Oakland Army Base [Rail Master Plan Report]

prepared for CCIG Oakland Global, LLC | prepared by HDR Engineering, Inc.

HDR

OAKLAND GLOBAL

INFRASTRUCTURE TEAM

PORT OF OAKLAND · CCIG OAKLAND GLOBAL LLC · CITY OF OAKLAND

"one vision, one team, one project"

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Executive Summary

Introduction

In August 2003, the US Army transferred 322 acres of the former Oakland Army Base (OAB) jointly to the City of Oakland and the Port of Oakland. Since July 2009, CCIG Oakland Global, LLC[1] (Oakland Global) has worked with the City of Oakland and the Port of Oakland on a singular vision for developing the former army base into a vital international trade and industry center known as the Oakland Global Trade and Industry Center (OGTIC). OGTIC (See **Figure ES-1**) consists of four major rail development components:

1. New Arrival Track (South of Powell Street to 7th)
2. Trade, Logistics, and Industrial Facilities
3. Intermodal Rail Terminal
4. 7th Street Grade Separation Rail Improvements

Figure ES-1: Oakland Trade and Industry Center

[1] *LLC consisting of AMB Property Corporation (Prologis) and California Capital Group*

HDR Engineering, Inc. (HDR) was retained by Oakland Global to assist in the development of a rail infrastructure master plan for OGTIC. HDR has been tasked, in cooperation with Oakland Global team member Industrial Railways Company (IRC), with developing the rail elements of the master plan that will provide near- and long-term support for the marine, intermodal rail, and industry facilities currently envisioned.

Study Purpose

Oakland Global and its partners, the City of Oakland and the Port of Oakland, are developing a Master Plan (MP) document for the OGTIC project that will provide a blue print to identify and program critical capital infrastructure investments including rail, roadway and utilities required to support the business enterprises envisioned for the former army base.

A critical part of the OGTIC Master Plan to revitalize the Oakland's waterfront, increase international trade, and promote economic growth is the rail infrastructure. The objectives of the rail portion of the overall Master Plan are to:

- Develop a scalable/fundable rail master plan with the flexibility to support both near- and long-term business opportunities at OGTIC.
- Identify operational and physical constraints to providing efficient rail service to OGTIC and mitigate them to the extent practicable.
- Improve rail access to OGTIC and existing intermodal rail facilities to support desired train volumes.
- Increase the Port of Oakland's intermodal rail throughput capacity as demand increases.

Rail Service Opportunities

Oakland Global has identified intermediate and long-term rail-related business opportunities for the OGTIC. The scenarios consider the current economic climate and seek to provide a reasonable return on rail infrastructure investments through tariffs, leases, and switching revenues based on currently available business opportunities. These opportunities include:

Near-Dock Intermodal Rail, which involves the construction of intermodal loading tracks and support tracks near marine terminals. Cargo is drayed from the marine terminal(s) to the intermodal rail yard on either public or private roads. If public roads are used, the trucks and chassis used to transport the containers must meet all the legal requirements for operating commercial vehicles.

Commodity Unit Trains, which involves the construction of unit train unloading facilities specific to the type of commodity and adequate support track to service the contracted volumes. Some types of commodities, including lumber and containerized grain, could use the near-dock intermodal terminal facilities. Others, including minerals and aggregates, require separate dedicated unloading facilities.

Manifest Rail Cargo, which involves the construction of a support yard and industrial switching leads to serve a proposed 106-acre industrial park development along Maritime Drive. The facilities could also be used to support temporary open-air transloading operations on vacant land.

Rail Master Plan Approach

The rail master planning effort looked at potential rail services and volumes over the next ten to twenty years. The build-out looks at the ultimate capacity of each of the identified rail services based on the overall capacity of the planned rail infrastructure.

The OGTIC Master Plan presumes a fully developed adjoining marine container terminal and intermodal rail terminal, bulk unloading terminal, and industrial park with the required rail support infrastructure. These improvements are envisioned to be implemented over a twenty-year period, or sooner if demand warrants.

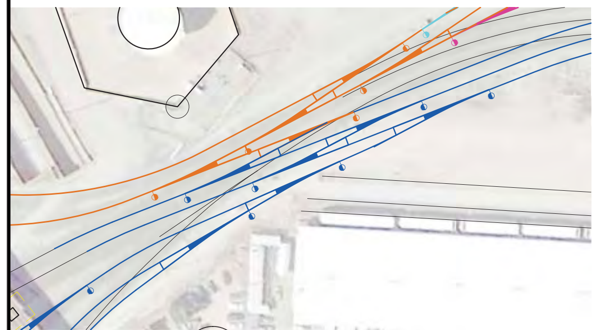
Each of the identified rail service opportunities requires its own unique rail infrastructure. The growth of one type of rail service ultimately constrains the growth of the others. For example, both commodity unit trains and near-dock intermodal rail require support tracks. The amount of land available to construct support tracks is limited, thus constraining the growth potential of one or both rail services. Each type of rail service has advantages and disadvantages. Ultimately, the market will determine the size of each type of rail service, provided adequate support infrastructure is available.

BUILD-OUT NEAR-DOCK INTERMODAL RAIL TERMINAL

The near-dock intermodal rail terminal (see **Figure ES-2**) is designed to support up to 400,000 lifts (or container moves) per year and generate 28 unit trains a week. The throughput capacity is achieved by utilizing six loading tracks approximately 4,000 feet long each serviced by five wide span rail mounted electric cranes. Each pair of loading tracks can hold one 8,000-foot unit train. Power is provided to the terminal by two separate 15kva from substations located off of 7th St. and 14th St. The terminal has approximately 17.7 acres of paved surface for internal access and container storage. Containers will be stacked 6 (wide) by 5 (high) with a stack capacity of approximately 2,660. The stack capacity is based on a 48 hr container dwell time. No refrigerated container electrical plug-ins are included in the current design concept. Approximately 1,096 trucks will access the terminal daily. Truck access to the terminal will be primarily by a public truck gate located at the west end of the terminal off of Maritime Street. The rail yard will be supplied with containers from all marine berths throughout the Port via trucking on public roads. However, an option has been designed in the Master Plan for an overhead, private road ("tug road") from the Ports America (PA) site (to the west) to facilitate movement of containers directly from PA to the intermodal yard. This private investment would facilitate off-road container movement from PA to the intermodal yard, thus reducing traffic from public roads.

UNIT TRAIN SUPPORT YARD

The proposed bulk unloading facility (West Gateway)and near-dock intermodal rail yard require nearby support tracks. The desired ratio of support tracks to loading tracks is 2:1 to 1.5-1. The Rail Master Plan calls for constructing an eight-track support yard (see **Figure ES-2**) adjacent to the proposed near-dock intermodal rail yard with tracks dedicated to either commodity or intermodal unit trains. The yard is designed to handle 24 to 28 intermodal and/or commodity unit trains per week.



1 DETAIL 1 - 7TH ST THROAT
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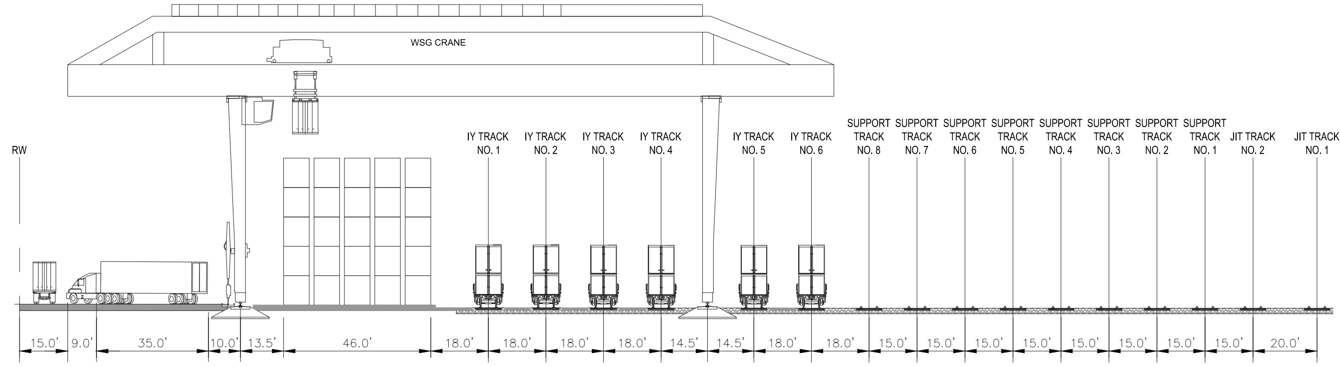


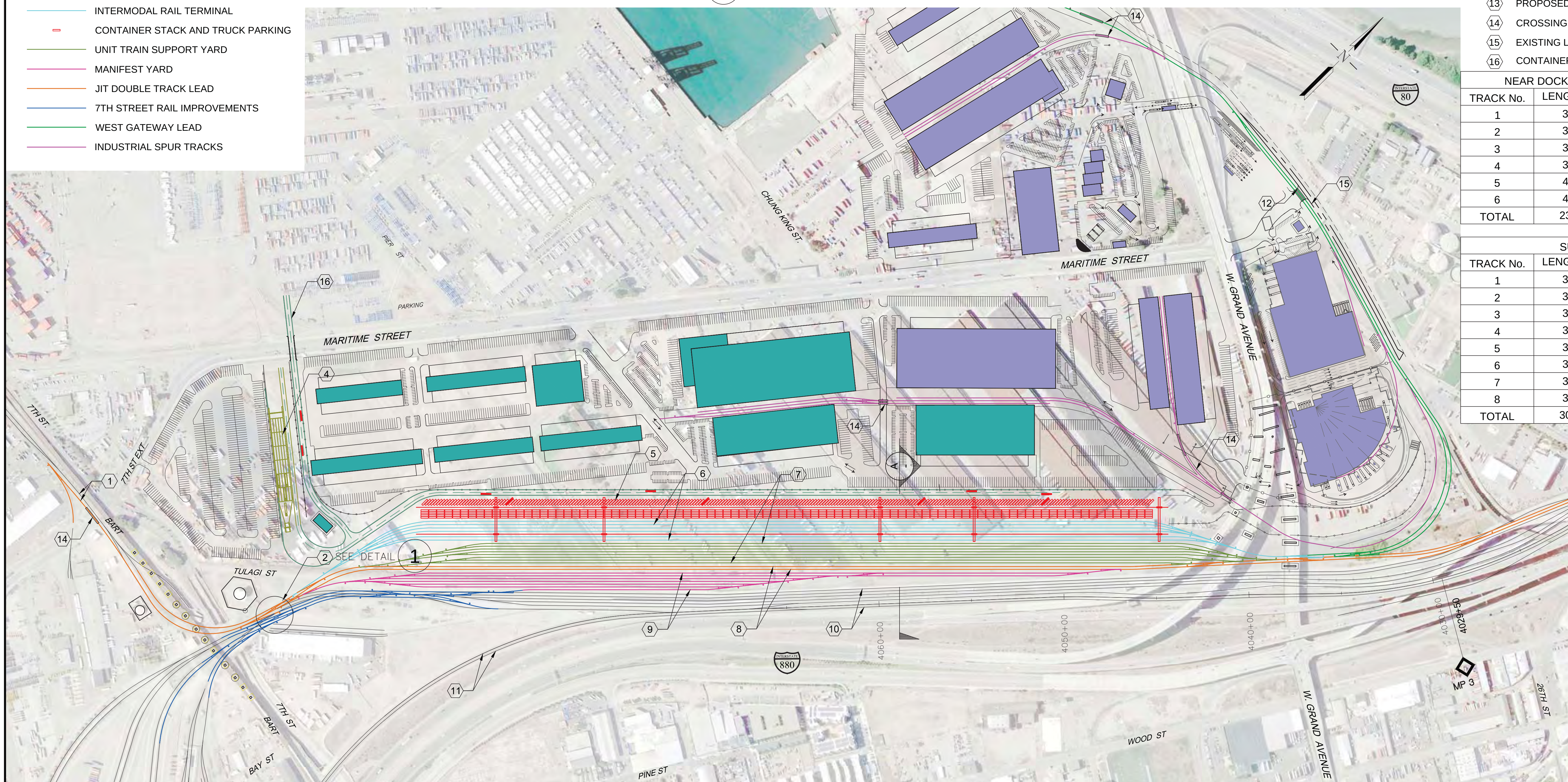
A SECTION A
1" = 30'

