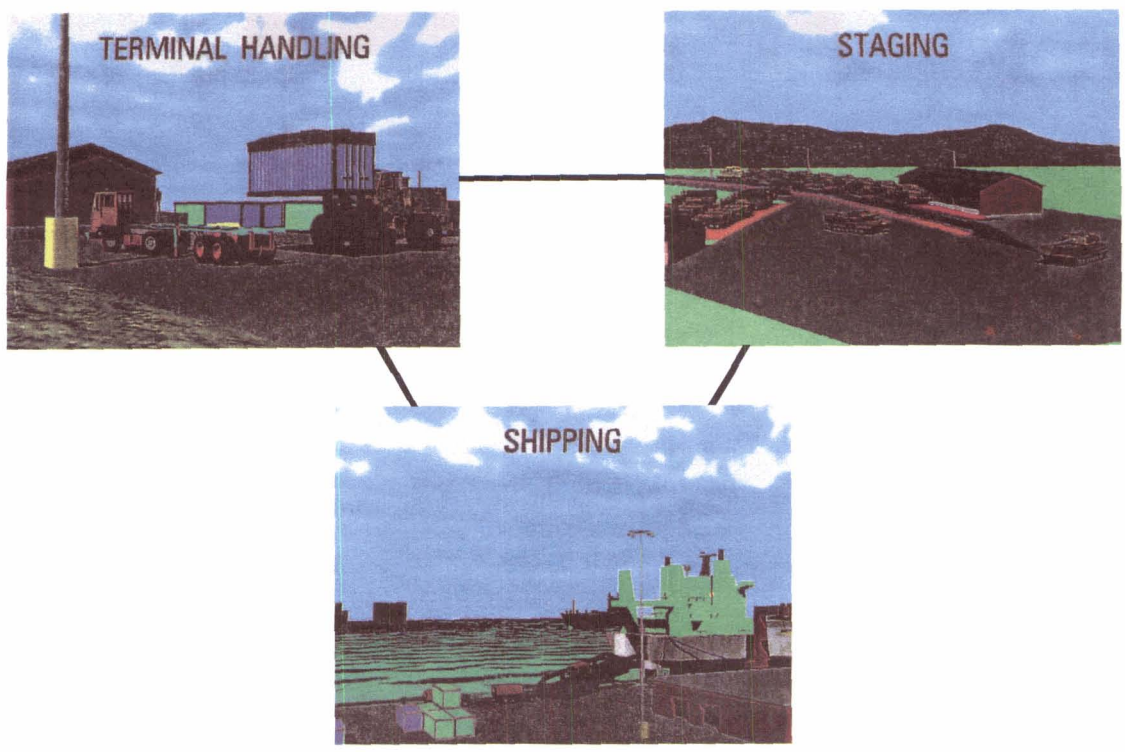
Port of Los Angeles Future Expansion

226-Acre APL Terminal (Expected 1997)

II. THROUGHPUT ANALYSIS

GENERAL

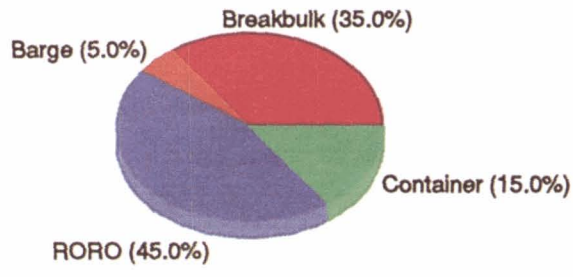
This section evaluates the throughput capability of the Port of Los Angeles using the port operational performance simulator (POPS) computer model. The model is based on a weak-link analysis in which each subsystem is analyzed separately and then compared to find the least capable subsystem. The weakest 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 terms of measurement tons (MTONs) 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 Storm statistics. We weighted the percentages to adjust for differences in cargo deadweights and expectations for future deployments.

