Port of
LONG BEACH
The Green Port

AIR EMISSIONS INVENTORY - 2013

July 2014

Prepared by:
STARCREST CONSULTING GROUP, LLC

Port of Long Beach
Air Emissions Inventory - 2013

Prepared for:

Port of
LONG BEACH
The Green Port

July 2014

Prepared by:

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ENVIRONMENTAL MANAGEMENT
AIR QUALITY • CLIMATE • SUSTAINABILITY

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Please note that there may be minor inconsistencies, due to rounding, associated with emission estimates, percent contribution, and other calculated numbers between the various sections, tables, and figures of this report. All estimates are calculated using more digits than presented in the various sections.

ACRONYMS AND ABBREVIATIONS

Act	activity
AAPA	American Association of Port Authorities
AQMP	Air Quality Management Plan
ATB	articulated tug and barge
BNSF	Burlington Northern Santa Fe Railroad
BSFC	brake specific fuel consumption
BTH	Business Transportation and Housing Agency
BW	breakwater
CAAP	Clean Air Action Plan
CARB	California Air Resources Board
CEC	California Energy Commission
CF	control factor
CHE	cargo handling equipment
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
D	distance
DB	dynamic braking
DF	deterioration factor
DMV	Department of Motor Vehicles
DOC	diesel oxidation catalyst
DPF	diesel particulate filter
DPM	diesel particulate matter
DR	deterioration rate
DTR	Drayage Truck Registry
DWT	deadweight tonnage
E	emissions
ECA	Emission control area
EEAI	Energy and Environmental Analysis, Inc.
EF	emission factor
EI	emissions inventory
EPA	U.S. Environmental Protection Agency
FCF	fuel correction factor
g/bhp-hr	grams per brake horsepower-hour
g/hr	grams per hour
g/kW-hr	grams per kilowatt-hour

g/mi	grams per mile
GHG	greenhouse gas
GVWR	gross vehicle weight rating
GWP	global warming potential
HC	hydrocarbons
HDV	heavy-duty vehicle
HFC	hydrofluorcarbon
HFO	heavy fuel oil
hp	horsepower
hr	hour(s)
ICTF	Intermodal Container Transfer Facility
IFO	intermediate fuel oil
IMO	International Maritime Organization
ITB	integrated tug and barge
kW	kilowatt
kW-hr	kilowatt-hour
lbs/day	pounds per day
LF	load factor
LLA	low load adjustment
Lloyd's	Lloyd's Register of Ships
LNG	liquefied natural gas
LPG	liquefied petroleum gas
LSI	large spark ignited (engine)
MarEx	Marine Exchange of Southern California
MCR	maximum continuous rating
MDO	marine diesel oil
MGO	marine gas oil
MMGT	million gross tons
MOU	Memorandum of Understanding
mph	miles per hour
MMGTM	million gross ton-miles
MY	model year
Na	not applicable
N	north
N_2O	nitrous oxide
nm	nautical miles
NO_x	oxides of nitrogen
OCR	optical character recognition
OGV	ocean-going vessel

PDTR	Ports Drayage Truck Registry
PHL	Pacific Harbor Line
PFC	perfluorocarbon
PM	particulate matter
PM_{10}	particulate matter less than 10 microns in diameter
$PM_{2.5}$	particulate matter less than 2.5 microns in diameter
POLA	Port of Los Angeles
POLB	Port of Long Beach
ppm	parts per million
PZ	precautionary zone
Reefer	refrigerated vessel
RFID	radio frequency identification
RL	rail locomotive
RO	residual oil
rpm	revolutions per minute
RSD	Regulatory Support Document
RTG	rubber tired gantry crane
S	sulfur
SCAG	Southern California Association of Governments
SCAQMD	South Coast Air Quality Management District
SF_6	sulfur hexafluoride
SFC	specific fuel consumption
SoCAB	South Coast Air Basin
SO_x	oxides of sulfur
SSA	Stevedoring Services of America
TEU	twenty-foot equivalent unit
tonnes	metric tonnes
tpy	tons per year
TWG	technical working group
U.S.	United States
ULCC	ultra large crude carriers
ULSD	ultra low sulfur diesel
UP	Union Pacific Railroad
UNFCC	United Nations Framework Connection on Climate change
USCG	U.S Coast Guard
VBP	vessel boarding program
VLCC	very large crude carrier
VLCS	very large cargo ship
VMT	vehicle miles of travel

VSR	vessel speed reduction
VTS	vessel traffic service
W	west
ZH	zero hour
ZMR	zero mile rate

EXECUTIVE SUMMARY

The Port of Long Beach (Port or POLB) annual activity-based emissions inventories serve as the primary tool to track the Port's efforts to reduce air emissions from port-related sources through implementation of measures identified in the San Pedro Bay Ports Clean Air Action Plan (CAAP) and regulations promulgated at the state and federal levels. To quantify the annual air emissions, the Port relies on operational information provided by Port tenants and operators. Development of the annual air emissions estimates is coordinated with a technical working group (TWG) comprised of representatives from the Port, the Port of Los Angeles, and the air regulatory agencies: U.S. Environmental Protection Agency, Region 9 (EPA), California Air Resources Board (CARB), and the South Coast Air Quality Management District (SCAQMD). Through collaboration with the TWG, the ports seek the consensus of the air regulatory agencies regarding the methodologies and information used to develop the emissions estimates.

Emissions from the following port-related source categories are evaluated:

- Ocean-going vessels (OGV)
- Harbor craft
- Cargo handling equipment (CHE)
- Locomotives
- Heavy-duty vehicles (HDV)

Exhaust emissions of the following pollutants, including greenhouse gases are quantified in the inventory:

- Particulate matter (PM) (10-micron, 2.5-micron)
- Diesel particulate matter (DPM)
- Oxides of nitrogen (NO_x)
- Oxides of sulfur (SO_x)
- Hydrocarbons (HC)
- Carbon monoxide (CO)
- Carbon dioxide equivalent (CO_2e)
- Carbon dioxide (CO_2)
- Methane (CH_4)
- Nitrous oxide (N_2O)

The geographical extent of the inventory includes emissions from the aforementioned port-related sources operating within the harbor district—rail locomotives and on-road trucks transporting cargo to and/or from the Port up to the cargo's first point of rest within the South Coast Air Basin (SoCAB) or up to the basin boundary, whichever comes first; and emissions from commercial marine vessels within the harbor and up to the study area boundary comprised of an over-water area bounded in the north by the south Ventura County line at the coast and in the south with the southern Orange county line at the coast.

Figure ES.1: 2013 Port of Long Beach Emissions Inventory Domain

CAAP Measures and Regulations Reflected in the 2013 Air Emissions Inventory

The implementation of existing CAAP measures and statewide and federal regulations and standards has significantly reduced emissions from port-related sources. The key CAAP measures and regulations reflected in the 2013 Air Emissions Inventory that contributed to reduced emissions from port-related sources are summarized below.

- The CARB OGV Fuel Regulation with expanded boundary was in effect for the entire calendar year of 2013. Also, 99% of vessels reduced their speed to 12 knots or less within 20 nm of the Port, while 88% of vessels slowed within 40 nm of the Port. Shore power at berth was used by 11% of the total vessel calls.

- CAAP measures and statewide regulations for cargo handling equipment and harbor craft, along with funding incentives resulted in the continued replacement of existing older equipment and engines with newer and cleaner engines, as well as installation of emissions reduction technologies such as diesel particulate filters.

- The final ban of older trucks calling at the Port at the beginning of 2012 resulted in significant turnover of older trucks to newer and cleaner trucks. Because of this, there was much less turnover in 2013 with the result that the call-weighted average age of the port-related trucks' engines was 4 years in 2013 compared to 3 years in 2012. This still compares well with the average truck age of 11 years in 2005. Not only are the trucks newer and therefore likely to be lower-mileage than in 2005, they meet significantly lower emission standards, particularly of DPM.

- Fleet-wide emissions from line haul locomotives at the Port continue to decrease relative to Port cargo throughput due to the gradual introduction of cleaner line haul locomotives as a result of the memorandum of understanding (MOU) between the air regulatory agencies and the Class 1 rail lines, although the decrease has slowed because the terms of the MOU have been met and normal fleet turnover has not yet made a significant impact on overall emission rates. This will change in coming years as newer locomotives replace older units. The switching fleet now consists almost completely of ultra-low emission locomotives meeting at least the Tier 3 emission standards. In addition, the utilization of on-dock rail has increased 40% in 2013 when compared to 2005 which further reduces drayage emissions associated with moving containers to the various rail yards servicing the port.

2013 Port of Long Beach Air Emissions Inventory Results

The results of the Port of Long Beach 2013 Air Emissions Inventory, including a comparison to the Port's 2005 air emissions inventory, are presented in Tables ES.1 and ES.2.

Table ES.1: 2005-2013 Port-related Air Emissions Comparison by Source Category

Category	PM_{10}	$PM_{2.5}$	DPM	NO_x	SO_x	CO	HC
2005 (tons)							
Ocean going vessels	721	578	618	6,627	6,591	579	249
Harbor craft	45	41	45	1,107	5	294	70
Cargo handling equipment	47	44	47	1,286	11	403	64
Locomotives	43	40	43	1,273	76	179	67
Heavy-duty vehicles	204	188	204	5,334	34	1,428	253
Total	**1,060**	**891**	**957**	**15,627**	**6,717**	**2,883**	**703**
2013 (tons)							
Ocean going vessels	126	114	99	4,258	644	462	219
Harbor craft	27	25	27	667	<1	313	56
Cargo handling equipment	11	10	10	546	1	617	36
Locomotives	25	23	25	695	1	156	39
Heavy-duty vehicles	16	14	14	1,045	3	318	52
Total	**205**	**186**	**175**	**7,211**	**650**	**1,866**	**402**
Change between 2005 and 2013 (percent)							
Ocean going vessels	-83%	-80%	-84%	-36%	-90%	-20%	-12%
Harbor craft	-40%	-39%	-40%	-40%	-80%	6%	-20%
Cargo handling equipment	-77%	-75%	-79%	-58%	-91%	53%	-44%
Locomotives	-42%	-43%	-42%	-45%	-99%	-13%	-42%
Heavy-duty vehicles	-92%	-93%	-93%	-80%	-91%	-78%	-79%
Total	**-81%**	**-79%**	**-82%**	**-54%**	**-90%**	**-35%**	**-43%**

Table ES.2: 2005-2013 Port-related GHG Emissions by Source Category

	CO_2e	CO_2	N_2O	CH_4
2005 (metric tons)				
Ocean-going vessels	375,409	368,712	21	5
Harbor craft	44,860	44,224	2	1
Cargo handling equipment	103,863	102,934	3	3
Locomotives	60,706	60,104	2	5
Heavy-duty vehicles	388,532	384,367	13	14
Total	**973,370**	**960,341**	**41**	**28**
2013 (metric tons)				
Ocean-going vessels	274,314	269,111	16	4
Harbor craft	40,743	40,164	2	1
Cargo handling equipment	103,292	102,516	2	4
Locomotives	55,111	54,574	1	4
Heavy-duty vehicles	300,872	297,682	10	3
Total	**774,332**	**764,047**	**31**	**16**
Change between 2005 and 2013 (percent)				
Ocean-going vessels	-27%	-27%	-24%	-20%
Harbor craft	-9%	-9%	0%	0%
Cargo handling equipment	-1%	0%	-33%	33%
Locomotives	-9%	-9%	-50%	-20%
Heavy-duty vehicles	-23%	-23%	-23%	-79%
Total	**-20%**	**-20%**	**-24%**	**-43%**

Table ES.3 compares vessel arrivals and container and cargo throughput at POLB in 2005 and 2013, including the average number of twenty-foot equivalent units (TEUs) per containership call.

Table ES.3: 2005-2013 Container Throughput and Vessel Call Comparison

Year	Container Throughput (TEU)	Cargo Throughput (metric tons)	All Arrivals	Containership Arrivals	Average TEU per call
2005	6,709,818	78,560,726	2,690	1,332	5,037
2013	6,730,574	77,929,480	1,921	911	7,388
Change (%)	**0.3%**	**-1%**	**-29%**	**-32%**	**47%**

Metrics to track the improvements to operational efficiencies and the effectiveness of the emissions reduction strategies and measures, in total emissions per unit of cargo handled through the port, are also estimated. Since Port operations are varied with a mix of containerized and non-containerized cargo, the metrics are based on TEU throughput and metric tons of cargo moved through the Port. Table ES.4 compares the tons of emissions per 10,000 TEU in 2005 and 2013, while Table ES.5 compares the tons of emissions per 100,000 metric tons in 2005 and 2013.

Table ES.4: 2005-2013 Port Emissions Efficiency Metric Comparison, tons per 10,000 TEU

EI Year	PM_{10}	$PM_{2.5}$	DPM	NO_x	SO_x	CO	HC	CO_2e
2005	1.58	1.33	1.43	23.29	10.01	4.30	1.05	1,596
2013	0.30	0.27	0.26	10.71	0.97	2.77	0.60	1,267
Change (%)	**-81%**	**-80%**	**-82%**	**-54%**	**-90%**	**-36%**	**-43%**	**-21%**

Table ES.5: 2005-2013 Port Emission Efficiency Metric Comparison, tons per 100,000 metric tons

EI Year	PM_{10}	$PM_{2.5}$	DPM	NO_x	SO_x	CO	HC	CO_2e
2005	1.35	1.13	1.22	19.89	8.55	3.67	0.89	1,363
2013	0.26	0.24	0.22	9.25	0.83	2.39	0.51	1,094
Change (%)	**-81%**	**-79%**	**-82%**	**-53%**	**-90%**	**-35%**	**-43%**	**-20%**

Progress towards CAAP Goals

One of the primary purposes of the Port's annual emissions inventories is to provide a progress update towards achieving the established CAAP San Pedro Bay Standards:

- By 2014, reduce emissions by 72% for DPM, 22% for NO_x, and 93% for SO_x from 2005 levels
- By 2023, reduce emissions by 77% for DPM, 59% for NO_x, and 93% for SO_x from 2005 levels

Economic forecasts indicate that cargo volumes through the Port of Long Beach will increase in upcoming years. While emissions reductions toward the established CAAP goals are expected to continue into the future, the rapid rate of emissions reductions seen in recent years may not continue as cargo volumes increase. Continued implementation of the CAAP and regulatory programs will continue to provide emissions benefits from port-related sources, and offset any anticipated impacts from the projected growth in trade.

Table ES.6 summarizes the Port's 2013 cumulative air emissions reductions of DPM, NO_x, and SO_x compared to the established CAAP San Pedro Bay Emissions Reduction Standards for 2014 and 2023.

Table ES.6: 2005-2013 Emissions Reductions Compared to CAAP San Pedro Bay Emissions Reduction Standards

Category	2005		2013
DPM (tons)			
Ocean-going vessels	618		99
Harbor craft	45		27
Cargo handling equipment	47		10
Locomotives	43		25
Heavy-duty vehicles	204		14
Total	**957**		**175**
Cumulative DPM Emissions Reduction Achieved in 2013			**82%**
CAAP San Pedro Bay DPM Emissions Reduction Standards		**2014**	**72%**
		2023	**77%**
NO_x (tons)			
Ocean-going vessels	6,627		4,258
Harbor craft	1,107		667
Cargo handling equipment	1,286		546
Locomotives	1,273		695
Heavy-duty vehicles	5,334		1,045
Total	**15,627**		**7,211**
Cumulative NOx Emissions Reduction Achieved in 2013			**54%**
CAAP San Pedro Bay NO_x Emissions Reduction Standards		**2014**	**22%**
		2023	**59%**
SO_x (tons)			
Ocean-going vessels	6,591		644
Harbor craft	5		<1
Cargo handling equipment	11		1
Locomotives	76		1
Heavy-duty vehicles	34		3
Total	**6,717**		**650**
Cumulative SOx Emissions Reduction Achieved in 2013			**90%**
CAAP San Pedro Bay SO_x Emissions Reduction Standards		**2014**	**93%**
		2023	**93%**

2013 Emissions Contribution to South Coast Air Basin Emissions

The following figures illustrate the Port's contribution to the total emissions in the SoCAB. The 2013 SoCAB emissions used for this comparison are based on the 2012 Air Quality Management Plan (AQMP)[1]. The other mobile source category includes aircraft, trains, ships, commercial boats, recreational boats, off-road recreational vehicles, and off-road equipment. The on-road source category includes light duty vehicles, medium duty trucks, heavy duty trucks, motorcycles, and buses. It should be noted that SoCAB PM_{10} and $PM_{2.5}$ emissions for on-road vehicles include brake and tire wear emissions whereas the Port's heavy-duty vehicle emissions do not include brake and tire wear. Due to rounding, the pie chart slices may not add up to 100%.

Figure ES.2: 2013 PM_{10} Emissions in the South Coast Air Basin, %

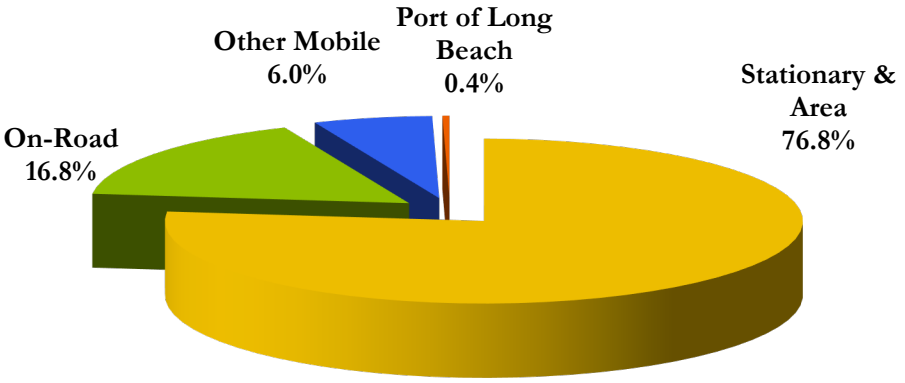
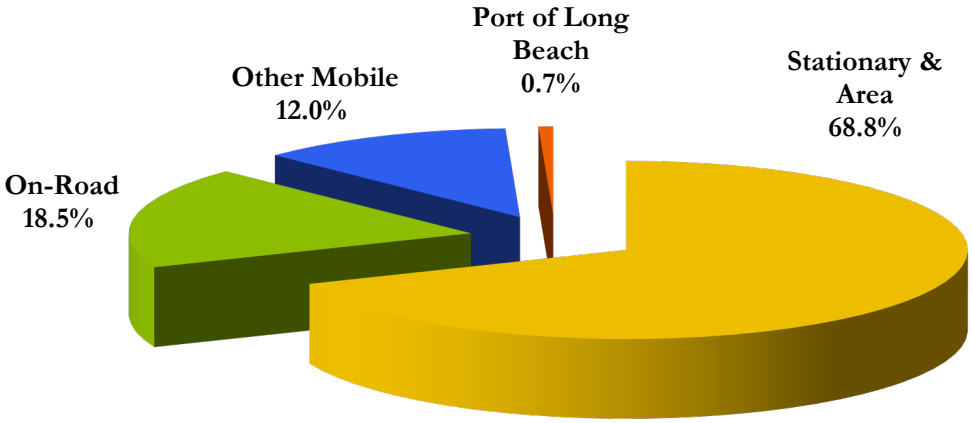


Figure ES.3: 2013 $PM_{2.5}$ Emissions in the South Coast Air Basin, %



[1] SCAQMD, *Final 2012 AQMP Appendix III, Base & Future Year Emissions Inventories*, February 2013.

Figure ES.4: 2013 DPM Emissions in the South Coast Air Basin, %

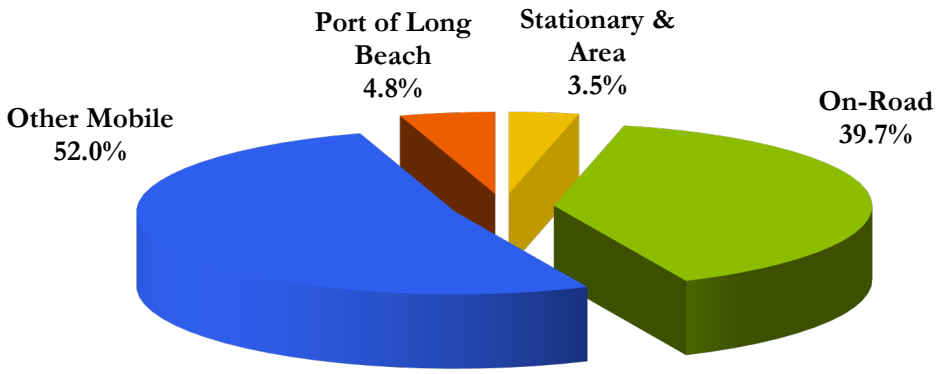


Figure ES.5: 2013 NO_x Emissions in the South Coast Air Basin, %

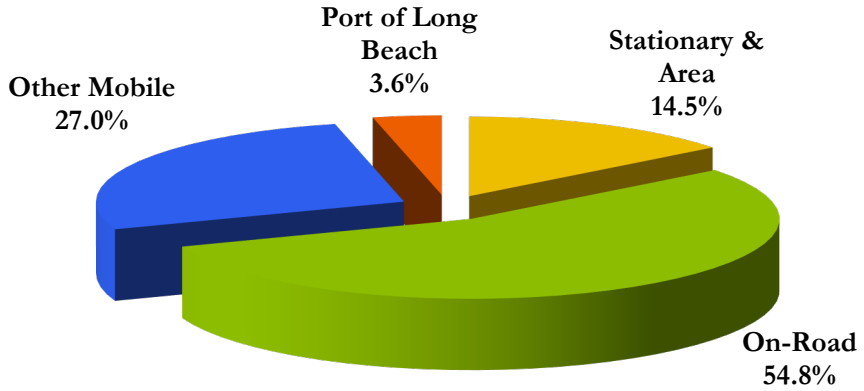
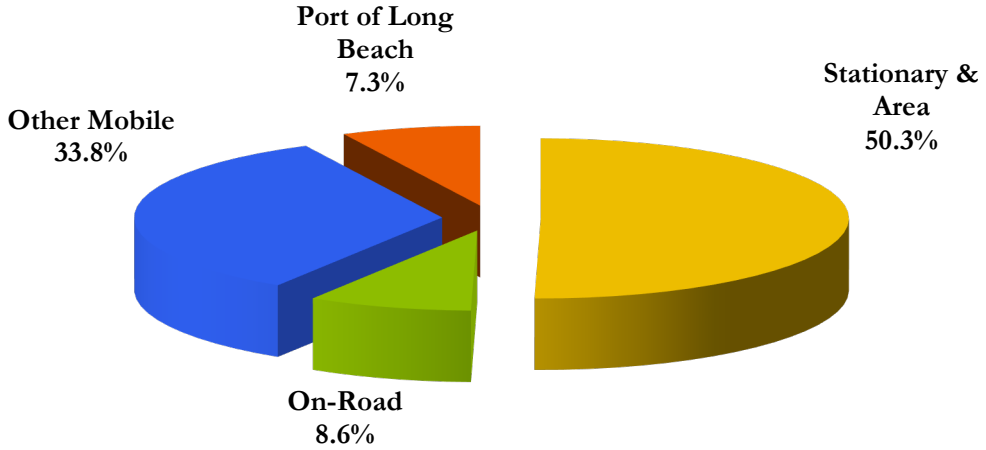


Figure ES.6: 2013 SO_x Emissions in the South Coast Air Basin, %



SECTION 1 INTRODUCTION

The Port of Long Beach (the Port or POLB) shares San Pedro Bay with the neighboring Port of Los Angeles (POLA). Together, the two ports comprise a significant regional and national economic engine for California and the United States (U.S.), through which approximately 32% of all containerized trade in the nation flows (14% for POLB alone)[2]. Combined, the POLB and POLA's customs district account for approximately $300 billion in annual trade. Despite a recent worldwide downturn in shipping, economic forecasts suggest that the demand for containerized cargo moving through the San Pedro Bay region will increase over the next two decades[3]. The economic benefits of the ports are felt throughout the nation.

The ports recognize that their ability to accommodate the projected growth in trade will depend upon their ability to address adverse environmental impacts (and, in particular, air quality impacts) that result from such trade. In November 2006, the ports of Long Beach and Los Angeles adopted the landmark Clean Air Action Plan (CAAP) that was designed to assist the ports with developing and implementing measures and strategies necessary to reduce air emissions and health risks associated with port operations, while allowing port development, and the job creation and economic activity associated with that development, to continue. The CAAP includes strategies to reduce emissions from port-related mobile source operations such as trucks, locomotives, ships, harbor craft, cranes and yard equipment. On November 22, 2010, the harbor commissioners of the two ports unanimously approved an update to the CAAP that identifies longer-term goals that build upon the commitments made in the original CAAP.

1.1 Reason for Study

In April 2004, the Port released its first activity-based inventory of emissions from port-related cargo handling equipment, rail locomotives, and on-road heavy-duty vehicles based on the 2002 calendar year. An addendum to the 2002 air emissions inventory was developed concurrently with the 2005 air emissions inventory to include emissions from ocean-going vessels and harbor craft.

Using a baseline year of 2005, annual air emissions inventories have been developed, and serve as the primary tool for the Port to track the progress of CAAP measures and regulations implemented to reduce port-related air emissions[4]. A discussion of regulatory and CAAP measures is provided in Appendix A. The 2013 Air Emissions Inventory (EI) presents estimates of emissions from port-related mobile sources based on activities that occurred in calendar year 2013. A comparison of the 2013 air emissions to relative to 2005 levels is also conducted.

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[2] American Association of Port Authorities (AAPA), *NAFTA Region Container 2012 Traffic,* May 2013.
[3] San Pedro Bay Container Forecast Update, The Tioga Group, Inc., July 2009.
[4] Port of Long Beach annual air emissions inventories can be found at *www.polb.com/emissions*.

Development of the annual air emissions inventories is coordinated with a technical working group (TWG) comprised of representatives from the ports and air regulatory agencies, including the U.S. Environmental Protection Agency Region 9 (EPA), California Air Resources Board (CARB), and South Coast Air Quality Management District (SCAQMD). Through collaboration with the TWG, the ports seek the consensus of the air regulatory agencies regarding methodologies and information used to develop the emissions estimates.

1.2 Scope of Study

The emissions in this report are based on the year of activity, the characterized pollutants, the port-related source of emissions, and the geographic boundaries in which the emissions occur.

1.2.1 Pollutants

The combustion of fuel from the operation of port-related vehicles and equipment result in exhaust emissions of air pollutants, including greenhouse gases. The pollutants estimated in the EI are described below.

Particulate Matter

Particulate matter (PM) is a complex mixture of extremely small particles and liquid droplets made up of a number of components including organic chemicals, metals, acids, and soil or dust particles. PM that are 10 micrometers in diameter or smaller generally pass through the throat and nose and enter the lungs and can affect the heart and lungs and cause serious health effects. PM emissions are grouped into two categories, particulate matter less than 10 microns in diameter (PM_{10}) and particulate matter less than 2.5 microns in diameter ($PM_{2.5}$).

PM_{10} emissions are inhalable coarse particles, such as those found near roadways and dusty industries, are larger than 2.5 micrometers and smaller than 10 micrometers in diameter. $PM_{2.5}$ emissions are fine particles 2.5 micrometers in diameter and smaller.

Diesel Particulate Matter

Diesel particulate matter (DPM) is part of a complex mixture that makes up diesel exhaust. In 1998, California identified diesel exhaust particulate matter as a toxic air contaminant based on its potential to cause cancer, premature death, and other health problems.

Oxides of Nitrogen

Oxides of nitrogen (NO_x) are a group of highly reactive gases produced during the fuel combustion process. NO_x reacts to form ground-level ozone and smog, and can contribute to respiratory problems.

Oxides of Sulfur

Oxides of sulfur (SO_x) are gases formed when fuel containing sulfur, such as coal and oil, is burned. SO_x can form particulates in the air and can contribute to respiratory problems.

Hydrocarbons
Fuels such as gasoline and diesel are mixtures of hydrocarbons (HC). HC emissions are fragments of fuel molecules that are only partially burned in the fuel combustion process. HC in the air react with NO_x and sunlight to contribute to the formation of ground-level ozone and greenhouse gases.

Carbon Monoxide
Carbon monoxide (CO) is a colorless, odorless gas emitted from the fuel combustion process. CO can cause harmful health effects by reducing oxygen delivery to the body's organs (like the heart and brain) and tissues. At extremely high levels, CO can cause death.

Greenhouse Gases
Emissions of greenhouse gases (GHG) carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O), which are combustion by-products, are estimated in this inventory. Other GHGs, such as fluorinated gases are not estimated because they are produced as a result of industrial processes not typically found at ports or in the maritime industry.

Since each GHG differs in its ability to absorb heat in the atmosphere, GHG emissions were normalized by multiplying individual GHG pollutant emissions by their respective global warming potentials (GPWs), listed below, and presented in the normalized units of CO_2e[5]:

- CO_2 – 1
- CH_4 – 21
- N_2O – 310

1.2.2 Emission Sources
Emissions are estimated from the following five port-related mobile source categories:

- Ocean-going vessels (OGV)
- Harbor craft
- Cargo handling equipment (CHE)
- Locomotives
- Heavy-duty vehicles (HDV)

[5] EPA, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2012,* April 2014.

The Port is a landlord port; it builds terminal facilities and leases them to shipping lines and stevedoring companies. The Port does not operate the terminals, ships, yard equipment, trucks or trains that move the cargo. Port tenants and shipping lines who own, operate and maintain equipment and own or charter vessels play an essential role in the development of an EI by providing the most accurate activity and operational information available for each of the source categories above. Activity and operational data collected are input into a database and emissions estimates are developed for each source category in a manner consistent with the latest estimating methodologies agreed upon by the Port and the TWG. Specific data collection and analytical approaches unique to each of the five source categories are described in subsequent sections of this report.

1.2.3 Geographical Domain

The 2013 EI includes emissions from equipment and vehicles that operate on port-owned and privately owned property within the Port of Long Beach Harbor District to the South Coast Air Basin boundaries. For OGVs and commercial harbor craft, the geographical extent is based on the same boundary used in previous marine vessel inventories developed for the SCAQMD.

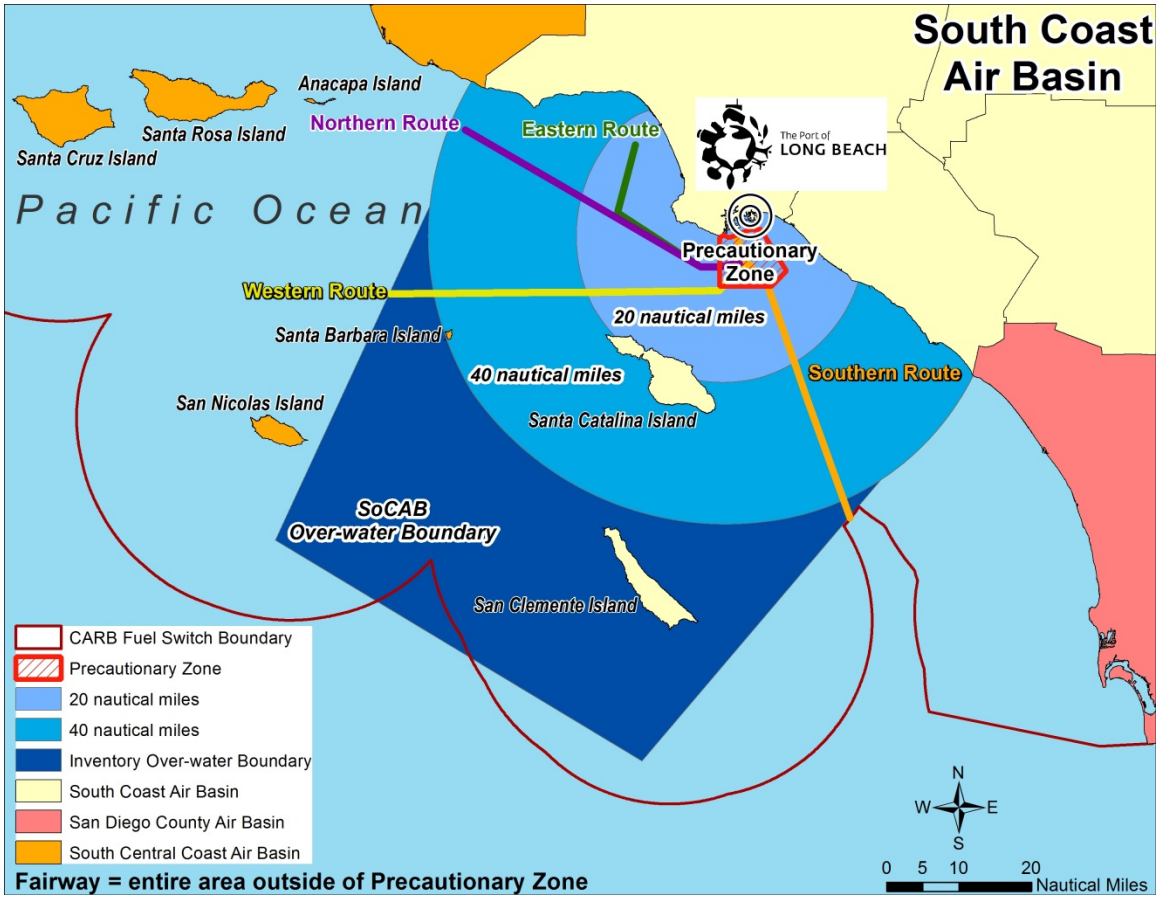
This section describes the geographic boundaries used for all source categories in this report.

Ocean-Going Vessels and Commercial Harbor Craft

The geographical domain of the OGV EI is the same boundary that has been used in the previous Port EIs since 2005. Originally selected to be consistent with the regulatory OGV EIs for the region, the geographical or over-water boundary is used to define the lengths of the various shipping routes used to access the Port. The lighter blue shading shows the CARB state inventory boundary line while the dark blue shows the South Coast Air Basin (SoCAB) over-water boundary. The geographic domain includes the area from the Port's berths and channels to the breakwater and beyond the breakwater to the following points that form a "box" that extends seaward from the Port:

- The northwest corner is located where the Ventura County and Los Angeles County lines intersect the Pacific Ocean at latitude 34° 02' 42.4" N, longitude 118° 56' 41.2" W.
- The southwest corner is located over the water, just south of the Territorial Sea boundary, south of San Nicolas Island at latitude 33° 00' 00.0" N, longitude 119° 30' 00.0" W.
- The southeast corner is located over the water, south of the Territorial Sea, south of San Clemente Island at latitude 32° 30' 00.0" N and longitude 118° 30' 00.0" W.
- The northeast corner is located where the Orange County and San Diego County lines intersect the Pacific Ocean at latitude 33° 23' 12.7" N, longitude 117° 35' 46.4" W.

Figure 1.1: OGV and Harbor Vessel Out of Port Geographical Extent



There are four primary shipping routes into the Port as designated by Marine Exchange of Southern California (MarEx).[6] The North route is typically used in West Coast United States/Canada and trans-Pacific voyages, the East route is used in transits to and from El Segundo Bay, the South route is used in Central/South American and Oceania voyages, and the West route is used in Hawaiian and eastern Oceania voyages. Each route is comprised of an inbound and an outbound lane, which separate vessel traffic arriving and departing the Port. The distances of these routes from the outer edge of the precautionary zone (PZ) to the over-water boundary and the distances of these routes from the breakwater (BW) to the outer edge of the PZ are listed in Table 1.1. These distances represent average distances traveled by ships on each route.

[6] Marine Exchange of California of Southern California, *Vessel Tracking Service. http://www.mxsocal.org.*

Table 1.1: Average Route Distances, nm

Shipping Route	PZ to Boundary Distance (nm)		BW to PZ Distance (nm)	
	Inbound	Outbound	Inbound	Outbound
Northern	43.3	42.4	9.5	10.0
Western	40.0	40.0	9.9	9.9
Southern	31.3	32.5	8.0	8.3
Eastern	25.7	25.7	9.5	9.5

The routes are further segmented by The Green Flag Vessel Speed Reduction program compliance zones; the 20 nautical mile (nm) zone is from the outer edge of the PZ to an arc 20 nm in radius from Point Fermin. The 20 to 40 nm zone is from the 20 nm arc to a further arc with a radius of 40 nm from Point Fermin.

Cargo Handling Equipment

The geographical scope for CHE is the terminals and facilities on which they operate. Figure 1.2 shows active Port terminals in 2013.

Figure 1.2: Cargo Handling Equipment Geographical Extent Port of Long Beach Map of Terminals

Railroad Locomotives and Heavy-Duty Vehicles

Emissions from switching and line haul locomotives are estimated for on-dock rail yards, intermodal yards on Port property, and the rail lines linking these facilities. For HDV associated with the hauling of cargo, emissions from queuing at terminal entry gates, travel and idling within the terminals, and queuing at the terminal exit gates are included in the 2013 EI. In addition to emissions that occur inside the Port facilities, emissions from locomotives and HDVs transporting cargo to or from the Port are estimated for activity that occurs within the SoCAB boundaries. Emissions are estimated up to the cargo's first point of rest within the SoCAB or up to the basin boundary, whichever occurred first. First point of rest is defined as the location where cargo, such as a container of goods, is first off-loaded from the transport device (truck or train) after leaving the Port. Examples include cargo transported from the Port by truck to a distribution center or to an off-port intermodal yard.

Figure 1.3 shows the SoCAB boundary for locomotives and HDVs relative to the Port. Since the ports of Long Beach and Los Angeles are interconnected with intermodal transportation linkages, every effort was made to only account for freight movements originating from or having a destination at the POLB.

Figure 1.3: Railroad Locomotives and Heavy Duty Vehicles Geographical Extent South Coast Air Basin Boundary

Railroad Locomotives

Figure 1.4 illustrates the rail track system serving both ports, and Figure 1.5 presents a broader view of the major rail routes in the SoCAB that are used to move port-related intermodal cargo.

Figure 1.4: Port Area Rail Lines

Figure 1.5: Air Basin Major Intermodal Rail Routes

Alameda Corridor

The Alameda Corridor is a 20-mile rail line used by intermodal and other trains servicing the San Pedro Bay ports and other customers in the area. Opened in 2002, the Alameda Corridor provides a more direct route between the ports and the transcontinental rail network interconnection near downtown Los Angeles than the routes that had previously been used, shortening the travel distance, eliminating many at-grade crossings, and reducing traffic congestion. Figure 1.6 illustrates the route of the Alameda Corridor and the routes it has replaced.

Figure 1.6: Alameda Corridor

1.2.4 Sources Not Included in the Emissions Inventory

The inventory does not include emissions from stationary sources because they are accounted for in stationary source permitting programs administered by the SCAQMD. The inventory also does not include emissions from vessels and equipment used in oil production operations, located either within the port boundary or offshore. The following industrial operations and other emission-producing activities, located on port property or on private property within the port boundaries are not included in the 2013 EI:

- Harbor Co-generation
- South East Resource Recovery Facility
- Tidelands Oil Production Company
- THUMS Oil Operations
- Long Beach Generation

These operations and activities are excluded from the 2013 EI because they are not related to the Port's goods movement activities or operations. Emissions associated with Tidelands and THUMS Oil Operations, are included in a separate study conducted to quantify oil industry-related emissions published in 2006[7].

1.3 Report Organization

This report presents the emissions and methodologies used for each source category in each of the following sections:

- Section 2 discusses ocean-going vessels
- Section 3 discusses harbor craft
- Section 4 discusses cargo handling equipment
- Section 5 discusses locomotives
- Section 6 discusses heavy-duty vehicles
- Section 7 discusses findings and results
- Section 8 compares 2013 emissions to 2005 emissions
- Section 9 discusses emissions metrics by source category
- Section 10 discusses anticipated impacts of control programs on emissions

The report also includes:

- Appendix A – Regulatory and San Pedro Bay Ports Clean Air Action Plan Measures
- Appendix B – Ocean-going vessels
- Appendix C – Harbor craft
- Appendix D – Cargo handling equipment
- Appendix E – Heavy-duty vehicles

[7] City of Long Beach, *Long Beach Gas and Oil Air Emissions Inventory,* prepared by Starcrest Consulting Group, LLC (Starcrest), October 2006.

SECTION 2 OCEAN-GOING VESSELS

This section presents emissions estimates for the OGV source category, including source description (2.1), geographical domain (2.2), data and information acquisition (2.3), operational profiles (2.4), emissions estimation methodology (2.5), and the emission estimates (2.6).

2.1 Source Description

Based on activity data obtained from the Marine Exchange of Southern California (MarEx), there were a total of 1,921 vessel calls (arrivals not including shifts) to the Port in 2013. The OGVs calling the port can be broadly divided into two groups: containerships, the predominant ship category for the Port, and non-containerships. These vessels are primarily used by shipping lines to transport retail goods and other containerized cargo in twenty- and forty-plus foot containers. The twenty-foot equivalent unit (TEU) is a standard unit for describing a container ship's cargo-carrying capacity, and is based on the size of a twenty-foot shipping container. For example, a 2,000-TEU vessel can accommodate 2,000 20-foot containers or an equivalent combination of 20-foot containers and the more common 40-foot containers.

- Auto carrier
- Containership
- General cargo
- Miscellaneous vessel
- Tanker
- Bulk carrier
- Cruise vessel
- Ocean-going tugboat (ITB/ATB)
- Roll-on roll-off vessel (RoRo)

Auto Carriers

Auto carriers transport vehicles. They have drivable ramps and can have substantial ventilation systems to prevent vehicle fuel vapors from pooling in the lower decks.

Bulk Carriers

Bulk carriers have open holds with giant hatches to carry dry goods in bulk such as coal, petroleum coke, salt, sugar, cement, gypsum, and other similar fine-grained commodities.

Containerships

Containerships carry 20- and 40-foot containers on their decks and in their holds, and are primarily used by shipping lines to transport retail goods. Containerships are divided into subtypes based on their TEU capacity.

Cruise Vessels

Cruise vessels carry passengers for pleasure voyages. These vessels have significant auxiliary engine demands to provide hotel amenities such as heating, air conditioning and electricity for thousands of passengers.

General Cargo Vessels

General cargo vessels carry diverse cargos such as steel, palletized goods, large heavy-duty machinery, and other heavy loads. Containers can also be carried on the vessel's top deck.

Ocean-going Tugboats

Commonly known as integrated tug barges (ITB) and articulated tug barges (ATB), the barge stern of the vessel is notched to accept a special tug which can be rigidly connected to the barge forming a single vessel. ITBs and ATBs are included in the ocean-going vessel inventory.

Refrigerated Vessels

Often called Reefers, these vessels are able to keep perishable cargo such as fruits, vegetables, and meats cool. Most of the cargo is stored below deck on pallets or transported inside refrigerated containers that are placed on top of the closed cargo hold.

Roll-on roll-off Vessels

RoRos, as they are typically known, are similar to automobile carriers, but can accommodate larger wheeled equipment, such as construction equipment.

Tanker Vessels

Tanker vessels transport liquids in bulk such as oil, chemicals, and specialty products such as tallow and molasses. Crude oil tankers are categorized into different categories depending on their dimensions.

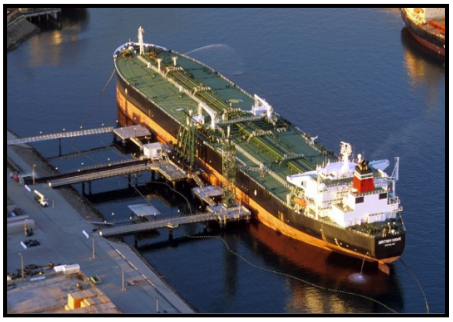


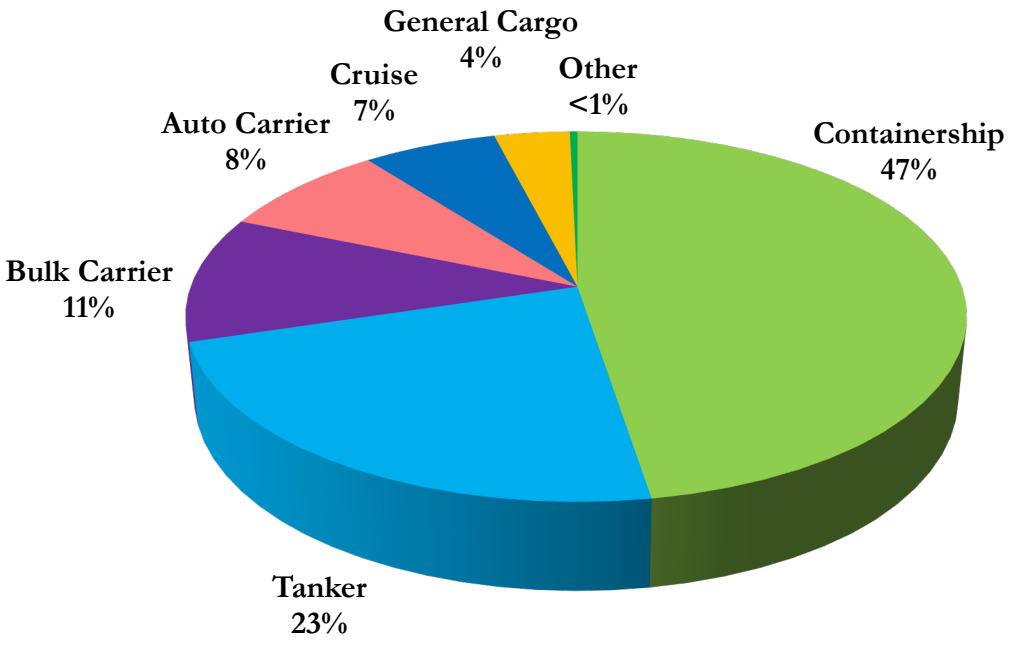
Table 2.1 compares the total TEUs and vessel calls at the port in 2005 and 2013. In addition to TEU comparisons, this table compares the total number of calls by all OGV types, the total number of containership calls and the average container density, expressed as TEUs per containership call. There was relatively no change in TEU throughput when comparing 2013 and 2005. However, the total number of vessel calls at the port decreased 29% compared to 2005, which may be due to the larger vessels calling the port in 2013.

Table 2.1: TEUs and Vessel Call Comparison, %

Year	Container Throughput TEUs	All Arrivals	Containership Arrivals	Average TEUs/Call
2005	6,709,818	2,690	1,332	5,037
2013	6,730,574	1,921	911	7,388
Change (%)	**0.3%**	**-29%**	**-32%**	**47%**

Figure 2.1 shows the percentage of calls by vessel type in 2013

Figure 2.1: 2013 Distribution of Calls by Vessel Type

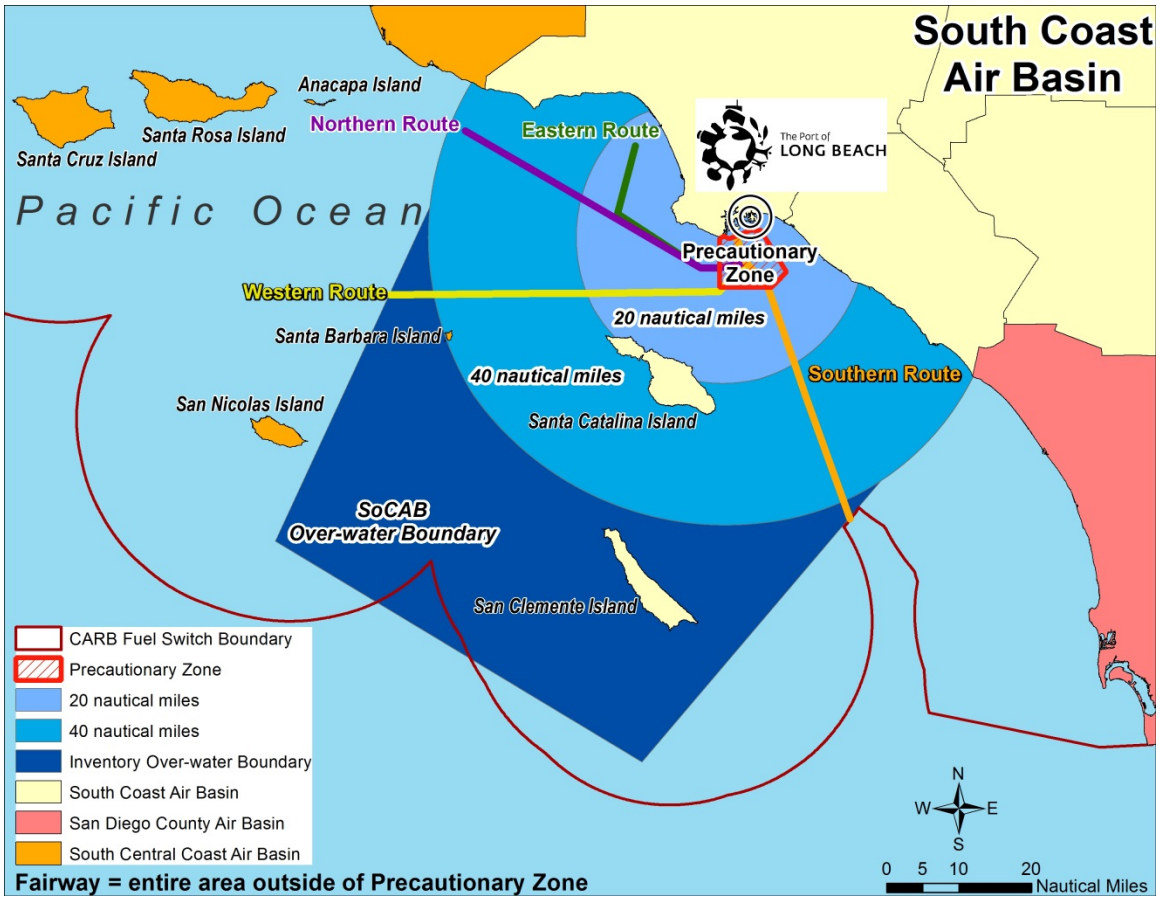


Appendix B includes information about the vessels that called at the port, including vessel flags of convenience, vessel characteristics, and a summary of vessels classified as frequent callers to the port.

2.2 Shipping Routes

The geographical domain of the 2013 emissions inventory for commercial marine vessels is the same overwater boundary as in previous EIs. The CARB OGV Fuel Regulation's expanded boundary is shown in Figure 2.2 along with the boundary of the study area and the major shipping routes. The 24-nautical-miles (nm) boundary in the original regulation was expanded to beyond the offshore islands (CARB Fuel Switch Boundary in the figure) in late 2011[8].

Figure 2.2: Major Shipping Routes



[8] CARB, *http://www.arb.ca.gov/ports/marinevess/documents/fuelogv13.pdf*

Table 2.2 presents distribution of arrivals and departures by route from 2008 through 2013.

Table 2.2: 2008 - 2013 Distribution of Arrivals and Departures by Route

Route	2008	2009	2010	2011	2012	2013
Northern	55%	38%	11%	9%	26%	29%
Western	9%	22%	51%	54%	34%	35%
Southern	35%	39%	37%	36%	40%	36%
Eastern	1%	1%	1%	1%	0.4%	0.4%

2.3 Data and Information Acquisition

Each source of data and information is detailed in the following subsections. Various sources of data and operational knowledge about the Port's marine activities are used to compile the data necessary to estimate emissions from OGV:

- Marine Exchange of Southern California
- Vessel Speed Reduction Program speed data
- Jacobsen Pilot Service
- IHS Fairplay (Lloyd's) - Lloyd's Register of Ships
- Port Vessel Boarding Program data
- Terminal shore power data
- Port tanker loading data

2.3.1 Marine Exchange of Southern California

The Marine Exchange of Southern California (MarEx) operates the Vessel Traffic Service (VTS) in cooperation with the U.S. Coast Guard (USCG), the ports of Long Beach and Los Angeles, and the State of California. The VTS was established in 1994 to provide traffic safety, traffic monitoring and security functions for the ports of Long Beach and Los Angeles, and is the first private/public VTS partnership in the country that is funded by industry. MarEx tracks ship routes using radar and Automated Identification System (AIS) receivers and also requires ships to report their activities to the VTS upon arrival and departure.

The MarEx data evaluated in developing emission estimates includes vessel names, arrival and departure dates and times, transit speeds and directions, berth of destination, and route designation. Data from the MarEx provides the primary basis for establishing:

- Distribution of arrival and departure travel directions by route
- Number of ship calls
- Names of vessels and International Maritime Organization (IMO) number
- Vessel origination and destination
- Vessel speeds
- Determination of hotelling time

Vessel arrivals include inbound trips from the sea to a berth and inbound trips from the sea to an anchorage. An inbound trip from the sea to an anchorage is assigned to the port if the next port of call after the anchorage is a berth at the Port. A call is made up of an arrival to, shifts (if applicable), time at-berth, time at anchorage (if applicable), and a departure from the emissions inventory domain.

2.3.2 Vessel Speed Reduction Program Data

MarEx monitors OGV speeds in the four shipping routes as part of the Vessel Speed Reduction (VSR) program that began in May 2001. Vessel speed information is recorded for each shipping route at a series of waypoints, located on arcs emanating from Point Fermin. The vessel speeds are measured in 5 nm increments, from the Precautionary Zone to the 40 nm waypoint. The measurement of vessel speeds from the 25 nm to 40 nm waypoints began in April 2008; previously, only speeds up to the 20 nm waypoint were measured. Vessel speeds in the Precautionary Zone are not provided by MarEx (see section 2.5.3 for assigned Precautionary Zone speeds by vessel type); however, USCG regulation limits vessel speeds within the Precautionary Zone to 12 knots.[9]

2.3.3 Jacobsen Pilot Service

The Jacobsen Pilot Service maintains an automated database that documents the times when the pilot boards the ship and when the pilot disembarks the ship. These dates and times have been used to estimate transit time profiles for harbor maneuvering from berth to the breakwater for the following movements:

- Inbound from sea
- Outbound to sea
- Anchorage shifts
- Other shifts including inter-port and intra-port shifts

Shifts are vessel movements within a port; please refer to section 2.4 for further explanation. Average in-harbor maneuvering times were used for each movement, ship type and terminal based on average trip times.

2.3.4 IHS Maritime- Lloyd's Register of Ships

The information source commonly known as HIS Maritime's "Lloyd's Register"[10] (or Lloyd's data) is considered to be the leading resource for ship characteristics such as build year, tonnage, rated speed and propulsion engine power, engine power plant configuration, age, and other parameters. The International Maritime Organization (IMO) and vessel classification societies do not require reporting of vessel auxiliary power characteristics therefore Lloyd's Register is generally incomplete for this information.

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[9] MarEx and USCG, *http://www.mxsocal.org/pdffiles/VTS%20LA.LB%20USER%20MANUAL%20JUNE%201,%202013%20.pdf*

[10] IHS Maritime (formerly IHS Fairplay) markets the ship characteristics data. See: *http://www.ihs.com/products/maritime-information/index.aspx*.

The Lloyd's data used in this report were obtained from IHS Fairplay in January 2013. To establish the characteristics of each vessel that called the port in 2013, the vessel information from Lloyd's is matched against the vessels reported by MarEx data that called the port in 2013. There was only one miscellaneous type vessel, that called the port in 2013 that did not match based on IMO number between the Lloyd's and the MarEx data sets. For these vessels, the average propulsion engine power and speed of similar types of vessel have been used as defaults for specific data; these averages are provided in Appendix B. The auxiliary engine and boiler defaults are obtained from a separate data source and further detailed in sections 2.3.5, 2.3.7, 2.5.9 and 2.5.10.

2.3.5 Vessel Boarding Program Survey Data

The best sources to obtain local activity data and ship parameters are the shipping lines that own and/or operate the vessels. The Port's Vessel Boarding Program (VBP) provides for an in-depth survey of OGVs during which Starcrest consultants board individual ships and interview the ship's executive and engineering staff, which usually includes the captain and chief engineer. Data collected from individual vessels includes:

- Main engine power
- Auxiliary engine power
- Auxiliary engine load
- Boiler fuel consumption
- Vessels that switched fuels
- Emission reduction technologies such as slide valves

For this inventory, information gathered from previous years' vessel boardings, along with new boarding data, has been used.

2.3.6 Vessel Shore Power Data

In 2013, several vessels calling at the Port used shore-side electrical power instead of running their diesel-powered auxiliary engines while at-berth. Terminal operators provided the number of vessel calls and corresponding berths that utilized shore power for hotelling operations. In 2013, shore power was used for 81 cruise vessel calls, 125 container vessel calls, and 16 liquid bulk vessel calls, representing about 11% of total vessel calls at the port.

2.3.7 Tanker Loading Data

Beginning in 2013, tanker activity data was collected to determine if a tanker was loading or discharging liquid bulk during time at berth. The mode of operation for a tanker at berth determines the auxiliary boiler engine load. The auxiliary boiler load demand is less during tanker loading operations than it is during discharging. Prior to this data being available in 2013, the default tanker auxiliary boiler load assumed that all tankers were discharging while at berth. In 2013, about 10% of the tanker calls used lower auxiliary boiler load.

2.4 Operational Profiles

Vessel activity is evaluated as the number of trips by trip type (e.g. arrival, departure, and shift) and trip segment. Trip segments are used for the portion of trip at-sea between the transit routes and the Precautionary Zone, within the Precautionary Zone, and within the breakwater. The following vessel operational modes are used to define the characteristics of a ship's operation within the emission inventory domain:

Transit Ship is operating in open water, also identified as "at sea mode".

Maneuvering Ship enters the breakwater. Additional power is typically brought online since the ship is traveling in restricted waters. Maneuvering time is based on the type of ship, associated speed, and distance traveled between the berth and the breakwater.

At-Berth Ship is stationary at the dock/berth; typically during loading and unloading of cargo. Ship is typically still active, operating auxiliary engines and boilers, however not operating its propulsion engines.

Anchorage Ship is anchored inside or just outside the breakwater waiting for reassignment, an open berth, or requires maintenance. Ship is typically still active, operating auxiliary engines and boilers, however not operating its propulsion engines.

Shift Ship movement other than an arrival or departure. Ship moves from one berth to another berth within the Port or from the Port of Los Angeles, or from/to an anchorage. A ship can have zero to several shifts per call. There are 3 broad categories of shift movements:

- *Intra-port shifts:* within a port from one berth to another.
- *Inter-port shifts:* between adjacent ports. Common occurrence in co-located ports such as Long Beach and Los Angeles.
- *Anchorage shifts*: between a terminal and an anchorage. For example, a vessel receives a partial load, goes to anchorage, and then returns to the terminal (or to another terminal) to complete loading.

Table 2.3 presents the numbers of arrivals, departures, and shifts associated with vessels at the Port in 2013. The containerships are classified by TEU size. For example, a Container-2000 is a containership with a container capacity of 2,000 to 2,999 TEU and a Container-1000 is a containership with a container capacity up to 1,999 TEU. Arrivals and departures may not match because the OGV activity is based on a calendar year.

Table 2.3: 2013 Total OGV Movements

Vessel Type	Arrival	Departure	Shift	Total
Auto Carrier	159	160	13	332
Bulk	202	210	225	637
Bulk - Heavy Load	2	2	1	5
Bulk - Self Discharging	7	7	0	14
Container - 1000	82	82	7	171
Container - 2000	54	53	5	112
Container - 3000	60	61	1	122
Container - 4000	215	215	5	435
Container - 5000	169	171	8	348
Container - 6000	1	1	1	3
Container - 7000	14	14	0	28
Container - 8000	177	178	3	358
Container - 9000	65	65	0	130
Container - 10000	17	17	0	34
Container - 11000	35	35	1	71
Container - 12000	7	7	0	14
Container - 13000	12	11	1	24
Container - 14000	3	3	0	6
Cruise	124	125	1	250
General Cargo	70	74	63	207
Ocean Tugs	3	3	3	9
Miscellaneous	2	2	0	4
RoRo	2	2	0	4
Tanker - Aframax	97	100	187	384
Tanker - Chemical	146	142	206	494
Tanker - Handysize	6	6	7	19
Tanker - Panamax	79	86	151	316
Tanker - Suezmax	78	80	139	297
Tanker - ULCC	28	30	93	151
Tanker - VLCC	5	5	19	29
Total	**1,921**	**1,947**	**1,140**	**5,008**

2.5 Emissions Estimation Methodology

In general, emissions from vessels' propulsion (or main) engines, auxiliary engines, and auxiliary boilers are estimated as a function of energy demand required to power the vessel by mode multiplied by an emission factor. Emission factor adjustments are then applied to account for the type of fuel used in the engines and control factors are applied to account for any emissions reduction measures and technologies. Based on interviews with vessel operators and the marine industry, incinerators, in general, are not used within the geographical study area (at-berth or near coastal waters). Therefore, their emissions are not estimated in this inventory.

Equations 2.1 and 2.2 are the basic equations used in estimating emissions by mode from OGV for propulsion engines, auxiliary engines, and boilers.

Equation 2.1

$$\boldsymbol{E_i = Energy_i \times EF \times FCF \times CF}$$

Where:

E_i = Emissions, grams
$Energy_i$ = Energy demand by mode, calculated using Equation 2.2 as the energy output of the engine (or engines) over the period of time, kW-hr
EF = Emission factor, g/kW-hr
FCF = Fuel correction factor, dimensionless
CF = Control factors for emission reduction measures, dimensionless

Energy by mode is calculated using Equation 2.2

Equation 2.2

$$\boldsymbol{Energy_i = Load \times Act}$$

Where:

$Energy_i$ = Energy demand by mode, kW-hr
Load = maximum continuous rated (MCR) times load factor (LF) for propulsion engine power (kW); reported operational load of the auxiliary engine(s), by mode (kW); or operational load of the auxiliary boiler, by mode (kW)
Act = activity, hours in mode

2.5.1 Propulsion Engine Maximum Continuous Rated (MCR) Power

MCR power, reported in kW, is defined as the manufacturers' rated continuous engine power output. For this study, it is assumed that the 'Power' value for each vessel's propulsion engines listed in Lloyd's is the MCR power. For diesel-electric configured ships, MCR is the combined rated electric propulsion motor(s) rating.

2.5.2 Propulsion Engine Load Factor

The load factor for propulsion engines is the ratio of actual speed compared to the ship's maximum rated speed. The load factor is estimated using the Propeller Law, which states that the propulsion engine load varies with the cube of the vessel speed. Therefore, a vessel's propulsion engine load at a given speed is estimated by taking the cube of that speed divided by the vessel's maximum speed, as shown by the following equation.

Equation 2.3

$$\boldsymbol{LF = (Speed_{Actual} / Speed_{Maximum})^3}$$

Where:

LF = load factor, dimensionless

$Speed_{Actual}$ = actual speed, knots

$Speed_{Maximum}$ = maximum speed, knots

For the purpose of estimating emissions, the load factor has been capped at 1.0 so that there are no calculated propulsion engine load factors greater than 100% (i.e., calculated load factors above 1.0 are assigned a load factor of 1.0).

2.5.3 Propulsion Engine Activity

Engine activity is measured in terms of hours of operation by mode. At-berth and anchorage times are determined from MarEx activity data. Average harbor maneuvering times are developed from data provided by Pilot data. Actual speeds provided by MarEx (discussed in section 2.3.2) are used for estimating vessel transit time beyond the PZ to the geographic boundary. Under the Port's Green Flag Program, many vessels reduce their speeds to 12 knots within 20 nm and 40 nm of Point Fermin.

Average vessel speeds in the precautionary zone by vessel type are presented in Table 2.4.

Table 2.4: Precautionary Zone Average Speed, knots

Vessel Type	Vessel Class	Average Speed
Auto Carrier	Fast	11.0
Bulk	Slow	9.0
Containership	Fast	11.0
Cruise	Fast	11.0
General Cargo	Slow	9.0
Miscellaneous	Slow	9.0
Ocean Tug	Slow	9.0
Reefer	Slow	9.0
RoRo	Slow	9.0
Tanker	Slow	9.0

A vessel's transit time (activity) in the precautionary zone and along the various routes outside the precautionary zone to the edge of the geographical boundary is estimated using equation 2.4.

Equation 2.4

$$\boldsymbol{Activity = D/Speed_{Actual}}$$

Where:

Activity = activity, hours
D = distance, nm
$Speed_{Actual}$ = actual ship speed, knots

2.5.4 Propulsion Engine Emission Factors

OGV diesel propulsion engines are categorizes into the following:

Slow speed diesel propulsion engines	Engines with maximum speeds less than 130 revolutions per minute (rpm)
Medium speed diesel propulsion engines	Engines with maximum speeds over 130 rpm (typically greater than 400 rpm) and less than 2,000 rpm.

Steamship vessels also called the port in 2013; however they represent a small percentage of the total vessel calls at the Port. The propulsion engine emission factors for pollutants evaluated in this EI, except for PM, were obtained from a study by ENTEC UK Limited's (ENTEC) in 2002.[11] The PM emission factors for slow- and medium- speed diesel propulsion engines were obtained from CARB.[12] PM emission factors for gas turbine and steamship vessels are from a 2004 report prepared by the IVL Swedish Environmental Research Institute's (IVL)[13]. The emission factors assume the use of residual fuel oil/ heavy fuel oil (HFO) which is intermediate fuel oil (IFO 380) or one with similar specifications, with an average sulfur content of 2.7%.

The 2012 emission inventory incorporated ship specific engine data provided on the IMO Engine International Air Pollution Prevention Certificate (EIAPP) for propulsion and auxiliary engines. For ships that provided the Port with EIAPP certificates as part of the Port's Green Ship Incentive Program[14] or collected through the VBP, ship specific NO_x emission factors are used for propulsion and auxiliary engines instead of default factors. This approach was adopted after obtaining consensus with the Technical Working Group (TWG). In 2013, there were a total 66 vessels for which EIAPP certificates were obtained, of which 18 vessels called the port.

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[11] ENTEC, *Quantification of Emissions from Ships Associated with Ship Movements between Ports in the European Community, Final Report*, July 2002. Prepared for the European Commission (ENTEC 2002).
[12] CARB, *A Critical Review of Ocean-Going Vessel Particulate Matter Emission Factors*, 9 Nov 07.
See: *www.arb.ca.gov/msei/offroad/pubs/ocean_going_vessels_pm_emfac.pdf.*
[13] IVL, *Methodology for Calculating Emissions from Ships: Update on Emission Factors".* Prepared by IVL Swedish Environmental Research Institute for the Swedish Environmental Protection Agency.
[14] POLB, *http://www.polb.com/environment/greenship.asp*

The default emission factors were used for vessels that did not have EIAPP certificates available for vessel specific NO_x emission factors.

Tables 2.5 and 2.6 list the default emission factors for propulsion engines assuming the use of HFO containing 2.7% sulfur and 0.3% sulfur marine diesel oil (MDO), by propulsion engine IMO tier level

To produce emission factors based on the use of MDO, the HFO emission factors are multiplied by a fuel correction factor (FCF), of 0.94 representing the NO_x combustion differences between MDO and HFO.

Table 2.5: Emission Factors for OGV Propulsion Engines using HFO and MDO, g/kW-hr

Engine Type	IMO Tier	Model Year	PM_{10}	$PM_{2.5}$	DPM	NO_x	SO_x	CO	HC
HFO 2.7% Sulfur									
Slow speed diesel	Tier 0[15]	≤ 1999	1.5	1.2	1.5	18.1	10.5	1.4	0.6
Medium speed diesel	Tier 0	≤ 1999	1.5	1.2	1.5	14.0	11.5	1.1	0.5
Slow speed diesel	Tier 1	2000 – 2010	1.5	1.2	1.5	17.0	10.5	1.4	0.6
Medium speed diesel	Tier 1	2000 – 2010	1.5	1.2	1.5	13.0	11.5	1.1	0.5
Slow speed diesel	Tier 2	2011 – 2015	1.5	1.2	1.5	15.3	10.5	1.4	0.6
Medium speed diesel	Tier 2	2011 – 2015	1.5	1.2	1.5	11.2	11.5	1.1	0.5
Gas turbine	na	all	0.05	0.04	0	6.1	16.5	0.2	0.1
Steamship	na	all	0.80	0.64	0	2.1	16.5	0.2	0.1
MDO/MGO 0.3% S									
Slow speed diesel	Tier 0	≤ 1999	0.32	0.29	0.32	17.0	1.2	1.4	0.6
Medium speed diesel	Tier 0	≤ 1999	0.32	0.29	0.32	13.2	1.3	1.1	0.5
Slow speed diesel	Tier 1	2000 – 2010	0.32	0.29	0.32	16.0	1.2	1.4	0.6
Medium speed diesel	Tier 1	2000 – 2010	0.32	0.29	0.32	12.2	1.3	1.1	0.5
Slow speed diesel	Tier 2	2011 – 2015	0.32	0.29	0.32	14.4	1.2	1.4	0.6
Medium speed diesel	Tier 2	2011 – 2015	0.32	0.29	0.32	10.5	1.3	1.1	0.5
Gas turbine	na	all	0.01	0.01	0	5.7	1.8	0.2	0.1
Steamship	na	all	0.17	0.15	0	2.0	1.8	0.2	0.1

[15] Tier 0 refers to all ships constructed prior to January 1, 2000, which did not have an IMO Tier requirement at the time of construction.

The emission factors for greenhouse gases CO_2, CH_4 and N_2O were obtained from the 2004 IVL study and are provided in Table 2.6.

Table 2.6: GHG Emission Factors for OGV Propulsion Engines using HFO and MDO, g/kW-hr

Engine	IMO Tier	Model Year	CO_2	N_2O	CH_4
HFO 2.7% Sulfur					
Slow speed diesel	Tier 0	≤ 1999	620	0.031	0.012
Medium speed diesel	Tier 0	≤ 1999	683	0.031	0.010
Slow speed diesel	Tier 1	2000 – 2010	620	0.031	0.012
Medium speed diesel	Tier 1	2000 – 2010	683	0.031	0.010
Slow speed diesel	Tier 2	2011 – 2015	620	0.031	0.012
Medium speed diesel	Tier 2	2011 – 2015	683	0.031	0.010
Gas turbine	na	all	970	0.080	0.002
Steamship	na	all	970	0.080	0.002
MDO/MGO 0.3% S					
Slow speed diesel	Tier 0	≤ 1999	589	0.029	0.012
Medium speed diesel	Tier 0	≤ 1999	649	0.029	0.010
Slow speed diesel	Tier 1	2000 – 2010	589	0.029	0.012
Medium speed diesel	Tier 1	2000 – 2010	649	0.029	0.010
Slow speed diesel	Tier 2	2011 – 2015	589	0.029	0.012
Medium speed diesel	Tier 2	2011 – 2015	649	0.029	0.010
Gas turbine	na	all	922	0.075	0.002
Steamship	na	all	922	0.075	0.002

2.5.5 Propulsion Engines Low Load Emission Factors

When vessels travel at slower speeds, such as when traveling in the VSR zone or maneuvering in the harbor, the diesel propulsion engines operate at lower loads, therefore less efficiently. In 2000, Energy and Environmental Analysis, Inc. (EEAI) conducted a study for the EPA to evaluate marine engine testing data from Lloyd's and the USCG.[16] EEAI derived emissions factors for low engine load conditions using a regression equation that reflects the observation that with decreased vessel speeds and engine loads, mass emissions (i.e., tons) are also decreased, while the emission rates, or factors (i.e., g/kW-hr) increase.

[16] EPA, *Analysis of Commercial Marine Vessels Emissions and Fuel Consumption Data,* February 2000. Prepared by Energy and Environmental Analysis, Inc. (EEAI) for Sierra Research. Work Assignment No. 1-10. EPA-420-R-002.

To derive the emission factors for low engine loads EEAI used Equation 2.5 below:

Equation 2.5

$$\boldsymbol{y = a(fractional\ load)^{-x} + b}$$

Where:

y = engine low-load emission factors, g/kW-hr
a = coefficient
b = intercept
x = exponent (negative)
fractional load = propulsion engine load factor (2% - 20%), derived by the Propeller Law, percent (see equation 2.3)

Table 2.7 presents the values for each of the variables in Equation 2.5, by pollutant.

Table 2.7: Low-Load Engine Emission Factor Regression Equation Variables

Pollutant	Exponent (x)	Intercept (b)	Coefficient (a)
PM	1.5	0.2551	0.0059
NO_x	1.5	10.4496	0.1255
CO	1.0	0.1458	0.8378
HC	1.5	0.3859	0.0667

Table 2.8 presents the resulting low-load emission factors for propulsion engines based on Equation 2.5 and the variables in Table 2.7.

Table 2.8: EEAI Emission Factors, g/kW-hr

Load	PM	NO_x	CO	HC
2%	2.34	54.82	42.04	23.97
3%	1.39	34.60	28.07	13.22
4%	0.99	26.14	21.09	8.72
5%	0.78	21.67	16.90	6.35
6%	0.66	18.99	14.11	4.92
7%	0.57	17.23	12.11	3.99
8%	0.52	16.00	10.62	3.33
9%	0.47	15.10	9.45	2.86
10%	0.44	14.42	8.52	2.50
11%	0.42	13.89	7.76	2.21
12%	0.40	13.47	7.13	1.99
13%	0.38	13.13	6.59	1.81
14%	0.37	12.85	6.13	1.66
15%	0.36	12.61	5.73	1.53
16%	0.35	12.41	5.38	1.43
17%	0.34	12.24	5.07	1.34
18%	0.33	12.09	4.80	1.26
19%	0.33	11.96	4.56	1.19

The propulsion engine low load emission factors shown in Table 2.8 above are based on a set of factors that predate those used for vessel propulsion engines operating in average conditions shown in Table 2.5 (such as at-sea transit, 20% or greater engine load). Therefore, they cannot be used directly to estimate emissions at low load conditions. To estimate propulsion engine emissions in low load conditions, the emission factors shown in Table 2.8 are further adjusted, resulting in adjustment multipliers that are then applied to the emissions factors shown in Tables 2.5 and 2.6. The low load adjustment (LLA) multipliers are determined by dividing each of the EEAI emission factors at loads under 20% by the EEAI emission factor at 20% load as shown in Equation 2.6. At 20% engine load, the adjustment factor is exactly 1.0 since the 20% load emission factor is divided into itself.

Equation 2.6

$$\boldsymbol{LLA\ (at\ x\ \%\ load)\ =\ y\ (at\ x\ \%\ load)\ /\ y\ (at\ 20\%\ load)}$$

Where:

LLA = Low load adjustment multiplier
x = engine load factor less than or equal to 20%
y = emission factor, g/kW-hr (see Table 2.9)

Table 2.9 lists the low-load adjustment multipliers for diesel propulsion engines operating in low load engine conditions. The emission factors for N_2O and CH_4 were adjusted based on the NO_x and HC low load adjustments, respectively. The LLA is not applied at engine loads greater than 20%. For propulsion engine loads below 20%, the LLA increases, reflecting the increased emission rates due to decreased engine efficiency. Low load emission factors are not applied to steamships or ships that have gas turbines because according to the EEAI study, the increase in emissions rates at low loads was only observed from diesel engines operating at slow speeds.