KEY NOTES:

1. JIT LEAD (DOUBLE TRACK)
2. 7th STREET THROAT
3. NOT USED
4. TRUCK GATE FOR NEAR DOCK TERMINAL
5. NEAR DOCK INTERMODAL TERMINAL CONTAINER PARKING
6. NEAR DOCK INTERMODAL TERMINAL TRACKS
7. SUPPORT YARD
8. JIT LEAD TRACKS
9. NEW KNIGHT YARD (MANIFEST)
10. EXISTING UPRR DESERT YARD
11. EXISTING UPRR MAINLINE TRACK 1 & 2
12. OAKLAND WEST GATEWAY LEAD
13. PROPOSED OUTBOUND GATE
14. CROSSING
15. EXISTING LEAD TRACK TO BE REMOVED
16. CONTAINER TERMINAL ACCESS ROAD (PRIVATE)

LEGEND

- INTERMODAL RAIL TERMINAL
- CONTAINER STACK AND TRUCK PARKING
- UNIT TRAIN SUPPORT YARD
- MANIFEST YARD
- JIT DOUBLE TRACK LEAD
- 7TH STREET RAIL IMPROVEMENTS
- WEST GATEWAY LEAD
- INDUSTRIAL SPUR TRACKS



NEAR DOCK INTERMODAL TERMINAL TRACKS

TRACK No.	LENGTH (FT)	270 FT CARS	305 FT CARS
1	3,800	14	12
2	3,840	14	12
3	3,870	14	12
4	3,930	14	12
5	4,050	15	13
6	4,120	15	13
TOTAL	23,610	86	74

SUPPORT YARD TRACKS

TRACK No.	LENGTH (FT)	270 FT CARS	305 FT CARS
1	3,800	14	12
2	3,810	14	12
3	3,810	14	12
4	3,890	14	12
5	3,890	14	12
6	3,910	14	12
7	3,740	13	12
8	3,920	14	12
TOTAL	30,770	111	96

KEY PLAN
(N.T.S.)

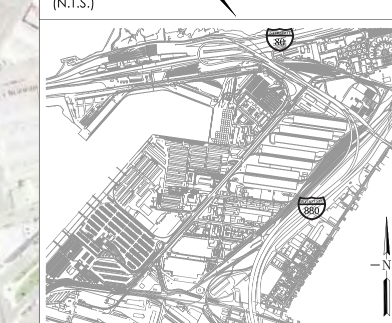


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Figure ES-2

PROJECT INFO.

OAKLAND GLOBAL TRADE AND INDUSTRY CENTER
OGTIC BUILD-OUT RAIL MASTER PLAN
NEAR-DOCK INTERMODAL RAIL

REV	DATE	COMMENT

JOB NO.	168294
SCALE:	1" = 300'
DATE:	01/31/2012
DRAWN BY:	IK
CHECKED BY:	BK

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KNIGHT (MANIFEST) YARD

The former Oakland Army Base manifest yard is replaced with a new seven-track flat switching yard (See **Figure ES-2**) with a 200-railcar storage capacity. The throughput capacity of the yard is estimated at between 100 and 150 railcars per day based on a 200- railcar capacity and estimated yard delay time of 36 to 48 hours. This facility can support between 13,000 and 20,000 revenue railcars annually.

The yard design provides an interchange connection with the UPRR's adjacent Desert Yard with access to the UPRR West Oakland Yard. The Rail Master Plan envisions that development of the Knight Yard is linked to the vertical development of the OAB industrial park and bulk material along West Gateway Lead to Wharf 7. Construction of the two longest yard tracks and connection to the UPRR Desert Yard is the recommended initial construction phase for the Knight Yard. As demand grows, the remaining four yard tracks can be added without interruption of rail service.

WEST GATEWAY LEAD AND INDUSTRY SPUR TRACKS

The existing West Oakland Gateway lead, which runs from the east end of the proposed Knight manifest yard west to Berth 7 is reconstructed to provide access to existing berths for bulk loading operations. This proposed industrial spur track design has 80 railcar unloading spots. Of particular concern is the rebuilt crossing at the end of North Maritime leading to EBMUD. This rebuilt and relocated crossing (from the abandoned Wake Avenue) will see 6 to 8 switching moves a day, with an average blocking time of 3 to 5 minues per train. Trains will not switch back and forth across EBMUD entrance, but pass across at 5 mph.

RAIL ACCESS IMPROVEMENTS

The Rail Master Plan identifies three specific rail access projects (See **Figure ES-2**) to improve arrival/departure of trains to the OGTIC, allow parallel arrival/departure moves into the near-dock intermodal yard and intermodal support yards, and to provide a separate double-track lead into the OIG intermodal rail terminal. Access improvements include:

1. UPRR Main Line Rail Access Improvements

The OGTIC MP includes the construction of approximately 6,200 ft. of new arrival/departure track constructed within the Union Pacific Railroad Company's (UPRR) existing right-of-way from Station 3968+00 (MP 4.2), just south of Powell Street to the north end of the proposed intermodal support yard at Station 4030+00 (MP3.0) where the new track ties into UPRR'S Desert Yard track (DY) No. 3 (DY3) track. The work includes installing a new power operated No. 20 turnout off of UPRR's DY2at MP 4.2 and realignment of DY 1-3 between Station 4010+00 and 4030+00 including installation of three No. 15 turnouts and one No. 15 crossover. The revised track configuration will allow parallel moves into the proposed near-dock intermodal yard and support tracks. The new arrival/departure track ties into existing DY 3 near Station 4030+00. While this work is outside of the project, it becomes an essential element of the overall project because it provides necessary improvements to the UPRR infrastructure that will allow rail access for Oakland Global Trade and Industry Center (OGTIC). These improvements are critical to maintain both capacity and fluidity for all of the rail traffic that shares this gateway into the Oakland terminal.

2. Joint Intermodal Terminal Double Track

The double track lead into the Port of Oakland's Joint Intermodal Terminal (JIT) will be reconstructed off of the new arrive/departure track that extends north to Powell Street. New No. 15 turnouts to JIT1 and JIT2 will be constructed at Stations 4026+00 and 4012+00 respectively. The reconstructed double track lead ties back into the existing JIT double track lead approximately 500 feet east of the existing Maritime Street at-grade crossing. The new JIT1 and JIT2 tracks can hold 7,400-foot and 8,800-foot-long trains between Maritime Street and Powell Street, respectively.

3. 7th Street Grade Separations

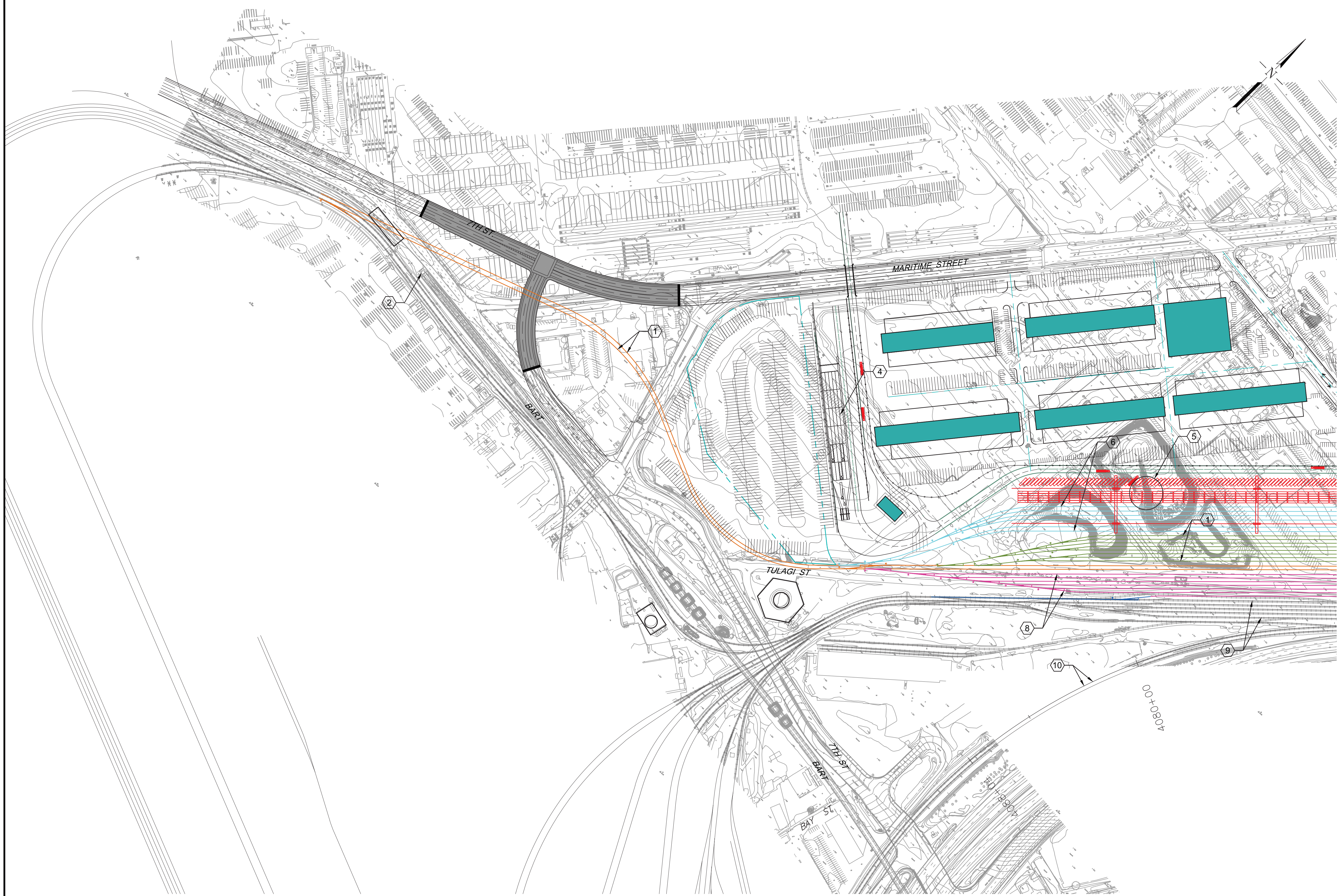
A. The existing underpass (of rails) at the eastern end of 7th Street is sufficient for existing and new rail lines. The rail master plan reconfigures the existing tracks over the street to provide parallel train movements between UPRR's Railport and Desert Yard. The reconfigured track also provides room for the proposed JIT double track discussed in Item No. 2 above. The master plan is considering possible improvements to the underpass to improve vehicluar traffic, not rail traffic.

This road improvement project is about modernization of the 7th Street underpass, not about increasing overall rail capacity.

B. An option to Item No. 2 above is a different routing of the JIT double track lead in a more north/south configuration. This would require construction of an elevated overpass to raise the elevated intersection of 7th and Maritime Drive (See **Figure ES-3**) to provide for a fully grade separated rail corridor to the BNSF's JIT. Under this design, the JIT double track lead is relocated to cross over the BART tunnel portal, then run parallel to Maritime Drive before crossing under the new elevated overpass at the intersection of 7th Street and Maritime Drive. An at-grade structure will be required to support the rail track over BART's Transbay Tube. The west lead tracks into the intermodal terminal, unit train support yard, and Knight (Manifest) Yard would be realigned. The proposed track configuration between UPRR's Railport and Desert Yard would remain unchanged.

C. Construction of an elevated overpass (Item B above) would be an alternate to the need for a private "tug" road between Ports America and the OHIT. The overpass would allow truck traffic and rail to pass underneath it.

D. There have been many past studies of connecting the JIT to a new OHIT. An elevated overpass as outlined in B above would open up connectivity on the ground without rail/road crossings at Maritime Drive. An overpass would allow more trackage on the ground, thus more train building options for BNSF's JIT. While connecting the JIT and OHIT directly is apparent (using an overpass), it does not yield a proportional increase in rail thoughput at the Port. Overall rail capacity of the Port is first driven by main line capacity, then by balancing arrival/departure track and support track with the capacity of the proposed rail facilities. Increasing lead lines within the Port adds track and train building flexibility and reduction of road crossings. However, it does not directly



KEY NOTES:

1. JIT LEAD (DOUBLE TRACK)
2. BART TUNNEL PORTAL
3. NOT USED
4. TRUCK GATE FOR NEAR DOCK TERMINAL
5. NEAR DOCK INTERMODAL TERMINAL CONTAINER PARKING
6. NEAR DOCK INTERMODAL TERMINAL TRACKS
7. SUPPORT YARD
8. NEW KNIGHT YARD (MANIFEST)
9. EXISTING UPRR DESERT YARD
10. EXISTING UPRR MAINLINE TRACK 1 & 2

KEY PLAN
(N.T.S.)

