APPENDIX I

Throughput Methodology

BERTHS 136-147 CONTAINER TERMINAL
PROJECTED THROUGHPUT

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Introduction

To support port-wide planning efforts and the specific requirements of environmental documents, the Port of Los Angeles Engineering Division has developed a method to estimate throughput for container terminals for the years 2005, 2010, 2015, 2025, and 2030. This paper addresses the general method of calculating projected cargo throughputs and then addresses the specific assumptions made when this method is applied to the numerous alternatives being studied in the environmental analysis of Berths 136-147 (TraPac). Port staff initiated this effort in late 2002 and have continued to revise estimates and this paper as alternatives changed and new information became available, such as actual through put numbers.

General Methodology

Two main sources of information regarding the container volume demand and capacity projections for the San Pedro Bay area were utilized in this report: the Mercer market-based study and the JWD Capacity Analysis Report. A third source of information was actual terminal throughput, which was used to set the initial 2005 projection.

The Mercer Study[1], dated July 2001, evaluated the potential container throughput demand for the two San Pedro Bay Ports, the Port of Los Angeles (POLA) and the Port of Long Beach (POLB). This market-based forecast was prepared by Mercer Management Consulting to project long term trends for various types of waterborne cargo, including containerized cargo. Their approach examined a wide range of market conditions, trade scenarios, demographics, trade barriers, and economic models for trading partners on a global basis. Although this forecast does examine general infrastructure and cargo handling capabilities of both the POLA and POLB, it is primarily a *demand* based market forecast that projects the volume of cargo that would be handled at the San Pedro Bay Ports, provided the physical capacity to do so was unconstrained.

The throughput projections were reported in terms of total number of TEUs (twenty-foot equivalent units) passing through both ports. Using best professional judgement on the information available at this time, staff distributed the throughput forecast by Mercer to individual terminals using the following method. As the Ports of Los Angeles and Long Beach are very similarly-sized facilities, and are likely to remain so for the foreseeable future, 50% of the total projected cargo throughput for a given year was assumed to come through the Port of Los Angeles, and the other 50% through the Port of Long Beach. A uniform per-acre throughput projection for all terminals was determined by dividing this number by the projected total acreage port-wide dedicated to container terminals for the corresponding year. Although individual container terminals do operate at different

[1] Mercer Management Consulting. July 2001. *San Pedro Bay Long-Term Cargo Forecast Update*

throughput-per-acre levels, over time it is not economical for a terminal to maintain significantly denser, and correspondingly more expensive, operations than its competitors. Also, projecting small differences in per-acre throughputs 10 and 20 years into the future would be speculative based on the single Mercer throughput value for the entire San Pedro Bay.

Figure 1 shows how the Mercer forecast was used to determine a demand-based projection for each of the Port's container terminals (assuming the proposed project is constructed at Berths 136-147). As the Mercer Study only projected demand through 2020, the projected annual rate of growth between 2010 to 2020 of 6.0% was used to extrapolate a 2025 demand value to correspond to the 2025 capacity projection described below. It should be noted that the port-wide projected throughput-per-gross-terminal-acre figures were greatly influenced by the addition of the Pier 400 Terminal acreage (484 acres) in year 2005. This resulted in a port wide average per-acre decrease in throughput from 4700 TEUs/gross acre(gr. ac.) in 2002 to 4000 TEUs/gross acre by 2005. However, this only represents an average, and as discussed previously, terminal throughput will typically vary from one terminal to another.

The second source of information utilized in this report was the November, 2002 JWD Capacity Analysis Report[2], and subsequent revisions to this report. This report evaluated the physical capacity of POLA's existing and planned container terminal expansion for the years 2002, 2005, 2010, and 2025. Unlike the previous forecast approach, this report examined the physical throughput *capacity* of each terminal based on a detailed analysis of berthing and backland operational criteria. Reasonably foreseeable changes to operational labor practices, increased hours of operation, ship sizes, container stacking heights, and other factors were built into a capacity analysis model. The model forecast per-acre throughput capacities independently for each terminal. It also determined whether the backland or berth was the limiting factor for each terminal and reported an overall terminal capacity for each of the analysis years. In all cases, the JWD model yielded a maximum practical per-acre capacity for the terminal for the given year. The report was updated in June of 2005 to include data for 2015 for all terminals. 2015 data was projected using assumptions consistent with the projections for the other years, which were not changed in this revision[3].