Table 2.9: Low Load Adjustment Multipliers for Emission Factors

Load	PM	NO_x	SO_x	CO	HC	CO_2	N_2O	CH_4
2%	7.29	4.63	1.00	9.70	21.18	1.00	4.63	21.18
3%	4.33	2.92	1.00	6.49	11.68	1.00	2.92	11.68
4%	3.09	2.21	1.00	4.86	7.71	1.00	2.21	7.71
5%	2.44	1.83	1.00	3.90	5.61	1.00	1.83	5.61
6%	2.04	1.60	1.00	3.26	4.35	1.00	1.60	4.35
7%	1.79	1.45	1.00	2.80	3.52	1.00	1.45	3.52
8%	1.61	1.35	1.00	2.45	2.95	1.00	1.35	2.95
9%	1.48	1.27	1.00	2.18	2.52	1.00	1.27	2.52
10%	1.38	1.22	1.00	1.97	2.18	1.00	1.22	2.18
11%	1.30	1.17	1.00	1.79	1.96	1.00	1.17	1.96
12%	1.24	1.14	1.00	1.64	1.76	1.00	1.14	1.76
13%	1.19	1.11	1.00	1.52	1.60	1.00	1.11	1.60
14%	1.15	1.08	1.00	1.41	1.47	1.00	1.08	1.47
15%	1.11	1.06	1.00	1.32	1.36	1.00	1.06	1.36
16%	1.08	1.05	1.00	1.24	1.26	1.00	1.05	1.26
17%	1.06	1.03	1.00	1.17	1.18	1.00	1.03	1.18
18%	1.04	1.02	1.00	1.11	1.11	1.00	1.02	1.11
19%	1.02	1.01	1.00	1.05	1.05	1.00	1.01	1.05
20%	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

The low load emission factor is calculated for each pollutant using Equation 2.7. In keeping with the port's emission estimating practice of assuming a minimum main engine load of 2%, the table of LLA factors does not include values for 1% load.

Equation 2.7

$$\boldsymbol{EF = Base\ EF \times LLA}$$

Where:

EF = Resulting low load emission factor
Base EF = Emission factor for slow speed diesel propulsion engines (see Tables 2.6 and 2.7)
LLA = Low load adjustment multiplier (see Table 2.9)

2.5.6 Propulsion Engine Harbor Maneuvering Loads

Propulsion engine loads for vessels operating within a harbor tend to be very low, especially on in-bound trips when the propulsion engines are off for periods of time as the vessels are reducing speed and being maneuvered to their berths. During docking, the propulsion engines are typically off as assist tugboats perform most of the work to position the ship against the wharf. Propulsion engine maneuvering loads are estimated using the Propeller Law, with the over-riding assumption that the lowest average engine load is 2%. The low load adjustment multipliers previously discussed are applied to the slow speed diesel propulsion engines.

Harbor transit speeds (in knots) within the breakwater were developed from VBP information and are used to set conservative load factors. Vessel maneuvering time within the breakwater is determined from Pilot data

Inbound fast ships (auto, container, cruise ships)	7 knots
Inbound slow ships (any other vessel type)	5 knots
Outbound traffic (all vessels)	8 knots

2.5.7 Propulsion Engine Power Defaults

Propulsion engine power from the most current Lloyd's data was used, with the exception of 1 vessel which had no propulsion engine power data listed in Lloyd's. A default average by similar vessel type was assumed for this vessel. The propulsion engine averages are found in the characteristics table in Appendix B.

2.5.8 Auxiliary Engine Emission Factors

Vessel specific NO_x emission factors were calculated from EIAPP certificates collected from the VBP or through the Port's Green Ship Incentive Program. For vessels that did not provide EIAPP certificates available, the default emission factors from ENTEC were applied.[17] The ENTEC auxiliary emission factors are presented in Tables 2.10 and 2.11.

Table 2.10: Emission Factors for Auxiliary Engines using HFO and MDO, g/kW-hr

Model Year	IMO Tier	PM_{10}	$PM_{2.5}$	DPM	NO_X	SO_x	CO[18]	HC
HFO 2.7% Sulfur								
≤ 1999	Tier 0	1.5	1.2	1.5	14.7	12.3	1.1	0.4
2000 - 2010	Tier 1	1.5	1.2	1.5	13.0	12.3	1.1	0.4
2011 - 2015	Tier 2	1.5	1.2	1.5	11.2	12.3	1.1	0.4
MDO/MGO 0.3% S								
≤ 1999	Tier 0	0.32	0.29	0.32	13.8	1.4	1.1	0.4
2000 - 2010	Tier 1	0.32	0.29	0.32	12.2	1.4	1.1	0.4
2011 - 2015	Tier 2	0.32	0.29	0.32	10.5	1.4	1.1	0.4

Table 2.11: GHG Emission Factors for Auxiliary Engines using HFO and MDO, g/kW-hr

Model Year	CO_2	N_2O	CH_4
HFO 2.7% Sulfur			
all	722	0.031	0.008
MDO/MGO 0.3% S			
all	686	0.029	0.008

2.5.9 Auxiliary Engine Load Defaults

Lloyd's data contains limited information on vessels' auxiliary engines because the IMO and vessel classification societies generally do not require reporting of vessel auxiliary power characteristics. For the vessels that called at the port in 2013, installed auxiliary engine power information is present in the Lloyd's data for only 25% of the discrete vessels and there is no information about loads by mode in the data set. In addition, the Lloyd's data provided is typically suspect based on corresponding visits under the VBP program, resulting in sometime significant differences to what's onboard the vessel and what's in the data set.

[17] ENTEC, *Quantification of Emissions from Ships Associated with Ship Movements between Ports in the European Community, Final Report*, July 2002. Prepared for the European Commission (ENTEC 2002).
[18] IVL 2004

The primary data source for auxiliary engine information is gathered from the VBP and sister ships. Sister ships are vessels built as a series and with near-identical characteristics, so it is assumed that the sister ships to a boarded vessel have the same auxiliary engine characteristics as the boarded vessel. The following hierarchy of data sources was established to determine OGV auxiliary engine power loads:

VBP ships	Latest auxiliary engine data for the boarded vessel
VBP sister ships	Latest auxiliary engine data based on the sister ship's boarded vessel
Port Defaults	Calculated average loads by vessel class for transit, hotelling, and maneuvering

Based on the hierarchy above, if auxiliary engine data were collected as part of the VBP, the most recent information is used. If a sister vessel is identified as part of the VBP survey or based on information from the shipping line, then the latest information collected is used for the sister ship. If a vessel has not been boarded and is not identified as a sister ship to a boarded vessel, or if there are gaps in the VBP data, then defaults by vessel class are used. The sources for auxiliary engine power information by vessel type are provided in Appendix B.

VBP data is used directly for all vessels that have called the Port and their applicable sister vessels. Typically, for those vessels not boarded, default auxiliary engine loads are calculated using the trip-weighted averages for each activity mode derived from the VBP dataset and applicable Lloyd's data. Table 2.12 summarizes the auxiliary engine load defaults used for the 2013 EI, by vessel subtype and activity mode. For diesel-electric cruise ships, the calculated house load defaults are listed in Table 2.13.

Table 2.12: 2013 Average Auxiliary Engine Load Defaults, kW

Vessel Type	Transit	Maneuvering	Berth Hotelling	Anchorage Hotelling
Auto Carrier	1079	2,391	1,284	1079
Bulk	312	825	208	312
Bulk - Self Discharging	462	1,223	272	462
Bulk - Wood Chips	305	807	179	305
Container - 1000	957	2,245	720	957
Container - 2000	985	2,188	1,039	985
Container - 3000	747	2,562	641	747
Container - 4000	1,403	2,472	1,136	1,403
Container - 5000	1,316	4,700	1,128	1,316
Container - 6000	1,162	2,591	804	1,162
Container - 7000	1,220	2,721	845	1,220
Container - 8000	1,457	3,249	1,008	1,457
Container - 9000	1,488	3,320	1,030	1,488
Container - 10000	1,375	1,675	1,075	1,375
Container - 11000	2,000	4,000	1,500	2,000
Container - 12000	2,500	4,500	2,000	2,500
Container - 13000	2,600	5,200	1,700	2,600
Container - 14000	3,000	5,500	3,000	3,000
Cruise	5,445	8,711	5,445	5,445
General Cargo	423	1,071	575	423
Ocean Tug	76	202	99	76
Miscellaneous	793	2,100	467	793
Reefer	630	1,889	1,091	630
RoRo	132	396	229	132
Tanker - Chemical	681	937	738	681
Tanker - Handysize	559	768	605	559
Tanker - Panamax	630	867	683	630
Tanker - Aframax	584	803	632	584
Tanker - Suezmax	718	988	778	718
Tanker - VLCC	1,080	1,486	1,171	1,080
Tanker - ULCC	1,080	1,486	1,171	1,080

Table 2.13: 2013 Diesel Electric Cruise Ship Average Auxiliary Engine Load Defaults, kW

Passenger Count	Transit	Maneuvering	Berth Hotelling
<1,500	3,500	3,500	3,000
1,500 < 2,000	7,000	7,000	6,500
2,000 < 2,500	10,500	10,500	9,500
2,500 < 3,000	11,000	11,000	10,000
3,000 < 3,500	11,500	11,500	10,500
3,500 < 4,000	12,000	12,000	11,000
4,000+	13,000	13,000	12,000

2.5.10 Auxiliary Boiler Emission Factors

OGVs have one or more fuel-fired boilers used for fuel heating and producing steam. Typically, the fuel-fired boilers are not used during transit at sea since many vessels are equipped with an exhaust gas recovery system or "economizer" that uses the heat of the main engine's exhaust for heating fuel or water. However, in recent years, vessels have reduced their speeds to comply with the VSR program extending up to 40 nm from the port. At lower speeds, it is believed that auxiliary boilers are actually used more often during transit because the lower speeds result in the cooling of main engine exhausts, making the vessels' economizers less effective. As such, it is assumed for the emission calculations that auxiliary boilers operate during maneuvering and transit when the main engine load factor is calculated to be less than 20%.

Table 2.14 and Table 2.15 show the emission factors from ENTEC's 2002 report for the fuel-fired boilers.

Table 2.14: Emission Factors for OGV Auxiliary Boilers using HFO and MDO, g/kW-hr

Type	PM_{10}	$PM_{2.5}$	DPM	NO_x	SO_x	CO	HC
HFO 2.7% Sulfur							
Steam boilers	0.8	0.64	0	2.1	16.5	0.2	0.1
MDO/MGO 0.3% S							
Steam boilers	0.17	0.15	0	2.0	1.8	0.2	0.1

Table 2.15: GHG Emission Factors for OGV Auxiliary Boilers using HFO and MDO, g/kW-hr

Type	CO_2	N_2O	CH_4
HFO 2.7% Sulfur			
Steam boilers	970	0.080	0.002
MDO/MGO 0.3% S			
Steam boilers	922	0.075	0.002

2.5.11 Auxiliary Boiler Load Defaults

Because Lloyd's data does not provide information on vessels' boilers information on boiler fuel consumption is collected from vessels during the VBP. Reported fuel consumption rates for boilers have been converted to equivalent kW using average specific fuel consumption (SFC) factor for residual fuel of 305 grams of fuel per kW-hour as reported in ENTEC's 2002 report[19].

The average boiler loads were calculated using the following equation, where "daily fuel" is the reported average fuel consumption rate in tonnes per day.

Equation 2.8

$$\boldsymbol{Average\ kW\ =}$$
$$\boldsymbol{((daily\ fuel/24\ hrs/day)\ \times\ 1{,}000{,}000\ g/tonne)/305\ g/kWhr}$$

Table 2.16 presents the calculated auxiliary boiler load defaults used for each vessel type. Compared to other vessel types, cruise ships have higher boiler usage due to the number of passengers on-board and the need for hot water, while tankers' boilers provide steam for steam-powered liquid pumps, inert gas for storage tanks, and heat to keep fuel warm for pumping. Ocean tugboats do not have boilers; therefore their boiler load default is zero. As previously discussed, typically boilers are not used at sea during normal transit; therefore, if the main engine load is greater than 20%, the boiler load default at sea is zero. If the main engine load is less than or equal to 20%, the maneuvering boiler load defaults shown in Table 2.16 are used.

In addition, tanker loading data was incorporated to account for the difference in demand on the auxiliary boiler during loading or discharging operations while at berth. As of the 2013 EI, if a tanker is loading liquid bulk while at berth, a lower auxiliary boiler load of 875 kW is applied.

[19] ENTEC, *Quantification of Emissions from Ships Associated with Ship Movements between Ports in the European Community, Final Report*, July 2002. Prepared for the European Commission (ENTEC 2002).

Table 2.16: 2013 Auxiliary Boiler Energy Defaults, kW

Vessel Type	Transit	Maneuvering	Berth Hotelling	Anchorage Hotelling
Auto Carrier	351	351	351	351
Bulk	132	132	132	132
Bulk - Self Discharging	132	132	132	132
Bulk - Wood Chips	132	132	132	132
Container - 1000	241	241	241	241
Container - 2000	325	325	325	325
Container - 3000	474	474	474	474
Container - 4000	492	492	492	492
Container - 5000	630	630	630	630
Container - 6000	565	565	565	565
Container - 7000	551	551	551	551
Container - 8000	525	525	525	525
Container - 9000	547	547	547	547
Container - 10000	749	749	749	749
Container - 11000	600	600	600	600
Container - 12000	600	600	600	600
Container - 13000	600	600	600	600
Container - 14000	700	700	700	700
Cruise	1,393	1,393	1,393	1,393
General Cargo	137	137	137	137
Ocean Tug	0	0	0	0
Miscellaneous	137	137	137	137
Reefer	255	255	255	255
RoRo	243	243	243	243
Tanker - Chemical	371	371	3,000	371
Tanker - Handysize	371	371	3,000	371
Tanker - Panamax	371	371	3,000	371
Tanker - Aframax	371	371	3,000	371
Tanker - Suezmax	371	371	3,000	371
Tanker - VLCC	371	371	3,000	371
Tanker - ULCC	371	371	3,000	371

2.5.12 Fuel Correction Factors

Fuel correction factors are used to adjust the emission estimates to account for fuels or other parameters that are different from the conditions under which the emission factors were developed. As previously discussed, the emission factors are appropriate for engines using residual/HFO fuel with average sulfur content of 2.7%. Table 2.17 lists the fuel correction factors used when the emission factors that are based on 2.7% sulfur fuel are used for engines that burned fuel with a lower sulfur content. These fuel correction factors are consistent with those used by CARB in their emission estimations methodology for ocean-going vessels.[20] The FCFs are applied to propulsion engines, auxiliary engines, and auxiliary boilers if they have switched fuel from the default residual fuel (2.7% average sulfur content) to a lower sulfur content fuel.

Table 2.17: Fuel Correction Factors

Actual Fuel	Sulfur Content	PM	NO_x	SO_x	CO	HC	CO_2	N_2O	CH_4
HFO	1.00%	0.73	1.00	0.370	1.00	1.00	1.00	1.00	1.00
MGO	0.30%	0.21	0.94	0.111	1.00	1.00	0.95	0.94	1.00

Beginning July 1, 2009, the CARB OGV low sulfur fuel regulation, adopted in July 2008, requires vessel operators to use marine gas oil (MGO) with a sulfur content less than 1.5% by weight or marine diesel oil (MDO) with a sulfur content equal to or less than 0.5% by weight within 24-nm from California coast (and while at-berth) in their diesel powered propulsion engines, auxiliary engines and auxiliary boilers.[21] Starting on August 1, 2013, the maximum fuel sulfur limit for MGO decreased from 1.5% to 1.0%, while the fuel sulfur limit for MDO remained at 0.5 %.

Starting with the 2011 EI, based on worldwide fuel sample data, an average 0.3% sulfur fuel content was used for main and auxiliary engines and for auxiliary boilers. The 0.3% average sulfur content is consistent with a survey conducted by CARB to support their fuel switch regulation and was also incorporated into CARB's OGV emissions inventory database. The TWG has agreed to continue the use of 0.3% sulfur fuel content as an average for distillate fuel for the 2013 EI.

In the 2013 calendar year, 100% compliance with CARB's OGV low sulfur fuel regulation is assumed and confirmed by CARB. CARB issued several Essential Modification Executive Orders exempting individual vessels that were granted an exemption from the fuel use specifications described in the OGV low sulfur fuel regulation after demonstrating that is not feasible to use the specified fuels in their auxiliary boilers unless essential modification to the vessels are made.[22] For these particular vessels, if the vessel called the port in 2013, the fuel switching was not included for the boilers; therefore, the emissions were estimated for the boilers as burning residual fuel.

[20] CARB, *http://www.arb.ca.gov/regact/2008/fuelogv08/fuelogv08.htm;* Appendix D, Tables II-6 to II-8.
[21] CARB, *www.arb.ca.gov/ports/marinevess/ogv.htm.*

Effective August 1, 2012, the North American Emission Control Area (ECA) required vessels traveling within the regulatory zone to use low sulfur fuel with a sulfur content of 1.0% or less.[23] For the purpose of this inventory, vessels which were previously assigned CARB fuel exemptions for auxiliary boilers, were assigned HFO 1.0% S fuel upon entrance into the ECA regulatory zone.

2.5.13 Emission Reduction Technologies

Control factors are used to take into account the emissions benefits associated with emission reduction technologies such as slide valves and the use of shore side electrical power at berth.

Shore Side Electrical Power

As an additional emission reduction strategy, shore side electrical power was used for 222 vessel calls representing about 11% of all vessel calls. For all shore-powered events, a control factor of 0.05 or a 95% reduction is applied for all pollutant and GHG emissions from auxiliary engines while at-berth for that event. This reduction estimate accounts for the time necessary to connect and disconnect the electrical power and to start up the auxiliary engines prior to departure.

Slide Valves

In past inventories, a PM and NO_x reduction was taken into account for fuel slide valves. Slide valve reductions are limited to two-stroke MAN main engines that are Tier 0 or Tier I. As part of the Technology Advancement Program (TAP), Man Diesel & Turbo A/S, Mitsui Engineering & Shipbuilding CO., Ltd., POLA, and POLB conducted a test at the Mitsui Tamano Works in Japan to determine if slide valves provide emission reduction benefits when ships are traveling below 25% load, as ship are doing when they are in compliance with the VSR program. The test was completed and the results are currently being used to develop load-based control factors for NO_x, PM, $PM_{2.5}$, DPM, HC, and N_2O. The work will include working with MAN Diesel & Turbo A/S to determine the distribution of the type of valves typically used in two-stroke engines to help set baseline scenarios. The CFs will be developed in coordination with the TWG and incorporated in the 2014 inventory. For 2013, both ports decided to set the CFs for slide valves to 1.0 (essentially turning their reductions off) as to avoid taking credit for offsets that are not supported by the test results and to avoid setting an arbitrary interim CFs that would be changed in the next inventory. Once the new CFs have been developed and agreed upon with the TWG, they will be applied to 2014 inventory and all previous inventories.

[23] The North American Emissions Control Area regulatory zone begins 200 nautical miles from the Pacific, Atlantic, and Gulf coasts of the United States (including 8 main Hawaiian Islands), Canada, and the French territories; it does not extend into marine areas subject to sovereignty or jurisdiction of other states.

2.5.14 Changes to methodology from previous years

The following improvements were made to the OGV emission calculation methodology in this inventory compared to the previous year methodology.

- There were no slide valve emission reductions taken for 2005-2013.
- CO_2 emission factors for auxiliary engines were changed from 683 to 722 g/kw-hr. This revision is consistent with CARB methodology.
- Hotelling time calculations were adjusted to account for a difference in the MarEx activity timestamp definition. It was determined that the arrival and departure timestamps indicate the time that a vessel enters or leaves the harbor, rather than the time a vessel arrives or departs berth, which had been the previous interpretation. The hotelling time calculations were adjusted to account for this difference.
- Tanker loading data was incorporated to account for the difference in demand on the auxiliary boiler during loading or discharging operations while at berth. If a tanker is loading liquid bulk while at berth, a lower auxiliary boiler load of 875 kW is applied.

2.6 Emission Estimates

A summary of the 2013 OGV emission estimates of all pollutants by vessel type is presented in Table 2.18 for criteria pollutants in tons and Table 2.19 for GHG emissions in metric tons. Ocean-going vessel data is presented in Appendix B.

Table 2.18: 2013 Ocean-going Vessel Emissions by Vessel Type, tons

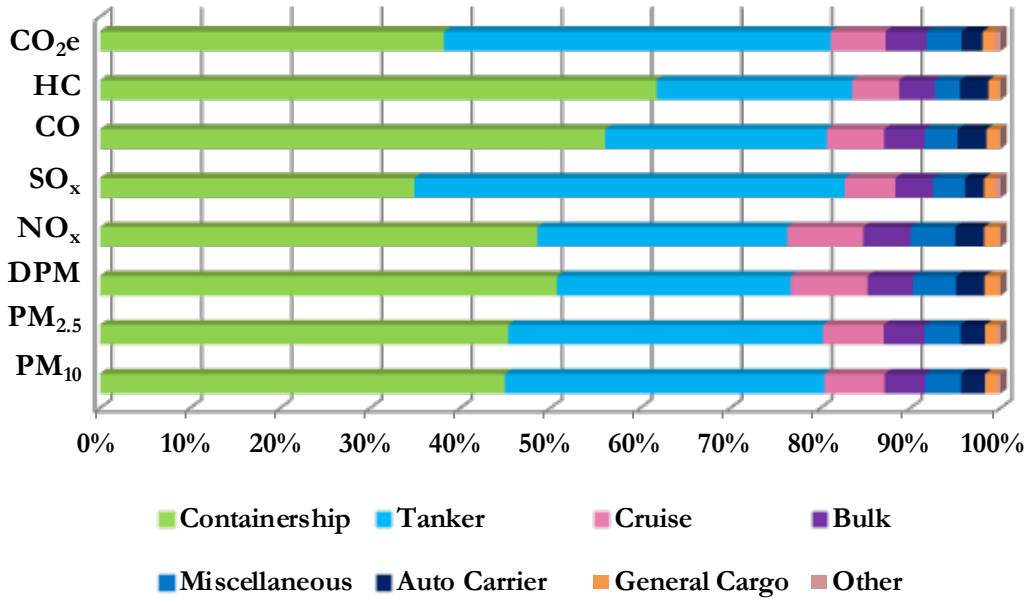
Vessel Type	PM_{10}	$PM_{2.5}$	DPM	NO_x	SO_x	CO	HC
Auto Carrier	3.4	3.1	3.1	135.3	13.7	14.8	6.8
Bulk	5.7	5.2	5.0	222.9	26.8	20.7	8.7
Containership	56.7	51.8	50.4	2,069.0	224.8	259.4	135.4
Cruise	8.5	7.7	8.5	360.1	36.1	29.6	11.4
General Cargo	1.8	1.6	1.7	71.2	8.3	6.5	2.7
Ocean Tug	0.1	0.1	0.1	2.3	0.2	0.2	0.1
Miscellaneous	5.0	4.6	4.8	212.9	23.1	17.0	6.2
RoRo	0.3	0.3	0.0	4.4	3.1	0.4	0.2
Tanker	44.7	40.0	25.8	1,180.2	307.7	113.6	47.6
Total	**126.2**	**114.4**	**99.4**	**4,258.3**	**643.8**	**462.2**	**219.1**

Table 2.19: 2013 Ocean-going Vessel GHG Emissions by Vessel Type, metric tons

Vessel Type	CO_2e	CO_2	N_2O	CH_4
Auto Carrier	6,393	6,282	0.3	0.1
Bulk	12,494	12,281	0.7	0.2
Containership	104,866	102,849	6.3	2.5
Cruise	16,771	16,546	0.7	0.2
General Cargo	3,840	3,778	0.2	0.0
Ocean Tug	112	111	0.0	0.0
Miscellaneous	10,704	10,550	0.5	0.1
RoRo	1,472	1,437	0.1	0.0
Tanker	117,662	115,278	7.6	0.9
Total	**274,314**	**269,111**	**16.4**	**4.0**

Figure 2.3 shows percentage of emissions of each pollutant by vessel type in 2013. Containerships have the highest percentage of overall emissions for the vessels (approximately 35 to 62%), followed by tankers (approximately 22 to 48%), cruise ships, bulk vessels, miscellaneous, auto carriers, and general cargo. The "other" category includes RoRos and ocean-going tugboats.

Figure 2.3: 2013 Ocean-going Vessel Emissions by Vessel Type, %



2.6.1 Emission Estimates by Engine Type

Tables 2.20 and 2.21 present summaries of the emission estimates by engine type.

Table 2.20: 2013 Ocean-going Vessel Emissions by Engine Type, tons

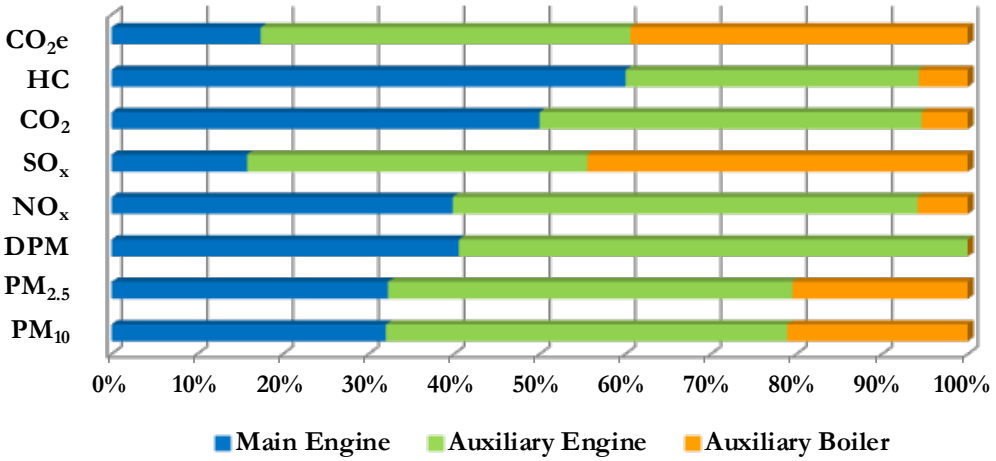
Engine Type	PM_{10}	$PM_{2.5}$	DPM	NO_x	SO_x	CO	HC
Auxiliary Engine	59.1	54.0	59.1	2,312.6	256.0	206.2	75.0
Auxiliary Boiler	26.6	23.4	0.0	248.7	286.2	25.0	12.5
Main Engine	40.4	36.9	40.3	1,696.8	101.8	231.0	131.5
Total	**126.2**	**114.4**	**99.4**	**4,258.3**	**643.8**	**462.2**	**219.1**

Table 2.21: 2013 Ocean-going Vessel GHG Emissions by Engine Type, metric tons

Engine Type	CO_2e	CO_2	N_2O	CH_4
Auxiliary Engine	118,474	116,906	5.0	1.4
Auxiliary Boiler	108,083	105,409	8.6	0.2
Main Engine	47,757	46,796	2.9	2.4
Total	**274,314**	**269,111**	**16.5**	**4.0**

Figure 2.4 shows results in percentages for emission estimates by engine type.

Figure 2.4: 2013 Ocean-going Vessel Emissions by Engine Type, %



2.6.2 Emission Estimates by Engine Type

Tables 2.22 and 2.23 present summaries of emission estimates by the various modes.

Table 2.22: 2013 Ocean-going Vessel Emissions by Mode, tons

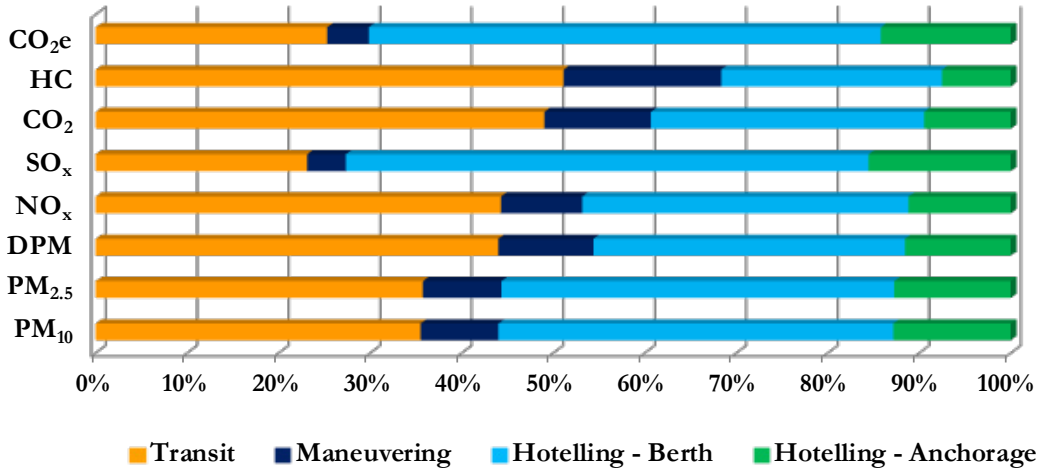
Mode	Engine Type	PM_{10}	$PM_{2.5}$	DPM	NO_x	SO_x	CO	HC
Transit	Auxiliary Engine	10.0	9.1	10.0	402.7	43.2	34.8	12.6
Transit	Auxiliary Boiler	1.0	0.9	0.0	11.0	10.4	1.1	0.6
Transit	Main Engine	33.8	30.9	33.7	1,472.3	95.3	190.7	98.8
Total Transit		**44.8**	**40.9**	**43.7**	**1,886.0**	**148.9**	**226.6**	**112.0**
Maneuvering	Auxiliary Engine	3.8	3.5	3.8	149.5	16.4	13.2	4.8
Maneuvering	Auxiliary Boiler	0.4	0.4	0.0	4.0	4.5	0.4	0.2
Maneuvering	Main Engine	6.6	6.0	6.6	224.6	6.5	40.3	32.8
Total Maneuvering		**10.8**	**9.9**	**10.4**	**378.1**	**27.4**	**53.9**	**37.8**
Hotelling at Berth	Auxiliary Engine	33.8	30.9	33.8	1,321.1	146.6	118.1	43.0
Hotelling at Berth	Auxiliary Boiler	20.5	18.1	0.0	196.9	221.2	19.8	9.9
Hotelling at Berth	Main Engine	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Hotelling - Berth		**54.3**	**49.0**	**33.8**	**1518.0**	**367.8**	**137.9**	**52.9**
Hotelling at Anchorage	Auxiliary Engine	11.5	10.5	11.5	439.3	49.8	40.1	14.6
Hotelling at Anchorage	Auxiliary Boiler	4.7	4.0	0.0	36.7	50.2	3.7	1.8
Hotelling at Anchorage	Main Engine	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Hotelling - Anchorage		**16.2**	**14.5**	**11.5**	**476.0**	**100.0**	**43.8**	**16.4**
Total		**126.2**	**114.4**	**99.4**	**4,258.3**	**643.8**	**462.2**	**219.1**

Table 2.23: 2013 Ocean-going Vessel Greenhouse Gas Emissions by Mode, metric tons

Mode	Engine Type	CO_2e	CO_2	N_2O	CH_4
Transit	Auxiliary Engine	19,980	19,715	0.8	0.2
Transit	Auxiliary Boiler	4,777	4,659	0.4	0.0
Transit	Main Engine	44,634	43,804	2.6	1.8
Total Transit		**69,391**	**68,178**	**3.8**	**2.0**
Maneuvering	Auxiliary Engine	7,582	7,482	0.3	0.1
Maneuvering	Auxiliary Boiler	1,753	1,710	0.1	0.0
Maneuvering	Main Engine	3,123	2,992	0.4	0.6
Total Maneuvering		**12,458**	**12,184**	**0.8**	**0.7**
Hotelling at Berth	Auxiliary Engine	67,854	66,956	2.8	0.8
Hotelling at Berth	Auxiliary Boiler	85,611	83,493	6.8	0.2
Hotelling at Berth	Main Engine	0	0	0.0	0.0
Total Hotelling - Berth		**153,465**	**150,449**	**9.6**	**1.0**
Hotelling at Anchorage	Auxiliary Engine	23,058	22,753	1.0	0.3
Hotelling at Anchorage	Auxiliary Boiler	15,942	15,547	1.3	0.0
Hotelling at Anchorage	Main Engine	0	0	0.0	0.0
Total Hotelling - Anchorage		**39,000**	**38,300**	**2.3**	**0.3**
Total		**274,314**	**269,111**	**16.5**	**4.0**

Figure 2.5 summarizes the percentage of emissions by mode.

Figure 2.5: 2013 Ocean-going Vessel Emissions by Mode, %



SECTION 3 HARBOR CRAFT

This section presents emissions estimates for the commercial harbor craft source category, including source description (3.1), geographical domain (3.2), data and information acquisition (3.3), operational profiles (3.4), emissions estimation methodology (3.5), and the emission estimates (3.6).

3.1 Source Description

Emissions from the following types of diesel-fueled harbor craft were quantified:

- Assist tugboats
- Crew, supply and work boats
- Ferry vessels
- Excursion vessels
- Government vessels
- Harbor tugboats
- Ocean tugboats

Assist tugboats
Assist tugboats help ships maneuver in the harbor during arrival, departure, and shifts. In general, they escort the ships from the breakwater to the berth upon their arrival and are dismissed at the outer harbor after escorting the ships from berth to the breakwater upon departure.

Crew, supply and work boats
Crew boats and supply boats are used for carrying personnel and supplies to and from off-shore and in-harbor locations. They may go to and from vessels at anchorage, construction sites, and off-shore platforms. Work boats perform duties such as utility inspection, surveying, spill response, training and construction.

Ferry vessels

Ferries transport people and property to the nearby islands. There are daily ferry trips from Long Beach to Santa Catalina Island that take approximately one hour and 15 minutes to transit one way.

Excursion vessels

Excursion vessels include harbor cruise and charter vessels for hire by the general public. Excursions in the Long Beach Harbor include daily 45-minute harbor cruises and seasonal whale watching cruises just outside the breakwater.

Government vessels

The City of Long Beach Fire Department operates harbor craft including two fireboats-the Liberty and the Challenger. In addition, although privately owned, two pilot boats operating at the Port are also included in this category.

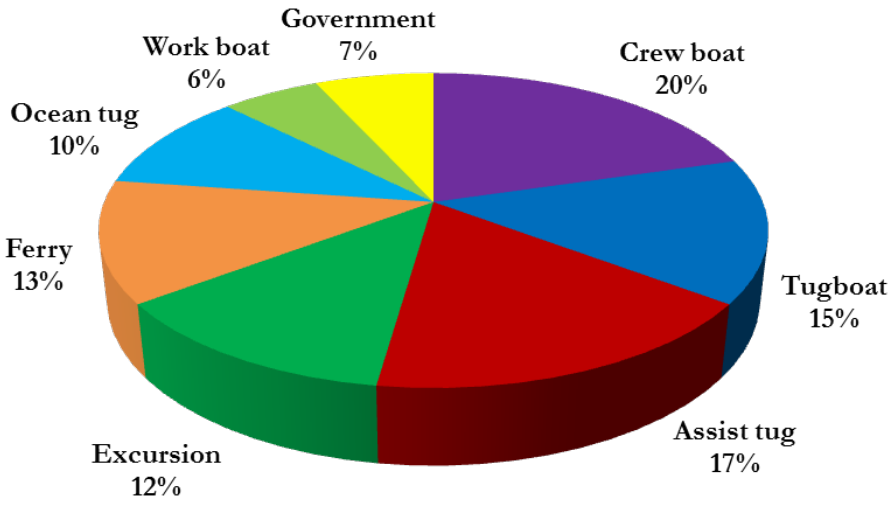
Harbor and ocean tugboats

Harbor tugboats primarily work within the harbor moving and positioning barges. Ocean or coastal tugboats, also called towboats, work mostly outside of the harbor to and from other ports.

Recreational vessels are not considered to be commercial harbor craft; therefore their emissions are not included in the inventory. Vessels associated exclusively with oil operations located at the Port are also excluded but are estimated in a separate inventory[24].

Figure 3.1 presents the distribution of the 88 diesel fueled commercial harbor craft inventoried for the Port in 2013.

Figure 3.1: 2013 Distribution Commercial Harbor Craft



3.2 Geographical Domain

The geographical delineation for harbor craft is the same as that for ocean-going vessels, described in Section 1.2.3.

3.3 Data and Information Acquisition

Harbor craft owners and operators were identified and contacted to obtain key operational parameters

- Vessel type
- Number, type and horsepower (or kilowatts) of main engine(s)
- Number, type and horsepower (or kilowatts) of auxiliary engine(s)
- Operating hours in 2013
- Annual diesel fuel consumption
- Qualitative information regarding how the vessels are used in service
- Engine model year

[24] POLB, *Long Beach Gas and Oil Air Emissions Inventory – 2005*, Prepared by Starcrest Consulting Group, LLC, October 2006.

- Replaced engines

The following companies provided information on their fleet of harbor craft:

Assist tugboats and harbor tugboats:
- Crowley Marine Services
- Foss Maritime Company
- Millennium Maritime

Crew boat and work boats:
- American Marine Corporation
- Connolly-Pacific
- Marine Spill Response Corporation (MSRC)
- Pacific Tugboat Services
- Southern California Ship Services

Ferry vessels:
- Catalina Express

Excursion vessels:
- Long Beach Sportfishing
- Spirit Cruises

Government vessels:
- Long Beach Fire Department
- Jacobsen Pilots (privately owned)

Harbor tugboats and ocean tugboats:
- Crowley Petroleum Services
- Sause Brothers Ocean Towing
- Westoil Marine Services

The SCAQMD was also contacted to obtain engine information associated with harbor craft that received grant funding from the Carl Moyer Memorial Air Quality Standard Attainment Program for engine repowers.

3.4 Operational Profiles

Tables 3.1 and 3.2 summarize the characteristics of main and auxiliary engines respectively, by vessel type operating at the Port in 2013. Averages of the model year, horsepower, or operating hours are used as default values when specific data is not available.

Table 3.1: 2013 Main Engine Characteristics by Harbor Craft Type

Harbor Craft Type	Vessel Count	Engine Count	Model year Minimum	Model year Maximum	Model year Average	Horsepower Minimum	Horsepower Maximum	Horsepower Average	Annual Hours Minimum	Annual Hours Maximum	Annual Hours Average
Assist tugboat	15	31	1980	2012	2004	600	3,385	1,971	91	2,163	1,199
Crew boat	18	43	2003	2012	2009	290	1,450	578	0	1,492	472
Excursion	11	18	1984	2013	2007	280	650	432	0	900	502
Ferry	11	24	1998	2011	2006	180	2,300	1,828	1,200	1,500	1,238
Government	6	11	1985	2003	1994	350	965	652	500	2,200	891
Ocean tugboat	9	18	1971	2006	1992	805	2,850	2,009	200	1,500	689
Harbor tugboat	13	27	2003	2012	2009	250	1,500	736	41	750	341
Work boat	5	12	2005	2013	2010	210	675	481	120	1,500	686
Total	**88**	**184**									

Table 3.2: 2013 Auxiliary Engine Characteristics by Harbor Craft Type

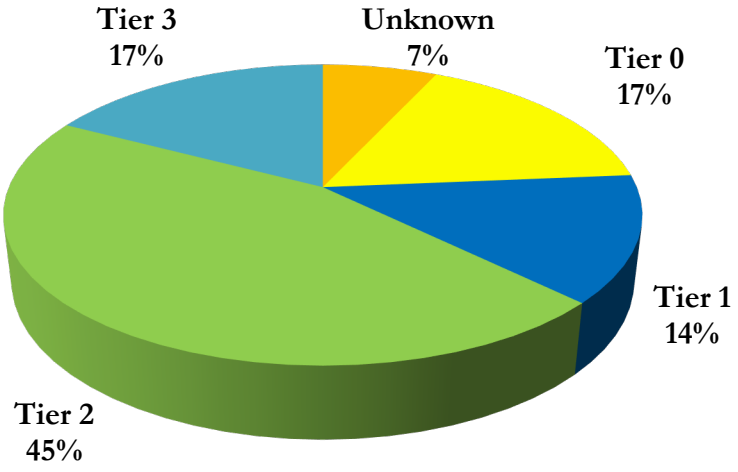
Harbor Craft Type	Vessel Count	Engine Count	Model year Minimum	Model year Maximum	Model year Average	Horsepower Minimum	Horsepower Maximum	Horsepower Average	Annual Hours Minimum	Annual Hours Maximum	Annual Hours Average
Assist tugboat	15	34	1980	2013	2008	67	425	175	75	3,486	1,186
Crew boat	18	20	1980	2012	2007	13	76	45	12	1,871	679
Excursion	11	9	1982	2012	1998	80	200	115	0	1,900	790
Ferry	11	16	1999	2013	2007	10	120	55	750	1,500	844
Government	6	7	1985	2003	1988	13	650	233	100	3,400	686
Ocean tugboat	9	18	1975	2006	1995	60	550	150	200	1,500	689
Harbor tugboat	13	21	2005	2012	2009	22	107	48	60	636	301
Work boat	5	8	1968	2013	1998	27	101	57	0	750	397
Total	**88**	**133**									

Harbor craft engines with known model year and horsepower are categorized by EPA marine engine standards. Engine information gathered from harbor craft operators does not identify the specific EPA certification standards or "tier" level, thus, the tier level is assumed for the engines based on emission standards.[25] The assumptions are consistent with CARB's harbor craft emission factors, which follow the same model year grouping as the EPA emissions standards for marine engines as shown in Table 3.3. Figure 3.2 provides the population distribution of all harbor craft propulsion and auxiliary engines operating at the Port in 2013. If model year and/or horsepower information are not available, the engines are classified as "unknown".

Table 3.3: Harbor Craft Marine Engine EPA Tier Levels

EPA Tier Level	Marine Engine Model Year	Horsepower
Tier 0	1999 and older	All
Tier 1	2000 to 2003	≤ 500 hp
Tier 1	2000 to 2006	> 500 hp
Tier 2	2004 up to Tier 3 below	≤ 500 hp
Tier 2	2007 up to Tier 3 below	>500 hp
Tier 3	2009 and newer	0 to 120 hp
Tier 3	2013 and newer	>120 to 175 hp
Tier 3	2014 and newer	>175 to 500 hp
Tier 3	2013 and newer	>500 to 750 hp
Tier 3	2012 to 2017	>750 to 1,900 hp
Tier 3	2013 to 2016	>1,900 to 3,300 hp
Tier 3	2014 to 2016	>3,300 hp

Figure 3.2: 2013 Distribution of Harbor Craft Engines by Engine Standards, %



[25] CFR (Code of Federal Regulation), 40 CFR, subpart 94.8 for Tier 1 and 2 and subpart 1042.101 for Tier 3.

3.5 Emissions Estimation Methodology

Harbor craft emissions are estimated for each engine individually, based on the engine's model year, power rating, and annual hours of operation. The Port's harbor craft emission calculation methodology is similar to the methodology used by the CARB emissions inventory for commercial harbor craft emissions operating in California.[26]

The basic equation used to estimate emissions from harbor craft engines is shown below in Equation 3.1.

Equation 3.1

$$\boldsymbol{E = Power \times Activity \times LF \times EF \times FCF}$$

Where:

E = emissions, grams/year
Power = rated power of the engine, hp or kW
Activity = engine activity, hours/year
LF = load factor (ratio of average power used during normal operations as compared to maximum rated power), dimensionless
EF = emission factor, grams of pollutant per unit of work, g/hp-hr or g/kW-hr
FCF = fuel correction factor to reflect changes in fuel properties that have occurred over time, dimensionless

[26] CARB, *Commercial Harbor Craft Regulatory Activities*, Appendix B: Emissions Estimation Methodology for Commercial Harbor Craft Operating in California. *http://www.arb.ca.gov/regact/2007/chc07/appb.pdf*. Viewed April 2011.

3.5.1 Load Factors

An engine load factor represents the average percentage of full load applied to an engine or the percent of rated engine power that is applied during the engine's operation. Table 3.4 summarizes the average engine load factors used for harbor craft propulsion and auxiliary engines. The engine load factors are from CARB's emission estimation methodology report[27], except the 31% engine load factor for assist tugboats and harbor tugboats, which are based on actual engine load readings collected in the San Pedro Bay and published in the 2001 Port of Los Angeles EI report[28].

Table 3.4: Harbor Craft Engine Load Factors

Harbor Craft Type	Auxiliary Engines	Main Engines
Assist tug	0.43	0.31
Crew boat	0.32	0.38
Excursion	0.43	0.42
Ferry	0.43	0.42
Government	0.43	0.51
Ocean tug	0.43	0.68
Tugboat	0.43	0.31
Work boat	0.32	0.38

3.5.2 Emission Factors, Deterioration Rates, and Useful Life

Emission factors, deterioration rates, and useful life for harbor craft are based on CARB's latest methodology, with the exception of greenhouse gas emission factors and the calculation of SO_x emission factor, which are discussed below.

The EF is a function of the zero hour (ZH) emission rate for the engine model year, in the absence of any malfunction or tampering of engine components that can change emissions, deterioration rate, and cumulative hours. The deterioration rate (DR) takes into account the change in the engine's base emissions (ZH emission rates) as the equipment is used, due to wear of various engine parts or reduced efficiency of emission control devices. The zero hour emission factors for commercial harbor craft, included in Appendix C of this report, were obtained from CARB.[29] The cumulative hours reflect the engine's total operating hours.

[27] CARB, *Emissions Estimation Methodology for Commercial Harbor Craft Operating in California*, Appendix B.
[28] Port of Los Angeles, *2001 Baseline Air Emissions Inventory,* Prepared by Starcrest Consulting Group, LLC, July 2005.
[29] CARB, *Commercial Harbor Craft Regulatory Activities.* Appendix B: Emissions Estimation Methodology for Commercial Harbor Craft Operating in California. *http://www.arb.ca.gov/regact/2007/chc07/appb.pdf.* Viewed April 2011.

The emission factor is calculated as:

Equation 3.2

$$EF = ZH + (DR \times Cumulative\ Hours)$$

Where:

ZH = zero hour emission rate for a given horsepower category and model year when the engine is new and there is no component malfunctioning, g/hp-hr or g/kW-hr
DR = deterioration rate (rate of change of emissions as a function of equipment age), g/hp-hr^2 or g/kW-hr^2
Cumulative hours = total number of hours the engine has been in use and calculated as annual operating hours times age of the engine, hours

The equation for the deterioration rate is shown in Equation 3.3. Table 3.5 lists the engine deterioration factors for harbor craft diesel engines, and Table 3.6 lists the useful life of harbor craft in years.

Equation 3.3

$$DR = (DF \times ZH) / cumulative\ hours\ at\ the\ end\ of\ useful\ life$$

Where:

DR = deterioration rate, g/hp-hr^2 or g/kW-hr^2
DF = deterioration factor; percent increase in emissions at the end of the useful life, %
ZH = emission rate for a given engine size category and model year when the engine is new and there is no component malfunctioning, g/hp-hr or g/kW-hr
Cumulative hours at the end of useful life = annual operating hours times useful life in years, hours

Table 3.5: Engine Deterioration Factors for Harbor Craft Diesel Engines

Horsepower Range	PM	NO_x	CO	HC
25 – 50	0.31	0.06	0.41	0.51
51 – 250	0.44	0.14	0.16	0.28
> 251	0.67	0.21	0.25	0.44

CARB defines the useful life of harbor craft as the age at which 50% of the engines are retired from the fleet; it is assumed that 100% of the engines will be retired at the age of twice the useful life.

Table 3.6: Useful Life by Harbor Craft Type, years

Harbor Craft Type	Auxiliary Engines	Main Engines
Assist tug	23	21
Crew boat	28	28
Excursion	20	20
Ferry	20	20
Government	25	19
Ocean tug	25	26
Tugboat	23	21
Work boat	28	28

3.5.3 Harbor Craft Greenhouse Gas Emission Factors

Greenhouse gas emissions factors for harbor craft are continuously evolving as more research is conducted and reviewed, so there is some variability in the emission factors recommended; emissions factors for CO_2, CH_4, and N_2O are sourced from the 2004 IVL study, and are listed in Appendix C.[30] The IVL study establishes the CH_4 emission factor as 2% of the hydrocarbon emission factor.

[30] IVL, Methodology for Calculating Emissions from Ships: Update on Emission Factors, 2004. Prepared by IVL Swedish Environmental Research Institute for the Swedish Environmental Protection Agency.

3.5.4 Harbor Craft SO_x Emissions

The SO_x emissions are a function of sulfur content in the fuel. The SO_x emission factors are developed to reflect the use of 15 ppm ultra-low sulfur diesel (ULSD) using a mass balance approach, which assumes that all of the sulfur (S) in the fuel is converted to SO_2 and emitted during the combustion process. While the mass balance approach calculates SO_2 specifically, it is used as a reasonable approximation of SO_x. The following example shows the calculation of the SO_x emission factor.

Equation 3.4

$$\boldsymbol{SOx\ EF = ULSD\ S\ content \times \frac{molecular\ mass\ of\ SO_2}{atomic\ mass\ of\ S} \times BSFC}$$

Where:

SO_x EF = Emission factor for SO_x, g/hp-hr

ULSD S content = sulfur content of the ULSD fuel, 15 grams of S/1,000,000 g of fuel

BSFC = Brake Specific Fuel Consumption, g/hp-hr

In the calculation above, the ULSD sulfur content is shown as 15 grams per sulfur per million grams of fuel. Two grams of SO_2 is emitted for each gram of sulfur in the fuel because the atomic weight of sulfur is 32 while the molecular weight of SO_2 is 64, meaning that the mass of SO_2 is two times that of sulfur. According to CARB's methodology for estimating emissions from commercial harbor craft, a brake specific fuel consumption rate of 184 gram per brake horsepower-hour is assumed.[31]

[31] CARB, *Commercial Harbor Craft Regulatory Activities. Appendix B: Emissions Estimation Methodology for Commercial Harbor Craft Operating in California. http://www.arb.ca.gov/msei/chc-appendix-b-emission-estimates-ver02-27-2012.pdf.*

3.5.5 Fuel Correction Factors

Fuel correction factors developed for commercial harbor craft assume engines use diesel fuel with higher sulfur content. To account for the required use of ULSD in harbor craft engines, the fuel correction factors shown in Table 3.7 account for the use of ULSD in harbor craft engines by equipment model year (MY). The fuel correction factor for SO_x reflects the change from diesel fuel with an average sulfur content of 350 parts per million (ppm) to ULSD (15 ppm). There is no available data that reflects the effect of different fuels on N_2O and CH_4 emissions, so it is assumed that the fuel correction factor for NO_x is also applicable to N_2O emissions and the fuel correction factor for HC is also applicable to CH_4 emissions, since N_2O is an oxide of nitrogen and CH_4 is a component of hydrocarbons.

Table 3.7: Harbor Craft ULSD Fuel Correction Factors

Equipment MY	PM	NO_x	SO_x	CO	HC	CO_2	N_2O	CH_4
1995 and older	0.720	0.930	0.043	1	0.72	1	0.930	0.72
1996 to 2010	0.800	0.948	0.043	1	0.72	1	0.948	0.72
2011 and newer	0.852	0.948	0.043	1	0.72	1	0.948	0.72

3.5.6 Improvements to Methodology from Previous Years

The emission calculation methodology used to estimate emissions from commercial harbor craft operating at the Port in 2013 is similar to the methodology used in the previous year emissions inventory reports[32]. For a comparison of 2013 emissions to 2005 emissions, refer to section 8.

[32] POLB, *http://www.polb.com/environment/air/emissions.asp*

3.6 Emission Estimates

Tables 3.8 and 3.9 summarize the estimated harbor craft vessel emissions by vessel type and engine type.

Table 3.8: 2013 Harbor Craft Emissions by Vessel and Engine Type, tons

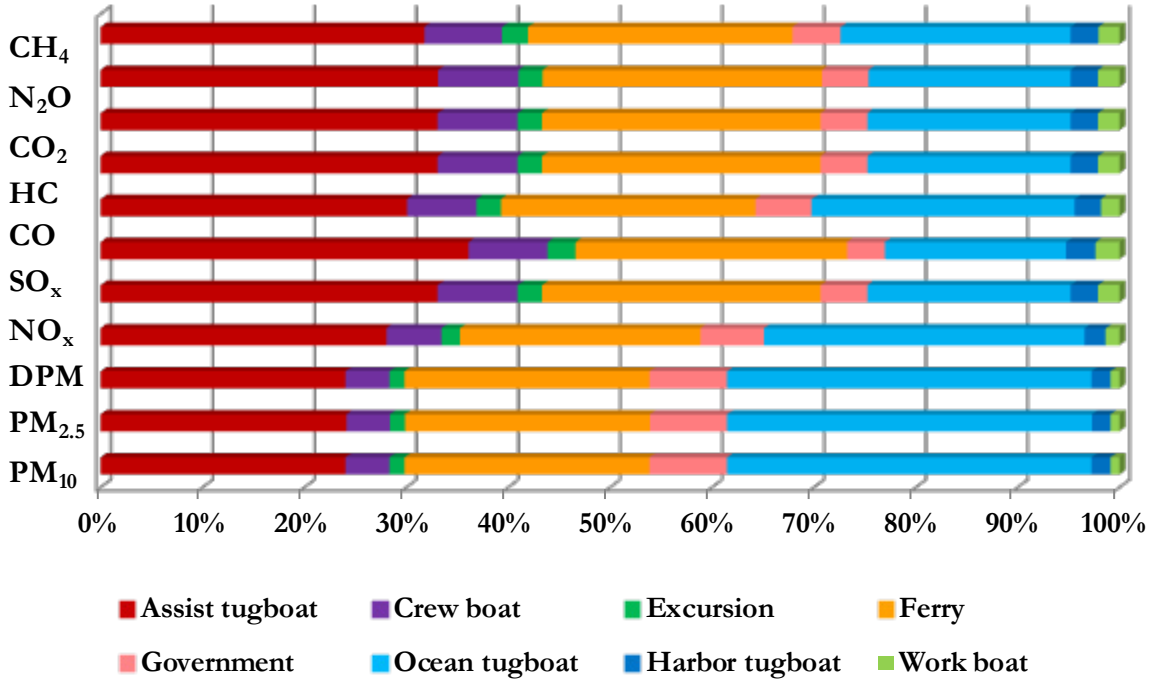
Harbor Craft	Engine Type	PM_{10}	$PM_{2.5}$	DPM	NO_x	SO_x	CO	HC
Assist tugboat	Auxiliary	0.5	0.5	0.5	15.0	0.0	11.8	1.9
	Propulsion	5.9	5.4	5.9	172.0	0.1	101.3	15.0
Assist tugboat Total		**6.4**	**5.9**	**6.4**	**187.0**	**0.1**	**113.1**	**16.9**
Crew Boat	Auxiliary	0.1	0.1	0.1	1.3	0.0	1.0	0.3
	Propulsion	1.1	1.0	1.1	34.8	0.0	23.2	3.6
Crew boat Total		**1.2**	**1.1**	**1.2**	**36.1**	**0.0**	**24.3**	**3.9**
Excursion	Auxiliary	0.1	0.1	0.1	2.2	0.0	1.4	0.3
	Propulsion	0.3	0.3	0.3	10.1	0.0	7.3	1.0
Excursion Total		**0.4**	**0.4**	**0.4**	**12.3**	**0.0**	**8.7**	**1.3**
Ferry	Auxiliary	0.1	0.1	0.1	1.7	0.0	1.3	0.4
	Propulsion	6.3	5.8	6.3	155.4	0.1	81.9	13.7
Ferry Total		**6.4**	**5.9**	**6.4**	**157.1**	**0.1**	**83.2**	**14.1**
Government	Auxiliary	0.1	0.1	0.1	1.6	0.0	0.7	0.2
	Propulsion	1.9	1.8	1.9	40.0	0.0	11.0	2.9
Government Total		**2.0**	**1.9**	**2.0**	**41.6**	**0.0**	**11.7**	**3.1**
Ocean tugboat Total	Auxiliary	0.3	0.3	0.3	6.3	0.0	3.3	0.7
	Propulsion	9.2	8.5	9.2	203.6	0.1	52.3	13.8
Ocean tugboat Total		**9.5**	**8.8**	**9.5**	**209.9**	**0.1**	**55.6**	**14.5**
Harbor tugboat	Auxiliary	0.0	0.0	0.0	0.7	0.0	0.6	0.2
	Propulsion	0.5	0.4	0.5	13.1	0.0	8.5	1.3
Harbor tugboat Total		**0.5**	**0.4**	**0.5**	**13.8**	**0.0**	**9.1**	**1.5**
Work boat	Auxiliary	0.0	0.0	0.0	0.3	0.0	0.2	0.1
	Propulsion	0.2	0.2	0.2	8.7	0.0	7.1	0.9
Work boat Total		**0.2**	**0.2**	**0.2**	**9.0**	**0.0**	**7.3**	**1.0**
Harbor Craft Total		**26.6**	**24.6**	**26.6**	**666.8**	**0.3**	**312.9**	**56.3**

Table 3.9: 2013 Harbor Craft GHG Emissions by Vessel and Engine Type, metric tons

Harbor Craft	Engine Type	CO_2e	CO_2	N_2O	CH_4
Assist tugboat	Auxiliary	1,366	1,347	0.1	0.0
	Propulsion	12,116	11,944	0.5	0.2
Assist tugboat Total		**13,482**	**13,291**	**0.6**	**0.2**
Crew Boat	Auxiliary	109	108	0.0	0.0
	Propulsion	3,088	3,044	0.1	0.1
Crew boat Total		**3,197**	**3,152**	**0.1**	**0.1**
Excursion	Auxiliary	146	144	0.0	0.0
	Propulsion	829	817	0.0	0.0
Excursion Total		**975**	**961**	**0.0**	**0.0**
Ferry	Auxiliary	144	142	0.0	0.0
	Propulsion	10,992	10,836	0.5	0.2
Ferry Total		**11,136**	**10,978**	**0.5**	**0.2**
Government	Auxiliary	58	57	0.0	0.0
	Propulsion	1,813	1,787	0.1	0.0
Government Total		**1,871**	**1,844**	**0.1**	**0.0**
Ocean tugboat Total	Auxiliary	318	313	0.0	0.0
	Propulsion	7,804	7,693	0.3	0.2
Ocean tugboat Total		**8,122**	**8,006**	**0.3**	**0.2**
Harbor tugboat	Auxiliary	64	64	0.0	0.0
	Propulsion	1,041	1,026	0.0	0.0
Harbor tugboat Total		**1,105**	**1,090**	**0.0**	**0.0**
Work boat	Auxiliary	22	21	0.0	0.0
	Propulsion	833	821	0.0	0.0
Work boat Total		**855**	**842**	**0.0**	**0.0**
Harbor Craft Total		**40,743**	**40,164**	**1.6**	**0.7**

Figure 3.3 shows that approximately 24 to 36% of the Port's total harbor craft emissions are attributed to assist tugs, while 24 to 27% of the total harbor craft emissions are attributed to ferries, 18 to 36% to ocean tugs, 4 to 8% to crew boats, 1 to 3% to excursion vessels, 4 to 8% to government vessels, 2 to 3% to harbor tugboats, and 1 to 2% to work boats.

Figure 3.3: 2013 Harbor Craft Emissions by Harbor Craft Type, %



SECTION 4 CARGO HANDLING EQUIPMENT

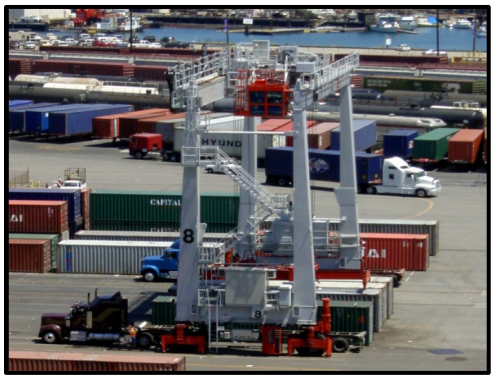
This section presents the following information for the CHE source category: source description (4.1), geographical domain (4.2), data and information acquisition (4.3), operational profiles (4.4), emissions estimation methodology (4.5), and emission estimates (4.6).

4.1 Source Description

The CHE category includes equipment that moves cargo such as containers, general cargo, and bulk cargo to and from marine vessels, railcars, and on-road trucks. The majority of CHE operate at marine terminals or rail yards and are generally composed of off-road equipment that are not designed to operate on public roadways. This inventory includes CHE powered by engines fueled by diesel, gasoline, propane and electricity. Emissions from the following types of CHE are evaluated in the 2013 EI:

- Forklift
- Rubber tired gantry (RTG) crane
- Side handler
- Sweeper
- Top handler
- Yard tractor
- Other Equipment
  - Bulldozer
  - Electric pallet jack
  - Crane
  - Excavator
  - Loader
  - Man lift
  - Material handler
  - Miscellaneous
  - Rail pusher
  - Skid steer loader
  - Tractor
  - Truck (fuel, utility, water, and vacuum trucks)

Forklifts
Forklifts are used to handle various types of cargo at both container and non-container terminals.



Rubber-tired gantry cranes
Also known at RTGs, these cranes move containers to and from container stacks.

Side Handlers
Side handlers, in general, move and stack the empty containers within a terminal. They are often also referred to as side picks or side loaders.

Sweepers
Sweepers are vehicles with attached brushes underneath that sweep the ground and pick up dirt and debris.

Top handlers
Top handlers move, stack and load containers using an overhead telescopic boom. They can be used in place of or in conjunction with RTGs to lift heavy containers within a terminal.

Yard tractors
Also known as yard hostlers or utility tractor rigs (UTRs); yard tractors are designed to move cargo containers on a terminal.

4.2 Geographical Domain

The CHE inventory consists of equipment from container, dry bulk, break bulk, liquid bulk, auto, and passenger terminals. A figure showing the terminals on which CHE operate is included in section 1.2.3. Following is the list of the terminals, by cargo type, included in the inventory:

Container Terminals:
- International Transportation Service, Inc.
- Long Beach Container Terminal
- Pacific Container Terminal
- SSA Marine Terminals – Pier A
- SSA Marine Terminals – Pier C
- Total Terminals International

Break-Bulk Terminals:
- Cooper/T. Smith Stevedoring
- Crescent Terminals (SSA Marine)
- SA Recycling
- Weyerhaeuser
- Connolly-Pacific

Auto Terminal:
- Toyota Logistics Services

Dry Bulk Terminals:
- Koch Carbon, Inc.
- Georgia–Pacific Gypsum
- Metro Ports
- Morton Salt
- Cemex USA
- Mitsubishi Cement
- National Gypsum Company

Passenger Terminal:
- Carnival Cruise Lines

Liquid Terminals:
- Tesoro Logistics (formerly BP Pipelines North America)
- Chemoil Marine Terminal
- Petro-Diamond
- Tesoro Refining and Marketing
- Vopak Terminal Long Beach

4.3 Data and Information Acquisition

The maintenance and/or CHE operating staff of each terminal were contacted in person or by e-mail or telephone to obtain equipment count and activity information on the CHE specific to their terminal's operation for the 2013 calendar year:

- Equipment type
- Equipment identification number
- Equipment make and model
- Engine make and model
- Rated horsepower (or kilowatts)
- Equipment and engine model year
- Type of fuel used (ULSD, gasoline or propane)
- Electric equipment
- Annual hours of operation (some terminals use hour meters)
- Installed Emissions reduction technologies
- On-road engine installed
- New equipment purchased
- Equipment retired or removed from service

For instances when data is not available, averages are used for the specific parameter, such as engine power, activity hours, and model year, to estimate emissions,

4.4 Operational Profiles

Table 4.1 summarizes the CHE data collected from the terminals for the 2013 calendar year. The average values shown in the following tables are population weighted, meaning that the values have been calculated by summing the values related to each individual piece of equipment (for which information is available) and dividing the sum by the number of pieces of equipment. For equipment without specific information available, these specific to CHE type and engine type averages have been used as defaults for equipment with missing information.

Table 4.1: 2013 Engine Characteristics for All CHE Operating at the Port

Equipment	Engine Type	Count	Power (hp)			Model Year			Annual Operating Hours		
			Min	Max	Average	Min	Max	Average	Min	Max	Average
Bulldozer	Diesel	4	92	285	194	1995	2012	2004	0	1,500	475
Crane	Diesel	2	177	334	256	1985	1991	1988	85	262	174
Crane	Electric	2	na	na	na	1980	2006	1993	0	0	0
Electric pallet jack	Electric	3	na	na	na	1997	2013	2008	14	73	42
Excavator	Diesel	3	322	371	338	2002	2005	2004	42	383	180
Forklift	Diesel	118	31	210	131	1979	2013	2004	0	2,347	470
Forklift	Electric	9	na	na	na	1995	2013	2002	0	708	285
Forklift	Gasoline	11	na	na	na	2012	2013	2013	0	510	67
Forklift	Propane	120	43	122	89	1976	2013	1998	0	1,500	256
Loader	Diesel	13	50	402	278	1985	2012	2004	0	2,101	1,116
Man Lift	Diesel	6	48	75	64	2005	2013	2010	130	462	272
Material handler	Diesel	4	322	717	460	2001	2008	2006	95	717	371
Material handler	Electric	1	na	na	na	1995	1995	1995	na	na	na
Miscellaneous	Diesel	2	13	13	13	2010	2010	2010	131	715	423
Miscellaneous	Electric	5	na	na	na	1994	2008	2001	na	na	na
Miscellaneous	Propane	1	na	na	na	1998	1998	1998	246	246	246
Rail pusher	Diesel	5	100	300	201	1997	2013	2008	76	585	334
RTG crane	Diesel	65	515	1,043	715	1998	2012	2005	0	4,070	2,126
Side handler	Diesel	19	120	240	205	1982	2011	2002	93	2,278	1,029
Skid steer loader	Diesel	2	49	70	60	2007	2008	2008	60	2,576	1,318
Sweeper	Diesel	9	39	230	153	2001	2009	2005	0	552	366
Sweeper	Electric	1	na	na	na	na	na	na	50	50	50
Sweeper	Gasoline	1	na	na	na	1,994	1,994	1,994	0	0	0
Sweeper	Propane	7	50	135	78	1982	2013	2001	0	600	140
Top handler	Diesel	174	174	375	294	1979	2013	2006	0	3,732	1,852
Tractor	Diesel	1	59	59	59	2009	2009	2009	80	80	80
Tractor	Propane	8	101	101	101	1996	1997	1996	494	705	596
Truck	Diesel	13	165	525	274	1981	2011	2002	0	1,547	419
Truck	Electric	5	na	na	na	2008	2009	2008	102	1,336	657
Truck	Gasoline	1	na	na	na	1977	1977	1977	na	na	na
Yard tractor, offroad	Diesel	136	173	245	179	2001	2008	2004	39	2,515	1,385
Yard tractor, onroad	Diesel	410	173	250	205	2004	2012	2008	0	3,422	1,979
Yard tractor, gasoline	Gasoline	83	335	335	335	2011	2011	2011	20	2,015	1,228
Yard tractor, propane	Propane	8	173	173	173	2009	2009	2009	0	0	0
Total		**1,252**									

Figure 4.1 presents the distribution of the 1,252 pieces of CHE inventoried at the Port in 2013.

Figure 4.1: 2013 Distribution of Port CHE by Equipment Type

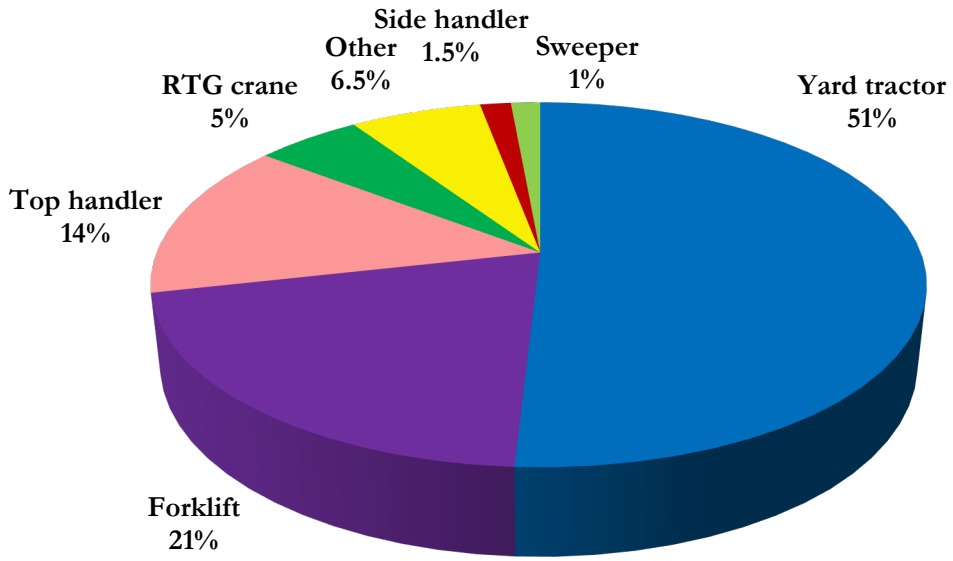
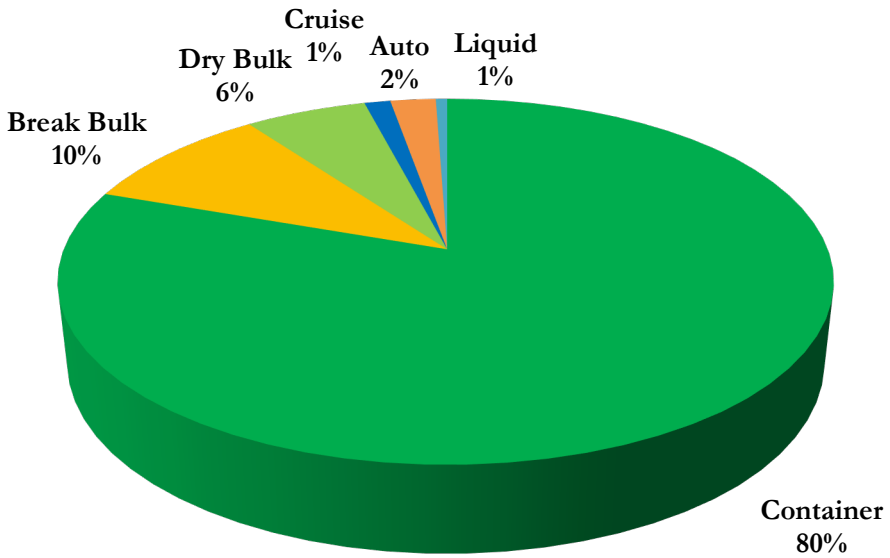


Figure 4.2 shows the distribution of CHE by terminal type.

Figure 4.2: 2013 Distribution of Port CHE by Terminal Type, %



Container terminals operate 80% of the CHE at the Port. Table 4.2 shows the percentage of container terminal CHE as compared to the total Port CHE.

Table 4.2: 2013 Distribution of CHE at Container Terminals

CHE Type	Total Count	Container Terminal Count	Container Terminal Percent
Forklift	258	96	37%
RTG crane	65	65	100%
Side handler	19	19	100%
Top handler	174	173	99%
Yard tractor	637	634	100%
Sweeper	18	7	39%
Other	81	12	15%
Total	**1,252**	**1,006**	**80%**

The characteristics of the CHE engines at the Port's container terminals are summarized in Table 4.3.

Table 4.3: 2013 Characteristics of CHE Engines at Container Terminals

Container Terminals	Count	Power (hp)			Model Year			Annual Operating Hours		
Equipment		Min	Max	Average	Min	Max	Average	Min	Max	Average
Forklift	96	50	210	122	1976	2013	2003	0	2,347	413
Man lift	2	62	74	68	2013	2013	2013	339	462	401
Miscellaneous	2	13	13	13	2010	2010	2010	131	715	423
Rail pusher	4	100	300	203	1997	2013	2007	76	585	334
RTG crane	65	515	1,043	715	1998	2012	2005	0	4,070	2,126
Side handler	19	120	240	205	1982	2011	2002	22	2,778	1,029
Sweeper	7	100	230	155	1994	2009	2003	0	552	331
Top handler	173	250	375	295	1994	2013	2007	0	3,732	1,863
Truck	4	207	207	207	1995	2008	2003	180	1,547	1,060
Yard tractor	634	173	335	216	2001	2012	2008	0	3,422	1,737
Total	**1,006**									

Table 4.4 shows the characteristics of the CHE engine at the Port's break-bulk terminals.

Table 4.4: 2013 Characteristics of CHE Engines at Break-Bulk Terminals

Break Bulk Terminals	Count	Power (hp)			Model Year			Annual Operating Hours		
Equipment		Min	Max	Average	Min	Max	Average	Min	Max	Average
Bulldozer	1	285	285	285	1995	1995	1995	0	0	0
Crane	3	0	334	111	1980	2006	1990	0	85	28
Excavator	3	322	371	338	2002	2005	2004	42	383	180
Forklift	85	60	200	126	1979	2012	2002	0	1,120	240
Loader	4	200	349	252	1985	2008	2000	81	2,000	680
Man Lift	2	62	75	69	2008	2009	2009	130	160	145
Material handler	5	0	717	368	1995	2008	2003	0	717	297
Miscellaneous	2	0	0	0	1994	2008	2001	0	0	0
Rail pusher	1	195	195	195	2013	2013	2013	0	0	0
Skid steer loader	1	70	70	70	2007	2007	2007	60	60	60
Sweeper	3	39	135	100	1982	2004	1997	20	600	310
Top handler	1	174	174	174	1979	1979	1979	50	50	50
Truck	6	300	525	421	1994	2011	2006	103	822	370
Yard tractor	3	na	na	na	2008	2008	2008	31	64	50
Total	**120**									

Tables 4.5, 4.6 and 4.7 show the characteristics of the CHE engines at the Port's seven dry bulk, six liquid bulk and one auto terminal, respectively. In 2013, some of the dry bulk terminals continue to remain idle; CHE activity hours at the idle terminals were assumed to be "zero".

Table 4.5: 2013 Characteristics of CHE Engines at Dry Bulk Terminals

Dry Bulk Terminals	Count	Power (hp)			Model Year			Annual Operating Hours		
Equipment		Min	Max	Average	Min	Max	Average	Min	Max	Average
Bulldozer	3	92	200	164	2004	2012	2007	0	1,500	633
Crane	1	177	177	177	1991	1991	1991	262	262	262
Forklift	48	0	177	68	1985	2010	2000	0	1,500	417
Loader	9	50	402	289	1989	2012	2005	0	2,101	1,310
Man lift	1	48	48	48	2005	2005	2005	269	269	269
Skid steer loader	1	49	49	49	2008	2008	2008	2,576	2,576	2,576
Sweeper	6	50	210	103	1996	2013	2006	0	540	172
Tractor	3	59	101	87	1997	2009	2001	80	705	426
Truck	3	165	170	168	1977	1997	1988	na	na	na
Total	**75**									

Table 4.6: 2013 Characteristics of CHE Engines at Liquid Bulk Terminals

Liquid Terminals	Count	Power (hp)			Model Year			Annual Operating Hours		
Equipment		Min	Max	Average	Min	Max	Average	Min	Max	Average
Forklift	5	45	120	65	1995	2004	1997	15	624	253
Manlift	1	na	na	na	2009	2009	2009	na	na	na
Truck	1	210	210	210	2006	2006	2006	250	250	250
Total	**7**									

Table 4.7: 2013 Characteristics of CHE Engines at Auto Terminals

Auto Terminals	Count	Power (hp)			Model Year			Annual Operating Hours		
Equipment		Min	Max	Average	Min	Max	Average	Min	Max	Average
Electric pallet jack	3	na	na	na	1997	2013	2008	14	73	42
Forklift	14	0	100	50	1995	2013	1999	2	708	233
Miscellaneous	4	na	na	na	1998	2003	2001	0	246	62
Sweeper	2	na	na	na	na	na	na	37	50	44
Truck, electric	5	na	na	na	2008	2009	2008	102	1,336	657
Total	**28**									

Table 4.8 shows the characteristics of CHE engines at the Long Beach cruise terminal.

Table 4.8: 2013 Characteristics of CHE Engines at the Long Beach Cruise Terminal

Passenger Terminal	Count	Power (hp)			Model Year			Annual Operating Hours		
Equipment		Min	Max	Average	Min	Max	Average	Min	Max	Average
Forklift	10	0	148	74	1981	2008	2001	0	918	493
Tractor	6	101	101	101	1996	1996	1996	595	595	595
Total	**16**									

Table 4.9 is a summary of the CHE engines by fuel type. The table shows that in 2013, 78.8% of the CHE engines inventoried were diesel-powered, followed by 11.5% powered by propane and 7.7% by gasoline engines.