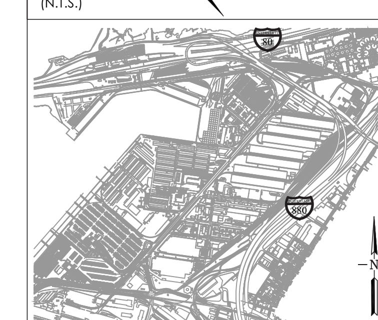


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Figure ES-3

PROJECT INFO.

OAKLAND GLOBAL TRADE AND INDUSTRY CENTER
OGTIC RAIL MASTER PLAN
7TH STREET FULLY GRADE SEPARATION OPTION

REV	DATE	COMMENT		
			JOB NO.	168294
			SCALE:	1" = 200'
			DATE:	01/31/2012
			DRAWN BY:	IK
			CHECKED BY:	BK

DRAWING NO.

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increase freight capacity. A new overpass, while beneficial, comes at a significant cost. A benefit/cost analysis is recommended to determine the project's cost effectiveness.

Conclusions

SUMMARY OF FINDINGS

The goal of the master planning effort was to define the rail infrastructure requirements for a wide range of potential rail services at the OGTIC project. The study looked at intermediate to long-term rail infrastructure requirements for the identified rail services and desired throughput capacities for intermodal rail. Based on this study, the following general conclusions can be drawn:

- The property within the OGTIC identified for rail infrastructure can support a wide range of rail-served uses, including intermodal rail, commodity unit trains, and manifest (industry) trains.

- Access improvements into the OGTIC are needed to support the additional train traffic generated by the OGTIC and improve the overall train movements into the existing UPRR Railport and BNSF JIT intermodal facilities. These improvements are included as part of the OGTIC rail master plan, although a significant portion of the improvements is located on UPRR property outside of OGTIC. The UPRR will need to analyze and approve these improvements.

- The proposed OGTIC rail improvements including the JIT double track lead, manifest yard, and unit train support yard should provide improved rail operations to the entire port rail system allowing trains to flow smoothly off of the mainlines and into their respective terminals without delaying other trains.

- The proposed manifest yard can support up to 20,000 revenue railcar loads annually and is capable of supporting the proposed industrial development.

- The Build-out Rail Master Plan envisions an intermodal rail facility with a throughput capacity of 400,000 lifts (container moves) annually.

- The rail master plan can support either of the proposed 7th Street design options, 1) leaving roads as is, or 2) building a new overpass. Most importantly, 7th Street improvements of any kind are not needed to support the development of the OGTIC project, and their absence would not reduce existing Port rail services.

- The proposed rail layouts should serve as a basis for the roadway and utility master planning efforts.

NEXT STEPS

Based on the information developed during this study, the following steps are recommended:

- Initiate formal discussions with the UPRR on proposed rail access improvements and required rail infrastructure needed to support potential new rail business to the OGTIC. Any proposed new rail business to the OGTIC will need to be approved by their senior management, as will all the rail improvments outlined herein. The process can take a minimum of 128 days.

- Initiate formal discussions with BNSF Railway to confirm that the proposed improvements are beneficial to their current and future operations at the Oakland JIT.
- Rail design and cost estimates should be refined and verified as additional survey information becomes available during and after the MP process.
- Develop designs from the MP to a more advanced state to fully detail the alignments and inter-workings of the proposed rail system, particularly how it interfaces with roads and other circulation improvments.

Introduction

Background

In August 2003, the US Army transferred 322 acres of the former Oakland Army Base (OAB) jointly to the City of Oakland and the Port of Oakland. In July 2009, the Port executed an Exclusive Negotiating Agreement with AMB Property Corporation (Prologis) and California Capital Group for the purpose of negotiating and executing a Master Lease Agreement for the development, operation and maintenance of the Port-owned portion of the former OAB. This enterprise, now CCIG Oakland Global, LLC (Oakland Global) has formed a public-private partnership with the City of Oakland and the Port of Oakland with the singular vision of developing the former army base into a vital international trade and industry center adjacent to the Port of Oakland.

The Project, now formally known as the Oakland Global Trade and Industry Center or OGTIC, consists of four major rail components (see **Figure 1**):

Figure 1: Oakland Trade and Industry Center

1. New Arrival Track (South of Powell Street to 7th)
2. Trade, Logistics, and Industrial Facilities
3. Intermodal Rail Terminal
4. 7th Street Grade Separation Rail Improvements

Oakland Global has entered into the master planning phase of the project and has retained HDR Engineering, Inc. (HDR) to assist in the development of a rail infrastructure master plan. HDR has been tasked, in cooperation with Oakland Global team member Industrial Railways Company (IRC), with developing the rail elements of the master plan that will provide near- and long-term support for the marine, intermodal rail, and industry facilities currently envisioned.

Project Understanding

GOALS + OBJECTIVES

The goal of the master planning phase of the OGTIC project is to provide Oakland Global and its partners, the City of Oakland and Port of Oakland, with a blue print that will enable them to identify and program critical capital infrastructure investments, including rail, roadway and utilities required to support the business enterprises envisioned for the former army base.

Rail is a critical component of Oakland Global's master plan to revitalize the Oakland waterfront, increase international trade, and promote economic growth. The key objectives of the rail master plan are to:

- Develop a scalable/fundable rail master plan with the flexibility to support both near-and long-term business opportunities at OGTIC.
- Identify operational and physical constraints to providing efficient rail service to OGTIC and mitigate them to the extent practicable.
- Improve rail access to OGTIC and existing intermodal rail facilities to support desired train volumes.
- Increase intermodal rail throughput capacity as demand increases.

Improvements to the existing Union Pacific Railroad's Railport and the BNSF Railway's Oakland JIT were not within the scope of work of this master planning effort.

RAIL SERVICE DEMAND SCENARIOS

Business models developed by Oakland Global for the industrial park, and intermodal rail terminal were used to estimate rail demand at the proposed rail-served facilities. These rail service scenarios were classified as intermediate and long-term development scenarios. The scenarios considers the current economic climate and seeks to provide a reasonable return on rail infrastructure investments through tariffs, leases, and switching revenues based on current business opportunities over a ten- to twenty-year period. As international trade recovers and intermodal rail demand grows, this scenario is designed to be both flexible and scalable to meet the Port of Oakland's needs. The long-term scenario envisions a fully developed intermodal rail terminal, and industrial park with the required rail support infrastructure. These improvements are envisioned to be implemented over a twenty-year period, or sooner if demand warrants, with minimal throwaway costs.

Detailed economic demand forecasting was not performed as part of this study. Rail demand estimates are based on a constrained modeling approach. Volumes are based on the maximum sustainable throughput capacities of fully developed facilities envisioned under the OGTIC master plan. Main line capacity analysis was also not part of this study's scope of work. It is normal practice for the UPRR and BNSF to perform this analysis in-house as part of their internal network capacity analysis process.

Existing Conditions

Study Area

For the purposes of this report, the study area is defined as the Oakland Rail Terminal (ORT) (see **Figure 2**), which consists of the track and associated facilities that exist between San Pablo, Mile Post (MP) 15.3, on the Union Pacific Railroad (UPRR) Martinez Subdivision, and Elmhurst, MP 13.5, located at the junction of the UPRR Niles and Coast Subdivisions.

All rail traffic into and out of Oakland Rail Terminal is over the UPRR system. Four major rail lines extend north and south from the Oakland Rail Terminal. The Martinez Subdivision starts in Oakland (starting on the main line adjacent to the former Oakland Army Base property) and runs north and east to Roseville, CA. It passes through Emeryville, Berkeley, Pinole and Martinez, where it crosses the Carquinez Straits to Benicia.

The Niles Subdivision runs south from West Oakland and Newark. It passes through Jack London Square, the UPRR East Oakland Yard, and provides the access to Oakland for the UPRR Coast Subdivision at Elmhurst (46th Avenue in East Oakland) and the Oakland Subdivision at Niles Junction near Fremont. The Coast Subdivision runs to Los Angeles via Santa Barbara, and the Oakland Subdivision is UPRR's route to Stockton, Southern California and Sacramento.

UPRR operates freight trains both originating from or destined to Oakland as well as through freight trains, which pass through the Oakland Terminal area. UPRR switching services for local industries and within the terminal operate over these same tracks.

In addition to the UPRR freight services, BNSF operates intermodal trains into JIT. Through freight trains and local switching move between Richmond and the Wood Street Yard over the UPRR main lines.

AMTRAK long-distance services to Seattle and Chicago and inter-city train services operated by CCJPA (Capital Corridor) and AMTRAK on behalf of Caltrans Division of Rail (San Joaquin service) also use the UPRR main lines to provide services.

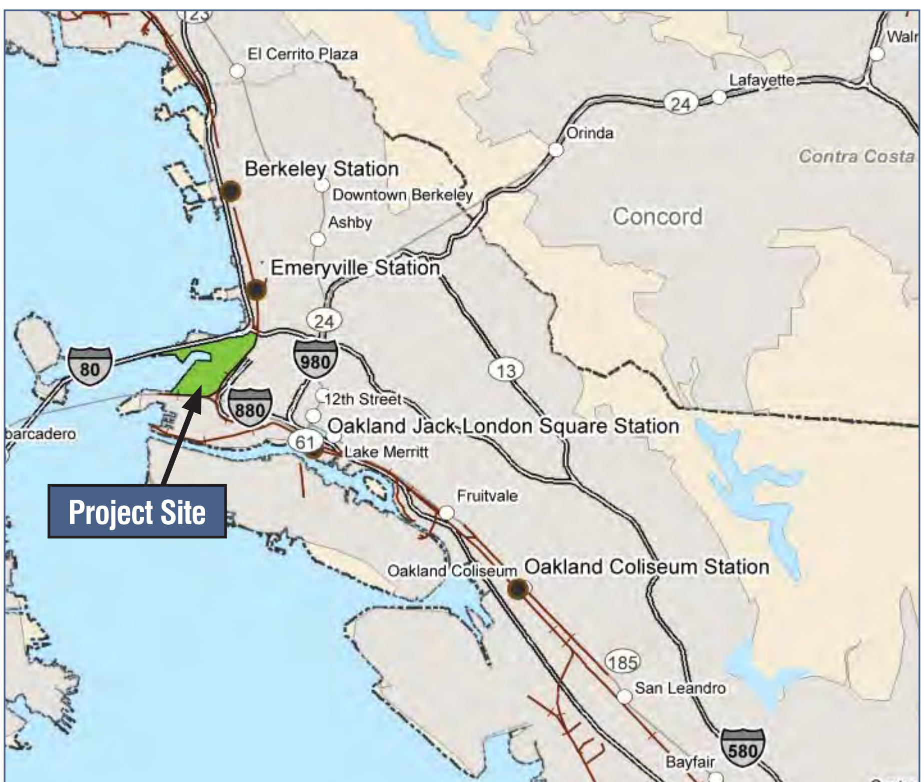


Figure 2: Oakland Rail Terminal

Train movements on both the Martinez and Niles Subdivisions are controlled by UPRR dispatchers in Omaha through a Centralized Traffic Control (CTC) system.

The double main track Martinez Subdivision is one of UPRR's eight most congested rail corridors, with upwards of 60 trains moving through Oakland per day. The Niles Subdivision is only slightly less congested with more than 40 trains moving over the double main track system.

Project Site

The project site (see **Figure 3**) consists of approximately 322 acres of the Oakland Army Base and Port of Oakland's Outer Harbor Marine Terminals. The project site is bounded on the south by 7th Street; on the north by EBMUD; on the east by Interstate 880; and on the west by San Francisco Bay. Major surface arterials within the project site include 7th Street, Maritime Drive, and Burma Road. The site encompasses the former Army base land and facilities.

Existing Oakland Rail Terminal Operations

OAKLAND INTERMODAL OPERATIONS SUMMARY

Two intermodal rail terminals currently provide services to Oakland. The UPRR owns and operates Railport Oakland. BNSF Railway operates the JIT, also referred to as Oakland International Gateway (OIG), under a lease from the Port of Oakland.

