



# California Refined Products Outlook

Prepared for PBF Energy, Inc.

June 1, 2021



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3. Leading experts on the supply and demand fundamentals that drive the West Coast transportation fuels markets.

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# Introduction & Purpose

California refined products demand is recovering from COVID-19 but is anticipated to decline due to a number of factors. New Bay Area Air Quality Management District (BAAQMD) rulemaking in the San Francisco Bay would reduce the level of particulate emissions for area fluid catalytic cracking (FCC) units, that would require sizable investment in required control technology, that could have a significant impact on the SF Bay, California and all of the West Coast product supply

Stillwater is hereby providing an assessment of the outlook for California transport fuel, how implementation of Rule 6-5 could affect supply and demand and impact state consumers.

# Summary & Highlights – Refined Products

1. Demand for California transportation fuels was decimated by COVID.
2. While demand for transportation fuels has been recovering, several factors will combine to put pressure on refined product demand and, ergo, financial performance.
3. With closure of Marathon Martinez (2020) and Phillips Rodeo (2023) SF Bay refineries, the market will be short in 2023, but balanced to long with subsequent demand erosion.
4. The idling of Marathon and Rodeo will reduce  $PM_{10}$  by more than contemplated by BAAQMD Rule 6-5.
5. Rule 6-5 will exert additional pressure on the impacted refineries in SF (Chevron and PBF), that will likely close rather than install BACT.
6. With only one remaining operating refinery in SF (Valero Benicia), SF will be significantly short refined products, more than any time ever for any enclave on the West Coast.
7. To balance, supply will shift to an enormous volume of foreign imports from Asia that will increase delivery lead times from a matter of days to weeks or months, and increasing vessel traffic, a serious concern over the past years for BAAQMD.

## Summary & Highlights – Refined Products (cont'd)

8. The level of imports will shift from crude to products, increasing SF Bay vessel traffic by 358 per year, (+14% vs 2019), straining marine oil terminals (MOT) capacity, and expose the Northern California supply system to outage, particularly during turnarounds or outages of the Valero refinery.
9. By comparison, ExxonMobil's 2015/16 Torrance outage flipped PADD 5 gasoline supply/demand from long to short, increasing foreign imports by only 65 KBD – driving prices up statewide.
10. BAAQMD staff expects that Valero will make a small investment to upgrade its existing wet gas scrubber to comply with new limits contemplated. However, should this not be feasible, it is likely demands may not be met.
11. And the CA consumer will pay the price - to the tune of \$6.7 billion annually.

The Marathon (2020) and Phillips (2023) refinery closures will reduce PM emissions by more than that contemplated by Rule 6-5, without an adverse effect on air quality due to increased vessel traffic.

## SECTION 1a:

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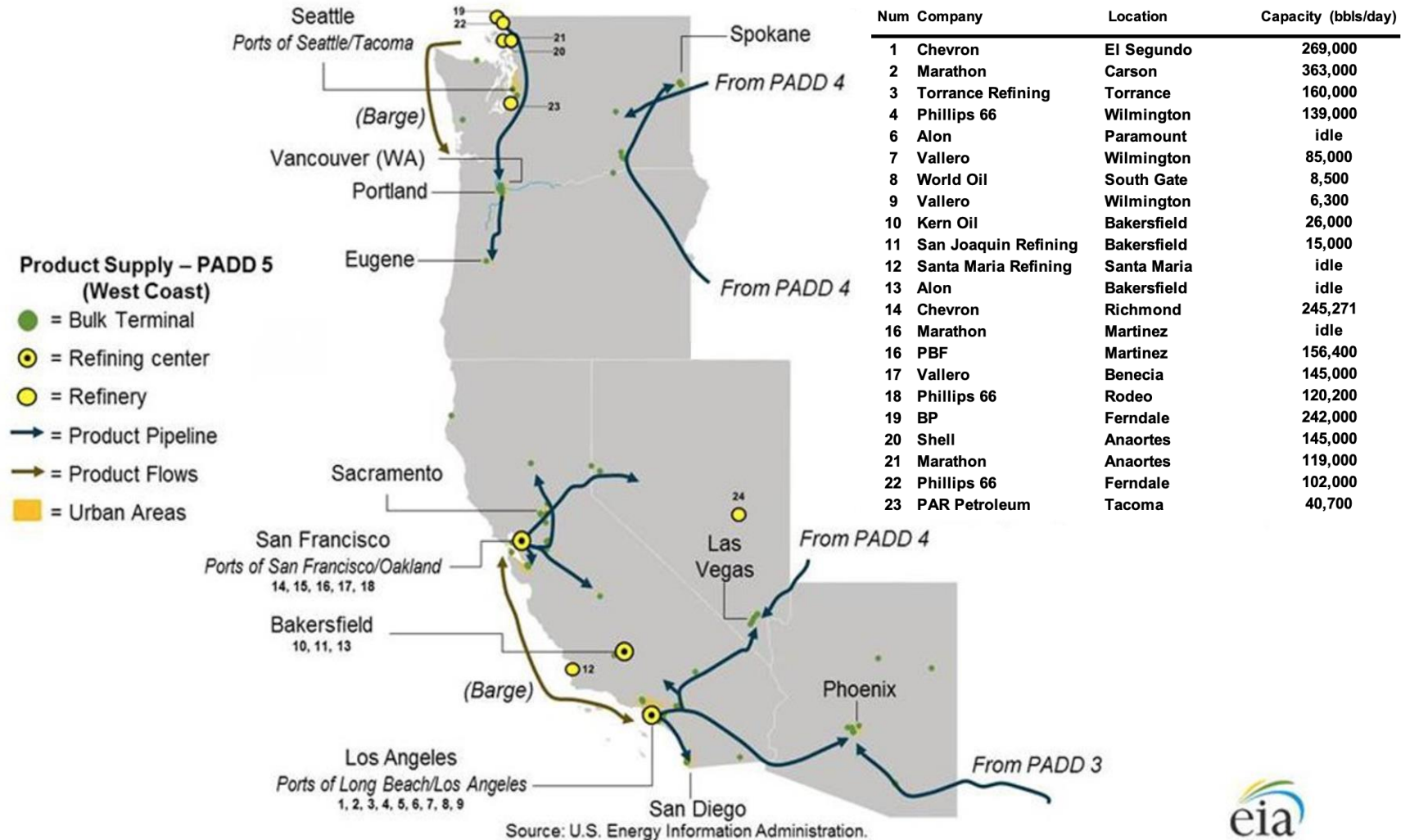
Current status and outlook for  
supply and demand of  
California petroleum products