Table 4.9: 2013 CHE Engines by Fuel Type

Equipment	Electric	Propane	Gasoline	Diesel	Total
Forklift	9	120	11	118	258
RTG crane	0	0	0	65	65
Side handler	0	0	0	19	19
Top handler	0	0	0	174	174
Yard tractor	0	8	83	546	637
Sweeper	1	7	1	9	18
Other	16	9	1	55	81
Total	**26**	**144**	**96**	**986**	**1,252**
Percent of Total	**2%**	**11.5%**	**7.7%**	**78.8%**	**100%**

Table 4.10 summarizes the distribution of diesel-powered CHE equipped with off-road and on-road diesel engines and by the off-road diesel engine standards. The on-road engines are generally lower in emissions than the off-road engines of the same model year.

Table 4.10: 2013 Count of Diesel-Powered CHE by Type and Engine Standard

Equipment Type	Tier 0	Tier 1	Tier 2	Tier 3	Tier 4	On-road	Total
Yard tractor	0	18	117	1	0	410	546
Forklift	11	31	44	29	3	0	118
Top handler	2	41	53	33	45	0	174
Other	8	4	13	11	11	8	55
RTG crane	0	28	21	7	9	0	65
Side handler	1	12	5	1	0	0	19
Sweeper	0	4	3	2	0	0	9
Total	**22**	**138**	**256**	**84**	**68**	**418**	**986**
Percent of Total	**2%**	**14%**	**26%**	**9%**	**7%**	**42%**	**100%**

4.5 Emissions Estimation Methodology

The emissions calculation methodology used to estimate CHE emissions is consistent with CARB's latest methodology for estimating emissions from CHE[33]. The basic equation used to estimate CHE emissions is as follows.

Equation 4.1

$$\boldsymbol{E = Power \times Activity \times LF \times EF \times FCF \times CF}$$

Where:

E = emissions, grams/year
Power = rated power of the engine, hp or kW
Activity = equipment's engine activity, hr/year
LF = load factor (ratio of average load used during normal operations as compared to full load at maximum rated horsepower), dimensionless
EF = emission factor, grams of pollutant per unit of work, g/hp-hr or g/kW-hr
FCF = fuel correction factor to reflect changes in fuel properties that have occurred over time, dimensionless
CF = control factor to reflect changes in emissions due to installation of emission reduction technologies not originally reflected in the emission factors, dimensionless

The emission factor is a function of the zero hour emission rate by fuel type (diesel, propane or liquefied natural gas), by CHE engine type (off-road or on-road), for the CHE engine model year (in the absence of any malfunction or tampering of engine components that can change emissions), deterioration rate, and cumulative hours. The deterioration rate reflects the fact that the engine's zero-hour emission rates change as the equipment is used, due to wear of various engine parts or reduced efficiency of emission control devices. The cumulative hours reflects the CHE engine's total operating hours. The emission factor is calculated as:

Equation 4.2

$$\boldsymbol{EF = ZH + (DR \times Cumulative\ Hours)}$$

Where:

ZH = zero-hour emission rate by fuel type by CHE engine type for a given horsepower category and model year, g/hp-hr or g/kW-hr
DR = deterioration rate (rate of change of emissions as a function of CHE engine age), g/hp-hr^2 or g/kW-hr^2
Cumulative hours = number of hours the CHE engine has been in use and calculated as annual operating hours times age of the CHE engine, hours

[33] CARB, Appendix B: *Emission Estimation Methodology for Cargo Handling Equipment Operating at Ports and Intermodal Rail Yards in California.*

4.5.1 Emission Factors

Zero-hour emission rates and deterioration rates vary by engine horsepower and model year depending upon the size of the engines, engine technology. Zero-emission rates and deterioration rates by horsepower and engine year were used for diesel engines certified to off-road and on-road emission standards, as well as gasoline and propane engines certified to large spark ignited engine emission standards.

The zero-hour emission and deterioration rates are consistent with those in CARB's latest emissions calculations methodology for cargo handling equipment. Please refer to Appendix D for a full list of the emissions rates used to estimate emissions from cargo handling equipment.

4.5.2 Load Factors and Fuel Correction Factors

Because engines are not continually used at their maximum horsepower rating during normal operation, the engine load factor represents the average percentage of power that is applied during the engine's operation. Load factors for CHE were primarily obtained from CARB's CHE methodology; however, the load factors for RTG cranes and yard tractors were revised based on studies conducted by the ports of Long Beach and Los Angeles in consultation with CARB. [34] Specifically, the yard tractor load factor of 39% or 0.39 has been used since 2006, and the load factor of 20% or 0.20 for RTG cranes has been used since 2008. Table 4.11 lists the load factors for specified CHE.

Table 4.11: Cargo Handling Equipment Engine Load Factors

CHE Type	Load Factor
RTG crane	0.20
Crane	0.43
Excavator	0.55
Forklift	0.30
Top handler, side pick, reach stacker	0.59
Truck, other with off-road engine	0.51
Truck, other with on-road engine	0.51
Sweeper	0.68
Loader, backhoe	0.55
Yard tractor with off-road engine	0.39
Yard tractor with on-road engine	0.39

[34] Port of Long Beach and Port of Los Angeles, *San Pedro Bay Ports Yard Tractor Load Factor Study and San Pedro Bay Ports Rubber-Tired Gantry Crane*, Prepared by Starcrest Consulting Group, LLC.

In 1993, CARB implemented the Low Sulfur Diesel Fuel Rule, which ultimately limited the sulfur content of diesel fuel marketed in California to 15 parts per million (ppm); this fuel is known as ULSD fuel[35]. To account for the differences in the fuel properties of CARB ULSD and previously available diesel fuel, fuel correction factors (FCF) were obtained from CARB and are shown in Table 4.12. The fuel correction factor for SO_x reflects the reduction in the sulfur content of diesel fuel from 140 ppm to 15 ppm ULSD.

Table 4.12: Fuel Correction Factors for ULSD

Equipment Model Year	PM	NO_x	SO_x	CO	HC	CO_2	N_2O	CH_4
1995 and older	0.720	0.930	0.110	1	0.720	1	0.930	0.720
1996 to 2010	0.800	0.948	0.110	1	0.720	1	0.948	0.720
2011 and newer	0.852	0.948	0.110	1	0.720	1	0.948	0.720

Table 4.13 shows the dimensionless fuel correction factors for gasoline engines[36]. LNG and propane engines have no FCF.

Table 4.13: Fuel Correction Factors for Gasoline

Equipment Model Year	PM	NO_x	SO_x	CO	HC	CO_2	N_2O	CH_4
1997 and older	1.000	0.867	1.000	0.795	0.850	1.000	0.867	0.850
1998 and newer	1.000	0.977	1.000	1.000	1.000	1.000	0.977	1.000

4.5.3 CHE Emissions Reduction Technologies and Control Factors

Table 4.14 is a summary of the emission reduction technologies used on diesel-powered equipment. It should be noted that some equipment utilized more than one emission reduction technology. The majority of the emission reduction technologies were installed either voluntarily or in order to meet requirements of CARB's Mobile Cargo Handling Equipment at Ports and Intermodal Rail Yards regulation adopted in 2005[37].

[35] CARB, *http://www.arb.ca.gov/fuels/diesel/081404dslregs.pdf;* Refer to The California Diesel Fuel Regulation; Title 13, California Code of Regulation, Sections 2281-2285 & Title 17, California Code of Regulation, Section 93114.
[36] CARB, *http://www.arb.ca.gov/msei/offroad/techmemo/arb_offroad_fuels.pdf*
[37] CARB, *http://www.arb.ca.gov/regact/cargo2005/cargo2005.htm;* Final rule posted on October 23, 2006.

Other emission control technologies used on CHE operated at the Port include diesel particulate filters (DPF) and Vycon's REGEN flywheel system (Vycon). In 2013, 182 out of 192 DPFs installed are verified by CARB to achieve Level 3 emissions reductions, resulting in an 85% or more reduction in DPM. There are 10 DPFs installed on RTG cranes that are verified by CARB to achieve Level 2 emissions reductions of 50% or more in DPM. Six of the propane fueled equipment are equipped with BlueCAT Technology[38].

Table 4.14: 2013 CHE Emission Reduction Technologies by Equipment Type

Equipment	DOC Installed	On-Road Engines	ULSD Fuel	DPF Installed	Vycon Installed	BlueCAT
Forklift	12	0	118	34	0	0
RTG crane	0	0	65	28	6	0
Side handler	12	0	19	17	0	0
Top handler	22	0	174	101	0	0
Yard tractor	93	410	546	0	0	0
Sweeper	0	0	9	0	0	0
Other	0	8	55	12	0	6
Total	**139**	**418**	**986**	**192**	**6**	**6**

Control factors are used to reflect the changes in emissions due to the use of various technologies such as DOCs and DPFs. The emission reduction percentages associated with the various emission reduction strategies have been either verified by or developed in consultation with CARB. Table 4.15 shows the emission reduction percentages, by air pollutant for the various technologies used on CHE.

Table 4.15: Emission Reductions Achieved from Control Technologies Used in CHE, %

Technology	PM_{10}	$PM_{2.5}$	DPM	NO_x	SO_x	CO	HC	CO_2	N_2O	CH_4
Nett BlueCat 300™	0%	0%	0%	85%	na	0%	85%	na	0%	0%
DOC	30%	30%	30%	0%	na	70%	70%	na	0%	70%
DPF CARB Level 3	85%	85%	85%	0%	na	0%	0%	na	0%	0%
DPF CARB Level 2	50%	50%	50%	0%	na	0%	0%	na	0%	0%
Vycon REGEN	25%	25%	25%	30%	15%	0%	0%	15%	30%	0%
Vycon + DPF Level 2	62.5%	62.5%	62.5%	30%	15%	0%	0%	15%	30%	0%

[38] CARB, *http://www.arb.ca.gov/msprog/offroad/orspark/documents/eog-09-013.pdf*

As shown in Table 4.16, the control factor is determined by subtracting the emission reduction percentage associated with the control technology (converted to decimal form) from 1.0. For example, a technology that achieves an emissions reduction of 70%, or 0.70, would have a control factor of 0.3 (1.0 – 0.7 = 0.3).

Table 4.16: Control Factors for Control Technologies Used in CHE

Technology	PM_{10}	$PM_{2.5}$	DPM	NO_x	SO_x	CO	HC	CO_2	N_2O	CH_4
Nett BlueCat for LSI	1.00	1.00	1.00	0.15	na	1.00	0.15	na	1.00	1.00
DOC	0.70	0.70	0.70	1.00	na	0.30	0.30	na	1.00	0.30
DPF level 3	0.15	0.15	0.15	1.00	na	1.00	1.00	na	1.00	1.00
DPF level 2	0.50	0.50	0.50	1.00	na	1.00	1.00	na	1.00	1.00
Vycon's REGEN	0.75	0.75	0.75	0.70	0.85	1.00	1.00	0.85	0.70	1.00
Vycon + DPF level 2	0.375	0.375	0.375	0.70	0.85	1.00	1.00	0.85	0.70	1.00

4.5.4 Improvements to Methodology from Previous Years

The emissions calculation methodology and the emission rates are same as used to estimate CHE emissions for the Port's 2011 and 2012 EIs.

4.6 Emission Estimates

A summary of the CHE emissions by terminal type is presented in Tables 4.17 and 4.18.

Table 4.17: 2013 CHE Emissions by Terminal Type, tons per year

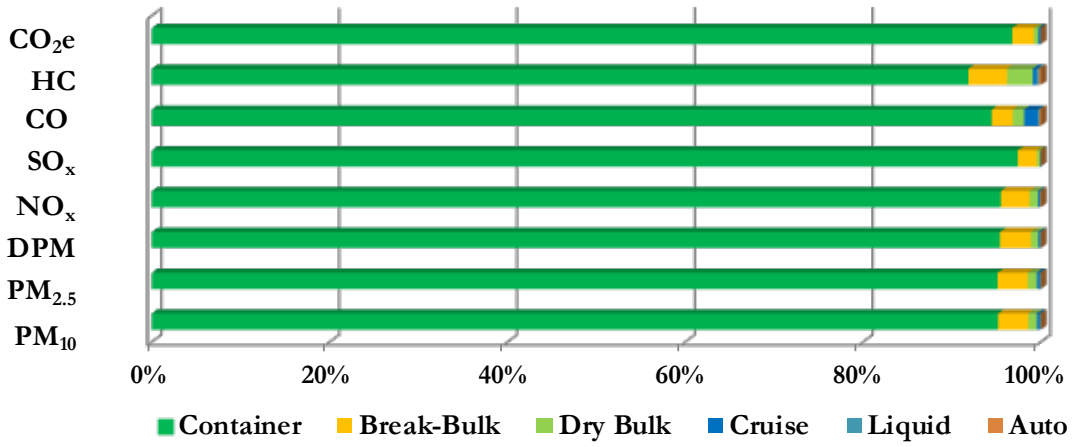
Terminal Type	PM_{10}	$PM_{2.5}$	DPM	NO_x	SO_x	CO	HC
Auto	0.0	0.0	0.0	0.4	0.0	1.0	0.1
Break-Bulk	0.4	0.3	0.3	17.7	0.0	14.8	1.5
Container	10.2	9.4	9.4	521.2	1.2	583.3	32.6
Cruise	0.0	0.0	0.0	0.9	0.0	9.6	0.2
Dry Bulk	0.1	0.1	0.1	5.2	0.0	7.7	1.0
Liquid	0.0	0.0	0.0	0.5	0.0	1.0	0.1
Total	**10.7**	**9.8**	**9.8**	**545.9**	**1.2**	**617.4**	**35.5**

Table 4.18: 2013 CHE GHG Emissions by Terminal Type, metric tons

Terminal Type	CO_2e	CO_2	N_2O	CH_4
Auto	24	24	0.0	0.0
Break-Bulk	2,506	2,485	0.1	0.1
Container	99,963	99,212	2.2	3.5
Cruise	217	216	0.0	0.0
Dry Bulk	540	537	0.0	0.0
Liquid	42	42	0.0	0.0
Total	**103,292**	**102,516**	**2.3**	**3.6**

Figure 4.3 presents the percentage of CHE emissions by terminal type. Container terminals at the Port account for approximately 95% of the PM and NO_x emissions, almost all of the SO_x emissions, 94% of the CO emissions, 92% of the hydrocarbon emissions, and 97% of the greenhouse gas emissions compared to total CHE emissions. The break-bulk, cruise, liquid and auto terminals account for the remainder of the emissions.

Figure 4.3: 2013 CHE Emissions by Terminal Type, %



Tables 4.19 and 4.20 present the CHE emissions by equipment and engine type. Emissions from boom lifts are included in the miscellaneous propane category. Emissions from rail car movers are included under the miscellaneous diesel category. Due to rounding totals in the table 4.19 and 4.20 may not exactly match the totals in tables 4.17 and 4.18.

Table 4.19: 2013 CHE Emissions by Equipment Type, tons

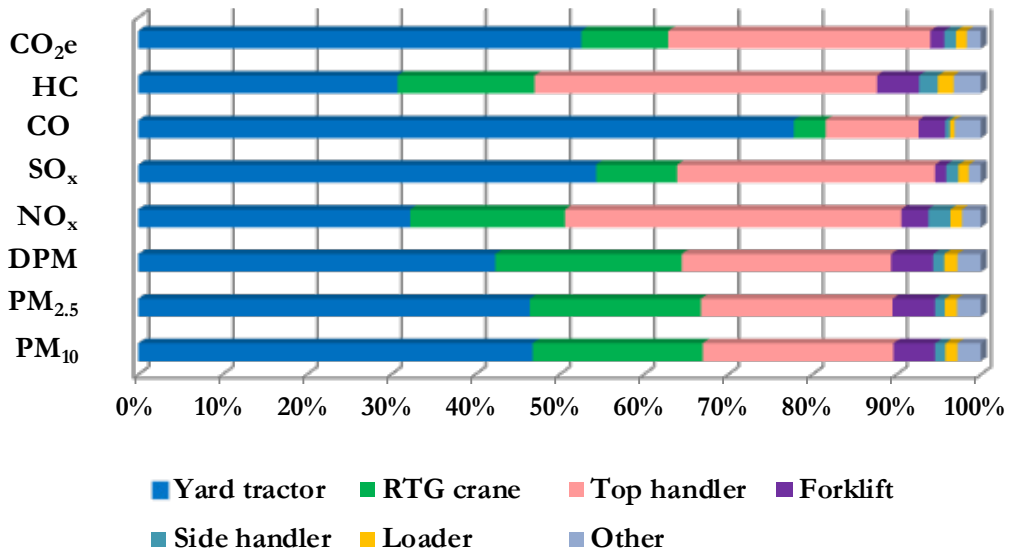
Port Equipment	Engine Type	PM_{10}	$PM_{2.5}$	DPM	NO_x	SO_x	CO	HC
Bulldozer	Diesel	0.0	0.0	0.0	0.9	0.0	0.3	0.1
Crane	Diesel	0.0	0.0	0.0	0.3	0.0	0.2	0.0
Excavator	Diesel	0.0	0.0	0.0	0.5	0.0	0.1	0.0
Forklift	Diesel	0.5	0.4	0.5	12.6	0.0	6.2	0.6
Forklift	Gasoline	0.0	0.0	0.0	0.1	0.0	0.7	0.0
Forklift	Propane	0.0	0.0	0.0	4.9	0.0	12.7	1.2
Loader	Diesel	0.2	0.1	0.2	7.6	0.0	3.2	0.7
Man lift	Diesel	0.0	0.0	0.0	0.2	0.0	0.2	0.0
Material handler	Diesel	0.0	0.0	0.0	1.3	0.0	0.4	0.1
Miscellaneous	Diesel	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Miscellaneous	Propane	0.0	0.0	0.0	0.1	0.0	0.4	0.0
Rail pusher	Diesel	0.0	0.0	0.0	0.6	0.0	0.3	0.0
RTG crane	Diesel	2.2	2.0	2.2	100.2	0.1	23.2	5.8
Side handler	Diesel	0.1	0.1	0.1	14.4	0.0	3.5	0.8
Skid steer loader	Diesel	0.0	0.0	0.0	0.5	0.0	0.5	0.0
Sweeper	Diesel	0.1	0.1	0.1	1.6	0.0	0.6	0.1
Sweeper	Propane	0.0	0.0	0.0	0.2	0.0	1.3	0.0
Top handler	Diesel	2.4	2.2	2.4	217.7	0.4	68.2	14.5
Tractor	Diesel	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tractor	Propane	0.0	0.0	0.0	1.1	0.0	10.4	0.3
Truck	Diesel	0.1	0.1	0.1	3.3	0.0	1.7	0.2
Truck	Gasoline	0.0	0.0	0.0	1.3	0.0	2.9	0.3
Yard tractor	Diesel	4.2	3.8	4.2	144.1	0.6	126.8	8.6
Yard tractor	Gasoline	0.9	0.8	0.0	32.1	0.1	353.8	2.3
Yard tractor	Propane	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total		**10.7**	**9.8**	**9.8**	**545.9**	**1.2**	**617.4**	**35.5**

Table 4.20: 2013 CHE GHG Emissions by Equipment Type, metric tons

Port Equipment	Engine Type	CO_2e	CO_2	N_2O	CH_4
Bulldozer	Diesel	107	105	0.0	0.0
Crane	Diesel	18	18	0.0	0.0
Excavator	Diesel	61	60	0.0	0.0
Forklift	Diesel	1,325	1,312	0.0	0.1
Forklift	Gasoline	21	21	0.0	0.0
Forklift	Propane	419	419	0.0	0.0
Loader	Diesel	1,318	1,307	0.0	0.1
Man lift	Diesel	30	30	0.0	0.0
Material handler	Diesel	202	200	0.0	0.0
Miscellaneous	Diesel	3	3	0.0	0.0
Miscellaneous	Propane	9	9	0.0	0.0
Rail pusher	Diesel	108	107	0.0	0.0
RTG crane	Diesel	10,648	10,555	0.3	0.5
Side handler	Diesel	1,425	1,410	0.0	0.1
Skid steer loader	Diesel	42	41	0.0	0.0
Sweeper	Diesel	208	206	0.0	0.0
Sweeper	Propane	45	45	0.0	0.0
Top handler	Diesel	32,112	31,812	0.9	1.5
Tractor	Diesel	1	1	0.0	0.0
Tractor	Propane	178	178	0.0	0.0
Truck	Diesel	627	623	0.0	0.0
Truck	Gasoline	63	62	0.0	0.0
Yard tractor	Diesel	44,458	44,221	0.7	0.8
Yard tractor	Gasoline	9,864	9,771	0.3	0.6
Yard tractor	Propane	0	0	0.0	0.0
Total		**103,292**	**102,516**	**2.2**	**3.7**

Figure 4.4 presents the percentage of CHE emissions by equipment type. Approximately 31% to 78%, depending on the pollutant, of the Port's CHE emissions are attributed to yard tractors. Yard tractors contribute 78% of total CHE CO emissions because recently terminal operators have started purchasing gasoline yard tractors which emit significantly higher CO emissions compared to similar diesel yard tractors engines. However, there is no DPM and NO_x emissions are low for gasoline yard tractors compared to similar diesel yard tractors. Top handlers, RTG cranes, side picks and forklifts account for most of the remainder of the emissions.

Figure 4.4: 2013 CHE Emissions by Equipment Type, %



SECTION 5 RAILROAD LOCOMOTIVES

This section presents emissions estimates for the railroad locomotives source category, including source description (5.1), geographical domain (5.2), data and information acquisition (5.3), operational profiles (5.4), the emissions estimation methodology (5.5), and the emissions estimates (5.6).

5.1 Source Description

Locomotives are used in railroad operations to move trains to, from, and around the port, transporting intermodal (containerized) freight, with lesser amounts of dry bulk, liquid bulk, and car-load (box car) freight. Locomotives operate differently from other types of mobile sources with respect to how they transmit power from engine to wheels. While most mobile sources use a physical coupling such as a transmission to transfer power from the engine to the wheels, a locomotive's engine turns a generator or alternator powering an electric motor that, in turn, powers the locomotive's wheels. The physical connection of the engine, transmission, and wheels of a typical mobile source means that the engine's speed varies with the vehicle's speed through a fixed set of gear ratios, resulting in the highly transient operating conditions that characterize mobile source operations, particularly regarding engine speed and load. In contrast, the locomotive's engine and drive system operate more independently, such that the engine can be operated at a particular speed without respect to the speed of the locomotive itself. This allows operation under more steady-state load and speed conditions, and as a result locomotives have been designed to operate in a series of discrete throttle settings called notches, ranging from notch positions one through eight, plus an idle position.

Many locomotives also have a feature known as dynamic braking, in which the electric drive engine operates as a generator to help slow the locomotive, with the resistance-generated power being dissipated as heat. While the engine is not generating motive power under dynamic braking, it is generating power to run cooling fans, so this operating condition is somewhat different from idling.

The railroad operations that utilize locomotives at the Port are typically described in terms of two different types of operation, line haul and switching. Line haul refers to the movement of cargo over long distances. Line haul operations occur within the Port as the initiation or termination of a line haul trip, as cargo is either picked up for transport to destinations across the country or is dropped off for shipment overseas. Switching refers to short movements of rail cars, such as in the assembling and disassembling of trains at various locations in and around the Port, sorting of the cars of inbound cargo trains into contiguous "fragments" for subsequent delivery to terminals, and the short distance hauling of rail cargo within the Port. The locomotives that perform these two functions are similar, and many locomotives used in switching service were formerly used as line haul locomotives. However, purpose-built switching locomotives are becoming more common; one example is the multi-engine genset switcher that is powered by a set of two or three relatively small diesel engines and generators rather than one large engine.

Container trains are the most common type of train operating at the Port. While equipment configurations vary, these trains typically consist of up to 26 or more double-stack railcars, each railcar consisting of five platforms. Each platform is capable of carrying up to four TEUs of containerized cargo; i.e., most platforms can carry up to two 40-foot containers. With this configuration the capacity of a 26-railcar train is 520 TEUs or about 290 containers at an average ratio of 1.8 TEU/container. As a practical matter, not all platforms carry four TEUs, because not all platforms are double stacked with two 40-foot containers; the current capacity or "density" is estimated to be approximately 95%. For example, a 26-car train would carry 520 TEUs x 95% = 494 TEUs or about 274 containers.

Line Haul Locomotives

Line haul locomotives are operated in the Port by Burlington Northern Santa Fe Railway Company (BNSF) and Union Pacific Railroad (UP). These two railroad companies are termed Class 1 railroads based on their relative size and revenues. Locomotives used for line haul operations are typically equipped with large, powerful engines of 3,000 to 4,000 hp or more, while switch engines are smaller, typically having one or more engines totaling 1,200 to 3,000 hp. Line haul locomotives are typically operated in groups of two to five units, with three or four units being most common, depending on the power requirements of the specific train being pulled and the horsepower capacities of available locomotives. Thus, two higher-horsepower locomotives may be able to pull a train that would take three units with lower power outputs. Locomotives operated in sets are connected such that every engine in the set can be operated in unison by an engineer in one of the locomotives.

Because the function of line haul locomotives is to transport freight to and from destinations across the country, there is no readily identifiable "fleet" of line haul locomotives that call on the Port other than each Class 1 railroads' nation-wide fleets. However, both UP and BNSF are party to a Memorandum of Understanding with CARB in which the railroads agreed to meet, in 2010, specified fleet-wide average emission rates from their line haul and switching locomotives operating in the SoCAB. The emission rates are calculated on a weighted average basis that applies to switching as well as line haul locomotives. As part of achieving these fleet average emission rates, the railroads diverted a higher percentage of their newer locomotives that meet EPA Tier 2 emission standards to the SoCAB and the Ports, reducing their Port-related line haul locomotive emissions. Under the MOU the railroads have reported information to CARB regarding their fleet average emissions for each year since 2010, and CARB has made the information for 2010 through 2012 available on their website. The information submitted by the railroads on their line haul locomotives that operated in the SoCAB during 2012 has been included in the emission factors and emission estimates presented below. While not specific to 2013 (since the 2013 information has not been made available in time for this report), the information is the latest currently available and represents an improvement over the default assumptions that have been used in previous emissions inventories.

Switching Locomotives

Switching locomotives deliver and pick up railcars transporting containers, liquid and dry bulk materials, automobiles and general cargo to and from terminals at the Port. Switching operations take place around the clock, seven days per week, although weekend activity is generally lower than weekday or weeknight activity.

Pacific Harbor Line (PHL) is the primary switching railroad at the Port. PHL operations are organized into scheduled shifts, each shift being dispatched to do specified tasks in shift-specific areas. For example, there is a daily shift servicing the Toyota import terminal and various other non-container terminals in the Port. Other shifts move empty or laden container rail cars to and from container terminals. Much of the work involves rearranging the order of railcars in a train to organize cars bound for the same destinations (inbound or outbound) into contiguous segments of the train, and to ensure proper train dynamics. Train dynamics can include, for example, locating railcars carrying hazardous materials the appropriate minimum distance from the locomotives, and properly distributing the train's weight. Although there is a defined schedule of shifts that perform the same basic tasks, there is little consistency or predictability to the work performed during a given shift or at a particular time.

PHL's fleet in 2013 consisted of 17 Tier 3+ locomotives and 6 locomotives that are powered by a set of three relatively small diesel engines and generators rather than one large engine (known as multi-engine genset switchers). These multi-engine genset units emit less than Tier 3 emission levels of most pollutants. UP and BNSF also operate low-emission switching locomotives at their off-port railyard locations, and Metro Ports conducts switching operations of rail cars transporting bulk cargo at the Pier G facility using a low-emission switcher and a standard switching locomotive.

Figures 5.1 and 5.2 illustrate typical line haul and switching locomotives, respectively, in use at the Port.

Figure 5.1: Typical Line Haul Locomotives

Figure 5.2: PHL Switching Locomotive

5.2 Geographical Domain

The specific activities included in this emissions inventory are movements of cargo within Port boundaries, or directly to or from port-owned properties such as terminals and on-port rail yards. The inventory does not include rail movements of cargo that occur solely outside the Port, such as off-port rail yard switching, and movements that neither begin or end at a Port property, such as east-bound line hauls that initiate in central Los Angeles intermodal yards. Please refer to Section 1.1.4 for a description of the geographical domain of the emissions inventory with regard to locomotive operations.

5.3 Data and Information Acquisition

To estimate emissions associated with Port-related activities of locomotives operating within the Port and outside the Port to the boundary of the SoCAB, information has been obtained from:

- Previous emissions studies
- Port cargo statistics
- Input from railroad operators
- Published information sources[39]

Terminal operators and Port departments have also provided information on Port rail operations that provides an additional level of understanding of overall line haul rail operations.

5.3.1 On-Port and Off-Port Switching Locomotive Data

For on-Port switching operations, PHL has previously provided a record of each of its locomotives including the fuel used per month in each locomotive. For reasons beyond their control PHL was not able to provide specific fuel use information relative to 2013 so the fuel usage in 2012 was apportioned to their locomotives to estimate 2013 fuel usage. This information was used along with EPA and manufacturer information on emission rates. For off-Port switching operations UP, the railway company operating the Intermodal Container Transfer Facility (ICTF), operated as a joint powers authority of the Port of Long Beach and the Port of Los Angeles, also provided information on their switch engines, including representative fuel usage from 2005 which was scaled to the change in facility container throughput between 2005 and 2013.

5.3.2 Line Haul Locomotive Data

Data collection is particularly difficult with respect to estimating line haul rail emissions associated with Port activities, and as a result, rail data for locomotive operations associated with Port activities continues to be less refined and specific than the data for other emission source categories. The Port continues to work on ways to further enhance the accuracy of the port activity data on which the rail emissions inventory is based. For the limited line haul operations within the Port, emission estimates are based on schedule and throughput information provided by the railroads, terminal operators, and EPA operational and emission factors. Off-Port line haul emissions are estimated using cargo movement information provided by the Class 1 railroads, and weight and distance information first developed for the 2005 emissions inventory.

In addition, railroad personnel were interviewed for an overview of their operations in the area. Certain information related to line haul locomotive fleets has been obtained from railroad companies' Internet websites, such as that of the Surface Transportation Board of the U.S. Department of Transportation, and the MOU compliance page of the ARB's website.

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[39] For example, EPA, *Emission Factors for Locomotives*: EPA-420-F-09-025, Office of Transportation and Air Quality, April 2009 and Regulatory Support Document: EPA Office of Mobile Sources, *Locomotive Emission Standards Regulatory Support Document,* April 1998, revised, both published as background to EPA's locomotive rule-making processes. Also, information provided by the Class 1 railroads to the ARB to document their compliance with the ARB/railroad MOU and made available by ARB on their website: *http://www.arb.ca.gov/railyard/1998agree/1998agree.htm.*

5.4 Operational Profiles

The goods movement rail system is described below in terms of the activities that are carried out by locomotive operators. For purposes of this inventory, "outbound" rail freight refers to cargo that has arrived on vessels and is being shipped to locations across the U.S whereas "inbound" rail freight is destined for shipment out of the Port by vessel. This is contrary to the usual port terminology of cargo off-loaded from vessels referred to as "inbound" and that loaded onto vessels as "outbound." Outbound rail cargo is also referred to as eastbound and inbound rail cargo is also referred to as westbound.

Outbound Trains
The assembly of outbound trains occurs in one of three ways. Container terminals with sufficient track space build trains on-terminal in on-dock railyards, using rail cars that have either remained on site after the off-loading of inbound containers or have been brought in by one of the railroads. Alternatively, some containers are transported by truck to an off-terminal transfer facility where the containers are transferred from truck chassis to railcars. Terminals can also store individual railcars or build a partial train on-terminal, to be collected later by a railroad (typically PHL) and moved to a rail yard with sufficient track space to build an entire train.

Within the Port, container terminals with on-dock rail facilities are the International Transportation Service (ITS) terminal, the Total Terminals International (TTI) terminal, the Long Beach Container Terminal (LBCT), the Pacific Container Terminal (PCT) and the Stevedoring Services of America (SSA) terminal on Pier A. Trains can also be assembled at the Pier B Yard located on the north side of the Port. Trains are also built outside of the Port at the Mead Yard, the Watson Yard, the Dolores Yard, and the Manuel Yard, and at locations within the Port of Los Angeles. If containers that are to be transported by rail are not loaded onto railcars at the Port, they are typically drayed to off-port locations operated by the line haul railroads, as noted above.

Inbound Trains
In-bound trains carrying cargo or empty containers destined for the same terminal are delivered directly to the terminal by the Class 1 railroads if the receiving terminal has the track space to accommodate all of the cars at one time. Trains carrying cargo bound for multiple terminals within one or both Ports are staged by the Class 1 railroads at several locations, where they are broken up, typically by PHL, and delivered to their destination terminals. Inbound trains are also delivered to off-Port locations such as the Watson Yard, the ICTF operated by UP, the Dolores Yard, and the Manuel Yard.

Of the off-Port locations, noted above, only the ICTF is included in the emission estimates presented in this emissions inventory, because of its status as a joint powers authority of the Port of Long Beach and the Port of Los Angeles. The ICTF emissions are allocated between the Port and Port of Los Angeles based on the relative cargo throughputs of the two Ports. This allocation is discussed further in subsection 5.5.1.

5.5 Emissions Estimation Methodology

The following section provides a description of the methods used to estimate emissions from switching and line haul locomotives operating within the Port and in the SoCAB.

Different calculation methods are required for the different types of locomotive activity because different types of information are used for different activities. However, an attempt has been made to standardize the activity measures used as the basis of calculations in order to develop consistent methodologies and results.

5.5.1 Switching Locomotive Emissions

Emissions from PHL's on-port switching operations have been based on the horsepower-hours of work represented by their reported locomotive fuel use, and emission factors from the EPA documents cited above and from information published by the locomotive manufacturers. The calculations estimate horsepower-hours worked by each locomotive based on fuel consumption in gallons per year, and combine the horsepower-hour estimates with emission factors in terms of grams of emissions per horsepower-hour (g/hp-hr). Fuel usage is converted to horsepower-hours using conversion factors that equate horsepower-hours to gallon of fuel (hp-hr/gal):

Equation 5.1

$$\boldsymbol{Annual\ work\ in\ hphr\ per\ year} = \frac{\boldsymbol{gallons}}{\boldsymbol{year}} \times \frac{\boldsymbol{hp\ hr}}{\boldsymbol{gallon}}$$

The calculation of emissions from horsepower-hours uses the following equation.

Equation 5.2

$$\boldsymbol{E} = \frac{\boldsymbol{Annual\ work} \times \boldsymbol{EF}}{(\boldsymbol{453.59\ g/lb} \times \boldsymbol{2{,}000\ lb/ton})}$$

Where:

E = emissions, tons per year
Annual work = annual work, hp-hrs/yr
EF = emission factor, grams pollutant per horsepower-hour

EPA in-use emission factors for Tier 3 locomotives have been used for the 17 Tier 3+ locomotives. Emission factors for PM_{10}, $PM_{2.5}$, and DPM from the Tier 3+ locomotive engines have been based on the EPA emission certification level of the engines, which is lower than the Tier 3 standard. Manufacturer's published emission rates have been used for the six genset switchers, which operate with three diesel engines originally certified to EPA Tier 3 nonroad engine standards. Emission rates published by the locomotives' manufacturer, National Railway Equipment Co. (NRE), have been used instead of the Tier 3 nonroad standards because differences in duty cycle between nonroad and locomotive operation make the nonroad standards less appropriate. The ICTF

switching emissions have been calculated using the genset emission factors noted above based on UP's MOU compliance submission to the ARB, which indicates that the switchers are genset units.

The EPA and NRE emission factors cover particulate, NO_x, CO, and HC emissions. SO_x emission factors have been developed to reflect the use of 15 ppm ULSD using a mass balance approach, which assumes that all of the sulfur (S) in the fuel is converted to SO_2 and emitted during the combustion process. While the mass balance approach calculates SO_2 specifically, it is used as a reasonable approximation of SO_x. The following example shows the calculation of the SO_x emission factor.

Equation 5.3

$$\frac{15\ g\ S}{1{,}000{,}000\ g\ fuel} \times \frac{3{,}200\ g\ fuel}{gal\ fuel} \times \frac{2\ g\ SO_2}{g\ S} \times \frac{gal\ fuel}{15.2\ hp\ hr} = 0.006\ g\ SO_2/hp\ hr$$

In this calculation, 15 ppm S is written as 15 grams S per million grams of fuel. The value of 15.2 hp-hr/gallon of fuel is the average brake-specific fuel consumption (BSFC) noted in EPA's technical literature on locomotive emission factors (EPA, 2009). Two grams of SO_2 is emitted for each gram of sulfur in the fuel because the atomic weight of sulfur is 32 while the molecular weight of SO_2 is 64, meaning that the mass of SO_2 is two times that of sulfur. The BSFC value of 15.2 hp-hr/gallon is used for the Tier 3+ locomotives. An evaluation of information released by NRE on the fuel consumption of the genset switchers indicates a BSFC of 17.9 hp-hr/gallon for those locomotives. They are apparently more fuel efficient and so can perform more work (i.e., hp-hr) for a given amount of fuel. Emission factors based on fuel consumptions (such as SO_x and CO_2) reflect the different BSFC values.

Greenhouse gas emission factors from EPA references[40] have been used to estimate emissions of the greenhouse gases CO_2, CH_4, and N_2O from locomotives. Additionally, all particulate emissions are assumed to be PM_{10} and DPM, and $PM_{2.5}$ emissions have been estimated as 92% of PM_{10} emissions to be consistent with CARB's $PM_{2.5}$ ratio used for offroad diesel equipment. Emission factors for the Tier 3 and genset switching locomotives are listed in Tables 5.1 and 5.2.

Table 5.1: Switching Emission Factors, g/hp-hr

Locomotive Type	PM_{10}	$PM_{2.5}$	DPM	NO_x	SO_x	CO	HC
Tier 3 Locomotives	0.036	0.033	0.036	4.5	0.006	1.83	0.26
Genset Locomotives	0.05	0.05	0.05	3.37	0.005	1.51	0.04
Tier 0 Locomotives	0.44	0.4	0.44	12.6	0.006	1.83	1.01

[40] EPA, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2012,* Draft February 2014.

Table 5.2: GHG Switching Emission Factors, g/hp-hr

Locomotive Type	CO_2	N_2O	CH_4
Tier 3 Locomotives	678	0.017	0.05
Genset Locomotives	578	0.015	0.05
Tier 0 Locomotives	678	0.017	0.05

The activity measure used in the switching emission estimates is total horsepower-hours of activity, derived from the locomotive-specific fuel use estimates for the on-port switching, and an estimate of off-port switching fuel use derived from information provided earlier by UP for the ICTF rail yard that is located on POLA property. For the ICTF, the reported 2005 fuel usage has been multiplied by the ratio of 2013 to 2005 container throughput reported by the railroad using the equation 5.4 and the assumption that switching activity varies linearly with container throughput. While not a specific calendar-year fuel consumption measurement, it has been noted that UP consistently provides fuel use estimates based on EPA-published fuel consumption figures rather than providing actual fueling totals, likely because of difficulties in identifying specific fuel subtotals related to the ICTF. For this reason, scaling past fuel consumption estimates to changes in throughput is a reasonable and consistent method of estimating changes in fuel consumption and emissions from year to year.

Equation 5.4

$$\boldsymbol{Fuel}\ (\mathbf{2013}) = \boldsymbol{Fuel}\ (\mathbf{2005}) \times \frac{\boldsymbol{Throughput}\ (\mathbf{2013})}{\boldsymbol{Throughput}\ (\mathbf{2005})}$$

As an example of how fuel usage was used to estimate total hp-hrs, a total of 10,000 gallons of fuel per year would be multiplied by EPA's fuel use factor (noted above) of 15.2 hp-hr per gallon (hp-hr/gal) to produce an estimate of 152,000 hp-hrs:

Equation 5.5

$$\mathbf{10,000}\,\frac{\boldsymbol{gal}}{\boldsymbol{year}} \times \frac{\mathbf{15.2}\ \boldsymbol{hp\ hr}}{\boldsymbol{gal}} = \mathbf{152,000}\ \boldsymbol{hp\ hr/year}$$

This would be multiplied by the g/hp-hr emission factors to estimate the mass of emissions over the year. An example for NO_x would be:

Equation 5.6

$$\frac{\mathbf{152,000}\ \boldsymbol{hp\ hr} \times \mathbf{4.5}\ \boldsymbol{NOx\ g/hp\ hr}}{(\mathbf{453.59}\ \boldsymbol{g/lb} \times \mathbf{2,000}\ \boldsymbol{lb/ton})} = \mathbf{0.75}\ \boldsymbol{tons\ NOx/year}$$

PHL operates within both the Port and the Port of Los Angeles. While some of the shifts are focused on activities in only one of the ports, other shifts may work in either or both ports depending upon the day's needs for switching services. Therefore, it is not possible to clearly designate which shifts operate solely within the Port so a method was developed for apportioning emissions between the two ports. To do this, the previous baseline emissions inventory evaluated the work shifts as to whether they are likely to work in either port exclusively or in both ports resulting in a split of 31% within the Port of Long Beach and 69% of activity within the Port of Los Angeles, which has been maintained for the current inventory. The difference between the two ports' allocations is so great in part because almost all work shifts involve at least some activity within PHL's main yard located in the Port of Los Angeles.

Rail cargo from both ports is handled at the off-dock ICTF, and the complexities of the rail system are such that apportionment of activity (and emissions) between the two ports is difficult. The previous baseline emissions inventories used an allocation of 45% for the Port of Long Beach and 55% for the Port of Los Angeles. This allocation has been maintained for the current inventory because it still seems a reasonable assumption, given that the Port of Long Beach's overall TEU throughput represented about 46% of the two ports' combined throughput in 2013. Regardless of apportionment, the sum of the two ports' emissions represents all of the estimated switching emissions from locomotives operated at the ICTF.

5.5.2 Line Haul Locomotive Emissions

Emissions from line haul locomotives operating in the Port have been estimated on an activity basis, i.e., estimates of the number and characteristics of locomotives that arrive and depart with cargo and/or empty containers. The information used in developing these estimates has been obtained from the Port and Port terminals.

The number of locomotive trips in the Port has been estimated by evaluating cargo movements, percentage of cargo transported by rail and typical number of locomotives per train, using a methodology similar to that first used for the 2002 baseline emissions inventory and also used for the subsequent inventories.

Emission factors have been developed from various sources, including the information submitted by the railroads to ARB to demonstrate compliance with the MOU,[41] EPA's recent documentation (EPA-420-F-09-025) representing EPA's estimates of emissions from line haul locomotives by engine tier level and an EPA publication on greenhouse gas emissions.[42]

[41] CARB, *http://www.arb.ca.gov/railyard/1998agree/1998agree.htm*, as cited above
[42] EPA, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2012,* April 2014.

To the extent possible, the MOU compliance data was used to develop the emission factors, since this data is the most location-specific information available. The data was used directly to develop the NO_x emission factor (based on submitted NO_x emission rates). The information on engine tier level frequency was used to develop emission factors for particulate, HC, and CO emissions. In the most recent compliance submittal available from ARB (2012), the railroads reported information by locomotive tier level: pre-Tier 0, Tier 0, Tier 1, Tier 2, and ultra-low emission locomotives (ULEL). The information included, for each tier level, the number of locomotives that worked in the South Coast Air Basin in 2012, the megawatt-hours (MWhrs) expended by the locomotives while in the basin, the percentage of MWhrs in each tier level, and the weighted average NOx emissions in grams per horsepower hour (g/hp-hr). A fleet average NO_x emission rate was calculated using the rates by tier level and the percentage of MWhrs in each tier level. In addition, UP used "ULEL credits" to achieve the required 5.5 g/hp-hr composite emission rate.

The method used to adapt the railroads' NO_x emissions data to the development of a NO_x emission factor for the ports' 2013 emissions inventories was to calculate a composite NO_x emission rate using the ratios of MWhr by line haul locomotive tier level reported by both railroads for 2012. The ULELs were not included in the line haul calculations because they are dedicated switchers with emission calculations as described in preceding paragraph. Table 5.3 presents the MOU compliance information submitted by both railroads and the composite of both railroads' pre-Tier 0 through Tier 2 locomotive NO_x emissions, showing a weighted average NO_x emission factor of 5.92 g/hp-hr.[43]

[43] Notes from railroads' MOU compliance submissions:

1. For more information on the U.S. EPA locomotive emission standards please visit. *http://www.epa.gov/oms/locomotives.htm.*
2. Number of locomotives is the sum of all individual locomotives that visited or operated within the SCAB at any time during 2012.
3. Many locomotives are certified to emission levels cleaner than the U.S. EPA emission standards or tiers. For the purposes of this table, a locomotive's actual certified emission level is grouped with the required tier level. Within each tier, the Weighted Average NO_x Emission Level is calculated by multiplying each individual locomotive's actual certification level by its megawatt-hours of operation.
4. The Tier Contribution is calculated by multiplying the % MWhrs by Tier Level by the Weighted Average NO_x Emission Level.

Table 5.3: MOU Compliance Data, MWhrs and g NOx/hp-hr

Engine Tier[1]	Number of Locomotives[2]	Megawatt -Hours (MWhrs)	%MWhrs by Tier Level	Wt'd Avg NOx (g/hp-hr)	Tier Contribution To Fleet Avg[4] (g/hp-hr)
BNSF					
Pre-Tier 0	0	0	0%	0	0.0
Tier 0	162	7,406	3%	7.8	0.3
Tier 1	683	40,493	19%	7.4	1.4
Tier 2	942	119,682	55%	5.0	2.7
Tier 3	220	16,117	7%	4.6	0.3
ULEL	91	34,092	16%	3.8	0.6
Total BNSF	**2,098**	**217,790**	**100%**		**5.3**
UP					
Pre-Tier 0	80	1,507	1%	12.6	0.1
Tier 0	2,507	62,861	28%	7.9	2.2
Tier 1	1,333	29,650	13%	6.7	0.9
Tier 2	1,456	113,984	50%	5.1	2.6
Tier 3	241	6,682	3%	4.9	0.1
ULEL	71	11,548	5%	2.5	0.1
Total UP	**5,688**	**226,232**	**100%**		**6.0**
			ULEL Credit Used		0.5
			UP Fleet Average		**5.5**
Both RRs, excluding ULELs and ULEL credits					
Pre-Tier 0	80	1,507	0%	12.6	0.05
Tier 0	2,669	70,267	18%	7.9	1.39
Tier 1	2,016	70,143	18%	7.1	1.25
Tier 2	2,398	233,666	59%	5.0	2.96
Tier 3	461	22,799	6%	4.7	0.27
Total both	**7,624**	**398,382**	**100%**		**5.92**

As noted in the text above and shown in Table 5.3, UP used ULEL credits established under the MOU as part of their compliance demonstration. These credits were not used in developing the line haul locomotive NO_x emission factor. Only the data on Pre-Tier 0 and Tiers 0 through 3 locomotives were used, as shown in the lower part of Table 5.3.

Emission factors for particulate matter (PM_{10}, $PM_{2.5}$, and DPM), HC, and CO were calculated using the tier-specific emission rates for those pollutants published by EPA[44] to develop weighted average emission factors using the MW-hr figures provided in the railroads' submissions. These results are presented in Table 5.4. The composites were calculated by multiplying each tier's emission factor by that tier's percentage of total MW-hrs, and summing the results for all tiers. For example, the PM_{10} tier-specific emission factor is 0.32 g/hp-hr for pre-tier 0 (uncontrolled), Tier 0, and Tier 1 locomotive engines, and 0.18 g/hp-hr for Tier 2 engines. Each tier's emission factor was multiplied by the corresponding percentage of MWhrs (1% for pre-tier 0, 16% for Tier 0, etc.) with the results entered under the "Fleet Composite" column for PM_{10}. The composite PM_{10} emission factor was calculated by summing the four values in that column. The other pollutants in the table were calculated in a similar manner.

Table 5.4: Fleet MWhrs and PM, HC, CO Emission Factors, g/hp-hr

Engine Tier	MWhr	% of MWhr	EPA Tier-specific PM_{10}	EPA Tier-specific HC	EPA Tier-specific CO	Fleet Composite PM_{10}	Fleet Composite HC	Fleet Composite CO
			g/hp-hr			g/hp-hr		
Pre-Tier 0	1,507	0%	0.32	0.48	1.28	0.00	0.00	0.01
Tier 0	70,267	18%	0.32	0.48	1.28	0.06	0.09	0.23
Tier 1	70,143	18%	0.32	0.47	1.28	0.06	0.08	0.23
Tier 2	233,666	59%	0.18	0.26	1.28	0.11	0.15	0.75
Tier 3	22,799	6%	0.08	0.13	1.28	0.01	0.01	0.07
Totals	**398,382**	**100%**				**0.22**	**0.33**	**1.28**

The SO_x emission factor has been estimated from assumed fuel sulfur content values using the same mass balance equation as the switching locomotives calculation. For line haul locomotives, which enter and leave California to pick up and deliver transcontinental rail cargo and typically refuel while in the SoCAB, the calculations are based on reasonably conservative assumptions derived from information provided by the Class 1 railroads. Inbound trains are assumed to use the fuel they were filled with before entering California, while outbound trains are assumed to refuel with ULSD before departing the SoCAB such that 90% of the outbound fuel is ULSD and 10% is the residual amount of out-of-state fuel. The out-of-state fuel is assumed to contain 43 ppm S, consistent with EPA assumptions,[45] while the ULSD limit of 15 ppm is used for the in-state fuel.

[44] EPA Office of Transportation and Air Quality, "Emission Factors for Locomotives" EPA-420-F-09-025 April 2009.

[45] EPA, Table 3.4-8a (p. 3-57) of "Final Regulatory Analysis: Control of Emissions from Nonroad Diesel Engines, EPA420-R-04-007 (May 2004)".

Table 5.5 summarizes the emission factors discussed above, presented in units of g/hp-hr.

Table 5.5: Emission Factors for Line Haul Locomotives, g/hp-hr

	PM_{10}	$PM_{2.5}$	DPM	NO_x	SO_x	CO	HC
EF, g/bhp-hr	0.22	0.20	0.22	5.92	0.009	1.28	0.33

The same information sources for greenhouse gases have been used for both line haul locomotives as for switching locomotives. However, EPA did not revise the BSFC figure for line haul locomotives as they did for switching locomotives. Table 5.6 lists the greenhouse gas emission factors derived from the EPA reference.[46]

Table 5.6: GHG Emission Factors for Line Haul Locomotives, g/hp-hr

	CO_2	N_2O	CH_4
EF, g/bhp-hr	494	0.013	0.040

On-Port Line Haul Emissions

On-port line haul locomotive activity has been estimated through an evaluation of the amount of cargo reported by the terminals to be transported by rail and their reported average or typical number of trains per week or per year. These numbers were combined with assumptions regarding the number of locomotives, on average, that are involved with on-port line haul railroad moves, and the average duration of incoming and outgoing port trips based on the same approach used in previous emissions inventories. The number of trains per year, locomotives per train, and on-port hours per train are multiplied together to calculate total locomotive hours per year. This activity information is summarized in Table 5.7. While most of the rail cargo, and the basis for these estimates, center on container traffic, the local switching railroad has reported that they prepare an average of one train per day of cargo other than containers for transport out of the San Pedro Bay Ports area. It has been assumed that a similar number of trains are inbound, and the total number has been split between both ports. Therefore, the number of trains per year includes an average of one non-container train every other day in each direction (for an annual total of 365 additional trains for each port).

[46] EPA, CO_2 - Table A-75, page A-46, Annex 2 of the report entitled: *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2012,* April 2014; CH_4 and N_2O - Table A-107, page A-150 in Annex 3 of the same report.

Table 5.7: 2013 Estimated On-Port Line Haul Locomotive Activity

Activity Measure	Inbound	Outbound	Total
Trains per Year	2,485	2,505	4,991
Locomotives per Train	3	3	N/A
Hours on Port per Trip	1	2.5	N/A
Locomotive Hours per Year	7,456	18,790	26,246

The average load factor for a typical line haul locomotive calling on the Port has been estimated by multiplying the percentage of full power in each throttle notch setting by the average percentage of line haul locomotive operating time in that setting, as summarized in Table 5.8. Both of these sets of percentages are EPA averages listed in the RSD documentation. This average load factor may be overestimated because the throttle notch distribution is representative of nation-wide operation; including time traveling uphill when the higher notch positions are most often used. However, detailed throttle notch information has not been available to enable the development of an average on-port load factor.

Table 5.8: Estimated Average Load Factor

Notch	% of Full Power in Notch	% of Operating Time in Notch	% Full Power x % Time
DB	2.1%	12.5%	0.3%
Idle	0.4%	38.0%	0.2%
1	5.0%	6.5%	0.3%
2	11.4%	6.5%	0.7%
3	23.5%	5.2%	1.2%
4	34.3%	4.4%	1.5%
5	48.1%	3.8%	1.8%
6	64.3%	3.9%	2.5%
7	86.6%	3.0%	2.6%
8	102.5%	16.2%	16.6%
Average line haul locomotive load factor:			**28%**

To estimate the total number of horsepower-hours for the year, the estimated number of locomotive hours for the Port is multiplied by average locomotive horsepower and the average load factor discussed above:

Equation 5.7

$$\mathbf{26,246}\ \boldsymbol{locomotive\ hours/year}\ \times\ \mathbf{4,000}\ \boldsymbol{hp/locomotive}\ \times\ \mathbf{0.28} = \mathbf{29.4}\ \boldsymbol{million\ hp-hr}\ (\boldsymbol{rounded})$$

Emission estimates for on-port line haul locomotive activity have been calculated by multiplying this estimate of horsepower-hours by the emission factors listed in Tables 5.5 and 5.6 in terms of g/hp-hr.

Out-of-Port Line Haul Emissions

Line haul locomotive activity between the Port and the air basin boundary has been estimated through an evaluation of the amount of Port cargo transported by rail and of average or typical train characteristics such as number of containers and number of gross tons per train. In this way, estimates of gross tonnage and fuel usage have been prepared, similar to the methodology used for the previous Port emissions inventories.

Four components of locomotive activity have been estimated to develop the off-port emission estimates: number of trains, average weight of each train, distances traveled within the SoCAB, and amount of fuel used per ton-mile of train activity. The average number of port-related trains is estimated to be approximately 27 per day through the Alameda Corridor[47] including non-container trains discussed above, based on the average train capacities discussed above, on average 274 containers per train, and the two San Pedro Bay Ports' 2013 intermodal throughputs. The gross weight, including locomotives, railcars, and freight, of a typical train is estimated to have been 7,276 tons in 2013, using the assumptions listed in Table 5.9. The distance assumptions are 21 miles for the Alameda Corridor and 84 miles between the north end of the Alameda Corridor and the Air Basin boundary.

Gross tons (in millions) have been calculated by multiplying the number of trains by the gross weight per train; for example in Table 5.10 this is illustrated by multiplying 4,627 trains per year by 7,276 tons per train (Table 5.9). The resulting 34 million gross ton (MMGT) figure is multiplied by the distance of each rail travel segment to estimate millions of gross ton-miles, also shown in Table 5.10. For the Alameda Corridor, this is 34 MMGT multiplied by 21 miles, which equals 714 MMGT-miles. This table also shows the estimated total fuel usage, estimated by multiplying the MMGT-miles by the average fuel consumption factor (gallons per thousand gross ton-miles) for the two line haul railroads. This average has been derived from information reported by the railroads to the U.S. Surface Transportation Board in an annual report known as the "R-1,"[48] the most recent of which,

[47] Overall Alameda Corridor traffic for 2012 was an average of 45 per day. This includes non-port-related traffic; *http://www.acta.org/PDF/CorridorTrainCounts.pdf.*

[48] BNSF Railway, *Class I Railroad Annual Report R-1 to the Surface Transportation Board for the Year Ending Dec. 31, 2012* (Union Pacific Railroad) and *Class I Railroad Annual Report R-1 to the Surface Transportation Board for the Year Ending Dec. 31, 2012.*

at the time of data collection, was for calendar year 2012. Among the details in this report are the total gallons of diesel fuel used in freight service and the total freight moved in thousand gross ton-miles. The total fuel reported by both railroads was divided by the total gross ton-miles to derive an average factor of 0.985 gallons of fuel per thousand gross ton-miles.

Also listed in Table 5.10 is the estimated total of out-of-port horsepower-hours, calculated by multiplying the fuel use by the fuel consumption conversion factor of 20.8 hp-hr/gal. The following examples illustrate the calculations underlying Table 5.10.

$$\mathbf{4,627\ trains/year\ \times\ 7,276\ GT/train = 34\ MMGT/year}$$

$$\mathbf{34\ MMGT/year\ \times\ 21\ miles = 714\ MMGT - miles/year}$$

$$\mathbf{714\ MMGT - miles/year\ +\ 2,856\ MMGT - miles/year\ = 3,570\ MMGT - miles/year}$$

$$\mathbf{3,570\ MMGT - \frac{miles}{year} \times\ 0.985 \frac{gals}{thousand} GT - miles\ = 3.57\ million\ gal/year}$$

$$\mathbf{3.57\ million \frac{gal}{year} \times\ 20.8\ hp - \frac{hr}{gal} = 74.3\ million\ hp - hr}$$

Table 5.9: Assumptions for Gross Weight of Trains

Train Component	Approximate Weight lbs	Weight tons	Number per train	Weight tons
Locomotive	420,000	210	4	840
Railcar (per double-stack platform)	40,000	20	130	2,600
Container		14.0	274	3,836
Total weight per train, gross tons				**7,276**

Table 5.10: 2013 Gross Ton-Mile, Fuel Use, and Horsepower-hour Estimate

	Trains per year	MMGT per year	Distance miles	MMGT-miles per year
Alameda Corridor	4,627	29	34	714
Central LA to Air Basin Boundary	4,627	29	34	2,856
Million gross ton-miles				**3,570**
Estimated million gallons of fuel				**3.57**
Estimated million hp-hr				**74.3**

Emission estimates for out-of-port line haul locomotive activity have been calculated by multiplying this estimate of overall horsepower-hours by the emission factors in terms of g/hp-hr.

5.5.3 Improvements to Methodology from Previous Years

The Port continues to use the most recent and locally-specific data available, including MOU compliance data reflective of actual recent line haul fleet mix characteristics. Upcoming international rules on the weighing of containers during shipment will ultimately provide a more robust estimate of the average weight of containers shipped by rail.

5.6 Emission Estimates

A summary of estimated emissions from locomotive operations related to the Port is presented in Tables 5.11 and 5.12. These emissions include operations within the Port and Port-related emissions outside the Port out to the boundary of the SoCAB.

Table 5.11: 2013 Port-Related Locomotive Estimated Emissions, tons

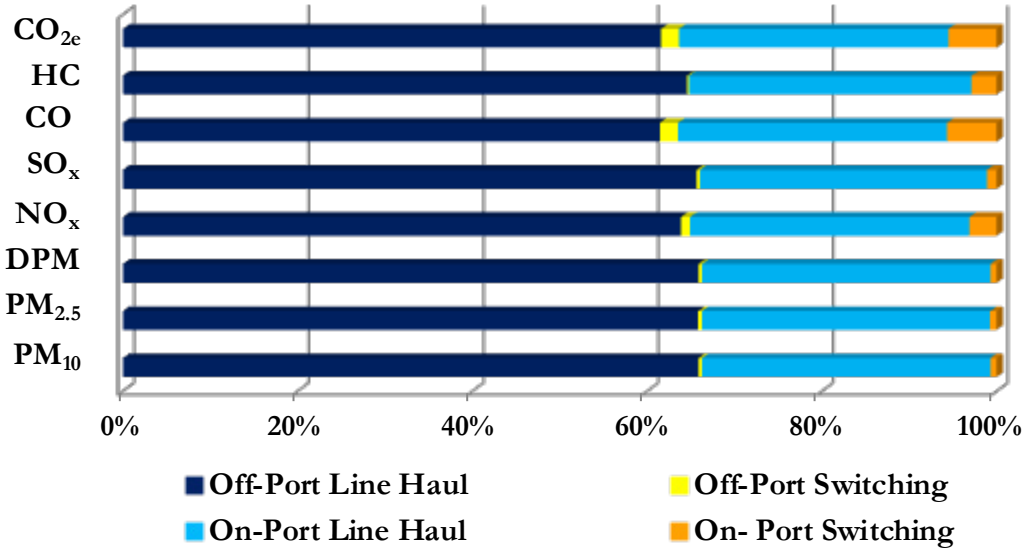
	PM_{10}	$PM_{2.5}$	DPM	NO_x	SO_x	CO	HC
On-Port Emissions							
Switching	0.3	0.2	0.3	23.5	0.0	9.1	1.3
Line Haul	7.1	6.5	7.1	191.8	0.3	41.5	10.7
On-Port Subtotal	7.4	6.7	7.4	215.3	0.3	50.6	12.0
Off-Port (Regional) Emissions							
Switching	0.1	0.1	0.1	6.7	0.0	3.0	0.1
Line Haul	17.6	16.0	17.6	473.5	0.7	102.4	26.4
Off-Port Subtotal	17.7	16.1	17.7	480.2	0.7	105.4	26.5
Total	**25.1**	**22.8**	**25.1**	**695.4**	**1.0**	**156.0**	**38.5**

Table 5.12: 2013 Port-Related Locomotive GHG Estimated Emissions, metric tons

	CO_2e	CO_2	N_2O	CH_4
On-Port Emissions				
Switching	3,095	3,066	0.1	0.2
Line Haul	14,694	14,550	0.4	1.2
On-Port Subtotal	17,789	17,617	0.5	1.4
Off-Port (Regional) Emissions				
Switching	1,050	1,040	0.03	0.1
Line Haul	36,272	35,918	0.9	2.9
Off-Port Subtotal	37,322	36,958	1.0	3.0
Total	55,111	54,574	1.4	4.4

The distribution of emissions is presented graphically in Figure 5.3. Approximately 65% of the rail locomotive emissions are attributed to off-port emissions and 35% to on-port emissions.

Figure 5.3: 2013 Port-Related Locomotive Operations Estimated Emissions, %



SECTION 6 HEAVY-DUTY VEHICLES

This section presents emissions estimates for the heavy-duty vehicles (HDV) source category, including source description (6.1), geographical delineation (6.2), data and information acquisition (6.3), operational profiles (6.4), the emissions estimation methodology (6.5), and the emission estimates (6.6).

6.1 Source Description

Heavy-duty vehicles, or trucks, are used extensively to move cargo, particularly containerized cargo, to and from the marine terminals that serve as the bridge between land and sea transportation. Trucks deliver cargo to both local and national destinations, and they also transfer containers between terminals and off-port railcar loading facilities, an activity known as drayage. In the course of their daily operations, trucks are driven onto and through the terminals, where they deliver and/or pick up cargo. They are also driven on the public roads within the Port boundaries, and on the public roads outside the Port.

While most of the trucks that service the Port's terminals are diesel-fueled vehicles, alternative fuel trucks, primarily those fueled by liquefied natural gas (LNG), made approximately 9.4% of the terminal calls in 2013, according to the Port's Clean Trucks Program (CTP) activity records and the Port Drayage Truck Registry (PDTR). Vehicles using fuel other than diesel fuel do not emit diesel particulate matter, so the diesel particulate emission estimates presented in this inventory have been adjusted to take the alternative-fueled trucks into account.

The most common configuration of HDV is the articulated tractor-trailer (truck and semi-trailer) having five axles, including the trailer axles. The most common type of trailer in the study area is the container trailer, built to accommodate standard-sized cargo containers. Additional trailer types include tankers, boxes, and flatbeds. A tractor traveling without an attached trailer is called a "bobtail." A tractor pulling an unloaded container trailer chassis is known simply as a "chassis." These vehicles are all classified as heavy HDVs regardless of their actual weight because the classification is based on gross vehicle weight rating (GVWR), which is a rating of the vehicle's total carrying capacity. Therefore, the emission estimates do not distinguish among the different configurations. As an example of typical HDVs, Figure 6.1 shows typical container trucks operating on a terminal.

Figure 6.1: Typical Container Trucks

6.2 Geographical Domain

The two major geographical components of truck activities have been evaluated for this inventory:

- On-terminal operations, which include waiting for terminal entry, transiting the terminal to drop off and/or pick up cargo, and departing the terminals.
- On-road operations, consisting of travel on public roads within the SoCAB. This also includes travel on public roads within the Port boundaries and those of the adjacent POLA.

The geographical domain for trucks is discussed in more detail in section 1.2.3 and below in 6.4.2.

6.3 Data and Information Acquisition

For on-terminal truck activity, the Port collected information regarding on-terminal truck activity during in-person and/or telephone interviews with terminal personnel. This information includes terminal gate operating schedules, on-terminal speeds, time and distance traveled on terminal while dropping off and/or picking up loads, and time spent idling at the entry and exit gates. Most terminals were able to provide estimates of these activity parameters, although few keep detailed records of information such as gate wait times and on-terminal turn-around time. However, the reported values appear to be reasonable and have been used in estimating on-terminal emissions, except where noted otherwise.

The Port retained Cambridge Systematics, Inc. to develop estimates of truck activity on the public roads inside and outside the Port using trip generation and travel demand models that have been developed to estimate the volumes (number of trucks) and average speeds on roadway segments between defined intersections. Output from the trip generation model (number of truck trips) is also used as a component of the on-terminal emission estimates.

6.4 Operational Profiles

Operational profiles were developed for on-terminal truck activity using data and information collected from terminal operators. These profiles are summarized in section 6.4.1. The on-road truck activity profiles were developed using trip generation and travel demand models summarized in section 6.4.2.

6.4.1 On-Terminal Truck Activity

Table 6.1 shows the range and average of reported operating characteristics of on-terminal truck activities at Port container terminals, while Table 6.2 shows the same summary data for non-container terminals and facilities.

Table 6.1: 2013 Summary of Reported Container Terminal Operating Characteristics

	Speed (mph)	Distance (miles)	Gate In (hours)	Unload/Load (hours)	Gate Out (hours)
Maximum	15	1.5	0.08	0.50	0.08
Minimum	5	0.5	0.03	0.29	0.00
Average	7	0.8	0.06	0.39	0.03

Table 6.2: 2013 Summary of Reported Non-Container Facility Operating Characteristics

	Speed (mph)	Distance (miles)	Gate In (hours)	Unload/Load (hours)	Gate Out (hours)
Maximum	10	0.5	0.08	0.50	0.08
Minimum	5	0.0	0.00	0.00	0.00
Average	6	0.2	0.01	0.09	0.01

The total numbers of truck calls in 2013 were 3,417,908 associated with container terminals and 160,980 associated with non-container facilities. The total number of truck calls associated with container terminals is based on the trip generation model described above, while non-container terminal truck calls were obtained from the terminal operators.

Table 6.3 provides the on-terminal operating parameters; listing total estimated vehicle miles traveled (VMT) and hours of idling on-terminal and waiting at entry gates.

Table 6.3: 2013 Estimated On-Terminal VMT and Idling Hours by Terminal

Terminal Type	Total Miles Traveled	Total Hours Idling (all trips)
Container	937,381	434,945
Container	497,922	368,831
Container	377,733	108,283
Container	305,968	293,729
Container	238,169	290,566
Container	202,916	170,449
Auto	3,275	5,629
Break Bulk	4,652	3,907
Break Bulk	2,065	661
Break Bulk	1,611	322
Break Bulk	1,500	0
Break Bulk	31	0
Dry Bulk	12,447	655
Dry Bulk	50	550
Liquid Bulk	5,500	4,400
Liquid Bulk	3,000	360
Liquid Bulk	1,350	0
Total	**2,595,567**	**1,683,287**

6.4.2 On-Road Truck Activity

The trip generation model is derived from a computer model originally designed to forecast truck volumes for the *2001 Port Transportation Study*.[49] The model has recently been updated to more closely reflect current conditions and incorporates each container terminal's average daily container throughput in 2013.

The results of the trip generation model were used as input to a regional travel demand model used for transportation planning by the Southern California Association of Governments (SCAG), the federally designated metropolitan planning organization for the SoCAB area. The terminal-specific truck travel information from the trip generation model, as well as the results of an origin/destination survey of approximately 3,300 Port-area truck drivers, were incorporated into the Port-area travel demand model to predict truck travel patterns and estimate the number of trucks traveling over roadways in the region. The model estimates the movements of Port-related trucks on their way from the Port until they make their first stop, whether for delivery of a container to a customer, a transloading facility, or an off-port rail yard, or when the trucks reaches the boundary of the SoCAB. Transloading is the process of unloading freight from its overseas shipping container and re-packing it for shipment to its destination over land.

[49] POLB, *Ports of Long Beach/Los Angeles Transportation Study*, Meyer, Mohaddes Associates. June, 2001 *http://www.polb.com/civica/filebank/blobdload.asp?BlobID=7969*

Figure 6.2 shows the roadways in and around the Port that trucks use in daily operations.

Figure 6.2: Port and Near-Port Roadways

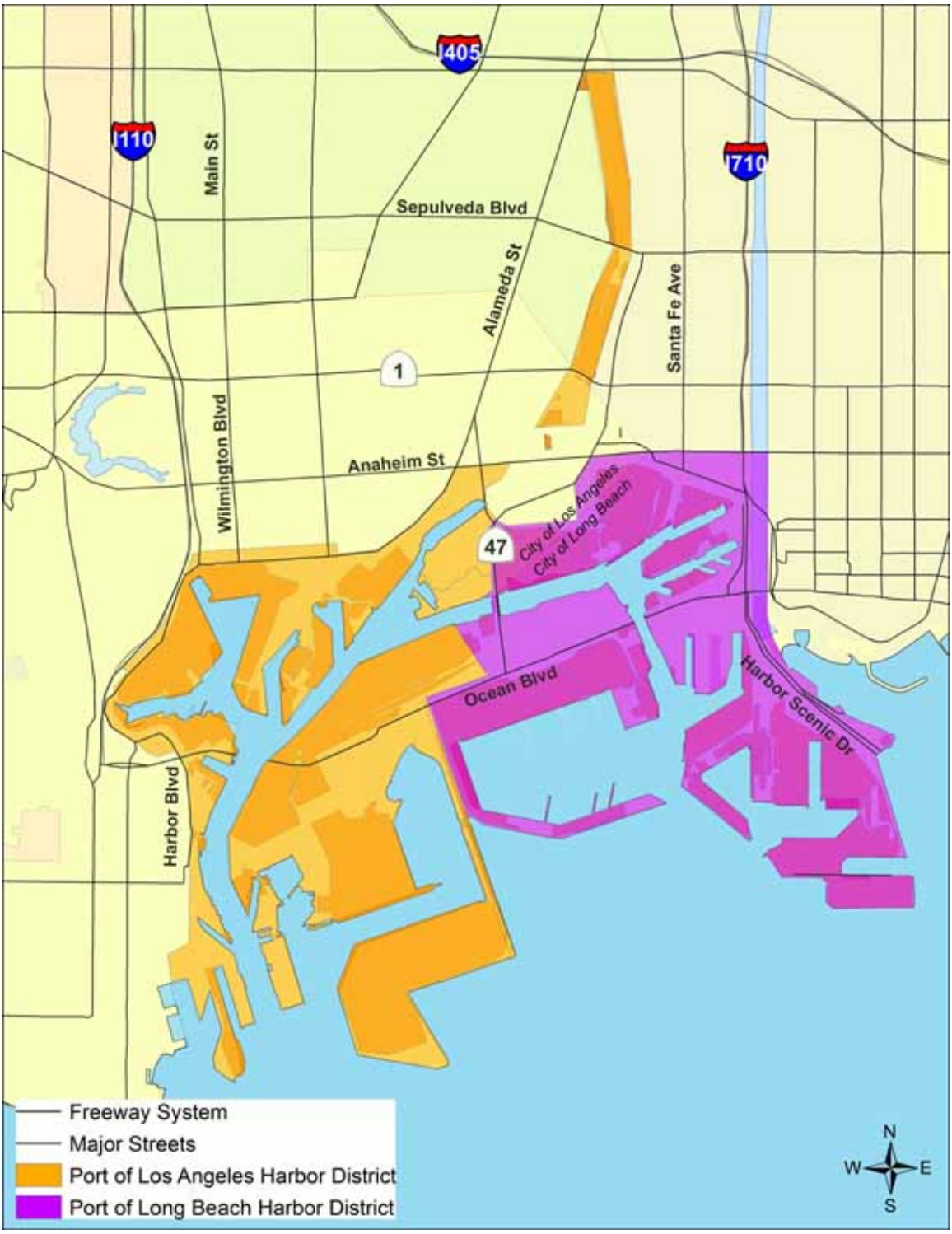


Figure 6.3 provides a regional map of the major area roadways. The daily traffic estimates are based on average weekday activity during an average month over these roads and on the regional network of smaller, local roads. The daily activities have been annualized for the emission estimates presented in this inventory on the basis of 300 days of terminal operation per year.

Figure 6.3: Regional Map

The travel demand model produces estimates of the number of trucks and their average speed in each direction over defined roadway segments, along with the length of each roadway segment. A brief example illustrating the data is provided in Table 6.4. The number of trucks and distances traveled are multiplied for each segment and summed to produce estimates of vehicle miles of travel. In addition, a VMT-weighted average speed was calculated taking into account how many miles were driven at each speed; these VMT and speed estimates were used with the speed-specific EMFAC emission factors (discussed in section 6.5) to estimate on-road driving emissions.

Table 6.4: On-road HDV Activity Modeling Results – Example

Distance (miles)	Volume Direction 1 (# trucks)	Volume Direction 2 (# trucks)	Speed Direction 1 (mph)	Speed Direction 2 (mph)
0.71	4	2	50	48
0.12	19	12	33	32
0.36	1	3	35	35
0.01	4	5	40	40
0.55	1	2	62	60
1.87	1	3	62	60
0.45	12	9	47	46
0.26	12	10	26	25

6.5 Emissions Estimation Methodology

The general equation for estimating the emissions inventory for a fleet of on-road vehicles can be expressed as:

Equation 6.1

$$\boldsymbol{E = Pop \times Act \times BER \times CorF}$$

Where:

E = Emissions (e.g. tons/year)
Pop = Population (number of vehicles of a particular model year in the fleet)
Act = Activity (average number of miles driven per truck, hours of idle operation)
BER = Basic Emission Rate (amount of pollutants emitted per unit of activity for vehicles of that model year), g/mile
CorF = Correction Factor (adjustment to BER for specific assumptions of activity and/or atmospheric conditions), dimensionless

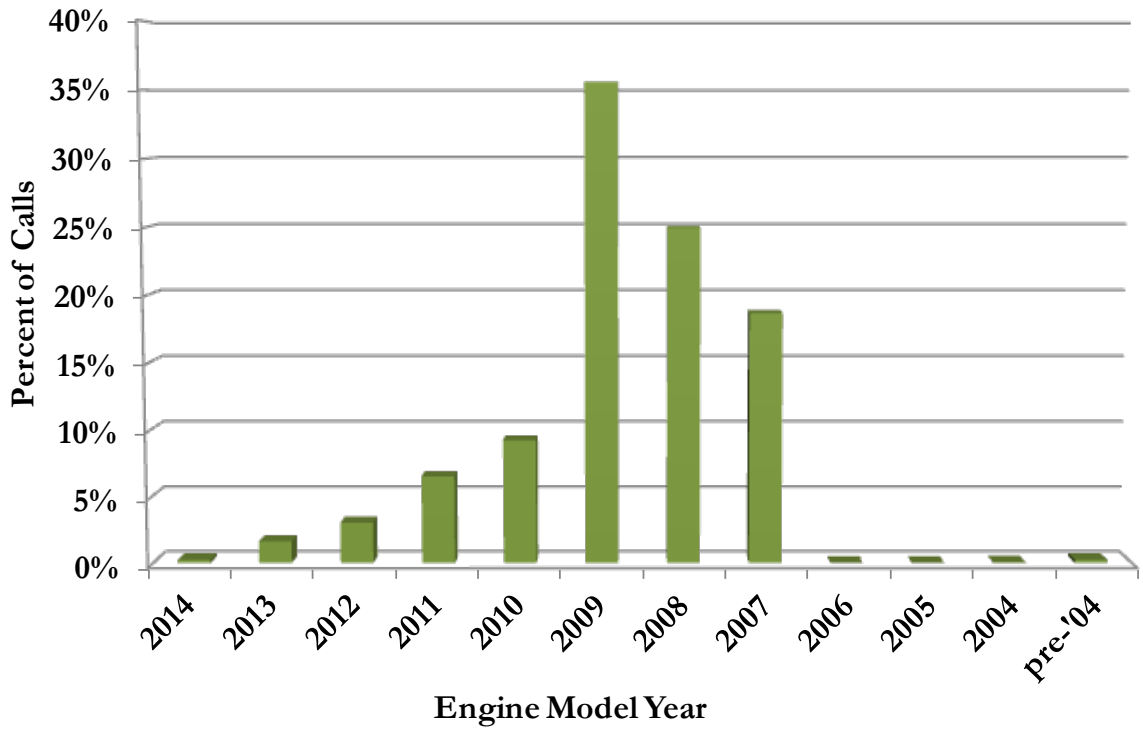
The emissions from all truck model years in the fleet are summed to complete the emission estimates. In practice, the fleet estimates are prepared by combining the base emission rates and correction factors for all model years in such a way as to develop a single set of emission factors that represent the fleet's distribution of model years. Population and activity are also combined to estimate total fleet activity, and the activity and emission factors are combined to estimate fleet emissions.