Both facilities are accessed over the UPRR Martinez Subdivision. BNSF trackage rights, granted as a condition of the 1996 SP/UPRR Merger, allow BNSF to run intermodal trains between its interchange point with UPRR near Richmond and JIT. The BNSF trains currently cross over and through the UPRR Desert Yard to access JIT.

Figure 3: Project Site

Railport Oakland occupies approximately 110 acres and consists of six loading tracks, with approximately 22,000 track feet (TF) under crane. The facility has approximately 28,000 TF of support track servicing the terminal. Support tracks are located in UPRR's West Oakland and Desert yards. The facility has extensive parking for containers and chassis and an automated gate system (AGS) that ties into their "Optimization Alternatives Strategic Intermodal Scheduler" (OASIS). The OASIS system coordinates terminal operations, train loading, billing and customer data interchange. The facility serves domestic and international container traffic.

JIT occupies approximately 85 acres and consists of three loading tracks, with approximately 13,000 TF under crane. The facility has approximately 16,000 TF of support track servicing the terminal and two tail tracks that are used to transfer cuts of cars from loading to support tracks. The JIT has an automated gate system and serves only international container traffic.

The current lift capacity of the two intermodal terminals in Oakland has been estimated in Port of Oakland's Maritime development Alternative Study to be 400,000 lifts at UPRR Railport and 240,000 lifts at JIT (operated by BNSF) at full capacity. UPRR could potentially increase their maximum capacity by adding additional working tracks to their facility.

OAKLAND CARLOAD AND NON-INTERMODAL OPERATIONS SUMMARY

Carload and non-intermodal traffic moves in boxcars, tank cars, hopper cars, gondolas etc. and are handled as individual shipments or commodity unit trains. Individual railcar shipments are gathered from industrial spurs within a terminal or industrial area, collected in a nearby rail yard, and then classified into trains by destination. These trains, referred to as manifest trains, move from terminal to terminal across the system to their final destination. At each terminal, railcars are reclassified into a new train. Railcars are often stored briefly at intermediate terminals until sufficient volumes are built up to make a full train to the next destination. It is a system of hub and spokes.

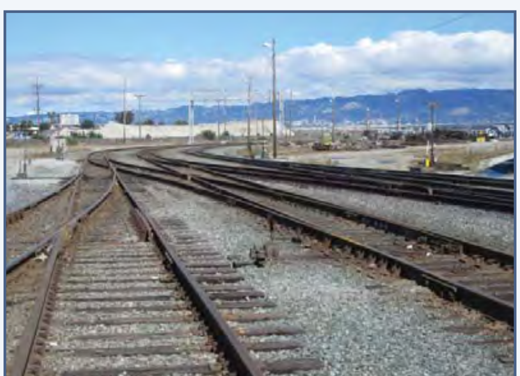
Some commodities, such as ethanol, grain and automobiles, can move in sufficient volumes to allow them to move as a single or unit train. These commodity unit trains are handled like intermodal trains. They move in complete trains from origin to destination, stopping only for fuel, required inspections, and to change crews and locomotives. Generally, these types of trains will originate and be destined to a commodity-specific terminal for loading and unloading.

Carload traffic and non–intermodal traffic is handled by UPRR in the West Oakland Yard. Additional tracks in the Desert Yard and in the East Oakland Yard support carload traffic in Oakland. UPRR traffic destined to industries located at the former Army Base is currently switched over from the West Oakland Yard and is spotted at the industry by the local switch crew. Railcars that arrive from or are destined to points on the BNSF must be switched between the industrial spurs and the Wood Street Yard, located on the east side of the UPRR main lines. This local switching is currently being performed by the Oakland Terminal Railway (OTR), jointly-owned by UPRR and BNSF. Currently, demand exceeds the railroad's capacity to serve the existing carload businesses limiting their ability to expand.

Site Constraints

The rail master planning effort was constrained by geographic site conditions, which limited the length and number of tracks through critical choke points as well as restricting horizontal and vertical track geometry. Identified constraints include:

SITE CONSTRAINTS



Figures 4, 5, & 6: 7th Street Yard Lead Tracks

7TH STREET GRADE SEPARATION

The 7th Street Grade Separation represents a significant choke point for existing rail traffic into UPRR’s Railport intermodal terminal and West Oakland yards and BNSF’s Oakland Joint Intermodal Terminal.

The underpass originally constructed in 1930 as a two-lane road with pedestrian underpass was widened to four lanes in 1969. The six tracks that cross over the underpass are the yard leads into Railport, West Oakland Yard, and OIG. Vertical rail clearances are restricted by the BART aerial guideway that crosses the railroad immediately south of 7th Street. The horizontal track geometry is restricted by the width of the underpass and location of the BART guideway columns. This creates a 12° 30’curve at south end of the Desert Yard that all trains pass over and further restricts the curves into JIT to 13° 30’.

Figure 7: I-80/I-580/I-880 Interchange Looking North

I-80/I-580/I-880 INTERCHANGE

The I-80/I-580/I-880 interchange (**Figure 7**) maze of columns presents a physical challenge to any new rail construction to the north of the project. The study did not consider relocating columns and rebuilding bridge spans as part of this study. Proposed improvements to the north must fit within the available right-of-way and between the existing tracks and columns.

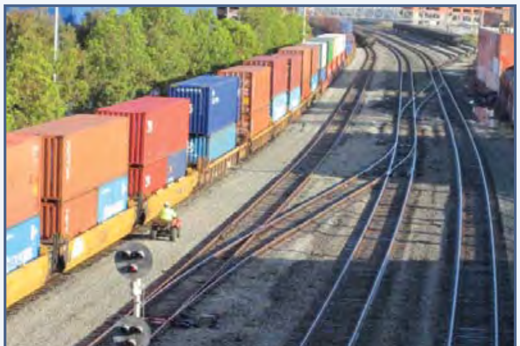


Figure 8: UPRR Right-of-Way 40th Street Overpass Looking North

UNION PACIFIC MAIN LINE (NORTH OF I-80/I-580/I-880 INTERCHANGE)

Proposed access improvements north of the project site must also fit within the existing UPRR 100-foot right-of-way (**Figure 8**). The right-of-way has two main lines and two long lead tracks that are used to arrive and depart trains into UPRR's Desert Yard. UPRR currently performs visual railcar inspections on these tracks.

Figure 9: Burma Road Looking East at Grand Avenue

GRAND AVENUE OVERPASS

Access to the outer harbor's west gateway is restricted by the existing columns of the Grand Avenue overpass (**Figure 9**). The existing rail line is centered between the columns. Initial site investigations indicate that it is possible to fit the two proposed tracks between the existing columns.

Design Basis Criteria

Many factors impact the performance and capacity of railroad terminals. The physical characteristics of the site, such as limitations on available land, configuration of the property, and adjoining land uses will often be the defining criteria in terminal design and operations planning. Different types of rail service, such as intermodal containers, rail transloading facilities, commodity unit trains, or traditional railcar manifest service will require different types of and configuration of working tracks, support track, fixed facilities, and open land to support the desired operation. The types of rail service may also change over time, requiring investments in new rail facilities.

Certain basic elements of an efficient rail terminal remain the same regardless of the types of business served. They must be able to arrive and depart trains without delaying main line operations, provide tracks of sufficient length and capacity to support the service, and allow for efficient switching without unduly blocking other rail movements or public roadways.

The following sections describe the design criteria and performance metrics used to develop the master plan rail layouts presented in this report for the various types of rail service currently envisioned for OGTIC.

Intermodal Rail

Performance metrics for key intermodal rail terminal activities were developed as part of this master plan to define the maximum sustainable capacity of various intermodal configurations that were considered as part of this study. These metrics reflect typical productivity levels and operational functions of both on-dock and near-dock intermodal rail terminals currently in operation throughout North America. They are based on current work practices and technology. Detailed performance simulations of the marine container terminal, intermodal rail yard, and rail network are recommended to confirm the throughput capacities, truck gate configuration and location, and rail infrastructure needs.

Table 1: Intermodal Rail Terminal Performance Metrics on the following page describes the performance measures used to develop various terminal layouts and estimate throughput capacities. Throughput capacities are expressed in “Lifts” or Twenty-Foot Equivalent Units” (TEU). A lift is defined as lifting one container onto or off of a railcar. One 40-foot container equates to 2 TEUs. The typical conversion factor used for converting lifts to TEUs is one lift equals 1.8 TEUs. Or, for every four forty-foot containers shipped, there is one twenty-foot container shipped, a ratio of 4:1.

Table 1: Intermodal Rail Terminal Performance Metrics

General Operational Parameters				
Parameter	Quantity			Comments/Assumptions
Working Days	362 days			Terminal Closed for Thanksgiving, Christmas, and New Year's.
Ship Call Weekly Peaking Factor	1.2			Assumed for study, no shipper data available.
Marine Terminal Work Shifts	1			Standard 8-hour work shift.
Rail Intermodal Yard Work Shifts	2			Standard 8-hour work shift. Assumes most work performed during 2nd and 3rd shifts.
Container Dwell Time	48 hrs.			Average detention time of a container at the intermodal rail yard.
TEU Conversion Factor	1.8 TEUs/Lift			For international trade, the conversion factors are trending higher toward 1.9 TUEs/Lift.
Intermodal Yard Productivity Rates Parameters				
Equipment Type	Rate (Lifts/Hr)			Comments/Assumptions
	Peak	Design(1)	Low	
Top Picks (Piggy Packers)	32	25	20	
Rubber Tire Gantry (RTG)	35	30	25	
Wide Span Rail Gantry (WSG)	35	30	25	Rates apply to both single span and nested crane configurations.
Rail Equipment Characteristics				
Type	Size			Comments/Assumptions
Locomotives	85 ft			Assume 3 locomotives per train.
International 5-well Intermodal Railcars	270 ft			Only holds 20- or 40-foot containers.
International 5-well Intermodal Railcars	305 ft			Can also accommodate 53 domestic containers.
Non-Intermodal Railcars	60 ft			Average length of different types of railcars including boxcars, tank cars, center beam lumber cars and gondolas.
Railroad Operational Parameters				
Parameter	Quantity			Comments/Assumptions
Train Arrival Time	2 hrs			Time to arrive unit train into two support yard tracks.
Train Departure Time	2 hrs			Time to build train from two intermodal or support yard tracks and depart terminal (incl. initial terminal air brake tests).
Marine Terminal Work Shifts	1			Standard 8-hour Work Shift
Rail Work Shifts	2			Assumes most of work is performed at night when Marine terminal operations cease and passenger train operations are reduced.
Train Length	8,000 ft			Based on maximum train lengths permitted by operating railroad.
Percent of Loads/Train	95%-100%			Assumes trains are fully loaded as container volumes increase.
Ratio of Inbound /Outbound Trains	50/50			Assume balance flow of imports to exports (includes empties).
Track Utilization Factor	60% -80%			Factor relates to the percentage of time a track can be occupied with cars and still provide reliable train operation.
Minimum Working Track Length	3,780 ft			Based on 14-270-foot five-well intermodal cars.

(1) Sustainable daily production rates used for initial sizing of the intermodal facility.

Intermodal unit trains are currently limited to a maximum train length of 8,000 feet. The design intermodal unit train consists of 28 five-well intermodal railcars capable of holding up to 280 40-foot containers. Union work rules restrict over-the-road train crews to only one switch move when delivering a train, which requires tracks used to arrive trains to be a minimum of 3,780 feet long. Any additional switching must be performed by terminal switch crews.

Study assumes that the new OHITterminal will be worked 2 shifts per day and that cranes working the intermodal tracks will have 6 to 8 hours of production per shift and that cranes working stacks, under the nested crane option, would have 8 hours of production per shift. Single cranes working both loading tracks and container stacks would have to split stack work and train unloading between the 2 shifts. A third shift could be added to work the stacks only.

Commodity Unit Trains

A unit train is defined as any full train that carries a single commodity from its origin to destination point. The train typically remains intact and is returned to its origin point for reloading. Depending on equipment cycle times, multiple unit trains may be required to supply the desired cargo volume. The commodity could be anything that generates enough volume to be moved as a unit train. These are typically bulk commodities including, grain, aggregates, minerals, coal, plastics, and chemicals. **Table 2: Unit Train Operating Parameters** describes the typical productivity level and operating requirements used to design rail support facilities for unit trains.