POLA staff evaluated the assumptions made in the JWD study and found them to represent reasonable forecasts of future conditions. The assumptions in the JWD report are specific to West Coast ports, and do not reflect trends or operating practices at Asian or other foreign ports. For example, the report shows 21 hours of effective operation for terminals operating around the clock, which allows for shift changes and other labor practices particular to the labor agreements at West Coast ports. No radical increases in throughput due to unforeseen technological changes are assumed, nor are radical decreases due to an expanded Panama Canal or the expansion of Mexican ports.

[2] JWD Group. November 2002. *Capacity Analysis Report Port of Los Angeles*
[3] JWD Group. June 2005. *Capacity Analysis Report Port of Los Angeles*

Since completion of the JWD Capacity Report, assumptions on the scope and timetable of expansions and improvements at the Berths 136-147 container terminal have been slightly modified. JWD provided the underlying model, incorporating the details and assumptions listed above, to the Port. After discussions with JWD, it was agreed that the scope changes at the two terminals could be reevaluated using this model by adjusting two parameters: number of berths and gross terminal acreage. By varying these two inputs, the Port was able to generate throughput capacity projections for the proposed projects and all alternatives for Berths 136-147.

All other parameters would remain the same, with one exception. At a meeting held on January 25, 2006, representatives of TraPac questioned the ship size assumptions made for the years 2010 through 2030. The assumed increase in ship size from 2005 to 2025 in the JWD model was approximately 20%, and TraPac indicated that based on their fleet expansion plans, the average size of a ship would nearly double between 2005 and 2025. The average number of lifts per ship call, which is directly related to average ship size, was accordingly modified. The resulting increase in throughput caused by this change was small, around 6% for 2025. This is due to the fact that unloading and loading rates are unchanged for the larger ships. The larger average ship size was used for all Berths 136-147 alternatives.

The Mercer Forecast and the JWD Capacity Report reported different container throughput projections for each of the analysis years. This difference was expected since the studies approached the cargo forecasts from different perspectives. Essentially, the reports discussed above can be used to provide an upper (capacity) and lower (demand) bound for projected terminal throughput for each of the analysis years. For the 2005 and 2010 forecast years the Mercer demand values were significantly lower than what the JWD Report identified for each terminal's capacity level. For the 2025 year, the reverse was true for Berths 136-147, where demand exceeded terminal capacity. Berths 136-147 were therefore considered capacity constrained. Refer to **Figure 2** for a summary of throughput projections for the proposed project.

For any given analysis year, where the capacity number is lower than the demand, it is clear that capacity will be the limiting factor. It can also be argued that in the opposite case, where demand is the lower number, it too will govern, as a terminal cannot process more cargo than is available. Initially Port staff had some concerns that this approach could possibly underestimate the throughput for a specific terminal by not accounting for the ability of individual terminals to handle more than the port-wide averages of market demand by operating at higher levels of efficiency than other terminals. But over the long run, considering that individual terminals do not have the unconstrained capability to capture market share without any regard to service, cost competitiveness, and profitability, staff believes this approach is valid. For a terminal to handle a greater number of containers per acre than its competitor, it could compromise service and in general would require additional labor costs, longer operating hours, that would result in higher expenses to operate that terminal.

The approach chosen by the Port seeks to consider both of these points. Originally, the three analysis years for this study were 2005, 2010, and 2025, with 2015 added later. For the earliest analysis year, 2005, a projection was calculated based on a 10% per year increase in throughput from its 2001/2002 actual levels. This used the best available data specific to the two terminals, and yields a value higher than projected demand but below capacity. Since this initial 2005 projection was made, it has since been possible to collect throughput data for the years 2003, 2004, and 2005 to check this assumption. The results are shown on **Figure 3**, and show that the 10% per year increase was close but slightly conservative for Berths 136-147. The higher calculated 2005 value was used in the throughput analysis.

Projections for the more distant year, 2025, select the lesser of the demand and capacity projections for that year. It is unreasonable to assume a terminal could operate above its capacity, and projecting a throughput level above the average demand per acre this far in the future would be speculative. For the remaining analysis years, 2010 and 2015, a reasonable balance between the demand and capacity projections can be calculated by straight line interpolation between the 2005 and 2025 projection, assuming linear growth between those years. If this value is greater than the JWD projected capacity, the capacity value is used as a limiting value. **Figure 4** graphically shows that this line lies above the JWD capacity projections, so the throughput projections for those years are constrained to the capacity. This methodology was reviewed by JWD, who concurred that it was a realistic and logical approach in a letter to POLA dated March 7, 2003[3].