SHIP MIX PERCENTAGES



RECEPTION/HANDLING

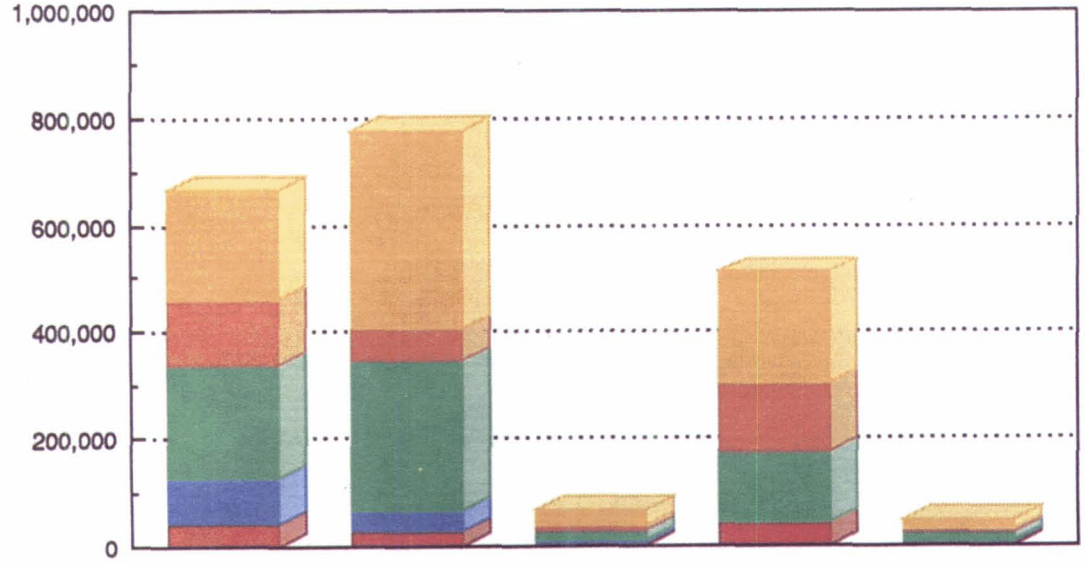
Highway. I-110 and California 47 provide access to the port. Each terminal has a designated entrance for trucks. The road network in and out of the terminals, including the gate processing of vehicles, could handle about 540,000 MTONs of equipment and supplies per day.

Roadable vehicles in convoys will process directly to the staging areas. Vehicles on commercial or military flatbed trailers without integral ramps will offload at portable ramps. The port has no permanent truck end ramps. Our analysis assumes the port has 14 portable ramps at various locations throughout the port. These ramps could offload more than 7,200 MTONs from flatbed trailers per day.

Supplies in van semitrailers will proceed to the 77 van handling positions. These docks can offload more than 512,000 MTONs of van semitrailer-shipped material per day. This report assumes that five rented container handlers are available for chassis operations. These container handlers can offload about 48,000 MTONs of cargo per day.

HIGHWAY RECEPTION/HANDLING CAPABILITY

MTON/DAY



SUBSYSTEMS	HIGHWAY	GATES	END RAMPS*	DOCKS	CONTAINERS
EAST CHANNEL	42,100	28,200	4,800	43,500	4,200
SAN PEDRO MC	84,900	38,200	4,800	0	4,200
WEST BASIN	210,900	278,900	19,200	131,200	16,300
EAST BASIN	121,800	58,200	9,600	128,000	5,300
TERM'L ISLAND	208,100	373,800	28,800	209,900	17,900

*14 additional ramps are assumed available.

Rail. Rail reception at the port is fair with three major railroad companies accessing the Los Angeles/Long Beach areas. The West Basin section of the port has the best rail service. This is because of the large container business handled by these berths. No tracks access the San Pedro Main Channel Terminal.