Table 2: Unit Train Operating Parameters

General Operational Parameters		
Parameter	Quantity	Comments/Assumptions
Working Days	362 days	Closed for Thanksgiving, Christmas, and New Year's.
Train Volumes	1 to 2 daily	Based on negotiated service agreements Main Line Operator.
Industry Switches	2 daily	Dependent on capacity of unloading facility. Minimum capacity for study assumed ½ train.
Average Detention Time in Yard	0 to 12 hrs	Cars are immediately spotted to unloading facility immediately upon arrival.
Average Detention Time at Industry	12 to 24 hrs	Dependent on unloading times.
Railcar Length	60 ft	Average length of different types of railcars including boxcars, tank cars, center beam lumber cars and gondolas.
Train Arrival Time	2 hrs	Time to arrive unit train into two support yard tracks.
Train Departure Time	2 hrs	Time to build train from two intermodal or support yard tracks and depart terminal (incl. initial terminal air brake tests).
Rail Work Shifts	1 to 3	Based on volume of traffic, and train slots for arrivals and departures.
Train Length	8,000 ft	Based on maximum train lengths permitted by operating railroad.
Ratio of support to Unit Train Volumes	2:1	Example: if service calls for 1 unit train per day, support track capacity is 2 unit trains plus ½ unit train if unloading facility cannot hold a full unit train.
Minimum Yard Track Length	3780 ft	

Manifest Service

Manifest service typically refers to a mix of commodities including manufactured goods, processed agricultural products, or building materials that traditionally were shipped in boxcars, flatcars or lumber cars to warehousing facilities. This type of service typically involves smaller car volumes with 5 to 20 carloads delivered at a time. Performance metrics for the manifest business were developed as part of the rail master plan to define the amount of rail infrastructure needed to support the proposed OGTIC industrial development master plan.

Manifest service is typically expressed in terms of annual carloads. Railcars arrive loaded and leave empty or arrive empty and leave loaded. Empty railcars are not counted as carloads. **Table 3: Manifest Service Operating Parameters** describes the typical productivity level and operating requirements used to design rail support facilities for industrial parks and rail-served industries.

Rail Design Criteria

TRACK STANDARDS

Design criteria and standards have been developed for this project based on a 35-year design life and the anticipated rail traffic types. The criteria is based primarily on the existing combined BNSF/UPRR standards as these two railroads will likely serve the facility. Where BNSF/UPRR standards are not appropriate, the AREMA manual for Railway Engineering and current practices of North American heavy haul industry practice will be followed. Please refer to Appendix A: Rail Design Criteria for the detailed design criteria used to develop the Rail Master Plan track layouts.

Table 3: Manifest Service Operating Parameters

General Operational Parameters		
Parameter	Quantity	Comments/Assumptions
Working Days	260 days	Five days per week with weekend switching service available as required.
Rail Car Interchanges with Main Line	1 to 2 daily	Based on negotiated service agreements with main line operator.
Industry Switches	1 to 2 daily	Typical once daily unless volumes require second switch or industry track capacity is limited.
Average Detention Time in Yard	24 to 48 hrs	Dependent on industry demand and main line switching service levels.
Average Detention Time at Industry	24 to 48 hrs	Typically less than 48 hrs since railcar demurrage charges begin to occur after 48 hours.
Railcar Lengths	60 ft	Average length of different types of railcars including boxcars, tank cars, center beam lumber cars, and gondolas.
Interchange Time	2 hrs	Time to pull railcars from interchange tracks.
Rail Work Shifts	1 to 3	Based on volume of traffic.
Train Length	8,000 ft	Based on maximum train lengths permitted by operating railroad.
Ratio of Yard to Industry Track	1:1 to 2:1	Dependent on yard dwell times and total capacity of industry tracks.
Minimum Yard Track Length	600 ft	Based on typical 10-railcar industry spot.

Rail Master Plan Concepts

Design Approach

The OGTIC project is in the early stages of planning. One of the first steps in the planning process is to develop a rail master plan that helps to define the full range of rail service possibilities without unduly eliminating or restricting one form of rail service over another until the economic advantages of each are fully understood.

The intent of the rail master plan is to develop the necessary support infrastructure and to allow market forces to determine the best use of a finite resource, i.e., rail capacity. Potential rail-served usages identified for OGTIC include:

On-Dock Intermodal Rail, which involves construction of intermodal rail loading tracks on the Ports of America marine container terminal property. The potential development on an on-dock intermodal rail terminal is not part of the OGTIC project and, therefore, not considered as part of this rail planning effort.

Near-Dock Intermodal Rail, which involves the construction of intermodal loading tracks and support tracks near marine terminals. Cargo is drayed from the marine terminal(s) to the intermodal rail yard on either public or private roads. If public roads are used, the trucks and chassis used to transport the containers must meet all the legal requirements for operating commercial vehicles.

Commodity Unit Trains, which involves the construction of unit train unloading facilities specific to the type of commodity and with adequate support track to service the contracted volumes.

Manifest Rail Cargo, which involves the construction of a support yard and industrial switching lead to serve a proposed industrial park development along Maritime Drive. The facilities could also be used to support open-air transloading operations.

Each of these rail uses requires its own unique rail infrastructure. The growth of one type of rail service ultimately constrains the growth of the others. For example, both commodity unit trains and near-dock intermodal rail requires support tracks. The amount of land available to construct support tracks is limited, thus constraining the growth potential of one or both. Each type of rail service has advantages and disadvantages. Ultimately, the market will determine the size of each facility, provided adequate support infrastructure is available.

The master rail plan must also be scalable. Rail is an expensive fixed capital investment. The rail master plan must allow for the construction of additional trackage without interrupting existing operations. The master plan should also allow for interim rail usages such as transloading until demand increases for planned rail services volumes.

The rail master planning effort was divided into two phases, intermediate and build-out. The intermediate phase looks at potential rail services and volumes over the next ten to fifteen years. The build-out phase looks at the ultimate capacity of each of the identified rail services based on the overall capacity of the planned rail infrastructure.

Build-out Rail Master Plan

The build-out rail master plan is based on the maximum estimated demand for rail service within the OGTIC.

BUILD-OUT NEAR-DOCK INTERMODAL RAIL

The build-out of the near-dock intermodal rail terminal is designed to support up to 400,000 lifts per year and generate 28 unit trains per week. The throughput capacity is achieved by utilizing six loading tracks approximately 4,000 feet long, serviced by five wide span rail mounted cranes. Refer to Appendix B – Rail Capacity Design Worksheets, Near-Dock Intermodal Rail Design Worksheet – 400,000 Annual Lifts for more detailed information.

The build-out plan (**See Figure 10: OGTIC Rail Master Plan – Near-Dock Intermodal Rail**) optimizes the facility by installing wide-span rail-mounted gantry cranes (5), over six closely spaced loading tracks and vertically stacking containers five-high by six-wide on site. The stack capacity is 2,660 40-ft containers. The proposed facility is capable of holding three 28-car intermodal unit trains. Electrical power is provided to the terminal by two separate substations (15 kva) located off of 7th street and 14th street. The facility could include a private grade-separated truck roadway ("tug road") to the Ports of America Marine Container Terminal. Approximately 1,096 trucks will access the terminal daily, with 50% of them utilizing the private Tug road. The remaining 50% will use a new truck gate off Maritime Drive.

A permanent yard air system is proposed for the operation to allow initial terminal air tests to be performed on site. The proposed configuration provides six loading and eight support tracks for a total of fourteen tracks, or a ratio of 1.3:1 of support track to loading track. The limited support track requires that the terminal operate at a high level of efficiency or add an additional shift during peak ship call periods.

The designer assumes 25% of the trains can arrive directly to the terminal.

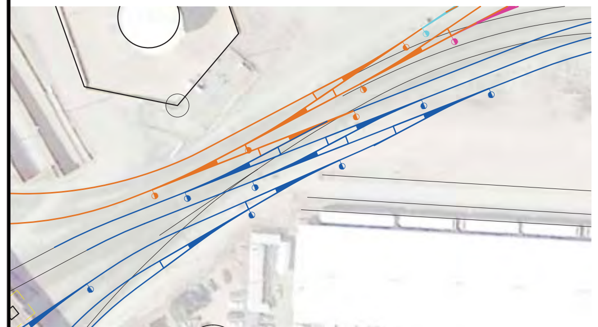
UNIT TRAIN SUPPORT YARD

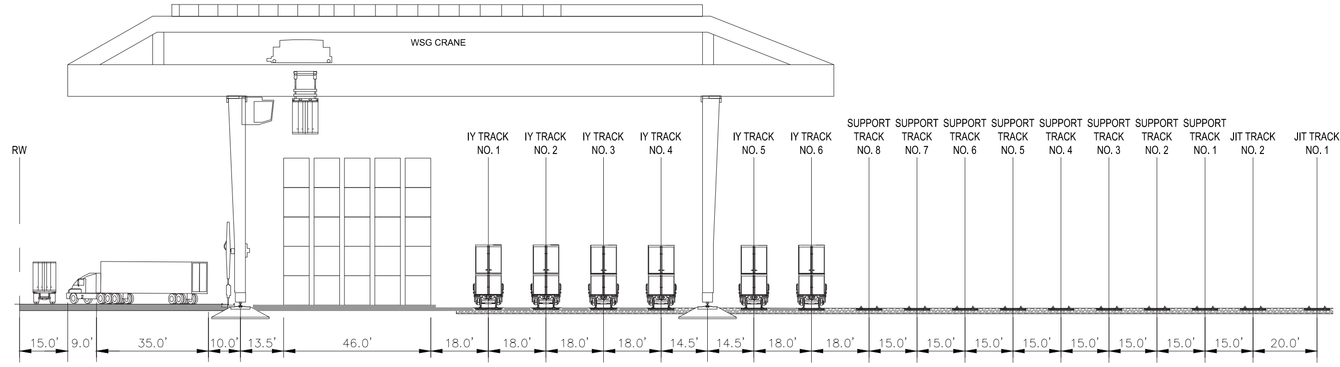
The proposed bulk unloading facility and near-dock intermodal rail yard require nearby support tracks. The desired ratio of support tracks to loading tracks is 2:1 to 1.5:1. The rail master plan calls for constructing an eight-track support yard (see Figure 10) adjacent to the proposed near-dock intermodal rail yard with tracks dedicated to either commodity or intermodal unit trains. The yard is designed to handle 24 to 28 commoidity and/or intermodal unit trains per week.

KNIGHT (MANIFEST) YARD

The former Oakland Army Base manifest yard is replaced with a new seven-track flat switching yard (See Figure 10) with a 200-railcar storage capacity. The throughput capacity of the yard is estimated at between 100 and 150 railcars per day based on a 200-railcar capacity and estimated yard delay time of 36 to 48 hours. This facility can support between 13,000 and 20,000 revenue railcars annually. Refer to Appendix B – Rail Capacity Design Worksheets, Manifest Yard Capacity Design Worksheet for more detailed design information.