# Historically with all refineries running, CA refineries have produced...

1. An excess of diesel than needed to meet demands (long)
2. But not enough gasoline and jet fuel (short)



SF refineries produce more transportation fuels than NoCal & Reno need; LA refineries do not produce enough for SoCal, AZ & NV.

Product Demand (CA, AZ, NV) in KBD	2019			
	Gas	Jet	Diesel	Total
<b>Northern CA</b>				
Demand	404	102	153	659
Biofuels Supplied	43	0	25	68
Production	410	109	180	699
Net (Long) Short	(49)	(7)	(52)	(108)
Foreign Imports	9	1	1	11
From PNW	8	0	0	8
From SoCA	(20)	(5)	0	(25)
Foreign Exports	(46)	(3)	(53)	(102)
Total (Out) In	(49)	(7)	(52)	(108)
<b>Southern CA</b>				
Demand	684	270	198	1152
Biofuels Supplied	58	0	29	87
Production	544	191	171	906
Net (Long) Short	82	79	(2)	159
Foreign Imports	43	40	1	84
From PNW	20	40	0	60
From NoCA	20	5	0	25
Foreign Exports	(1)	(6)	(3)	(10)
Total (Out) In	82	79	(2)	159

Sources: Stillwater analysis, EIA data, CEC LPP Movements



SF was 108 KBD long product pre-COVID. Refiners export gasoline and diesel to balance supply.

# SF Bay marine traffic for ships or barges to load and/or offload crude oil, feedstocks, or products was in excess of 2500.

Facility	Vessel calls	
	Ship	Barge
CHEVRON RICHMOND	420	325
TESORO, AMORCO-MARTINEZ <sup>1</sup>	94	0
TESORO, AVON-MARTINEZ	51	3
VALERO BENICIA	94	73
SHELL MARTINEZ	79	112
PHILLIPS 66 RODEO	84	118
PHILLIPS 66 RICHMOND	171	130
Sub-total Refineries	993	761
TRANSMONTAIGNE -MTZ	61	65
SHORE TERMINALS	48	14
TRANSMONTAIGNE RICH	30	200
IMTT, RICHMOND	3	321
RICHMOND PRODUCTS	15	8
KINDER MORGAN	1	0
<b>Sub-total third party terminals</b>	<b>158</b>	<b>608</b>
<b>TOTAL</b>	<b>1151</b>	<b>1369</b>

Source: Stillwater analysis, CA State Lands Commission data.

1. Tesoro Terminals subsequently purchased by Marathon in 2019.

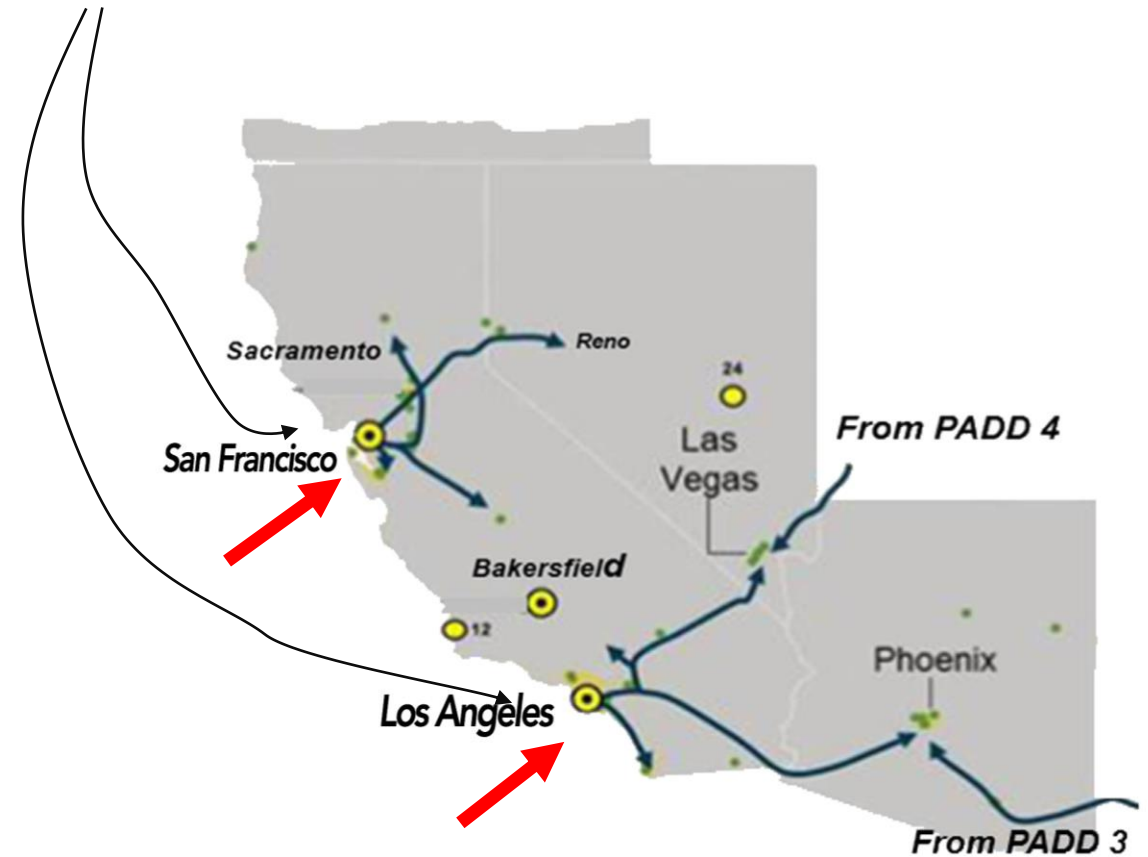
# Several factors will impact the future:

1. How long to recover demand lost by the pandemic?
2. Increased displacement of diesel by BD & RD (This is projected to increase from 54 KBD in 2019 to 124 KBD in 2023 to 147 kbd in 2026).
3. How fast do EVs increase penetration into the light and heavy-duty vehicle markets?
4. Does sustainable aviation fuel (SAF) begin to materially displace petroleum jet fuel?
5. What other regulations are implemented impacting refiners and/or product markets?
6. How do consumer's travel habits change? These include commuting, air and road travel.
7. How do consumer's purchasing habits change? Do trips to local stores continue to be displaced by on-line orders that require delivery?

There are many factors that add to uncertainties in the market.

By 2023, loss in production from refinery closures will more than offset demand erosion and biofuels growth, so NoCal will net short products.

Product Demand (CA, AZ, NV) in KBD	2023			
	Gas	Jet	Diesel	Total
<b>Northern CA</b>				
Demand	371	94	160	625
Biofuels Supplied	38	0	55	93
Production	282	98	115	495
Net (Long) Short	51	(4)	(10)	37
Foreign Imports	16	0	0	16
From PNW	32	0	0	32
From SoCA	5	(2)	0	3
Foreign Exports	(2)	(2)	(10)	(14)
Total (Out) In	51	(4)	(10)	37
<b>Southern CA</b>				
Demand	628	255	195	1079
Biofuels Supplied	58	0	59	117
Production	553	214	158	925
Net (Long) Short	17	41	(22)	37
Foreign Imports	12	43	0	55
From PNW	10	2	0	12
From NoCA	(5)	2	0	(3)
Foreign Exports	0	(6)	(22)	(28)
Total (Out) In	17	41	(22)	36



Sources: Stillwater analysis, EIA data, CEC LPP Movements

P66 and Marathon closures make both NoCal and SoCal short after recovery from COVID.

By 2026, continued demand declines cause NoCal to become balanced and SoCal to become less short.

Product Demand (CA, AZ, NV) in KBD		2026			
		Gas	Jet	Diesel	Total
<b>Northern CA</b>					
Demand		345	104	158	607
Biofuels Supplied		37	0	73	110
Production		302	108	85	495
Net (Long) Short		6	(4)	0	2
Foreign Imports		0	0	0	0
From PNW		10	4	10	24
From SoCA		0	(6)	0	(6)
Foreign Exports		(4)	(2)	(10)	(16)
Total (Out) In		6	(4)	0	2
<b>Southern CA</b>					
Demand		588	272	199	1059
Biofuels Supplied		56	0	74	130
Production		530	243	134	907
Net (Long) Short		2	29	(9)	22
Foreign Imports		2	37	0	39
From PNW		10	6	0	16
From NoCA		0	6	0	6
Foreign Exports		(10)	(20)	(9)	(39)
Total (Out) In		2	29	(9)	22

Sources: Stillwater analysis, EIA data, CEC LPP Movements



...pressuring refining cracks and margins.

## SECTION 1b

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Likely impact of the BAAQMD  
Rule 6-5 on SF Bay,  
California and West Coast  
petroleum products



# BAAQMD Rule 6-5 Summary

1. Emissions from petroleum refinery fluidized catalytic cracking units total approximately 825 tons per year of PM<sub>10</sub>.
2. These emissions contribute to approximately 50 percent of all refinery PM<sub>10</sub> emissions, represent approximately 17 percent of PM<sub>10</sub> emissions from all inventoried stationary sources at facilities with Air District permits,
3. ...but 3 percent of all human-made PM<sub>10</sub> emissions in the Bay Area.
4. BAAQMD Staff estimate that implanting wet gas scrubbing on the impacted refineries would reduce PM<sub>10</sub> emissions by 493 tons per year.

**Table 1 – Particulate Matter Emissions from Petroleum Refinery Fluidized Catalytic Cracking Units by Facility**

Facility	FCCU Fresh Feed Capacity (barrels per day) <sup>26</sup>	PM <sub>10</sub> (tons per year)	PM <sub>2.5</sub> (tons per year)
Chevron Products Richmond <sup>a</sup>	80,000	245	229
Marathon Martinez Refinery <sup>b,c</sup>	70,000	190	190
PBF Martinez Refinery <sup>a</sup>	67,400	309	300
Valero Benicia Refinery <sup>d</sup>	72,000	81	81
<b>Total<sup>e</sup></b>	<b>289,400</b>	<b>825</b>	<b>800</b>

<sup>a</sup> Emissions based on reported 2018 facility emissions inventory for total PM.