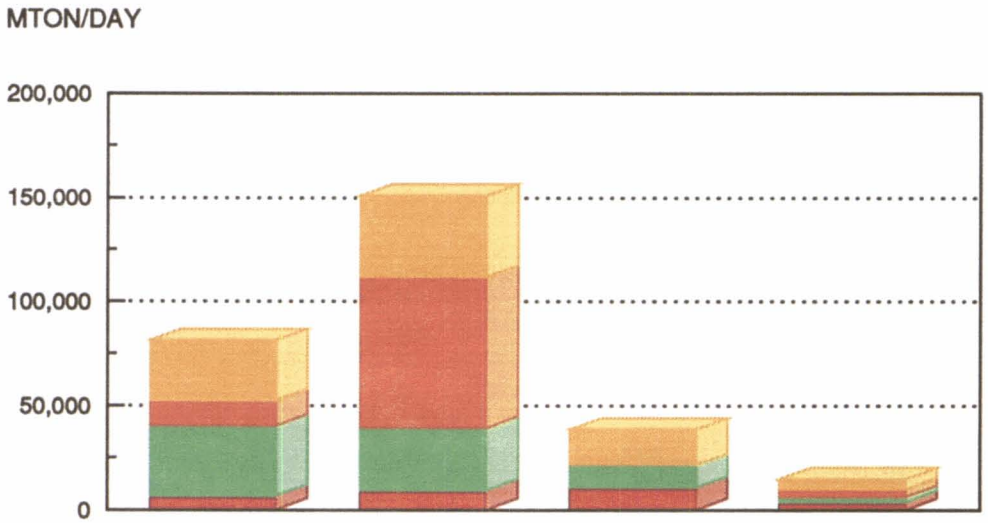
This analysis assumes the port or unit can rent, build, or provide 11 portable rail end ramps. These would be in addition to the five ramps regularly used for bilevel operations at the auto import facility at berth 195. We assume the additional portable ramps would be used at the railyard inland of berth 142-146, the spurs inland of berth 174, and the railyard on the north side of Terminal Island. One would be used inland of the shed at berth 54-55.

RAIL DELIVERY

Terminal	Train Length (railcars)	Trains Per Day
East Channel	60	1
San Pedro MC	-	0
West Basin	20	15
East Basin	20	5
Terminal Island	20	5

Boxcars could offload at the transit sheds where about 36 boxcar handling positions are available.

RAIL RECEPTION/HANDLING CAPABILITY



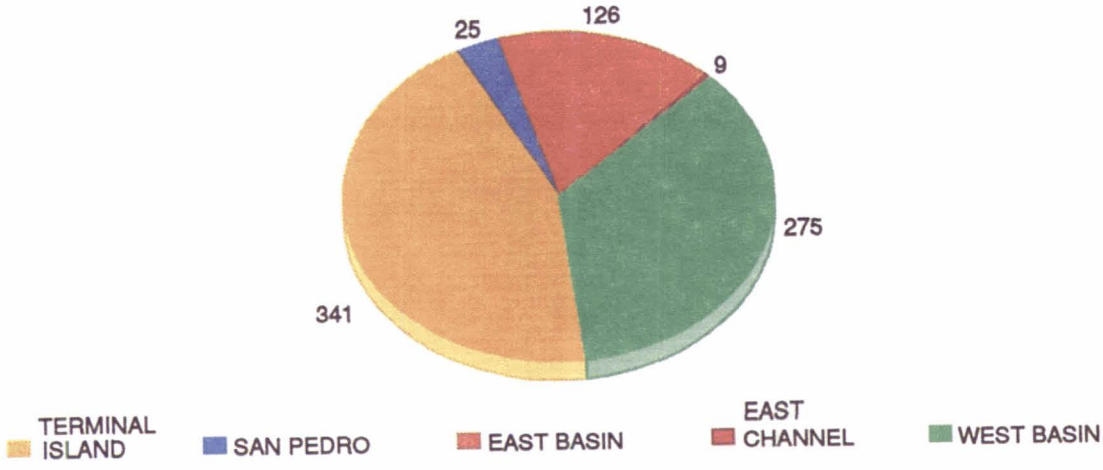
SUBSYSTEMS	TRACKAGE	END RAMPS*	DOCKS	COFC
EAST CHANNEL	6,800	9,300	10,800	3,800
WEST BASIN	33,700	30,100	10,800	2,600
EAST BASIN	12,000	72,500	0	3,750
TERM'L ISLAND	28,900	39,100	17,300	4,800

* 5 ramps are available, 11 are assumed to be made available.