The yard design provides an interchange connection with the UPRR's adjacent Desert



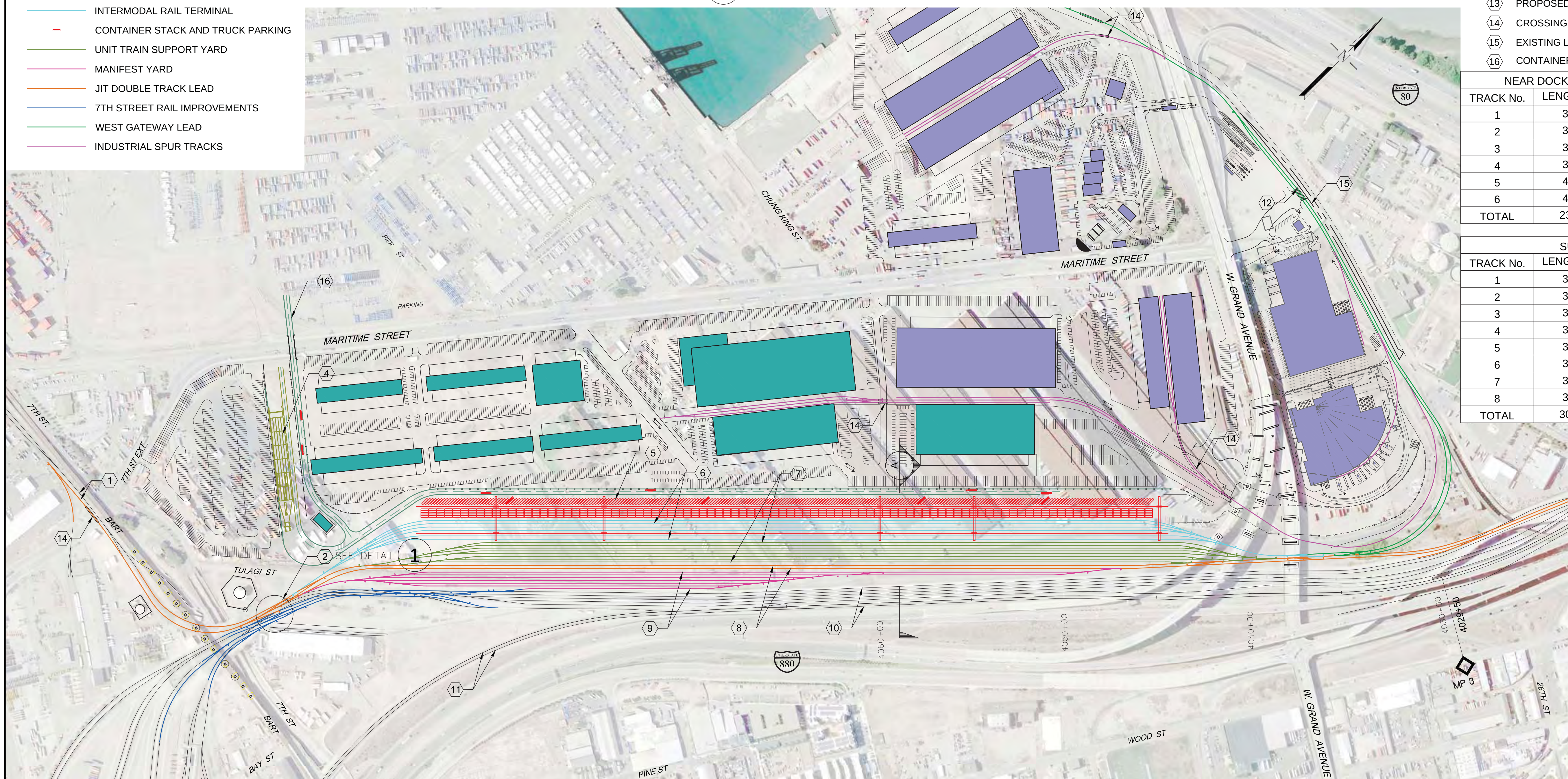


KEY NOTES:

1. JIT LEAD (DOUBLE TRACK)
2. 7th STREET THROAT
3. NOT USED
4. TRUCK GATE FOR NEAR DOCK TERMINAL
5. NEAR DOCK INTERMODAL TERMINAL CONTAINER PARKING
6. NEAR DOCK INTERMODAL TERMINAL TRACKS
7. SUPPORT YARD
8. JIT LEAD TRACKS
9. NEW KNIGHT YARD (MANIFEST)
10. EXISTING UPRR DESERT YARD
11. EXISTING UPRR MAINLINE TRACK 1 & 2
12. OAKLAND WEST GATEWAY LEAD
13. PROPOSED OUTBOUND GATE
14. CROSSING
15. EXISTING LEAD TRACK TO BE REMOVED
16. CONTAINER TERMINAL ACCESS ROAD (PRIVATE)

LEGEND

- INTERMODAL RAIL TERMINAL
- CONTAINER STACK AND TRUCK PARKING
- UNIT TRAIN SUPPORT YARD
- MANIFEST YARD
- JIT DOUBLE TRACK LEAD
- 7TH STREET RAIL IMPROVEMENTS
- WEST GATEWAY LEAD
- INDUSTRIAL SPUR TRACKS



NEAR DOCK INTERMODAL TERMINAL TRACKS

TRACK No.	LENGTH (FT)	270 FT CARS	305 FT CARS
1	3,800	14	12
2	3,840	14	12
3	3,870	14	12
4	3,930	14	12
5	4,050	15	13
6	4,120	15	13
TOTAL	23,610	86	74

SUPPORT YARD TRACKS

TRACK No.	LENGTH (FT)	270 FT CARS	305 FT CARS
1	3,800	14	12
2	3,810	14	12
3	3,810	14	12
4	3,890	14	12
5	3,890	14	12
6	3,910	14	12
7	3,740	13	12
8	3,920	14	12
TOTAL	30,770	111	96

GRAPHIC SCALE
0 150 300 600 900
(IN FEET)
1 INCH = 300 FT.

KEY PLAN
(N.T.S.)

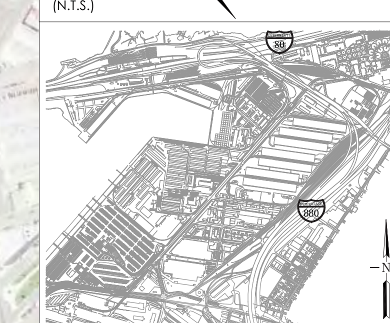


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Figure 10

PROJECT INFO.

OAKLAND GLOBAL TRADE AND INDUSTRY CENTER

OGTIC BUILD-OUT RAIL MASTER PLAN

NEAR-DOCK INTERMODAL RAIL

REV	DATE	COMMENT

JOB NO.	168294
SCALE:	1" = 300'
DATE:	01/31/2012
DRAWN BY:	IK
CHECKED BY:	BK

DRAWING NO.
SHEET OF

Feb 06, 2012 – 3:13pm, Plotted By:kelly
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Yard. The rail master plan envisions that the Knight Yard construction is linked to the vertical development of the industrial park along Maritime Drive. Construction of the two longest yard tracks and connection to the UPRR Desert Yard is the recommended initial construction phase for the Knight Yard. As demand grows, the remaining four yard tracks can be added without interruption of rail service.

WEST GATEWAY LEAD AND INDUSTRY SPUR TRACKS

The existing West Oakland Gateway lead (2 tracks), which runs from the east end of the proposed Knight manifest yard west to Berth 7 is reconstructed to provide access to the existing berths for bulk unloading. The proposed industrial spur track design has 80 railcar unloading spots.

The double track lead will include two new at-grade crossings of the relocated Burma Road, replacing an existing crossing. Existing private crossings for EBMUD will be replaced as part of this work. This rebuilt and relocated crossing (from the abandoned Wake Avenue) will see 6 to 8 switching moves a day, with an average blocking time of 3 to 5 minutes as trains move across the crossing. Trains are not expected to switch back and forth across the crossing, blocking the crossing for extended periods.

RAIL ACCESS IMPROVEMENTS

The rail master plan identifies three specific rail access projects (See Figure 10) to improve arrival /departure of trains to the OGTIC, allow parallel arrival /departure moves into the near-dock intermodal and intermodal support yards, and to provide a separate double track lead into the JIT intermodal rail terminal. Access improvements include:

UPRR Main Line Rail Access Improvements

The Master Plan includes the construction of approximately 6,200 ft. of new arrival/departure track constructed within the Union Pacific Railroad Company's (UPRR) existing right-of-way from Station 3968+00 (MP 4.2), just south of Powell Street to the north end of the proposed intermodal support yard at Station 4030+00 (MP3.0) where the new track ties into UPRR'S Desert Yard track (DY) No. 3 (DY3) track. The work includes installing a new power operated No. 20 turnout off of UPRR's DY2at MP 4.2 and realignment of DY 1-3 between Station 4010+00 and 4030+00 including installation of three No. 15 turnouts and one No. 15 crossover. The revised track configuration will allow parallel moves into the proposed near-dock intermodal yard and support tracks. The new arrival/ departure track ties into existing DY 3 near Station 4030+00

Joint Intermodal Terminal Double Track

A new double track lead, into the Port of Oakland's Joint Intermodal Yard (JIT), will be constructed off of the new arrive/departure track adjacent to the UPRR Desert Yard. New No. 15 turnouts to JIT1 and JIT2 will be constructed at Stations 4026+00 and 4012+00 respectively. The new double track lead ties back into the existing JIT double track lead approximately 500 feet east of the existing Maritime Street grade crossing. The new JIT1 and JIT2 tracks can hold 7,400 ft. and 8,800 ft. long trains between Maritime Drive and Powell Street respectively. These two new JIT leads will allow two full trains to be pocketed, simultaneously, clear of the

Maritime Street at-grade crossing and the UPRR main lines.

Because of the JIT track layout, intermodal railcars will be moved into and out of the facility in approximately 4,000-foot train lengths. Outbound full trains can be built on the new JIT leads and inbound trains will be broken on the JIT leads.

Based on the JIT working track capacity, it can be assumed that JIT will handle 3 trains a day in each direction. This will require 6 to 8 train movements a day to cross the Maritime Street at-grade crossing. These train movements will be held north or south of the at-grade crossing when necessary, and will only block the crossing while moving through. Trains will pass through the crossing at an average speed of 5 mph, resulting in approximately a 9-minute delay at the crossing per train movement. Many of these movements will be made at night, when traffic in the area is at a minimum.

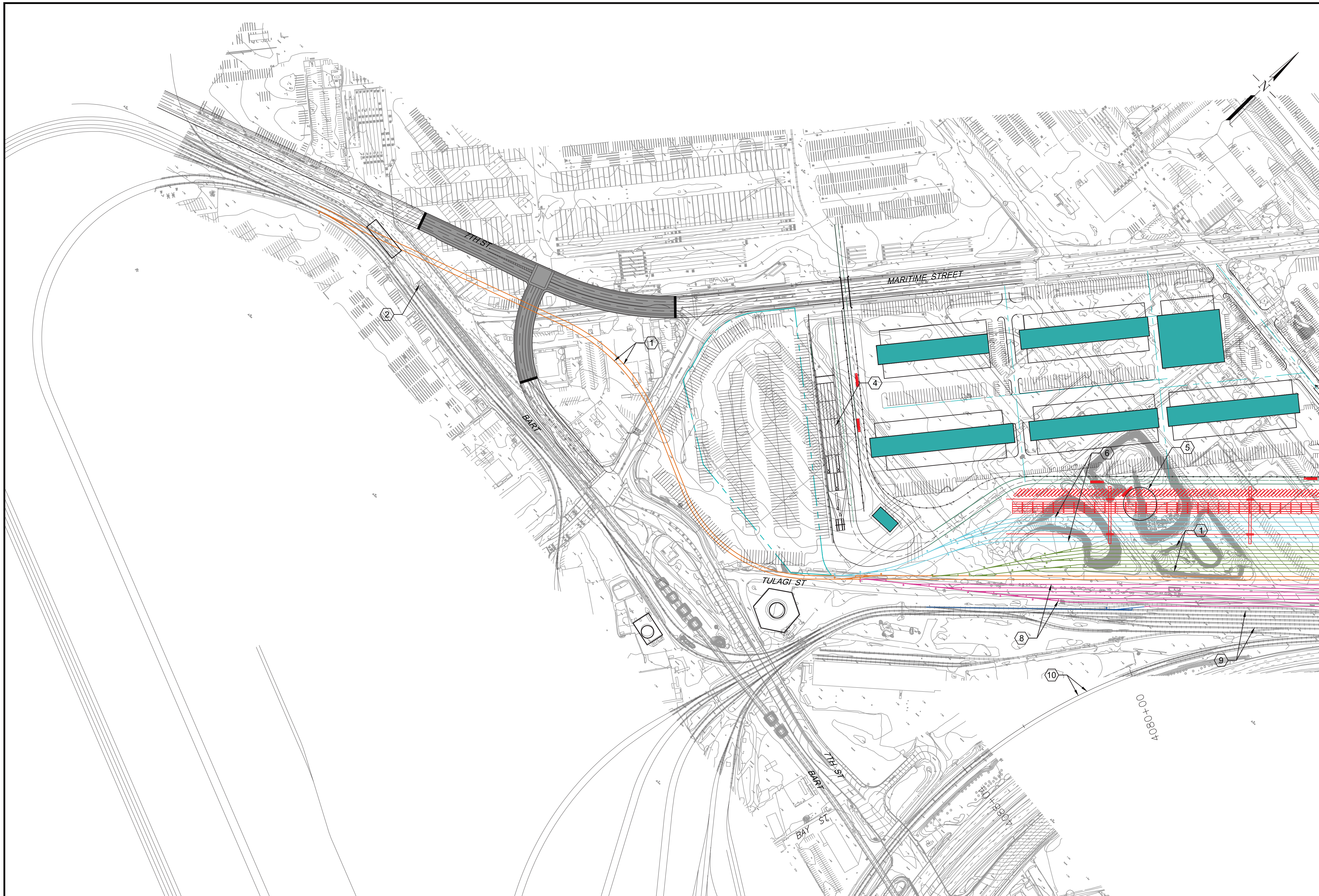
7th Street Grade Separations

A. The existing underpass (of rails) at the eastern end of 7th Street is sufficient for existing and new railines. The rail master plan reconfigures the existing tracks over the street to provide parallel train movements between UPRR's Railport and Desert Yard. The reconfigured track also provides room for the proposed JIT double track discussed in Item No. 2 above.