6.5.1 Model Year Distribution

Because vehicle emissions vary according to the vehicle's model year and age, the activity level of trucks within each model year is an important part of developing emission estimates. The 2013 model year distribution for the current emissions inventory is based on call data originating from radio frequency identification (RFID) data, which tracked over 5.5 million truck calls made to the Port of Long Beach and Port of Los Angeles in 2013, as well as engine model year data drawn from the Port Drayage Truck Registry (PDTR). The PDTR contains model year information on all registered drayage trucks serving the Port and the fuel type used by each truck, from which an adjustment factor was developed for non-diesel fueled vehicles. The RFID data provided the number of calls made by each engine model year.

The distribution of the truck fleet's engine model year by calls, used to develop the composite emission factors, is presented in Figure 6.4. The call weighted average engine age of the Port-related fleet in 2013 was approximately 4 years, older than the 3-year average in 2012 because there was very little turnover in the almost-new fleet.

Figure 6.4: 2013 Engine Model Year Distribution of the Heavy-Duty Truck Fleet



6.5.2 The EMFAC Model

The EMFAC model was developed by CARB to calculate the fleet emissions of various vehicle classes in the California fleet. The output from the most recent version of the model released in 2011, EMFAC2011, was used to estimate the emissions from trucks that called on the Port in 2013.

CARB provides access through their website to EMFAC2011 databases that provide emission rates in grams per mile by speed and by model year for various subcategories of heavy-duty vehicles including drayage trucks.[50] This data, coupled with Port-specific engine model year distribution and vehicle miles traveled by speed are used to calculate emissions from Port-related heavy-duty trucks in tons per year.

6.5.3 Overview of the EMFAC2011 Emissions Calculation Methodology

EMFAC2011 models the basic emission rate in units of grams per mile as a constant value over time with a "zero mile rate" representing the emissions of the vehicle when it is new or like-new assuming that the truck is well maintained and un-tampered, plus a deterioration rate representing the gradual increase in the emission rate over time as the engine accumulates mileage.

Equation 6.2

$$\boldsymbol{BER = ZMR + (DR \times CM\,/10{,}000)}$$

Where:

BER = Basic Emission Rate (amount of pollutants emitted per unit of activity for vehicles of that model year), g/mile

ZMR = Zero Mile Rate (emissions of the vehicle when new or like-new), g/mile

DR = Deterioration Rate (slope representing the gradual increase in the emission rate over time as a functions of use), g/mi/10,000 miles

CM = Cumulative Mileage (total miles on the vehicle since new), miles

Emission rates for each engine model year and speed that are obtained from EMFAC2011 reflect the correction factors included in equation 6.1 to reflect vehicle specific activity such as speed, type and quality of fuel burned, and specific ambient conditions such as temperature and relative humidity.

CARB has published idle emission factors expressed in grams per hour (g/hr) to estimate idle emissions associated with drayage operations. The idle emission factors are multiplied by the estimated hours of idle operation to derive the emission estimates. CARB has developed "low idle" and "high idle" emission rates to represent emissions from different types of truck idling. The low idle rates are "indicative of a truck in queue to either pick up or drop off a shipment," whereas the high idle rates "reflect activity associated with truck stops, rest areas, and distribution centers" rather

[50] CARB, *http://www.arb.ca.gov/msei/modeling.htm#emfac2011_web_based_data.*

than normal port operations.[51] The low idle emission factors are presented in Table 6.5.[52] The idling emissions are likely to be somewhat over-estimated because the idling estimates are based on the entire time that trucks are on terminal (except for driving time), which does not account for times that trucks are turned off while on terminal. No data source has been identified that would provide a reliable estimate of the average percentage of time the trucks' engines are turned off while on terminal.

Table 6.5: Idle Emission Rates (g/hr)

Model Years	HC	CO	NO_x	PM	CO_2
Pre-1987	18.648	28.4	42.501	3.4272	4,271
1987-90	10.944	23.4	65.286	1.7136	4,507
1991-93	8.712	21.5	72.912	1.2816	4,610
1994-97	6.9696	19.8	79.329	0.9576	4,713
1998-02	5.2272	17.8	85.653	0.6624	4,846
2003-06	4.2984	16.6	88.815	0.5184	4,934
2007-09	4.2984	16.6	27.9	0.0576	4,934
2010+	4.2984	16.6	27.9	0.0576	4,934

6.5.4 Speed-Specific Emission Factors

Composite model year and speed specific gram-per-mile emission rates reflect the distribution of truck calls by engine model year within the fleet of trucks calling at Port terminals, with a single emission factor for each 5-mile-per-hour speed increment representing the distribution of model years using the call-weighted model year distribution discussed in the previous subsection. A single set of pollutant specific gram-per-hour idle emission rates has also been derived using the distribution of truck calls by engine model year.

Because the EMFAC model does not produce emission factors for N_2O or speed-specific emission factors for SO_x, emission factors for these pollutants were developed using a mass balance approach for SO_x and a gram-per-gallon emission factor from CARB for N_2O.

The following equation was used to derive the SO_x emission factor:

Equation 6.3

$$\boldsymbol{SOx\ emissions\ (g/mile)} = \frac{(\mathbf{15}\ \boldsymbol{g\ S}/\mathbf{1{,}000{,}000}\ \boldsymbol{g\ fuel}) \times (\mathbf{3{,}220}\ \boldsymbol{g/gallon}) \times (\mathbf{2}\ \boldsymbol{g\ SOx\ /g\ S})}{(\mathbf{5.64}\ \boldsymbol{miles/gallon})}$$

[51] CARB, *http://www.arb.ca.gov/msei/onroad/latest_revisions.htm#hhddt_idle.*

[52] CARB, *www.arb.ca.gov/msei/emfac2011-documentation-final.pdf for CO_2 and NO_x* (Table 11-6); *www.arb.ca.gov/msei/onroad/techmemo/revised_hhddt_emission_factors_and_speed_corr_factors.pdf for the remaining pollutants* (Table 11); and *www.arb.ca.gov/msei/onroad/techmemo/onroad_emissions_invntry_fuel_corr_factors.pdf for fuel correction factors* (Table 9).

The emission calculations are based on the use of 15 ppm ULSD diesel fuel. The weight of a gallon of diesel fuel is assumed to be 7.1 pounds or 3,220 grams (7.1 lbs x 453.59 g/lb). Based on the EMFAC2011 model, the 2013 fleet average fuel economy of the heavy-heavy duty diesel fleet was calculated to be 5.80 miles per gallon. The N_2O emission factor was calculated using the following equation:

Equation 6.4

$$\boldsymbol{N_2O\ emissions\ (g/mile)} = \frac{(\mathbf{0.3316}\ \boldsymbol{g\ N_2O/gallon})}{(\mathbf{5.80}\ \boldsymbol{miles/gallon})}$$

Idling emission rates of SO_2 and N_2O have been based on an average fuel consumption rate of 0.48 gallons of diesel per hour during idling derived from an analysis of the idling CO_2 emission factor established by CARB).

Tables 6.6 and 6.7 summarize the speed-specific emission factors used to estimate emissions. The emission factors were multiplied by the on-road and on-terminal VMT and on-terminal idling hours to develop the overall on-road and on-terminal emission estimates.

Table 6.6: Speed-Specific Composite Emission Factors

Speed Range (mph)	PM_{10}	$PM_{2.5}$	DPM	NO_x	SO_x	CO	HC	Units
0 (Idle)	0.0595	0.0547	0.0541	28.0441	0.0385	16.6047	4.3025	g/hr
1 - 5	0.0917	0.0844	0.0834	18.8977	0.0167	7.9843	3.1759	g/mi
6 - 10	0.082	0.0754	0.0746	14.1912	0.0167	4.9809	1.8477	g/mi
11 - 15	0.0731	0.0673	0.0665	10.6692	0.0167	2.8955	0.9389	g/mi
16 - 20	0.0644	0.0592	0.0586	8.0614	0.0167	1.5741	0.4033	g/mi
21 - 25	0.0612	0.0563	0.0557	7.2318	0.0167	1.4838	0.3521	g/mi
26 - 30	0.0605	0.0557	0.0551	6.526	0.0167	1.42	0.3068	g/mi
31 - 35	0.0622	0.0572	0.0566	5.9427	0.0167	1.3828	0.2675	g/mi
36 - 40	0.0665	0.0612	0.0605	5.4815	0.0167	1.3723	0.234	g/mi
41 - 45	0.0734	0.0675	0.0668	5.1431	0.0167	1.3884	0.2065	g/mi
46 - 50	0.0827	0.0761	0.0753	4.9273	0.0167	1.431	0.1849	g/mi
51 - 55	0.0945	0.0869	0.086	4.8352	0.0167	1.5004	0.1693	g/mi
56 - 60	0.1089	0.1002	0.0991	4.8643	0.0167	1.5963	0.1595	g/mi
61 - 65	0.1258	0.1157	0.1145	5.0183	0.0167	1.7188	0.1557	g/mi
66 - 70	0.1452	0.1336	0.1321	5.301	0.0167	1.868	0.1579	g/mi

Table 6.7: Speed-Specific GHG Emission Factors

Speed Range (mph)	CO_2	N_2O	CH_4	Units
0 (Idle)	4,934	0.1592	0.2531	g/hr
1 - 5	4,074	0.0572	0.1868	g/mi
6 - 10	3,365	0.0572	0.1087	g/mi
11 - 15	2,763	0.0572	0.0552	g/mi
16 - 20	2,180	0.0572	0.0237	g/mi
21 - 25	2,034	0.0572	0.0207	g/mi
26 - 30	1,909	0.0572	0.0180	g/mi
31 - 35	1,806	0.0572	0.0157	g/mi
36 - 40	1,723	0.0572	0.0138	g/mi
41 - 45	1,662	0.0572	0.0121	g/mi
46 - 50	1,622	0.0572	0.0109	g/mi
51 - 55	1,604	0.0572	0.0100	g/mi
56 - 60	1,606	0.0572	0.0094	g/mi
61 - 65	1,630	0.0572	0.0092	g/mi
66 - 70	1,675	0.0572	0.0093	g/mi

6.5.5 Improvements to Methodology from Previous Years

The following improvements to the data and methodology underlying the emission calculations were made in this inventory compared to the previous EI. Refer to Section 8 for a comparison of 2013 emissions with 2005 emissions.

- The trip generation model and the travel demand model that estimate the number of truck trips and vehicle activity on public roads were enhanced and updated with current data related to terminal operations and on-road travel.

The improvements noted above do not represent a change of methodology, but an improvement in estimating methods that better reflect current port and terminal operations.

6.6 Emission Estimates

Tables 6.8 and 6.9 summarize the vehicle miles traveled and emissions associated with overall HDV activity.

Table 6.8: 2013 HDV Emissions, tons

Activity Location	Vehicle Miles Traveled	PM_{10}	$PM_{2.5}$	DPM	NO_x	SO_x	CO	HC
On-Terminal	2,595,567	0.4	0.3	0.3	102.6	0.0	51.5	16.1
On-Road	169,710,761	15.1	13.9	13.7	942.4	3.2	266.9	36.2
Total	**172,306,328**	**15.5**	**14.2**	**14.0**	**1,045.0**	**3.2**	**318.4**	**52.3**

Table 6.9: 2013 HDV GHG Emissions, metric tons

Activity Location	Vehicle Miles Traveled	CO_2e	CO_2	N_2O	CH_4
On-Terminal	2,595,567	18,559	18,416	0.4	0.9
On-Road	169,710,761	282,313	279,266	9.7	1.9
Total	**172,306,328**	**300,872**	**297,682**	**10.1**	**2.8**

Tables 6.10 through 6.13 show the vehicle miles traveled and emissions associated with container terminal activity separately from emissions associated with other Port terminals and facilities.

Table 6.10: 2013 HDV Emissions Associated with Container Terminals, tons

Activity Location	Vehicle Miles Traveled	PM_{10}	$PM_{2.5}$	DPM	NO_x	SO_x	CO	HC
On-Terminal	2,560,088	0.4	0.3	0.3	101.4	0.0	50.9	15.9
On-Road	162,092,418	14.4	13.3	13.1	900.1	3.1	254.9	34.6
Total	**164,652,505**	**14.8**	**13.6**	**13.4**	**1,001.5**	**3.1**	**305.9**	**50.6**

Table 6.11: 2013 HDV GHG Emissions Associated with Container Terminals, metric tons

Activity Location	Vehicle Miles Traveled	CO_2e	CO_2	N_2O	CH_4
On-Terminal	2,560,088	18,339	18,196	0.4	0.9
On-Road	162,092,418	269,651	266,730	9.3	1.8
Total	**164,652,505**	**287,990**	**284,926**	**9.7**	**2.7**

Table 6.12: 2013 HDV Emissions Associated with Other Port Terminals, tons

Activity Location	Vehicle Miles Traveled	PM_{10}	$PM_{2.5}$	DPM	NO_x	SO_x	CO	HC
On-Terminal	35,479	0.0	0.0	0.0	1.2	0.0	0.6	0.2
On-Road	7,618,344	0.7	0.6	0.6	42.3	0.1	12.0	1.6
Total	**7,653,823**	**0.7**	**0.6**	**0.6**	**43.5**	**0.1**	**12.6**	**1.8**

Table 6.13: 2013 HDV GHG Emissions Associated with Other Port Terminals, metric tons

Activity Location	Vehicle Miles Traveled	CO_2e	CO_2	N_2O	CH_4
On-Terminal	35,479	220	220	0.0	0.0
On-Road	7,618,344	12,662	12,536	0.4	0.1
Total	**7,653,823**	**12,882**	**12,756**	**0.4**	**0.1**

SECTION 7 SUMMARY OF 2013 EMISSION RESULTS

The emission results for the Port of Long Beach 2013 Air Emissions Inventory are presented in this section. Table 7.1 summarizes the 2013 total port-related emissions in the South Coast Air Basin by category in tons per year.

Table 7.1: 2013 Port-related Emissions by Category, tons

Category	PM_{10}	$PM_{2.5}$	DPM	NO_x	SO_x	CO	HC
Ocean going vessels	126	114	99	4,258	644	462	219
Harbor craft	27	25	27	667	1	313	56
Cargo handling equipment	11	10	10	546	1	617	36
Locomotives	25	23	25	695	1	156	39
Heavy-duty vehicles	16	14	14	1,045	3	318	52
Total	**205**	**186**	**175**	**7,211**	**650**	**1,866**	**402**

Table 7.2 summarizes the 2013 total port-related GHG emissions including the CO_2e in metric tons per year.

Table 7.2: 2013 Port-related GHG Emissions by Category, metric tons

Category	CO_2e	CO_2	N_2O	CH_4
Ocean going vessels	274,314	269,111	16	4
Harbor craft	40,743	40,164	2	1
Cargo handling equipment	103,292	102,516	2	4
Locomotives	55,111	54,574	1	4
Heavy-duty vehicles	300,872	297,682	10	3
Total	**774,332**	**764,047**	**31**	**16**

Figure 7.1 shows the distribution of the 2013 total port-related emissions for each pollutant and category. OGV (57%) and harbor craft (15%) contribute the highest percentage of DPM emissions among the port-related sources. OGV (59%) and heavy-duty trucks (14%) account for the majority of NO_x emissions. Over 99% of the SO_x emissions are attributed to ocean-going vessels. CHE (33%) and OGV (25%) account for the majority of CO emissions. OGV (55%) and harbor craft (14%) account for the majority of hydrocarbon emissions. OGV (35%) and heavy-duty trucks (39%) account for the majority of CO_2 emissions.

Figure 7.1: 2013 Port-related Emissions by Category, %

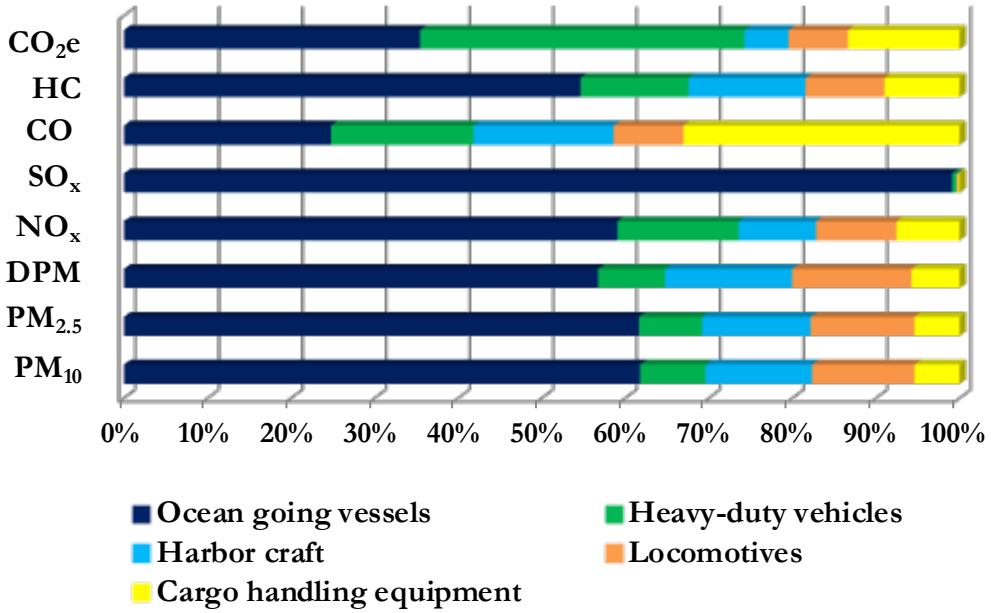


Table 7.3: 2013 Port-related Emissions Percent Contribution by Source Category

Source Category	DPM		NO_x		SO_x		CO_2e	
	tons	%	tons	%	tons	%	metric tons	%
Ocean going vessels	99	57%	4,258	59%	644	99.1%	274,314	35.4%
Harbor craft	27	15%	667	9%	1	<0.2%	40,743	5.3%
Cargo handling equipment	10	6%	546	8%	1	<0.2%	103,292	13.3%
Rail locomotives	25	14%	695	10%	1	<0.2%	55,111	7.1%
Heavy-duty vehicles	14	8%	1,045	14%	3	0.5%	300,872	38.9%
Total	**175**	**100%**	**7,211**	**100%**	**650**	**100.0%**	**774,332**	**100.0%**

Another way to view the total emissions is in relation to whether they occurred inside the Port boundary or outside the Port boundary. Tables 7.4 and 7.5 show the distribution of Port-related emissions as it relates to the port boundary. Emissions from the following sources and activities occurred within the Port boundary:

- Harbor maneuvering and hotelling emissions from ocean-going vessels
- In-harbor emissions from harbor craft
- All cargo handling equipment emissions
- On-terminal and on-port on-road emissions from heavy-duty vehicles
- On-port emissions from locomotives including switching and line haul

Emissions from the following sources and activities occurred outside the Port boundary:

- Transit emissions from ocean-going vessels between the breakwater and the SoCAB boundary.
- Emissions from harbor craft operating between the breakwater and the SoCAB boundary
- Off -port on-road emissions from heavy-duty vehicles up to the SoCAB boundary or first point of rest
- Off-port emissions from locomotives up to the SoCAB boundary or first point of rest

Table 7.4: 2013 Port-related Emissions in the SoCAB Basin and within the Port Boundary, tons

Category	Port Related Emissions	PM_{10}	$PM_{2.5}$	DPM	NO_x	SO_x	CO	HC
OGV	Inside Port boundary	81	73	55	2,372	495	235	107
	Outside Port boundary	45	41	44	1,886	149	227	112
	Total OGV emissions	**126**	**114**	**99**	**4,258**	**644**	**462**	**219**
Harbor Craft	Inside Port boundary	18	17	18	463	0	217	39
	Outside Port boundary	9	8	9	204	1	96	17
	Total Harbor Craft emissions	**27**	**25**	**27**	**667**	**1**	**313**	**56**
CHE	Inside Port boundary	11	10	10	546	1	617	36
	Outside Port boundary	0	0	0	0	0	0	0
	Total CHE emissions	**11**	**10**	**10**	**546**	**1**	**617**	**36**
Locomotives	Inside Port boundary	7	7	7	215	0	51	12
	Outside Port boundary	18	16	18	480	1	105	27
	Total Locomotive emissions	**25**	**23**	**25**	**695**	**1**	**156**	**39**
HDV	Inside Port boundary	0.4	0.3	0.3	103	0	52	16
	Outside Port boundary	15	14	14	942	3	267	36
	Total Truck emissions	**16**	**14**	**14**	**1,045**	**3**	**318**	**52**
Total	Inside Port boundary	117	108	90	3,699	496	1,172	210
	Outside Port boundary	87	79	85	3,512	154	695	192
	Total Port-related emissions	**205**	**186**	**175**	**7,211**	**650**	**1,866**	**402**

Table 7.5: 2013 Port-related GHG Emissions in the SoCAB Basin and within the Port Domain, metric tons

Category	Port Related Emissions	CO_2e	CO_2	N_2O	CH_4
OGV	Inside Port boundary	204,924	200,933	13	2
	Outside Port boundary	69,391	68,178	3	2
	Total OGV emissions	**274,314**	**269,111**	**16**	**4**
Harbor Craft	Inside Port boundary	27,764	27,371	1	1
	Outside Port boundary	12,979	12,793	1	0
	Total Harbor Craft emissions	**40,743**	**40,164**	**2**	**1**
CHE	Inside Port boundary	103,292	102,516	2	4
	Outside Port boundary	0	0	0	0
	Total CHE emissions	**103,292**	**102,516**	**2**	**4**
Locomotives	Inside Port boundary	17,789	17,617	0	1
	Outside Port boundary	37,322	36,958	1	3
	Total Locomotive emissions	**55,111**	**54,574**	**1**	**4**
HDV	Inside Port boundary	18,559	18,416	0	1
	Outside Port boundary	282,313	279,266	10	2
	Total Truck emissions	**300,872**	**297,682**	**10**	**3**
Total	Inside Port boundary	372,328	366,852	16	9
	Outside Port boundary	402,004	397,197	15	7
	Total Port-related emissions	**774,332**	**764,047**	**31**	**16**

The following figures and tables compare the Port's contribution of emissions to the total overall emissions in the SoCAB by major source category. The 2013 SoCAB emissions used for this comparison are based on the 2013 AQMP[53]. It should be noted that SoCAB PM_{10} and $PM_{2.5}$ emissions for on-road vehicles include brake and tire wear emissions whereas the Port's HDV emissions do not include brake and tire wear. Due to rounding, the percentages may not add up to 100%.

Figure 7.2: 2013 PM_{10} Emissions in the South Coast Air Basin, %

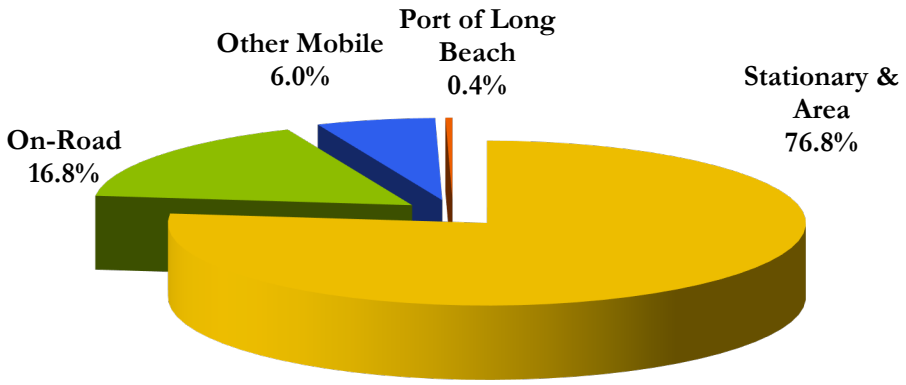
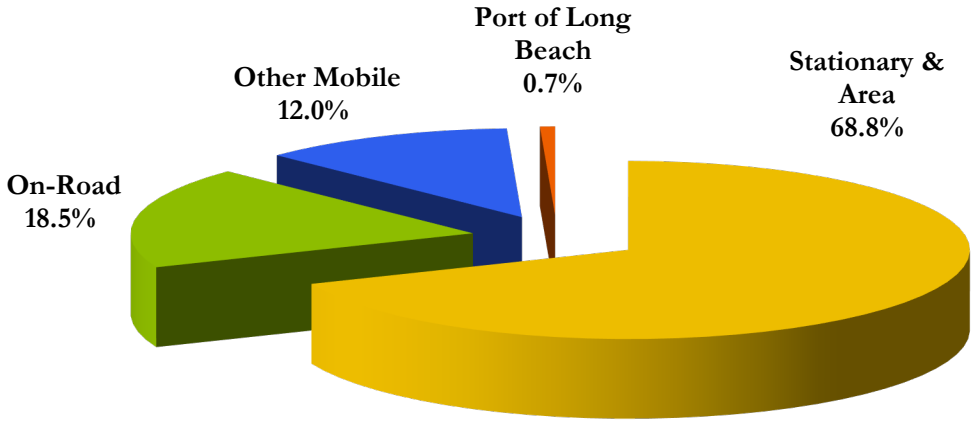


Figure 7.3: 2013 $PM_{2.5}$ Emissions in the South Coast Air Basin, %



[53] SCAQMD, *Final 2012 Air Quality Management Plan Appendix III, Base & Future Year Emissions Inventories*, February 2013.

Figure 7.4: 2013 DPM Emissions in the South Coast Air Basin, %

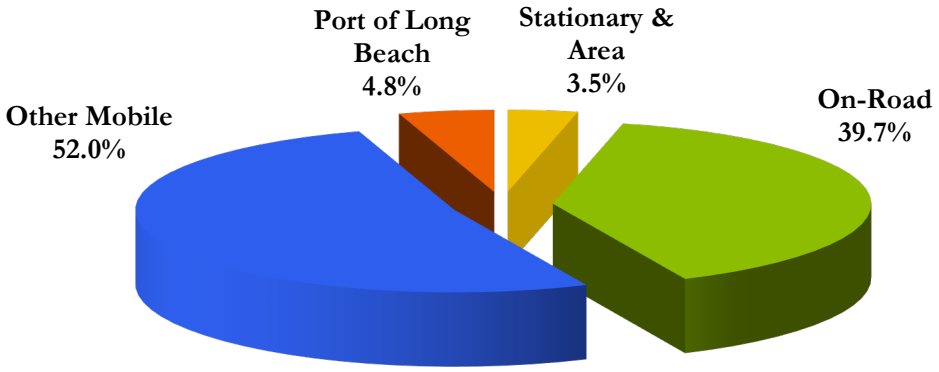


Figure 7.5: 2013 NO_x Emissions in the South Coast Air Basin, %

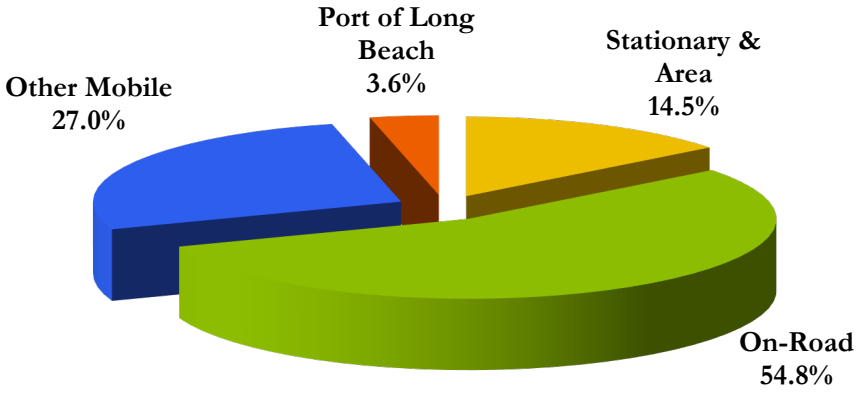


Figure 7.6: 2013 SO_x Emissions in the South Coast Air Basin, %

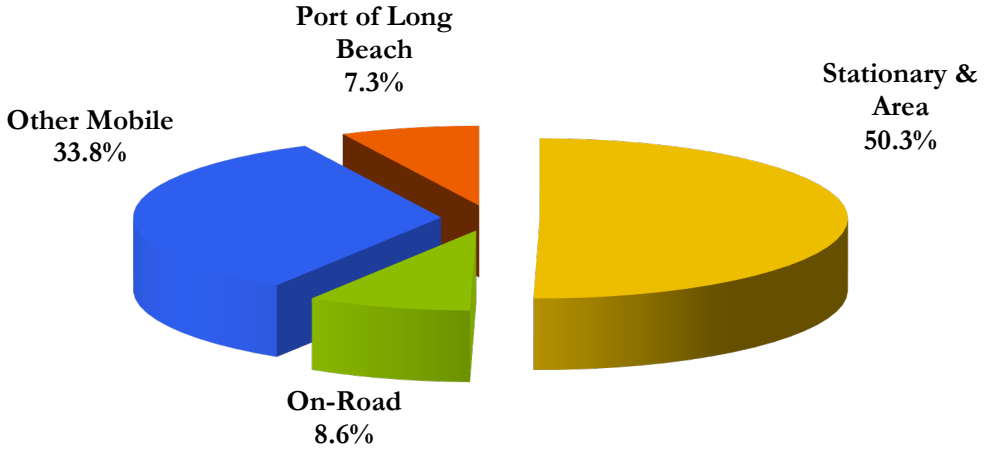


Table 7.6: 2013 PM_{10} Emissions Percentage Comparison, tons and %

Category	Subcategory	PM_{10}	Percent PM_{10} Emissions of Total		
			Category	Port	SoCAB AQMP
OGV	Auto carrier	3.4	2.7%	2%	0.01%
OGV	Bulk vessel	5.7	4.5%	3%	0.01%
OGV	Containership	56.7	44.9%	28%	0.10%
OGV	Cruise	8.5	6.7%	4%	0.01%
OGV	General cargo	1.8	1.4%	1%	0.00%
OGV	Ocean tug (ATB/ITB)	0.1	0.1%	0%	0.00%
OGV	Miscellaneous	5.0	4.0%	2%	0.01%
OGV	RoRo	0.3	0.2%	0%	0.00%
OGV	Tanker	44.7	35.4%	22%	0.08%
OGV	**Subtotal**	**126**	**100%**	**62%**	**0.22%**
Harbor Craft	Assist tug	6.4	24.1%	3%	0.01%
Harbor Craft	Crewboat	1.2	4.5%	1%	0.00%
Harbor Craft	Excursion	0.4	1.5%	0%	0.00%
Harbor Craft	Ferry	6.4	24.1%	3%	0.01%
Harbor Craft	Government	2.0	7.5%	1%	0.00%
Harbor Craft	Ocean tugboat	9.5	35.7%	5%	0.02%
Harbor Craft	Harbor tug	0.5	1.9%	0%	0.00%
Harbor Craft	Work boat	0.2	0.8%	0%	0.00%
Harbor Craft	**Subtotal**	**27**	**100%**	**13%**	**0.05%**
CHE	RTG crane	2.2	21%	1%	0.00%
CHE	Forklift	0.5	5%	0%	0.00%
CHE	Top handler, side pick	2.5	23%	1%	0.00%
CHE	Other	0.4	4%	0%	0.00%
CHE	Yard tractor	5.1	48%	2%	0.01%
CHE	**Subtotal**	**11**	**100%**	**4%**	**0.02%**
Locomotives	Switching	0.4	1.6%	0%	0.00%
Locomotives	Line haul	24.7	98.4%	12%	0.04%
Locomotives	**Subtotal**	**25**	**100%**	**12%**	**0.04%**
HDV	On-Terminal	0.4	2.6%	0%	0.00%
HDV	On-road	15.1	97.4%	7%	0.03%
HDV	**Subtotal**	**16**	**100%**	**7%**	**0.03%**
Port	**Total**	**205**			**0.4%**
SoCAB AQMP	**Total**	**57,413**			

Table 7.7: 2013 $PM_{2.5}$ Emissions Percentage Comparison, tons and %

Category	Subcategory	$PM_{2.5}$	Percent $PM_{2.5}$ Emissions of Total		
			Category	Port	SoCAB AQMP
OGV	Auto carrier	3.1	2.7%	2%	0.01%
OGV	Bulk vessel	5.2	4.5%	3%	0.02%
OGV	Containership	51.8	45.3%	28%	0.20%
OGV	Cruise	7.7	6.7%	4%	0.03%
OGV	General cargo	1.6	1.4%	1%	0.01%
OGV	Ocean tug (ATB/ITB)	0.1	0.1%	0%	0.00%
OGV	Miscellaneous	4.6	4.0%	2%	0.02%
OGV	RoRo	0.3	0.3%	0%	0.00%
OGV	Tanker	40.0	35.0%	22%	0.15%
OGV	**Subtotal**	**114**	**100%**	**62%**	**0.44%**
Harbor Craft	Assist tug	5.9	24.0%	3%	0.02%
Harbor Craft	Crewboat	1.1	4.5%	1%	0.00%
Harbor Craft	Excursion	0.4	1.6%	0%	0.00%
Harbor Craft	Ferry	5.9	24.0%	3%	0.02%
Harbor Craft	Government	1.9	7.7%	1%	0.01%
Harbor Craft	Ocean tugboat	8.8	35.8%	5%	0.03%
Harbor Craft	Harbor tug	0.4	1.6%	0%	0.00%
Harbor Craft	Work boat	0.2	0.8%	0%	0.00%
Harbor Craft	**Subtotal**	**25**	**100%**	**13%**	**0.09%**
CHE	RTG crane	2.0	20%	1%	0.01%
CHE	Forklift	0.5	5%	0%	0.00%
CHE	Top handler, side pick	2.4	24%	1%	0.01%
CHE	Other	0.4	4%	0%	0.00%
CHE	Yard tractor	4.6	46%	2%	0.02%
CHE	**Subtotal**	**10**	**100%**	**4%**	**0.04%**
Locomotives	Switching	0.3	1.3%	0%	0.00%
Locomotives	Line haul	22.5	98.7%	12%	0.09%
Locomotives	**Subtotal**	**23**	**100%**	**12%**	**0.09%**
HDV	On-Terminal	0.3	2.1%	0%	0.00%
HDV	On-road	13.9	97.9%	7%	0.05%
HDV	**Subtotal**	**14**	**100%**	**7%**	**0.05%**
Port	**Total**	**186**			**0.7%**
SoCAB AQMP	**Total**	**26,103**			

Table 7.8: 2013 DPM Emissions Percentage Comparison, tons and %

Category	Subcategory	DPM	Percent DPM Emissions of Total		
			Category	Port	SoCAB AQMP
OGV	Auto carrier	3.1	3.1%	2%	0.09%
OGV	Bulk vessel	5.0	5.0%	3%	0.14%
OGV	Containership	50.4	50.7%	29%	1.40%
OGV	Cruise	8.5	8.6%	5%	0.24%
OGV	General cargo	1.7	1.7%	1%	0.05%
OGV	Ocean tug (ATB/ITB)	0.1	0.1%	0%	0.00%
OGV	Miscellaneous	4.8	4.8%	3%	0.13%
OGV	RoRo	0.0	0.0%	0%	0.00%
OGV	Tanker	25.8	26.0%	15%	0.72%
OGV	**Subtotal**	**99**	**100%**	**58%**	**2.77%**
Harbor Craft	Assist tug	6.4	24.1%	4%	0.18%
Harbor Craft	Crewboat	1.2	4.5%	1%	0.03%
Harbor Craft	Excursion	0.4	1.5%	0%	0.01%
Harbor Craft	Ferry	6.4	24.1%	4%	0.18%
Harbor Craft	Government	2.0	7.5%	1%	0.06%
Harbor Craft	Ocean tugboat	9.5	35.7%	5%	0.26%
Harbor Craft	Harbor tug	0.5	1.9%	0%	0.01%
Harbor Craft	Work boat	0.2	0.8%	0%	0.01%
Harbor Craft	**Subtotal**	**27**	**100%**	**15%**	**0.74%**
CHE	RTG crane	2.2	22%	1%	0.06%
CHE	Forklift	0.5	5%	0%	0.01%
CHE	Top handler, side pick	2.6	26%	1%	0.07%
CHE	Other	0.4	4%	0%	0.01%
CHE	Yard tractor	4.2	42%	2%	0.12%
CHE	**Subtotal**	**10**	**100%**	**4%**	**0.27%**
Locomotives	Switching	0.4	1.4%	0%	0.01%
Locomotives	Line haul	24.7	98.6%	14%	0.69%
Locomotives	**Subtotal**	**25**	**100%**	**14%**	**0.70%**
HDV	On-Terminal	0.3	2.1%	0%	0.01%
HDV	On-road	13.7	97.9%	8%	0.38%
HDV	**Subtotal**	**14**	**100%**	**8%**	**0.39%**
Port	**Total**	**175**			**4.9%**
SoCAB AQMP	**Total**	**3,604**			

Table 7.9: 2013 NO_x Emissions Percentage Comparison, tons and %

Category	Subcategory	NO_x	Percent NO_x Emissions of Total		
			Category	Port	SoCAB AQMP
OGV	Auto carrier	135.3	3.2%	2%	0.07%
OGV	Bulk vessel	222.9	5.2%	3%	0.11%
OGV	Containership	2,069.0	48.6%	29%	1.03%
OGV	Cruise	360.1	8.5%	5%	0.18%
OGV	General cargo	71.2	1.7%	1%	0.04%
OGV	Ocean tug (ATB/ITB)	2.3	0.1%	0%	0.00%
OGV	Miscellaneous	212.9	5.0%	3%	0.11%
OGV	RoRo	4.4	0.1%	0%	0.00%
OGV	Tanker	1,180.2	27.7%	16%	0.59%
OGV	**Subtotal**	**4,258**	**100%**	**59%**	**2.13%**
Harbor Craft	Assist tug	187.0	28.0%	3%	0.09%
Harbor Craft	Crewboat	36.1	5.4%	1%	0.02%
Harbor Craft	Excursion	12.3	1.8%	0%	0.01%
Harbor Craft	Ferry	157.1	23.6%	2%	0.08%
Harbor Craft	Government	41.6	6.2%	1%	0.02%
Harbor Craft	Ocean tugboat	209.9	31.5%	3%	0.10%
Harbor Craft	Harbor tug	13.8	2.1%	0%	0.01%
Harbor Craft	Work boat	9.0	1.3%	0%	0.00%
Harbor Craft	**Subtotal**	**667**	**100%**	**9%**	**0.33%**
CHE	RTG crane	100.2	18%	1%	0.05%
CHE	Forklift	17.5	3%	0%	0.01%
CHE	Top handler, side pick	232.0	43%	3%	0.12%
CHE	Other	19.7	4%	0%	0.01%
CHE	Yard tractor	176.2	32%	2%	0.09%
CHE	**Subtotal**	**546**	**100%**	**8%**	**0.27%**
Locomotives	Switching	30.1	4.3%	0%	0.02%
Locomotives	Line haul	665.3	95.7%	9%	0.33%
Locomotives	**Subtotal**	**695**	**100%**	**10%**	**0.35%**
HDV	On-Terminal	102.6	9.8%	1%	0.05%
HDV	On-road	942.4	90.2%	13%	0.47%
HDV	**Subtotal**	**1,045**	**100%**	**14%**	**0.52%**
Port	**Total**	**7,211**			**3.6%**
SoCAB AQMP	**Total**	**200,035**			

Table 7.10: 2013 SO_x Emissions by Category Percentage Comparison, tons and %

Category	Subcategory	SO_x	Percent SO_x Emissions of Total Category	Port	SoCAB AQMP
OGV	Auto carrier	13.7	2.1%	2%	0.15%
OGV	Bulk vessel	26.8	4.2%	4%	0.30%
OGV	Containership	224.8	34.9%	35%	2.53%
OGV	Cruise	36.1	5.6%	6%	0.41%
OGV	General cargo	8.3	1.3%	1%	0.09%
OGV	Ocean tug (ATB/ITB)	0.2	0.0%	0%	0.00%
OGV	Miscellaneous	23.1	3.6%	4%	0.26%
OGV	RoRo	3.1	0.5%	0%	0.03%
OGV	Tanker	307.7	47.8%	47%	3.46%
OGV	**Subtotal**	**644**	**100%**	**99%**	**7.24%**
Harbor Craft	Assist tug	0.15	33.1%	0%	0.00%
Harbor Craft	Crewboat	0.01	2.7%	0%	0.00%
Harbor Craft	Excursion	0.13	27.3%	0%	0.00%
Harbor Craft	Ferry	0.09	19.9%	0%	0.00%
Harbor Craft	Government	0.02	4.6%	0%	0.00%
Harbor Craft	Ocean tugboat	0.01	2.4%	0%	0.00%
Harbor Craft	Harbor tug	0.04	7.8%	0%	0.00%
Harbor Craft	Work boat	0.01	2.1%	0%	0.00%
Harbor Craft	**Subtotal**	**<1**	**100%**	**0%**	**0.01%**
CHE	RTG crane	0.1	8%	0%	0.00%
CHE	Forklift	0.0	0%	0%	0.00%
CHE	Top handler, side pick	0.4	33%	0%	0.00%
CHE	Other	0.0	0%	0%	0.00%
CHE	Yard tractor	0.7	58%	0%	0.01%
CHE	**Subtotal**	**1**	**100%**	**0%**	**0.01%**
Locomotives	Switching	0.0	0.0%	0%	0.00%
Locomotives	Line haul	1.0	100.0%	0%	0.01%
Locomotives	**Subtotal**	**1**	**100%**	**0%**	**0.01%**
HDV	On-Terminal	0.0	0.0%	0%	0.00%
HDV	On-road	3.2	100.0%	0%	0.04%
HDV	**Subtotal**	**3**	**100%**	**0%**	**0.04%**
Port	**Total**	**650**			**7.3%**
SoCAB AQMP	**Total**	**8,893**			

Table 7.11: 2013 CO_2e Emissions by Category Percentage Comparison, metric tons and %

Category	Subcategory	CO_2e Emissions	Percent Emissions of Total Category	Percent Emissions of Total Port
OGV	Auto carrier	6,393	2.3%	1%
OGV	Bulk vessel	12,494	4.6%	2%
OGV	Containership	104,866	38.2%	14%
OGV	Cruise	16,771	6.1%	2%
OGV	General cargo	3,840	1.4%	0%
OGV	Ocean tug (ATB/ITB)	112	0.0%	0%
OGV	Miscellaneous	10,704	3.9%	1%
OGV	RoRo	1,472	0.5%	0%
OGV	Tanker	117,662	42.9%	15%
OGV	**Subtotal**	**274,314**	**100%**	**35%**
Harbor Craft	Assist tug	13,482	33.1%	2%
Harbor Craft	Harbor tug	3,197	7.8%	0%
Harbor Craft	Ferry	975	2.4%	0%
Harbor Craft	Ocean tugboat	11,136	27.3%	1%
Harbor Craft	Government	1,871	4.6%	0%
Harbor Craft	Excursion	8,122	19.9%	1%
Harbor Craft	Crewboat	1,105	2.7%	0%
Harbor Craft	Work boat	855	2.1%	0%
Harbor Craft	**Subtotal**	**40,743**	**100%**	**5%**
CHE	RTG crane	10,648	10%	1%
CHE	Forklift	1,765	2%	0%
CHE	Top handler, side pick	33,537	32%	4%
CHE	Other	3,020	3%	0%
CHE	Yard tractor	54,323	53%	7%
CHE	**Subtotal**	**103,292**	**100%**	**13%**
Locomotives	Switching	4,145	7.5%	1%
Locomotives	Line haul	50,966	92.5%	7%
Locomotives	**Subtotal**	**55,111**	**100%**	**7%**
HDV	On-Terminal	18,559	6.2%	2%
HDV	On-road	282,313	93.8%	36%
HDV	**Subtotal**	**300,872**	**100%**	**39%**
Port	**Total**	**774,332**		

SECTION 8 COMPARISON OF 2013 AND 2005 FINDINGS AND EMISSION ESTIMATES

The emissions estimates for 2013 and 2005 calendar year activity are compared in this section. Each source category is highlighted in a separate subsection that compares findings for that source category and presents the emissions comparisons. If there was a methodological change in 2013 for a source category; then, the 2005 emissions were recalculated using 2005 activity with the new 2013 methodology to provide a valid basis for comparison. Due to rounding, the values may not add up to the whole number values for the percentage change or total emissions at the bottom of each table.

Table 8.1 and Figure 8.1 compare the number of vessel calls and container cargo throughput as well as the average TEUs per containership call between 2005 and 2013. There was relatively no change in TEU throughput when comparing 2013 and 2005. However, the number of overall vessel calls and containership calls at the Port decreased compared to 2005. The average numbers of TEUs per containership calls increased in 2013 by 47%, which shows improved efficiency due to bigger containership visits in 2013 compared to 2005 resulting in more TEUs being handled per vessel call.

Table 8.1: 2005-2013 Container Throughput and Vessel Call Comparison

Year	Container Throughput TEUs	All Arrivals	Containership Arrivals	Average TEUs/Call
2005	6,709,818	2,690	1,332	5,037
2013	6,730,574	1,921	911	7,388
Change (%)	**0.3%**	**-29%**	**-32%**	**47%**

Figure 8.1: 2005-2013 Container Throughput and Vessel Call Change, %

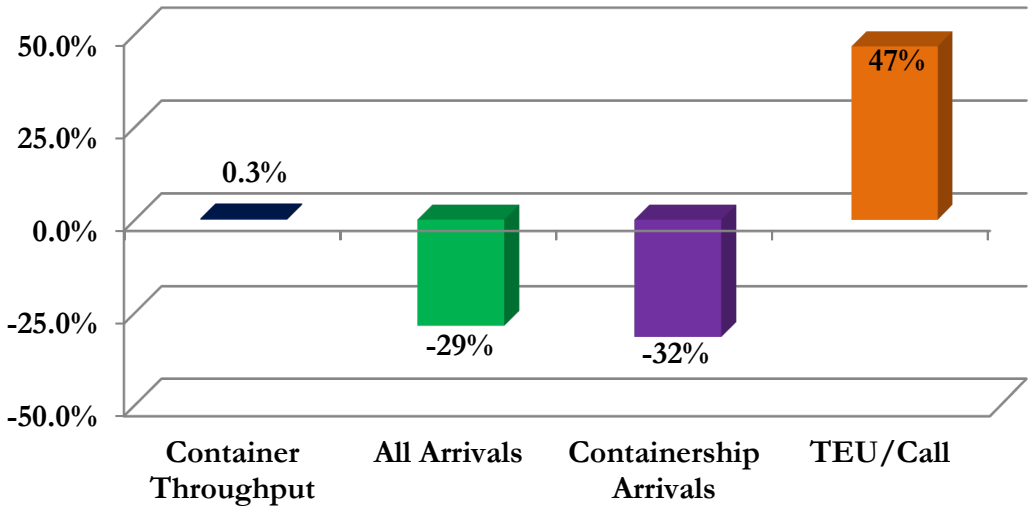


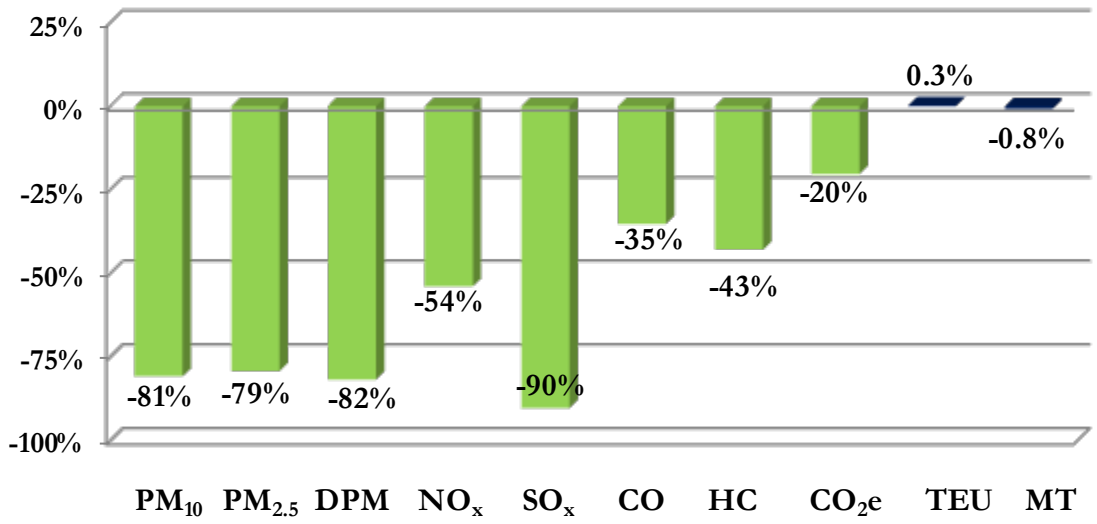
Table 8.2 and Figure 8.2 present the total net change in emissions for all source categories in 2013 as compared to 2005. Port-related emissions decreased for all pollutants ranging from 20% to 90% in 2013 when compared to 2005 due to implementation of emission reduction strategies, and improvement in the terminals' operational efficiency.

Table 8.2: 2005-2013 Port Emissions Comparison, tons and %

EI Year	PM_{10}	$PM_{2.5}$	DPM	NO_x	SO_x	CO	HC	CO_2e
2005	1,060	891	957	15,627	6,717	2,883	702	973,370
2013	205	186	175	7,211	650	1,866	402	774,332
Change	**-855**	**-705**	**-782**	**-8,416**	**-6,067**	**-1,017**	**-300**	**-199,038**
Change (%)	**-81%**	**-79%**	**-82%**	**-54%**	**-90%**	**-35%**	**-43%**	**-20%**

Figure 8.2 illustrates the 2005-2013 percent change in emissions and the percent change in throughput, including containerized cargo in TEU and total tonnage in metric tons (MT).

Figure 8.2: 2005-2013 Port Emissions Change, %



The following summarizes the comparison of 2005 and 2013 emissions by source category.

Ocean-Going Vessels
Emissions from OGV were reduced across all pollutants. These reductions are primarily attributed to the Port's vessel speed reduction program, the CARB low sulfur marine fuel regulation and shore power.

Harbor Craft
Harbor craft emissions decreased for most pollutants, with the exception of CO. The increase in CO emissions is related to the impact from the introduction of cleaner engines that do not have lower CO standards. The decrease in emissions for all other pollutants is due to newer engines and lower activity in 2013 as compared to 2005.

Cargo Handling Equipment
Cargo handling equipment emissions decreased for all pollutants, except for CO. The decrease in emissions for cargo handling equipment can be attributed to the continued replacement and retrofit of existing equipment with cleaner engines as a result of the implementation of CAAP measures and the CARB regulation for cargo handling equipment. The increase in CO emissions from cargo handling equipment is attributed to the addition of several gasoline-fuel yard tractors that have higher CO emission rates compared to conventional diesel yard tractors and due to the continued decrease in DOC retrofits that had a reduction in CO emissions.

Locomotives
Emissions from rail locomotives decreased in 2013 as compared to 2005 even though throughput for on-dock rail increased 40%. The decrease in locomotive emissions was primarily due to rail system efficiency improvements, use of cleaner fuels, and the turnover to cleaner locomotives, which occurred in part as a result of the implementation of the CARB/railroad MOU in 2010.

Heavy-Duty Vehicles
Truck emissions decreased significantly in 2013 compared with 2005 because of the implementation of the Port's Clean Trucks Program that resulted in a newer fleet of trucks, lower overall reported idling times, and decreased total vehicle miles travelled due to the increase in utilization of on-dock rail.

Tables 8.3 through 8.5 compare emissions change by source category from 2005 to 2013.

Table 8.3: 2005-2013 Port Emissions Comparison by Source Category, tons and %

	PM_{10}	$PM_{2.5}$	DPM	NO_x	SO_x	CO	HC
2005							
Ocean-going vessels	721	578	618	6,627	6,591	579	249
Harbor craft	45	41	45	1,107	5	294	70
Cargo handling equipment	47	44	47	1,286	11	403	64
Locomotives	43	40	43	1,273	76	179	67
Heavy-duty vehicles	204	188	204	5,334	34	1,428	253
Total	**1,060**	**891**	**957**	**15,627**	**6,717**	**2,883**	**702**
2013							
Ocean-going vessels	126	114	99	4,258	644	462	219
Harbor craft	27	25	27	667	1	313	56
Cargo handling equipment	11	10	10	546	1	617	36
Locomotives	25	23	25	695	1	156	39
Heavy-duty vehicles	16	14	14	1,045	3	318	52
Total	**205**	**186**	**175**	**7,211**	**650**	**1,866**	**402**
% Change							
Ocean-going vessels	-83%	-80%	-84%	-36%	-90%	-20%	-12%
Harbor craft	-40%	-39%	-40%	-40%	-90%	6%	-20%
Cargo handling equipment	-77%	-75%	-79%	-58%	-89%	53%	-44%
Locomotives	-42%	-43%	-42%	-45%	-99%	-13%	-43%
Heavy-duty vehicles	-92%	-93%	-93%	-80%	-91%	-78%	-79%
Total	**-81%**	**-79%**	**-82%**	**-54%**	**-90%**	**-35%**	**-43%**

Table 8.4 compares GHG emissions change by source category. The CO_2e port-wide emissions decreased by 20% in 2013 compared to 2005. The decrease in CO_2e port-wide emissions can be attributed to decrease in overall activity, clean trucks program and vessel speed reduction program for OGVs.

Table 8.4: 2005-2013 Port GHG Emissions Comparison by Source Category, metric tons and %

	CO_2e	CO_2	N_2O	CH_4
2005				
Ocean-going vessels	375,409	368,712	21	5
Harbor craft	44,860	44,224	2	1
Cargo handling equipment	103,863	102,934	3	3
Locomotives	60,706	60,104	2	5
Heavy-duty vehicles	388,532	384,367	13	14
Total	**973,370**	**960,341**	**41**	**28**
2013				
Ocean-going vessels	274,314	269,111	16	4
Harbor craft	40,743	40,164	2	1
Cargo handling equipment	103,292	102,516	2	4
Locomotives	55,111	54,574	1	4
Heavy-duty vehicles	300,872	297,682	10	3
Total	**774,332**	**764,047**	**31**	**16**
% Change				
Ocean-going vessels	-27%	-27%	-19%	-20%
Harbor craft	-9%	-9%	0%	0%
Cargo handling equipment	-1%	0%	-33%	33%
Locomotives	-9%	-9%	-50%	-20%
Heavy-duty vehicles	-23%	-23%	-23%	-79%
Total	**-20%**	**-20%**	**-22%**	**-43%**

Table 8.5: 2005-2013 Port Emissions Comparison

Source Category	DPM, tons			NO_x, tons			SO_x, tons			CO_2e, metric tons		
	2005	2013	% Change	2005	2013	% Change	2005	2013	% Change	2005	2012	% Change
Ocean going vessels	618	99	-84%	6,627	4,258	-36%	6,591	644	-90%	375,409	274,314	-27%
Harbor craft	45	27	-40%	1,107	667	-40%	5	1	-90%	44,860	40,743	9%
Cargo handling equipment	47	10	-79%	1,286	546	-58%	11	1	-89%	103,863	103,292	1%
Rail locomotives	43	25	-42%	1,273	695	-45%	76	1	-99%	60,706	55,111	-9%
Heavy-duty vehicles	204	14	-93%	5,334	1,045	-80%	34	3	-91%	388,532	300,872	-23%
Total	**957**	**175**	**-82%**	**15,627**	**7,211**	**-54%**	**6,717**	**650**	**-90%**	**973,370**	**774,332**	**-20%**

8.1 Ocean-Going Vessels

There were improvements to the ocean-going vessels emission calculation methodology in this inventory compared to the previous year methodology. The following improvements were implemented in OGV emission calculation methodology for the 2013 emissions inventory compared to the 2012 emissions calculation methodology.

- There were no slide valve emission reductions taken for 2005-2013
- CO_2 emission factors for auxiliary engines were changed from 683 to 722 g/kw-hr. This revision is consistent with CARB methodology.
- Hotelling time calculations were adjusted to account for a difference in the MarEx activity timestamp definition. It was determined that the arrival and departure timestamps indicate the time that a vessel enters or leaves the harbor, rather than the time a vessel arrives or departs berth, which had been the previous interpretation. The hotelling time calculations were adjusted to account for this difference.
- Tanker loading data was incorporated to account for the difference in demand on the auxiliary boiler during loading or discharging operations while at berth. If a tanker is loading liquid bulk while at berth, a lower auxiliary boiler load of 875 kW is applied.

Table 8.6 compares overall OGV engine and boiler activity (in terms of kW-hrs) for the 2005 and 2013 emission estimates. The table shows a 49% decrease in propulsion engine activity, 5% decrease in auxiliary engine activity and 2% increase in boiler activity for an overall 17% decrease in total engine/boiler activity. The decrease in main engine activity is attributed to the slower speeds of vessels participating in the VSR program and the decrease in number of vessel calls. As vessel speed is reduced, propulsion engine power is also reduced. The decrease in auxiliary engine is due to the use of shore power at some berths in 2013, a different vessel fleet mix in 2013 which changed engine power, and the decrease in number of vessel calls.

Table 8.6: 2005-2013 OGV Engine Activity Comparison, kW-hrs

Year	All Engines	Main Eng	Aux Eng	Boiler
2005	489,005,404	153,369,455	223,813,912	111,822,036
2013	404,044,242	77,828,045	212,704,868	113,511,329
Change (%)	**-17%**	**-49%**	**-5%**	**2%**

Table 8.7 compares the vessel calls and TEU throughput for 2005 and 2013. The throughput remained the same, while count of total arrival calls and containership calls was lower in 2013 as compared to 2005.

Table 8.7: 2005-2013 Vessel Containers per Vessel Call Comparison, TEUs and calls

Year	Container Throughput TEUs	All Calls	Containership Calls	Average TEUs/Call
2005	6,709,818	2,690	1,332	5,037
2013	6,730,574	1,921	911	7,388
Change (%)	**0.3%**	**-29%**	**-32%**	**47%**

The various emission reduction strategies for ocean-going vessels that were in effect in 2013 are listed in Table 8.8 and summarized below:

- The percent of calls with IMO Tier I+ vessels (constructed in 2000 and newer) was 87% in 2013 as compared to 36% in 2005.
- The percent of vessel calls that switched to a cleaner fuel (0.3% S) for boilers, main and auxiliary engines at berth and within the CARB regulated boundary was 100% for the entire calendar year 2013 due to the CARB Fuel Regulation, with the exception of some boiler exemptions granted to specific vessels.
- In 2013, approximately 99% of the vessel calls complied with the VSR program (within 20 nm) as compared to 68% in 2005. For the 20 to 40 nm, 88% compliance rate in 2013 as compared to 0% in 2005.
- Approximately 11% of vessel calls used shore power in 2013 as compared with none in 2005.

Table 8.8: 2005-2013 OGV Emission Reduction Strategies

	Percent (%) of All Calls					
Year	IMO Tier I+	Fuel Switch Aux Eng	Fuel Switch Main Eng	VSR 20 nm	VSR 40 nm	Shore Power
2005	36%	14%	0%	68%	0%	0%
2013	87%	100%	100%	99%	88%	11%

Note: the 100% fuel switch compliance is for vessels transiting within the CARB Fuel Switch boundary.

Prior to the CARB OGV Fuel Regulation, the Northern route was the predominant route for trade with Asia and points north of San Pedro Bay. After the regulation became effective, the Western route (west of the Channel Islands) became the predominant shipping route for ships trading with Asia and points north of San Pedro Bay, presumably to avoid the CARB OGV Fuel Regulation compliance zone. Since the adjustment of the fuel regulation boundary by CARB in December 2011, ships have started to transition back to using the Northern route for trade with Asia. This shift in route selection is highlighted Table 8.9.

Table 8.9: 2013 Percentage Distribution of Arrivals and Departures by Route

Route	2008	2009	2010	2011	2012	2013
Northern	55%	38%	11%	9%	26%	29%
Western	9%	22%	51%	54%	34%	35%
Southern	35%	39%	37%	36%	40%	36%
Eastern	1%	1%	1%	1%	0.4%	0.4%

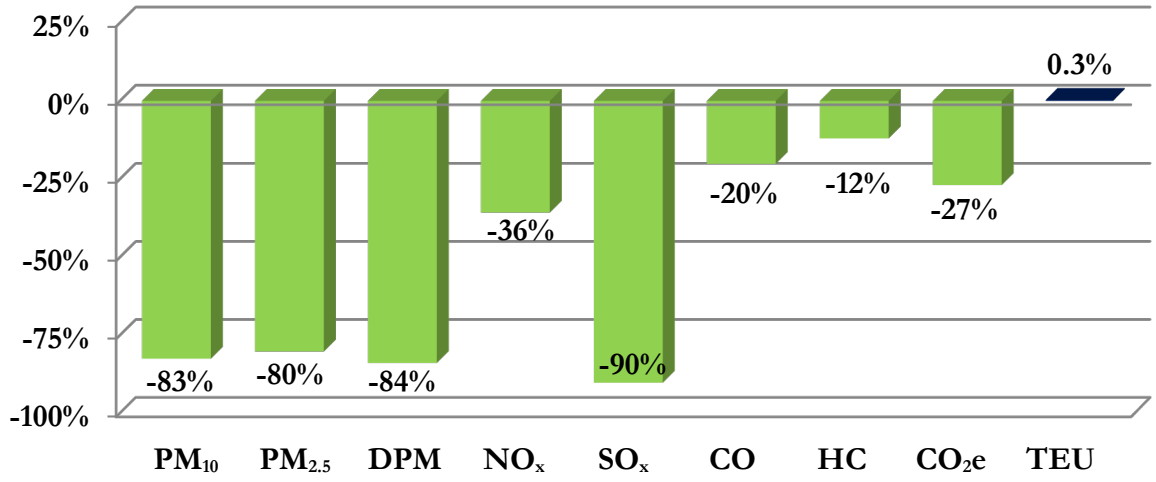
Table 8.10 shows the emissions estimate comparisons for calendar year 2013 and 2005 for OGV in tons per year and as a percent change. OGV emissions decreased for all pollutants in 2013 compared to 2005. Reductions in OGV emissions are mainly attributed to the vessel speed reduction program (all pollutants); CARB marine fuel regulation which became effective July 2009 and was enforced throughout all of 2013; and the use of shore power for certain vessels at berth.

Table 8.10: 2005-2013 OGV Emissions Comparison, tons and %

Year	PM_{10}	$PM_{2.5}$	DPM	NO_x	SO_x	CO	HC	CO_2e
2005	721	578	618	6,627	6,591	579	249	375,409
2013	126	114	99	4,258	644	462	219	274,314
Change	**-595**	**-464**	**-519**	**-2,369**	**-5,948**	**-117**	**-30**	**-101,093**
Change (%)	**-83%**	**-80%**	**-84%**	**-36%**	**-90%**	**-20%**	**-12%**	**-27%**

From 2005 to 2013, emissions decreased 83% for particulate matter, 84% for DPM, 36% for NO_x, 90% for SO_x, 20% for CO, and 12% for HC. Figure 8.3 also highlights the slight change in TEU throughput compared to emission changes from 2005 to 2013.

Figure 8.3: 2005-2013 OGV Emissions Comparison, %



8.2 Harbor Craft

As shown in Table 8.11, the harbor craft population count operating at the Port decreased by 4%, there was a 5% increase in total engine count (most harbor craft are equipped with more than one engine), and a 9% decrease in the overall activity (as measured by kilowatt hours) from 2005 to 2013. The total number of repowered engines in the harbor craft vessel fleet more than doubled since 2005.

Table 8.11: 2005-2013 Harbor Craft Engine and Activity Comparison, hours, kW-hr, and %

Year	Vessel Count	Engine Count	Total kW-hr	Repowered Engine Count	Total Hours
2005	92	301	67,684,712	79	285,586
2013	88	317	61,472,972	217	237,088
Change (%)	**-4%**	**5%**	**-9%**	**175%**	**-17%**

Table 8.12 compares the changes in propulsion and auxiliary engine average horsepower and usage hours in 2013 compared to 2005. Some of the changes in horsepower and hours may be attributed to improvement in data collection and better record keeping required with grant funded engine replacement projects. The engine power (HP) and hours (hrs) change impacts the activity (kilowatt hours) comparison.

Table 8.12: 2005-2013 Engine Power and Activity Change, %

Harbor Craft	Propulsion Engines		Auxiliary Engines	
Type	HP	Hrs	HP	Hrs
Assist tugboat	-3%	-15%	34%	-15%
Crew boat	45%	-30%	25%	18%
Excursion	-35%	-56%	6%	-68%
Ferry	3%	3%	13%	-2%
Government	13%	-76%	-64%	3%
Ocean tugboat	1%	135%	-1%	135%
Harbor tugboat	-27%	-59%	-38%	-65%
Work boat	38%	449%	214%	635%

Table 8.13 summarizes the distribution of engines based on EPA's engine standards for 2005 and 2013. Since 2005, the percentage of Tier 2 engines increased significantly due to the introduction of newer vessels with newer engines into the fleet and replacements of existing higher-emitting engines with cleaner engines. The majority of Tier 3 engines are small engines with model year 2009 and newer. Over the years, with better data collection techniques and better record keeping required with grant funded repowers, the number of engines of unknown tier level has decreased by over 75%.

Table 8.13: 2005-2013 Harbor Craft Engine Tier Change, %

Engine Tier	2005 Engine Count	2013 Engine Count	Change
Unknown	102	22	-78%
Tier 0	86	53	-38%
Tier 1	94	43	-54%
Tier 2	19	144	658%
Tier 3	0	55	na
Total	**301**	**317**	

There was no change to the emission estimating methodology in 2013 compared with the previous year. Thus, the 2005 emissions listed in the previous EI report are included below for the comparison. Table 8.14 shows the emissions estimate comparisons for harbor craft in tons per year and as a percent change.

Table 8.14: 2005-2013 Harbor Craft Emissions Comparison, tons and %

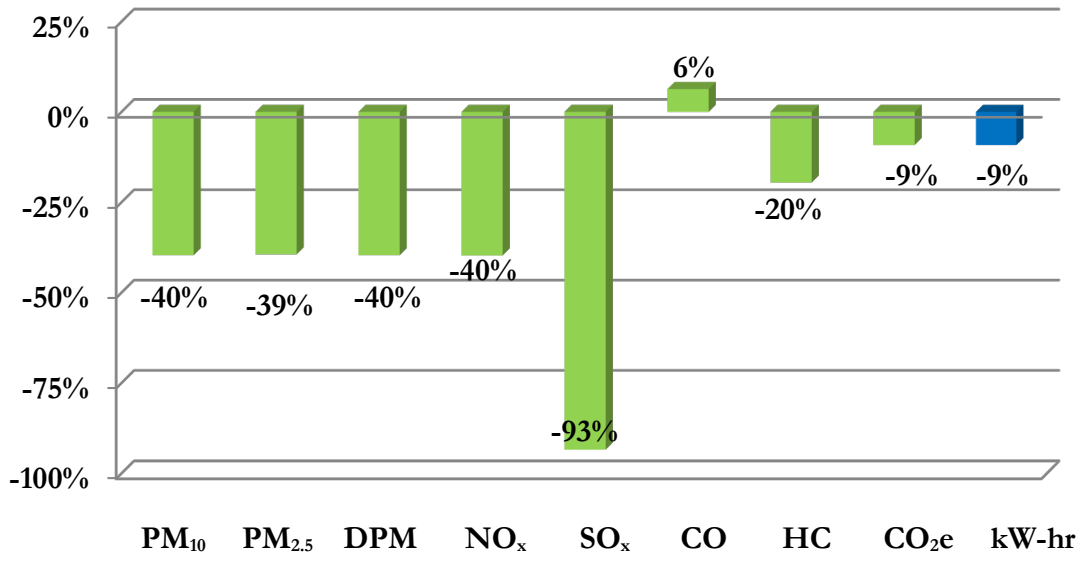
Year	PM_{10}	$PM_{2.5}$	DPM	NO_x	SO_x	CO	HC	CO_2e
2005	45	41	45	1,107	5	294	70	44,860
2013	27	25	27	667	1	313	56	40,743
Change	**-14**	**-16**	**-18**	**-440**	**-4**	**19**	**-14**	**-4,117**
Change (%)	**-34%**	**-39%**	**-40%**	**-40%**	**-89%**	**6%**	**-20%**	**-9%**

In 2013, there was a significant reduction (89%) in SO_x emissions due to the exclusive use of 15 ppm ULSD in all harbor craft equipped with diesel engines. In 2005, none of the harbor craft diesel engines used ULSD. There was a 41% reduction in PM emissions, 40% reduction in NO_x emissions, and 19% reduction in hydrocarbons. The decrease in emissions, with the exception of CO, is greater than the decrease in activity and is attributed to significant engine repowers and replacement of older harbor craft with new vessels since 2005. There was a 6% increase in emissions of CO. The increase in CO is more directly related to an increase in Tier 2 and Tier 3 engines that have higher CO emission rates compared to pre-Tier 2. Due to the stringency of the PM and (NO_x + HC) standards of Tier 2 engines, less stringent Tier 2 CO standards were adopted, which resulted in higher CO

emission rates as reflected in CARB's emission rates for harbor craft found in Appendix C of this report.

Figure 8.4 shows the comparison of harbor craft emissions between 2005 and 2013.

Figure 8.4: 2005-2013 Harbor Craft Emissions Comparison, %



8.3 Cargo Handling Equipment

Between 2005 and 2013, there was a 1% decrease in the equipment count and a 2% decrease in activity, measured as total kilowatt-hours.

Table 8.15: 2005-2013 CHE Count and Engine Activity Comparison

Year	Population	Activity (kW-hr)
2005	1,259	134,511,925
2013	1,252	131,493,563
Change (%)	**-1%**	**-2%**

Tables 8.16 and 8.17 compare the CHE emission reduction technologies and fuels used in 2013 with those used in 2005. There was a significant increase in the number of CHE equipped with cleaner on-road engines in 2013. CHE equipped with DOCs continued to be replaced with newer equipment, thus the DOC count is less than it was in 2005. Most of the DPFs installed are Tier 3 level, with the exception of the 10 DPFs that are level 2 because they were installed prior to CARB granting the manufacturer, Rypos, Inc., a conditional verification for the Rypos Active DPF/C3+ for RTG cranes[54].

Although not shown in the table, there are 83 gasoline yard tractors in 2013. The gasoline yard tractors replaced existing diesel yard tractors.

[54] CARB, *http://www.arb.ca.gov/diesel/verdev/companies/rypos/activedpf3.pdf*

Table 8.16: 2005-2013 CHE Emission Reduction Technology Equipment Count Comparison

Equipment	2005 DOC	2013 DOC	2005 On-road Engine	2013 On-road Engine	2005 DPF	2013 DPF	2005 Vycon	2013 Vycon	2005 BlueCAT	2013 BlueCAT
Forklift	40	12	0	0	0	34	0	0	0	0
RTG crane	11	0	0	0	0	28	0	6	0	0
Side handler	42	12	0	0	0	17	0	0	0	0
Top handler	92	22	0	0	0	102	0	0	0	0
Yard tractor	514	93	53	410	0	0	0	0	0	0
Other	2	0	0	8	0	12	0	0	0	6
Total	**701**	**139**	**53**	**418**	**0**	**193**	**0**	**6**	**0**	**6**

Table 8.17: 2005-2013 CHE Equipment Count by Fuel Type Comparison

Equipment	2005 Emulsified Fuel	2013 Emulsified Fuel	2005 O2 Diesel	2013 O2 Diesel	2005 ULSD	2013 ULSD	2005 Propane Engine	2013 Propane Engine
Forklift	3	0	4	0	0	118	122	120
RTG crane	16	0	12	0	0	65	0	0
Side handler	4	0	8	0	0	19	0	0
Top handler	10	0	10	0	0	174	0	0
Yard tractor	151	0	81	0	0	546	0	8
Other	2	0	0	0	0	64	11	16
Total	**186**	**0**	**115**	**0**	**0**	**986**	**133**	**144**

There was no change to the emission estimating methodology in 2013. Thus, the 2005 emissions listed are the same as the 2005 emissions listed in the previous report.

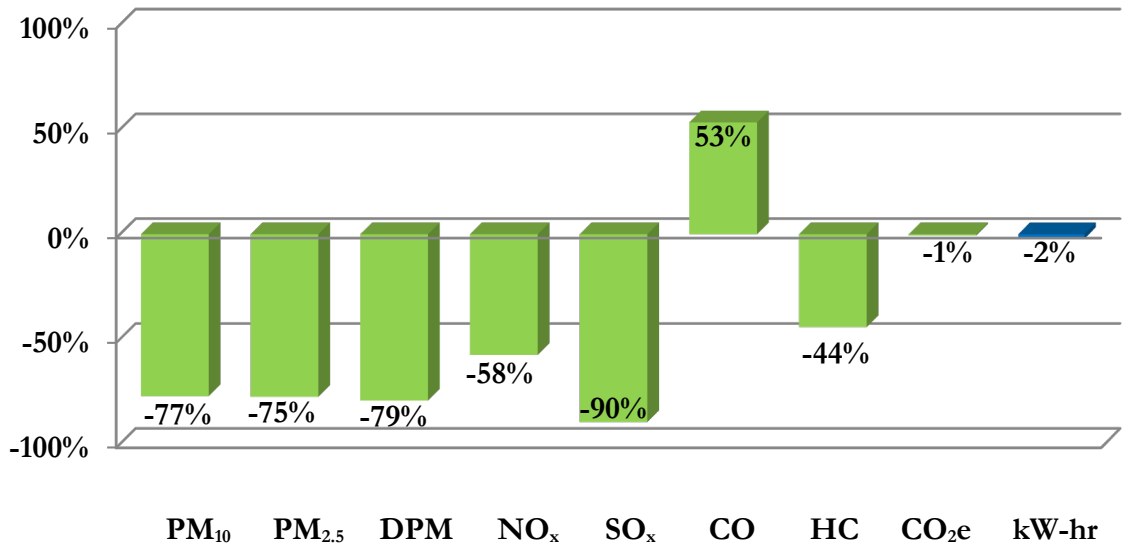
Table 8.18 and Figure 8.5 show the emissions estimate comparisons for calendar year 2013 and 2005 for cargo handling equipment in tons per year and as a percent change.