<sup>b</sup> Reported 2018 facility emissions inventory only included filterable PM. Emissions shown here are based on average 2020 source test emission rate data for total PM. PM<sub>2.5</sub> emissions were assumed to be equal to PM<sub>10</sub> emissions.

<sup>c</sup> The Marathon Martinez Refinery announced the idling of the refinery, including the facility's fluidized catalytic cracking unit, in April 2020. Marathon announced in July 2020 that the facility would remain indefinitely idled with no plans to restart.

<sup>d</sup> Reported 2018 facility emissions inventory only included filterable PM. Emissions shown here are based on average 2016-2019 source test emission rates data for total PM at flue gas scrubber stack, which includes combined emissions from Valero's fluidized catalytic cracking unit and coker unit. PM<sub>2.5</sub> emissions were assumed to be equal to PM<sub>10</sub> emissions.

<sup>e</sup> Total figures shown include the Marathon Martinez Refinery, which was idled in April 2020 and remains indefinitely idled.

Source: TAFF REPORT Proposed Amendments to Regulation 6, Rule 5: Particulate Emissions from Petroleum Refinery Fluidized Catalytic Cracking Units, March 2021



## BAAQMD Rule 6-5 Summary (cont'd)

5. The two impacted refineries estimate the cost to be \$2.2 billion - \$1.4 billion for Chevron and \$0.8 billion for PBF to achieve a 400 ton per year reduction in PM10.
6. However, PM<sub>10</sub> emissions in the SF Bay have already been favorably impacted by Marathon's Martinez closure, and will again in 2023 by Phillips' Rodeo closure, both well in advance of the results from Rule 6-5.
7. Based on BAAQMD Staff data that FCCs represent 50% of refinery emissions, it is estimated that Marathon closure reduced PM10 by 2 x 190, or 380 tons per year.
8. Using BAAQMD 2011, it is estimated that the Phillips closure will reduce PM<sub>10</sub> by an additional 150 tons per year, starting in 2023.

The shutdown of Marathon and planned closure of Phillips 66 will reduce PM<sub>10</sub> by more than that estimate for Rule 6-5, and years before.



# IMPACT OF BAAQMD Rule 6-5 AMENDMENTS

1. If implemented the BAAQMD Rule 6-5 will disadvantage the two impacted refineries vs the sole unaffected SF refinery, and none of the LA or PNW refineries.
2. Impacted refineries have little alternatives - install BACT or close, a partial operation with no FCC/Ally, minimum crude and gas oil sales is unlikely.

What happens if these refineries close?

# PBF & Chevron closures result in the SF Bay and the entire West Coast short products

Product Demand (CA, AZ, NV) in KBD		2026 w/o Chev & PBF			
		Gas	Jet	Diesel	Total
<b>Northern CA</b>					
Demand		345	104	158	607
Biofuels Supplied		37	0	73	110
Production		95	20	25	140
Net (Long) Short		213	84	60	357
Foreign Imports		125	80	30	235
From PNW		38	12	30	80
From SoCA		50	(6)	0	44
Foreign Exports		0	(2)	0	(2)
Total (Out) In		213	84	60	357
<b>Southern CA</b>					
Demand		588	272	199	1059
Biofuels Supplied		56	0	74	130
Production		570	213	134	917
Net (Long) Short		(38)	59	(9)	12
Foreign Imports		6	47	0	53
From PNW		16	6	0	22
From NoCA		(50)	6	0	(44)
Foreign Exports		(10)	0	(9)	(19)
Total (Out) In		(38)	59	(9)	12