After the alternative modeling effort for Berths 100-131 and 136-147 began, it was determined that the analysis should also consider cargo projections out to year 2030. Because neither the Mercer nor JWD study projected throughput beyond 2025, two assumptions were made. First, after discussions with staff from JWD, it was assumed that the JWD throughput capacity for 2025 was essentially a maximum practical capacity for the terminals, based on current assumptions. These include the fact that POLA terminals, by 2025, are operating at 24 hour, 7 day per week operations and container operations are densified to the maximum extent practical. Assuming any increase beyond this level of throughput would be based on speculation. The second assumption was that, by applying a continual 6% growth rate to the Mercer Demand Projections, the demand would outstrip capacity at all POLA terminals by 2030. The 2030 throughput projection is therefore the JWD capacity projection for 2025 for both terminals.

In addition to total throughput in TEUs for each terminal, number of ship calls required to achieve this throughput has also been projected. One of the inputs to the JWD capacity model is the average number of "lifts" per ship visit, which represents the number of containers loaded and unloaded from a ship on an average visit. This number was based on a review of ship call data for each individual terminal, and is scaled up in later forecast years to represent larger ships and increasing fractions of cargo bound for the Port. The number of containers can be converted to TEUs by multiplying by a conversion factor, also unique to each terminal, that takes into account the ratio of twenty-foot, forty-foot, and forty-five foot containers used by each shipping line. Dividing the projected annual

[3] Letter, Mark Sisson, JWD Group, to Port of Los Angeles, 7 March 2003

throughput of a terminal by the average number of TEUs loaded and unloaded during a ship call gives an approximation of the number of ship calls for the year.

This approximation was further refined by considering ship scheduling method used by most shipping lines. For the most part, container ships of a given size are arranged into "strings" that allow a shipper to call at the Port of Los Angeles once per week per string, providing a regular schedule for the shipper's customers. Each string will represent 52 annual ship calls, therefore the total annual ship calls should be a multiple of 52. Additional ship calls are not added individually but instead by adding a "string", or another weekly ship call. Although shippers do not tend to run bi-weekly services, a multiple of 26 was used for the Port's throughput forecasts, to allow for schedule irregularities, invitees, and diversions. The number of annual ship calls generated by the method described in the previous paragraph was rounded up to the next multiple of 26, unless it was within three calls of the next lowest multiple of 26, in which case it was rounded down. This method is assumed to yield an estimate of annual ship calls that is slightly high, but is consistent with the real-world operations of shipping lines.

Specific Assumptions – Berths 136-147

The throughput capacity analysis model generated by JWD for the Berths 136-147 TraPac terminal was provided to the Port in the form of an Excel spreadsheet. All the alternatives were analyzed using this spreadsheet and varying the acreage and number of berths as appropriate to each alternative. The results are summarized in **Figure 5**, showing gross terminal acreage, number of berths, capacity projection (JWD), demand projection (Mercer), and the final projection determined by the Port, for each analysis year in each alternative. For 2005 throughput projections, all alternatives assume the existing terminal will remain unchanged in terms of number of berths and acreage. For 2010 and 2025, the assumptions used to adjust the gross terminal acreage and number of berths are listed below. In all cases, it is assumed that there is no change in number of berths or total terminal acreage between 2025 and 2030.

Proposed Project

The proposed project assumes for 2010 that total terminal area will increase to 233 acres based on development of existing land (including 7 acres north of the existing railroad tracks and 4 acres immediately west of the existing TraPac gate) and 5 acres of fill behind Berth 136 in the Northwest Slip. This fill will be constructed under a separate project. There is no change of acreage assumed in 2015. In 2025, terminal area is assumed to increase to 243 acres by filling and developing the remaining 10 acres in the Northwest Slip. While the total number of berths remains unchanged from 2005 at 3.5, the assumption behind this changes. Larger ship sizes are expected to reduce the effectiveness of Berths 136-139 from 2 to 1.5 berths, while retrofits and new construction at Berths 142-147 will increase the effective number of berths there to 2. While the Northwest Slip fill will allow 400 feet to be added to Berths 136-139, this will still not be enough to increase the effective number of berths there from 1.5. Total number of berths remains 3.5.