Table 8.18: 2005-2013 Cargo Handling Equipment Comparison of Emission Estimates, tons and %

EI Year	PM_{10}	$PM_{2.5}$	DPM	NO_x	SO_x	CO	HC	CO_2e
2005	47	44	47	1,286	11	403	64	103,863
2013	11	10	10	546	1	617	36	103,292
Change	**-37**	**-34**	**-38**	**-740**	**-10**	**215**	**-28**	**-571**
Change (%)	**-77%**	**-75%**	**-79%**	**-58%**	**-90%**	**53%**	**-44%**	**-1%**

The decrease in SO_x emissions is due to the use of 15 ppm ULSD in all cargo handling equipment with diesel engines in 2013. The emission reductions ranging from 44% to 90% for all pollutants, except CO emissions is due to the continued implementation of the CAAP measure for CHE and CARB's CHE regulation resulting in the introduction of newer and cleaner equipment including equipment with on-road engines in combination with the use of ULSD. In addition, more equipment was retrofitted with DPFs in 2013 than in previous years which also resulted in greater PM emission reductions. The CO emissions increase is due to the increased use of gasoline yard tractors and other alternative fueled equipment that have higher CO emission rates compared to diesel yard tractors they replaced.

Figure 8.5: 2005-2013 CHE Emissions Change, %



The following tables and figures for CHE activities are included as additional comparisons between 2005 and 2013. Table 8.19 and Figure 8.6 show a comparison of CHE counts by equipment type. In total, there was a 1% decrease in equipment count from 2005 to 2013. Forklifts, RTG cranes, yard tractors and side handler equipment counts went down from 2005 due to equipment retirement, and terminal efficiency improvements.

Table 8.19: 2005-2013 CHE Equipment Count and Change, %

Equipment	2005	2013	Change
Forklift	295	258	-13%
RTG crane	85	65	-24%
Side handler	43	19	-56%
Top handler	113	174	54%
Yard tractor	641	637	-1%
Sweeper	15	18	20%
Other	67	81	21%
Total	**1,259**	**1,252**	**-1%**

Figure 8.6: CHE Count Comparison, %

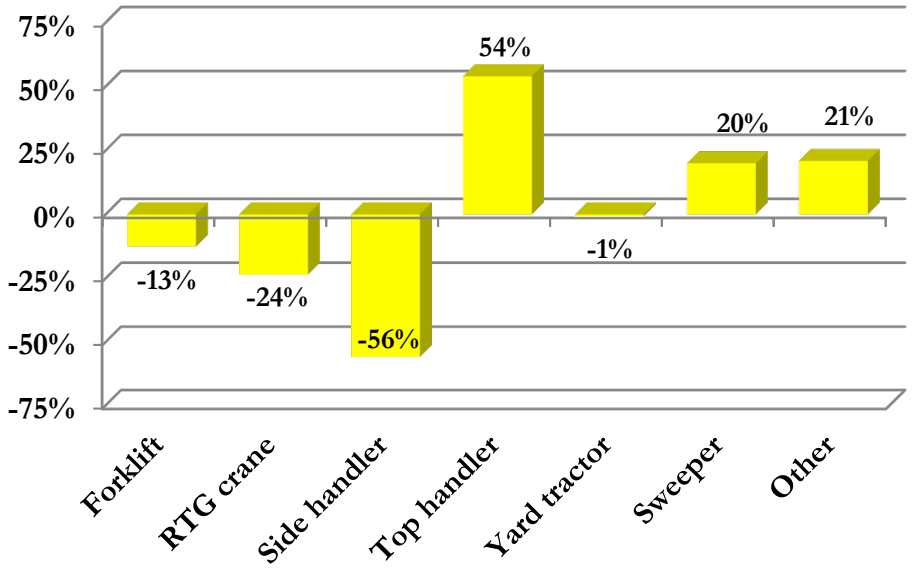


Table 8.20 and Figure 8.7 show the comparison of CHE activity by equipment type. Except for RTG cranes, the average annual hours of activity were lower than in 2013 than 2005.

Table 8.20: 2005-2013 CHE Activity by Equipment Type, hours and %

Equipment	2005	2013	Change
Forklift	710	270	-62%
RTG crane	1,964	2,126	8%
Side handler	1,148	1,029	-10%
Top handler	1,999	1,852	-7%
Yard tractor	2,186	1,148	-47%
Sweeper	502	139	-72%

Figure 8.7: 2005-2013 CHE Activity Change, %

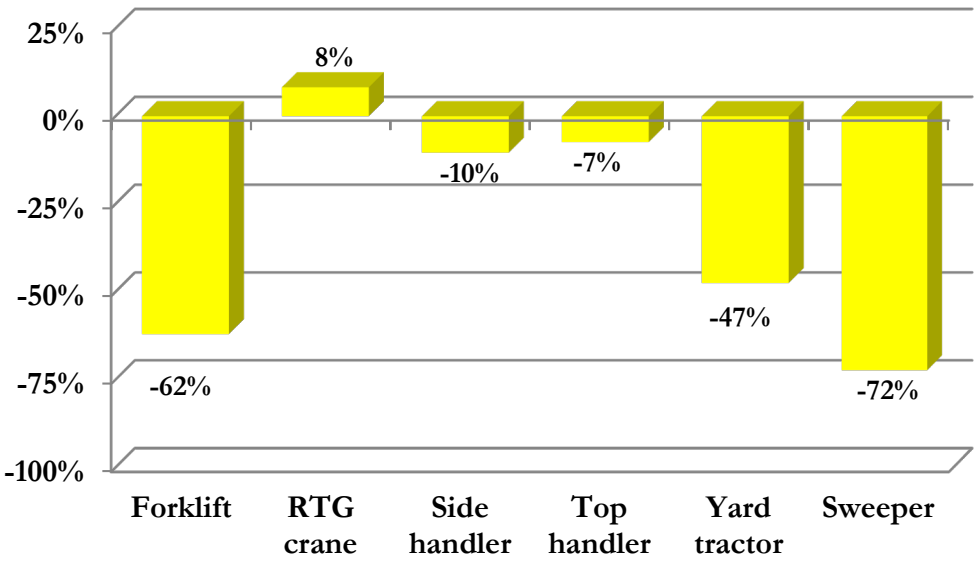
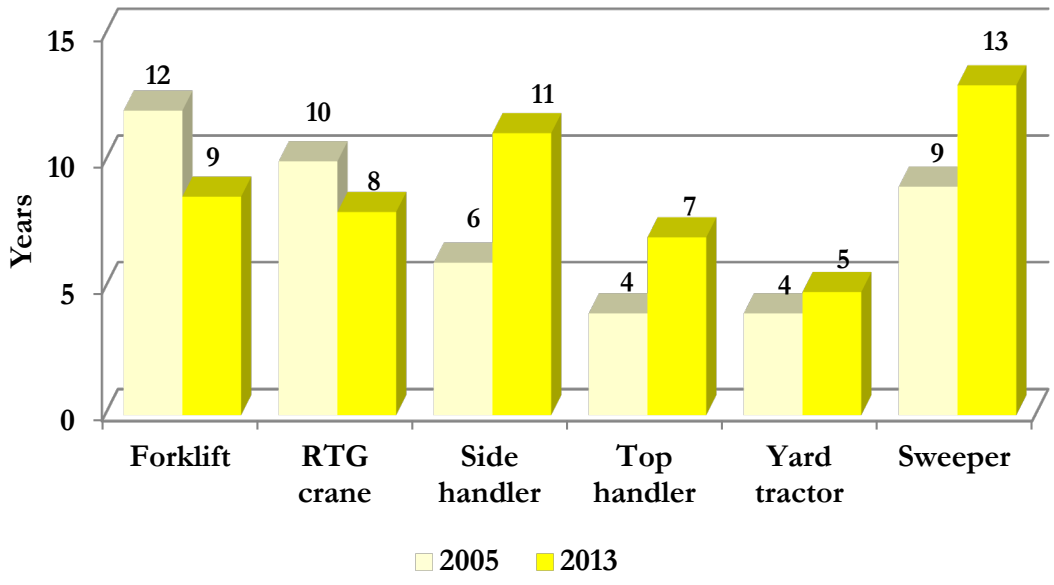


Table 8.21 and Figure 8.8 show a comparison of the average model year and average age for CHE by equipment type. The average age of forklifts and RTG cranes are lower than in 2005. The average age of side handlers, top handlers, yard tractors and sweepers are greater in 2013 than 2005 even though the average model year of the equipment is newer.

Table 8.21: 2005-2013 CHE Average Model Year and Age Comparison, year

Equipment	MY 2005	MY 2013	Age 2005	Age 2013
Forklift	1993	2004	12	9
RTG crane	1995	2005	10	8
Side handler	1999	2002	6	11
Top handler	2001	2006	4	7
Yard tractor	2001	2008	4	5
Sweeper	1996	2000	9	13

Figure 8.8: 2005-2013 CHE Average Age Change, year



8.4 Locomotives

Table 8.22 shows the various throughput comparisons for rail transportation in 2005 and 2013. From 2005 to 2013, there was hardly any change in total port throughput but a 40% increase in on-dock rail throughput, with the percentage of on-dock rail increasing from 16% of all container throughput to 23%.

Table 8.22: 2005-2013 Container Throughput Comparison, TEU and %

	2005	2013	Change
Total Port Throughput	6,709,818	6,730,574	0.3%
Total On-Dock Rail*	1,094,765	1,533,647	40%
% On-Dock	16%	23%	

*Based on average of 1.8 TEUs per container

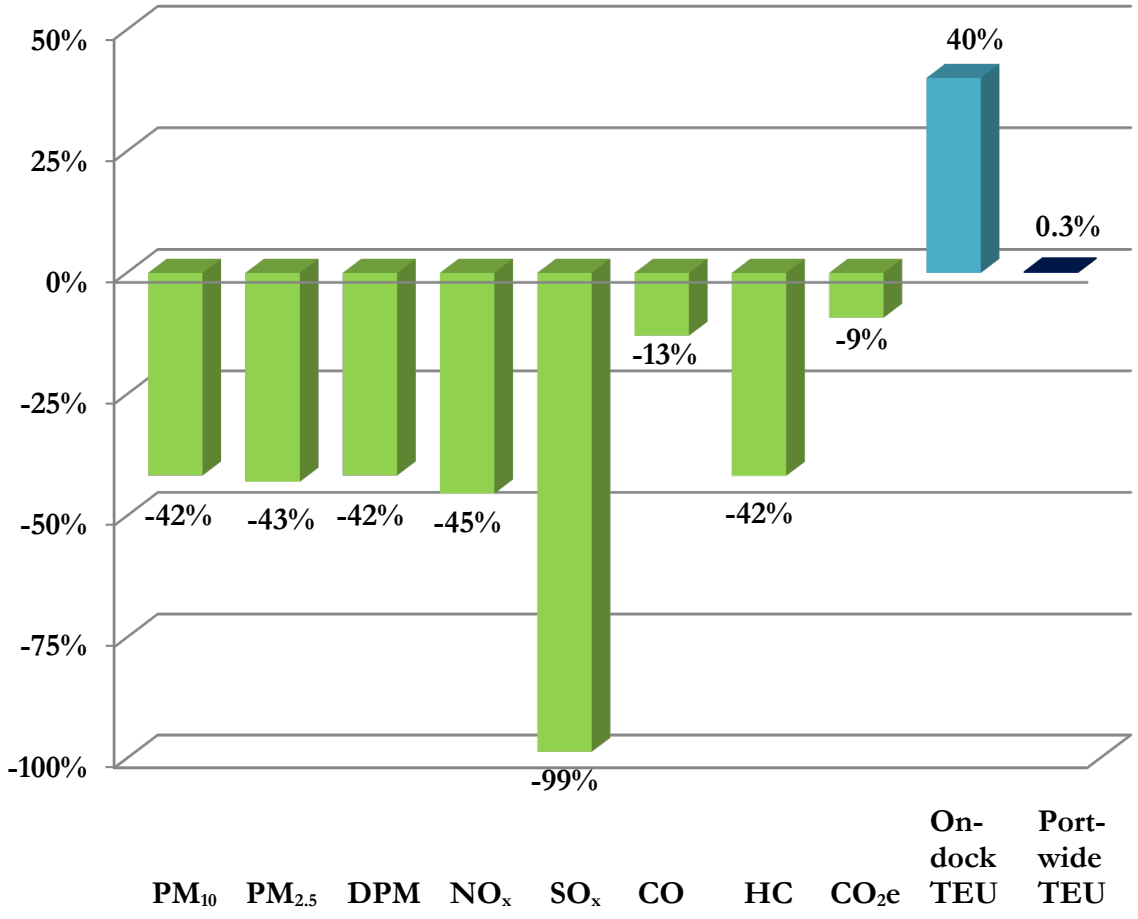
The methodology used to estimate 2013 rail locomotive emissions was the same as that used in the previous EI; therefore, the 2005 emissions did not change from previous EI. Table 8.23 shows the emissions estimate comparisons for calendar year 2013 and 2005 for locomotive engines in tons per year and as a percent change (CO_2e is presented in metric tons).

Table 8.23: 2005-2013 Locomotive Emissions Comparison, tons and %

EI Year	PM_{10}	$PM_{2.5}$	DPM	NO_x	SO_x	CO	HC	CO_2e
2005	43	40	43	1,273	76	179	66	60,706
2013	25	23	25	695	1	156	39	55,111
Change	**-18**	**-17**	**-18**	**-578**	**-75**	**-23**	**-27**	**-5,595**
Change (%)	**-42%**	**-43%**	**-42%**	**-45%**	**-99%**	**-13%**	**-42%**	**-9%**

There was an overall decrease in emissions from rail locomotives in the range of 9% to 99% from 2005 to 2013. The decrease in locomotive emissions in 2013 was due to turn over to cleaner locomotives, use of ULSD by all locomotives, and rail system efficiency improvements. PHL's fleet has turned over from old uncontrolled switchers to the latest ultra-low emissions switching locomotives, and UP has also gone to ultra-low emissions switchers at the ICTF. The line haul fleet has been modernized, meeting the MOU agreement of overall Tier 2 average NO_x emissions, and doing that (by sending newer locomotives to the SCAB) has also reduced other emissions. CO_2 has been reduced despite the increase in rail throughput through efficiency improvements implemented by the railroads and the terminals. Figure 8.9 summarizes the emissions changes from 2005 to 2013 for rail locomotives at the Port.

Figure 8.9: 2005-2013 Locomotive Emissions Change, %



8.5 Heavy-Duty Vehicles

The same as for the 2012 emissions inventory, data collected under the Port's Clean Trucks Program (CTP) on activity and truck characteristics (including terminal calls, fuel type, engine model year) to develop the model year distribution of truck calls in 2013. Since the CTP did not exist in 2005 there is no way to recalculate 2005 emissions to account for this change. However, since the concept of the model year distribution is essentially similar in both years, the comparison between 2005 and 2013 should still be a valid comparison.

Another difference between 2013 and earlier years is the use of improved models of terminal operations and on-road travel. This does not represent a change of methodology, however, but an improvement in estimating methods that better reflect current port and terminal operations.

Emissions from the HDV source category have continued to improve due largely to the following factors affecting the number of truck visits, newer trucks, and average idling times compared with 2005.

- Newer fleet of trucks in 2013 due to the Port's Clean Trucks Program (CTP).
- The terminals optimized their gate systems with OCR and, more recently, the addition of radio frequency identification (RFID) readers to identify and help check in trucks complying with the CTP ban provisions, which helped reduce idling time.
- Assembly Bill 2650 (known as the Lowenthal Bill), introduced in 2004, required that each marine terminal in California operate in a manner that does not cause the engines on trucks to idle or queue for more than 30 minutes while waiting to enter the gate into the marine terminal.
- Since July 2005, all marine terminals at the ports of Long Beach and Los Angeles, offer off-peak shifts on nights and weekends. As part of the program, a Traffic Mitigation Fee is required for cargo movement through the ports during peak daytime hours.

The average on-terminal total idling time report by the container terminals has continued to improve. Table 8.24 shows the decrease in total port-wide idling time.

Table 8.24: 2005-2013 HDV Total Idling Time Comparison, hours and %

EI Year	Total Idling Hours
2005	3,854,273
2013	1,683,287
Change (%)	**-56%**

Table 8.25 compares the vehicle miles traveled by heavy-duty trucks in 2005 and 2013.

Table 8.25: 2005-2013 HDV Vehicle Miles Traveled Comparison, miles and %

Activity Location	2005 VMT	2013 VMT	Change %
On-Terminal	2,866,476	2,595,567	-9%
On-Road	213,716,895	169,710,761	-21%
	216,583,371	**172,306,328**	**-20%**

Table 8.26 summarizes the average age of the port-related fleet for 2005 and 2013. Compared to 2005, the average engine age of trucks visiting the Port has decreased from 11 to 4 years due to the Port's Clean Trucks Program that was launched in October 2008 requiring the progressive ban of pre-2007 trucks between 2008 and 2013.

Table 8.26: 2005-2013 HDV Fleet Weighted Average Engine Age Comparison, years

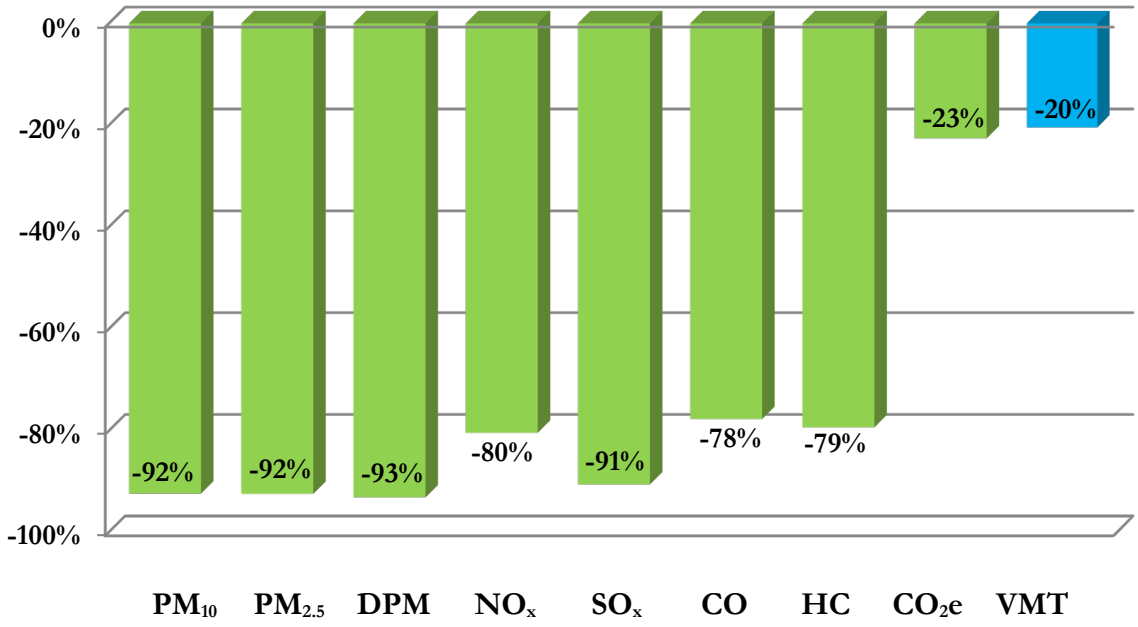
EI Year	Call-Weighted Average Engine Age
2005	11
2013	4

Emissions from HDVs decreased in 2013 when compared to 2005 due to the newer fleet of trucks in 2013 attributed to the Port's CTP; lower idling time (-56%); the decreased total vehicle miles travelled (-20%); and the use of ULSD had (which had an impact on SO_x emissions). These factors had a positive impact on the heavy-duty vehicle emissions, which decreased between 2005 and 2013 by 93% for DPM, 80% for NO_x, 91% for SO_x, 78% for CO, and 79% for HC. Table 8.27 and Figure 8.10 summarize the emission changes.

Table 8.27: 2005-2013 HDV Emissions Comparison, tons and %

EI Year	PM_{10}	$PM_{2.5}$	DPM	NO_x	SO_x	CO	HC	CO_2e
2005	204	188	204	5,334	34	1,428	253	388,532
2013	16	14	14	1,045	3	318	52	300,872
Change	**-189**	**-174**	**-190**	**-4,289**	**-31**	**-1,110**	**-201**	**-87,660**
Change (%)	**-92%**	**-92%**	**-93%**	**-80%**	**-91%**	**-78%**	**-79%**	**-23%**

Figure 8.10: 2005-2013 HDV Emissions Change, %



8.6 CAAP Progress

One of the main purposes of the Port's annual emissions inventories is to provide a progress update on achieving the Clean Air Action Plan's San Pedro Bay Standards. These standards consist of the following reductions goals:

- Mass Emissions Reduction Standards:
  - By 2014, reduce emissions by 72% for DPM, 22% for NO_x, and 93% for SO_x from 2005 levels
  - By 2023, reduce emissions by 77% for DPM, 59% for NO_x, and 93% for SO_x from 2005 levels

The reduction of port-related emissions in 2013 compared to 2005 can be attributed to a number of initiatives, including emissions reduction programs implemented by the Port, such as the Clean Trucks Program, Green Flag Vessel Speed Reduction Program, and early adoption of shore power for vessels at berth. CARB's OGV fuel switch program was also a significant factor for emission reductions.

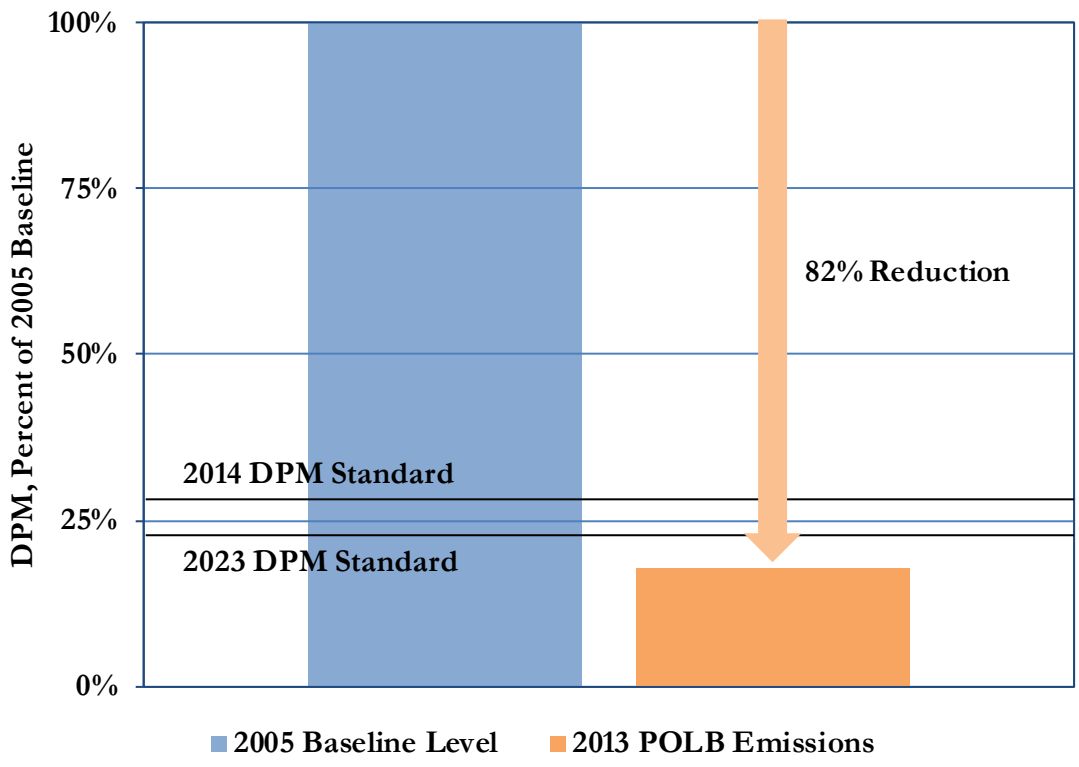
Economic forecasts indicate that cargo volumes through the Port of Long Beach will increase in upcoming years. While emission reductions are expected to continue in the future toward meeting the CAAP goals, the rapid rate of emission reductions in recent years may not continue as cargo volumes increase and the "easy" reductions have been achieved. However, continued implementation of the CAAP and regulatory programs will continue to provide emissions benefits from port-related sources, and offset impacts from the projected growth in trade.

The mass emissions reduction standards are represented as a percentage reduction of emissions from 2005 levels. Tables 8.28 to 8.30 and Figures 8.11 through 8.13 present the standardized estimates of emissions by source category for calendar years 2005 and 2013 using the 2013 methodology. Additionally, the figures provide the 2014 and 2023 mass emissions reduction standards against the 2005-2013 comparison.

Table 8.28: 2005-2013 DPM Annual Emissions by Category, tpy

Category	2005	2013
Ocean-going vessels	618	99
Harbor craft	45	27
Cargo handling equipment	47	10
Locomotives	43	25
Heavy-duty vehicles	204	14
Total	**957**	**175**
% Cumulative Reduction		**82%**

Figure 8.11: 2005-2013 DPM Reductions to Date

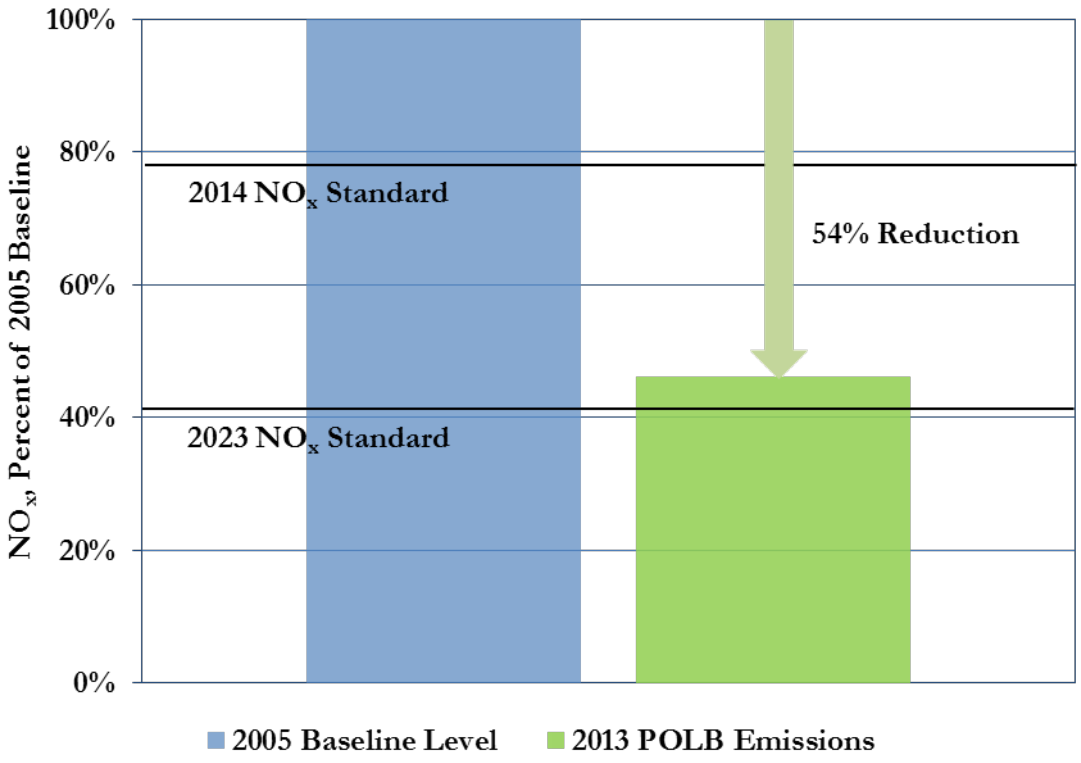


As shown in Table 8.28 and Figure 8.11 above, in 2013 the Port met the 2014 DPM mass emission reduction standard of 72% and the 2023 standard of 77%. The reduction of DPM emissions is the result of the implementation of CAAP measures including vessel speed reduction, shore power, and the Clean Trucks Program. CARB's OGV marine fuel regulation with expanded boundary was in effect for the full year in 2013 also contributed to the overall reduction of DPM emissions. It is anticipated that the DPM reduction trend will continue in subsequent years due to more stringent requirements for vessel fuels in 2014/2015 as required by CARB and the 2015 implementation of ECA by IMO.

Table 8.29: 2005-2013 NO_x Annual Emissions by Category, tpy

Category	2005	2013
Ocean-going vessels	6,627	4,258
Harbor craft	1,107	667
Cargo handling equipment	1,286	546
Locomotives	1,273	695
Heavy-duty vehicles	5,334	1,045
Total	**15,627**	**7,211**
% Cumulative Reduction		**54%**

Figure 8.12: 2005-2013 NO_x Reductions to Date

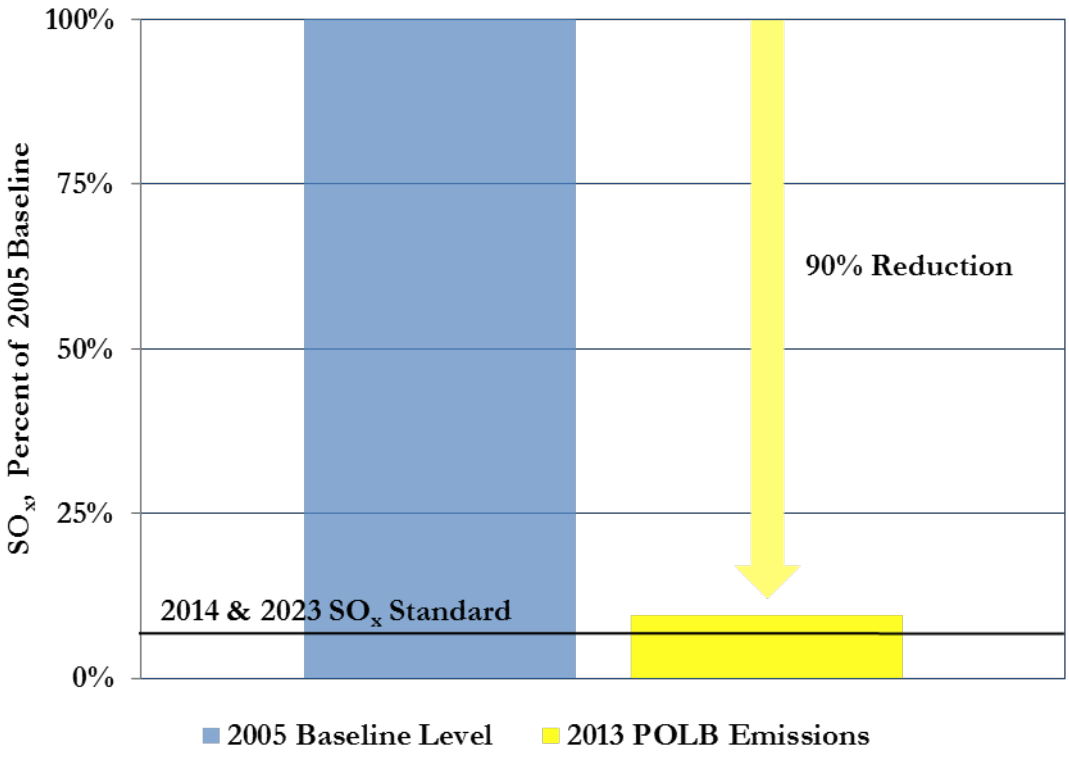


As shown in Table 8.29 and Figure 8.12 above, in 2013, the Port exceeded the 2014 NO_x mass emission reduction standard of 22%, and is more than three-quarters of the way towards meeting the 2023 NO_x emission reduction standard of 59%. CAAP measures including the Clean Trucks Program, the Vessel Speed Reduction Program, shore power, the use of slide valves in OGVs, and CARB's fuel switch regulation are the primary strategies for reducing NO_x emissions. In addition to CAAP measures, CARB's OGV shore power regulation, and implementation of more stringent NO_x standards for vessels as required by IMO will significantly help in meeting these standards despite potential increases in throughput.

Table 8.30: 2005-2013 SO_x Annual Emissions by Category, tons per year

Category	2005	2013
Ocean-going vessels	6,591	644
Harbor craft	5	1
Cargo handling equipment	11	1
Locomotives	76	1
Heavy-duty vehicles	34	3
Total	**6,717**	**650**
% Cumulative Reduction		**90%**

Figure 8.13: 2005-2013 SO_x Reductions to Date



As shown in Table 8.30 and Figure 8.13 above, in 2013 the Port was more than three quarters of the way towards meeting the SO_x emission reduction standard of 93% in 2014 and 2023. Implementation of CAAP measures including the Clean Trucks Program, VSR, and shore power, as well as CARB's OGV fuel regulation and the implementation of an ECA by the IMO in subsequent years will further reduce SO_x emissions at the Port.

SECTION 9 METRICS PER SOURCE CATEGORY

In order to measure progress of the various emissions reduction goals, the Port has established metrics to track emissions per unit of work by source category. Since port operations are varied with a mix of container and non-container cargo, the metrics listed in this section are based on TEU throughput and metric tons of cargo moved through the Port. Table 9.1 compares the amount of throughput in 2013 and 2005 in TEU and metric tons.

Table 9.1: 2005-2013 Container and Cargo Throughputs and Change, %

Year	Throughput Container (TEU)	Throughput Cargo (metric tons)
2005	6,709,818	78,560,726
2013	6,730,574	77,929,480
Change (%)	**0.3%**	**-0.8%**

Table 9.2 and Figure 9.1 show the port-wide tons of emissions per 100,000 metric tons of cargo in 2005 and 2013. The port-wide tons of emissions per 100,000 metric tons of cargo decreased in 2013; an improvement from 2005.

Table 9.2: 2005-2013 Port Emission Efficiency Metric Comparison, annual tons per 100,000 metric tons of cargo and %

Year	PM_{10}	$PM_{2.5}$	DPM	NO_x	SO_x	CO	HC	CO_2e
2005	1.35	1.13	1.22	19.89	8.55	3.67	0.89	1,363
2013	0.26	0.24	0.22	9.25	0.83	2.39	0.51	1,094
Change (%)	**-81%**	**-79%**	**-82%**	**-53%**	**-90%**	**-35%**	**-43%**	**-20%**

Figure 9.1: 2005-2013 Port Emission Efficiency Metric Changes, %

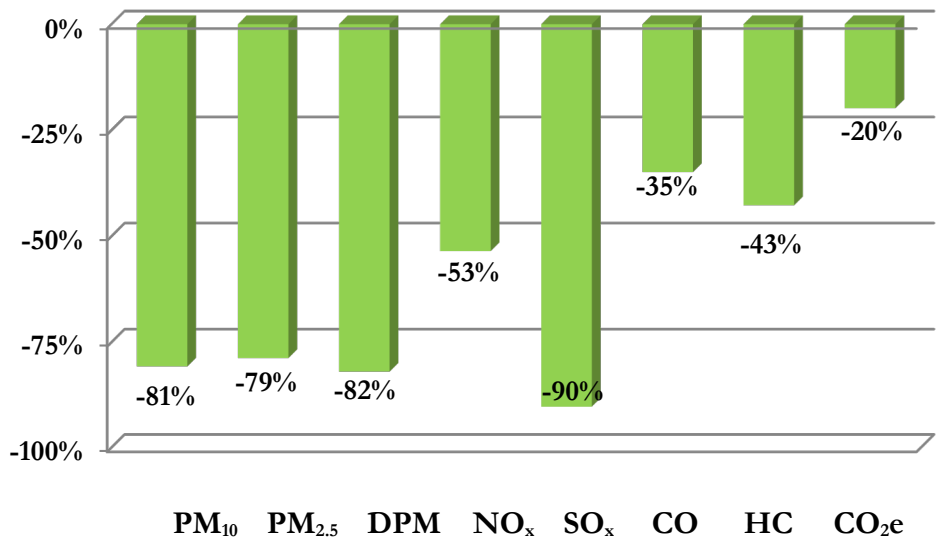


Table 9.3 shows the port-wide tons of emissions associated with container terminals per 10,000 TEU for 2005 and 2013. The tons of emissions per 10,000 TEU decreased in 2013 for the pollutants shown; an improvement from 2005.

Table 9.3: 2005-2013 Port Container Terminals Efficiency Metric Comparison, annual tons per 10,000 TEU and %

Year	DPM	NO_x	SO_x	CO_2e
2005	1.0	17.2	5.2	1,173
2013	0.2	6.7	0.3	903
Change	**-0.8**	**-10.5**	**-4.8**	**-270**
Change (%)	**-84%**	**-61%**	**-93%**	**-23%**

Table 9.4 shows the port-wide tons of emissions associated with non-container terminals/movement per 100,000 metric tons of cargo for 2005 and 2013. The tons of emissions per 100,000 metric tons decreased in 2013 for all pollutants shown, an improvement from 2005.

Table 9.4: 2005-2013 Port Non-Container Terminals Emission Efficiency Metric Comparison, annual tons per 100,000 metric tons of cargo and %

Year	DPM	NO_x	SO_x	CO_2e
2005	0.7	9.6	7.7	670
2013	0.2	6.7	1.1	585
Change	**-0.5**	**-2.9**	**-6.6**	**-85**
Change (%)	**-77%**	**-30%**	**-86%**	**-13%**

Table 9.5 and Figure 9.2 show the OGV tons of emissions per 100,000 metric tons of cargo for 2005 and 2013. The tons of emissions per 100,000 metric tons of cargo were decreased for all pollutants in 2013 from 2005 which is an improvement.

Table 9.5: 2005-2013 OGV Emission Efficiency Metric Comparison, annual tons per 100,000 metric tons of cargo and %

Year	PM_{10}	$PM_{2.5}$	DPM	NO_x	SO_x	CO	HC	CO_2e
2005	0.9	0.7	0.8	8.4	8.4	0.7	0.3	478
2013	0.2	0.2	0.1	5.5	0.8	0.6	0.3	352
Change (%)	**-83%**	**-80%**	**-84%**	**-35%**	**-90%**	**-20%**	**-13%**	**-26%**

Figure 9.2: 2005-2013 OGV Emission Efficiency Metric Changes, %

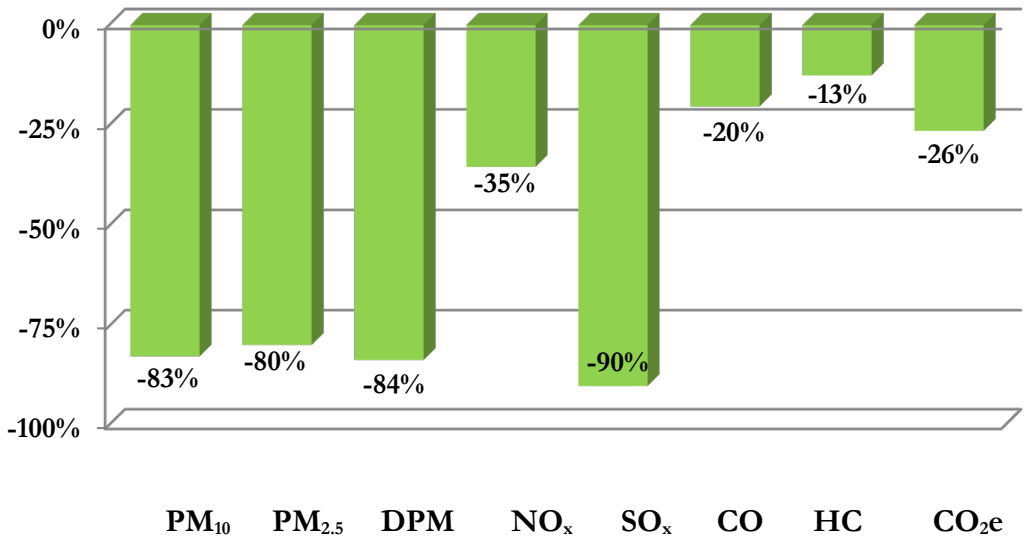


Table 9.6 shows the OGV tons of emissions associated with container terminals per 10,000 TEU for 2005 and 2013. The tons of emissions per 10,000 TEU decreased in 2013 for the pollutants shown; an improvement from 2005.

Table 9.6: 2005-2013 OGV Container Terminals Emission Efficiency Metric Comparison, annual tons per 10,000 TEU and %

Year	DPM	NO_x	SO_x	CO_2e
2005	0.6	5.6	5.0	303
2013	0.1	3.1	0.3	171
Change	**-0.5**	**-2.5**	**-4.7**	**-131**
Change (%)	**-87%**	**-45%**	**-93%**	**-43%**

Table 9.7 shows the tons of emissions associated with non-container terminals/movement per 100,000 metric tons of cargo for 2005 and 2013. The tons of emissions per 100,000 metric tons decreased in 2013 for the pollutants shown, an improvement from 2005.

Table 9.7: 2005-2013 OGV Non-Container Terminals Emission Efficiency Metric Comparison, annual tons per 100,000 metric tons of cargo and %

Year	DPM	NO_x	SO_x	CO_2e
2005	0.6	6.8	7.7	496
2013	0.1	5.5	1.1	466
Change	**-0.5**	**-1.3**	**-6.6**	**-29**
Change (%)	**-80%**	**-19%**	**-86%**	**-6%**

Table 9.8 and Figure 9.3 show the harbor craft tons of emissions per 100,000 metric tons of cargo for 2005 and 2013. The tons of emissions per 100,000 metric tons decreased for most pollutants in 2013 from 2005, except for CO. For most pollutants, reduction in emission per 100,000 metric tons of cargo shows is due to emissions control measures/replacement of older harbor crafts with newer and improvement in efficiency in 2013 for harbor craft for most pollutants.

Table 9.8: 2005-2013 Harbor Craft Emission Efficiency Metric Comparison, annual tons per 100,000 metric tons of cargo and %

Year	PM_{10}	$PM_{2.5}$	DPM	NO_x	SO_x	CO	HC	CO_2e
2005	0.06	0.05	0.06	1.41	0.01	0.37	0.09	63
2013	0.03	0.03	0.03	0.86	0.00	0.40	0.07	58
Change (%)	**-40%**	**-40%**	**-40%**	**-39%**	**-90%**	**7%**	**-18%**	**-8%**

Figure 9.3: 2005-2013 Harbor Craft Emission Efficiency Metric Changes, %

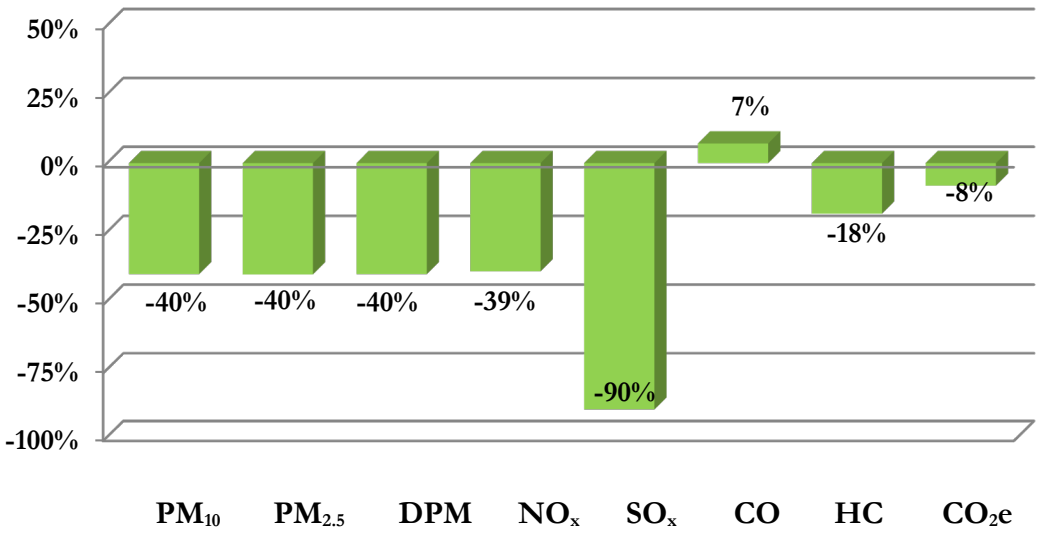


Table 9.9 and Figure 9.4 show the CHE tons of emissions per 100,000 metric tons for 2005 and 2013. With the exception of CO and CO_2, the tons of emissions per 100,000 metric tons decreased for all pollutants in 2013; an improvement from 2005.

Table 9.9: 2005-2013 CHE Emission Efficiency Metric Comparison, annual tons per 100,000 metric tons of cargo and %

Year	PM_{10}	$PM_{2.5}$	DPM	NO_x	SO_x	CO	HC	CO_2e
2005	0.06	0.06	0.06	1.64	0.01	0.51	0.08	145
2013	0.01	0.01	0.01	0.70	0.00	0.79	0.05	146
Change (%)	**-77%**	**-77%**	**-79%**	**-57%**	**-89%**	**55%**	**-44%**	**0%**

Figure 9.4: 2005-2013 CHE Emission Efficiency Metric Changes, %

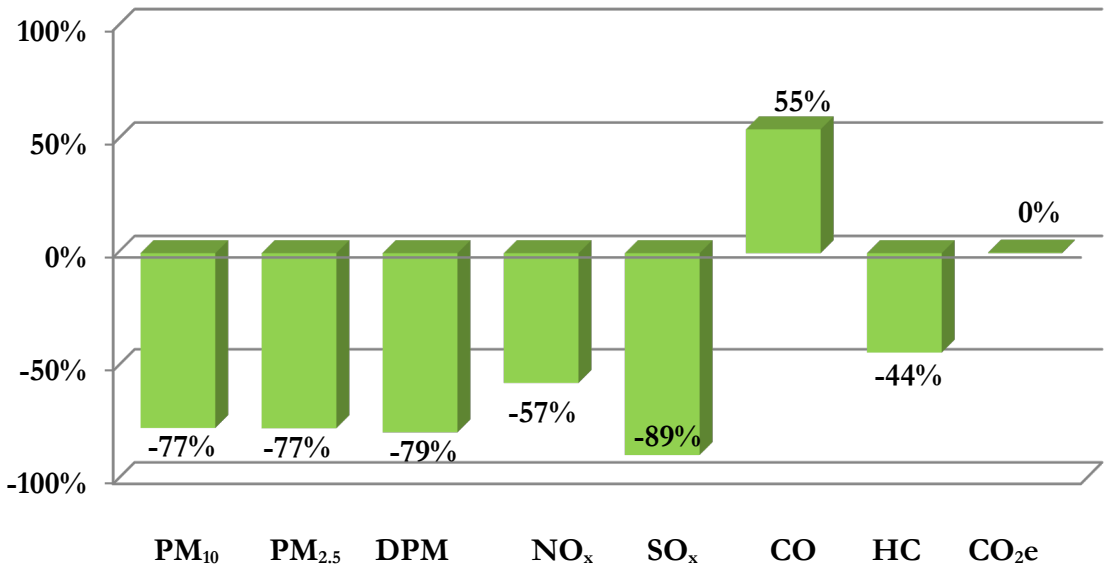


Table 9.10 shows the CHE tons of emissions associated with container terminals per 10,000 TEU for 2005 and 2013. Except for CO_2e, the tons of emissions per 10,000 TEU decreased in 2013 for the pollutants shown; an improvement from 2005.

Table 9.10: 2005-2013 CHE Container Terminals Emission Efficiency Metric Comparison, annual tons per 10,000 TEU and %

Year	DPM	NO_x	SO_x	CO_2e
2005	0.06	1.72	0.02	155
2013	0.01	0.77	0.00	163
Change	**-0.05**	**-0.95**	**-0.02**	**9**
Change (%)	**-83%**	**-55%**	**-100%**	**6%**

Table 9.11 shows the CHE tons of emissions associated with non-container terminals/movement per 100,000 metric tons of cargo for 2005 and 2013. The DPM, NO_x, and CO_2 tons of emissions per 100,000 metric tons decreased in 2013 compared to 2005, an improvement from 2005. The SO_x remained flat.

Table 9.11: 2005-2013 CHE Non-Container Terminals Emission Efficiency Metric Comparison, annual tons per 100,000 metric tons of cargo and %

Year	DPM	NO_x	SO_x	CO_2e
2005	0.01	0.32	0.00	25
2013	0.00	0.06	0.00	9
Change	**-0.01**	**-0.26**	**0.00**	**-16**
Change (%)	**-100%**	**-81%**	**0%**	**-63%**

Table 9.12 and Figure 9.5 show the rail locomotive tons of emissions per 100,000 metric tons of cargo for 2005 and 2013. The tons of emissions per 100,000 metric tons of cargo decreased for all pollutants in 2013 from 2005, which is an improvement.

Table 9.12: 2005-2013 Locomotive Emission Efficiency Metric Comparison, annual tons per 100,000 metric tons of cargo and %

Year	PM_{10}	$PM_{2.5}$	DPM	NO_x	SO_x	CO	HC	CO_2e
2005	0.05	0.05	0.05	1.62	0.10	0.23	0.08	85
2013	0.03	0.03	0.03	0.82	0.00	0.18	0.05	71
Change (%)	**-44%**	**-45%**	**-44%**	**-50%**	**-97%**	**-20%**	**-46%**	**-17%**

Figure 9.5: 2005-2013 Locomotive Emission Efficiency Metric Changes, %

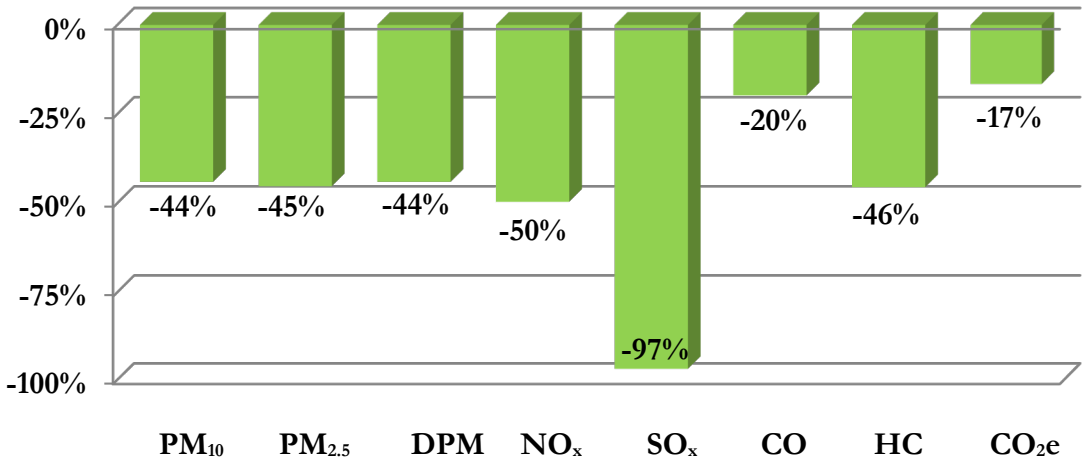


Table 9.13 shows the locomotive tons of emissions associated with container terminals per 10,000 TEU for 2005 and 2013. The tons of emissions per 10,000 TEU decreased in 2013 for the pollutants shown; an improvement from 2005.

Table 9.13: 2005-2013 Locomotive Container Terminals Emission Efficiency Metric Comparison, annual tons per 10,000 TEU and %

Year	DPM	NO_x	SO_x	CO_2e
2005	0.06	1.71	0.10	90
2013	0.03	0.94	0.00	81
Change	**-0.03**	**-0.77**	**-0.10**	**-9**
Change (%)	**-50%**	**-45%**	**-100%**	**-10%**

Table 9.14 shows the locomotive tons of emissions associated with non-container terminals/movement per 100,000 metric tons of cargo for 2005 and 2013. Except for DPM and CO_2e, the tons of emissions per 100,000 metric tons decreased for all pollutants in 2013 compared to 2005, an improvement from 2005.

Table 9.14: 2005-2013 Locomotive Non-Container Terminals Emission Efficiency Metric Comparison, annual tons per 100,000 metric tons of cargo and %

Year	DPM	NO_x	SO_x	CO_2e
2005	0.01	0.29	0.02	15.3
2013	0.01	0.16	0.00	15.4
Change	**0.00**	**-0.13**	**-0.02**	**0.1**
Change (%)	**0%**	**-45%**	**-100%**	**1%**

Table 9.15 and Figure 9.6 show the HDV tons of emissions per 100,000 metric tons of cargo for 2005 and 2013. The tons of emissions per 100,000 metric tons of cargo decreased for all pollutants in 2013 from 2005, which is an improvement.

Table 9.15: 2005-2013 HDV Emission Efficiency Metric Comparison, annual tons per 100,000 metric tons of cargo and %

Year	PM_{10}	$PM_{2.5}$	DPM	NO_x	SO_x	CO	HC	CO_2e
2005	0.26	0.24	0.26	6.79	0.04	1.82	0.32	495
2013	0.02	0.02	0.02	1.34	0.00	0.41	0.07	386
Change (%)	**-92%**	**-92%**	**-93%**	**-80%**	**-90%**	**-78%**	**-79%**	**-22%**

Figure 9.6: 2005-2013 HDV Emission Efficiency Metric Changes, %

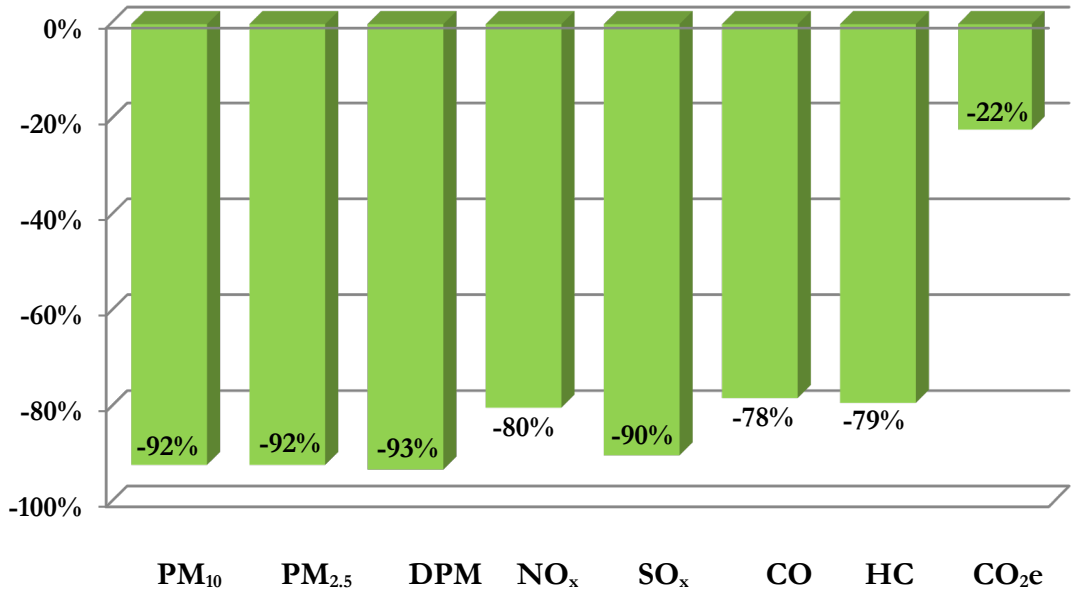


Table 9.16 shows the HDV tons of emissions associated with container terminals per 10,000 TEU for 2005 and 2013. The tons of emissions per 10,000 TEU decreased in 2013 for the pollutants shown; an improvement from 2005.

Table 9.16: 2005-2013 HDV Container Terminals Emission Efficiency Metric Comparison, annual tons per 10,000 TEU and %

Year	DPM	NO_x	SO_x	CO_2e
2005	0.28	7.36	0.05	589
2013	0.02	1.49	0.01	471
Change	**-0.26**	**-5.87**	**-0.05**	**-118**
Change (%)	**-93%**	**-80%**	**-90%**	**-20%**

Table 9.17 shows the HDV tons of emissions associated with non-container terminals/movement per 100,000 metric tons of cargo for 2005 and 2013. The tons of emissions per 100,000 metric tons decreased in 2013 compared to 2005, an improvement from 2005.

Table 9.17: 2005-2013 HDV Non-Container Terminals Emission Efficiency Metric Comparison, annual tons per 100,000 metric tons of cargo and %

Year	DPM	NO_x	SO_x	CO_2e
2005	0.04	0.94	0.01	76
2013	0.00	0.11	0.00	35
Change	**-0.04**	**-0.83**	**-0.01**	**-40**
Change (%)	**-95%**	**-88%**	**-100%**	**-53%**

SECTION 10 LOOKING FORWARD

Port-related mobile source emissions have continued to decrease due to the implementation of the CAAP and regulatory programs. There was an 11% increase in throughput in 2013 over 2012 and the 2013 throughput was similar to the 2005 throughput (0.3%). In 2014, the TEU throughput may increase from the previous year as evidenced from the TEU throughput levels in the fiscal year to date comparison of 2014 to 2013. The 2014 EI will reflect the Port's actual throughput level in 2014 and the net emissions benefits associated with the implementation of CAAP measures and regulatory programs. In addition, consistent with the Port's EI development process, the latest available emission factors and methods will be incorporated into the 2014 EI.

The following is a brief description of the anticipated impacts of control programs and measures for each source category, which will result in further reduction of emissions from these port-related sources in 2014:

Ocean-Going Vessels

Continued implementation of CAAP measures, including the use of shore power for vessels at berth and the Port's vessel speed reduction program, will result in significant emission benefits. In 2014, CARB's marine fuel regulation requiring the use of lower sulfur fuel in main and auxiliary engines and auxiliary boilers will lower the limit to 0.1% S fuel resulting in additional reductions. Also starting January 1, 2014, CARB's ships at berth regulation commences, although it is expected to have a slow start as vessel fleets and terminals may not be ready to shore power at the beginning of 2014. This at berth regulation will have an impact as the year progresses and in future years.

Harbor Craft

Under the CARB regulation for commercial harbor craft, in-use, newly purchased, or replacement engines in crew boats, commercial fishing vessels, ferries, excursion vessels, tug boats, pilot boats, workboats, and tow boats must meet EPA's most stringent emission standards per a compliance schedule set by CARB for in-use engines and for new engines at the time of purchase. For harbor craft with home ports in the SoCAB, the compliance schedule for in-use engine replacements will continue in a phased-in approach.

Cargo Handling Equipment

The continued implementation of the CAAP measure and CARB's in-use regulation for cargo handling equipment will result in emissions benefits due to the replacement of existing older equipment with newer and cleaner equipment powered by on-road engines or the cleanest engine available.

Locomotives

The 1998 memorandum of understanding (MOU) among the Class 1 railroads (UP and BNSF), CARB, and EPA requires the accelerated introduction of cleaner locomotives in SoCAB. Specifically, the MOU required BNSF and UP to achieve fleet-wide average NO_x emission rates meeting EPA's Tier 2 line haul emission standard for their locomotives operating in SoCAB by 2010, a goal that the railroads have met. Additional reductions in subsequent years will be slower now that the MOU is in force but further reductions will occur as the railroads continue to turn over their nation-wide fleets. The switching fleet is now composed almost entirely of ultra-low emission locomotives.

Heavy-Duty Vehicles

Implementation of the Clean Trucks Program has resulted in significant emission reductions due to replacement of older trucks with newer ones that meet more stringent emission standards. The final ban, which restricted pre-2007 trucks, came into effect January 1, 2012. In future years, the Port will continue the efforts to increase the population of alternatively powered trucks serving the Port, which will reduce emissions of DPM and, depending on the fuel source or technology employed, may reduce emissions of other pollutants.

APPENDIX A

AIR QUALITY REGULATORY AND SAN PEDRO BAY PORTS CLEAN AIR ACTION PLAN MEASURES AND PROGRAMS

REGULATORY AND SAN PEDRO BAY PORTS CLEAN AIR ACTION PLAN MEASURES

Sources of emissions evaluated in this inventory include five mobile source categories: OGVs, HDVs, CHE, harbor craft and locomotives. The responsibility for the control of emissions from these sources falls under the jurisdiction of local [South Coast Air Quality Management District (SCAQMD)], state [California Air Resources Board (CARB)] or federal [U.S. Environmental Protection Agency (EPA)] agencies. The ports of Long Beach and Los Angeles adopted the landmark Clean Air Action Plan (CAAP) in November 2006 to curb port-related air pollution by at least 45% in five years. On November 22, 2010, the harbor commissioners of the two ports unanimously approved an update to the CAAP (2010 CAAP Update) which set even more aggressive goals for reducing air pollution and health risks from port operations through the establishment of the San Pedro Bay Standards.

San Pedro Bay Standards

The San Pedro Bay Standards are a statement of the ports' commitment to significantly reduce the air quality impacts from port operations. Achievement of the standards listed below will require diligent implementation of all of the known CAAP measures and additional aggressive actions to seek out further emissions and health risk reductions from port-related sources from strategies that will emerge over time.

Health Risk Reduction Standard

To complement the CARB's emission air pollution reduction plan programs including Diesel Risk Reduction Plan, the ports of Long Beach and Los Angeles have developed the following standard for reducing overall port-related health risk impacts, relative to 2005 emissions level:

- By 2020, reduce the population-weighted cancer risk of ports-related DPM emissions by 85% in highly-impacted communities located in proximity to port sources and throughout the residential areas in the port region.

Emissions Reduction Standard

Consistent with the ports' commitment to meet their fair-share of mass emission reductions of air pollutants, the ports of Long Beach and Los Angeles have developed the following standards for reducing air pollutant emissions from port-related activities, relative to 2005 emission levels:

- By 2014, reduce emissions of NO_x by 22%, of sulfur oxides (SO_x) by 93%, and of DPM by 72% to support attainment of the national fine particulate matter ($PM_{2.5}$) standards.
- By 2023, reduce emissions of NO_x by 59%, of SO_x by 93%, and of DPM by 77% to support attainment of the national and federal 8-hour ozone standards and national fine particulate matter ($PM_{2.5}$) standards.

Regulatory programs and CAAP measures developed to reduce emissions from Port-related activities are described by source category.

Ocean-Going Vessels

IMO Emission Standards for Marine Propulsion Engines
In 1997, the International Maritime Organization (IMO) adopted emission standards for oxides of nitrogen (NO_x) from marine propulsion engines, which are contained in Annex VI to the International Convention for the Prevention of Pollution from Ships (MARPOL), regulations for the Prevention of Air Pollution from Ships.[1] On July 21, 2008, the United States ratified MARPOL Annex VI and signed into law the Maritime Pollution Protection Act of 2008. The requirements became enforceable through the Act to Prevent Pollution from Ships (APPS) in January 2009. Engine manufacturers have been certifying engines to the Annex VI NO_x limits since 2000, as the standards became retroactive once Annex VI was ratified.

In October 2008, the IMO adopted amendments by introducing new Tier 2 and Tier 3 NO_x engine emission rate limits. The NO_x limits apply to marine diesel engines installed on newly built ships based on the rated engine speed and the year the ship is built.[2] Tier 3 standards are required for vessels that are built on or after January 1, 2016 and operate in an Emissions Control Area (ECA).

Existing ships built between 1990 and 2000, with marine diesel engines less than 5,000 kW and a per cylinder displacement 90 liters or more are subject to retrofit requirements of the Tier 1 NO_x standards, provided that an approved method, by the vessel's flag state, for that engine has been certified and notification has been submitted to IMO . Major conversions, as defined by IMO, of marine diesel engines on all existing ships built prior to January 1, 2000, would be subject to the Tier 1 NO_x standards.

At its 65th session of May 2013, the Marine Environment Protection Committee (MEPC) agreed to consider an amendment to postpone the implementation of the Tier 3 NO_x standards within ECAs from 2016 to 2021. The United States along with Canada, Denmark, Germany, and Japan provided information in a paper that challenged the reasoning behind that decision and recommended that the Committee reconsider its decision and retain the original implementation date of January 2016. The Tier 3 NO_x Standards applicable to marine diesel engines that are installed on ships constructed on or after 1 January 2016 and which operates in the North American Emission Control Area or the U.S. Caribbean Sea Emission Control Area that are designated for the control of NO_x emissions were adopted during the 66th session of MEPC in March 2014, and are expected to be operative in September 2015.

The Tier III requirements do not apply to a marine diesel engine installed on a ship constructed prior to 1 January 2021 of less than 500 gross tonnage, of 24 m or over in length, designed and used solely, for recreational purposes.

The MEPC also approved draft amendments to MARPOL Annex VI regarding adoption of Annex VI NO_x regulations for engines solely fuelled by gaseous fuels. The committee is expected to adopt this amendment during MEPC 67 meeting.

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[1] IMO, *http://www.imo.org/ourwork/environment/pollutionprevention/airpollution/pages/air-pollution.aspx*
[2]IMO, *http://www.epa.gov/otaq/regs/nonroad/marine/ci/mepc58-23-annexes13-14.pdf*, Annexes 13 and 14 to the report of the Marine Environment Protection Committee on its fifty-eighth session (MEPC 58/23), Pages 19 and 21

The NO_x limits for marine diesel engines by tier level, based on the engine's speed in revolutions per minute (rpm) are summarized in Table A.1 below:

Table A.1: NO_x Limits for Marine Diesel Engine, g/kW-hr

Tier	Keel Laid Date	NO_x Limits, g/kW-hr Engine Speed (n), rpm		
		rpm<130	130 ≤ rpm < 2000	rpm ≥ 2000
Tier 1	1/1/2000 – 12/31/2010	17	$45 \times n^{-0.20}$	9.8
Tier 2	1/1/2011 – 12/31/2015	14.4	$44 \times n^{-0.23}$	7.7
Tier 3 (ECA)	1/1/2016 +	3.4	$9 \times n^{-0.20}$	2.0

IMO Low Sulfur Fuel Requirements for Marine Engines
In October 2008, the IMO adopted amendments under MARPOL Annex VI, placing a global limit on marine fuel sulfur content of 3.5% by 2012, reduced from the previous 4.5% sulfur limit. The sulfur limit will be further reduced to 0.5% by 2020, or at the latest, by 2025, pending a technical review in 2018. In all ECAs, fuel sulfur content was capped at 1.0% in 2012, and will be further reduced to 0.1% sulfur in 2015. The waters within 200 miles of North American coasts were officially designated an ECA on March 26, 2010.

IMO Energy Efficiency Design Index (EEDI) for International Shipping
On July 15, 2011, IMO amended MARPOL to include energy efficiency standards for new ships through the designation of an Energy Efficiency Design Index (EEDI).[3] The EEDI standards are expressed as percent emissions reductions from reference lines established for each ship class and are applicable to container ships, general cargo ships, refrigerated cargo carriers, gas tankers, oil and chemical tankers, dry bulk carriers, and combination dry/liquid bulk carriers. The reference lines by ship class were developed by fitting a curve through data on EEDI values of the existing fleet. At the 66th session of MEPC held March 31 to April 4, 2014, the committee adopted an amendment to extend the EEDI implementation to RoRo cargo, passenger ships, LNG carriers, and cruise passenger ships. The amendment is expected to be operative in September 2015.

By requiring minimum efficiency levels for ships, reductions in fuel consumption will subsequently result in reductions of CO_2 emissions and other pollutants emitted into the air. The EEDI standards were included in the new chapter 4 of MARPOL Annex VI are phased in over several years as follows:

- 2013: meet or exceed applicable reference line
- 2015: 10% reduction from the applicable reference line
- 2020: 20% reduction from the applicable reference line 2025: 30% reduction from the applicable reference line

[3] EPA, *http://www.epa.gov/otaq/regs/nonroad/marine/ci/420f11025.pdf*

EPA Final Regulation – Control of Emissions of Air Pollution from Locomotive and Marine Compression Ignited Engines Less than 30 Liters per Cylinder

On March 14, 2008, the EPA finalized a three part program designed to dramatically reduce emissions from marine diesel engines with displacement (i.e. swept volume) less than 30 liters per cylinder.[4] EPA lists the following categories for compression ignition diesel marine engines based on engine displacement per cylinder:

- Category 1: less than 5 liters per cylinder
- Category 2: equal to 5 liters per cylinder, but less than 30 liters per cylinder
- Category 3: equal to or greater than 30 liters per cylinder

The EPA regulation impacts some marine propulsion engines and the marine auxiliary engines used on vessels. When fully implemented, this rule will cut particulate matter (PM) emissions from these engines by as much as 90% and NO_x emissions by as much as 80%.

The regulations introduced two tiers of standards – Tier 3 and Tier 4 – which apply to both new and remanufactured marine diesel engines, as follows:

- *Newly-built engines:* Tier 3 standards apply to engines used in commercial, recreational and auxiliary power applications (including those below 37 kW that were previously covered by non-road engine standards). The emissions standards for newly-built engines are phasing in beginning in 2009. Tier 4 standards apply to engines above 600 kW or 800 horsepower (hp) on commercial vessels based on the application of high-efficiency catalytic after-treatment technology, phasing in beginning in 2014.

- *Remanufactured engines:* The standards apply to commercial marine diesel engines above 600 kW when these engines are remanufactured and will take effect as soon as certified systems become available.

[4] EPA, *http://www.epa.gov/otaq/marine.htm#regs*

EPA Emission Standards for Marine Diesel Engines above 30 Liters per Cylinder (Category 3 Engines)
In 2004, Tier 1 standards for Category 3 marine engines went into effect, establishing NO_x standards based upon internationally negotiated emissions rates and readily available emissions-control technology. In December 2009, EPA finalized emission standards for Category 3 marine diesel engines installed on U.S. flagged vessels as well as marine fuel sulfur limits that are equivalent to the amendments adapted by MARPOL Annex VI in 2008. The final regulation establishes stricter standards for NO_x as summarized in Table A.2.

Table A.2: EPA Emission Standards for Category 3 Marine Diesel Engines, g/kW-hr

Tier Level	Model Year	Engine Speed (n), rpm	NO_x g/kW-hr	HC g/kW-hr	CO g/kW-hr
Tier 1	2004	rpm < 130 130 ≤ 2,000 rpm ≥ 2,000	17 $45 \times n^{-0.20}$ 9.8	Not Applicable	Not Applicable
Tier 2	2011	rpm < 130 130 ≤ 2,000 rpm ≥ 2,000	14.4 $44 \times n^{-0.23}$ 7.7	2.0	5.0
Tier 3	2016	rpm < 130 130 ≤ 2,000 rpm ≥ 2,000	3.4 $9.0 \times n^{-0.20}$ 2.0	2.0	5.0

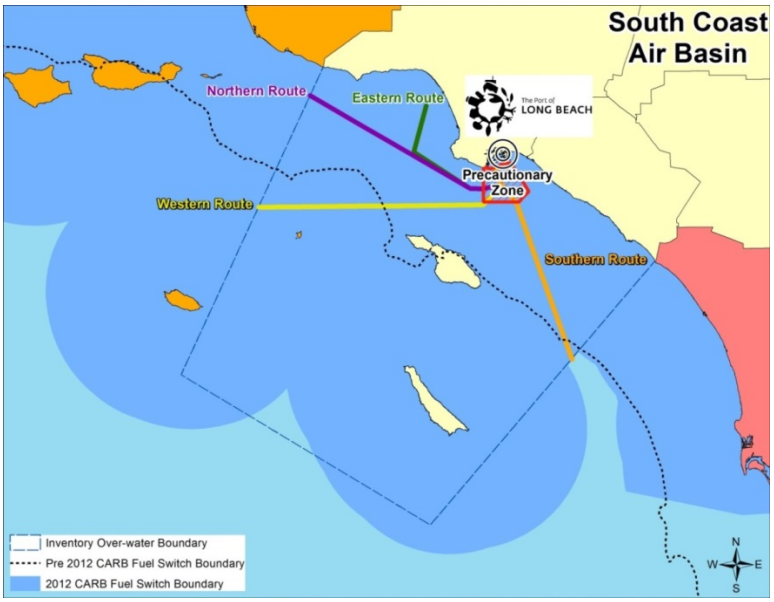
Over recent years, several cruise lines have applied for flexibility under the IMO requirements to support the development of exhaust gas cleaning technology. In August 2013, Carnival Corporation and plc (Carnival) received an approval from United States Coast Guard and USEPA for a trial program under which 32 Carnival ships will be exempt from ECA low sulfur fuel requirement in support of development of exhaust gas cleaning technology that has potential to meet or exceed 2015 fuel sulfur standard ECA requirements, as well as provide additional benefits in the reduction of particulate matter and black carbon, at a lower cost than using lower sulfur fuel. The exhaust cleaning systems will be installed between 2014 and 2016 during ship's dry-dock schedule[5].

CARB Low Sulfur Fuel for Marine Auxiliary Engines, Main Engines and Auxiliary Boilers
On July 24, 2008, CARB adopted low sulfur fuel requirements for marine main engines, auxiliary engines, and auxiliary boilers within 24 nautical miles (nm) of the California coastline. Enforcement of the regulation began on July 1, 2009 requiring the use of marine gas oil (MGO) with a sulfur content less than or equal to 1.5% by weight or marine diesel oil (MDO) with a sulfur content less than or equal to 0.5% by weight. Amendments to the low sulfur fuel requirements were approved by the Office of Administrative Law and starting on August 1, 2012, the maximum fuel sulfur limit for MGO decreased from 1.5% to 1.0%, while the fuel sulfur limit for MDO remained at 0.5 %. Starting January 1, 2014, the use of MGO or MDO with sulfur content equal to or less than 0.1 % will be required in all engines and boilers.

[5] EPA, *http://www.epa.gov/otaq/documents/oceanvessels/carnival-letter-epa-uscg-response-8-8-13.pdf*

The amendment to the low sulfur fuel regulation also allowed for the expansion of the regulatory boundary in Southern California to be consistent with the Contiguous Zone. In December 2011, CARB started enforcement of the expanded regulatory boundary. This new boundary includes the region 24 nm from the California shoreline, including 24 nm from the shoreline of the Channel Islands. There is also a small region near the north end of the Santa Barbara Channel that was excluded from the regulatory boundary to encourage vessels to use the established shipping lanes in the Channel. The amended regulatory area is shown in Figure A.1.[6]

Figure A.1: Amended CARB Marine Fuel Regulatory Area



CARB Regulation to Reduce Emissions from Diesel Auxiliary Engines on Ocean-going Vessels While at Berth at a California Port (CARB's at-Berth Emissions Reduction regulation)

On December 6, 2007, CARB adopted a regulation to require that auxiliary diesel engines on OGVs be shut down for specified percentages of fleet's visits and also the fleet's at-berth auxiliary engine power generation be reduced by the same percentages.[7] While the use of shore power is expected to be the primary means of compliance, as an alternative, vessel operators may employ any combination of clean emissions control technologies to achieve equivalent reductions. This regulation is applicable to container, cruise, and refrigerated cargo vessels. By 2014, vessel operators relying on shore power are required to shut down their auxiliary engines at berth for 50% of the fleet's vessel visits and also reduce their onboard auxiliary engine power generation by 50%. The percentage of required shore power visits per fleet will increase to 70% in 2017 and 80% in 2020. For vessel operators choosing the emission reduction equivalency alternative, the regulation requires a 10% reduction in OGV hoteling emissions starting in 2010, increasing to an 80% reduction by 2020.

[6] CARB, *http://www.arb.ca.gov/regact/2011/ogv11/ogv11appc.pdf*
[7] CARB, *http://www.arb.ca.gov/regact/2007/shorepwr07/shorepwr07.htm.*

In December 2013, CARB issued a regulatory advisory[8] that provides relief to those vessel fleets that have shown good faith effort in complying with various requirements of at-berth regulation but need flexibility between January 1 and June 30, 2014, under five scenarios:

1) The vessel fleet visiting the port is equipped to receive shore power but the terminal's berth is not ready to provide shore power
2) During calendar year 2014, a vessel makes its first commissioning visit to a terminal (one commissioning visit per terminal), and during the visit, the auxiliary engines operate longer than three hours.
3) During the first and second calendar quarter of 2014, a vessel uses shore power but fails to meet the three/five-hour time limit for connecting or disconnecting shore power.
4) During the first and second calendar quarters of 2014, a vessel is unable to use shore power due to delays in receiving shore power equipment and making retrofits to the vessel to utilize the equipment.
5) During the first and second calendar quarters of 2014, vessels are using an alternative technology (while that technology is undergoing in-use emission testing) to help comply with the At-Berth Regulation.