Sources: Stillwater analysis, EIA data, CEC LPP Movements

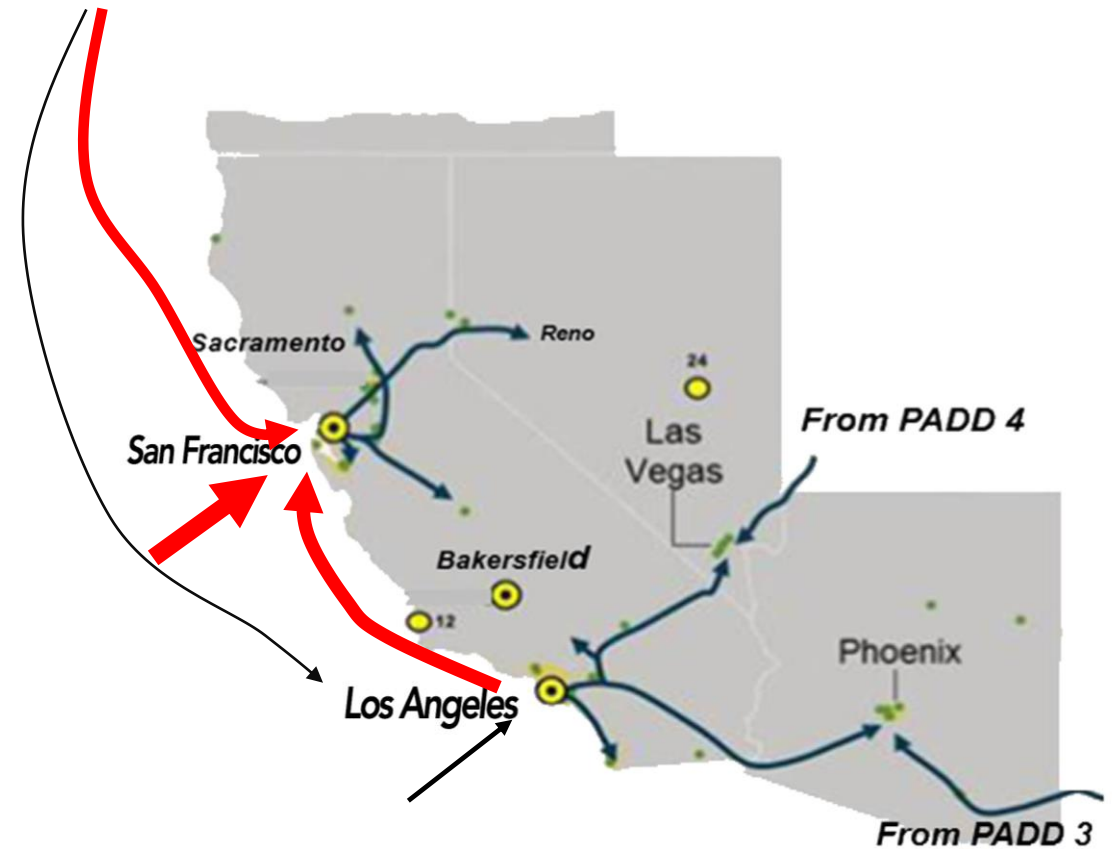


...requiring a significant increase in foreign product imports.

# These shutdowns will increase foreign and domestic products shipped into the SF Bay by 355 KBD

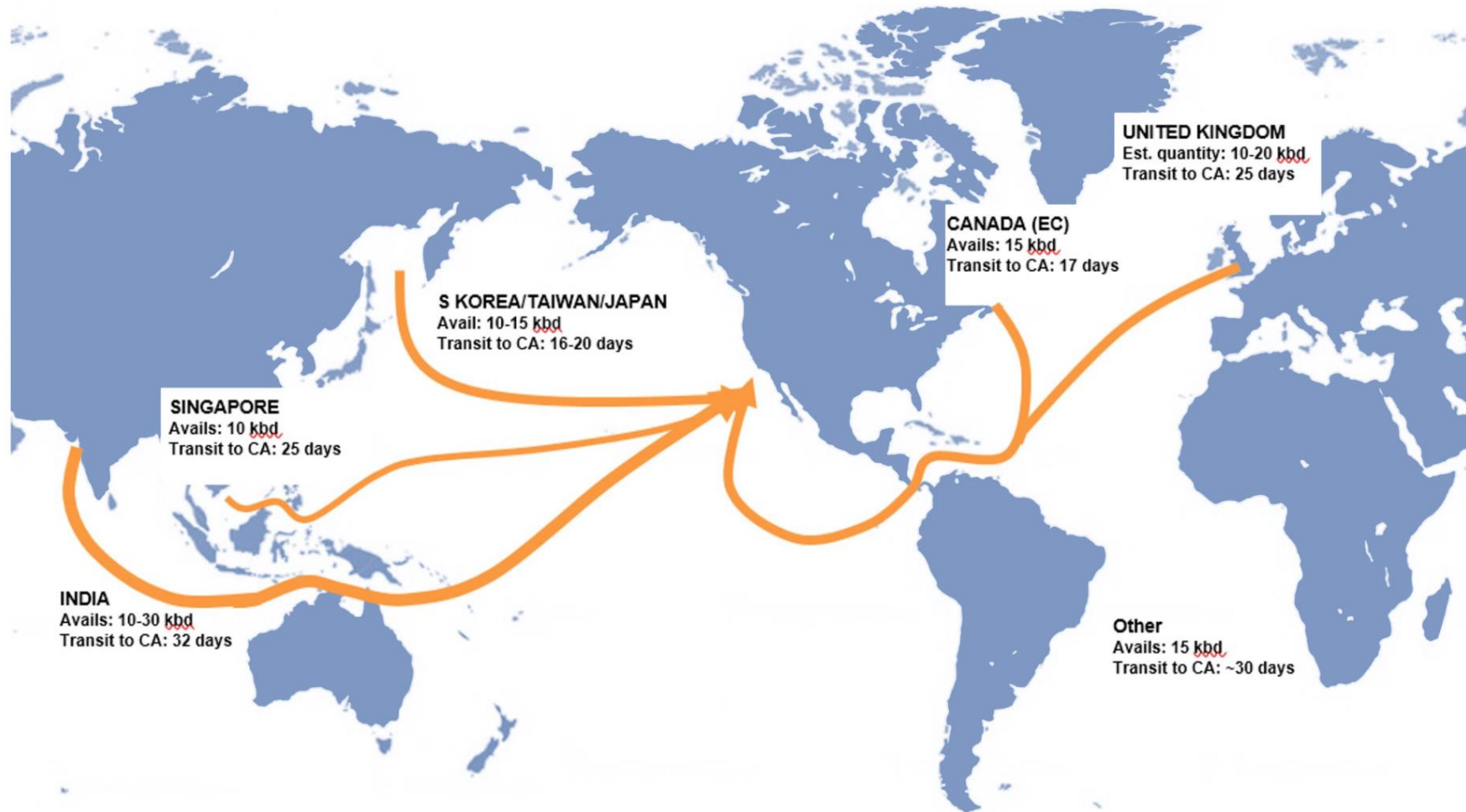
Product Demand (CA, AZ, NV) in KBD	2026 w/o Chev & PBF vs 2026			
	Gas	Jet	Diesel	Total
<b>Northern CA</b>				
Demand	0	0	0	0
Biofuels Supplied	0	0	0	0
Production	(207)	(88)	(60)	(355)
Net (Long) Short	207	88	60	355
Foreign Imports	125	80	30	235
From PNW	28	8	20	56
From SoCA	50	0	0	50
Foreign Exports	4	0	10	14
Total (Out) In	207	88	60	355
<b>Southern CA</b>				
Demand	0	0	0	0
Biofuels Supplied	0	0	0	0
Production	40	(30)	0	10
Net (Long) Short	(40)	30	0	(10)
Foreign Imports	4	10	0	14
From PNW	6	0	0	6
From NoCA	(50)	0	0	(50)
Foreign Exports	0	20	0	20
Total (Out) In	(40)	30	0	(10)

Sources: Stillwater analysis, EIA data, CEC LPP Movements



...which results in a sizeable increase in both long-haul volumes and SF Bay vessel traffic.