B. An option to Item No. 2 above is a different routing of the JIT double track lead in a more north/south configuration. This would require construction of an elevated overpass to raise the intersection of 7th and Maritime Drive (See Figure 11) to provide for a grade separated rail corridor to the BNSF's OGIT. Under this design the JIT double track lead is relocated to cross over the BART tunnel portal, then runs parallel to Maritime Drive before crossing under the elevated intersection of 7th Street and Maritime Drive. The west lead tracks into the intermodal terminal, unit train support yard, and Knight (Manifest) Yard would be realigned. The proposed track configuration between UPRR's Railport and Desert Yard would remain unchanged.

C. Construction of an elevated overpass (Item B above) would be an alternate to the "tug road" between Ports America and the OHIT. The overpass would allow truck traffic and rail to pass underneath it.

D. There have been many past studies of connecting the JIT to a new OHIT. An elevated overpass as outlined in B above would open up connectivity on the ground without rail/road crossings at Maritime Street. An overpass would allow more trackage on the ground, thus more train building options for BNSF's JIT. While connecting the JIT and OHIT directly is apparent (using an overpass), it does not yield proportional increase in rail thoughput. Overall rail capacity of the Port is first driven by main line capacity, then by balancing arrival/departure track and support track with the capacity of the proposed rail facilities. Increasing lead lines within the Port adds track and train building flexibility and, with the overpass option, reduction of road crossings. However, it does not directly increase freight capacity. A new overpass, while beneficial, also has a significant cost impact. A benefit/cost analysis is recommended to determine the project's cost effectiveness.



KEY NOTES:

1. JIT LEAD (DOUBLE TRACK)
2. BART TUNNEL PORTAL
3. NOT USED
4. TRUCK GATE FOR NEAR DOCK TERMINAL
5. NEAR DOCK INTERMODAL TERMINAL CONTAINER PARKING
6. NEAR DOCK INTERMODAL TERMINAL TRACKS
7. SUPPORT YARD
8. NEW KNIGHT YARD (MANIFEST)
9. EXISTING UPRR DESERT YARD
10. EXISTING UPRR MAINLINE TRACK 1 & 2

KEY PLAN
(N.T.S.)

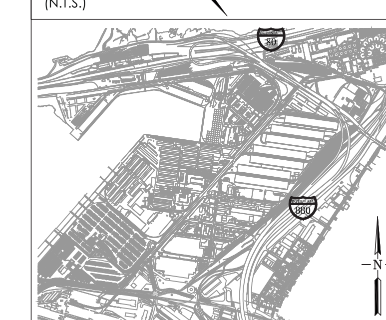


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Figure 11

PROJECT INFO.

OAKLAND GLOBAL TRADE AND INDUSTRY CENTER

OGTIC RAIL MASTER PLAN
7TH STREET FULLY GRADE SEPARATION OPTION

REV	DATE	COMMENT

JOB NO.	168294
SCALE:	1" = 200'
DATE:	01/31/2012
DRAWN BY:	IK
CHECKED BY:	BK

DRAWING NO.

SHEET OF

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Project Capital Costs and Schedule

Project capital cost estimate and schedule were prepared for the rail infrastructure and incorporated into the overall OGTIC Master Plan documents. Please refer to the MP documents for detailed schedule and cost information.

Conclusions

Summary of Findings

The goal of the master planning effort was to define the rail infrastructure requirements for a wide range of potential rail services at the OGTIC project. The study looked at intermediate to long-term rail infrastructure requirements for the identified rail services and desired throughput capacities for intermodal rail. Based on this study, the following general conclusions can be drawn:

- The property within the OGTIC identified for rail infrastructure can support a wide range of rail-served uses, including intermodal rail, commodity unit trains, and manifest (industry) trains.
- Access improvements into the OGTIC are needed to support the additional train traffic generated by the OGTIC and improve the overall train movements into the existing UPRR Railport and BNSF JIT intermodal facilities. These improvements are included as part of the OGTIC rail master plan, although a significant portion of the improvements is located on UPRR property outside of OGTIC. The UPRR will need to analyze and approve these improvements.
- The proposed OGTIC rail improvements including the JIT double track lead, manifest yard, and unit train support yard should provide improved rail operations to the entire port rail system allowing trains to flow smoothly off of the mainlines and into their respective terminals without delaying other trains.
- The proposed manifest yard can support up to 20,000 revenue railcar loads annually and is capable of supporting the proposed industrial development.
- The Build-out Rail Master Plan envisions an intermodal rail facility with a throughput capacity of 400,000 lifts annually.
- The rail master plan can be achieved with or without any 7th Street changes.

The proposed rail layouts serve as a basis for the roadway and utility master planning efforts.

Next Steps

Based on the information developed during this study, the following steps are recommended:

- Initiate formal discussions with the UPRR on proposed rail access improvements and required rail infrastructure needed to support potential new rail business to the OGTIC. Since this is one of UPRR's eight most congested corridors, any proposed new rail business to the OGTIC will need to be approved by their senior management. The process can take a minimum of 128 days.
- Initiate formal discussions with the BNSF to confirm that the proposed improvements are beneficial to their current and future operations at the Joint Intermodal Terminal.
- Rail design and cost estimates should be refined and verified as additional survey information becomes available.

- Perform detailed rail and traffic studies to confirm the capacity of the proposed rail facilities and potential traffic impacts.

Appendix A: Rail Design Criteria

RIGHT-OF-WAY

There is no standard right-of-way width for the project because of the layout of the site and the complexity of the areas to be served by rail. Improvements proposed within existing UPRR right-of-way will comply with UPRR requirements. To the extent practicable, the minimum clearance from the centerline of track to the adjacent right-of-way line shall be 10 feet, with the desired clearance of 25 feet.

TRACK SECTION

The track section varies depending on location, whether the track is a yard, a lead or connecting track, or an extension of a main line. Proper drainage design is of paramount importance regardless of type of track. To minimize maintenance and to help prevent track failures and improve safety, the design for all tracks must incorporate proper drainage.

The entire project site is slightly above sea level. The site consists of reclaimed land and is generally flat. The site is subject to settlement, requiring the site to be surcharged or rail facilities designed to accommodate the predicted settlement.

Typical single and double track sections consist of a 6-inch layer of subballast on top of a prepared subgrade. The subgrade is shaped to allow drainage to flow away from the track on both outward sides. Typical yard or multiple track(s) will also have a 6-inch layer of subballast on top of a prepared subgrade; however, the subgrade in this case is shaped to drain into track underdrains between tracks at every alternate track. The track drains will convey runoff to appropriate catch basins where oils and sediments can be trapped before entering the Bay. Walkways for trainmen will be incorporated into the typical track section as described by CPUC G.O. 118.

Where maintenance and access roads are needed, the subballast and subgrade will be extended an additional 10 feet (or more) to allow the placement of a road.

TRACK GEOMETRY, HORIZONTAL AND VERTICAL ALIGNMENT

The circular or simple curve for the track geometry will be based on the chord definition and specified by its degree of curve (Dc). The degree of curve has been adopted as a unit of sharpness and is defined as the central angle subtended by a 100-foot-long chord for ease of field layout. The important relations of simple curves for the chord definition are as follows:

Radius	$R = 50/\sin(Dc/2)$;
Length of curve	$Lc = 100\ (\triangle/Dc)$;
Tangent distance	$T = R\tan(\triangle/2)$;

The minimum length of circular curve will be 100 feet for main lines and 50 feet for yard and industry tracks. See **Figure 1** for illustration of the simple circular curve.

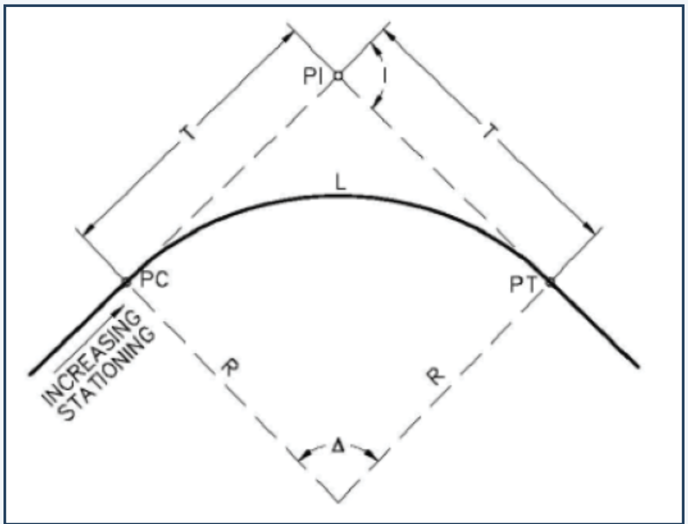

Figure 1: Simple Circular Curve

△	Total Intersection Angle
L	Length of Circular Curve
PC	Point of Curve
PI	Point of Intersection of Main Tangents
PT	Point of Tangent
R	Radius of Curve
T	The Tangent Distance (semi-tangent)

Spiral (transition) curves will be used only on main lines where speeds exceed 25 mph, and all other curves in the project will be simple curves. Superelevation on main line is based on a 1-inch unbalance for given speed and curvature. Superelevation on other curved track will be determined on a location basis. **See Table 1** for maximum allowable horizontal curvature.

Table 1: Maximum Horizontal Curvature

Type	Maximum Curvature (Degrees)	
	Preferred	Absolute
Main Track (Speed > 25 mph)	4º00'00"	n/a
Yard and Industry Tracks (10 mph)	10º00'00"	12º30'00"

The minimum return curve radii to use that provide safe train operations to connect with parallel tracks are listed in **Table 2** below:

Table 2: Required Turnout Return Curves

Location	Turnout Number	Degree of Curve
Yard, ladder & lead tracks	9	9º30'00"
Yard, ladder & lead tracks	11	5º45'
Main line, main line sidings & lead tracks	15	3º15'
Main line & main line sidings	20	1º45'

Vertical curves will be designed as recommended in AREMA Manual for Railway Engineering shown in the following formula:

$$L = (D\,V^2K)\ /A$$

where,

A = vertical acceleration, in ft/sec^2

D = absolute value of the difference in rates of grades expressed in decimal

K = 2.15 conversion factor to give L, in feet

L = length of vertical curve, in feet

V = speed of train, in miles per hour

The recommended vertical acceleration (A) for freight trains for both sags and summits is 0.10 ft/sec2. The minimum length of vertical curve on tracks where speed exceeds 25 mph will not be less than 100 feet. On tracks where the speed is 25 mph or less, the minimum vertical curve length will not be less than 50 feet. In summit areas, locations of all signals shall be checked for visibility.

See **Figure 2** for vertical curve nomenclature.