Alternative 1 - Proposed Project without 10-Acre Fill

This alternative is identical to the Proposed Project for 2010. Acreage does not increase in 2015, 2025, or 2030, remaining constant at 233 acres. The number of berths for each year follows the same assumption as the proposed project, and remains the constant at 3.5.

Alternative 2 - Proposed Project with Reduced Wharf Construction

This alternative is identical to Alternative 1 with respect to terminal acreage. For number of berths, however, it assumes that only retrofit work is performed at Berths 142-147, with no new wharf construction. This limits the effective number of berths at 142-147 to 1.5, which combined with the 1.5 effective berths at 136-139 for 2010 and 2025 yields an effective berth number of 3 for both projections.

Alternative 3 - OMNI Cargo Terminal

This alternative assumes that the entire terminal is turned over to OMNI uses, and that no new wharves are built, no existing wharves are retrofitted, and no fills are constructed. The number of effective berths is reduced to 3 in 2010, as larger ships reduce the effective length of Berths 136-139 to 1.5. In 2025, the number of effective berths at 142-147 reduces to 1 due to shallow depth and 50 foot crane rail gage. The acreage assumption for 2010 is the same as the proposed project. Acreage does not increase for 2015, 2025, or 2030. It is assumed that one-third of the terminal acreage would be devoted to containers.

Alternative 4 - No Federal Action

This alternative uses the same assumptions for number of berths and terminal acreage as Alternative 3. The terminal remains a dedicated container terminal, so the total acreage of 233 acres is used in the model.

Alternative 5 - No Project

This alternative assumes that no improvements are constructed at the TraPac facility. Terminal acreage remains constant at the present 176 acres, and no wharf retrofits or new wharves are constructed. The number of effective berths therefore decreases at the same rate assumed in Alternative 3: 3 berths in 2010 and 2015, and 2.5 in 2025 and 2030.

PORT OF LOS ANGELES
TERMINAL THROUGHPUT EVALUATION

3/19/2007

CONTAINER TERMINAL	GROSS TERMINAL AREA (ACRES) 2002 (August)	2005	2010	2015	2020	2025 (note 4)	Actual data from May 2001 thru April 2002
B100-131 see notes1&2	226	261	323	323	323	366	based on full build out of terminal, incl. GATX and add'l fill
B136-147 see note 3	176	176	233	233	243	243	based on EIS/EIR proposed project alternative
B206-209	84	84	84	84	84	84	assumes hugo neu remains, no westways
B212-225	192	192	192	192	192	192	includes 24 acres at TICTIF
B226-236	208	230	285	285	285	285	incl 24ac@tictf. 2ac & 20 ac exp by 2005, 55 ac laxt exp by 2010
B302-305	291	291	331	331	331	331	40 ac exp by 2010
B401-406	0	484	484	484	684	684	200 ac exp by 2020, 01/02 teu's via RDP at B145/147
Total Area	1177	1718	1932	1932	2142	2185	
MERCER PROJECTIONS							Mercer Management Consulting. July 2001. The Mercer Study evaluated projections to the year 2020. The year 2025 throughput projection is an extrapolation from 2020 to 2025 @ 6% per year.
POLA Total teu's	5488000	6827000	9847000	13172000	17629500	23592200	
Teu's/gr acre	4700	4000	5100	6800	8200	10800	

1) Includes use of 40 acres in B100 for year 11 months of the 2001/2002. (effective acreage for entire year of 222 acres).

2) 2010 acreage based on wharf improvement alternative that maintains current wharf alignment for Berths 121-131.

3) 2001/02 teu/gr. ac. calculation is based on the Berth 136-147 operating area of 125 gross acres for majority of 01/02 year; although August 2002 area is 176 acres.