The required supply lines especially for gasoline will move from local to Asia with long in transit time



...exposing the SF Bay to supply disruptions and outages.

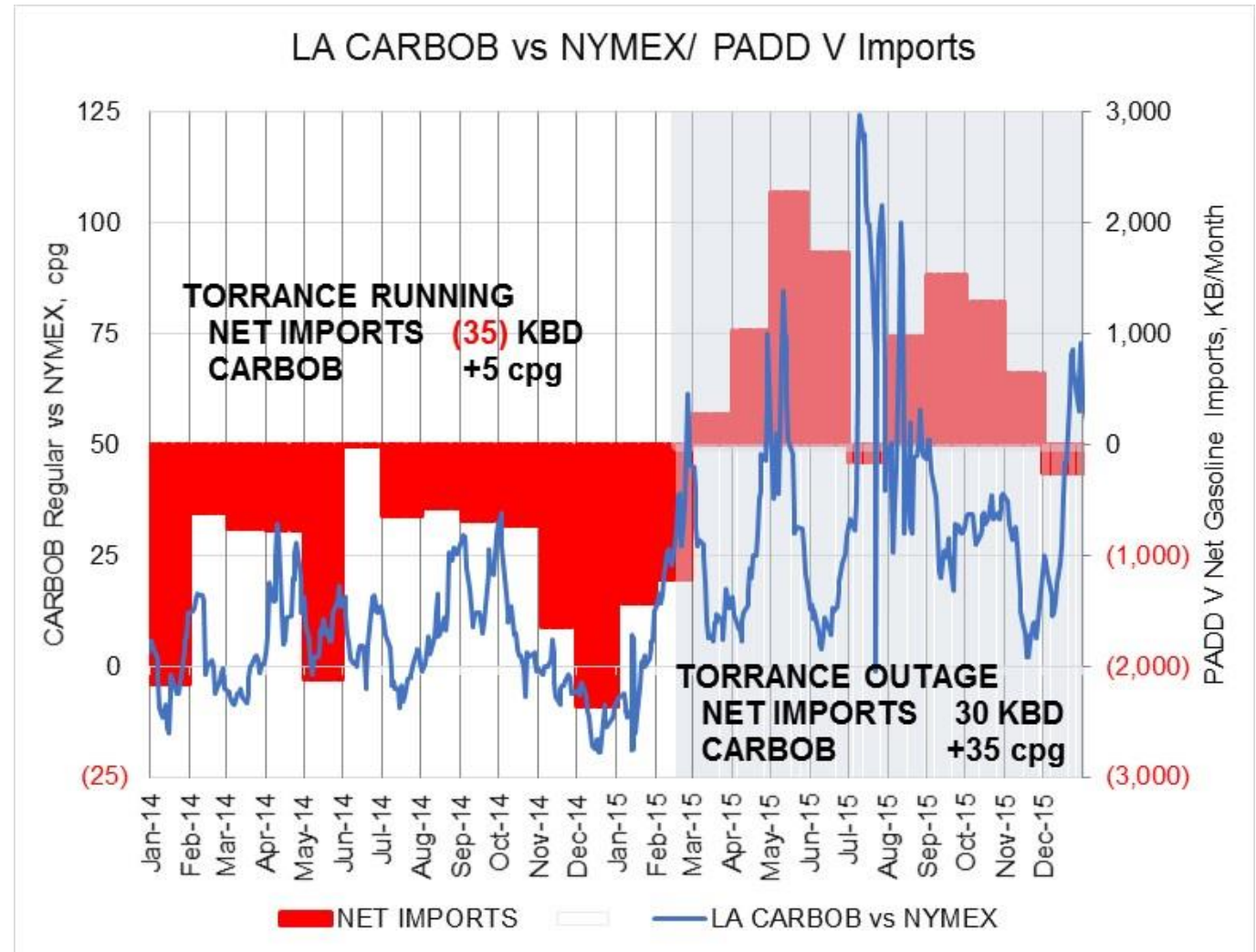
# Compared to 2026 with Chevron and PBF in operation, SF Bay marine oil traffic will increase significantly - by 358 per year

Volumes in KBD	2026 Crude Input	by Pipeline	by Marine	w/o Chevron & PBF	Change	Vessel Capacity KB	Annual Vessel Calls
<b>CRUDE</b>							
Chevron Richmond	226	0	226	idle	(226)	600	(137)
PBF Martinez	144	70	74	idle	(74)	350	(77)
<b>Total Crude</b>	<b>370</b>	<b>70</b>	<b>300</b>	<b>0</b>	<b>(300)</b>		<b>(214)</b>
<b>REFINED PRODUCT</b>							
Foreign Imparts			0	235	235		
From PNW			24	80	56		
From SoCA			(6)	44	50		
Foreign Exports			(16)	(2)	14		
<b>Total Products (Out) In</b>			<b>2</b>	<b>357</b>	<b>355</b>		
Tankers in			0	235		320	268
Tankers Out			18	2		320	(18)
Barges in			6	132		120	383
Barges out			24	6		120	(55)
<b>Total Products</b>							<b>578</b>
<b>Increase/(decrease) Vessel Calls</b>							<b>363</b>

Source: Stillwater analysis

...nearly five times the proposed increase of 76 due to Phillips MOT permit request (on hold).