STAGING

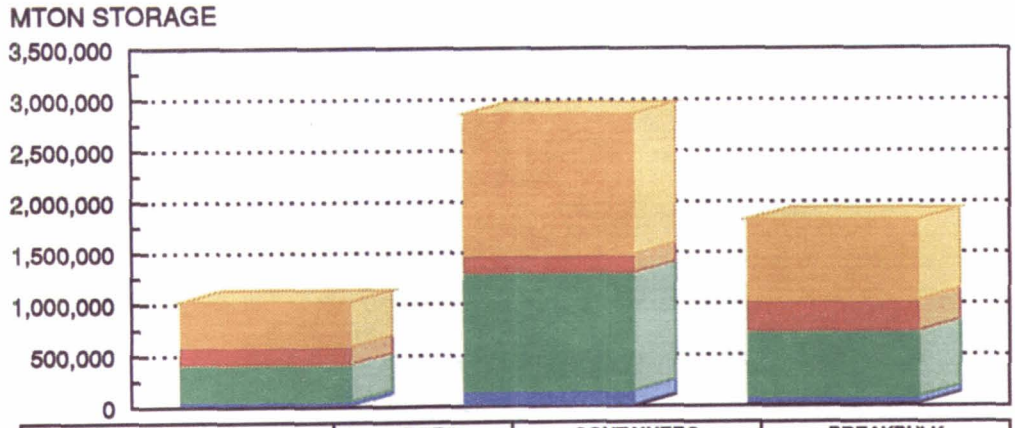
The terminals have a total of about 770 acres of open paved staging. Also, more than a million square feet of covered storage is available.

OPEN STAGING ACREAGE



The terminals can perform operations on RORO, container, or breakbulk ships. The cargo mix depends on the anticipated vessel type. For example, cargo will be containerized if a container ship is planned. The chart below provides the staging capability for the cargo for each of these vessel types. If a combination ship is expected, then a portion of each involved capability should be assumed.