4) The total full build out acreage shown for 2025 include assumptions for additional acreages at numerous terminals, which will be part of subsequent EIRs

FIGURE 1

PORT OF LOS ANGELES
BERTHS 136-147 THROUGHPUT ANALYSIS

revised 03/29/07

TERMINAL	Gross Terminal Area (acres)	2001 Actual teu's/gross acre	Market **Demand** Mercer Study (7/2002) teu's/gross acre [2]	Terminal **Capacity** JWD Study (6/2005) teu's/gross acre [1]	**POLA Projection For WBMTIP teu's/gross acre [3]**	Notes
BERTH 136-147						
2001(actuals)	176	4369				
2005	176	n/a	4000	7000	**5800**	
2010	233	n/a	5100	6800	**6800**	straight line increase from 2005 to 2025
2015	233	n/a	6800	7500	**7500[4]**	JWD value is limiting factor
2025	243	n/a	10800	9800	**9800**	JWD value is limiting factor
2030	243	n/a	n/a	9800	**9800**	Terminal at JWD Capacity

[1] The 10/2002 JWD Study (with 6/2005 update) evaluated potential terminal capacity based on maximizing backland and berthing facilities utilization with assumed increases in labor productivity ship sizes, and other terminal improvements or advancements that may or may not occur in the time frames considered.

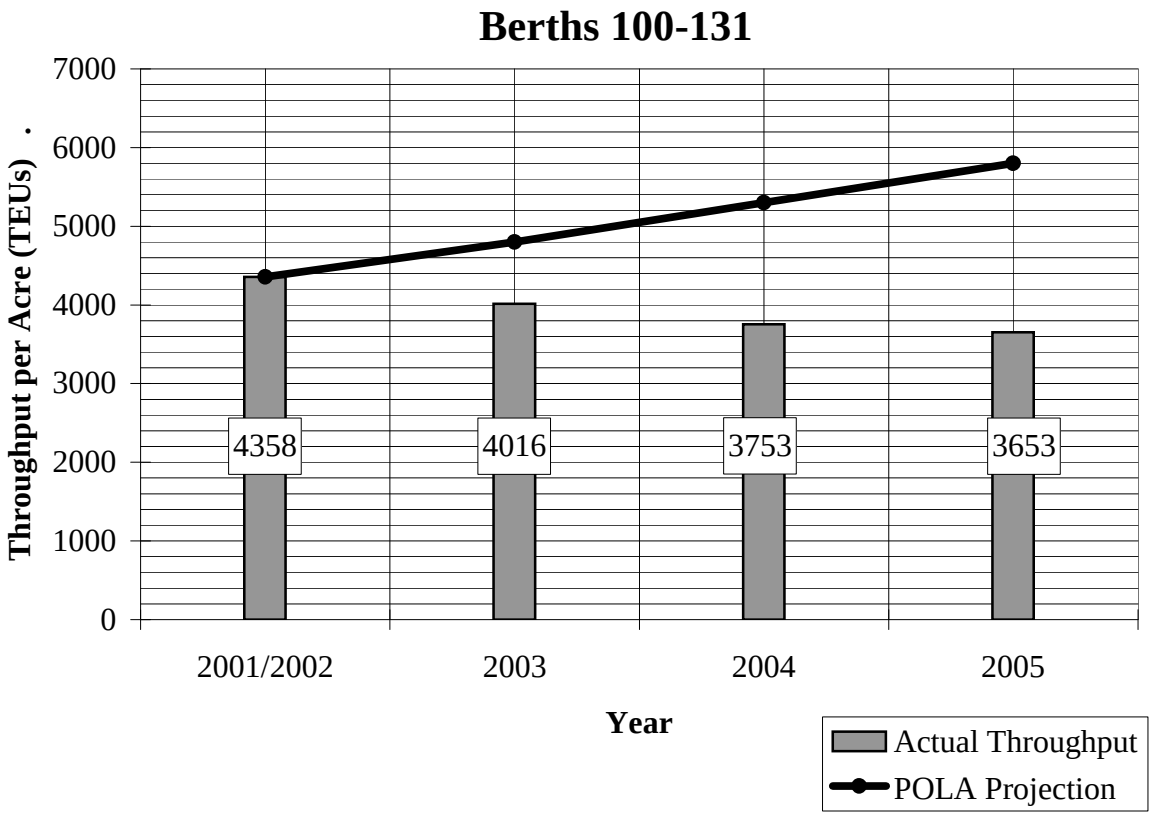
[2] The Mercer forecast is a port of LA/LB combined thru-put demand analysis. The teu's per gross acre calculations represent a 50% market share for the Port of LA spread evenly to each terminal based on their size in gross acres. The teu's per acre are a port wide number.

[3] The POLA projections for the WBMTIP terminals were based on an evaluation of the information of both the Mercer and JWD information.