In order to qualify for temporary relief as described above, vessel fleet operators will have to submit certain documentation so that CARB can ensure good faith effort.

CARB Regulation Related to Ocean-going Vessel Onboard Incineration
This regulation was adopted by CARB in 2005 and was amended in 2006. As of November 2007, all cruise ships and ocean-going vessels of 300 registered gross tons or more are prohibited from conducting on-board incineration within 3 nm of the California coast. Enactment of this regulation reduces toxic air contaminants such as dioxins and toxics metals exposure to the public, as well as PM and hydrocarbon emissions generated during incineration.

CAAP Measure- OGV1; Vessel Speed Reduction (VSR) Program
In May 2001, the Port of Long Beach, the Port of Los Angeles, EPA Region 9, CARB, SCAQMD, the Pacific Merchant Shipping Association (PMSA), and the Marine Exchange of Southern California entered into a Memorandum of Understanding (MOU) for OGVs to voluntarily reduce their speed to 12 knots at a distance of 20 nautical miles (nm) from Point Fermin through the year 2004. With reduced speeds, less power is needed from the main engine, which in turn reduces NO_x emissions and fuel consumption.

OGV1 continues and expands the VSR program by continuing the 12-knot VSR zone between Point Fermin and the 20 nm distance, and expanding it to 40 nm from Point Fermin. There are three primary implementation approaches for this measure: 1) continuation of the voluntary program, 2) incorporation of VSR requirements in new leases, and 3) CARB's VSR strategy. Parallel to the voluntary, incentive based strategies, compliance with the VSR program to 40 nm from Point Fermin will be negotiated into new and re-negotiated lease requirements.

[8] CARB, *http://www.arb.ca.gov/ports/shorepower/forms/regulatoryadvisory/regulatoryadvisory12232013.pdf*

VSR was identified as an early action measure in CARB's Climate Change Scoping Plan developed under the California Global Warming Solutions Act, or Assembly Bill 32 to reduce greenhouse gas emissions. The ports intend to work closely with CARB to facilitate a statewide VSR program and ensure that the programs are aligned.

Port of Long Beach Green Flag Program
The Port has committed as much as $2.2 million a year to encourage participation in the voluntary vessel ship speed reduction program. Vessels that dock at the Port of Long Beach earn a Green Flag Environmental Achievement Award when they attain 100% compliance with the voluntary vessel speed reduction program between Point Fermin and the 20 nm distance for a 12-month period. Carriers that achieve a 90% or better compliance rate in a 12-month period are eligible for a 15% reduction in dockage otherwise payable to the Port (Green Rate) in the following year.

In 2008, the Board of Harbor Commissioners approved an expansion of the VSR compliance zone to 40 nm from Point Fermin starting in January 2009. Vessel operators that achieve a 90% compliance rate to 40 nm of Point Fermin within a 12-month period receive an incentive rate that is 25% less than regular dockage otherwise payable to the Port (Green Plus Rate) in the following calendar year. In 2013, the VSR compliance rate was 99% within the 20 nm of the Port and 88% within the 40 nm zone.

CAAP Measure OGV2; Reduction of At-Berth OGV Emissions
OGV2 requires the use of shore power to reduce hoteling emissions at all container, one crude, and one bulk terminal at the Port of Long Beach and at all container and cruise terminals and one liquid bulk terminal at the Port of Los Angeles by 2014. This measure also facilitates CARB's at-berth emissions reduction regulatory requirement but also accelerates the use of shore-power including vessel categories not covered under the state's shore power regulation, such as tankers. This measure also requires demonstration and application of alternative emissions reduction technologies for ships that are not good candidates for shore power, to be facilitated through the Technology Advancement Program (TAP).

CAAP Measures-OGV3 and 4; OGV Main & Auxiliary Engine Fuel Standards
For vessels subject to a lease requirement, this measure requires the use of lower sulfur distillate fuels with a maximum sulfur content of 0.2% in the auxiliary and main engines of OGVs within 40 nm of Point Fermin and at berth until the requirements under the CARB low sulfur regulation and ECA come into effect.

CAAP Measures OGV5 and 6; OGV Main &Auxiliary Engine Emissions Improvements and Green Ship Award Program
OGV5 maximizes the early introduction and preferential deployment of vessels to the San Pedro Bay Ports with cleaner/newer engines meeting the new IMO NO_x standard for ECAs. Measure OGV6 focuses on reducing diesel particulate matter (DPM) and NOx from the legacy fleet through identification and deployment of effective emission reduction technologies.

On June 18, 2012 the Port of Long Beach Board of Harbor Commissioners adopted the voluntary, incentive-based Green Ship Award program[9]. Vessels with main engines meeting IMO's Tier 2 or Tier 3 standards are eligible for incentives ranging from $2,500 to $6,000 per ship call. The Green Ship program goal is for 50 percent of all ship calls at the Port of Long Beach be made with Tier 2 vessels and 40 percent with Tier 3 vessels by 2023.

Harbor Craft

EPA Emission Standards for Harbor Craft Engines
On March 14, 2008, EPA finalized new emission standards for new Category 1 and Category 2 diesel engines rated over 50 hp used for propulsion in most harbor craft.[10] The new Tier 3 engine standards began phase-in starting in 2009. The more stringent Tier 4 engine standards, based on the application of high-efficiency catalytic after-treatment technologies, will phase in beginning in 2014 and will apply only to commercial marine diesel engines greater than 800 hp. The regulation also includes requirements for remanufacturing commercial marine diesel engines greater than 800 hp.

CARB Regulation to Reduce Emissions from Diesel Engines on Commercial Harbor Craft
In November 2007, CARB adopted a regulation that reduces DPM and NO_x emissions from new and in-use commercial harbor craft operating in Regulated California Waters (i.e., internal waters, ports, and coastal waters within 24 nm of the California coastline.[11] Under CARB's definition, commercial harbor craft includes tugboats, towboats, ferries, excursion vessels, workboats, crew boats, and fishing vessels.

All in-use, newly purchased, or replacement engines must meet the EPA's most stringent emission standards according to the compliance schedule set by CARB. In addition, propulsion engines on all new ferries acquired after January 1, 2009, with a capacity of more than 75 passengers, are required to apply best available control technologies to engines to meet EPA Tier 2 or Tier 3 marine engine standards at the time of vessel acquisition. For harbor craft home ported in the SCAQMD, the compliance schedule is accelerated by two years compared to statewide requirements. Enforcement of the CARB commercial harbor craft regulation began in August 2012 after the EPA granted CARB authorization to enforce the emissions/engine standard provisions under the Clean Air Act.[12] CARB amended the commercial harbor craft regulation in 2010 to include crew and supply vessels, barges and dredges, but is deferring enforcement of the emissions requirements for these harbor craft until they receive an authorization from the EPA. As of May 2013, CARB has approved three marine engine rebuild kits that can be used to meet Tier 2 standards.[13]

[9] POLB, *http://www.polb.com/environment/greenship.asp*
[10] USEPA, *http://www.epa.gov/otaq/standards/nonroad/marineci.htm*
[11] CARB, *http://www.arb.ca.gov/regact/2010/chc10/chc10.htm*
[12] CARB, *http://www.arb.ca.gov/enf/advs/advs436.pdf*
[13] CARB, *http://www.arb.ca.gov/ports/marinevess/harborcraft/documents/alttech.pdf*

CARB Low Sulfur Fuel Requirement for Harbor Craft
Starting January 1, 2006 harbor craft operating in the SCAQMD are required to use ultra-low sulfur diesel (ULSD) fuel, which has a sulfur content limit of 15 parts per million (ppm) and a lower aromatic hydrocarbon content. While the use of ULSD results in NO_x and DPM reductions, the use of low sulfur fuel in harbor craft retrofit with emissions control devices such as diesel particulate filters (DPFs) can effectively reduce PM by an additional 85% or more.

CAAP Measure HC1- Performance Standards for Harbor Craft
In addition to the implementation of CARB's commercial harbor craft regulation and the EPA's Tier 3 and 4 standards, HC1 seeks to further reduce emissions by encouraging repowering all harbor craft home based in the San Pedro Bay to Tier 3 levels within five years after the engines become available; and requiring the use of shore power for tub boats. The ports also plan to accelerate harbor craft emission reductions through emerging technologies such as the hybrid tug, more-efficient engine configurations, alternative fuels, and the use of incentives or voluntary measures to encourage engine repower or retrofit.

Cargo Handling Equipment

EPA Emission Standards for Non-Road Diesel Powered Equipment
The EPA's Tier 1, Tier 2, Tier 3, and Tier 4 (interim Tier 4 and final) emissions standards for non-road diesel engines require compliance with progressively more stringent standards for HC, CO, DPM, and NO_x.[14] Tier 4 standards for non-road diesel powered equipment complement the 2007+ on-road heavy-duty engine standards which require 90% reductions in DPM and NO_x compared to previous levels. In order to meet these standards, engine manufacturers are producing new engines with advanced emissions control technologies similar to those already in place for on-road heavy-duty diesel vehicles. These standards for new engines were phased in starting in 2008 with smaller engines until all but the very largest diesel engines meet NO_x and PM standards in 2015. Currently, the interim Tier 4 standards include a 90% reduction in PM and a 60% reduction in NO_x.

CARB Cargo Handling Equipment Regulation
In December 2005 CARB adopted a regulation designed to reduce emissions from cargo handling equipment (CHE) at ports, such as yard tractors and forklifts. The regulation calls for the replacement or retrofit of existing engines with engines that use Best Available Control Technology (BACT). Beginning January 1, 2007 the regulation requires newly purchased, leased, or rented yard tractors to be equipped with a 2007 or later on-road engine or a Final Tier 4 off-road engine. Newly purchased, leased, or rented non-yard tractors are required to be equipped with a certified on-road or off-road engine meeting the current model year standards in effect at the time the engine is added to a fleet. If the engine is a pre-2004 model year, then the highest-level available Verified Diesel Emission Control System (VDECS) must be installed within one year. In-use yard tractors are required to meet either 2007 or later certified on-road engine standards, Final Tier 4 off-road engine standards, or install verified emission controls that result in equivalent or fewer DPM and NO_x emissions than a Final Tier 4 off-road engine. In-use non-yard tractors must install the highest-level available VDECS, and/or replace an on-road or off-road engine meeting the current model year standards. Compliance dates were phased in beginning on December 31, 2007 based on the age of

[14] EPA, *http://www.epa.gov/otaq/standards/nonroad/nonroadci.htm*

the engine and number of equipment in each model year group. In September of 2011, CARB's board adopted an amendment[15] to the original regulation described above. The amendment included a new requirement for annual opacity measurement provided additional flexibility in the options needed to control CHE emissions.

CARB received EPA authorization to enforce the original Cargo Handling Equipment Regulation, including new and in-use engine emission limits in November 2011. As of March 2014, CARB has not received USEPA's authorization to enforce opacity measurement requirements.

CARB New Emission Standards, Test Procedures, for Large Spark Ignition (LSI) Engine Forklifts and Other Industrial Equipment

Since 2007, CARB promulgated more stringent emissions standards for hydrocarbon and oxides of nitrogen combined and implemented emissions test procedures for LSI engines with a horsepower rating of 25 horsepower or greater. The stringent new engine emission standards and test procedures were implemented in two phases. The first phase (2.0 g/hp-hr of HC + NO_x) was implemented for engines built between January 1, 2007 and December 31, 2009. The second phase (0.6 g/hp-hr of HC + NO_x) was implemented for engines built starting in January 1, 2010.[16]

CARB Fleet Requirements for Large Spark Ignition Engines[17]

Initially promulgated in 2007 and amended in 2010, CARB established fleet average emissions requirements for the existing fleet of LSI engines with a horsepower rating of 25 horsepower or greater. The regulation also establishes verification procedures for manufacturers of retrofit emission control systems. The fleet requirements only apply to forklifts, sweepers/scrubbers, industrial tow tractors, and ground support equipment, agricultural and forest operations; boneyard, in-field, operations, retired, and service equipment.

The fleet requirements for HC + NO_x standards were phased in on January 1 of 2009, 2011, and 2013. Depending upon the size of the fleet, the fleet standards vary within the same year of implementation. CARB received USEPA's approval to enforce this regulation on April of 2012.

CAAP Measures CHE1- Performance Standards for CHE

This measure calls for CHE emission reductions beyond CARB's CHE regulation at the time of terminal lease renewal. As of 2007, all CHE purchases must meet the following performance standards of the cleanest available NO_x alternative-fueled engine meeting 0.01 grams per brake horsepower (g/bhp-hr) PM available at time of purchase; or cleanest available NO_x diesel-fueled engine meeting 0.01 g/bhp-hr PM, available at time of purchase. If no engines are available meeting the 0.01 g/bhp-hr PM standard, then operators must purchase the cleanest available engine (either fuel type) and install the cleanest VDEC available.

[15] CARB, *http://www.arb.ca.gov/regact/2011/cargo11/cargo11.htm*
[16] CARB, *http://www.arb.ca.gov/regact/2008/lsi2008/lsi2008.htm.*
[17] CARB, *http://www.arb.ca.gov/regact/2010/offroadlsi10/lsifinalreg.pdf*

As of 2011, all yard tractors operating at the San Pedro Bay Ports are required to meet at a minimum, EPA 2007 on-road or Tier 4 engine emission standards. By the end of 2012, all pre-2007 on-road or pre Tier 4 off-road top picks, forklifts, reach stackers, rubber tired gantry cranes (RTGs), and straddle carriers <750 hp are required to meet at a minimum EPA 2007 on-road engine emission standards or Tier 4 off-road engine emission standards. By the end of 2014, all CHE with engines >750 hp must meet at a minimum the EPA Tier 4 off-road engine standards. Starting in 2007 (until equipment is replaced with Tier 4), all CHE with engines >750 hp were to be equipped with the cleanest available VDECS verified by CARB.

Locomotives

EPA Emissions Standards for New and Remanufactured Locomotives and Locomotive Engines- Latest Regulation Finalized on 14 March 2008[18]

In March 1998, EPA adopted Tier 0 (1973-2001), Tier 1 (2002-2004), and Tier 2 (2005+) emissions standards applicable to newly manufactured and remanufactured railroad locomotives and locomotive engines. These standards require compliance with progressively more stringent standards for emissions of hydrocarbon, CO, NO_x, and DPM. Although the more stringent standard, Tier 2, results in over 40% reduction in NO_x and 60% reduction in DPM compared to Tier 0, the full potential of these reductions will not be realized in the next five years because of the long life of diesel locomotive engines.

In March 2008, EPA adopted its final regulation, "Control of Emissions of Air Pollution from Locomotive and Marine Compression Ignited Engines Less than 30 Liters per Cylinder."[19] When fully implemented, this rule will cut PM emissions from these engines by as much as 90% and NO_x emissions by as much as 80%.

The regulation introduces two tiers of standards[20], Tier 3 and Tier 4, which apply to new locomotives as well as standards for remanufactured locomotives, as follows:

- *Newly-Manufactured Locomotives:* The new Tier 3 emission standards achieved 50% reduction in PM beyond the Tier 2 standards and became effective in 2012. The longer term Tier 4 emission standards which are based on the application of high efficiency catalytic after-treatment technologies for NO_x and PM will become effective in 2015 and will achieve over 80% reduction in PM and NO_x compared with the Tier 2 standards.

- *Remanufactured Locomotives:* The regulation also establishes emission standards for remanufactured Tier 0, 1, and 2 locomotives that would achieve approximately 50% reduction in PM and up to 20% reduction in NO_x.

[18] EPA, *http://www.epa.gov/otaq/regs/nonroad/420f08004.htm.*
[19] EPA, *http://www.epa.gov/otaq/regs/nonroad/420f08004.pdf*
[20] EPA, *http://www.epa.gov/otaq/standards/nonroad/locomotives.htm*

CARB Low Sulfur Fuel Requirement for Intrastate Locomotives
In 2004, CARB adopted a low sulfur fuel requirement for intrastate locomotives. Intrastate locomotives are defined as those locomotives that operate at least 90% of the time within the borders of the state, based on hours of operation, miles traveled, or fuel consumption. Since January 1, 2007 statewide, intrastate locomotives have been required to use CARB off-road diesel fuel that has a sulfur content limit of 15 ppm and a lower aromatic content, mostly applicable to switchers.[21] The use of fuel with lower sulfur and aromatics will result in NO_x and DPM reductions. In addition, use of low sulfur fuel will facilitate retrofitting locomotives with emissions control devices such as DPFs that have potential to reduce DPM by 85%.

CARB Statewide Strategies to Reduce Locomotive and Associated Rail Yard Emissions
To accelerate the implementation of Tier 2 locomotive engines in the SoCAB, CARB and EPA Region 9 entered into an enforceable memorandum of understanding (MOU) in 1998 with the two major Class 1 freight railroads operating in California, Union Pacific (UP) and Burlington Northern Santa Fe (BNSF).[22] The MOU requires UP and BNSF to concentrate their nationwide introduction of Tier 2 locomotives preferentially within the SoCAB, which would achieve 65% reduction in NO_x by 2010. In 2005, CARB entered into another MOU with UP and BNSF to phase out non-essential idling and install idling reduction devices, identify and expeditiously repair locomotives that smoke excessively, and maximize the use of 15 ppm sulfur fuel. The railroads agreed to provide information to CARB documenting their compliance with the MOUs during the second quarter of 2012, and CARB has reported that they expect to complete their evaluation of this data by mid-year 2012.

June 2010 Proposed Railyard Commitments
In addition to the 1998 and 2005 MOUs between CARB and the Class 1 rail operators described above, in June 2010, CARB's staff proposed, on voluntary basis, railyard-specific commitments[23] with Class 1 operators to accelerate further DPM emission and risk reductions at four railyards in the South Coast Air Basin, including the Intermodal Container Transfer Facility (ICTF) located in the port area. The voluntary commitments were to establish reporting and tracking mechanisms and deadlines to accelerate reductions of DPM emissions. The rail commitments would have required Class 1 operators to reduce DPM emissions by 85 percent by 2020 relative to 2005 emission levels within the fence line of each of the four railyards. In December of 2013, CARB's Executive Officer decided not to approve the commitments instead proposed to initiate a comprehensive emissions reduction program for the entire freight sector including rail.[24] CARB will include these goals in the AB 32 Scoping Plan[25] update under sustainable freight strategy initiative and "Vision for Clean Air: A Framework for Air Quality and Climate Planning"[26] document which is CARB's vision for transition to zero- and near-zero emission technologies.

[21] CARB, *http://www.arb.ca.gov/msprog/offroad/loco/loco.htm#intrastate*
[22] CARB, *http://www.arb.ca.gov/msprog/offroad/loco/loco.htm*
Last updated by CARB on April 11, 2011
[23] CARB, *http://www.arb.ca.gov/railyard/commitments/staffreport061710.pdf*
[24] CARB, *http://www.arb.ca.gov/railyard/commitments/commitments.htm*
[25] CARB, *http://www.arb.ca.gov/cc/scopingplan/scopingplan.htm*
[26] CARB, *http://www.arb.ca.gov/planning/vision/vision.htm*

CAAP Measure RL1- Pacific Harbor Line Rail Switch Engine Modernization
RL1 implements the switch locomotive engine modernization and emission reduction requirements included in the operating agreements between the ports and Pacific Harbor Line (PHL). In 2010, PHL and the ports entered into a third amendment to their operating agreements, and in 2012 completed the repower of 16 Tier 2 switcher locomotives meet "Tier 3-plus". "Tier 3-plus" standards have PM emissions that are exceeding Tier 3 PM emission rates but not meeting Tier 4 standards.

CAAP Measure RL2- Class 1 Line-haul and Switcher Fleet Modernization
The focus of this measure is to ensure all of the emission reductions associated with the CARB Class 1 railroads MOU and the 2008 EPA locomotive engine standards are met and appropriately accounted for. The ultimate goal of this measure is that by 2023, all Class 1 locomotives entering the ports will meet emissions equivalent to Tier 3 locomotive standards.

CAAP Measure RL3- New and Redeveloped Near-Dock Rail Yards
This measure focuses on new and redeveloped near-dock rail facilities located on port properties. The goal of this measure is to incorporate the cleanest locomotive, CHE, and HDV technologies into near-dock rail operations. One of the major goals of this measure is to achieve significant reductions in locomotive emissions through the accelerated turnover of the existing locomotive fleet to newer, lower emitting models. The ports will work with regulatory agencies (EPA, CARB and SCAQMD) toward the goal of achieving a line-haul and switcher locomotive fleet with an emissions equivalent of 95% Tier 4 compliant engines operating within the ports, and statewide, as expeditiously as possible.

Heavy-Duty Vehicles

EPA Engine Emission Standards for New 2007+ On-road Heavy-Duty Vehicles
In 2001, CARB adopted EPA's stringent emission standards for 2007+. This regulation requires HDV engine manufacturers to meet a 0.01 g/bhp-hr PM standard starting in 2007, which is 90% lower than the 2004 PM standard of 0.1 g/bhp-hr. The regulation requires a phase-in of a 0.2 g/bhp-hr NO_x standard between 2007 and 2010. By 2010, all engines are required to meet the 0.2 g/bhp-hr NO_x standard, which represents a greater than 90% reduction compared to the 2004 NO_x standard of 2.4 g/bhp-hr.

CARB Heavy-Duty Vehicle On-Board Diagnostics Requirement
In 2005 CARB adopted a comprehensive HDV On-Board Diagnostics (OBD) regulation, which ensures that the increasingly stringent HDV emissions standards being phased in are maintained throughout the vehicle's useful life. The OBD regulation requires manufacturers to install a system in HDVs to monitor virtually every emissions related component on the vehicle. The OBD regulation was phased in beginning with the 2010 model years with full implementation required by 2016.

CARB Ultra-Low Sulfur Diesel (ULSD) Fuel Requirement
In 2003 CARB adopted a regulation requiring that diesel fuel produced or offered for sale in California for use in any on-road or non-road vehicular diesel engine (with the exception of locomotive and marine diesel engines) contain no more than 15 ppm of sulfur by weight statewide, beginning in June 2006. This ULSD fuel is needed in order for retrofit technologies, such as diesel particulate filters, to work successfully.

CARB Regulation for Reducing Emissions from On-road Heavy-Duty Diesel Trucks Dedicated to Goods Movement at California Ports
As a part of CARB's emissions reduction plan for ports and goods movement in California, in December 2007, CARB's Board adopted a regulation to modernize the class 8 drayage truck fleet, trucks with gross vehicle weight rating greater than 33,000 pounds that operate at California's ports. This objective was to be achieved in two phases:

1. By December 31, 2009, all pre-1994 model year (MY) engines were to be retired or replaced with 1994 and newer MY engines. Furthermore, all drayage trucks with 1994 – 2003 MY engines were required to achieve an 85% PM emission reduction through the use of an ARB approved Level 3 VDECS.

2. By December 31, 2013, all trucks operating at California ports must comply with the 2007+ on-road heavy-duty truck engine standards.

In December 2010, CARB's Board acted on amendments to include Class 7 drayage trucks (with gross vehicle weight rating greater than 26,000 pounds and less than 33,001 pounds) in the drayage truck regulation as follows: (a) to accelerate the filter requirement to January 1, 2012 for Class 7 drayage trucks in the South Coast Air Basin, and (b) to require Class 7 drayage trucks statewide to operate with 2007 or newer emission standard engines by January 1, 2014.

CARB also expanded the definition of drayage trucks to include those non-compliant trucks that may not directly come to the ports to pick up or drop off cargo but that engage in moving cargo, destined to or originated from port facilities, to or from near-port facilities or rail yards. This practice, known as "dray-off," reduces the effectiveness of the drayage truck regulation because otherwise non-compliant trucks still operate near the ports and rail yards.

CARB staff is proposing amendments to the current regulation to assist small fleets, low mileage fleets, and fleets operating exclusively in certain areas with cleaner air; provide new opportunities for fleet owners to access public incentive funds; and recognize fleet owners that made early investments to comply. These amendments were approved by CARB board during the April 2014 board hearing[27]. None of the amendments directly affect drayage truck requirements.

[27] CARB, *http://www.arb.ca.gov/msprog/onrdiesel/documents/faqamend14.pdf*

CARB On-Road Heavy-Duty Diesel Vehicles (In-Use) Regulation
In December 2008, CARB adopted a regulation that requires existing HDVs to be replaced or retrofitted to meet the latest NO_x and PM Best Available Control Technology (BACT). By January 1, 2021, all model year 2007 class 8 drayage trucks are required to meet NO_x and PM BACT (i.e. 2010+ EPA engine standards). Model year 2008 and Model year 2009 on-road heavy-duty engines must be replaced with 2010+ engines by January 1, 2022 and January 1, 2023 respectively.

CARB Heavy-Duty Vehicle Greenhouse Gas Emission Reduction Regulation
In December 2008, CARB adopted a new regulation to reduce greenhouse gas emissions by improving the fuel efficiency of heavy-duty tractors that pull 53-foot or longer box-type trailers through improvements in tractor and trailer aerodynamics and the use of low rolling resistance tires. All pre-2012 model year tractors that pull affected trailers, are required to use SmartWay verified low rolling resistance tires beginning January 1, 2012. Pre-2012 model year 53-foot or longer-type box trailers are required to be SmartWay certified or retrofitted with SmartWay verified technologies by December 31, 2012 with the exception of 2003-2008 model year refrigerated-van trailers equipped with 2003 or later transport refrigeration units which will have a compliance phase-in between 2017 and 2019. Drayage tractors and trailers that operate within a 100-mile radius of a port or intermodal rail yard are exempt from this regulation.

In December 2013, CARB board approved new regulations that aligned California's GHG emission standards and test procedures[28] adopted in 2008 with those of the federal Phase 1 GHG regulation[29]. Built upon phase 1 standards, EPA and National Highway Traffic Safety Administration (NHTSA) are working on proposing stricter GHG standards for new medium and heavy-duty engines and vehicles, called Phase 2[30]. These two federal agencies are expected to release Notice of Proposed Rule Making (NPRM) by March of 2015 and adoption of the regulation by 2016. This effort may include new national GHG emission reduction requirements for trailers. CARB staff is working closely with U.S. EPA and NHTSA to develop Phase 2.

CAAP Measures HDV1- Performance Standards for On-road Heavy-Duty Vehicles; Clean Trucks Program
The ports of Long Beach and Los Angeles Clean Trucks Programs progressively banned older trucks from operating at the two ports. The ban was implemented in three phases as follows:

1. By October 1, 2008 – All pre-1989 trucks are banned from port services.

2. By January 1, 2010 – All 1989-1993 trucks along and un-retrofitted 1994-2003 trucks are banned from port services.

3. By January 1, 2012 – All trucks that do not meet 2007 and later on-road heavy-duty engine standards are banned from port services.

In January 2012, the Port of Long Beach Board of Harbor Commissioners adopted a resolution that includes Class 7 drayage trucks and bans the "dray-off" practice under the Clean Trucks Program.

[28] CARB, *http://www.arb.ca.gov/cc/scopingplan/document/updatedscopingplan2013.htm, Appendix B, page 10*
[29] EPA, *http://www.epa.gov/otaq/climate/regs-heavy-duty.htm*
[30] EPA, *http://www.epa.gov/otaq/climate/regs-heavy-duty.htm*

Greenhouse Gases

Assembly Bill 32 (AB32), the California Global Warming Solutions Act of 2006, established a comprehensive program requiring CARB to develop regulatory and market mechanisms to reduce greenhouse gas (GHG) emissions to 1990 levels by the year 2020 and further reduce GHG emissions to 80% below 1990 levels by 2050. Mandatory caps began in 2012 for significant sources and were to be ratcheted down as needed to meet the 2020 goals.

On October 25, 2007, CARB approved several emission reduction strategies to reduce GHG emissions as early action measures pertaining to goods movement activities for ships, port drayage trucks, cargo handling equipment, and transport refrigeration units.

In December 2008, CARB adopted the Climate Change Scoping Plan to achieve the reductions in GHG emissions mandated in AB 32. On May 2014, CARB approved the first update[31] of the Climate Change Scoping Plan (Scoping Plan). In the updated Scoping Plan, CARB revised the 2020 statewide GHG emission limit to 431 million metric tons of carbon dioxide equivalent (MMT CO2e). The initial Scoping Plan had a budget of 427 MMT CO2e. The change in budget is due to revised global warming potential of greenhouse gases as suggested by United Nations Framework Convention on Climate Change (UNFCCC), international climate agencies using the scientifically updated GWP values in the IPCC's Fourth Assessment Report (AR4)[32] that was released in 2007. CARB used the 100 year GWP climate change programs The AB 32 Scoping Plan contains the main strategies California will use to reduce the GHGs that cause climate change. Several of these measures are targeted at goods movement[33], including ports, and are expected to achieve a combined 3.5 million metric tons of carbon dioxide equivalent. Status of the proposed measures that were included in the original Scoping Plan affecting goods movement has been updated as follows[34]:

- T-2: Low Carbon Fuel Standards Regulation. It was adopted in 2009 setting low carbon intensity targets between 2011 and 2020 and requiring 10% reduction in GHG emissions intensity of transportation fuels used in California by at least 10 percent by 2020. CARB staff is proposing to re-adopt the LCFS regulation in 2014.
- T-5: Ship electrification at ports, previously adopted as regulation in December 2007
- T-6: Goods movement efficiency measures (Port Drayage Trucks regulation adopted in December 2007 and later amended in December 2010 to include class 7 trucks that were not covered under original regulation but found to be engaging in drayage activities at the ports; other measures under development)
- T-7: Heavy-Duty Vehicle GHG Emission Reduction. Previously adopted as regulation in December 2008. Harmonized with EPA and NHTSA Phase 1 standards. Currently CARB is working with the two federal agencies to develop phase 2 standards which are expected to be finalized in 2015.

[31] CARB, *http://www.arb.ca.gov/cc/scopingplan/document/updatedscopingplan2013.htm*
[32] IPCC, *www.ipcc.ch/publications_and_data/publications_ipcc_fourth_assessment_report_synthesis_report.htm*
[33] CARB, *http://www.arb.ca.gov/cc/scopingplan/sp_measures_implementation_timeline.pdf;* page 4
[34] CARB, *http://www.arb.ca.gov/cc/scopingplan/2013_update/appendix_b.pdf*

- T-8: Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP) approved in 2009 with a goal of accelerating the deployment of commercialized hybrid and zero-emission medium and heavy-duty vehicles in California. $5 million in additional HVIP funding was approved as part of the AQIP Funding Plan for Fiscal Year 2013-14, along with an additional one time $10 million appropriation from the Legislature (Senate Bill 359; Corbett, Chapter 415, Statutes of 2013), and HVIP will re-launch in spring 2014.

Sustainable Freight Transport Initiative

In January 2014, CARB adopted Resolution 14-2 which directed staff to engage all interested stakeholders to provide input on the development of a Sustainable Freight Strategy (Strategy) document by the end of 2014. The purpose of the Strategy is facilitate actions that move California towards a sustainable freight transport system that is characterized by zero or near zero emissions by keeping in mind the freight system priorities such as: keeping California's ports and logistics industry competitive; creating jobs in California and training local workers; system reliability, velocity and capacity; integration with the national and international freight transportation system; transition to cleaner, renewable transportation energy sources; and a system that supports healthy, livable communities.

2012 South Coast Air Quality Management District Air Quality Management Plan (AQMP)

The SCAQMD Governing Board adopted the Final 2012 AQMP on December 7, 2012[35]. Currently, South Coast Air Basin is classified as nonattainment for the federal 24-hour $PM_{2.5}$ standards. The region has to achieve attainment by December 2014 and the submittal of the State Implementation Plan (SIP) to EPA by December 2012 is required. Attainment of the 24-hour $PM_{2.5}$ SIP should be demonstrated by 2014 with a 5-year extension option. The 2012 AQMP as mandated by the California Health & Safety Code must demonstrate achievement and maintenance of state and federal ambient air quality standards through adoption of all feasible measures.[36] The 2012 AQMP is an integrated multi-pollutant plan which will demonstrate a strategy to attain the 24-hour $PM_{2.5}$ federal standard by 2014; provide an annual standard $PM_{2.5}$ SIP update and maintenance plan; and provide revisions to the 8-hour ozone SIP, including an update on "black box" measures for 8-hour ozone standard by 2023 and EPA's recently adopted final rule for the implementation of 8-hour ozone standard of 75 ppb by 2032.

NO_x, SO_x, VOC, directly emitted $PM_{2.5}$, and ammonia are major contributors resulting in the formation of $PM_{2.5}$. In the 2012 AQMP, weighing factors in terms of the value in tons per day of emissions reductions relative to ambient concentration improvements of $PM_{2.5}$ are developed to aid in assessing various combinations of different pollutant reduction to achieve the $PM_{2.5}$ goal in 2014. After demonstrating 2014 $PM_{2.5}$ attainment in 2014, the SCAQMD and CARB must demonstrate strategies to attain the 1997 and 2008 8-hour ozone standards in 2023 and 2032.

[35] SCAQMD, *http://www.aqmd.gov/aqmp/2012aqmp/Final/index.html*
[36] California Health and Safety Code, *http://www.leginfo.ca.gov/cgi-bin/displaycode?section=hsc&group=40001-41000&file=40460-40471*

Vision for Clean Air: A Framework for Air Quality and Climate Planning[37]

The Vision for Clean Air is a multi-pollutant (air quality and climate) planning draft document developed in collaboration by CARB, SCAQMD and the San Joaquin Valley Air Pollution Control District to integrate strategies to meet Clean Air Act requirements as part of SIPs/AQMPs, and AB 32 goals, as well as freight transport planning. The 2012 $PM_{2.5}$ AQMP recently finalized by SCAQMD draws upon the framework outlined in the Vision for Clean Air document.

The Vision for Clean Air examines what needs to be done to meet both air quality and climate goals over time. This plan lays out several scenarios that will guide planners to determine combinations of current and future advanced technologies, energy, and efficiency assumptions needed to meet various SIPs, Health Risk and climate goals between now and 2050. The following are the air quality goals used in the scenario development process:

- Achieve the 0.08 ppm 8-hour federal ozone standard by 2023 by reducing NO_x emissions by 80 percent from 2010 levels.
- Achieve the 0.075 ppm 8-hour federal ozone standard by 2032 by reducing NO_x emissions by 90 percent from 2010 levels.
- Reduce greenhouse gas emissions by 80 percent below 1990 levels by 2050. This is equivalent to 85 percent from today's levels.

Freight Sector is one of the key areas included in the scenarios. It covers all five mobile sources operated at the port. The scenarios highlight the acceleration of zero- and near-zero emissions technologies, fuels and electrical energy generation from renewal sources and gains in operational efficiencies to meet the state and local multi-pollutant goals and sustain economic growth.

[37] CARB, *http://www.arb.ca.gov/planning/vision/vision.htm*

APPENDIX B

OCEAN-GOING VESSELS

OGV Findings

The following tables and figures for ocean-going vessels (OGV) are included in the Appendix for as additional findings for those interested in OGV details that may have not been included in the report section. Table B.1 shows the 2013 emissions by vessel subtype for particulate matter (PM_{10} and $PM_{2.5}$), diesel particulate matter (DPM), oxides of nitrogen (NO_x), oxides of sulfur (SO_x), carbon monoxide (CO) and hydrocarbon (HC).

Table B.1: 2013 Ocean-going Vessel Emissions by Vessel Subtype

Vessel Type	PM_{10}	$PM_{2.5}$	DPM	NO_x	SO_x	CO	HC
Auto Carrier	3.4	3.1	3.1	135.3	13.7	14.8	6.8
Bulk - General	5.5	5.0	4.9	217.4	26.2	20.3	8.5
Bulk - Heavy Load	0.1	0.1	0.0	2.2	0.3	0.2	0.1
Bulk - Self Discharging	0.1	0.1	0.1	3.3	0.4	0.3	0.1
Container - 1000	2.2	2.0	2.0	93.0	9.2	9.3	4.3
Container - 2000	2.0	1.8	1.9	83.1	8.0	8.9	4.1
Container - 3000	2.0	1.9	1.8	80.3	8.3	9.3	4.6
Container - 4000	11.2	10.2	9.8	399.7	45.7	51.3	26.7
Container - 5000	9.4	8.6	8.4	351.6	36.2	44.6	24.1
Container - 6000	0.1	0.1	0.1	2.5	0.3	0.3	0.2
Container - 7000	1.2	1.1	1.0	42.7	4.7	5.3	2.7
Container - 8000	15.2	13.9	13.5	537.8	58.8	70.9	38.3
Container - 9000	5.3	4.9	4.8	197.0	20.7	24.6	12.9
Container - 10000	1.5	1.3	1.3	51.0	6.1	6.7	3.5
Container - 11000	3.6	3.3	3.2	131.3	14.4	15.8	8.1
Container - 12000	1.0	0.9	0.9	32.4	4.1	4.1	1.9
Container - 13000	1.5	1.4	1.3	49.0	6.2	6.3	3.1
Container - 14000	0.5	0.5	0.5	17.6	2.1	2.0	1.0
Cruise	8.5	7.7	8.5	360.1	36.1	29.6	11.4
General Cargo	1.8	1.6	1.7	71.2	8.3	6.5	2.7
Ocean Tug	0.1	0.1	0.1	2.3	0.2	0.2	0.1
Miscellaneous	5.0	4.6	4.8	212.9	23.1	17.0	6.2
RoRo	0.3	0.3	0.0	4.4	3.1	0.4	0.2
Tanker - Aframax	10.1	8.9	4.5	222.2	77.6	21.8	9.5
Tanker - Chemical	9.6	8.7	5.3	245.3	68.3	24.9	10.5
Tanker - Handysize	0.3	0.3	0.2	8.0	2.1	0.7	0.3
Tanker - Panamax	8.9	7.8	3.5	187.4	71.1	17.9	7.7
Tanker - Suezmax	8.6	7.9	7.8	314.4	42.1	29.0	11.6
Tanker - ULCC	6.1	5.4	3.7	168.4	40.4	16.0	6.7
Tanker - VLCC	1.0	1.0	0.8	34.4	6.1	3.3	1.4
Total	**126.0**	**114.3**	**99.4**	**4,258.1**	**643.9**	**462.2**	**219.0**

Table B.2 shows the 2013 emissions by vessel subtype for greenhouse gases (GHG) including carbon dioxide equivalent (CO_2E), carbon dioxide, (CO_2), nitrous oxide (N_2O), and methane (CH_4).

Table B.2: 2013 Ocean-going Vessel GHG Emissions by Vessel Subtype, tonnes

Vessel Type	CO_2e	CO_2	N_2O	CH_4
Auto Carrier	6,393	6,282	0.3	0.1
Bulk - General	12,184	11,976	0.7	0.2
Bulk - Heavy Load	130	128	0.0	0.0
Bulk - Self Discharging	180	177	0.0	0.0
Container - 1000	4,280	4,205	0.2	0.1
Container - 2000	3,736	3,673	0.2	0.1
Container - 3000	3,890	3,816	0.2	0.1
Container - 4000	21,310	20,892	1.3	0.5
Container - 5000	16,885	16,551	1.0	0.4
Container - 6000	129	126	0.0	0.0
Container - 7000	2,199	2,156	0.1	0.0
Container - 8000	27,433	26,895	1.7	0.7
Container - 9000	9,681	9,494	0.6	0.2
Container - 10000	2,843	2,787	0.2	0.1
Container - 11000	6,704	6,580	0.4	0.1
Container - 12000	1,911	1,878	0.1	0.0
Container - 13000	2,889	2,837	0.2	0.1
Container - 14000	976	959	0.1	0.0
Cruise	16,771	16,546	0.7	0.2
General Cargo	3,840	3,778	0.2	0.0
Ocean Tug	112	111	0.0	0.0
Miscellaneous	10,704	10,550	0.5	0.1
RoRo	1,472	1,437	0.1	0.0
Tanker - Aframax	25,569	25,022	1.8	0.2
Tanker - Chemical	30,605	29,957	2.1	0.2
Tanker - Handyboat	731	716	0.0	0.0
Tanker - Panamax	24,265	23,734	1.7	0.1
Tanker - Suezmax	19,589	19,274	1.0	0.2
Tanker - ULCC	14,064	13,790	0.9	0.1
Tanker - VLCC	2,839	2,785	0.2	0.0
Total	**274,315**	**269,111**	**16.5**	**4.0**

Flags of Convenience

Most OGVs are foreign flagged ships and approximately 96% of the OGVs that visited the Port in 2013 were registered outside the United States (U.S.). Although only 4% of the individual OGVs are registered in the U.S., they represented 11% of all calls. This is most likely because the U.S. flagged OGVs make shorter, more frequent stops along the west coast. Figures B.1 and B.2 show the breakdown of the ships registered by country or flag, by discrete vessel, and by the number of calls, respectively.

Figure B.1: Flag of Registry, Discrete Vessel

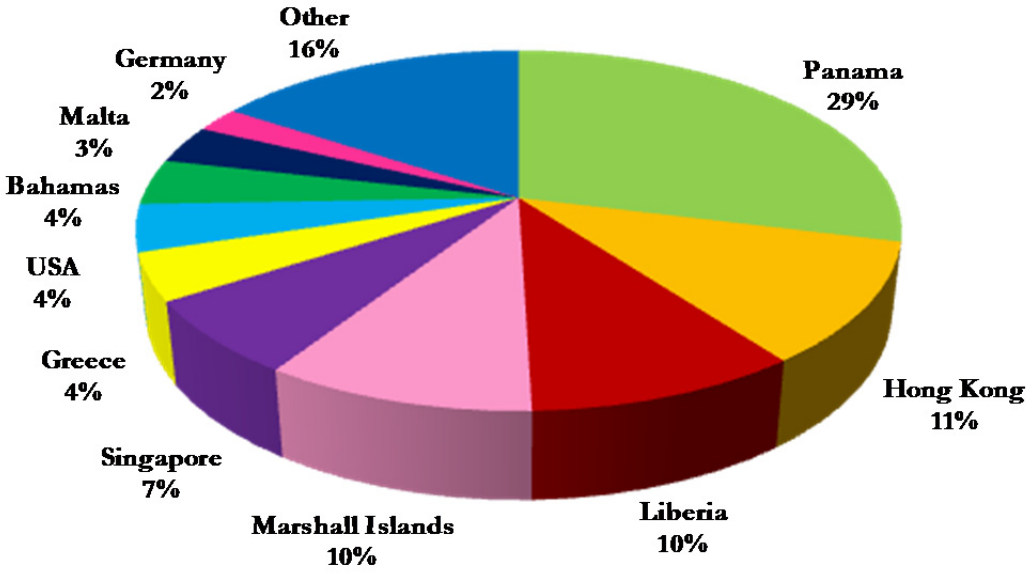
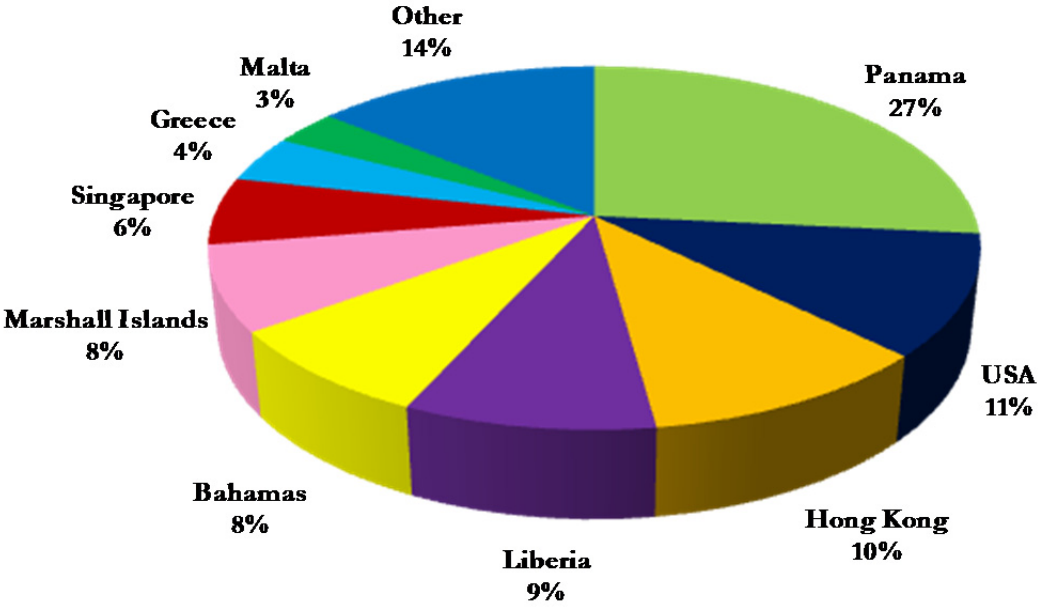


Figure B.2: Flag of Registry, Vessel Call



Next and Last Port of Call

Figures B.3 and B.4 summarize the next (to) port and last (from) port, respectively, for vessels that called in 2013.

Figure B.3: Next (To) Port

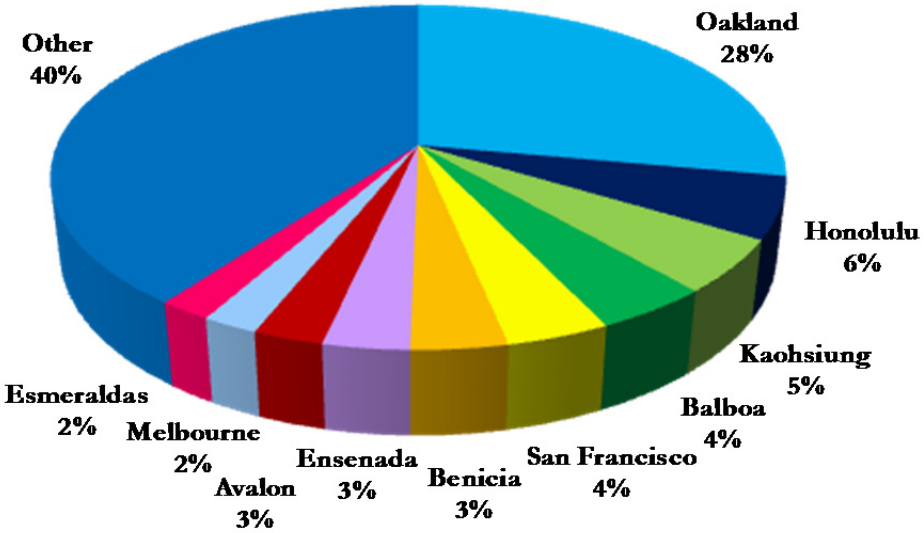
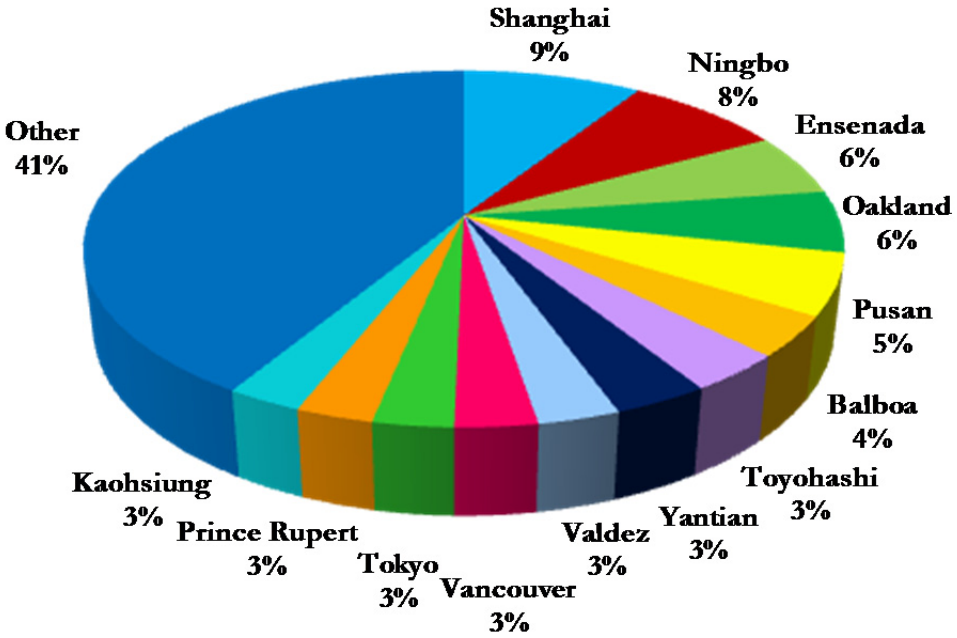


Figure B.4: Last (From) Port



Vessel Characteristics

Table B.3 summarizes the average vessel and engine characteristics by vessel type. The average values for year built, deadweight (DWT), speed, and engine power are based on the specific vessels that called at the Port. Please note that the main engine power is total power installed and not on a per engine basis and the units are in kilowatts (kW).

Table B.3: 2013 Port of Long Beach Vessel Type Characteristics

Vessel Type	Year Built	Age (Years)	DWT (tons)	Max Speed (knots)	Main Eng (kW)	Aux Eng (kW)
Auto Carrier	2002	11	22,759	19.9	15,357	2,429
Bulk - General	2005	8	59,497	14.4	8,847	825
Bulk - Heavy Load	1983	30	23,628	15.0	7,110	1,223
Bulk - Self Discharging	1977	36	26,608	15.5	8,500	807
Container - 1000	1991	22	26,399	20.8	18,692	2,245
Container - 2000	2000	13	35,257	22.0	26,323	2,694
Container - 3000	1997	16	39,420	22.5	28,386	2,562
Container - 4000	2005	8	59,388	23.7	41,719	2,442
Container - 5000	2002	11	68,019	24.8	47,526	4,040
Container - 6000	2008	5	83,293	25.6	57,198	2,591
Container - 7000	2004	9	93,574	24.0	68,973	2,475
Container - 8000	2007	6	101,598	25.3	68,319	2,765
Container - 9000	2007	6	115,982	25.1	69,275	3,320
Container - 10000	2009	4	120,837	24.9	68,639	1,675
Container - 11000	2008	5	130,629	24.8	70,326	4,000
Container - 12000	2010	3	139,445	23.0	72,239	4,500
Container - 13000	2010	3	143,703	24.6	73,545	5,200
Container - 14000	2010	3	165,724	24.0	72,239	5,500
Cruise	1994	19	7,365	18.8	32,184	10,961
General Cargo	2003	10	31,476	14.9	7,845	1,025
Ocean Tugs	2003	10	764	12.0	7,327	202
Miscellaneous	1989	24	10,430	16.0	14,400	2,285
RoRo	1974	39	20,275	21.0	27,216	396
Tanker - Aframax	2007	6	113,202	15.2	13,589	803
Tanker - Chemical	2006	7	39,874	14.8	8,467	937
Tanker - Handysize	2002	11	46,761	14.8	8,739	807
Tanker - Panamax	2003	10	71,204	14.8	11,390	867
Tanker - Suezmax	2004	9	176,870	15.5	23,640	3,238
Tanker - ULCC	2004	9	312,076	15.4	27,938	1,486
Tanker - VLCC	2005	8	298,101	15.7	25,345	1,486

Figures B.5 through B.8 show the characteristics of vessels visiting the Port in 2013. The containerships are categorized into twenty-foot equivalent (TEU) categories. As shown in Figure B.5, the larger containerships (11,000+TEU) that called the Port were newer vessels, less than 5 years old. The self-discharging bulk vessels are the oldest vessels. Also, larger containerships had the highest maximum rated speeds, as shown in Figure B.6.

Figure B.5: 2013 Average Age of Vessels that Called the Port, years

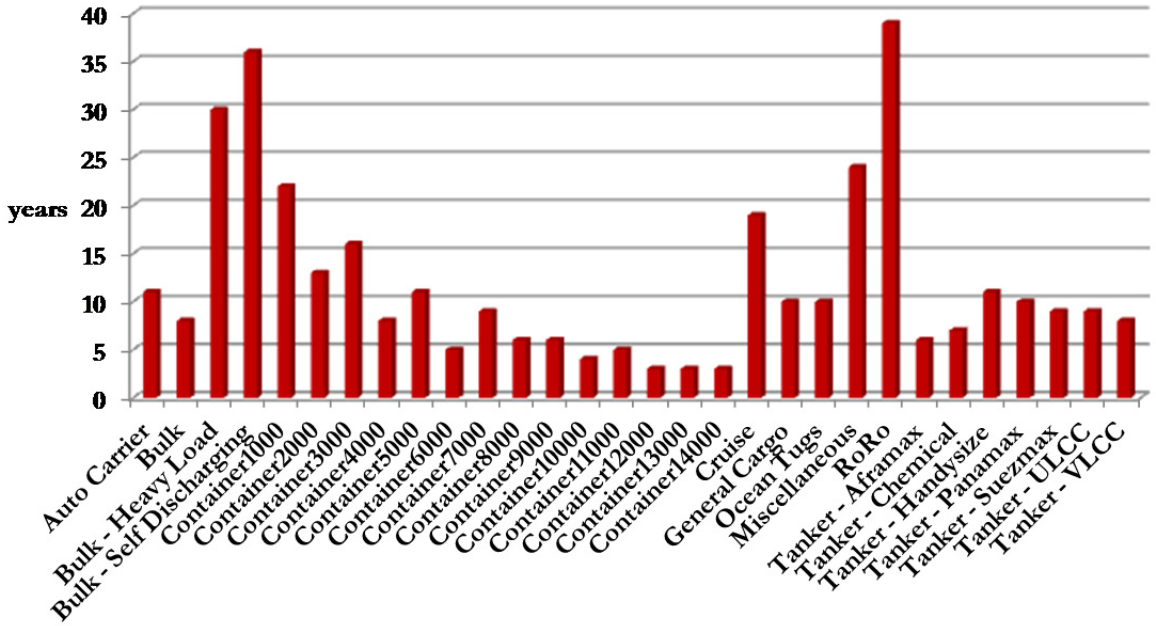
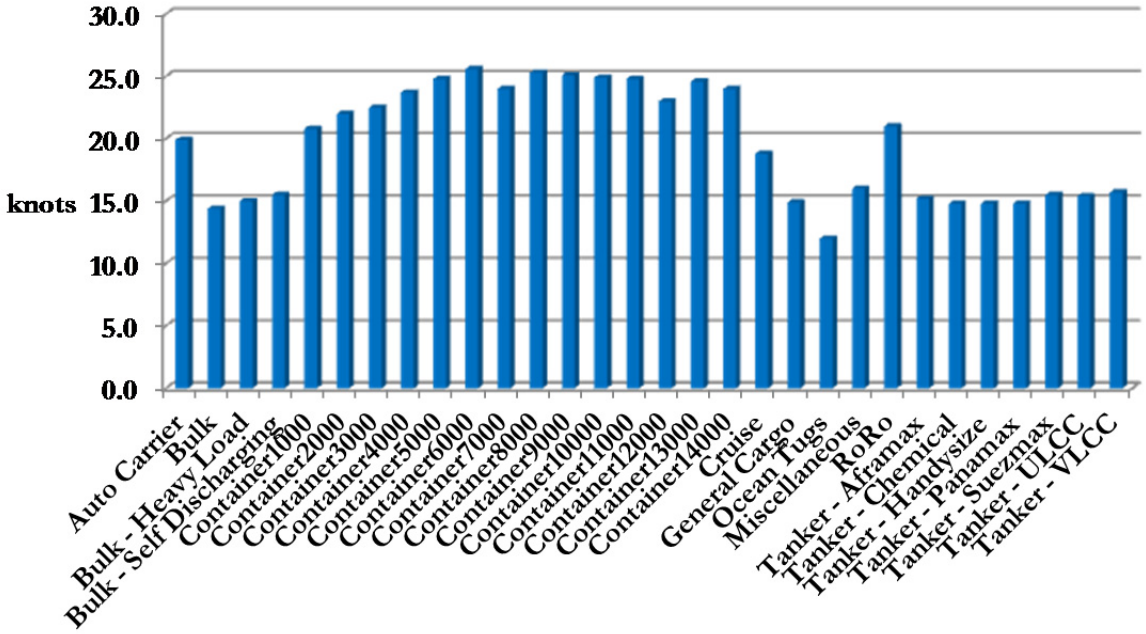


Figure B.6: 2013 Average Max Speed of Vessels that Called the Port, knots



The Suezmax, ULCC and VLCC tankers had the largest average deadweight tonnage (Figure B.7), and the larger containerships had the highest main engine installed power (Figure B.8).

Figure B.7: 2013 Average Deadweight of Vessels that Called the Port, tons

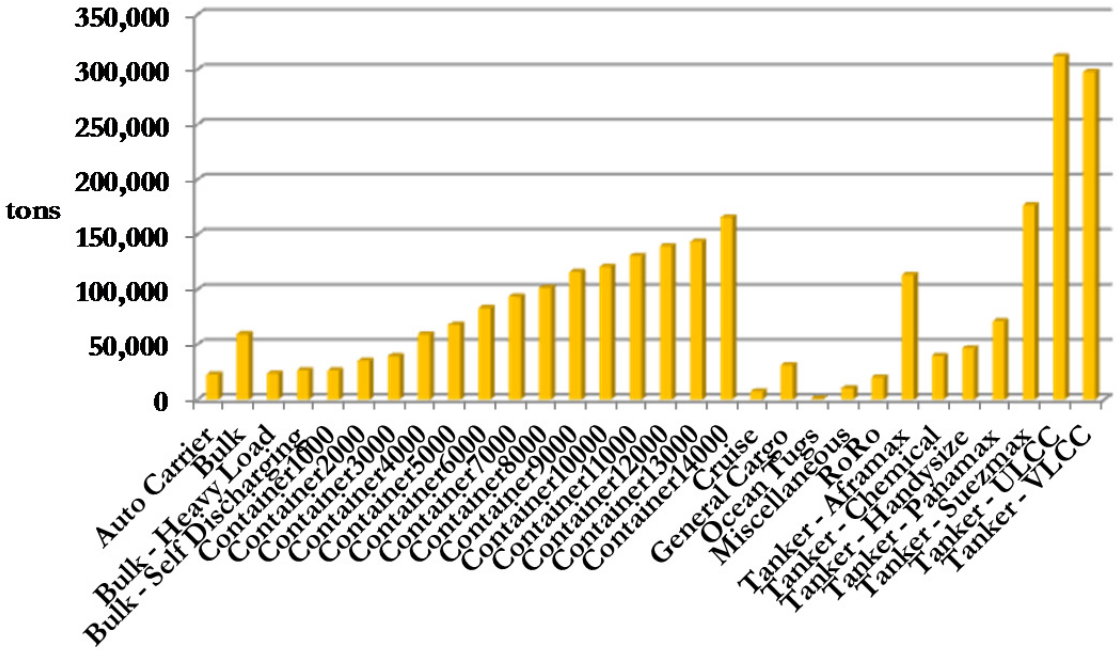
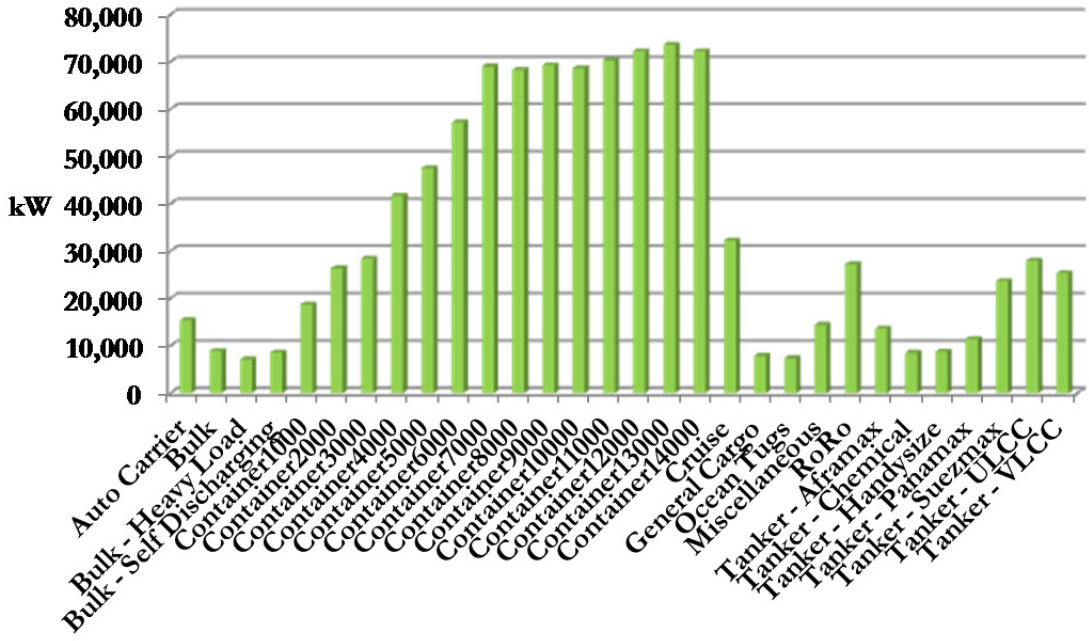


Figure B.8: 2013 Average Main Engine Total Installed Power of Vessels that Called the Port, kW



Frequent Callers

For purpose of this EI, a frequent caller is defined as a vessel that made six or more calls in one calendar year. All vessels that made an inbound call to a berth or anchorage at the Port were included in this estimate. Table B.4 shows 13% of vessels that called the Port in 2013 are frequent callers. Container vessels had the highest percentage of frequent callers in 2013.

Table B.4: 2013 Percentage of Frequent Callers

Vessel Type	Frequent Vessels	Total Vessels	Percent Frequent Vessels
Auto Carrier	2	93	2%
Bulk	0	177	0%
Bulk - Heavy Load	0	2	0%
Bulk - Self Discharging	1	1	100%
Container - 1000	1	16	6%
Container - 2000	5	7	71%
Container - 3000	2	15	13%
Container - 4000	15	49	31%
Container - 5000	7	42	17%
Container - 6000	0	1	0%
Container - 7000	0	6	0%
Container - 8000	15	39	38%
Container - 9000	7	12	58%
Container - 10000	2	5	40%
Container - 11000	3	6	50%
Container - 12000	1	2	50%
Container - 13000	1	3	33%
Container - 14000	0	3	0%
Cruise	2	7	29%
General Cargo	1	56	2%
Ocean Tug	0	2	0%
Miscellaneous	0	2	0%
RoRo	0	2	0%
Tanker - Aframax	5	26	19%
Tanker - Chemical	6	78	8%
Tanker - Handysize	0	6	0%
Tanker - Panamax	0	45	0%
Tanker - Suezmax	3	27	11%
Tanker - ULCC	0	20	0%
Tanker - VLCC	0	5	0%
Total	**79**	**755**	
Average			**10%**

Hotelling Time at Berth and Anchorage

Tables B.5 and B.6 show the range and average hotelling times at berth and anchorage, respectively. The following tables are for information only and the averages shown are not used in emissions calculations since actual data is known for every vessel call.

Table B.5: 2013 Hotelling Times at Berth for Vessels that Called the Port of Long Beach by Vessel Type, hours

Vessel Type	Min Hours	Max Hours	Avg Hours
Auto Carrier	2.8	42.7	12.3
Bulk - General	4.7	180.9	54.4
Bulk - Heavy Load	85.4	225.7	155.5
Bulk - Self Discharging	22.6	38.6	32.9
Container - 1000	2.4	72.6	33.0
Container - 2000	60.2	97.7	74.8
Container - 3000	9.0	107.3	78.5
Container - 4000	84.3	131.8	101.6
Container - 5000	75.0	129.6	99.3
Container - 6000	85.3	95.8	92.3
Container - 7000	11.2	71.4	56.0
Container - 8000	15.8	60.4	32.2
Container - 9000	9.2	108.3	53.4
Container - 10000	9.2	241.1	42.6
Container - 11000	73.3	73.3	73.3
Container - 12000	46.9	74.5	62.9
Container - 13000	11.6	144.0	79.3
Container - 14000	56.9	118.2	73.6
Cruise	0.5	20.5	11.7
General Cargo	6.3	109.0	30.6
Ocean Tugs	16.6	114.6	49.3
Miscellaneous	8,137.3	8,330.3	8,233.8
RoRo	2,224.3	3,686.3	2,955.3
Tanker - Aframax	12.3	135.0	43.9
Tanker - Chemical	7.5	193.9	37.9
Tanker - Handysize	15.2	70.5	31.5
Tanker - Panamax	13.2	153.2	41.7
Tanker - Suezmax	13.1	57.4	26.6
Tanker - ULCC	16.1	60.4	34.7
Tanker - VLCC	19.9	47.3	30.3

Table B.6 shows the range and average hotelling times at anchorage with the actual vessel calls for each vessel subtype that visited the anchorages.