By comparison,  
 ExxonMobil's 2015/16  
 Torrance outage  
 flipped PADD 5  
 gasoline  
 supply/demand from  
 long to short,  
 increasing net imports  
 by only 65 KBD



Source: Stillwater analysis, OPIS, EIA data

...increasing spot prices by +30 cpg to attract imports.

**CA consumers will pay the price, to the tune of \$6.7B annually**

...and impact consumers in Washington, Oregon, and Nevada.



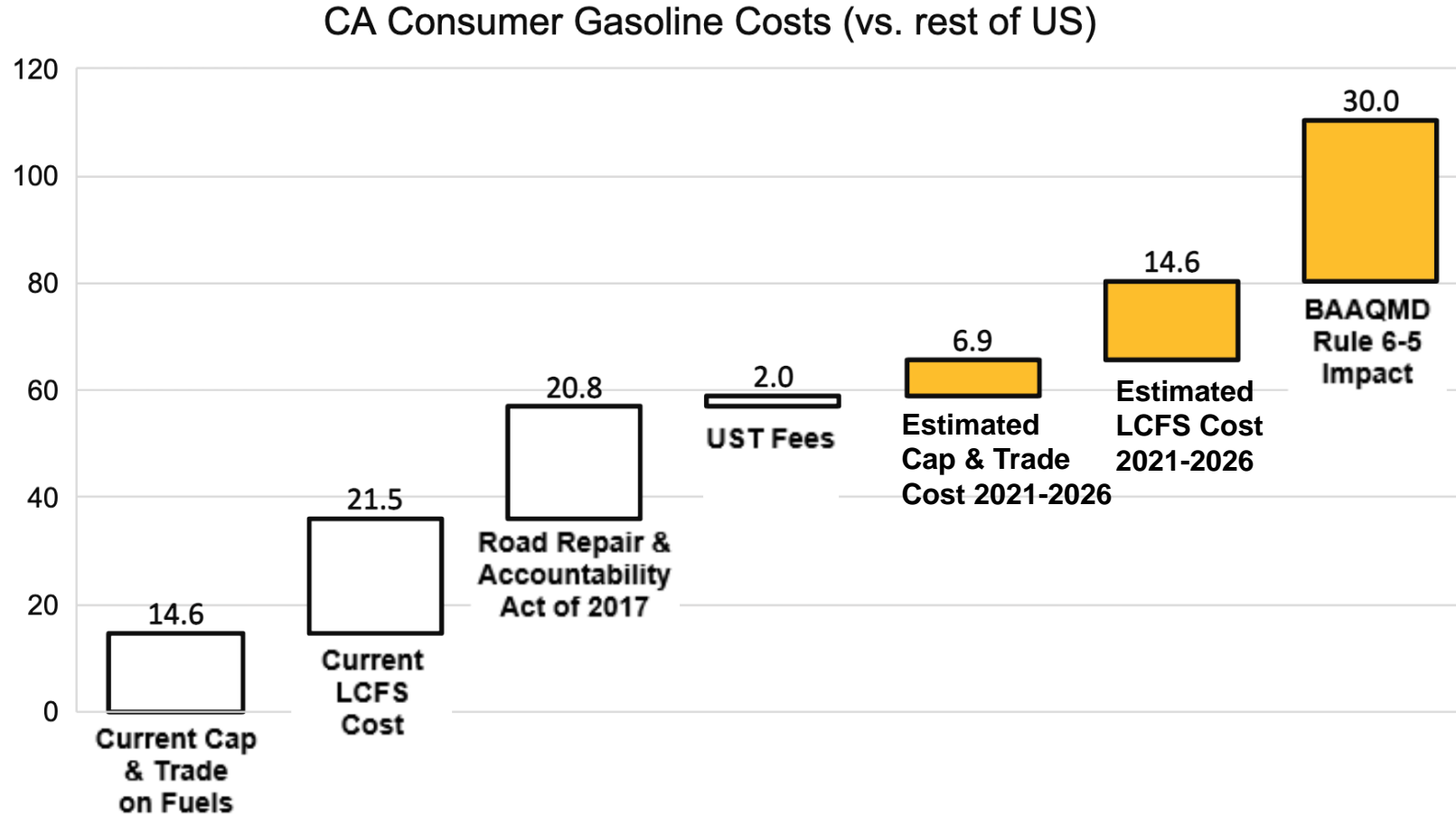
## SECTION 1c

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Other likely or currently contemplated regulations that would significantly worsen the costs to CA consumers



The cost to CA consumers is already considerable (60 cpg) and will increase by an additional 52 cpg with this rule.



# SECTION 1d

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## Summary



# Summary & Highlights – Refined Products

1. Demand for California transportation fuels was decimated by COVID.
2. While demand for transportation fuels has been recovering, several factors will combine to put pressure on refined product demand, and ergo financial performance.
3. With the closure of Marathon Martinez (2020) and Phillips Rodeo (2023) SF Bay refineries, the market will be short in 2023, but balanced to long with subsequent demand erosion.
4. The idling of Marathon and Rodeo will reduce  $PM_{10}$  by more than contemplated by BAAQMD Rule 6-5.
5. Rule 6-5 will exert additional pressure on the impacted refineries in SF (Chevron and PBF), that will likely close rather than install BACT.