[4] The straight line interpolation value for this year is higher, but the JWD capacity governs

FIGURE 2

Comparison of Projected and Actual Throughput, 2001/2002 through 2004



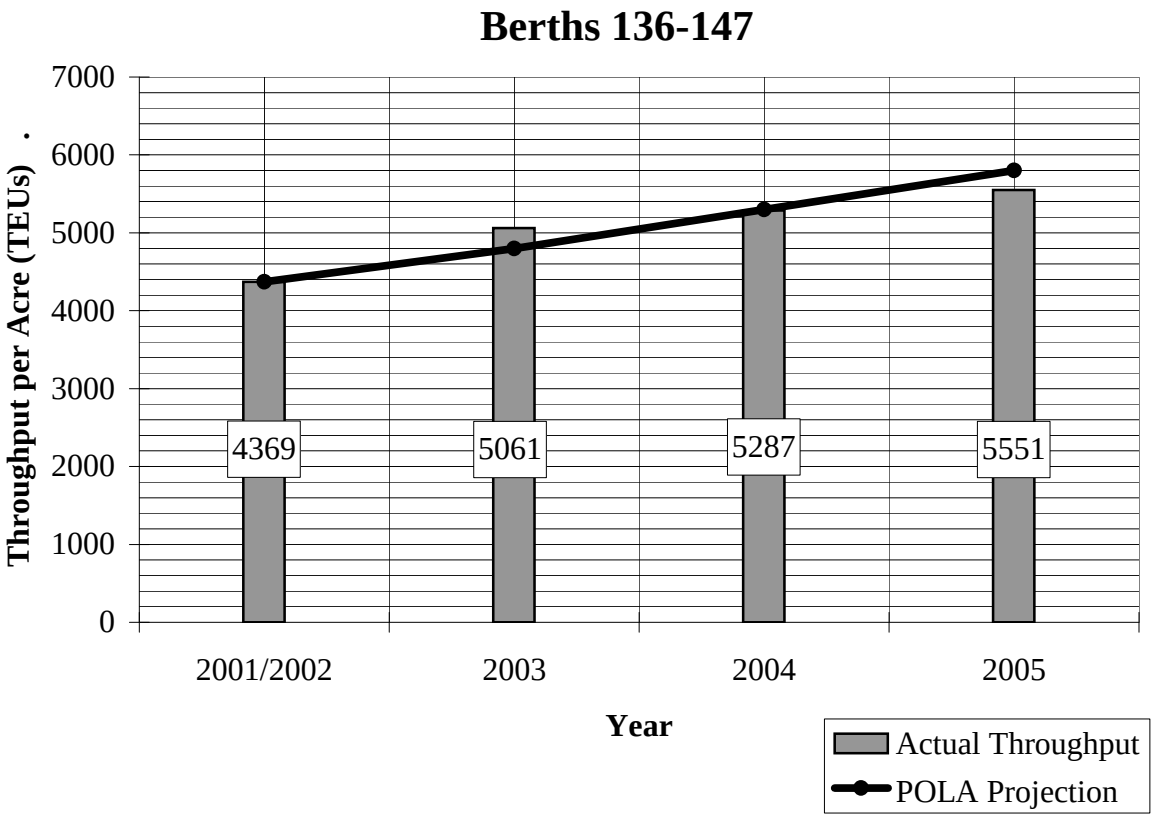
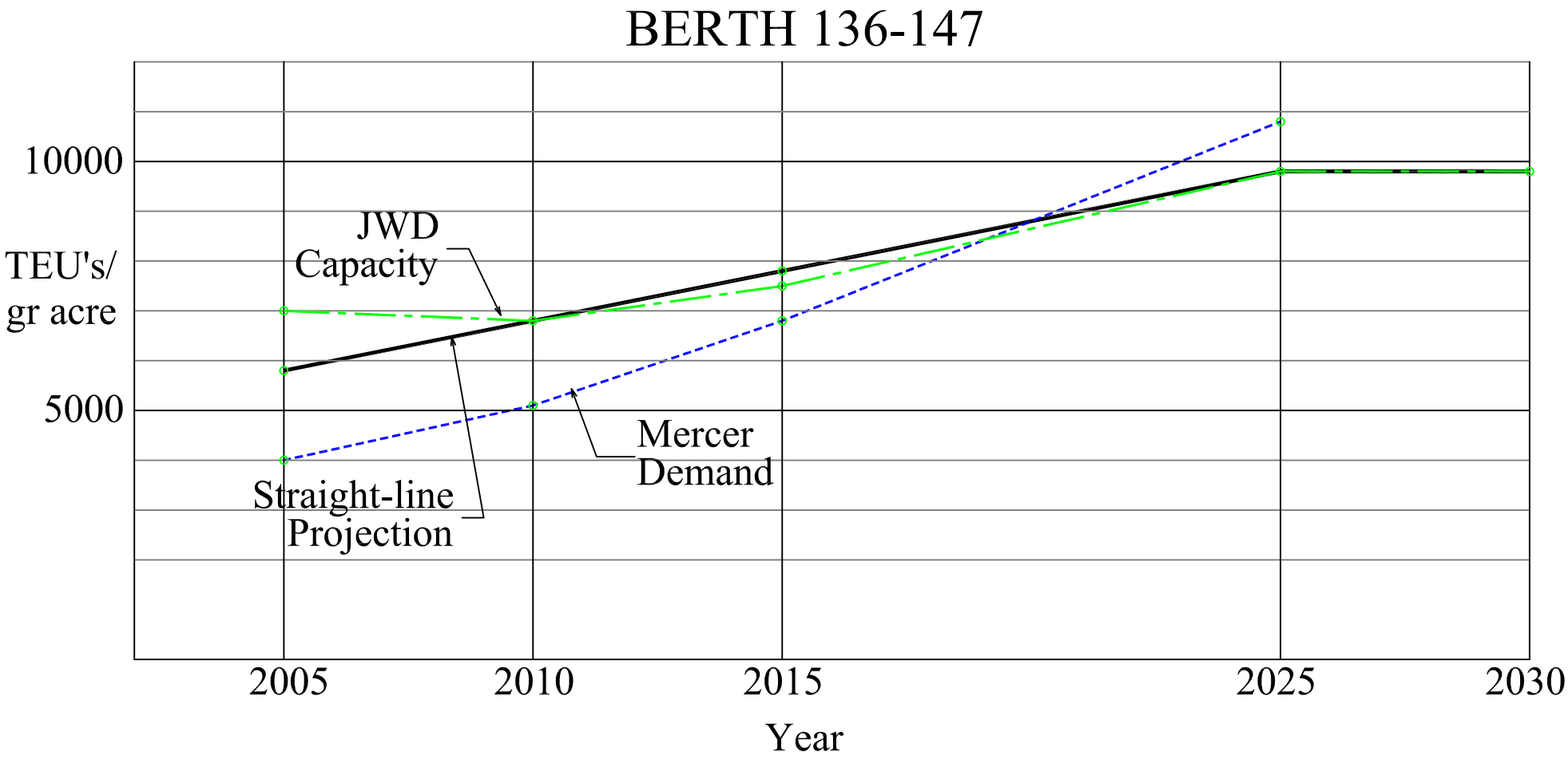