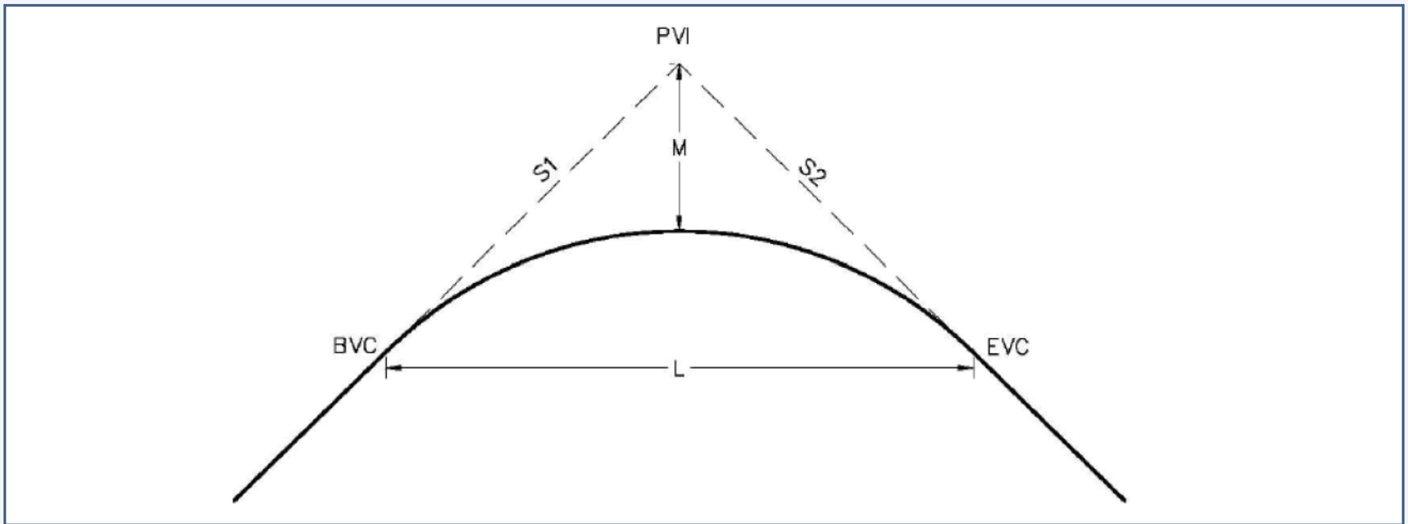

Figure 2: Vertical Curve

BVC	Beginning of Vertical Curve
EVC	End of Vertical Curve
PVI	Point of Intersection for Vertical Curve
S1	Slope of Entering Tangent in Percent
S2	Slope of Departing Tangent in Percent
L	Length of Vertical Curve
M	Correction in Elevation at PVI
EL	Elevation

When vertical Curve is Concave Downward:

M = [(EL @ PVI x 2) – (EL @ BVC + EL @ PVI)] / 4

When vertical Curve is Concave Upward Upward:

M = [(EL @ BVC + EL @ EVC) – (EL @ PVI x 2)] / 4

The minimum tangent length for yard and non-revenue tracks shall be established as per **Table 3**.

Table 3: Minimum Allowable Tangent Lengths

Minimum Tangent Location On Yard and Non-Revenue Tracks	Minimum Tangent Length (feet)	
	Preferred	Absolute Minimum
Between reverse curves	100	60
Between Point of Switches of turnouts (TOs)	60	15*

**Tangent length will not be less than the length of stock rail projection*

TRACK CENTERS

Track centers for all tracks are governed by CPUC General Order (G.O.) 26-D. Most sidings, double leads, and parallel yard tracks will have 15-foot track centers. Ladder tracks parallel to main line or lead tracks will have 20-foot track centers. In special cases where parallel leads or sidings exceed 12° curvature, track centers will be greater than 15 feet, as indicated in CPUC G.O. 26-D.

TURNOUT STANDARDS

Four different turnout sizes are planned for the project: Nos. 9, 11, 15 and 20. All turnouts will be standard left- or right-hand turnouts with Rail Bound Manganese (RBM) frogs. No. 9 turnouts will be used primarily in most yard and ladder tracks and where leads and spurs tie into other leads or yard tracks. No. 11 turnouts will be used within lead and connecting lead tracks. No. 15 turnouts are proposed to be used in main line, main line sidings or main lead tracks where the turnouts are power operated and controlled remotely to allow for speeds in excess of 25 mph, and No. 20 turnouts are proposed to be used in main line and main line sidings where the turnouts are power operated and controlled remotely to allow for speeds up to 40 mph. **Table 4** shows the switch point-to-point of intersection (PI) distances, frog angle and maximum allowable speed (in the diverging direction).

Table 4: Turnout Information

Turnout	PS to PI Distance (feet)	Frog Angle	Max. Allowable operating speed (mph)
9	30.17	6°21’35”	15
11	31.25	5°12’18”	20
15	39.97	3°49’06”	30
20	61.06	2°51’51”	40

Walkways at turnouts will be in accordance of CPUC G.O. 118.

RAIL STANDARDS

Standard rail sections for the project will be as follows:

- Main Line – 136 RE
- JIT Leads – 136 RE
- Yard Track – 115 RE or greater
- Industry Spur Tracks 115 RE or greater

Rail will be continuously welded rail (CWR). Joints are permitted within the project frogs, switches, and where insulated joints are required unless approved by the operating railroad. All welded connections, whether used to fabricate strings or created in the field to weld strings together, will be fully ultrasonically tested in accordance with AREMA standards.

CROSSTIES

Crossties used in this project will be 8’-3”concrete except at turnouts where timber crossties will be used. At grade crossings, either concrete or timber crossties are permitted. Tie spacing will be 24 inches on centers for main lines and lead tracks. Tie spacing for yard tracks and industry spurs will be 26 inches on centers.

CLEARANCES

Clearances, distance from track or nearest rail to an obstruction horizontally, and the distance from the plane of the top of rail vertically, will be governed by CPUC G.O. 26-D. Clearances to overhead power and communication lines above top of rail are governed by CPUC G.O. 95. CPUC G.O. 26-D contains the minimum distances of signal masts, poles, columns, walls, sign posts, and facility appurtenances, etc., from the track or nearest rail as appropriate.

FENCING

Chain link fencing where required for security shall be 8-foot fencing with three strands of barbed wire on top.

Appendix B: Rail Capacity Design Worksheets

CCIG Oakland Global Development
Oakland Outer Harbor Rail Intermodal Yard

Near-Dock Intermodal Design Work Sheet -400,000 Lifts/Year

TERMINAL PERFORMANCE (INPUT)

Terminal Operations

Annual Lifts =	=	400,000	
Working Days =	=	362	
Crane Type =	=	2	1=Side Lder 2= RTG,RMG
Crane Configuration =	=	1	1= Std 2= Nested
Crane Production Rate	=	30	See table below
Nested Crane Prod. Rate	=	-	See table below
Container Dwell Time	=	2	In days
Ship Call Peaking Factor	=	**1.2**	Weekly

Crane Production Rates			
	Rate (Lifts/Hr.)		
Type	Peak	Sustainable	Low
RTG	35	30	25
Side Loader	32	25	20
RMG	35	30	25
RMG (Nested)	35	30	22

Rolling Stock

Locomotives/Train	=	3	
Locomotive Length	=	85	See table below
Car Length	=	270	See table below
Max. Train Length	=	8,000	

Railcars				
	5-well	3-well	1-well	Locomotives
BNSF	270	n/a	n/a	85
UPRR	305	n/a	n/a	85
Capacity	10	n/a	n/a	n/a
Capacity	10	n/a	n/a	n/a

Rail Operational Assumptions

Arrival Time (hrs)	=	2	Dependent on rail configuration
Departure Time (hrs)	=	2	Dependent on rail configuration
Staging Track Ratio	=	1.5	Recommended range 1 to 2
Arrival/Departure Tracks	=	2	Recommend range 2 to 4
Rail Yard Working Shifts	=	2	9 Hours crane production/shift
Container Stack Shifts	=	2	8 Hours crane production/shift
No. Train Cuts Allowed	=	2	Limited to 2 for road crews
Percent Loads/Train	=	95%	Recommended range 85% to 100%
Track Utilization Factor	=	80%	Recommended range = 50% to 80%

TERMINAL DESIGN REQUIREMENTS (OUTPUT)

Terminal Productivity

Train Length	=	7,815
Railcars/Train	=	28
Peak Lifts/Day	=	1,330
Peak Trains/Day	=	5.0
Containers/Train	=	266

Terminal Infrastructure

Length Load Out Tracks	=	3,780
No. Cranes	=	5
No. Nested Cranes	=	-
No. Load out Tracks	=	6
Stack Capacity	=	2,660

Terminal Support Infrastructure

Staging Tracks	=	9	
Inbound Gate Capacity	=	n/a	
Outbound Gate Capacity	=	n/a	
On-Site Parking	=	0	(combination of chassis or grounded paring)

Disclaimer: This spread sheet model was prepared for the sole use of CCIG Oakland Global Development. It is intended as a high level planning tool to allow experienced designers to roughly size various elements rail intermodal terminals based on various metrics and assumptions. Detailed rail and terminal operational simulation modeling is recommended to advance design beyond planning level.

Use Instructions:

Orange colored cells allow users to modify inputs to the spread.
Light blue are either fixed inputs or description of the inputs. Fixed inputs are based on commonly accepted design metrics. These metrics can vary significantly depending specific local site conditions and practices.
Light olive colored cells are outputs based on user supplied inputs.

Note: All cells except orange colored cells are locked to prevent accidental overwriting of formulas.

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Rail Shipping Volumes Work Sheet -Rail Master Plan

Summary of Railcar Volumes

											Switching Movements					
	OGTIC															
Type of Rail Cargo	Work	Daily Railcars		Trains (120 railcars)				Annual Railcars			Internal OGTIC Switches		Destination	Average round Trip Distance (miles)	No. of switch moves/day	Total switching distance
	Days	Inbound	Outbound	Inbound	Outbound	Daily Total	Annual Total	Inbound	Outbound	Total	To Industry	To Yard				
Manifest Cargo	260	53	53	0.4	0.4	0.8	208	13,780	13,780	27,560	53	53	Industry Spot	5.8	2	11.6
Commodity Unit Train (one daily)	260	120	120	1	1	2	520	31,200	31,200	62,400	60	60	West Gateway Bulk Terminal	4.9	2	9.8

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Rail Shipping Volumes Work Sheet -Rail Master Plan

Non-Intermodal Railcar Capacity Volumes

New Knight (Manifest) Yard Capacity Calculations

Track No. North to South)	Clear Length (TF)	Capacity (60-ft Railcars)
1[(1)]	2280	38
2[(1)]	2070	34
3	2080	34
4	1970	32
5	1690	28
6	1560	26
7	990	16
Total	12640	208

(1) Excludes switching leads east of ladder tracks.

Average Yard Detention Time (hours)

Desirable	**36**
Maximum	**48**

Manual (Static) Yard Capacity Formulas [(2)]

$V_Y = V_D * T_D / 24$ $V_D = V_Y * 24 / T_D$

V_D = Daily Traffic Volumes (Railcars/Day)

T_D = Average Yard Detention Time (Hours)

V_Y = Average Number of Railcars Detained at the Yard

(2) Reference: FRA Railroad Classification Yard Technology Manual, March 1981

Daily Railcar Volumes based on Knight Yard Capacity

V_Y = 208

$T_{D(des.)}$ = 36

$T_{D(max.)}$ = 48

$V_{D(des.)} = V_Y * 24 / T_{D(des.)}$ = 138 Manifest yard capacity exceeds industry service requirements

$V_{D(min.)} = V_Y * 24 / T_{D(max.)}$ = 104

Warehouse/Transload Car Spot Capacity

Warehouse No. (East to West)	Dock Length (TF)	Capacity (60-ft Railcars)	
1	700	11	
2	600	10	
3	800	13	
4	630	10	
5	780	13	
6	630	10	
7	800	13	
8	N/A		Warehouse located west of 14th Street
9	N/A		Warehouse located west of 14th Street
10	N/A		Warehouse located west of 14th Street
11	N/A		Warehouse located west of 14th Street
12	600	10	
13	800	13	
Total	4940	80	

Average Industry Detention Time (hours)

Desirable	**36**
Maximum	**48**

Daily Railcar Volumes based on Warehousing car spot capacity

V_Y = 80

$T_{D(des.)}$ = 36

$T_{D(max.)}$ = 48

Total No. of Railcars Switched to Industry

$V_{D(des.)} = V_Y * 24 / T_{D(des.)}$ = 53 Total of 106 railcars daily between manifest yard and industry spurs

$V_{D(min.)} = V_Y * 24 / T_{D(max.)}$ = 40 Total of 80 railcars daily between manifest yard and industry spurs

Oakland West Gateway Bulk Terminal

Trains per day	No.	No. of Railcars (60-ft.)	Train Length
Inbound (loaded)	1	120	7200
Outbound (empty)	1	120	7200

Bulk Unloading Terminal Capacity = 60

Required Switches to/from Bulk Terminal /day = 2 (60 car cuts)

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