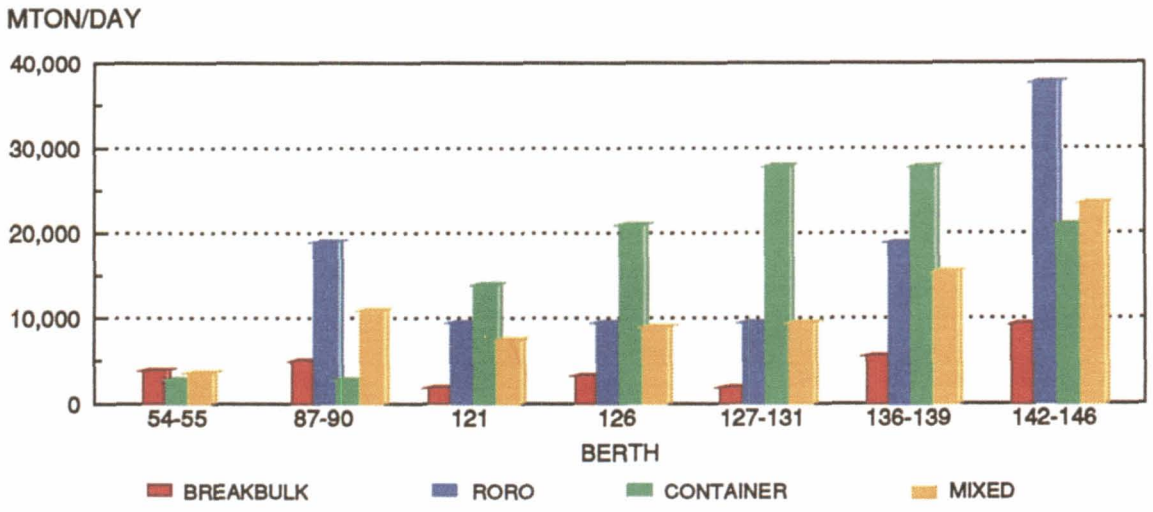
OPEN STAGING CAPABILITY



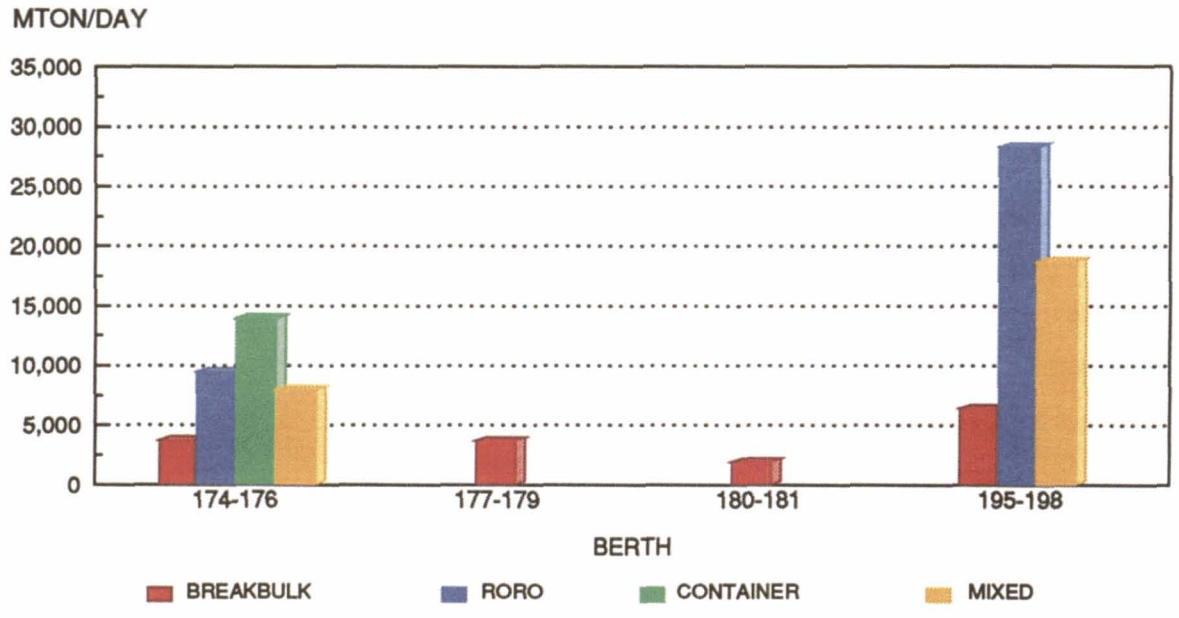
VESSEL TYPE	RORO	CONTAINERS	BREAKBULK
EAST CHANNEL	0	9,200	7,700
SAN PEDRO MC	33,100	139,400	58,400
WEST BASIN	364,800	1,152,000	643,200
EAST BASIN	167,700	184,000	295,700
TERM'L ISLAND	436,700	1,379,000	796,200