Figure 3



WEST BASIN TERMINALS
THROUGHPUT PROJECTIONS

revised: 04/02/07

FIGURE 4

WEST BASIN TERMINALS THROUGHPUT ANALYSIS
TraPac Container Terminal EIS/EIR Alternatives

Capacity Projections - Throughput in TEU's per Acre

2005

Alternative	Gross Terminal Acreage	# of Berths	JWD	Mercer	POLA projection (2002 + 10%/yr)	Total Projected Throughput (TEUs)	# of Ship Calls, "Average Ship"	"Average Ship" Lifts Per Call	Ship Calls based on weekly & biweekly services
1 Proposed Project	176	3.5	7000	4000	5800	1,020,800	271	2,217	286
2 Proposed w/o 15 ac Fill	176	3.5	7000	4000	5800	1,020,800	271	2,217	286
3 Reduced Wharf	176	3.5	7000	4000	5800	1,020,800	271	2,217	286
4 OMNI Terminal*	59	3.5	7000	4000	5800	342,200	91	2,217	104
5 No Federal Action Project	176	3.5	7000	4000	5800	1,020,800	271	2,217	286
6 No Project	176	3.5	7000	4000	5800	1,020,800	271	2,217	286

2007

Alternative	Gross Terminal Acreage	# of Berths	POLA projection (Inter-polated)	Total Projected Throughput (TEUs)	# of Ship Calls, "Average Ship"	"Average Ship" Lifts Per Call	Ship Calls based on weekly & biweekly services
1 Proposed Project	176	3.5	6200	1,091,200	268	2,394	286
2 Proposed w/o 15 ac Fill	176	3.5	6300	1,108,800	272	2,394	286
3 Reduced Wharf	176	3.5	6100	1,073,600	264	2,394	286
4 OMNI Terminal*	59	3.5	6000	354,000	87	2,394	104
5 No Federal Action Project	176	3.5	6000	1,056,000	259	2,394	260
6 No Project	176	3.5	6200	1,091,200	268	2,394	286

2010

Alternative	Gross Terminal Acreage	# of Berths	JWD	Mercer	POLA projection (Inter-polated)	Total Projected Throughput (TEUs)	# of Ship Calls, "Average Ship"	"Average Ship" Lifts Per Call	Ship Calls based on weekly & biweekly services
1 Proposed Project	233	3.5	6800	5100	6800	1,584,400	350	2,660	364
2 Proposed w/o 15 ac Fill	233	3.5	6800	5100	6900	1,607,700	356	2,660	364
3 Reduced Wharf	233	3.0	5800	5100	5800	1,351,400	299	2,660	312
4 OMNI Terminal*	78	3.0	5800	5100	5800	452,400	100	2,660	104
5 No Federal Action Project	233	3.0	5800	5100	5800	1,351,400	299	2,660	312
6 No Project	176	3.0	7700	5100	6800	1,196,800	265	2,660	286

2015

Alternative	Gross Terminal Acreage	# of Berths	JWD	Mercer	POLA projection (Inter-polated)	Total Projected Throughput (TEUs)	# of Ship Calls, "Average Ship"	"Average Ship" Lifts Per Call	Ship Calls based on weekly & biweekly services
1 Proposed Project	233	3.5	7500	6800	7500	1,747,500	309	3,325	312
2 Proposed w/o 15 ac Fill	233	3.5	7500	6800	7500	1,747,500	309	3,325	312
3 Reduced Wharf	233	3.0	6400	6800	6400	1,491,200	283	3,325	286
4 OMNI Terminal*	78	3.0	6400	6800	6400	499,200	95	3,325	104
5 No Federal Action Project	233	3.0	6400	6800	6400	1,491,200	283	3,325	286
6 No Project	176	3.0	8500	6800	7700	1,355,200	257	3,325	260

2025

Alternative	Gross Terminal Acreage	# of Berths	JWD	Mercer	POLA projection (lesser of JWD/ Mercer)	Total Projected Throughput (TEUs)	# of Ship Calls, "Average Ship"	"Average Ship" Lifts Per Call	Ship Calls based on weekly & biweekly services
1 Proposed Project	243	3.5	9800	10800	9800	2,389,000	334	4,212	338
2 Proposed w/o 15 ac Fill	233	3.5	10300	10800	10300	2,389,000	334	4,212	338
3 Reduced Wharf	233	3.0	8700	10800	8700	2,035,000	300	3,990	312
4 OMNI Terminal*	78	2.5	7300	10800	7300	565,700	83	3,990	104
5 No Federal Action Project	233	2.5	7300	10800	7300	1,697,000	250	3,990	260
6 No Project	176	2.5	9600	10800	9600	1,697,000	250	3,990	260

2030

Alternative	Gross Terminal Acreage	# of Berths	POLA projection (JWD capacity)	Total Projected Throughput (TEUs)	# of Ship Calls, "Average Ship"	"Average Ship" Lifts Per Call	Ship Calls based on weekly & biweekly services
1 Proposed Project	243	3.5	9800	2,389,000	334	4,212	338
2 Proposed w/o 15 ac Fill	233	3.5	10300	2,389,000	334	4,212	338
3 Reduced Wharf	233	3.0	8700	2,035,000	300	3,990	312
4 OMNI Terminal*	78	2.5	7300	565,700	83	3,990	104
5 No Federal Action Project	233	2.5	7300	1,697,000	250	3,990	260
6 No Project	176	2.5	9600	1,697,000	250	3,990	260

* assumes 1/3 of total terminal acreage devoted to containers

Note: Ship sizes for years 2010 through 2030 were increased based on a meeting with representatives of TraPac on January 25, 2006.

FIGURE 5