6. With only one remaining operating refinery in SF (Valero Benicia), SF will be significantly short refined products, more than any time ever for any enclave on the West Coast.

7. To balance, supply will shift to an enormous volume of foreign imports from Asia, that will increase delivery lead times from a matter of days, to weeks or months and increasing vessel traffic, a serious concern over the past years for BAAQMD.

Product Demand (CA, AZ, NV) in KBD	2019			2023			2026			2026 w/o CH & PBF		
	Gas	Jet	Diesel	Gas	Jet	Diesel	Gas	Jet	Diesel	Gas	Jet	Diesel
<b>North CA</b>												
Demand	404	102	153	371	94	160	345	104	158	345	104	158
Biofuels Supplied	43	0	25	38	0	55	37	0	73	37	0	73
Production	410	109	180	282	98	115	302	108	85	95	20	25
<b>Net (Long) Short</b>	<b>(49)</b>	<b>(7)</b>	<b>(52)</b>	<b>51</b>	<b>(4)</b>	<b>(10)</b>	<b>6</b>	<b>(4)</b>	<b>0</b>	<b>213</b>	<b>84</b>	<b>60</b>
<b>Southern CA</b>												
Demand	684	270	198	628	255	195	588	272	199	588	272	199
Biofuels Supplied	58	0	29	58	0	59	56	0	74	56	0	74
Production	544	191	171	553	214	158	530	243	134	570	213	134
<b>Net (Long) Short</b>	<b>82</b>	<b>79</b>	<b>(2)</b>	<b>17</b>	<b>41</b>	<b>(22)</b>	<b>2</b>	<b>29</b>	<b>(9)</b>	<b>(38)</b>	<b>59</b>	<b>(9)</b>
<b>Total California</b>												
Demand	1088	372	351	999	350	355	934	376	357	934	376	357
Biofuels Supplied	101	0	54	96	0	114	93	0	147	93	0	147
Production	954	300	351	835	312	273	832	351	219	665	233	159
<b>Net (Long) Short</b>	<b>33</b>	<b>72</b>	<b>(54)</b>	<b>68</b>	<b>38</b>	<b>(32)</b>	<b>9</b>	<b>25</b>	<b>(9)</b>	<b>176</b>	<b>143</b>	<b>51</b>

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8. The level of imports will shift from crude to products, increasing SF Bay vessel traffic by 358 per year, (+14% vs 2019), straining marine oil terminals (MOT) capacity, and expose the Northern California supply system to outage, particularly during turnarounds or outages of the Valero refinery.
9. By comparison, ExxonMobil's 2015/16 Torrance outage flipped PADD 5 gasoline supply/demand from long to short, increasing foreign imports by only 65 KBD – driving prices up statewide.
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The Marathon (2020) and Phillips (2023) refinery closures will reduce PM emissions by more than that contemplated by Rule 6-5, without an adverse effect on air quality due to increased vessel traffic.



**Stillwater Associates**

*...experience runs deep*

# Appendix





# SF Bay Marine Oil Terminals (MOTs)

Marine Oil Terminals (MOTs) in the Bay Area					
Location	Name	Berth	Products Storage	Connections to distribution	Utilization
Pittsburg	Bay Bulk	1	None	Roadways, pipeline, truck rack	PetCoke
Richmond	BP Lubricants	1	None	Roadways, pipeline, truck rack	Petro Lube Oils
Richmond	BP West Coast	1	None	Roadways, pipeline, truck rack	Petro Lube Oils
Richmond	California Oils	1	Yes-Liquid Bulk	Roadways, pipeline, truck rack, rail	Petro Lube Oils
Richmond	Chevron Longwarf	4	None	Roadways, pipeline, truck rack, rail	Petro Lube Oils
Richmond	ConocoPhillips	1	None	Roadways, pipeline, truck rack, rail	Petro Lube Oils
Richmond	IMTT	1	Yes-Liquid Bulk	Roadways, pipeline, truck rack, rail	Bulk Liquid Storage
Richmond	Kinder Morgan	1	Yes-Liquid Bulk	Roadways, pipeline, truck rack, rail	CARB, CARB ULSD, Ehanol
Richmond	Levin Richmond Terminal Corp	1	None	Roadways, pipeline, truck rack, rail	Bulk Liquid Storage, Bauxite, Petcoke, Coal, Scrap Metal, Ores
Martinez	Marathon Amorco	1	Yes-Liquid Bulk	Roadways, truck rack, rail	Auto, Petcoke
Martinez	Marathon Avon	1	None	Roadways, truck rack, rail	Petcoke
Selby	NuStar Energy	1	None	Roadways, truck rack, rail	Gasoline, gasoline blend stocks, jet fuel, aviation gas, MTBE, ethanol, JP-5, JP-8.
Richmond	Pacific Atlantic Terminals	1	None	Roadways, truck rack, rail	Petroleum Products
Martinez	PBF Energy	1	None	Roadways	Petroleum Products
Rodeo	Phillips 66	1	Yes	Roadways, pipeline, truck rack, rail	Gasoline, diesel & aviation fuel, PetCoke, Sulfur
Martinez	Transmontaigne	1	None	Roadways	Crude oil, finished products
Benicia	Valero Dock	1	Yes		Jet, diesel, asphalt, CARB

Source: Morgan Shipping, SFO Marine Oil Terminal Port Listing