Table B.6: 2013 Hotelling Times at Anchorage by Vessel Type, hours

Vessel Type	Min Hours	Max Hours	Avg Hours	Anchor Call Count
Auto Carrier	2.8	25.1	16.1	8
Bulk - General	2.7	313.5	62.5	180
Bulk - Heavy Load	9.3	9.3	9.3	1
Bulk - Self Discharging	0.0	0.0	0.0	0
Container - 1000	2.1	87.2	30.6	5
Container - 2000	0.0	0.0	0.0	0
Container - 3000	0.0	0.0	0.0	0
Container - 4000	0.0	0.0	0.0	0
Container - 5000	5.6	5.6	5.6	1
Container - 6000	0.0	0.0	0.0	0
Container - 7000	1.1	3.6	2.5	3
Container - 8000	0.0	0.0	0.0	0
Container - 9000	0.8	10.0	6.6	4
Container - 10000	1.3	12.6	7.3	5
Container - 11000	3.3	3.3	3.3	1
Container - 12000	0.0	0.0	0.0	0
Container - 13000	2.1	2.1	2.1	1
Container - 14000	0.0	0.0	0.0	0
Cruise	0.0	0.0	0.0	0
General Cargo	1.2	181.7	47.8	54
Ocean Tugs	22.8	30.1	26.5	2
Miscellaneous	0.0	0.0	0.0	0
RoRo	0.0	0.0	0.0	0
Tanker - Aframax	1.6	370.0	47.3	171
Tanker - Chemical	0.5	356.7	37.9	162
Tanker - Handysize	4.4	73.1	25.9	7
Tanker - Panamax	2.0	274.9	41.0	131
Tanker - Suezmax	0.6	228.8	53.2	123
Tanker - ULCC	5.4	324.1	75.7	70
Tanker - VLCC	12.0	287.3	96.1	14

OCEAN-GOING VESSELS DATA

Vessel ID	Vessel Type	Model Year	Flag	DWT (tons)	Max Speed (knots)	Cap	Cap Units	Engine Type	Power (kW)	Slide Valve
C0100412	Container1000	1973	USA	22,501	25	1,712	TEU	Aux	5,916	N
C0100412	Container1000	1973	USA	22,501	25	1,712	TEU	Auxiliary Boiler	241	N
C0100412	Container1000	1973	USA	22,501	25	1,712	TEU	Main	22,067	N
ROR00256	RoRo	1974	USA	20,275	21	937	TEU	Aux	880	N
ROR00256	RoRo	1974	USA	20,275	21	937	TEU	Auxiliary Boiler	243	N
ROR00256	RoRo	1974	USA	20,275	21	937	TEU	Main	27,216	N
ROR00704	RoRo	1975	USA	20,275	21	937	TEU	Aux	880	N
ROR00704	RoRo	1975	USA	20,275	21	937	TEU	Auxiliary Boiler	243	N
ROR00704	RoRo	1975	USA	20,275	21	937	TEU	Main	27,216	N
TNS00091	Tanker - Suezmax	1976	USA	124,644	17	0	TEU	Aux	2,993	N
TNS00091	Tanker - Suezmax	1976	USA	124,644	17	0	TEU	Auxiliary Boiler	371	N
TNS00091	Tanker - Suezmax	1976	USA	124,644	17	0	TEU	Main	22,067	N
C0100675	Container1000	1977	USA	24,683	20	1,626	TEU	Aux	5,916	N
C0100675	Container1000	1977	USA	24,683	20	1,626	TEU	Auxiliary Boiler	241	N
C0100675	Container1000	1977	USA	24,683	20	1,626	TEU	Main	23,538	N
BSD00423	Bulk - Self Discharging	1977	BHS	26,608	15.5	0	TEU	Aux	2,781	N
BSD00423	Bulk - Self Discharging	1977	BHS	26,608	15.5	0	TEU	Auxiliary Boiler	132	N
BSD00423	Bulk - Self Discharging	1977	BHS	26,608	15.5	0	TEU	Main	8,500	N
C0300343	Container3000	1981	USA	30,825	23.3	3,027	TEU	Aux	5,338	N
C0300343	Container3000	1981	USA	30,825	23.3	3,027	TEU	Auxiliary Boiler	474	N
C0300343	Container3000	1981	USA	30,825	23.3	3,027	TEU	Main	31,774	N
C0100055	Container1000	1981	USA	30,652	23.3	1,994	TEU	Aux	5,916	N
C0100055	Container1000	1981	USA	30,652	23.3	1,994	TEU	Auxiliary Boiler	241	N
C0100055	Container1000	1981	USA	30,652	23.3	1,994	TEU	Main	31,774	N
BBB00099	Bulk	1981	HKG	60,732	14.8	0	TEU	Aux	1,793	N
BBB00099	Bulk	1981	HKG	60,732	14.8	0	TEU	Auxiliary Boiler	132	N
BBB00099	Bulk	1981	HKG	60,732	14.8	0	TEU	Main	9,635	N
BBH00204	Bulk - Heavy Load	1981	VCT	34,588	15	0	TEU	Aux	2,717	N
BBH00204	Bulk - Heavy Load	1981	VCT	34,588	15	0	TEU	Auxiliary Boiler	132	N
BBH00204	Bulk - Heavy Load	1981	VCT	34,588	15	0	TEU	Main	10,591	N
ACC00755	Auto Carrier	1982	NOR	44,013	21	0	TEU	Aux	4,723	N
ACC00755	Auto Carrier	1982	NOR	44,013	21	0	TEU	Auxiliary Boiler	253	N
ACC00755	Auto Carrier	1982	NOR	44,013	21	0	TEU	Main	26,921	Y
ACC00533	Auto Carrier	1982	NOR	43,986	20.5	0	TEU	Aux	8,376	N
ACC00533	Auto Carrier	1982	NOR	43,986	20.5	0	TEU	Auxiliary Boiler	253	N
ACC00533	Auto Carrier	1982	NOR	43,986	20.5	0	TEU	Main	26,919	Y
ACC00613	Auto Carrier	1984	PAN	15,509	18.5	0	TEU	Aux	4,723	N
ACC00613	Auto Carrier	1984	PAN	15,509	18.5	0	TEU	Auxiliary Boiler	253	N
ACC00613	Auto Carrier	1984	PAN	15,509	18.5	0	TEU	Main	10,400	N
GCC00483	General Cargo	1984	BHS	41,728	13.1	1,584	TEU	Aux	2,305	N
GCC00483	General Cargo	1984	BHS	41,728	13.1	1,584	TEU	Auxiliary Boiler	137	N
GCC00483	General Cargo	1984	BHS	41,728	13.1	1,584	TEU	Main	6,055	N
ACC00333	Auto Carrier	1985	JPN	14,155	18.3	0	TEU	Aux	4,723	N
ACC00333	Auto Carrier	1985	JPN	14,155	18.3	0	TEU	Auxiliary Boiler	253	N
ACC00333	Auto Carrier	1985	JPN	14,155	18.3	0	TEU	Main	9,856	N
GCC00311	General Cargo	1986	BHS	45,295	14.6	2,029	TEU	Aux	2,305	N
GCC00311	General Cargo	1986	BHS	45,295	14.6	2,029	TEU	Auxiliary Boiler	137	N
GCC00311	General Cargo	1986	BHS	45,295	14.6	2,029	TEU	Main	8,363	N

Vessel ID	Vessel Type	Model Year	Flag	DWT (tons)	Max Speed (knots)	Cap	Cap Units	Engine Type	Power (kW)	Slide Valve
GCC00451	General Cargo	1986	BHS	45,252	14.6	2,029	TEU	Aux	2,305	N
GCC00451	General Cargo	1986	BHS	45,252	14.6	2,029	TEU	Auxiliary Boiler	137	N
GCC00451	General Cargo	1986	BHS	45,252	14.6	2,029	TEU	Main	8,363	N
ACC00521	Auto Carrier	1985	PAN	19,108	18.5	0	TEU	Aux	4,723	N
ACC00521	Auto Carrier	1985	PAN	19,108	18.5	0	TEU	Auxiliary Boiler	253	N
ACC00521	Auto Carrier	1985	PAN	19,108	18.5	0	TEU	Main	9,414	N
ACC00719	Auto Carrier	1987	PAN	14,104	18.3	0	TEU	Aux	4,723	N
ACC00719	Auto Carrier	1987	PAN	14,104	18.3	0	TEU	Auxiliary Boiler	253	N
ACC00719	Auto Carrier	1987	PAN	14,104	18.3	0	TEU	Main	9,650	N
C0400620	Container4000	1988	GRC	60,639	23	4,437	TEU	Aux	6,650	N
C0400620	Container4000	1988	GRC	60,639	23	4,437	TEU	Auxiliary Boiler	492	N
C0400620	Container4000	1988	GRC	60,639	23	4,437	TEU	Main	42,424	N
BBH00499	Bulk - Heavy Load	1987	PAN	7,190	15	545	TEU	Aux	2,717	N
BBH00499	Bulk - Heavy Load	1987	PAN	7,190	15	545	TEU	Auxiliary Boiler	132	N
BBH00499	Bulk - Heavy Load	1987	PAN	7,190	15	545	TEU	Main	1,890	N
C0400371	Container4000	1990	PAN	60,350	24	4,814	TEU	Aux	6,680	N
C0400371	Container4000	1990	PAN	60,350	24	4,814	TEU	Auxiliary Boiler	492	N
C0400371	Container4000	1990	PAN	60,350	24	4,814	TEU	Main	42,424	N
MIS00400	MISC	1983	LBR	10,430	12.5	0	TEU	Aux	4,667	N
MIS00400	MISC	1983	LBR	10,430	12.5	0	TEU	Auxiliary Boiler	137	N
MIS00400	MISC	1983	LBR	10,430	12.5	0	TEU	Main	13,200	N
C0400132	Container4000	1991	PAN	60,350	24	4,437	TEU	Aux	7,155	N
C0400132	Container4000	1991	PAN	60,350	24	4,437	TEU	Auxiliary Boiler	492	N
C0400132	Container4000	1991	PAN	60,350	24	4,437	TEU	Main	42,424	Y
GCC00052	General Cargo	1990	MLT	22,130	16.5	1,094	TEU	Aux	2,582	N
GCC00052	General Cargo	1990	MLT	22,130	16.5	1,094	TEU	Auxiliary Boiler	137	N
GCC00052	General Cargo	1990	MLT	22,130	16.5	1,094	TEU	Main	9,500	N
ACC00001	Auto Carrier	1989	PAN	14,366	19.1	0	TEU	Aux	4,723	N
ACC00001	Auto Carrier	1989	PAN	14,366	19.1	0	TEU	Auxiliary Boiler	253	N
ACC00001	Auto Carrier	1989	PAN	14,366	19.1	0	TEU	Main	10,813	N
C0300393	Container3000	1991	LBR	46,975	21	3,005	TEU	Aux	5,338	N
C0300393	Container3000	1991	LBR	46,975	21	3,005	TEU	Auxiliary Boiler	474	N
C0300393	Container3000	1991	LBR	46,975	21	3,005	TEU	Main	21,699	N
C0300062	Container3000	1991	LBR	46,975	21	3,352	TEU	Aux	5,338	N
C0300062	Container3000	1991	LBR	46,975	21	3,352	TEU	Auxiliary Boiler	474	N
C0300062	Container3000	1991	LBR	46,975	21	3,352	TEU	Main	21,699	N
ACC00352	Auto Carrier	1989	VUT	18,273	19.3	0	TEU	Aux	4,723	N
ACC00352	Auto Carrier	1989	VUT	18,273	19.3	0	TEU	Auxiliary Boiler	253	N
ACC00352	Auto Carrier	1989	VUT	18,273	19.3	0	TEU	Main	12,175	N
C0100787	Container1000	1991	SGP	24,693	19.1	1,404	TEU	Aux	5,916	N
C0100787	Container1000	1991	SGP	24,693	19.1	1,404	TEU	Auxiliary Boiler	241	N
C0100787	Container1000	1991	SGP	24,693	19.1	1,404	TEU	Main	10,590	N
C0400329	Container4000	1992	PHL	57,904	23	4,229	TEU	Aux	6,680	N
C0400329	Container4000	1992	PHL	57,904	23	4,229	TEU	Auxiliary Boiler	492	N
C0400329	Container4000	1992	PHL	57,904	23	4,229	TEU	Main	34,379	N
C0200498	Container2000	1991	USA	28,555	22.5	2,019	TEU	Aux	5,470	N
C0200498	Container2000	1991	USA	28,555	22.5	2,019	TEU	Auxiliary Boiler	325	N
C0200498	Container2000	1991	USA	28,555	22.5	2,019	TEU	Main	25,125	N

Vessel ID	Vessel Type	Model Year	Flag	DWT (tons)	Max Speed (knots)	Cap	Cap Units	Engine Type	Power (kW)	Slide Valve
BBB00090	Bulk	1990	PAN	69,338	14.5	0	TEU	Aux	1,100	N
BBB00090	Bulk	1990	PAN	69,338	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00090	Bulk	1990	PAN	69,338	14.5	0	TEU	Main	8,827	N
GCC00340	General Cargo	1992	BHS	46,956	14.5	1,688	TEU	Aux	2,208	N
GCC00340	General Cargo	1992	BHS	46,956	14.5	1,688	TEU	Auxiliary Boiler	137	N
GCC00340	General Cargo	1992	BHS	46,956	14.5	1,688	TEU	Main	8,952	N
ACC00666	Auto Carrier	1991	PAN	14,274	19	0	TEU	Aux	4,723	N
ACC00666	Auto Carrier	1991	PAN	14,274	19	0	TEU	Auxiliary Boiler	253	N
ACC00666	Auto Carrier	1991	PAN	14,274	19	0	TEU	Main	10,813	N
ACC00287	Auto Carrier	1992	PAN	13,157	18.8	0	TEU	Aux	4,723	N
ACC00287	Auto Carrier	1992	PAN	13,157	18.8	0	TEU	Auxiliary Boiler	253	N
ACC00287	Auto Carrier	1992	PAN	13,157	18.8	0	TEU	Main	10,665	N
C0400736	Container4000	1994	LBR	62,742	24	4,024	TEU	Aux	6,680	N
C0400736	Container4000	1994	LBR	62,742	24	4,024	TEU	Auxiliary Boiler	492	N
C0400736	Container4000	1994	LBR	62,742	24	4,024	TEU	Main	37,880	N
CRU00163	Cruise	1993	BHS	7,180	18	0	TEU	Aux	825	N
CRU00163	Cruise	1993	BHS	7,180	18	0	TEU	Auxiliary Boiler	1,393	N
CRU00163	Cruise	1993	BHS	7,180	18	0	TEU	Main	31,236	N
BBB00146	Bulk	1993	LBR	69,087	14.5	0	TEU	Aux	1,793	N
BBB00146	Bulk	1993	LBR	69,087	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00146	Bulk	1993	LBR	69,087	14.5	0	TEU	Main	8,827	N
CRU00173	Cruise	1996	BMU	8,418	22.5	0	TEU	Aux	2,250	N
CRU00173	Cruise	1996	BMU	8,418	22.5	0	TEU	Auxiliary Boiler	1,393	N
CRU00173	Cruise	1996	BMU	8,418	22.5	0	TEU	Main	42,000	N
TNC00479	Tanker - Chemical	1995	PAN	19,999	15.1	0	TEU	Aux	2,839	N
TNC00479	Tanker - Chemical	1995	PAN	19,999	15.1	0	TEU	Auxiliary Boiler	371	N
TNC00479	Tanker - Chemical	1995	PAN	19,999	15.1	0	TEU	Main	7,061	N
C0500076	Container5000	1995	PAN	67,272	25.6	5,302	TEU	Aux	9,400	N
C0500076	Container5000	1995	PAN	67,272	25.6	5,302	TEU	Auxiliary Boiler	630	N
C0500076	Container5000	1995	PAN	67,272	25.6	5,302	TEU	Main	54,814	N
GCC00697	General Cargo	1995	PAN	11,511	15	0	TEU	Aux	2,305	N
GCC00697	General Cargo	1995	PAN	11,511	15	0	TEU	Auxiliary Boiler	137	N
GCC00697	General Cargo	1995	PAN	11,511	15	0	TEU	Main	5,296	N
C0500082	Container5000	1996	PAN	67,115	26.4	5,302	TEU	Aux	9,400	N
C0500082	Container5000	1996	PAN	67,115	26.4	5,302	TEU	Auxiliary Boiler	630	N
C0500082	Container5000	1996	PAN	67,115	26.4	5,302	TEU	Main	54,794	N
C0500692	Container5000	1996	PAN	67,298	26.4	5,302	TEU	Aux	9,400	N
C0500692	Container5000	1996	PAN	67,298	26.4	5,302	TEU	Auxiliary Boiler	630	N
C0500692	Container5000	1996	PAN	67,298	26.4	5,302	TEU	Main	54,794	N
TNH00420	Tanker - Handysize	1996	USA	46,103	14.5	0	TEU	Aux	2,328	N
TNH00420	Tanker - Handysize	1996	USA	46,103	14.5	0	TEU	Auxiliary Boiler	371	N
TNH00420	Tanker - Handysize	1996	USA	46,103	14.5	0	TEU	Main	7,944	N
C0500470	Container5000	1996	PAN	69,285	24.5	5,618	TEU	Aux	10,033	N
C0500470	Container5000	1996	PAN	69,285	24.5	5,618	TEU	Auxiliary Boiler	630	N
C0500470	Container5000	1996	PAN	69,285	24.5	5,618	TEU	Main	43,100	N
C0500377	Container5000	1996	PAN	69,285	24.5	5,618	TEU	Aux	10,153	N
C0500377	Container5000	1996	PAN	69,285	24.5	5,618	TEU	Auxiliary Boiler	630	N
C0500377	Container5000	1996	PAN	69,285	24.5	5,618	TEU	Main	43,100	N

Vessel ID	Vessel Type	Model Year	Flag	DWT (tons)	Max Speed (knots)	Cap	Cap Units	Engine Type	Power (kW)	Slide Valve
C0500018	Container5000	1996	PAN	69,285	24.5	5,618	TEU	Aux	10,033	N
C0500018	Container5000	1996	PAN	69,285	24.5	5,618	TEU	Auxiliary Boiler	630	N
C0500018	Container5000	1996	PAN	69,285	24.5	5,618	TEU	Main	43,100	N
C0500117	Container5000	1997	PAN	69,285	24.5	5,618	TEU	Aux	10,033	N
C0500117	Container5000	1997	PAN	69,285	24.5	5,618	TEU	Auxiliary Boiler	630	N
C0500117	Container5000	1997	PAN	69,285	24.5	5,618	TEU	Main	43,100	N
C0500625	Container5000	1997	PAN	69,285	24.5	5,618	TEU	Aux	10,033	N
C0500625	Container5000	1997	PAN	69,285	24.5	5,618	TEU	Auxiliary Boiler	630	N
C0500625	Container5000	1997	PAN	69,285	24.5	5,618	TEU	Main	43,100	N
C0500438	Container5000	1997	PAN	69,285	24.5	5,618	TEU	Aux	10,033	N
C0500438	Container5000	1997	PAN	69,285	24.5	5,618	TEU	Auxiliary Boiler	630	N
C0500438	Container5000	1997	PAN	69,285	24.5	5,618	TEU	Main	43,100	N
ACC00540	Auto Carrier	1996	USA	48,988	19.5	0	TEU	Aux	4,723	N
ACC00540	Auto Carrier	1996	USA	48,988	19.5	0	TEU	Auxiliary Boiler	253	N
ACC00540	Auto Carrier	1996	USA	48,988	19.5	0	TEU	Main	25,000	Y
BBB00465	Bulk	1996	MHL	73,317	14	0	TEU	Aux	1,793	N
BBB00465	Bulk	1996	MHL	73,317	14	0	TEU	Auxiliary Boiler	132	N
BBB00465	Bulk	1996	MHL	73,317	14	0	TEU	Main	8,233	N
C0100566	Container1000	1996	SGP	24,657	19	1,550	TEU	Aux	5,916	N
C0100566	Container1000	1996	SGP	24,657	19	1,550	TEU	Auxiliary Boiler	241	N
C0100566	Container1000	1996	SGP	24,657	19	1,550	TEU	Main	10,592	N
C0100261	Container1000	1996	SGP	24,662	19	1,550	TEU	Aux	5,916	N
C0100261	Container1000	1996	SGP	24,662	19	1,550	TEU	Auxiliary Boiler	241	N
C0100261	Container1000	1996	SGP	24,662	19	1,550	TEU	Main	10,592	N
C0100682	Container1000	1996	SGP	24,650	19	1,550	TEU	Aux	5,916	N
C0100682	Container1000	1996	SGP	24,650	19	1,550	TEU	Auxiliary Boiler	241	N
C0100682	Container1000	1996	SGP	24,650	19	1,550	TEU	Main	10,591	N
TNC00595	Tanker - Chemical	1998	CYM	37,059	16.2	0	TEU	Aux	960	N
TNC00595	Tanker - Chemical	1998	CYM	37,059	16.2	0	TEU	Auxiliary Boiler	371	N
TNC00595	Tanker - Chemical	1998	CYM	37,059	16.2	0	TEU	Main	13,365	N
BBB00492	Bulk	1995	ATG	23,522	13.7	0	TEU	Aux	1,793	N
BBB00492	Bulk	1995	ATG	23,522	13.7	0	TEU	Auxiliary Boiler	132	N
BBB00492	Bulk	1995	ATG	23,522	13.7	0	TEU	Main	4,891	N
TNH00591	Tanker - Handysize	1997	USA	46,069	14.5	0	TEU	Aux	2,328	N
TNH00591	Tanker - Handysize	1997	USA	46,069	14.5	0	TEU	Auxiliary Boiler	371	N
TNH00591	Tanker - Handysize	1997	USA	46,069	14.5	0	TEU	Main	6,752	N
GCC00203	General Cargo	1996	CHN	22,271	16.2	1,094	TEU	Aux	2,305	N
GCC00203	General Cargo	1996	CHN	22,271	16.2	1,094	TEU	Auxiliary Boiler	137	N
GCC00203	General Cargo	1996	CHN	22,271	16.2	1,094	TEU	Main	9,500	N
MIS00257	MISC	1996	LBR	10,430	19.6	0	TEU	Aux	4,667	N
MIS00257	MISC	1996	LBR	10,430	19.6	0	TEU	Auxiliary Boiler	137	N
MIS00257	MISC	1996	LBR	10,430	19.6	0	TEU	Main	15,600	N
C0100389	Container1000	1997	CYP	23,051	19	1,730	TEU	Aux	5,916	N
C0100389	Container1000	1997	CYP	23,051	19	1,730	TEU	Auxiliary Boiler	241	N
C0100389	Container1000	1997	CYP	23,051	19	1,730	TEU	Main	13,328	N
GCC00421	General Cargo	1996	PAN	11,285	14.7	0	TEU	Aux	2,305	N
GCC00421	General Cargo	1996	PAN	11,285	14.7	0	TEU	Auxiliary Boiler	137	N
GCC00421	General Cargo	1996	PAN	11,285	14.7	0	TEU	Main	5,296	N

Vessel ID	Vessel Type	Model Year	Flag	DWT (tons)	Max Speed (knots)	Cap	Cap Units	Engine Type	Power (kW)	Slide Valve
TNC00542	Tanker - Chemical	1998	USA	45,671	16	0	TEU	Aux	2,839	N
TNC00542	Tanker - Chemical	1998	USA	45,671	16	0	TEU	Auxiliary Boiler	371	N
TNC00542	Tanker - Chemical	1998	USA	45,671	16	0	TEU	Main	9,849	N
TNC00427	Tanker - Chemical	1997	CYM	22,198	15.2	0	TEU	Aux	2,839	N
TNC00427	Tanker - Chemical	1997	CYM	22,198	15.2	0	TEU	Auxiliary Boiler	371	N
TNC00427	Tanker - Chemical	1997	CYM	22,198	15.2	0	TEU	Main	8,800	N
BBB00538	Bulk	1997	PAN	72,437	14.5	0	TEU	Aux	1,793	N
BBB00538	Bulk	1997	PAN	72,437	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00538	Bulk	1997	PAN	72,437	14.5	0	TEU	Main	8,827	N
CRU00116	Cruise	1998	NLD	6,150	22	0	TEU	Aux	890	N
CRU00116	Cruise	1998	NLD	6,150	22	0	TEU	Auxiliary Boiler	1,393	N
CRU00116	Cruise	1998	NLD	6,150	22	0	TEU	Main	26,000	N
C0100507	Container1000	1997	SGP	24,637	19	1,550	TEU	Aux	5,916	N
C0100507	Container1000	1997	SGP	24,637	19	1,550	TEU	Auxiliary Boiler	241	N
C0100507	Container1000	1997	SGP	24,637	19	1,550	TEU	Main	10,592	N
C0100152	Container1000	1997	SGP	24,636	19	1,550	TEU	Aux	5,916	N
C0100152	Container1000	1997	SGP	24,636	19	1,550	TEU	Auxiliary Boiler	241	N
C0100152	Container1000	1997	SGP	24,636	19	1,550	TEU	Main	10,592	N
GCC00784	General Cargo	1997	PAN	13,046	15	0	TEU	Aux	2,305	N
GCC00784	General Cargo	1997	PAN	13,046	15	0	TEU	Auxiliary Boiler	137	N
GCC00784	General Cargo	1997	PAN	13,046	15	0	TEU	Main	5,296	N
TNS00183	Tanker - Suezmax	1998	GRC	146,639	14.3	0	TEU	Aux	2,993	N
TNS00183	Tanker - Suezmax	1998	GRC	146,639	14.3	0	TEU	Auxiliary Boiler	371	N
TNS00183	Tanker - Suezmax	1998	GRC	146,639	14.3	0	TEU	Main	16,858	N
BBB00624	Bulk	1996	SGP	73,762	14.5	0	TEU	Aux	1,380	N
BBB00624	Bulk	1996	SGP	73,762	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00624	Bulk	1996	SGP	73,762	14.5	0	TEU	Main	8,878	N
C0500383	Container5000	1998	PAN	68,955	25.6	5,308	TEU	Aux	9,400	N
C0500383	Container5000	1998	PAN	68,955	25.6	5,308	TEU	Auxiliary Boiler	630	N
C0500383	Container5000	1998	PAN	68,955	25.6	5,308	TEU	Main	54,899	N
C0500014	Container5000	1998	PAN	68,955	25.6	5,308	TEU	Aux	9,400	N
C0500014	Container5000	1998	PAN	68,955	25.6	5,308	TEU	Auxiliary Boiler	630	N
C0500014	Container5000	1998	PAN	68,955	25.6	5,308	TEU	Main	54,899	N
TNC00782	Tanker - Chemical	1997	PAN	19,365	14.7	0	TEU	Aux	2,839	N
TNC00782	Tanker - Chemical	1997	PAN	19,365	14.7	0	TEU	Auxiliary Boiler	371	N
TNC00782	Tanker - Chemical	1997	PAN	19,365	14.7	0	TEU	Main	6,179	N
GCC00015	General Cargo	1997	PAN	25,008	14.5	0	TEU	Aux	2,305	N
GCC00015	General Cargo	1997	PAN	25,008	14.5	0	TEU	Auxiliary Boiler	137	N
GCC00015	General Cargo	1997	PAN	25,008	14.5	0	TEU	Main	6,157	N
GCC00064	General Cargo	1997	PAN	25,012	14.5	0	TEU	Aux	2,305	N
GCC00064	General Cargo	1997	PAN	25,012	14.5	0	TEU	Auxiliary Boiler	137	N
GCC00064	General Cargo	1997	PAN	25,012	14.5	0	TEU	Main	6,157	N
ACC00253	Auto Carrier	1998	PAN	16,669	19.2	0	TEU	Aux	4,723	N
ACC00253	Auto Carrier	1998	PAN	16,669	19.2	0	TEU	Auxiliary Boiler	253	N
ACC00253	Auto Carrier	1998	PAN	16,669	19.2	0	TEU	Main	12,357	N
BBB00769	Bulk	1998	CYM	72,891	13.5	0	TEU	Aux	1,793	N
BBB00769	Bulk	1998	CYM	72,891	13.5	0	TEU	Auxiliary Boiler	132	N
BBB00769	Bulk	1998	CYM	72,891	13.5	0	TEU	Main	8,680	N

Vessel ID	Vessel Type	Model Year	Flag	DWT (tons)	Max Speed (knots)	Cap	Cap Units	Engine Type	Power (kW)	Slide Valve
GCC00025	General Cargo	1998	BHS	8,447	16	650	TEU	Aux	1,763	N
GCC00025	General Cargo	1998	BHS	8,447	16	650	TEU	Auxiliary Boiler	137	N
GCC00025	General Cargo	1998	BHS	8,447	16	650	TEU	Main	7,800	N
BBB00276	Bulk	1997	HKG	71,399	14	0	TEU	Aux	1,793	N
BBB00276	Bulk	1997	HKG	71,399	14	0	TEU	Auxiliary Boiler	132	N
BBB00276	Bulk	1997	HKG	71,399	14	0	TEU	Main	8,532	N
GCC00528	General Cargo	1998	PAN	11,410	14.7	0	TEU	Aux	2,305	N
GCC00528	General Cargo	1998	PAN	11,410	14.7	0	TEU	Auxiliary Boiler	137	N
GCC00528	General Cargo	1998	PAN	11,410	14.7	0	TEU	Main	5,296	N
TNC00193	Tanker - Chemical	1998	LBR	19,996	15.5	0	TEU	Aux	2,100	N
TNC00193	Tanker - Chemical	1998	LBR	19,996	15.5	0	TEU	Auxiliary Boiler	371	N
TNC00193	Tanker - Chemical	1998	LBR	19,996	15.5	0	TEU	Main	7,175	N
ACC00623	Auto Carrier	1997	PAN	21,514	19.3	0	TEU	Aux	4,723	N
ACC00623	Auto Carrier	1997	PAN	21,514	19.3	0	TEU	Auxiliary Boiler	253	N
ACC00623	Auto Carrier	1997	PAN	21,514	19.3	0	TEU	Main	14,123	N
GCC00300	General Cargo	1998	PAN	12,248	13.5	0	TEU	Aux	2,305	N
GCC00300	General Cargo	1998	PAN	12,248	13.5	0	TEU	Auxiliary Boiler	137	N
GCC00300	General Cargo	1998	PAN	12,248	13.5	0	TEU	Main	4,193	N
BBB00553	Bulk	1998	CHE	73,035	14	0	TEU	Aux	1,793	N
BBB00553	Bulk	1998	CHE	73,035	14	0	TEU	Auxiliary Boiler	132	N
BBB00553	Bulk	1998	CHE	73,035	14	0	TEU	Main	9,847	N
ACC00560	Auto Carrier	1998	PAN	21,503	19.3	0	TEU	Aux	4,723	N
ACC00560	Auto Carrier	1998	PAN	21,503	19.3	0	TEU	Auxiliary Boiler	253	N
ACC00560	Auto Carrier	1998	PAN	21,503	19.3	0	TEU	Main	14,123	N
TNU00030	Tanker - ULCC	1999	IOM	306,397	15	0	TEU	Aux	4,647	N
TNU00030	Tanker - ULCC	1999	IOM	306,397	15	0	TEU	Auxiliary Boiler	371	N
TNU00030	Tanker - ULCC	1999	IOM	306,397	15	0	TEU	Main	25,467	N
TNU00737	Tanker - ULCC	2000	IOM	306,307	15	0	TEU	Aux	4,647	N
TNU00737	Tanker - ULCC	2000	IOM	306,307	15	0	TEU	Auxiliary Boiler	371	N
TNU00737	Tanker - ULCC	2000	IOM	306,307	15	0	TEU	Main	25,467	N
TNU00202	Tanker - ULCC	2000	IOM	305,994	15	0	TEU	Aux	4,647	N
TNU00202	Tanker - ULCC	2000	IOM	305,994	15	0	TEU	Auxiliary Boiler	371	N
TNU00202	Tanker - ULCC	2000	IOM	305,994	15	0	TEU	Main	25,467	N
ACC00107	Auto Carrier	1998	USA	22,747	19.3	0	TEU	Aux	4,723	N
ACC00107	Auto Carrier	1998	USA	22,747	19.3	0	TEU	Auxiliary Boiler	253	N
ACC00107	Auto Carrier	1998	USA	22,747	19.3	0	TEU	Main	14,123	N
BBB00226	Bulk	1998	MLT	72,083	14.3	0	TEU	Aux	1,793	N
BBB00226	Bulk	1998	MLT	72,083	14.3	0	TEU	Auxiliary Boiler	132	N
BBB00226	Bulk	1998	MLT	72,083	14.3	0	TEU	Main	9,268	N
TNP00394	Tanker - Panamax	1998	LBR	63,331	14.5	0	TEU	Aux	2,627	N
TNP00394	Tanker - Panamax	1998	LBR	63,331	14.5	0	TEU	Auxiliary Boiler	371	N
TNP00394	Tanker - Panamax	1998	LBR	63,331	14.5	0	TEU	Main	9,597	N
CRU00192	Cruise	1998	NLD	7,327	21	0	TEU	Aux	1,210	N
CRU00192	Cruise	1998	NLD	7,327	21	0	TEU	Auxiliary Boiler	1,393	N
CRU00192	Cruise	1998	NLD	7,327	21	0	TEU	Main	31,000	N
TNP00131	Tanker - Panamax	1999	LBR	73,083	15	0	TEU	Aux	2,400	N
TNP00131	Tanker - Panamax	1999	LBR	73,083	15	0	TEU	Auxiliary Boiler	371	N
TNP00131	Tanker - Panamax	1999	LBR	73,083	15	0	TEU	Main	12,269	N

Vessel ID	Vessel Type	Model Year	Flag	DWT (tons)	Max Speed (knots)	Cap	Cap Units	Engine Type	Power (kW)	Slide Valve
ACC00063	Auto Carrier	1999	NOR	39,516	20	2,392	TEU	Aux	4,723	N
ACC00063	Auto Carrier	1999	NOR	39,516	20	2,392	TEU	Auxiliary Boiler	253	N
ACC00063	Auto Carrier	1999	NOR	39,516	20	2,392	TEU	Main	20,940	Y
ACC00627	Auto Carrier	2000	NOR	38,300	20	2,340	TEU	Aux	4,723	N
ACC00627	Auto Carrier	2000	NOR	38,300	20	2,340	TEU	Auxiliary Boiler	253	N
ACC00627	Auto Carrier	2000	NOR	38,300	20	2,340	TEU	Main	20,940	Y
ACC00323	Auto Carrier	2000	NOR	39,516	20	2,340	TEU	Aux	4,723	N
ACC00323	Auto Carrier	2000	NOR	39,516	20	2,340	TEU	Auxiliary Boiler	253	N
ACC00323	Auto Carrier	2000	NOR	39,516	20	2,340	TEU	Main	20,940	Y
TNS00375	Tanker - Suezmax	1998	USA	141,740	16.6	0	TEU	Aux	2,993	N
TNS00375	Tanker - Suezmax	1998	USA	141,740	16.6	0	TEU	Auxiliary Boiler	371	N
TNS00375	Tanker - Suezmax	1998	USA	141,740	16.6	0	TEU	Main	22,087	N
GCC00384	General Cargo	1998	GIB	4,299	12.5	274	TEU	Aux	2,305	N
GCC00384	General Cargo	1998	GIB	4,299	12.5	274	TEU	Auxiliary Boiler	137	N
GCC00384	General Cargo	1998	GIB	4,299	12.5	274	TEU	Main	2,841	N
C0500372	Container5000	1999	DEU	68,824	26.3	5,618	TEU	Aux	9,400	N
C0500372	Container5000	1999	DEU	68,824	26.3	5,618	TEU	Auxiliary Boiler	630	N
C0500372	Container5000	1999	DEU	68,824	26.3	5,618	TEU	Main	54,945	N
C0500179	Container5000	1999	DEU	68,996	26.3	5,618	TEU	Aux	9,400	N
C0500179	Container5000	1999	DEU	68,996	26.3	5,618	TEU	Auxiliary Boiler	630	N
C0500179	Container5000	1999	DEU	68,996	26.3	5,618	TEU	Main	54,945	N
C0500698	Container5000	1999	DEU	68,790	26.3	5,618	TEU	Aux	9,400	N
C0500698	Container5000	1999	DEU	68,790	26.3	5,618	TEU	Auxiliary Boiler	630	N
C0500698	Container5000	1999	DEU	68,790	26.3	5,618	TEU	Main	54,945	N
C0500220	Container5000	2000	DEU	68,819	26.3	5,618	TEU	Aux	9,400	N
C0500220	Container5000	2000	DEU	68,819	26.3	5,618	TEU	Auxiliary Boiler	630	N
C0500220	Container5000	2000	DEU	68,819	26.3	5,618	TEU	Main	54,945	N
BBB00244	Bulk	1999	PAN	23,641	13.8	0	TEU	Aux	1,793	N
BBB00244	Bulk	1999	PAN	23,641	13.8	0	TEU	Auxiliary Boiler	132	N
BBB00244	Bulk	1999	PAN	23,641	13.8	0	TEU	Main	5,296	N
C0100611	Container1000	1999	HKG	24,973	20	1,728	TEU	Aux	5,916	N
C0100611	Container1000	1999	HKG	24,973	20	1,728	TEU	Auxiliary Boiler	241	N
C0100611	Container1000	1999	HKG	24,973	20	1,728	TEU	Main	13,753	N
C0100126	Container1000	1999	HKG	24,921	20	1,728	TEU	Aux	5,916	N
C0100126	Container1000	1999	HKG	24,921	20	1,728	TEU	Auxiliary Boiler	241	N
C0100126	Container1000	1999	HKG	24,921	20	1,728	TEU	Main	14,121	N
ACC00722	Auto Carrier	1999	PAN	16,750	20	0	TEU	Aux	4,723	N
ACC00722	Auto Carrier	1999	PAN	16,750	20	0	TEU	Auxiliary Boiler	253	N
ACC00722	Auto Carrier	1999	PAN	16,750	20	0	TEU	Main	14,314	N
BBB00658	Bulk	1999	LBR	73,976	13.6	0	TEU	Aux	1,458	N
BBB00658	Bulk	1999	LBR	73,976	13.6	0	TEU	Auxiliary Boiler	132	N
BBB00658	Bulk	1999	LBR	73,976	13.6	0	TEU	Main	8,900	N
BBB00005	Bulk	2000	CYP	75,259	14.8	0	TEU	Aux	1,793	N
BBB00005	Bulk	2000	CYP	75,259	14.8	0	TEU	Auxiliary Boiler	132	N
BBB00005	Bulk	2000	CYP	75,259	14.8	0	TEU	Main	12,269	N
TNP00197	Tanker - Panamax	2000	MHL	68,467	14.5	0	TEU	Aux	1,982	N
TNP00197	Tanker - Panamax	2000	MHL	68,467	14.5	0	TEU	Auxiliary Boiler	371	N
TNP00197	Tanker - Panamax	2000	MHL	68,467	14.5	0	TEU	Main	10,002	N

Vessel ID	Vessel Type	Model Year	Flag	DWT (tons)	Max Speed (knots)	Cap	Cap Units	Engine Type	Power (kW)	Slide Valve
TNP00319	Tanker - Panamax	2000	MHL	68,467	14.5	0	TEU	Aux	1,982	N
TNP00319	Tanker - Panamax	2000	MHL	68,467	14.5	0	TEU	Auxiliary Boiler	371	N
TNP00319	Tanker - Panamax	2000	MHL	68,467	14.5	0	TEU	Main	10,002	N
TNU00248	Tanker - ULCC	2001	MHL	309,327	15.2	0	TEU	Aux	3,416	N
TNU00248	Tanker - ULCC	2001	MHL	309,327	15.2	0	TEU	Auxiliary Boiler	371	N
TNU00248	Tanker - ULCC	2001	MHL	309,327	15.2	0	TEU	Main	25,484	N
TNU00172	Tanker - ULCC	2001	MHL	309,285	15.2	0	TEU	Aux	3,416	N
TNU00172	Tanker - ULCC	2001	MHL	309,285	15.2	0	TEU	Auxiliary Boiler	371	N
TNU00172	Tanker - ULCC	2001	MHL	309,285	15.2	0	TEU	Main	25,484	N
BBB00051	Bulk	2000	VUT	32,787	14.5	0	TEU	Aux	1,793	N
BBB00051	Bulk	2000	VUT	32,787	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00051	Bulk	2000	VUT	32,787	14.5	0	TEU	Main	6,620	N
ACC00442	Auto Carrier	2000	NOR	38,500	20	2,340	TEU	Aux	4,723	N
ACC00442	Auto Carrier	2000	NOR	38,500	20	2,340	TEU	Auxiliary Boiler	253	N
ACC00442	Auto Carrier	2000	NOR	38,500	20	2,340	TEU	Main	20,940	Y
C0500367	Container5000	2001	GBR	69,224	25	5,618	TEU	Aux	9,400	N
C0500367	Container5000	2001	GBR	69,224	25	5,618	TEU	Auxiliary Boiler	630	N
C0500367	Container5000	2001	GBR	69,224	25	5,618	TEU	Main	43,103	N
C0500217	Container5000	2001	GBR	69,196	25	5,618	TEU	Aux	9,400	N
C0500217	Container5000	2001	GBR	69,196	25	5,618	TEU	Auxiliary Boiler	630	N
C0500217	Container5000	2001	GBR	69,196	25	5,618	TEU	Main	43,100	N
TNP00363	Tanker - Panamax	2000	MHL	68,467	14.5	0	TEU	Aux	1,982	N
TNP00363	Tanker - Panamax	2000	MHL	68,467	14.5	0	TEU	Auxiliary Boiler	371	N
TNP00363	Tanker - Panamax	2000	MHL	68,467	14.5	0	TEU	Main	10,002	N
BBB00642	Bulk	2001	PAN	53,806	14.7	0	TEU	Aux	1,793	N
BBB00642	Bulk	2001	PAN	53,806	14.7	0	TEU	Auxiliary Boiler	132	N
BBB00642	Bulk	2001	PAN	53,806	14.7	0	TEU	Main	9,726	N
TNC00693	Tanker - Chemical	2000	PAN	19,998	15.3	0	TEU	Aux	2,839	N
TNC00693	Tanker - Chemical	2000	PAN	19,998	15.3	0	TEU	Auxiliary Boiler	371	N
TNC00693	Tanker - Chemical	2000	PAN	19,998	15.3	0	TEU	Main	7,060	N
TNC00327	Tanker - Chemical	2000	SGP	20,583	14.5	0	TEU	Aux	2,839	N
TNC00327	Tanker - Chemical	2000	SGP	20,583	14.5	0	TEU	Auxiliary Boiler	371	N
TNC00327	Tanker - Chemical	2000	SGP	20,583	14.5	0	TEU	Main	7,060	N
BBB00293	Bulk	2001	CYP	75,202	14.8	0	TEU	Aux	1,793	N
BBB00293	Bulk	2001	CYP	75,202	14.8	0	TEU	Auxiliary Boiler	132	N
BBB00293	Bulk	2001	CYP	75,202	14.8	0	TEU	Main	11,172	N
C0100686	Container1000	2000	HKG	24,924	20	1,728	TEU	Aux	5,916	N
C0100686	Container1000	2000	HKG	24,924	20	1,728	TEU	Auxiliary Boiler	241	N
C0100686	Container1000	2000	HKG	24,924	20	1,728	TEU	Main	14,121	N
C0100604	Container1000	2000	HKG	24,935	20	1,728	TEU	Aux	5,916	N
C0100604	Container1000	2000	HKG	24,935	20	1,728	TEU	Auxiliary Boiler	241	N
C0100604	Container1000	2000	HKG	24,935	20	1,728	TEU	Main	14,123	N
CRU00433	Cruise	2002	NLD	10,965	22	0	TEU	Aux	1,278	N
CRU00433	Cruise	2002	NLD	10,965	22	0	TEU	Auxiliary Boiler	1,393	N
CRU00433	Cruise	2002	NLD	10,965	22	0	TEU	Main	35,200	N
C0400079	Container4000	2002	HKG	50,790	23.3	4,253	TEU	Aux	6,680	N
C0400079	Container4000	2002	HKG	50,790	23.3	4,253	TEU	Auxiliary Boiler	492	N
C0400079	Container4000	2002	HKG	50,790	23.3	4,253	TEU	Main	36,515	N
BBB00539	Bulk	2000	PAN	50,341	14	0	TEU	Aux	1,793	N
BBB00539	Bulk	2000	PAN	50,341	14	0	TEU	Auxiliary Boiler	132	N

Vessel ID	Vessel Type	Model Year	Flag	DWT (tons)	Max Speed (knots)	Cap	Cap Units	Engine Type	Power (kW)	Slide Valve
BBB00539	Bulk	2000	PAN	50,341	14	0	TEU	Main	8,090	N
C0500544	Container5000	2001	GBR	69,207	24.5	5,618	TEU	Aux	9,400	N
C0500544	Container5000	2001	GBR	69,207	24.5	5,618	TEU	Auxiliary Boiler	630	N
C0500544	Container5000	2001	GBR	69,207	24.5	5,618	TEU	Main	43,100	N
TNC00531	Tanker - Chemical	2000	HKG	34,465	15	0	TEU	Aux	2,839	N
TNC00531	Tanker - Chemical	2000	HKG	34,465	15	0	TEU	Auxiliary Boiler	371	N
TNC00531	Tanker - Chemical	2000	HKG	34,465	15	0	TEU	Main	7,944	N
ACC00310	Auto Carrier	2000	PAN	16,837	20	0	TEU	Aux	4,723	N
ACC00310	Auto Carrier	2000	PAN	16,837	20	0	TEU	Auxiliary Boiler	253	N
ACC00310	Auto Carrier	2000	PAN	16,837	20	0	TEU	Main	11,181	N
ACC00662	Auto Carrier	2001	PAN	16,837	20	0	TEU	Aux	4,723	N
ACC00662	Auto Carrier	2001	PAN	16,837	20	0	TEU	Auxiliary Boiler	253	N
ACC00662	Auto Carrier	2001	PAN	16,837	20	0	TEU	Main	11,180	N
BBB00119	Bulk	2001	KOR	73,870	14.5	0	TEU	Aux	1,793	N
BBB00119	Bulk	2001	KOR	73,870	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00119	Bulk	2001	KOR	73,870	14.5	0	TEU	Main	10,371	N
BBB00049	Bulk	2001	PAN	76,662	15	0	TEU	Aux	1,793	N
BBB00049	Bulk	2001	PAN	76,662	15	0	TEU	Auxiliary Boiler	132	N
BBB00049	Bulk	2001	PAN	76,662	15	0	TEU	Main	10,320	N
C0400269	Container4000	2001	LBR	66,686	24	4,839	TEU	Aux	6,680	N
C0400269	Container4000	2001	LBR	66,686	24	4,839	TEU	Auxiliary Boiler	492	N
C0400269	Container4000	2001	LBR	66,686	24	4,839	TEU	Main	41,109	Y
C0400790	Container4000	2001	GBR	66,686	24	4,992	TEU	Aux	6,680	N
C0400790	Container4000	2001	GBR	66,686	24	4,992	TEU	Auxiliary Boiler	492	N
C0400790	Container4000	2001	GBR	66,686	24	4,992	TEU	Main	41,039	N
C0400597	Container4000	2002	LBR	66,686	24	4,839	TEU	Aux	6,680	N
C0400597	Container4000	2002	LBR	66,686	24	4,839	TEU	Auxiliary Boiler	492	N
C0400597	Container4000	2002	LBR	66,686	24	4,839	TEU	Main	41,039	Y
C0400136	Container4000	2002	HKG	66,686	24	4,992	TEU	Aux	6,680	N
C0400136	Container4000	2002	HKG	66,686	24	4,992	TEU	Auxiliary Boiler	492	N
C0400136	Container4000	2002	HKG	66,686	24	4,992	TEU	Main	41,106	N
C0400066	Container4000	2002	HKG	66,597	24	4,992	TEU	Aux	6,680	N
C0400066	Container4000	2002	HKG	66,597	24	4,992	TEU	Auxiliary Boiler	492	N
C0400066	Container4000	2002	HKG	66,597	24	4,992	TEU	Main	41,106	Y
C0400519	Container4000	2001	LBR	58,750	24	4,389	TEU	Aux	6,680	N
C0400519	Container4000	2001	LBR	58,750	24	4,389	TEU	Auxiliary Boiler	492	N
C0400519	Container4000	2001	LBR	58,750	24	4,389	TEU	Main	41,039	N
C0400592	Container4000	2002	LBR	58,768	24	4,389	TEU	Aux	6,680	N
C0400592	Container4000	2002	LBR	58,768	24	4,389	TEU	Auxiliary Boiler	492	N
C0400592	Container4000	2002	LBR	58,768	24	4,389	TEU	Main	41,039	N
TNP00700	Tanker - Panamax	2001	MHL	69,697	14.6	0	TEU	Aux	4,287	N
TNP00700	Tanker - Panamax	2001	MHL	69,697	14.6	0	TEU	Auxiliary Boiler	371	N
TNP00700	Tanker - Panamax	2001	MHL	69,697	14.6	0	TEU	Main	10,217	N
TNP00024	Tanker - Panamax	2001	MHL	69,708	14.6	0	TEU	Aux	4,287	N
TNP00024	Tanker - Panamax	2001	MHL	69,708	14.6	0	TEU	Auxiliary Boiler	371	N
TNP00024	Tanker - Panamax	2001	MHL	69,708	14.6	0	TEU	Main	10,217	N
TNP00448	Tanker - Panamax	2002	MHL	69,629	14.6	0	TEU	Aux	4,287	N
TNP00448	Tanker - Panamax	2002	MHL	69,629	14.6	0	TEU	Auxiliary Boiler	371	N
TNP00448	Tanker - Panamax	2002	MHL	69,629	14.6	0	TEU	Main	10,217	N
GCC00490	General Cargo	2001	BHS	47,818	14.2	424	TEU	Aux	2,305	N

Vessel ID	Vessel Type	Model Year	Flag	DWT (tons)	Max Speed (knots)	Cap	Cap Units	Engine Type	Power (kW)	Slide Valve
GCC00490	General Cargo	2001	BHS	47,818	14.2	424	TEU	Auxiliary Boiler	137	N
GCC00490	General Cargo	2001	BHS	47,818	14.2	424	TEU	Main	8,900	N
ACC00487	Auto Carrier	2001	MHL	17,950	20	0	TEU	Aux	4,723	N
ACC00487	Auto Carrier	2001	MHL	17,950	20	0	TEU	Auxiliary Boiler	253	N
ACC00487	Auto Carrier	2001	MHL	17,950	20	0	TEU	Main	17,759	N
TNS00680	Tanker - Suezmax	2002	GRC	149,994	15.4	0	TEU	Aux	2,625	N
TNS00680	Tanker - Suezmax	2002	GRC	149,994	15.4	0	TEU	Auxiliary Boiler	371	N
TNS00680	Tanker - Suezmax	2002	GRC	149,994	15.4	0	TEU	Main	16,460	N
TNU00145	Tanker - ULCC	2001	MHL	305,796	16	0	TEU	Aux	3,780	N
TNU00145	Tanker - ULCC	2001	MHL	305,796	16	0	TEU	Auxiliary Boiler	371	N
TNU00145	Tanker - ULCC	2001	MHL	305,796	16	0	TEU	Main	29,349	N
CRU00235	Cruise	2000	PAN	7,089	22	0	TEU	Aux	1,290	N
CRU00235	Cruise	2000	PAN	7,089	22	0	TEU	Auxiliary Boiler	1,393	N
CRU00235	Cruise	2000	PAN	7,089	22	0	TEU	Main	35,200	N
BBB00477	Bulk	2000	PAN	23,573	13.7	0	TEU	Aux	1,793	N
BBB00477	Bulk	2000	PAN	23,573	13.7	0	TEU	Auxiliary Boiler	132	N
BBB00477	Bulk	2000	PAN	23,573	13.7	0	TEU	Main	5,295	N
BBB00678	Bulk	2001	PAN	76,679	15	0	TEU	Aux	1,793	N
BBB00678	Bulk	2001	PAN	76,679	15	0	TEU	Auxiliary Boiler	132	N
BBB00678	Bulk	2001	PAN	76,679	15	0	TEU	Main	12,268	N
ACC00603	Auto Carrier	2001	PAN	17,201	20	0	TEU	Aux	4,723	N
ACC00603	Auto Carrier	2001	PAN	17,201	20	0	TEU	Auxiliary Boiler	253	N
ACC00603	Auto Carrier	2001	PAN	17,201	20	0	TEU	Main	13,940	N
C0400695	Container4000	2002	LBR	50,760	23.3	4,253	TEU	Aux	7,440	N
C0400695	Container4000	2002	LBR	50,760	23.3	4,253	TEU	Auxiliary Boiler	492	N
C0400695	Container4000	2002	LBR	50,760	23.3	4,253	TEU	Main	36,515	N
C0400153	Container4000	2003	LBR	50,900	23.3	4,253	TEU	Aux	6,680	N
C0400153	Container4000	2003	LBR	50,900	23.3	4,253	TEU	Auxiliary Boiler	492	N
C0400153	Container4000	2003	LBR	50,900	23.3	4,253	TEU	Main	36,515	N
TNU00026	Tanker - ULCC	2002	BHS	308,875	15.9	0	TEU	Aux	4,502	N
TNU00026	Tanker - ULCC	2002	BHS	308,875	15.9	0	TEU	Auxiliary Boiler	371	N
TNU00026	Tanker - ULCC	2002	BHS	308,875	15.9	0	TEU	Main	27,186	N
TNP00182	Tanker - Panamax	2001	MHL	69,684	14.6	0	TEU	Aux	3,031	N
TNP00182	Tanker - Panamax	2001	MHL	69,684	14.6	0	TEU	Auxiliary Boiler	371	N
TNP00182	Tanker - Panamax	2001	MHL	69,684	14.6	0	TEU	Main	10,217	N
C0800344	Container8000	2002	HKG	99,518	25	8,063	TEU	Aux	11,205	N
C0800344	Container8000	2002	HKG	99,518	25	8,063	TEU	Auxiliary Boiler	525	N
C0800344	Container8000	2002	HKG	99,518	25	8,063	TEU	Main	68,518	Y
C0800008	Container8000	2002	HKG	99,508	25	8,063	TEU	Aux	11,205	N
C0800008	Container8000	2002	HKG	99,508	25	8,063	TEU	Auxiliary Boiler	525	N
C0800008	Container8000	2002	HKG	99,508	25	8,063	TEU	Main	68,494	Y
TNS00568	Tanker - Suezmax	2001	USA	141,740	16.5	0	TEU	Aux	2,993	N
TNS00568	Tanker - Suezmax	2001	USA	141,740	16.5	0	TEU	Auxiliary Boiler	371	N
TNS00568	Tanker - Suezmax	2001	USA	141,740	16.5	0	TEU	Main	22,087	N
C0200563	Container2000	2001	USA	38,261	21.8	2,831	TEU	Aux	5,470	N
C0200563	Container2000	2001	USA	38,261	21.8	2,831	TEU	Auxiliary Boiler	325	N
C0200563	Container2000	2001	USA	38,261	21.8	2,831	TEU	Main	28,879	Y
GCC00785	General Cargo	2002	MHL	30,151	18	1,888	TEU	Aux	2,305	N
GCC00785	General Cargo	2002	MHL	30,151	18	1,888	TEU	Auxiliary Boiler	137	N
GCC00785	General Cargo	2002	MHL	30,151	18	1,888	TEU	Main	15,785	N

Vessel ID	Vessel Type	Model Year	Flag	DWT (tons)	Max Speed (knots)	Cap	Cap Units	Engine Type	Power (kW)	Slide Valve
TNS00459	Tanker - Suezmax	2003	USA	193,049	15.3	0	TEU	Aux	2,993	N
TNS00459	Tanker - Suezmax	2003	USA	193,049	15.3	0	TEU	Auxiliary Boiler	371	N
TNS00459	Tanker - Suezmax	2003	USA	193,049	15.3	0	TEU	Main	26,820	N
TNS00168	Tanker - Suezmax	2003	USA	193,049	15.3	0	TEU	Aux	2,993	N
TNS00168	Tanker - Suezmax	2003	USA	193,049	15.3	0	TEU	Auxiliary Boiler	371	N
TNS00168	Tanker - Suezmax	2003	USA	193,049	15.3	0	TEU	Main	26,820	N
TNS00077	Tanker - Suezmax	2004	USA	193,048	15.3	0	TEU	Aux	2,993	N
TNS00077	Tanker - Suezmax	2004	USA	193,048	15.3	0	TEU	Auxiliary Boiler	371	N
TNS00077	Tanker - Suezmax	2004	USA	193,048	15.3	0	TEU	Main	26,820	N
BBB00701	Bulk	2004	IND	75,926	14	0	TEU	Aux	1,793	N
BBB00701	Bulk	2004	IND	75,926	14	0	TEU	Auxiliary Boiler	132	N
BBB00701	Bulk	2004	IND	75,926	14	0	TEU	Main	9,010	Y
TNC00364	Tanker - Chemical	2001	MHL	19,997	15.5	0	TEU	Aux	2,839	N
TNC00364	Tanker - Chemical	2001	MHL	19,997	15.5	0	TEU	Auxiliary Boiler	371	N
TNC00364	Tanker - Chemical	2001	MHL	19,997	15.5	0	TEU	Main	7,080	N
BBB00149	Bulk	2001	PAN	23,587	13.7	0	TEU	Aux	1,793	N
BBB00149	Bulk	2001	PAN	23,587	13.7	0	TEU	Auxiliary Boiler	132	N
BBB00149	Bulk	2001	PAN	23,587	13.7	0	TEU	Main	5,295	N
BBB00224	Bulk	2002	TUR	52,344	14.5	0	TEU	Aux	1,440	N
BBB00224	Bulk	2002	TUR	52,344	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00224	Bulk	2002	TUR	52,344	14.5	0	TEU	Main	7,800	N
BBB00143	Bulk	2001	MLT	31,635	14.7	0	TEU	Aux	1,793	N
BBB00143	Bulk	2001	MLT	31,635	14.7	0	TEU	Auxiliary Boiler	132	N
BBB00143	Bulk	2001	MLT	31,635	14.7	0	TEU	Main	7,061	N
C0500042	Container5000	2000	GBR	68,910	24.5	5,618	TEU	Aux	9,400	N
C0500042	Container5000	2000	GBR	68,910	24.5	5,618	TEU	Auxiliary Boiler	630	N
C0500042	Container5000	2000	GBR	68,910	24.5	5,618	TEU	Main	43,100	N
C0500482	Container5000	2001	GBR	69,107	24.5	5,618	TEU	Aux	9,400	N
C0500482	Container5000	2001	GBR	69,107	24.5	5,618	TEU	Auxiliary Boiler	630	N
C0500482	Container5000	2001	GBR	69,107	24.5	5,618	TEU	Main	43,100	N
C0500391	Container5000	2002	DEU	68,200	26.3	5,752	TEU	Aux	9,400	N
C0500391	Container5000	2002	DEU	68,200	26.3	5,752	TEU	Auxiliary Boiler	630	N
C0500391	Container5000	2002	DEU	68,200	26.3	5,752	TEU	Main	54,899	N
C0500330	Container5000	2002	DEU	67,979	26.3	5,752	TEU	Aux	9,400	N
C0500330	Container5000	2002	DEU	67,979	26.3	5,752	TEU	Auxiliary Boiler	630	N
C0500330	Container5000	2002	DEU	67,979	26.3	5,752	TEU	Main	57,199	N
TNV00342	Tanker - VLCC	2002	LBR	299,157	15.6	0	TEU	Aux	4,502	N
TNV00342	Tanker - VLCC	2002	LBR	299,157	15.6	0	TEU	Auxiliary Boiler	371	N
TNV00342	Tanker - VLCC	2002	LBR	299,157	15.6	0	TEU	Main	25,089	N
TNA00334	Tanker - Aframax	2003	MHL	112,045	15.1	0	TEU	Aux	2,432	N
TNA00334	Tanker - Aframax	2003	MHL	112,045	15.1	0	TEU	Auxiliary Boiler	371	N
TNA00334	Tanker - Aframax	2003	MHL	112,045	15.1	0	TEU	Main	14,280	N
BBB00046	Bulk	2001	GRC	74,764	14.5	0	TEU	Aux	1,793	N
BBB00046	Bulk	2001	GRC	74,764	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00046	Bulk	2001	GRC	74,764	14.5	0	TEU	Main	11,299	N
ACC00559	Auto Carrier	2001	PAN	17,232	20	0	TEU	Aux	4,723	N
ACC00559	Auto Carrier	2001	PAN	17,232	20	0	TEU	Auxiliary Boiler	253	N
ACC00559	Auto Carrier	2001	PAN	17,232	20	0	TEU	Main	13,940	N
TNS00574	Tanker - Suezmax	2002	USA	141,740	16.5	0	TEU	Aux	2,993	N
TNS00574	Tanker - Suezmax	2002	USA	141,740	16.5	0	TEU	Auxiliary Boiler	371	N

Vessel ID	Vessel Type	Model Year	Flag	DWT (tons)	Max Speed (knots)	Cap	Cap Units	Engine Type	Power (kW)	Slide Valve
TNS00574	Tanker - Suezmax	2002	USA	141,740	16.5	0	TEU	Main	22,087	N
C0400357	Container4000	2002	HKG	63,160	25.5	4,646	TEU	Aux	6,680	N
C0400357	Container4000	2002	HKG	63,160	25.5	4,646	TEU	Auxiliary Boiler	492	N
C0400357	Container4000	2002	HKG	63,160	25.5	4,646	TEU	Main	49,451	N
C0400688	Container4000	2002	PAN	63,046	25.5	4,646	TEU	Aux	6,680	N
C0400688	Container4000	2002	PAN	63,046	25.5	4,646	TEU	Auxiliary Boiler	492	N
C0400688	Container4000	2002	PAN	63,046	25.5	4,646	TEU	Main	49,451	N
TNP00461	Tanker - Panamax	2002	LBR	70,392	15	0	TEU	Aux	1,980	N
TNP00461	Tanker - Panamax	2002	LBR	70,392	15	0	TEU	Auxiliary Boiler	371	N
TNP00461	Tanker - Panamax	2002	LBR	70,392	15	0	TEU	Main	10,010	N
C0400711	Container4000	2002	GIB	53,554	24	4,713	TEU	Aux	6,680	N
C0400711	Container4000	2002	GIB	53,554	24	4,713	TEU	Auxiliary Boiler	492	N
C0400711	Container4000	2002	GIB	53,554	24	4,713	TEU	Main	36,774	N
BBB00096	Bulk	2002	MLT	31,350	14.7	0	TEU	Aux	1,793	N
BBB00096	Bulk	2002	MLT	31,350	14.7	0	TEU	Auxiliary Boiler	132	N
BBB00096	Bulk	2002	MLT	31,350	14.7	0	TEU	Main	7,061	N
TNP00378	Tanker - Panamax	2002	CYP	68,467	14.5	0	TEU	Aux	1,982	N
TNP00378	Tanker - Panamax	2002	CYP	68,467	14.5	0	TEU	Auxiliary Boiler	371	N
TNP00378	Tanker - Panamax	2002	CYP	68,467	14.5	0	TEU	Main	10,002	N
TNP00274	Tanker - Panamax	2002	CYP	68,439	14.5	0	TEU	Aux	1,982	N
TNP00274	Tanker - Panamax	2002	CYP	68,439	14.5	0	TEU	Auxiliary Boiler	371	N
TNP00274	Tanker - Panamax	2002	CYP	68,439	14.5	0	TEU	Main	10,002	N
TNP00706	Tanker - Panamax	2002	ITA	72,344	14	0	TEU	Aux	2,627	N
TNP00706	Tanker - Panamax	2002	ITA	72,344	14	0	TEU	Auxiliary Boiler	371	N
TNP00706	Tanker - Panamax	2002	ITA	72,344	14	0	TEU	Main	11,290	N
C0800760	Container8000	2003	HKG	99,500	25	8,063	TEU	Aux	11,205	N
C0800760	Container8000	2003	HKG	99,500	25	8,063	TEU	Auxiliary Boiler	525	N
C0800760	Container8000	2003	HKG	99,500	25	8,063	TEU	Main	68,494	Y
GCC00515	General Cargo	2002	USA	8,097	16.5	522	TEU	Aux	2,305	N
GCC00515	General Cargo	2002	USA	8,097	16.5	522	TEU	Auxiliary Boiler	137	N
GCC00515	General Cargo	2002	USA	8,097	16.5	522	TEU	Main	5,400	N
TNC00374	Tanker - Chemical	2003	BMU	47,288	14.8	0	TEU	Aux	2,839	N
TNC00374	Tanker - Chemical	2003	BMU	47,288	14.8	0	TEU	Auxiliary Boiler	371	N
TNC00374	Tanker - Chemical	2003	BMU	47,288	14.8	0	TEU	Main	8,580	N
TNP00139	Tanker - Panamax	2003	MHL	70,156	14.7	0	TEU	Aux	2,627	N
TNP00139	Tanker - Panamax	2003	MHL	70,156	14.7	0	TEU	Auxiliary Boiler	371	N
TNP00139	Tanker - Panamax	2003	MHL	70,156	14.7	0	TEU	Main	13,548	N
BBB00236	Bulk	2001	MLT	74,816	14.5	0	TEU	Aux	1,845	N
BBB00236	Bulk	2001	MLT	74,816	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00236	Bulk	2001	MLT	74,816	14.5	0	TEU	Main	10,200	N
BBB00650	Bulk	2003	PAN	75,707	14.5	0	TEU	Aux	1,793	N
BBB00650	Bulk	2003	PAN	75,707	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00650	Bulk	2003	PAN	75,707	14.5	0	TEU	Main	8,974	N
BBB00699	Bulk	2002	MHL	31,829	14	0	TEU	Aux	1,793	N
BBB00699	Bulk	2002	MHL	31,829	14	0	TEU	Auxiliary Boiler	132	N
BBB00699	Bulk	2002	MHL	31,829	14	0	TEU	Main	6,620	N
TNC00405	Tanker - Chemical	2001	SGP	27,186	14.8	0	TEU	Aux	2,100	N
TNC00405	Tanker - Chemical	2001	SGP	27,186	14.8	0	TEU	Auxiliary Boiler	371	N
TNC00405	Tanker - Chemical	2001	SGP	27,186	14.8	0	TEU	Main	7,080	N
TNC00641	Tanker - Chemical	2002	MHL	19,997	14.7	0	TEU	Aux	2,839	N

Vessel ID	Vessel Type	Model Year	Flag	DWT (tons)	Max Speed (knots)	Cap	Cap Units	Engine Type	Power (kW)	Slide Valve
TNC00641	Tanker - Chemical	2002	MHL	19,997	14.7	0	TEU	Auxiliary Boiler	371	N
TNC00641	Tanker - Chemical	2002	MHL	19,997	14.7	0	TEU	Main	6,230	N
TNC00312	Tanker - Chemical	2002	SGP	21,184	15.5	0	TEU	Aux	2,040	N
TNC00312	Tanker - Chemical	2002	SGP	21,184	15.5	0	TEU	Auxiliary Boiler	371	N
TNC00312	Tanker - Chemical	2002	SGP	21,184	15.5	0	TEU	Main	6,150	N
BBB00033	Bulk	2001	IOM	46,232	14.3	0	TEU	Aux	1,793	N
BBB00033	Bulk	2001	IOM	46,232	14.3	0	TEU	Auxiliary Boiler	132	N
BBB00033	Bulk	2001	IOM	46,232	14.3	0	TEU	Main	8,782	N
TNP00753	Tanker - Panamax	2002	GRC	68,439	14.5	0	TEU	Aux	1,982	N
TNP00753	Tanker - Panamax	2002	GRC	68,439	14.5	0	TEU	Auxiliary Boiler	371	N
TNP00753	Tanker - Panamax	2002	GRC	68,439	14.5	0	TEU	Main	10,002	N
TNP00069	Tanker - Panamax	2002	LBR	72,353	15	0	TEU	Aux	2,627	N
TNP00069	Tanker - Panamax	2002	LBR	72,353	15	0	TEU	Auxiliary Boiler	371	N
TNP00069	Tanker - Panamax	2002	LBR	72,353	15	0	TEU	Main	11,290	N
TNH00013	Tanker - Handysize	2002	PAN	46,013	14.6	0	TEU	Aux	2,328	N
TNH00013	Tanker - Handysize	2002	PAN	46,013	14.6	0	TEU	Auxiliary Boiler	371	N
TNH00013	Tanker - Handysize	2002	PAN	46,013	14.6	0	TEU	Main	9,267	N
TNA00211	Tanker - Aframax	2003	IOM	106,138	14.5	0	TEU	Aux	2,470	N
TNA00211	Tanker - Aframax	2003	IOM	106,138	14.5	0	TEU	Auxiliary Boiler	371	N
TNA00211	Tanker - Aframax	2003	IOM	106,138	14.5	0	TEU	Main	12,239	N
TNA00085	Tanker - Aframax	2003	IOM	106,070	14.3	0	TEU	Aux	2,450	N
TNA00085	Tanker - Aframax	2003	IOM	106,070	14.3	0	TEU	Auxiliary Boiler	371	N
TNA00085	Tanker - Aframax	2003	IOM	106,070	14.3	0	TEU	Main	12,240	N
BBB00558	Bulk	2002	LBR	76,610	15.3	0	TEU	Aux	1,793	N
BBB00558	Bulk	2002	LBR	76,610	15.3	0	TEU	Auxiliary Boiler	132	N
BBB00558	Bulk	2002	LBR	76,610	15.3	0	TEU	Main	10,320	N
C0500252	Container5000	2002	PAN	67,197	25	5,576	TEU	Aux	9,400	N
C0500252	Container5000	2002	PAN	67,197	25	5,576	TEU	Auxiliary Boiler	630	N
C0500252	Container5000	2002	PAN	67,197	25	5,576	TEU	Main	57,221	N
ACC00041	Auto Carrier	2003	PAN	19,550	20	0	TEU	Aux	4,723	N
ACC00041	Auto Carrier	2003	PAN	19,550	20	0	TEU	Auxiliary Boiler	253	N
ACC00041	Auto Carrier	2003	PAN	19,550	20	0	TEU	Main	14,161	N
BBB00047	Bulk	2002	LUX	31,646	14.7	0	TEU	Aux	1,793	N
BBB00047	Bulk	2002	LUX	31,646	14.7	0	TEU	Auxiliary Boiler	132	N
BBB00047	Bulk	2002	LUX	31,646	14.7	0	TEU	Main	7,061	N
C0200628	Container2000	2002	USA	38,261	21.8	2,831	TEU	Aux	5,470	N
C0200628	Container2000	2002	USA	38,261	21.8	2,831	TEU	Auxiliary Boiler	325	N
C0200628	Container2000	2002	USA	38,261	21.8	2,831	TEU	Main	28,879	Y
BBB00732	Bulk	2002	HKG	33,745	14.8	0	TEU	Aux	1,793	N
BBB00732	Bulk	2002	HKG	33,745	14.8	0	TEU	Auxiliary Boiler	132	N
BBB00732	Bulk	2002	HKG	33,745	14.8	0	TEU	Main	6,230	N
TNS00768	Tanker - Suezmax	2004	USA	193,048	15.3	0	TEU	Aux	2,993	N
TNS00768	Tanker - Suezmax	2004	USA	193,048	15.3	0	TEU	Auxiliary Boiler	371	N
TNS00768	Tanker - Suezmax	2004	USA	193,048	15.3	0	TEU	Main	26,820	N
TNC00543	Tanker - Chemical	2004	MHL	46,168	14.5	0	TEU	Aux	3,355	N
TNC00543	Tanker - Chemical	2004	MHL	46,168	14.5	0	TEU	Auxiliary Boiler	371	N
TNC00543	Tanker - Chemical	2004	MHL	46,168	14.5	0	TEU	Main	9,480	Y
GCC00502	General Cargo	2002	CYP	30,435	19.2	1,904	TEU	Aux	3,260	N
GCC00502	General Cargo	2002	CYP	30,435	19.2	1,904	TEU	Auxiliary Boiler	137	N
GCC00502	General Cargo	2002	CYP	30,435	19.2	1,904	TEU	Main	16,520	N

Vessel ID	Vessel Type	Model Year	Flag	DWT (tons)	Max Speed (knots)	Cap	Cap Units	Engine Type	Power (kW)	Slide Valve
TNC00496	Tanker - Chemical	2004	BHS	19,997	14.7	0	TEU	Aux	2,839	N
TNC00496	Tanker - Chemical	2004	BHS	19,997	14.7	0	TEU	Auxiliary Boiler	371	N
TNC00496	Tanker - Chemical	2004	BHS	19,997	14.7	0	TEU	Main	6,230	N
GCC00059	General Cargo	2004	PRT	31,647	14.7	0	TEU	Aux	2,305	N
GCC00059	General Cargo	2004	PRT	31,647	14.7	0	TEU	Auxiliary Boiler	137	N
GCC00059	General Cargo	2004	PRT	31,647	14.7	0	TEU	Main	7,061	N
ACC00654	Auto Carrier	2002	JPN	17,442	20	0	TEU	Aux	4,723	N
ACC00654	Auto Carrier	2002	JPN	17,442	20	0	TEU	Auxiliary Boiler	253	N
ACC00654	Auto Carrier	2002	JPN	17,442	20	0	TEU	Main	13,940	N
ACC00174	Auto Carrier	2002	JPN	17,481	20	0	TEU	Aux	4,723	N
ACC00174	Auto Carrier	2002	JPN	17,481	20	0	TEU	Auxiliary Boiler	253	N
ACC00174	Auto Carrier	2002	JPN	17,481	20	0	TEU	Main	13,940	N
TNP00057	Tanker - Panamax	2004	MHL	74,999	16	0	TEU	Aux	3,020	N
TNP00057	Tanker - Panamax	2004	MHL	74,999	16	0	TEU	Auxiliary Boiler	371	N
TNP00057	Tanker - Panamax	2004	MHL	74,999	16	0	TEU	Main	13,548	Y
TNC00452	Tanker - Chemical	2002	SGP	32,363	15	0	TEU	Aux	0	N
TNC00452	Tanker - Chemical	2002	SGP	32,363	15	0	TEU	Auxiliary Boiler	371	N
TNC00452	Tanker - Chemical	2002	SGP	32,363	15	0	TEU	Main	7,980	N
C0200480	Container2000	2003	USA	38,261	21.8	2,831	TEU	Aux	5,470	N
C0200480	Container2000	2003	USA	38,261	21.8	2,831	TEU	Auxiliary Boiler	325	N
C0200480	Container2000	2003	USA	38,261	21.8	2,831	TEU	Main	28,879	Y
C0200486	Container2000	2004	USA	34,026	22	2,526	TEU	Aux	5,470	N
C0200486	Container2000	2004	USA	34,026	22	2,526	TEU	Auxiliary Boiler	325	N
C0200486	Container2000	2004	USA	34,026	22	2,526	TEU	Main	21,769	Y
ACC00191	Auto Carrier	2003	PAN	20,111	20	0	TEU	Aux	4,723	N
ACC00191	Auto Carrier	2003	PAN	20,111	20	0	TEU	Auxiliary Boiler	253	N
ACC00191	Auto Carrier	2003	PAN	20,111	20	0	TEU	Main	15,540	N
ACC00718	Auto Carrier	2004	PAN	21,443	20	0	TEU	Aux	4,723	N
ACC00718	Auto Carrier	2004	PAN	21,443	20	0	TEU	Auxiliary Boiler	253	N
ACC00718	Auto Carrier	2004	PAN	21,443	20	0	TEU	Main	15,540	N
BBB00743	Bulk	2004	PAN	52,571	14.3	0	TEU	Aux	1,793	N
BBB00743	Bulk	2004	PAN	52,571	14.3	0	TEU	Auxiliary Boiler	132	N
BBB00743	Bulk	2004	PAN	52,571	14.3	0	TEU	Main	7,800	Y
BBB00012	Bulk	2003	HKG	48,821	14.5	0	TEU	Aux	1,793	N
BBB00012	Bulk	2003	HKG	48,821	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00012	Bulk	2003	HKG	48,821	14.5	0	TEU	Main	6,545	N
TNP00157	Tanker - Panamax	2003	IOM	70,681	14.9	0	TEU	Aux	2,627	N
TNP00157	Tanker - Panamax	2003	IOM	70,681	14.9	0	TEU	Auxiliary Boiler	371	N
TNP00157	Tanker - Panamax	2003	IOM	70,681	14.9	0	TEU	Main	13,560	N
TNP00674	Tanker - Panamax	2003	IOM	70,616	14.9	0	TEU	Aux	2,627	N
TNP00674	Tanker - Panamax	2003	IOM	70,616	14.9	0	TEU	Auxiliary Boiler	371	N
TNP00674	Tanker - Panamax	2003	IOM	70,616	14.9	0	TEU	Main	13,560	N
TNP00170	Tanker - Panamax	2003	MHL	69,636	14.6	0	TEU	Aux	2,627	N
TNP00170	Tanker - Panamax	2003	MHL	69,636	14.6	0	TEU	Auxiliary Boiler	371	N
TNP00170	Tanker - Panamax	2003	MHL	69,636	14.6	0	TEU	Main	10,223	N
TNP00078	Tanker - Panamax	2003	MHL	69,636	14.6	0	TEU	Aux	2,627	N
TNP00078	Tanker - Panamax	2003	MHL	69,636	14.6	0	TEU	Auxiliary Boiler	371	N
TNP00078	Tanker - Panamax	2003	MHL	69,636	14.6	0	TEU	Main	10,223	N
ITB00250	ITB	2001	USA	449	12	0	TEU	Aux	449	N
ITB00250	ITB	2001	USA	449	12	0	TEU	Auxiliary Boiler	0	N

Vessel ID	Vessel Type	Model Year	Flag	DWT (tons)	Max Speed (knots)	Cap	Cap Units	Engine Type	Power (kW)	Slide Valve
ITB00250	ITB	2001	USA	449	12	0	TEU	Main	6,825	N
BBB00484	Bulk	2002	HKG	29,738	14.3	0	TEU	Aux	1,793	N
BBB00484	Bulk	2002	HKG	29,738	14.3	0	TEU	Auxiliary Boiler	132	N
BBB00484	Bulk	2002	HKG	29,738	14.3	0	TEU	Main	6,150	N
ITB00004	ITB	2001	USA	945	12	0	TEU	Aux	449	N
ITB00004	ITB	2001	USA	945	12	0	TEU	Auxiliary Boiler	0	N
ITB00004	ITB	2001	USA	945	12	0	TEU	Main	6,767	N
C0500103	Container5000	2003	PAN	68,254	24.3	5,059	TEU	Aux	9,400	N
C0500103	Container5000	2003	PAN	68,254	24.3	5,059	TEU	Auxiliary Boiler	630	N
C0500103	Container5000	2003	PAN	68,254	24.3	5,059	TEU	Main	41,106	N
TNC00141	Tanker - Chemical	2002	SGP	32,315	15	0	TEU	Aux	2,280	N
TNC00141	Tanker - Chemical	2002	SGP	32,315	15	0	TEU	Auxiliary Boiler	371	N
TNC00141	Tanker - Chemical	2002	SGP	32,315	15	0	TEU	Main	7,980	N
TNC00072	Tanker - Chemical	2003	SGP	33,573	15	0	TEU	Aux	1,920	N
TNC00072	Tanker - Chemical	2003	SGP	33,573	15	0	TEU	Auxiliary Boiler	371	N
TNC00072	Tanker - Chemical	2003	SGP	33,573	15	0	TEU	Main	7,980	N
TNC00428	Tanker - Chemical	2002	PAN	46,383	15.2	0	TEU	Aux	2,839	N
TNC00428	Tanker - Chemical	2002	PAN	46,383	15.2	0	TEU	Auxiliary Boiler	371	N
TNC00428	Tanker - Chemical	2002	PAN	46,383	15.2	0	TEU	Main	10,203	N
BBB00289	Bulk	2004	IND	76,015	14	0	TEU	Aux	2,117	N
BBB00289	Bulk	2004	IND	76,015	14	0	TEU	Auxiliary Boiler	132	N
BBB00289	Bulk	2004	IND	76,015	14	0	TEU	Main	8,550	Y
C0400347	Container4000	2003	PAN	66,694	24	4,900	TEU	Aux	6,680	N
C0400347	Container4000	2003	PAN	66,694	24	4,900	TEU	Auxiliary Boiler	492	N
C0400347	Container4000	2003	PAN	66,694	24	4,900	TEU	Main	41,106	N
C0400058	Container4000	2003	PAN	66,786	24	4,900	TEU	Aux	6,680	N
C0400058	Container4000	2003	PAN	66,786	24	4,900	TEU	Auxiliary Boiler	492	N
C0400058	Container4000	2003	PAN	66,786	24	4,900	TEU	Main	41,106	N
TNP00537	Tanker - Panamax	2003	LBR	71,024	16.1	0	TEU	Aux	2,627	N
TNP00537	Tanker - Panamax	2003	LBR	71,024	16.1	0	TEU	Auxiliary Boiler	371	N
TNP00537	Tanker - Panamax	2003	LBR	71,024	16.1	0	TEU	Main	12,240	N
C0400588	Container4000	2003	ISR	62,740	24	4,814	TEU	Aux	6,480	N
C0400588	Container4000	2003	ISR	62,740	24	4,814	TEU	Auxiliary Boiler	492	N
C0400588	Container4000	2003	ISR	62,740	24	4,814	TEU	Main	41,078	N
C0400341	Container4000	2004	GBR	62,740	24	4,992	TEU	Aux	6,480	N
C0400341	Container4000	2004	GBR	62,740	24	4,992	TEU	Auxiliary Boiler	492	N
C0400341	Container4000	2004	GBR	62,740	24	4,992	TEU	Main	41,078	Y
C0400665	Container4000	2004	LBR	62,740	24	4,992	TEU	Aux	6,480	N
C0400665	Container4000	2004	LBR	62,740	24	4,992	TEU	Auxiliary Boiler	492	N
C0400665	Container4000	2004	LBR	62,740	24	4,992	TEU	Main	41,078	Y
C0500317	Container5000	2003	PAN	68,372	24.3	5,059	TEU	Aux	9,400	N
C0500317	Container5000	2003	PAN	68,372	24.3	5,059	TEU	Auxiliary Boiler	630	N
C0500317	Container5000	2003	PAN	68,372	24.3	5,059	TEU	Main	41,106	N
TNA00254	Tanker - Aframax	2004	IOM	114,809	15.7	0	TEU	Aux	3,272	N
TNA00254	Tanker - Aframax	2004	IOM	114,809	15.7	0	TEU	Auxiliary Boiler	371	N
TNA00254	Tanker - Aframax	2004	IOM	114,809	15.7	0	TEU	Main	15,801	Y
TNP00098	Tanker - Panamax	2004	BHS	72,825	15.2	0	TEU	Aux	2,627	N
TNP00098	Tanker - Panamax	2004	BHS	72,825	15.2	0	TEU	Auxiliary Boiler	371	N
TNP00098	Tanker - Panamax	2004	BHS	72,825	15.2	0	TEU	Main	11,500	Y
BBB00663	Bulk	2002	HKG	28,710	14.1	0	TEU	Aux	1,793	N

Vessel ID	Vessel Type	Model Year	Flag	DWT (tons)	Max Speed (knots)	Cap	Cap Units	Engine Type	Power (kW)	Slide Valve
BBB00663	Bulk	2002	HKG	28,710	14.1	0	TEU	Auxiliary Boiler	132	N
BBB00663	Bulk	2002	HKG	28,710	14.1	0	TEU	Main	5,900	N
C0500228	Container5000	2004	LBR	66,937	24.5	5,075	TEU	Aux	9,400	N
C0500228	Container5000	2004	LBR	66,937	24.5	5,075	TEU	Auxiliary Boiler	630	N
C0500228	Container5000	2004	LBR	66,937	24.5	5,075	TEU	Main	45,763	N
TNP00111	Tanker - Panamax	2004	BHS	72,829	15	0	TEU	Aux	2,627	N
TNP00111	Tanker - Panamax	2004	BHS	72,829	15	0	TEU	Auxiliary Boiler	371	N
TNP00111	Tanker - Panamax	2004	BHS	72,829	15	0	TEU	Main	11,500	Y
TNP00065	Tanker - Panamax	2003	BHS	72,854	15	0	TEU	Aux	2,627	N
TNP00065	Tanker - Panamax	2003	BHS	72,854	15	0	TEU	Auxiliary Boiler	371	N
TNP00065	Tanker - Panamax	2003	BHS	72,854	15	0	TEU	Main	11,500	N
TNC00748	Tanker - Chemical	2004	MEX	46,911	14.5	0	TEU	Aux	3,330	N
TNC00748	Tanker - Chemical	2004	MEX	46,911	14.5	0	TEU	Auxiliary Boiler	371	N
TNC00748	Tanker - Chemical	2004	MEX	46,911	14.5	0	TEU	Main	8,580	Y
ACC00668	Auto Carrier	2004	PAN	20,120	20	0	TEU	Aux	4,723	N
ACC00668	Auto Carrier	2004	PAN	20,120	20	0	TEU	Auxiliary Boiler	253	N
ACC00668	Auto Carrier	2004	PAN	20,120	20	0	TEU	Main	15,540	N
ACC00703	Auto Carrier	2004	PAN	20,146	20	0	TEU	Aux	4,723	N
ACC00703	Auto Carrier	2004	PAN	20,146	20	0	TEU	Auxiliary Boiler	253	N
ACC00703	Auto Carrier	2004	PAN	20,146	20	0	TEU	Main	15,540	N
ACC00009	Auto Carrier	2004	PAN	20,098	20	0	TEU	Aux	4,723	N
ACC00009	Auto Carrier	2004	PAN	20,098	20	0	TEU	Auxiliary Boiler	253	N
ACC00009	Auto Carrier	2004	PAN	20,098	20	0	TEU	Main	15,540	N
ACC00524	Auto Carrier	2004	PAN	21,466	20	0	TEU	Aux	4,723	N
ACC00524	Auto Carrier	2004	PAN	21,466	20	0	TEU	Auxiliary Boiler	253	N
ACC00524	Auto Carrier	2004	PAN	21,466	20	0	TEU	Main	15,540	N
ACC00387	Auto Carrier	2004	PAN	21,471	20	0	TEU	Aux	4,723	N
ACC00387	Auto Carrier	2004	PAN	21,471	20	0	TEU	Auxiliary Boiler	253	N
ACC00387	Auto Carrier	2004	PAN	21,471	20	0	TEU	Main	15,540	N
ACC00469	Auto Carrier	2004	PAN	21,453	20	0	TEU	Aux	4,723	N
ACC00469	Auto Carrier	2004	PAN	21,453	20	0	TEU	Auxiliary Boiler	253	N
ACC00469	Auto Carrier	2004	PAN	21,453	20	0	TEU	Main	15,540	N
TNV00003	Tanker - VLCC	2003	GRC	299,095	15.6	0	TEU	Aux	4,502	N
TNV00003	Tanker - VLCC	2003	GRC	299,095	15.6	0	TEU	Auxiliary Boiler	371	N
TNV00003	Tanker - VLCC	2003	GRC	299,095	15.6	0	TEU	Main	25,088	N
C0800729	Container8000	2004	HKG	99,620	25	8,063	TEU	Aux	11,205	N
C0800729	Container8000	2004	HKG	99,620	25	8,063	TEU	Auxiliary Boiler	525	N
C0800729	Container8000	2004	HKG	99,620	25	8,063	TEU	Main	68,489	Y
C0800080	Container8000	2004	HKG	99,500	25	8,063	TEU	Aux	11,205	N
C0800080	Container8000	2004	HKG	99,500	25	8,063	TEU	Auxiliary Boiler	525	N
C0800080	Container8000	2004	HKG	99,500	25	8,063	TEU	Main	68,469	Y
C0700112	Container7000	2004	LUX	93,643	24	7,488	TEU	Aux	9,384	N
C0700112	Container7000	2004	LUX	93,643	24	7,488	TEU	Auxiliary Boiler	551	N
C0700112	Container7000	2004	LUX	93,643	24	7,488	TEU	Main	69,619	N
C0700453	Container7000	2004	LUX	93,572	24	7,488	TEU	Aux	9,384	N
C0700453	Container7000	2004	LUX	93,572	24	7,488	TEU	Auxiliary Boiler	551	N
C0700453	Container7000	2004	LUX	93,572	24	7,488	TEU	Main	69,619	N
TNU00138	Tanker - ULCC	2004	GRC	308,829	15.9	0	TEU	Aux	4,502	N
TNU00138	Tanker - ULCC	2004	GRC	308,829	15.9	0	TEU	Auxiliary Boiler	371	N
TNU00138	Tanker - ULCC	2004	GRC	308,829	15.9	0	TEU	Main	27,160	Y