SHIPPING

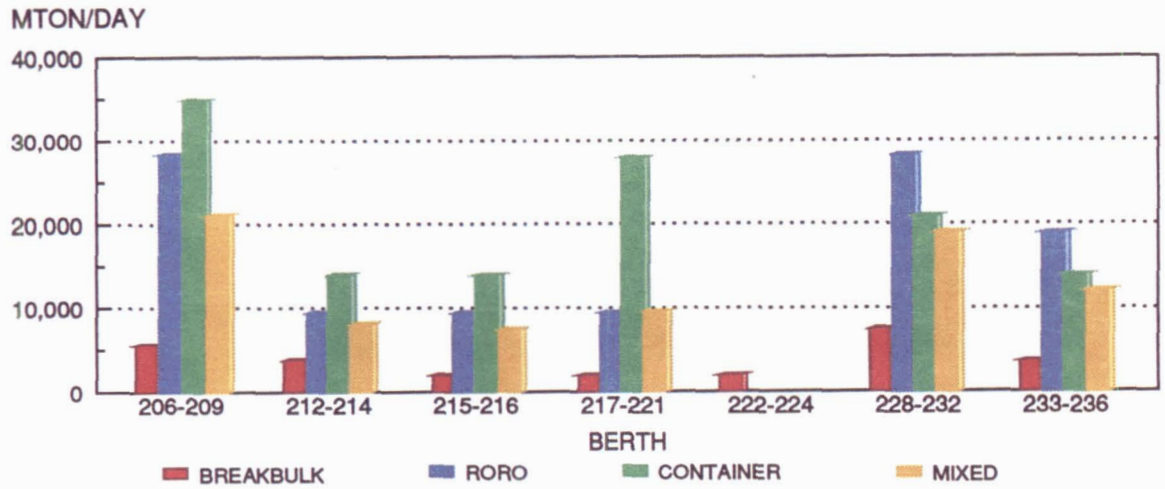
Throughputs for each berth are shown below. They are based on various factors including MHE used, loading, operational, and berth usage rates as well as berth and ship compatibility.



BERTH THROUGHPUT CAPABILITY



BERTH THROUGHPUT CAPABILITY



CONVERSION FACTORS		
Breakbulk:	0.4	STON per MTON
RORO:	0.25	STON per MTON
Containers	0.4	STON per MTON

The type of ship preferred at each berth is based on the methodology described in the appendix. The evaluation is based on a snapshot view of the current physical characteristics of the berths and the MHE available. The evaluation to the right gives no considerations for enhancements, such as equipment. The lower the number for a berth, the better it is suitable for loading operations.

Table 1 shows the compatibility for various vessel types. This table indicates for each type of ship the number of vessels that can berth at a particular wharf. The table also provides the limitations that can hinder shipping operations.

PREFERENCE BERTH SELECTION

BERTH	*BB*	*RORO*	*CNTNR*
54-55	14	-	-
87-90	17	9	-
121	9	11	8
126	6	5	7
127-131	5	4	4
136-139	3	1	2
142-146	1	2	6
174-176	13	11	10
177-179	13	11	10
180-181	15	-	-
195-198	18	14	-
206-209	2	9	1
212-214	9	5	9
215-216	9	13	12
217-221	3	3	3
222-224	8	-	-
227	19	-	-
228-232	6	5	5
233-236	9	5	10

TABLE 1
SUMMARY OF CAPABILITIES OF EAST CHANNEL

VESSEL	***BERTHS*** **54-55**
Breakbulk	
C3-S-33a	2
C3-S-37c	
C3-S-37d	2
C3-S-38a	2
C4-S-1a	
C4-S-1qb and 1u	2
C4-S-58a	2
C4-S-65a	2
C4-S-66a	2
C4-S69b	
Seatrain	
GA and PR-class	2
Barge	
LASH C8-S-81b	1
LASH C9-S-8d	a
LASH Lighter	10
SEABEE C8-S-82a	a
SEABEE barge	7
RORO	
Comet	d,o
C7-S-95a/Maine-class	b
Ponce-class	b,h
Great Land-class	b,h
Cygnus/Pilot-class	b
Meteor	d,o
AmEagle/Condor	b
MV Ambassador	d
FSS-class	b
Cape D-class	b
Cape H-class	a,b
Container	
C6-S-1w	2,e
C7-S-68e	1,e
C8-S-85c	1,3
Combination	
C5-S-78a	2,e
C5-S-37e	2,e

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

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

TABLE 1 - Cont
SUMMARY OF BERTHING CAPABILITIES OF TERMINAL ISLAND

VESSEL	BERTHS					
	206-209	212-214	215-216	217-221	222-224	227
Breakbulk						
C3-S-33a	3	2	1	1	1	c
C3-S-37c	3	2	1	1	1	c
C3-S-37d	3	2	1	1	1	c
C3-S-38a	3	2	1	1	1	c
C3-S-1a	3	2	1	1	1	c
C4-S-1qb and 1u	3	2	1	1	1	c
C4-S-58a	3	2	1	1	1	c
C4-S-65a	3	2	1	1	1	c
C4-S-66a	3	2	1	1	1	c
C4-S-69b	3	1	1	1	1	c
Seatrain						
GA and PR-class	3	2	1	1	1	c
Barge						
LASH C8-S-81b	2	1	c	1	1	c
LASH C9-S-81d	2	1	c	1	1	c
LASH Lighter	14	8	5	6	6	1
SEABEE C8-S-82a	2	1	c	1	1	c
SEABEE barge	10	6	4	4	4	c
RORO						
Comet	d,i,j	d,i,j	d,i,j	d,i,j	d,o	c,d
C7-S-95a/Maine-class	2	1	1	1	b	c
Ponce-class	h	h	h	h	b,h	c,h
Great Land-class	h	h	h	h	b,h	c,h
Cygnus/Pilot-class	3	1	1	1	b	c
Meteor	d,i,j	d,i,j	d,i,j	d,i,j	d,o	c,d
AmEagle/Condor	i,j	i,j	i,j	i,j	b	c
MV Ambassador	d	d	d	d	d	c,d
FSS-class	2,i	1,i	c	c	b,c	c
Cape D-class	i,j	i,j	i,j	i,j	b	c
Cape H-class	2,i	1,i	1,i	1,i	b	c
Container						
C6-S-1w	2	1	1	1	1,e	c,e
C7-S-68e	2	1	1	1	1,e	c,e
C8-S-85c	2	1	c	1	1,e	c,e
Combination						
C5-S-78a	3	1	1	1	1,e	c,e
C5-S-37e	3	1	1	1	1,e	c,e

a = maximum vessel draft llimited 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.

TABLE 1 - Cont

SUMMARY OF BERTHING CAPABILITIES OF WEST BASIN

	BERTHS				
VESSEL	121	126	127-131	136-139	142-146
Breakbulk					
C3-S-33a	1	2	1	3	5
C3-S-37c	1	1	1	3	5
C3-S-37d	1	1	1	3	5
C3-S-38a	1	2	2	3	5
C4-S-1a	1	1	1	3	5
C4-S-1qb and 1u	1	1	1	3	5
C4-S-58a	1	1	1	3	4
C4-S-65a	1	1	1	3	5
C4-S-66a	1	1	1	3	5
C4-S-69b	1	1	1	2	4
Seatrain					
GA and PR-class	1	1	1	3	5
Barge					
LASH C8-S-81b	1	1	1	2	3
LASH C9-S-81d	1	1	a	1	3
LASH Lighter	6	7	7	12	21
SEABEE C8-S-82a	1	1	a	1	3
SEABEE barge	4	5	5	9	14
RORO					
Comet	d,i,j	d,i,j	d,i,j	d,i,j	d,i,j
C7-S95a/Maine-class	1	1	1	2	3
Ponce-class	h	h	h	h	h
Great Land-class	h	h	h	h	h
Cygnus/Pilot-class	1	1	1	2	4
Meteor	d,i,j	d,i,j	d,i,j	d,i,j	d,i,j
AmEagle/Condor	i,j	i,j	i,j	i,j	i,j
MV Ambassador	d	d	d	d	d
FSS-class	1,i	1,i	1,i	1,i	3,i
Cape D-class	i,j	i,j	i,j	i,j	i,j
Cape H-class	1,i	1,i	1,i	1,i	1,i
Container					
C6-S-1w	1	1	1	2	4
C7-S-68e	1	1	1	2	4
C8-S-85c	1	1	1	2	3
Combination					
C5-S-78a	1	1	1	2	4
C5-S-37e	1	1	1	2	4

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

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