Vessel ID	Vessel Type	Model Year	Flag	DWT (tons)	Max Speed (knots)	Cap	Cap Units	Engine Type	Power (kW)	Slide Valve
C0800021	Container8000	2004	DEU	101,661	24.5	8,238	TEU	Aux	11,205	N
C0800021	Container8000	2004	DEU	101,661	24.5	8,238	TEU	Auxiliary Boiler	525	N
C0800021	Container8000	2004	DEU	101,661	24.5	8,238	TEU	Main	68,639	Y
C0800434	Container8000	2004	DEU	101,898	25.4	8,238	TEU	Aux	11,205	N
C0800434	Container8000	2004	DEU	101,898	25.4	8,238	TEU	Auxiliary Boiler	525	N
C0800434	Container8000	2004	DEU	101,898	25.4	8,238	TEU	Main	68,665	Y
C0800556	Container8000	2004	DEU	101,906	24.4	8,238	TEU	Aux	11,205	N
C0800556	Container8000	2004	DEU	101,906	24.4	8,238	TEU	Auxiliary Boiler	525	N
C0800556	Container8000	2004	DEU	101,906	24.4	8,238	TEU	Main	68,665	Y
C0800284	Container8000	2004	BHS	101,661	24.4	8,238	TEU	Aux	12,824	N
C0800284	Container8000	2004	BHS	101,661	24.4	8,238	TEU	Auxiliary Boiler	525	N
C0800284	Container8000	2004	BHS	101,661	24.4	8,238	TEU	Main	68,665	Y
BBB00561	Bulk	2004	SGP	75,912	14	0	TEU	Aux	1,365	N
BBB00561	Bulk	2004	SGP	75,912	14	0	TEU	Auxiliary Boiler	132	N
BBB00561	Bulk	2004	SGP	75,912	14	0	TEU	Main	9,010	Y
BBB00113	Bulk	2002	HKG	28,428	13.5	0	TEU	Aux	1,793	N
BBB00113	Bulk	2002	HKG	28,428	13.5	0	TEU	Auxiliary Boiler	132	N
BBB00113	Bulk	2002	HKG	28,428	13.5	0	TEU	Main	5,850	N
C0500074	Container5000	2004	DEU	68,150	23	5,060	TEU	Aux	9,400	N
C0500074	Container5000	2004	DEU	68,150	23	5,060	TEU	Auxiliary Boiler	630	N
C0500074	Container5000	2004	DEU	68,150	23	5,060	TEU	Main	41,106	Y
C0500169	Container5000	2004	MHL	68,282	23	5,060	TEU	Aux	9,400	N
C0500169	Container5000	2004	MHL	68,282	23	5,060	TEU	Auxiliary Boiler	630	N
C0500169	Container5000	2004	MHL	68,282	23	5,060	TEU	Main	41,106	Y
BBB00493	Bulk	2004	MHL	53,299	14.2	0	TEU	Aux	2,310	N
BBB00493	Bulk	2004	MHL	53,299	14.2	0	TEU	Auxiliary Boiler	132	N
BBB00493	Bulk	2004	MHL	53,299	14.2	0	TEU	Main	9,485	Y
TNP00605	Tanker - Panamax	2004	IOM	70,681	14.9	0	TEU	Aux	2,627	N
TNP00605	Tanker - Panamax	2004	IOM	70,681	14.9	0	TEU	Auxiliary Boiler	371	N
TNP00605	Tanker - Panamax	2004	IOM	70,681	14.9	0	TEU	Main	13,548	Y
TNP00265	Tanker - Panamax	2004	IOM	70,681	14.9	0	TEU	Aux	2,627	N
TNP00265	Tanker - Panamax	2004	IOM	70,681	14.9	0	TEU	Auxiliary Boiler	371	N
TNP00265	Tanker - Panamax	2004	IOM	70,681	14.9	0	TEU	Main	13,548	Y
BBB00108	Bulk	2004	PAN	76,453	14	0	TEU	Aux	1,793	N
BBB00108	Bulk	2004	PAN	76,453	14	0	TEU	Auxiliary Boiler	132	N
BBB00108	Bulk	2004	PAN	76,453	14	0	TEU	Main	11,060	Y
C0500104	Container5000	2004	ISR	66,938	24.5	5,040	TEU	Aux	9,400	N
C0500104	Container5000	2004	ISR	66,938	24.5	5,040	TEU	Auxiliary Boiler	630	N
C0500104	Container5000	2004	ISR	66,938	24.5	5,040	TEU	Main	43,920	Y
C0800436	Container8000	2005	MLT	105,034	25.4	8,034	TEU	Aux	11,205	N
C0800436	Container8000	2005	MLT	105,034	25.4	8,034	TEU	Auxiliary Boiler	525	N
C0800436	Container8000	2005	MLT	105,034	25.4	8,034	TEU	Main	61,799	N
TNP00354	Tanker - Panamax	2004	GRC	61,328	14.8	0	TEU	Aux	2,018	N
TNP00354	Tanker - Panamax	2004	GRC	61,328	14.8	0	TEU	Auxiliary Boiler	371	N
TNP00354	Tanker - Panamax	2004	GRC	61,328	14.8	0	TEU	Main	10,010	Y
TNA00162	Tanker - Aframax	2004	HKG	106,029	14	0	TEU	Aux	2,400	N
TNA00162	Tanker - Aframax	2004	HKG	106,029	14	0	TEU	Auxiliary Boiler	371	N
TNA00162	Tanker - Aframax	2004	HKG	106,029	14	0	TEU	Main	14,048	Y
C0500648	Container5000	2004	LBR	66,939	24.5	5,075	TEU	Aux	9,400	N
C0500648	Container5000	2004	LBR	66,939	24.5	5,075	TEU	Auxiliary Boiler	630	N

Vessel ID	Vessel Type	Model Year	Flag	DWT (tons)	Max Speed (knots)	Cap	Cap Units	Engine Type	Power (kW)	Slide Valve
C0500648	Container5000	2004	LBR	66,939	24.5	5,075	TEU	Main	45,779	N
C0800432	Container8000	2004	PAN	101,874	25.4	8,238	TEU	Aux	11,205	N
C0800432	Container8000	2004	PAN	101,874	25.4	8,238	TEU	Auxiliary Boiler	525	N
C0800432	Container8000	2004	PAN	101,874	25.4	8,238	TEU	Main	68,665	Y
C0500573	Container5000	2004	MHL	66,478	25	5,117	TEU	Aux	9,400	N
C0500573	Container5000	2004	MHL	66,478	25	5,117	TEU	Auxiliary Boiler	630	N
C0500573	Container5000	2004	MHL	66,478	25	5,117	TEU	Main	45,777	N
C0500181	Container5000	2004	MHL	66,501	25	5,117	TEU	Aux	9,400	N
C0500181	Container5000	2004	MHL	66,501	25	5,117	TEU	Auxiliary Boiler	630	N
C0500181	Container5000	2004	MHL	66,501	25	5,117	TEU	Main	45,777	N
C0700038	Container7000	2005	DEU	93,545	24	7,471	TEU	Aux	9,384	N
C0700038	Container7000	2005	DEU	93,545	24	7,471	TEU	Auxiliary Boiler	551	N
C0700038	Container7000	2005	DEU	93,545	24	7,471	TEU	Main	68,489	Y
C0700644	Container7000	2005	DEU	93,570	24	7,471	TEU	Aux	9,384	N
C0700644	Container7000	2005	DEU	93,570	24	7,471	TEU	Auxiliary Boiler	551	N
C0700644	Container7000	2005	DEU	93,570	24	7,471	TEU	Main	68,489	Y
C0500415	Container5000	2004	SGP	67,022	24.2	5,028	TEU	Aux	9,400	N
C0500415	Container5000	2004	SGP	67,022	24.2	5,028	TEU	Auxiliary Boiler	630	N
C0500415	Container5000	2004	SGP	67,022	24.2	5,028	TEU	Main	45,759	N
BBB00232	Bulk	2004	SGP	87,052	14	0	TEU	Aux	1,899	N
BBB00232	Bulk	2004	SGP	87,052	14	0	TEU	Auxiliary Boiler	132	N
BBB00232	Bulk	2004	SGP	87,052	14	0	TEU	Main	10,300	N
ACC00567	Auto Carrier	2004	PAN	21,447	20	0	TEU	Aux	4,723	N
ACC00567	Auto Carrier	2004	PAN	21,447	20	0	TEU	Auxiliary Boiler	253	N
ACC00567	Auto Carrier	2004	PAN	21,447	20	0	TEU	Main	15,540	N
BBB00054	Bulk	2004	HKG	28,449	14	0	TEU	Aux	1,793	N
BBB00054	Bulk	2004	HKG	28,449	14	0	TEU	Auxiliary Boiler	132	N
BBB00054	Bulk	2004	HKG	28,449	14	0	TEU	Main	5,850	Y
TNU00424	Tanker - ULCC	2004	BHS	318,658	15.7	0	TEU	Aux	4,108	N
TNU00424	Tanker - ULCC	2004	BHS	318,658	15.7	0	TEU	Auxiliary Boiler	371	N
TNU00424	Tanker - ULCC	2004	BHS	318,658	15.7	0	TEU	Main	29,326	Y
GCC00578	General Cargo	2002	MHL	29,822	18	1,888	TEU	Aux	2,305	N
GCC00578	General Cargo	2002	MHL	29,822	18	1,888	TEU	Auxiliary Boiler	137	N
GCC00578	General Cargo	2002	MHL	29,822	18	1,888	TEU	Main	15,785	N
C0400100	Container4000	2004	PAN	65,038	23.5	4,738	TEU	Aux	6,680	N
C0400100	Container4000	2004	PAN	65,038	23.5	4,738	TEU	Auxiliary Boiler	492	N
C0400100	Container4000	2004	PAN	65,038	23.5	4,738	TEU	Main	44,583	Y
TNU00373	Tanker - ULCC	2004	BHS	318,669	15.7	0	TEU	Aux	4,108	N
TNU00373	Tanker - ULCC	2004	BHS	318,669	15.7	0	TEU	Auxiliary Boiler	371	N
TNU00373	Tanker - ULCC	2004	BHS	318,669	15.7	0	TEU	Main	29,326	Y
C0400242	Container4000	2004	PAN	64,990	23.5	4,738	TEU	Aux	6,680	N
C0400242	Container4000	2004	PAN	64,990	23.5	4,738	TEU	Auxiliary Boiler	492	N
C0400242	Container4000	2004	PAN	64,990	23.5	4,738	TEU	Main	44,583	Y
TNA00127	Tanker - Aframax	2004	BHS	115,525	15.3	0	TEU	Aux	2,340	N
TNA00127	Tanker - Aframax	2004	BHS	115,525	15.3	0	TEU	Auxiliary Boiler	371	N
TNA00127	Tanker - Aframax	2004	BHS	115,525	15.3	0	TEU	Main	14,313	Y
TNU00759	Tanker - ULCC	2004	MYS	300,542	15.6	0	TEU	Aux	4,502	N
TNU00759	Tanker - ULCC	2004	MYS	300,542	15.6	0	TEU	Auxiliary Boiler	371	N
TNU00759	Tanker - ULCC	2004	MYS	300,542	15.6	0	TEU	Main	25,089	Y
ACC00147	Auto Carrier	2004	PAN	18,947	20	0	TEU	Aux	4,723	N

Vessel ID	Vessel Type	Model Year	Flag	DWT (tons)	Max Speed (knots)	Cap	Cap Units	Engine Type	Power (kW)	Slide Valve
ACC00147	Auto Carrier	2004	PAN	18,947	20	0	TEU	Auxiliary Boiler	253	N
ACC00147	Auto Carrier	2004	PAN	18,947	20	0	TEU	Main	15,130	N
ACC00781	Auto Carrier	2004	PAN	18,944	20.6	0	TEU	Aux	4,723	N
ACC00781	Auto Carrier	2004	PAN	18,944	20.6	0	TEU	Auxiliary Boiler	253	N
ACC00781	Auto Carrier	2004	PAN	18,944	20.6	0	TEU	Main	15,130	N
ACC00584	Auto Carrier	2004	PAN	19,106	20.6	0	TEU	Aux	4,723	N
ACC00584	Auto Carrier	2004	PAN	19,106	20.6	0	TEU	Auxiliary Boiler	253	N
ACC00584	Auto Carrier	2004	PAN	19,106	20.6	0	TEU	Main	14,315	N
BBB00705	Bulk	2004	PAN	29,870	14.3	0	TEU	Aux	1,793	N
BBB00705	Bulk	2004	PAN	29,870	14.3	0	TEU	Auxiliary Boiler	132	N
BBB00705	Bulk	2004	PAN	29,870	14.3	0	TEU	Main	6,150	N
ACC00295	Auto Carrier	2004	PAN	17,738	20.7	0	TEU	Aux	4,723	N
ACC00295	Auto Carrier	2004	PAN	17,738	20.7	0	TEU	Auxiliary Boiler	253	N
ACC00295	Auto Carrier	2004	PAN	17,738	20.7	0	TEU	Main	15,090	N
BBB00180	Bulk	2004	HKG	52,050	15.2	0	TEU	Aux	1,793	N
BBB00180	Bulk	2004	HKG	52,050	15.2	0	TEU	Auxiliary Boiler	132	N
BBB00180	Bulk	2004	HKG	52,050	15.2	0	TEU	Main	8,100	N
BBB00335	Bulk	2004	MHL	76,801	14.5	0	TEU	Aux	1,793	N
BBB00335	Bulk	2004	MHL	76,801	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00335	Bulk	2004	MHL	76,801	14.5	0	TEU	Main	9,230	Y
BBB00431	Bulk	2004	HKG	31,923	14.5	0	TEU	Aux	1,793	N
BBB00431	Bulk	2004	HKG	31,923	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00431	Bulk	2004	HKG	31,923	14.5	0	TEU	Main	6,840	N
C0700657	Container7000	2005	DEU	93,594	24	7,471	TEU	Aux	9,384	N
C0700657	Container7000	2005	DEU	93,594	24	7,471	TEU	Auxiliary Boiler	551	N
C0700657	Container7000	2005	DEU	93,594	24	7,471	TEU	Main	68,489	Y
C0700569	Container7000	2005	DEU	93,558	24	7,471	TEU	Aux	9,384	N
C0700569	Container7000	2005	DEU	93,558	24	7,471	TEU	Auxiliary Boiler	551	N
C0700569	Container7000	2005	DEU	93,558	24	7,471	TEU	Main	68,489	Y
TNP00097	Tanker - Panamax	2004	LBR	73,869	14	0	TEU	Aux	3,205	N
TNP00097	Tanker - Panamax	2004	LBR	73,869	14	0	TEU	Auxiliary Boiler	371	N
TNP00097	Tanker - Panamax	2004	LBR	73,869	14	0	TEU	Main	11,290	Y
C0800525	Container8000	2005	LBR	105,014	25.4	8,034	TEU	Aux	11,205	N
C0800525	Container8000	2005	LBR	105,014	25.4	8,034	TEU	Auxiliary Boiler	525	N
C0800525	Container8000	2005	LBR	105,014	25.4	8,034	TEU	Main	61,799	N
BBB00165	Bulk	2004	MLT	74,432	13.8	0	TEU	Aux	1,793	N
BBB00165	Bulk	2004	MLT	74,432	13.8	0	TEU	Auxiliary Boiler	132	N
BBB00165	Bulk	2004	MLT	74,432	13.8	0	TEU	Main	11,299	Y
C0900260	Container9000	2005	FRA	113,964	24.4	9,415	TEU	Aux	12,858	N
C0900260	Container9000	2005	FRA	113,964	24.4	9,415	TEU	Auxiliary Boiler	547	N
C0900260	Container9000	2005	FRA	113,964	24.4	9,415	TEU	Main	68,639	Y
C0900376	Container9000	2006	FRA	113,909	24.4	9,415	TEU	Aux	12,824	N
C0900376	Container9000	2006	FRA	113,909	24.4	9,415	TEU	Auxiliary Boiler	547	N
C0900376	Container9000	2006	FRA	113,909	24.4	9,415	TEU	Main	68,639	Y
BBB00109	Bulk	2004	PAN	32,564	14.3	0	TEU	Aux	1,793	N
BBB00109	Bulk	2004	PAN	32,564	14.3	0	TEU	Auxiliary Boiler	132	N
BBB00109	Bulk	2004	PAN	32,564	14.3	0	TEU	Main	5,627	N
C0500209	Container5000	2004	PAN	67,209	25.6	5,800	TEU	Aux	9,416	N
C0500209	Container5000	2004	PAN	67,209	25.6	5,800	TEU	Auxiliary Boiler	630	N
C0500209	Container5000	2004	PAN	67,209	25.6	5,800	TEU	Main	57,199	Y

Vessel ID	Vessel Type	Model Year	Flag	DWT (tons)	Max Speed (knots)	Cap	Cap Units	Engine Type	Power (kW)	Slide Valve
C0500536	Container5000	2004	PAN	67,209	25.6	5,800	TEU	Aux	9,416	N
C0500536	Container5000	2004	PAN	67,209	25.6	5,800	TEU	Auxiliary Boiler	630	N
C0500536	Container5000	2004	PAN	67,209	25.6	5,800	TEU	Main	57,203	Y
C0800386	Container8000	2005	HKG	99,602	25	8,063	TEU	Aux	11,205	N
C0800386	Container8000	2005	HKG	99,602	25	8,063	TEU	Auxiliary Boiler	525	N
C0800386	Container8000	2005	HKG	99,602	25	8,063	TEU	Main	68,489	Y
C0800608	Container8000	2006	HKG	99,618	25	8,063	TEU	Aux	11,205	N
C0800608	Container8000	2006	HKG	99,618	25	8,063	TEU	Auxiliary Boiler	525	N
C0800608	Container8000	2006	HKG	99,618	25	8,063	TEU	Main	68,489	Y
C0800406	Container8000	2005	LBR	102,756	25.6	8,238	TEU	Aux	11,205	N
C0800406	Container8000	2005	LBR	102,756	25.6	8,238	TEU	Auxiliary Boiler	525	N
C0800406	Container8000	2005	LBR	102,756	25.6	8,238	TEU	Main	68,638	Y
C0800135	Container8000	2005	LBR	102,759	25.6	8,238	TEU	Aux	11,205	N
C0800135	Container8000	2005	LBR	102,759	25.6	8,238	TEU	Auxiliary Boiler	525	N
C0800135	Container8000	2005	LBR	102,759	25.6	8,238	TEU	Main	68,638	Y
TNP00388	Tanker - Panamax	2006	MHL	74,908	14.9	0	TEU	Aux	2,627	N
TNP00388	Tanker - Panamax	2006	MHL	74,908	14.9	0	TEU	Auxiliary Boiler	371	N
TNP00388	Tanker - Panamax	2006	MHL	74,908	14.9	0	TEU	Main	13,560	Y
TNP00094	Tanker - Panamax	2006	MHL	74,933	14.9	0	TEU	Aux	2,627	N
TNP00094	Tanker - Panamax	2006	MHL	74,933	14.9	0	TEU	Auxiliary Boiler	371	N
TNP00094	Tanker - Panamax	2006	MHL	74,933	14.9	0	TEU	Main	13,548	Y
TNP00601	Tanker - Panamax	2007	CYM	74,875	14.9	0	TEU	Aux	2,400	N
TNP00601	Tanker - Panamax	2007	CYM	74,875	14.9	0	TEU	Auxiliary Boiler	371	N
TNP00601	Tanker - Panamax	2007	CYM	74,875	14.9	0	TEU	Main	13,548	Y
C0500056	Container5000	2005	PAN	71,309	25	5,642	TEU	Aux	9,400	N
C0500056	Container5000	2005	PAN	71,309	25	5,642	TEU	Auxiliary Boiler	630	N
C0500056	Container5000	2005	PAN	71,309	25	5,642	TEU	Main	62,943	Y
C0500365	Container5000	2005	PAN	71,270	25	5,642	TEU	Aux	9,400	N
C0500365	Container5000	2005	PAN	71,270	25	5,642	TEU	Auxiliary Boiler	630	N
C0500365	Container5000	2005	PAN	71,270	25	5,642	TEU	Main	62,943	Y
C0800419	Container8000	2006	PAN	98,849	24.5	8,212	TEU	Aux	11,205	N
C0800419	Container8000	2006	PAN	98,849	24.5	8,212	TEU	Auxiliary Boiler	525	N
C0800419	Container8000	2006	PAN	98,849	24.5	8,212	TEU	Main	67,269	Y
C0800640	Container8000	2007	PAN	98,849	25.6	8,212	TEU	Aux	11,205	N
C0800640	Container8000	2007	PAN	98,849	25.6	8,212	TEU	Auxiliary Boiler	525	N
C0800640	Container8000	2007	PAN	98,849	25.6	8,212	TEU	Main	68,639	Y
C0500435	Container5000	2006	MHL	68,165	23	5,059	TEU	Aux	9,400	N
C0500435	Container5000	2006	MHL	68,165	23	5,059	TEU	Auxiliary Boiler	630	N
C0500435	Container5000	2006	MHL	68,165	23	5,059	TEU	Main	41,129	Y
TNS00390	Tanker - Suezmax	2004	LBR	150,205	15.4	0	TEU	Aux	2,400	N
TNS00390	Tanker - Suezmax	2004	LBR	150,205	15.4	0	TEU	Auxiliary Boiler	371	N
TNS00390	Tanker - Suezmax	2004	LBR	150,205	15.4	0	TEU	Main	16,440	N
BBB00439	Bulk	2004	PAN	56,052	14.5	0	TEU	Aux	1,793	N
BBB00439	Bulk	2004	PAN	56,052	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00439	Bulk	2004	PAN	56,052	14.5	0	TEU	Main	9,480	Y
ACC00019	Auto Carrier	2004	PAN	18,288	19.8	0	TEU	Aux	4,723	N
ACC00019	Auto Carrier	2004	PAN	18,288	19.8	0	TEU	Auxiliary Boiler	253	N
ACC00019	Auto Carrier	2004	PAN	18,288	19.8	0	TEU	Main	14,280	Y
ACC00690	Auto Carrier	2004	PAN	18,312	19.8	0	TEU	Aux	4,723	N
ACC00690	Auto Carrier	2004	PAN	18,312	19.8	0	TEU	Auxiliary Boiler	253	N

Vessel ID	Vessel Type	Model Year	Flag	DWT (tons)	Max Speed (knots)	Cap	Cap Units	Engine Type	Power (kW)	Slide Valve
ACC00690	Auto Carrier	2004	PAN	18,312	19.8	0	TEU	Main	14,280	Y
ACC00636	Auto Carrier	2004	PAN	18,318	20.6	0	TEU	Aux	4,723	N
ACC00636	Auto Carrier	2004	PAN	18,318	20.6	0	TEU	Auxiliary Boiler	253	N
ACC00636	Auto Carrier	2004	PAN	18,318	20.6	0	TEU	Main	14,280	Y
C0300034	Container3000	2005	CYP	44,053	22.7	3,398	TEU	Aux	5,338	N
C0300034	Container3000	2005	CYP	44,053	22.7	3,398	TEU	Auxiliary Boiler	474	N
C0300034	Container3000	2005	CYP	44,053	22.7	3,398	TEU	Main	28,879	Y
C0300237	Container3000	2006	ATG	44,052	22.6	3,398	TEU	Aux	5,338	N
C0300237	Container3000	2006	ATG	44,052	22.6	3,398	TEU	Auxiliary Boiler	474	N
C0300237	Container3000	2006	ATG	44,052	22.6	3,398	TEU	Main	28,879	Y
C0300565	Container3000	2006	LBR	44,022	22.7	3,398	TEU	Aux	5,338	N
C0300565	Container3000	2006	LBR	44,022	22.7	3,398	TEU	Auxiliary Boiler	474	N
C0300565	Container3000	2006	LBR	44,022	22.7	3,398	TEU	Main	28,879	Y
BBB00359	Bulk	2004	JPN	86,062	14	0	TEU	Aux	1,793	N
BBB00359	Bulk	2004	JPN	86,062	14	0	TEU	Auxiliary Boiler	132	N
BBB00359	Bulk	2004	JPN	86,062	14	0	TEU	Main	11,289	Y
BBB00495	Bulk	2003	MHL	76,838	14.5	0	TEU	Aux	1,365	N
BBB00495	Bulk	2003	MHL	76,838	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00495	Bulk	2003	MHL	76,838	14.5	0	TEU	Main	9,319	N
BBB00581	Bulk	2004	PAN	76,784	14.5	0	TEU	Aux	1,793	N
BBB00581	Bulk	2004	PAN	76,784	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00581	Bulk	2004	PAN	76,784	14.5	0	TEU	Main	9,230	Y
BBB00156	Bulk	2004	MLT	76,801	14.5	0	TEU	Aux	1,433	N
BBB00156	Bulk	2004	MLT	76,801	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00156	Bulk	2004	MLT	76,801	14.5	0	TEU	Main	9,230	Y
BBB00783	Bulk	2004	PAN	76,806	14.5	0	TEU	Aux	1,793	N
BBB00783	Bulk	2004	PAN	76,806	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00783	Bulk	2004	PAN	76,806	14.5	0	TEU	Main	9,230	Y
C0900346	Container9000	2006	LBR	110,633	25.2	9,178	TEU	Aux	11,447	N
C0900346	Container9000	2006	LBR	110,633	25.2	9,178	TEU	Auxiliary Boiler	547	N
C0900346	Container9000	2006	LBR	110,633	25.2	9,178	TEU	Main	68,489	Y
C0900263	Container9000	2006	LBR	110,697	25.2	9,178	TEU	Aux	11,447	N
C0900263	Container9000	2006	LBR	110,697	25.2	9,178	TEU	Auxiliary Boiler	547	N
C0900263	Container9000	2006	LBR	110,697	25.2	9,178	TEU	Main	68,519	Y
C0200422	Container2000	2004	LBR	34,444	22	2,490	TEU	Aux	5,470	N
C0200422	Container2000	2004	LBR	34,444	22	2,490	TEU	Auxiliary Boiler	325	N
C0200422	Container2000	2004	LBR	34,444	22	2,490	TEU	Main	21,560	N
BBB00593	Bulk	2004	LBR	74,475	13.8	0	TEU	Aux	1,793	N
BBB00593	Bulk	2004	LBR	74,475	13.8	0	TEU	Auxiliary Boiler	132	N
BBB00593	Bulk	2004	LBR	74,475	13.8	0	TEU	Main	8,990	Y
C0800614	Container8000	2005	DEU	101,570	25.4	8,204	TEU	Aux	11,205	N
C0800614	Container8000	2005	DEU	101,570	25.4	8,204	TEU	Auxiliary Boiler	525	N
C0800614	Container8000	2005	DEU	101,570	25.4	8,204	TEU	Main	68,665	Y
C0800348	Container8000	2005	DEU	101,491	25.4	8,204	TEU	Aux	11,205	N
C0800348	Container8000	2005	DEU	101,491	25.4	8,204	TEU	Auxiliary Boiler	525	N
C0800348	Container8000	2005	DEU	101,491	25.4	8,204	TEU	Main	68,639	Y
C0800290	Container8000	2006	LBR	100,680	25.4	8,204	TEU	Aux	11,205	N
C0800290	Container8000	2006	LBR	100,680	25.4	8,204	TEU	Auxiliary Boiler	525	N
C0800290	Container8000	2006	LBR	100,680	25.4	8,204	TEU	Main	68,639	Y
C0900121	Container9000	2005	GRC	107,526	25.4	9,469	TEU	Aux	11,447	N

Vessel ID	Vessel Type	Model Year	Flag	DWT (tons)	Max Speed (knots)	Cap	Cap Units	Engine Type	Power (kW)	Slide Valve
C0900121	Container9000	2005	GRC	107,526	25.4	9,469	TEU	Auxiliary Boiler	547	N
C0900121	Container9000	2005	GRC	107,526	25.4	9,469	TEU	Main	74,759	Y
TNP00291	Tanker - Panamax	2004	GRC	69,523	14.6	0	TEU	Aux	3,000	N
TNP00291	Tanker - Panamax	2004	GRC	69,523	14.6	0	TEU	Auxiliary Boiler	371	N
TNP00291	Tanker - Panamax	2004	GRC	69,523	14.6	0	TEU	Main	10,365	Y
TNP00270	Tanker - Panamax	2006	GRC	73,584	14.7	0	TEU	Aux	2,627	N
TNP00270	Tanker - Panamax	2006	GRC	73,584	14.7	0	TEU	Auxiliary Boiler	371	N
TNP00270	Tanker - Panamax	2006	GRC	73,584	14.7	0	TEU	Main	11,290	Y
TNP00318	Tanker - Panamax	2006	GRC	73,675	14.7	0	TEU	Aux	2,627	N
TNP00318	Tanker - Panamax	2006	GRC	73,675	14.7	0	TEU	Auxiliary Boiler	371	N
TNP00318	Tanker - Panamax	2006	GRC	73,675	14.7	0	TEU	Main	11,290	Y
TNP00399	Tanker - Panamax	2004	BHS	61,213	14.8	0	TEU	Aux	2,018	N
TNP00399	Tanker - Panamax	2004	BHS	61,213	14.8	0	TEU	Auxiliary Boiler	371	N
TNP00399	Tanker - Panamax	2004	BHS	61,213	14.8	0	TEU	Main	10,010	Y
TNP00016	Tanker - Panamax	2004	MHL	73,917	14	0	TEU	Aux	2,627	N
TNP00016	Tanker - Panamax	2004	MHL	73,917	14	0	TEU	Auxiliary Boiler	371	N
TNP00016	Tanker - Panamax	2004	MHL	73,917	14	0	TEU	Main	11,299	Y
TNP00725	Tanker - Panamax	2004	MHL	73,911	14	0	TEU	Aux	2,627	N
TNP00725	Tanker - Panamax	2004	MHL	73,911	14	0	TEU	Auxiliary Boiler	371	N
TNP00725	Tanker - Panamax	2004	MHL	73,911	14	0	TEU	Main	11,299	Y
C0900201	Container9000	2006	GRC	107,482	25.4	9,469	TEU	Aux	11,447	N
C0900201	Container9000	2006	GRC	107,482	25.4	9,469	TEU	Auxiliary Boiler	547	N
C0900201	Container9000	2006	GRC	107,482	25.4	9,469	TEU	Main	74,759	Y
ACC00027	Auto Carrier	2004	PAN	21,402	20	0	TEU	Aux	4,723	N
ACC00027	Auto Carrier	2004	PAN	21,402	20	0	TEU	Auxiliary Boiler	253	N
ACC00027	Auto Carrier	2004	PAN	21,402	20	0	TEU	Main	15,540	N
TNP00401	Tanker - Panamax	2004	GRC	72,247	15	0	TEU	Aux	2,627	N
TNP00401	Tanker - Panamax	2004	GRC	72,247	15	0	TEU	Auxiliary Boiler	371	N
TNP00401	Tanker - Panamax	2004	GRC	72,247	15	0	TEU	Main	11,299	Y
C0800381	Container8000	2006	PAN	107,895	25.3	8,401	TEU	Aux	11,205	N
C0800381	Container8000	2006	PAN	107,895	25.3	8,401	TEU	Auxiliary Boiler	525	N
C0800381	Container8000	2006	PAN	107,895	25.3	8,401	TEU	Main	68,519	Y
GCC00332	General Cargo	2005	PAN	31,734	14.7	0	TEU	Aux	2,305	N
GCC00332	General Cargo	2005	PAN	31,734	14.7	0	TEU	Auxiliary Boiler	137	N
GCC00332	General Cargo	2005	PAN	31,734	14.7	0	TEU	Main	7,061	N
GCC00142	General Cargo	2004	PAN	31,734	14.5	0	TEU	Aux	2,305	N
GCC00142	General Cargo	2004	PAN	31,734	14.5	0	TEU	Auxiliary Boiler	137	N
GCC00142	General Cargo	2004	PAN	31,734	14.5	0	TEU	Main	7,061	N
GCC00616	General Cargo	2004	HKG	14,514	13.5	0	TEU	Aux	2,305	N
GCC00616	General Cargo	2004	HKG	14,514	13.5	0	TEU	Auxiliary Boiler	137	N
GCC00616	General Cargo	2004	HKG	14,514	13.5	0	TEU	Main	4,200	N
C0800738	Container8000	2007	HKG	99,678	25	8,063	TEU	Aux	11,205	N
C0800738	Container8000	2007	HKG	99,678	25	8,063	TEU	Auxiliary Boiler	525	N
C0800738	Container8000	2007	HKG	99,678	25	8,063	TEU	Main	68,489	Y
BBB00266	Bulk	2004	HKG	76,598	15.2	0	TEU	Aux	1,793	N
BBB00266	Bulk	2004	HKG	76,598	15.2	0	TEU	Auxiliary Boiler	132	N
BBB00266	Bulk	2004	HKG	76,598	15.2	0	TEU	Main	10,321	Y
BBB00655	Bulk	2004	HKG	28,709	14.5	0	TEU	Aux	1,793	N
BBB00655	Bulk	2004	HKG	28,709	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00655	Bulk	2004	HKG	28,709	14.5	0	TEU	Main	5,900	N

Vessel ID	Vessel Type	Model Year	Flag	DWT (tons)	Max Speed (knots)	Cap	Cap Units	Engine Type	Power (kW)	Slide Valve
TNC00238	Tanker - Chemical	2004	PAN	19,947	15.7	0	TEU	Aux	2,839	N
TNC00238	Tanker - Chemical	2004	PAN	19,947	15.7	0	TEU	Auxiliary Boiler	371	N
TNC00238	Tanker - Chemical	2004	PAN	19,947	15.7	0	TEU	Main	6,150	N
TNP00418	Tanker - Panamax	2004	GRC	74,543	15	0	TEU	Aux	2,078	N
TNP00418	Tanker - Panamax	2004	GRC	74,543	15	0	TEU	Auxiliary Boiler	371	N
TNP00418	Tanker - Panamax	2004	GRC	74,543	15	0	TEU	Main	9,710	Y
BBB00178	Bulk	2004	HKG	31,871	14.5	0	TEU	Aux	1,793	N
BBB00178	Bulk	2004	HKG	31,871	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00178	Bulk	2004	HKG	31,871	14.5	0	TEU	Main	6,840	N
C0200589	Container2000	2006	LBR	37,800	22	2,742	TEU	Aux	5,470	N
C0200589	Container2000	2006	LBR	37,800	22	2,742	TEU	Auxiliary Boiler	325	N
C0200589	Container2000	2006	LBR	37,800	22	2,742	TEU	Main	21,769	Y
ACC00596	Auto Carrier	2006	BHS	21,021	20.4	0	TEU	Aux	4,723	N
ACC00596	Auto Carrier	2006	BHS	21,021	20.4	0	TEU	Auxiliary Boiler	253	N
ACC00596	Auto Carrier	2006	BHS	21,021	20.4	0	TEU	Main	15,539	Y
BBB00144	Bulk	2004	HKG	28,433	13.5	0	TEU	Aux	1,793	N
BBB00144	Bulk	2004	HKG	28,433	13.5	0	TEU	Auxiliary Boiler	132	N
BBB00144	Bulk	2004	HKG	28,433	13.5	0	TEU	Main	5,850	Y
TNC00606	Tanker - Chemical	2005	MHL	29,006	14.5	0	TEU	Aux	2,385	N
TNC00606	Tanker - Chemical	2005	MHL	29,006	14.5	0	TEU	Auxiliary Boiler	371	N
TNC00606	Tanker - Chemical	2005	MHL	29,006	14.5	0	TEU	Main	7,860	Y
TNU00773	Tanker - ULCC	2006	MHL	317,713	15.5	0	TEU	Aux	3,960	N
TNU00773	Tanker - ULCC	2006	MHL	317,713	15.5	0	TEU	Auxiliary Boiler	371	N
TNU00773	Tanker - ULCC	2006	MHL	317,713	15.5	0	TEU	Main	29,730	Y
C0300288	Container3000	2006	LBR	46,287	23.4	3,768	TEU	Aux	5,338	N
C0300288	Container3000	2006	LBR	46,287	23.4	3,768	TEU	Auxiliary Boiler	474	N
C0300288	Container3000	2006	LBR	46,287	23.4	3,768	TEU	Main	32,435	Y
BBB00717	Bulk	2004	PAN	52,454	14.5	0	TEU	Aux	0	N
BBB00717	Bulk	2004	PAN	52,454	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00717	Bulk	2004	PAN	52,454	14.5	0	TEU	Main	7,800	Y
BBB00017	Bulk	2004	PAN	54,881	14.5	0	TEU	Aux	1,793	N
BBB00017	Bulk	2004	PAN	54,881	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00017	Bulk	2004	PAN	54,881	14.5	0	TEU	Main	9,480	Y
TNA00765	Tanker - Aframax	2004	BHS	105,495	14.9	0	TEU	Aux	2,755	N
TNA00765	Tanker - Aframax	2004	BHS	105,495	14.9	0	TEU	Auxiliary Boiler	371	N
TNA00765	Tanker - Aframax	2004	BHS	105,495	14.9	0	TEU	Main	12,000	N
TNU00599	Tanker - ULCC	2006	GRC	306,507	15.3	0	TEU	Aux	4,502	N
TNU00599	Tanker - ULCC	2006	GRC	306,507	15.3	0	TEU	Auxiliary Boiler	371	N
TNU00599	Tanker - ULCC	2006	GRC	306,507	15.3	0	TEU	Main	29,399	N
TNU00726	Tanker - ULCC	2006	MHL	306,543	15.4	0	TEU	Aux	4,502	N
TNU00726	Tanker - ULCC	2006	MHL	306,543	15.4	0	TEU	Auxiliary Boiler	371	N
TNU00726	Tanker - ULCC	2006	MHL	306,543	15.4	0	TEU	Main	29,399	N
BBB00068	Bulk	2004	PAN	53,474	15	0	TEU	Aux	1,793	N
BBB00068	Bulk	2004	PAN	53,474	15	0	TEU	Auxiliary Boiler	132	N
BBB00068	Bulk	2004	PAN	53,474	15	0	TEU	Main	9,480	Y
BBB00716	Bulk	2004	GRC	87,144	14.5	0	TEU	Aux	1,793	N
BBB00716	Bulk	2004	GRC	87,144	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00716	Bulk	2004	GRC	87,144	14.5	0	TEU	Main	10,300	N
BBB00286	Bulk	2005	PAN	52,415	14.3	0	TEU	Aux	1,793	N
BBB00286	Bulk	2005	PAN	52,415	14.3	0	TEU	Auxiliary Boiler	132	N

Vessel ID	Vessel Type	Model Year	Flag	DWT (tons)	Max Speed (knots)	Cap	Cap Units	Engine Type	Power (kW)	Slide Valve
BBB00286	Bulk	2005	PAN	52,415	14.3	0	TEU	Main	7,796	Y
BBB00200	Bulk	2005	HKG	28,398	14	0	TEU	Aux	0	N
BBB00200	Bulk	2005	HKG	28,398	14	0	TEU	Auxiliary Boiler	132	N
BBB00200	Bulk	2005	HKG	28,398	14	0	TEU	Main	5,850	Y
BBB00629	Bulk	2004	HKG	29,671	14.3	0	TEU	Aux	1,793	N
BBB00629	Bulk	2004	HKG	29,671	14.3	0	TEU	Auxiliary Boiler	132	N
BBB00629	Bulk	2004	HKG	29,671	14.3	0	TEU	Main	6,150	N
BBB00458	Bulk	2004	PAN	35,283	14.2	0	TEU	Aux	1,793	N
BBB00458	Bulk	2004	PAN	35,283	14.2	0	TEU	Auxiliary Boiler	132	N
BBB00458	Bulk	2004	PAN	35,283	14.2	0	TEU	Main	6,656	Y
BBB00554	Bulk	2004	PAN	54,049	14.5	0	TEU	Aux	1,793	N
BBB00554	Bulk	2004	PAN	54,049	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00554	Bulk	2004	PAN	54,049	14.5	0	TEU	Main	8,208	Y
BBB00646	Bulk	2004	TUR	18,830	13	0	TEU	Aux	1,793	N
BBB00646	Bulk	2004	TUR	18,830	13	0	TEU	Auxiliary Boiler	132	N
BBB00646	Bulk	2004	TUR	18,830	13	0	TEU	Main	5,180	N
C0500241	Container5000	2006	SGP	67,680	26	5,527	TEU	Aux	9,400	N
C0500241	Container5000	2006	SGP	67,680	26	5,527	TEU	Auxiliary Boiler	630	N
C0500241	Container5000	2006	SGP	67,680	26	5,527	TEU	Main	54,941	N
C0500285	Container5000	2007	SGP	67,797	26	5,527	TEU	Aux	9,400	N
C0500285	Container5000	2007	SGP	67,797	26	5,527	TEU	Auxiliary Boiler	630	N
C0500285	Container5000	2007	SGP	67,797	26	5,527	TEU	Main	57,199	N
TNP00615	Tanker - Panamax	2004	LBR	73,869	14	0	TEU	Aux	3,205	N
TNP00615	Tanker - Panamax	2004	LBR	73,869	14	0	TEU	Auxiliary Boiler	371	N
TNP00615	Tanker - Panamax	2004	LBR	73,869	14	0	TEU	Main	11,290	Y
BBB00687	Bulk	2006	LBR	53,538	14.2	0	TEU	Aux	2,310	N
BBB00687	Bulk	2006	LBR	53,538	14.2	0	TEU	Auxiliary Boiler	132	N
BBB00687	Bulk	2006	LBR	53,538	14.2	0	TEU	Main	9,479	Y
BBB00243	Bulk	2004	HKG	76,620	14.5	0	TEU	Aux	1,460	N
BBB00243	Bulk	2004	HKG	76,620	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00243	Bulk	2004	HKG	76,620	14.5	0	TEU	Main	9,230	Y
C0500555	Container5000	2007	SGP	67,797	26	5,527	TEU	Aux	9,400	N
C0500555	Container5000	2007	SGP	67,797	26	5,527	TEU	Auxiliary Boiler	630	N
C0500555	Container5000	2007	SGP	67,797	26	5,527	TEU	Main	54,941	N
TNC00281	Tanker - Chemical	2004	PAN	19,996	15	0	TEU	Aux	2,839	N
TNC00281	Tanker - Chemical	2004	PAN	19,996	15	0	TEU	Auxiliary Boiler	371	N
TNC00281	Tanker - Chemical	2004	PAN	19,996	15	0	TEU	Main	6,230	N
BBB00314	Bulk	2004	PAN	56,049	14.5	0	TEU	Aux	1,793	N
BBB00314	Bulk	2004	PAN	56,049	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00314	Bulk	2004	PAN	56,049	14.5	0	TEU	Main	9,480	Y
BBB00454	Bulk	2004	PAN	56,039	14.5	0	TEU	Aux	1,793	N
BBB00454	Bulk	2004	PAN	56,039	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00454	Bulk	2004	PAN	56,039	14.5	0	TEU	Main	9,480	Y
TNC00189	Tanker - Chemical	2007	HKG	47,128	14.5	0	TEU	Aux	2,839	N
TNC00189	Tanker - Chemical	2007	HKG	47,128	14.5	0	TEU	Auxiliary Boiler	371	N
TNC00189	Tanker - Chemical	2007	HKG	47,128	14.5	0	TEU	Main	9,480	Y
ACC00577	Auto Carrier	2006	SWE	18,700	19	0	TEU	Aux	3,453	N
ACC00577	Auto Carrier	2006	SWE	18,700	19	0	TEU	Auxiliary Boiler	253	N
ACC00577	Auto Carrier	2006	SWE	18,700	19	0	TEU	Main	15,820	Y
CRU00053	Cruise	2005	PAN	11,843	22	0	TEU	Aux	1,300	N

Vessel ID	Vessel Type	Model Year	Flag	DWT (tons)	Max Speed (knots)	Cap	Cap Units	Engine Type	Power (kW)	Slide Valve
CRU00053	Cruise	2005	PAN	11,843	22	0	TEU	Auxiliary Boiler	1,393	N
CRU00053	Cruise	2005	PAN	11,843	22	0	TEU	Main	40,000	N
TNH00643	Tanker - Handysize	2005	PAN	47,999	15.1	0	TEU	Aux	2,328	N
TNH00643	Tanker - Handysize	2005	PAN	47,999	15.1	0	TEU	Auxiliary Boiler	371	N
TNH00643	Tanker - Handysize	2005	PAN	47,999	15.1	0	TEU	Main	9,480	Y
TNC00105	Tanker - Chemical	2005	PAN	47,931	15.4	0	TEU	Aux	2,839	N
TNC00105	Tanker - Chemical	2005	PAN	47,931	15.4	0	TEU	Auxiliary Boiler	371	N
TNC00105	Tanker - Chemical	2005	PAN	47,931	15.4	0	TEU	Main	11,060	Y
C0400022	Container4000	2006	PAN	62,958	23.5	4,803	TEU	Aux	6,680	N
C0400022	Container4000	2006	PAN	62,958	23.5	4,803	TEU	Auxiliary Boiler	492	N
C0400022	Container4000	2006	PAN	62,958	23.5	4,803	TEU	Main	51,389	Y
C0400328	Container4000	2006	PAN	62,953	23.5	4,803	TEU	Aux	6,680	N
C0400328	Container4000	2006	PAN	62,953	23.5	4,803	TEU	Auxiliary Boiler	492	N
C0400328	Container4000	2006	PAN	62,953	23.5	4,803	TEU	Main	51,389	Y
TNA00207	Tanker - Aframax	2006	MHL	115,867	15	0	TEU	Aux	2,432	N
TNA00207	Tanker - Aframax	2006	MHL	115,867	15	0	TEU	Auxiliary Boiler	371	N
TNA00207	Tanker - Aframax	2006	MHL	115,867	15	0	TEU	Main	13,560	Y
TNA00774	Tanker - Aframax	2007	MHL	116,095	15	0	TEU	Aux	2,432	N
TNA00774	Tanker - Aframax	2007	MHL	116,095	15	0	TEU	Auxiliary Boiler	371	N
TNA00774	Tanker - Aframax	2007	MHL	116,095	15	0	TEU	Main	13,560	Y
TNC00028	Tanker - Chemical	2006	PAN	33,682	14.7	0	TEU	Aux	2,839	N
TNC00028	Tanker - Chemical	2006	PAN	33,682	14.7	0	TEU	Auxiliary Boiler	371	N
TNC00028	Tanker - Chemical	2006	PAN	33,682	14.7	0	TEU	Main	7,980	N
BBB00303	Bulk	2004	SGP	76,948	14.1	0	TEU	Aux	1,793	N
BBB00303	Bulk	2004	SGP	76,948	14.1	0	TEU	Auxiliary Boiler	132	N
BBB00303	Bulk	2004	SGP	76,948	14.1	0	TEU	Main	9,930	Y
BBB00734	Bulk	2004	PAN	76,602	13.8	0	TEU	Aux	1,793	N
BBB00734	Bulk	2004	PAN	76,602	13.8	0	TEU	Auxiliary Boiler	132	N
BBB00734	Bulk	2004	PAN	76,602	13.8	0	TEU	Main	10,320	Y
TNP00213	Tanker - Panamax	2004	CYP	74,997	15.6	0	TEU	Aux	2,627	N
TNP00213	Tanker - Panamax	2004	CYP	74,997	15.6	0	TEU	Auxiliary Boiler	371	N
TNP00213	Tanker - Panamax	2004	CYP	74,997	15.6	0	TEU	Main	12,268	N
TNA00282	Tanker - Aframax	2004	LBR	105,576	14.8	0	TEU	Aux	2,425	N
TNA00282	Tanker - Aframax	2004	LBR	105,576	14.8	0	TEU	Auxiliary Boiler	371	N
TNA00282	Tanker - Aframax	2004	LBR	105,576	14.8	0	TEU	Main	12,000	N
TNC00002	Tanker - Chemical	2007	HKG	47,128	14.5	0	TEU	Aux	2,839	N
TNC00002	Tanker - Chemical	2007	HKG	47,128	14.5	0	TEU	Auxiliary Boiler	371	N
TNC00002	Tanker - Chemical	2007	HKG	47,128	14.5	0	TEU	Main	9,480	Y
TNC00101	Tanker - Chemical	2007	HKG	47,128	14.5	0	TEU	Aux	2,839	N
TNC00101	Tanker - Chemical	2007	HKG	47,128	14.5	0	TEU	Auxiliary Boiler	371	N
TNC00101	Tanker - Chemical	2007	HKG	47,128	14.5	0	TEU	Main	9,480	Y
ACC00366	Auto Carrier	2007	BHS	18,867	20	0	TEU	Aux	4,723	N
ACC00366	Auto Carrier	2007	BHS	18,867	20	0	TEU	Auxiliary Boiler	253	N
ACC00366	Auto Carrier	2007	BHS	18,867	20	0	TEU	Main	15,540	N
ACC00188	Auto Carrier	2007	BHS	18,865	20	0	TEU	Aux	4,723	N
ACC00188	Auto Carrier	2007	BHS	18,865	20	0	TEU	Auxiliary Boiler	253	N
ACC00188	Auto Carrier	2007	BHS	18,865	20	0	TEU	Main	15,130	N
ACC00518	Auto Carrier	2007	BHS	18,864	20	0	TEU	Aux	4,723	N
ACC00518	Auto Carrier	2007	BHS	18,864	20	0	TEU	Auxiliary Boiler	253	N
ACC00518	Auto Carrier	2007	BHS	18,864	20	0	TEU	Main	15,130	Y

Vessel ID	Vessel Type	Model Year	Flag	DWT (tons)	Max Speed (knots)	Cap	Cap Units	Engine Type	Power (kW)	Slide Valve
ACC00339	Auto Carrier	2008	BHS	18,858	20	0	TEU	Aux	4,723	N
ACC00339	Auto Carrier	2008	BHS	18,858	20	0	TEU	Auxiliary Boiler	253	N
ACC00339	Auto Carrier	2008	BHS	18,858	20	0	TEU	Main	15,820	Y
TNC00621	Tanker - Chemical	2006	HKG	19,998	14.7	0	TEU	Aux	2,839	N
TNC00621	Tanker - Chemical	2006	HKG	19,998	14.7	0	TEU	Auxiliary Boiler	371	N
TNC00621	Tanker - Chemical	2006	HKG	19,998	14.7	0	TEU	Main	6,150	N
TNC00007	Tanker - Chemical	2005	SGP	29,015	14	0	TEU	Aux	2,825	N
TNC00007	Tanker - Chemical	2005	SGP	29,015	14	0	TEU	Auxiliary Boiler	371	N
TNC00007	Tanker - Chemical	2005	SGP	29,015	14	0	TEU	Main	7,150	Y
TNC00756	Tanker - Chemical	2006	SGP	29,013	14	0	TEU	Aux	2,825	N
TNC00756	Tanker - Chemical	2006	SGP	29,013	14	0	TEU	Auxiliary Boiler	371	N
TNC00756	Tanker - Chemical	2006	SGP	29,013	14	0	TEU	Main	7,150	Y
TNP00509	Tanker - Panamax	2008	SGP	76,580	15.4	0	TEU	Aux	2,400	N
TNP00509	Tanker - Panamax	2008	SGP	76,580	15.4	0	TEU	Auxiliary Boiler	371	N
TNP00509	Tanker - Panamax	2008	SGP	76,580	15.4	0	TEU	Main	12,268	Y
BBB00315	Bulk	2003	ITA	76,596	15.3	0	TEU	Aux	1,793	N
BBB00315	Bulk	2003	ITA	76,596	15.3	0	TEU	Auxiliary Boiler	132	N
BBB00315	Bulk	2003	ITA	76,596	15.3	0	TEU	Main	10,320	N
BBB00770	Bulk	2005	PAN	76,596	14	0	TEU	Aux	1,793	N
BBB00770	Bulk	2005	PAN	76,596	14	0	TEU	Auxiliary Boiler	132	N
BBB00770	Bulk	2005	PAN	76,596	14	0	TEU	Main	10,320	Y
BBB00130	Bulk	2005	PAN	76,598	15.2	0	TEU	Aux	1,793	N
BBB00130	Bulk	2005	PAN	76,598	15.2	0	TEU	Auxiliary Boiler	132	N
BBB00130	Bulk	2005	PAN	76,598	15.2	0	TEU	Main	10,320	Y
ACC00416	Auto Carrier	2004	PAN	20,141	20	0	TEU	Aux	4,723	N
ACC00416	Auto Carrier	2004	PAN	20,141	20	0	TEU	Auxiliary Boiler	253	N
ACC00416	Auto Carrier	2004	PAN	20,141	20	0	TEU	Main	15,540	N
TNA00316	Tanker - Aframax	2004	HKG	115,577	15	0	TEU	Aux	2,432	N
TNA00316	Tanker - Aframax	2004	HKG	115,577	15	0	TEU	Auxiliary Boiler	371	N
TNA00316	Tanker - Aframax	2004	HKG	115,577	15	0	TEU	Main	11,700	Y
BBB00277	Bulk	2004	PAN	55,688	14.5	0	TEU	Aux	1,793	N
BBB00277	Bulk	2004	PAN	55,688	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00277	Bulk	2004	PAN	55,688	14.5	0	TEU	Main	8,208	Y
C1000043	Container10000	2007	PAN	109,968	24.8	10,060	TEU	Aux	14,358	N
C1000043	Container10000	2007	PAN	109,968	24.8	10,060	TEU	Auxiliary Boiler		N
C1000043	Container10000	2007	PAN	109,968	24.8	10,060	TEU	Main	68,639	Y
TNC00115	Tanker - Chemical	2004	LBR	23,322	14.6	0	TEU	Aux	2,839	N
TNC00115	Tanker - Chemical	2004	LBR	23,322	14.6	0	TEU	Auxiliary Boiler	371	N
TNC00115	Tanker - Chemical	2004	LBR	23,322	14.6	0	TEU	Main	7,080	N
TNC00360	Tanker - Chemical	2006	SGP	19,885	14.5	0	TEU	Aux	2,839	N
TNC00360	Tanker - Chemical	2006	SGP	19,885	14.5	0	TEU	Auxiliary Boiler	371	N
TNC00360	Tanker - Chemical	2006	SGP	19,885	14.5	0	TEU	Main	6,230	N
TNP00727	Tanker - Panamax	2008	PAN	63,599	15.4	0	TEU	Aux	2,880	N
TNP00727	Tanker - Panamax	2008	PAN	63,599	15.4	0	TEU	Auxiliary Boiler	371	N
TNP00727	Tanker - Panamax	2008	PAN	63,599	15.4	0	TEU	Main	13,560	Y
TNA00187	Tanker - Aframax	2007	SGP	115,915	15.3	0	TEU	Aux	2,640	N
TNA00187	Tanker - Aframax	2007	SGP	115,915	15.3	0	TEU	Auxiliary Boiler	371	N
TNA00187	Tanker - Aframax	2007	SGP	115,915	15.3	0	TEU	Main	13,560	Y
BBB00626	Bulk	2005	PAN	83,051	14.5	0	TEU	Aux	1,793	N
BBB00626	Bulk	2005	PAN	83,051	14.5	0	TEU	Auxiliary Boiler	132	N

Vessel ID	Vessel Type	Model Year	Flag	DWT (tons)	Max Speed (knots)	Cap	Cap Units	Engine Type	Power (kW)	Slide Valve
BBB00626	Bulk	2005	PAN	83,051	14.5	0	TEU	Main	9,800	Y
TNU00036	Tanker - ULCC	2007	GRC	321,300	15.3	0	TEU	Aux	4,320	N
TNU00036	Tanker - ULCC	2007	GRC	321,300	15.3	0	TEU	Auxiliary Boiler	371	N
TNU00036	Tanker - ULCC	2007	GRC	321,300	15.3	0	TEU	Main	29,399	N
TNC00778	Tanker - Chemical	2005	PAN	19,932	14.6	0	TEU	Aux	2,839	N
TNC00778	Tanker - Chemical	2005	PAN	19,932	14.6	0	TEU	Auxiliary Boiler	371	N
TNC00778	Tanker - Chemical	2005	PAN	19,932	14.6	0	TEU	Main	6,150	N
BBB00529	Bulk	2006	CHN	76,611	14.5	0	TEU	Aux	1,793	N
BBB00529	Bulk	2006	CHN	76,611	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00529	Bulk	2006	CHN	76,611	14.5	0	TEU	Main	10,200	Y
TNC00582	Tanker - Chemical	2006	USA	46,817	14.6	0	TEU	Aux	2,839	N
TNC00582	Tanker - Chemical	2006	USA	46,817	14.6	0	TEU	Auxiliary Boiler	371	N
TNC00582	Tanker - Chemical	2006	USA	46,817	14.6	0	TEU	Main	8,580	Y
TNC00160	Tanker - Chemical	2007	USA	46,802	14.6	0	TEU	Aux	2,839	N
TNC00160	Tanker - Chemical	2007	USA	46,802	14.6	0	TEU	Auxiliary Boiler	371	N
TNC00160	Tanker - Chemical	2007	USA	46,802	14.6	0	TEU	Main	8,700	Y
TNC00673	Tanker - Chemical	2008	USA	46,666	14.6	0	TEU	Aux	2,839	N
TNC00673	Tanker - Chemical	2008	USA	46,666	14.6	0	TEU	Auxiliary Boiler	371	N
TNC00673	Tanker - Chemical	2008	USA	46,666	14.6	0	TEU	Main	8,700	Y
TNC00404	Tanker - Chemical	2008	USA	46,653	14.6	0	TEU	Aux	2,839	N
TNC00404	Tanker - Chemical	2008	USA	46,653	14.6	0	TEU	Auxiliary Boiler	371	N
TNC00404	Tanker - Chemical	2008	USA	46,653	14.6	0	TEU	Main	8,700	Y
TNC00445	Tanker - Chemical	2009	USA	46,666	14.6	0	TEU	Aux	2,839	N
TNC00445	Tanker - Chemical	2009	USA	46,666	14.6	0	TEU	Auxiliary Boiler	371	N
TNC00445	Tanker - Chemical	2009	USA	46,666	14.6	0	TEU	Main	8,580	Y
TNA00761	Tanker - Aframax	2007	CYP	104,535	15	0	TEU	Aux	3,600	N
TNA00761	Tanker - Aframax	2007	CYP	104,535	15	0	TEU	Auxiliary Boiler	371	N
TNA00761	Tanker - Aframax	2007	CYP	104,535	15	0	TEU	Main	15,820	Y
ACC00221	Auto Carrier	2006	CYM	17,325	19.8	0	TEU	Aux	4,723	N
ACC00221	Auto Carrier	2006	CYM	17,325	19.8	0	TEU	Auxiliary Boiler	253	N
ACC00221	Auto Carrier	2006	CYM	17,325	19.8	0	TEU	Main	15,090	Y
ACC00259	Auto Carrier	2007	PAN	21,424	20	0	TEU	Aux	4,723	N
ACC00259	Auto Carrier	2007	PAN	21,424	20	0	TEU	Auxiliary Boiler	253	N
ACC00259	Auto Carrier	2007	PAN	21,424	20	0	TEU	Main	15,540	N
C1000255	Container10000	2007	HKG	111,315	25.8	10,062	TEU	Aux		N
C1000255	Container10000	2007	HKG	111,315	25.8	10,062	TEU	Auxiliary Boiler		N
C1000255	Container10000	2007	HKG	111,315	25.8	10,062	TEU	Main	68,639	Y
C1000392	Container10000	2008	HKG	111,499	25.8	10,062	TEU	Aux		N
C1000392	Container10000	2008	HKG	111,499	25.8	10,062	TEU	Auxiliary Boiler		N
C1000392	Container10000	2008	HKG	111,499	25.8	10,062	TEU	Main	68,639	Y
ACC00709	Auto Carrier	2007	BHS	20,958	20.5	0	TEU	Aux	4,723	N
ACC00709	Auto Carrier	2007	BHS	20,958	20.5	0	TEU	Auxiliary Boiler	253	N
ACC00709	Auto Carrier	2007	BHS	20,958	20.5	0	TEU	Main	15,539	Y
BBB00449	Bulk	2007	MHL	53,828	14.2	0	TEU	Aux	2,040	N
BBB00449	Bulk	2007	MHL	53,828	14.2	0	TEU	Auxiliary Boiler	132	N
BBB00449	Bulk	2007	MHL	53,828	14.2	0	TEU	Main	9,480	Y
BBB00251	Bulk	2006	LBR	56,557	14.5	0	TEU	Aux	1,793	N
BBB00251	Bulk	2006	LBR	56,557	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00251	Bulk	2006	LBR	56,557	14.5	0	TEU	Main	8,890	N
BBB00351	Bulk	2004	PAN	76,561	14	0	TEU	Aux	1,793	N

Vessel ID	Vessel Type	Model Year	Flag	DWT (tons)	Max Speed (knots)	Cap	Cap Units	Engine Type	Power (kW)	Slide Valve
BBB00351	Bulk	2004	PAN	76,561	14	0	TEU	Auxiliary Boiler	132	N
BBB00351	Bulk	2004	PAN	76,561	14	0	TEU	Main	12,240	Y
ACC00176	Auto Carrier	2006	PAN	17,765	20	0	TEU	Aux	4,723	N
ACC00176	Auto Carrier	2006	PAN	17,765	20	0	TEU	Auxiliary Boiler	253	N
ACC00176	Auto Carrier	2006	PAN	17,765	20	0	TEU	Main	16,360	N
GCC00506	General Cargo	2006	PAN	32,248	14.3	0	TEU	Aux	2,305	N
GCC00506	General Cargo	2006	PAN	32,248	14.3	0	TEU	Auxiliary Boiler	137	N
GCC00506	General Cargo	2006	PAN	32,248	14.3	0	TEU	Main	6,620	N
TNH00684	Tanker - Handysize	2008	PAN	45,967	14.6	0	TEU	Aux	2,328	N
TNH00684	Tanker - Handysize	2008	PAN	45,967	14.6	0	TEU	Auxiliary Boiler	371	N
TNH00684	Tanker - Handysize	2008	PAN	45,967	14.6	0	TEU	Main	9,267	N
TNC00301	Tanker - Chemical	2008	HKG	19,994	14.7	0	TEU	Aux	2,839	N
TNC00301	Tanker - Chemical	2008	HKG	19,994	14.7	0	TEU	Auxiliary Boiler	371	N
TNC00301	Tanker - Chemical	2008	HKG	19,994	14.7	0	TEU	Main	6,150	N
C0900083	Container9000	2008	MLT	120,892	25.3	9,661	TEU	Aux	11,447	N
C0900083	Container9000	2008	MLT	120,892	25.3	9,661	TEU	Auxiliary Boiler	547	N
C0900083	Container9000	2008	MLT	120,892	25.3	9,661	TEU	Main	68,638	N
TNU00210	Tanker - ULCC	2007	MLT	319,994	15.7	0	TEU	Aux	2,250	N
TNU00210	Tanker - ULCC	2007	MLT	319,994	15.7	0	TEU	Auxiliary Boiler	371	N
TNU00210	Tanker - ULCC	2007	MLT	319,994	15.7	0	TEU	Main	29,340	Y
C0900548	Container9000	2008	LBR	120,943	25.3	9,661	TEU	Aux	11,447	N
C0900548	Container9000	2008	LBR	120,943	25.3	9,661	TEU	Auxiliary Boiler	547	N
C0900548	Container9000	2008	LBR	120,943	25.3	9,661	TEU	Main	68,639	N
TNC00212	Tanker - Chemical	2008	MHL	21,206	14.3	0	TEU	Aux	2,839	N
TNC00212	Tanker - Chemical	2008	MHL	21,206	14.3	0	TEU	Auxiliary Boiler	371	N
TNC00212	Tanker - Chemical	2008	MHL	21,206	14.3	0	TEU	Main	6,150	N
ITB00214	ITB	2007	USA	786	12	0	TEU	Aux	449	N
ITB00214	ITB	2007	USA	786	12	0	TEU	Auxiliary Boiler	0	N
ITB00214	ITB	2007	USA	786	12	0	TEU	Main	7,999	N
GCC00637	General Cargo	2006	PAN	33,440	14.3	0	TEU	Aux	2,305	N
GCC00637	General Cargo	2006	PAN	33,440	14.3	0	TEU	Auxiliary Boiler	137	N
GCC00637	General Cargo	2006	PAN	33,440	14.3	0	TEU	Main	6,250	N
ACC00450	Auto Carrier	2008	SWE	30,089	20.8	0	TEU	Aux	3,853	N
ACC00450	Auto Carrier	2008	SWE	30,089	20.8	0	TEU	Auxiliary Boiler	253	N
ACC00450	Auto Carrier	2008	SWE	30,089	20.8	0	TEU	Main	18,080	Y
ACC00777	Auto Carrier	2008	SWE	30,134	20.8	0	TEU	Aux	3,853	N
ACC00777	Auto Carrier	2008	SWE	30,134	20.8	0	TEU	Auxiliary Boiler	253	N
ACC00777	Auto Carrier	2008	SWE	30,134	20.8	0	TEU	Main	18,080	Y
ACC00468	Auto Carrier	2008	NOR	30,089	20.8	0	TEU	Aux	3,853	N
ACC00468	Auto Carrier	2008	NOR	30,089	20.8	0	TEU	Auxiliary Boiler	253	N
ACC00468	Auto Carrier	2008	NOR	30,089	20.8	0	TEU	Main	18,080	Y
ACC00306	Auto Carrier	2008	NOR	29,936	20.8	0	TEU	Aux	3,853	N
ACC00306	Auto Carrier	2008	NOR	29,936	20.8	0	TEU	Auxiliary Boiler	253	N
ACC00306	Auto Carrier	2008	NOR	29,936	20.8	0	TEU	Main	18,080	Y
BBB00298	Bulk	2008	HKG	33,098	13.7	0	TEU	Aux	1,640	N
BBB00298	Bulk	2008	HKG	33,098	13.7	0	TEU	Auxiliary Boiler	132	N
BBB00298	Bulk	2008	HKG	33,098	13.7	0	TEU	Main	6,480	N
GCC00610	General Cargo	2007	MHL	32,029	14.5	0	TEU	Aux	2,305	N
GCC00610	General Cargo	2007	MHL	32,029	14.5	0	TEU	Auxiliary Boiler	137	N
GCC00610	General Cargo	2007	MHL	32,029	14.5	0	TEU	Main	6,840	N

Vessel ID	Vessel Type	Model Year	Flag	DWT (tons)	Max Speed (knots)	Cap	Cap Units	Engine Type	Power (kW)	Slide Valve
TNC00754	Tanker - Chemical	2007	SGP	20,564	14.5	0	TEU	Aux	2,839	N
TNC00754	Tanker - Chemical	2007	SGP	20,564	14.5	0	TEU	Auxiliary Boiler	371	N
TNC00754	Tanker - Chemical	2007	SGP	20,564	14.5	0	TEU	Main	6,230	N
ACC00430	Auto Carrier	2007	JPN	17,289	19.8	0	TEU	Aux	4,723	N
ACC00430	Auto Carrier	2007	JPN	17,289	19.8	0	TEU	Auxiliary Boiler	253	N
ACC00430	Auto Carrier	2007	JPN	17,289	19.8	0	TEU	Main	15,090	N
TNC00125	Tanker - Chemical	2008	HKG	47,128	14.5	0	TEU	Aux	2,839	N
TNC00125	Tanker - Chemical	2008	HKG	47,128	14.5	0	TEU	Auxiliary Boiler	371	N
TNC00125	Tanker - Chemical	2008	HKG	47,128	14.5	0	TEU	Main	9,480	Y
TNC00194	Tanker - Chemical	2009	BHS	46,554	14.5	0	TEU	Aux	3,900	N
TNC00194	Tanker - Chemical	2009	BHS	46,554	14.5	0	TEU	Auxiliary Boiler	371	N
TNC00194	Tanker - Chemical	2009	BHS	46,554	14.5	0	TEU	Main	8,598	Y
TNP00190	Tanker - Panamax	2008	LBR	74,329	15.3	0	TEU	Aux	2,627	N
TNP00190	Tanker - Panamax	2008	LBR	74,329	15.3	0	TEU	Auxiliary Boiler	371	N
TNP00190	Tanker - Panamax	2008	LBR	74,329	15.3	0	TEU	Main	12,240	Y
GCC00273	General Cargo	2006	PAN	32,228	14.3	0	TEU	Aux	2,305	N
GCC00273	General Cargo	2006	PAN	32,228	14.3	0	TEU	Auxiliary Boiler	137	N
GCC00273	General Cargo	2006	PAN	32,228	14.3	0	TEU	Main	5,627	N
TNC00504	Tanker - Chemical	2008	HKG	36,677	14.5	0	TEU	Aux	2,839	N
TNC00504	Tanker - Chemical	2008	HKG	36,677	14.5	0	TEU	Auxiliary Boiler	371	N
TNC00504	Tanker - Chemical	2008	HKG	36,677	14.5	0	TEU	Main	7,860	Y
TNV00198	Tanker - VLCC	2008	MHL	297,974	15.8	0	TEU	Aux	4,502	N
TNV00198	Tanker - VLCC	2008	MHL	297,974	15.8	0	TEU	Auxiliary Boiler	371	N
TNV00198	Tanker - VLCC	2008	MHL	297,974	15.8	0	TEU	Main	25,480	Y
BBB00775	Bulk	2004	HKG	28,456	13.5	0	TEU	Aux	1,500	N
BBB00775	Bulk	2004	HKG	28,456	13.5	0	TEU	Auxiliary Boiler	132	N
BBB00775	Bulk	2004	HKG	28,456	13.5	0	TEU	Main	5,850	N
GCC00267	General Cargo	2006	BHS	72,863	15.5	445	TEU	Aux	3,480	N
GCC00267	General Cargo	2006	BHS	72,863	15.5	445	TEU	Auxiliary Boiler	137	N
GCC00267	General Cargo	2006	BHS	72,863	15.5	445	TEU	Main	12,577	Y
GCC00541	General Cargo	2006	PAN	54,204	14.5	256	TEU	Aux	2,305	N
GCC00541	General Cargo	2006	PAN	54,204	14.5	256	TEU	Auxiliary Boiler	137	N
GCC00541	General Cargo	2006	PAN	54,204	14.5	256	TEU	Main	8,208	Y
TNC00689	Tanker - Chemical	2007	ITA	50,633	14.9	0	TEU	Aux	2,910	N
TNC00689	Tanker - Chemical	2007	ITA	50,633	14.9	0	TEU	Auxiliary Boiler	371	N
TNC00689	Tanker - Chemical	2007	ITA	50,633	14.9	0	TEU	Main	9,485	N
GCC00600	General Cargo	2007	ATG	12,651	15.5	665	TEU	Aux	2,305	N
GCC00600	General Cargo	2007	ATG	12,651	15.5	665	TEU	Auxiliary Boiler	137	N
GCC00600	General Cargo	2007	ATG	12,651	15.5	665	TEU	Main	5,400	N
C0400602	Container4000	2008	PAN	51,733	24	4,275	TEU	Aux	6,680	N
C0400602	Container4000	2008	PAN	51,733	24	4,275	TEU	Auxiliary Boiler	492	N
C0400602	Container4000	2008	PAN	51,733	24	4,275	TEU	Main	40,039	N
C0400368	Container4000	2008	PAN	51,733	24.5	4,275	TEU	Aux	6,680	N
C0400368	Container4000	2008	PAN	51,733	24.5	4,275	TEU	Auxiliary Boiler	492	N
C0400368	Container4000	2008	PAN	51,733	24.5	4,275	TEU	Main	40,039	N
C0400485	Container4000	2008	PAN	51,733	24.5	4,275	TEU	Aux	6,680	N
C0400485	Container4000	2008	PAN	51,733	24.5	4,275	TEU	Auxiliary Boiler	492	N
C0400485	Container4000	2008	PAN	51,733	24.5	4,275	TEU	Main	36,540	N
C0400750	Container4000	2008	MLT	50,829	23.3	4,253	TEU	Aux	6,680	N
C0400750	Container4000	2008	MLT	50,829	23.3	4,253	TEU	Auxiliary Boiler	492	N

Vessel ID	Vessel Type	Model Year	Flag	DWT (tons)	Max Speed (knots)	Cap	Cap Units	Engine Type	Power (kW)	Slide Valve
C0400750	Container4000	2008	MLT	50,829	23.3	4,253	TEU	Main	36,559	Y
TNU00651	Tanker - ULCC	2009	LBR	319,300	15.4	0	TEU	Aux	4,540	N
TNU00651	Tanker - ULCC	2009	LBR	319,300	15.4	0	TEU	Auxiliary Boiler	371	N
TNU00651	Tanker - ULCC	2009	LBR	319,300	15.4	0	TEU	Main	29,399	N
TNC00549	Tanker - Chemical	2008	PAN	19,998	14.7	0	TEU	Aux	1,650	N
TNC00549	Tanker - Chemical	2008	PAN	19,998	14.7	0	TEU	Auxiliary Boiler	371	N
TNC00549	Tanker - Chemical	2008	PAN	19,998	14.7	0	TEU	Main	6,480	N
TNC00618	Tanker - Chemical	2008	GRC	50,349	14.9	0	TEU	Aux	2,839	N
TNC00618	Tanker - Chemical	2008	GRC	50,349	14.9	0	TEU	Auxiliary Boiler	371	N
TNC00618	Tanker - Chemical	2008	GRC	50,349	14.9	0	TEU	Main	9,480	Y
BBB00379	Bulk	2004	PHL	55,496	14.5	0	TEU	Aux	1,793	N
BBB00379	Bulk	2004	PHL	55,496	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00379	Bulk	2004	PHL	55,496	14.5	0	TEU	Main	8,208	Y
C0800656	Container8000	2008	SGP	98,849	24.5	8,212	TEU	Aux	11,205	N
C0800656	Container8000	2008	SGP	98,849	24.5	8,212	TEU	Auxiliary Boiler	525	N
C0800656	Container8000	2008	SGP	98,849	24.5	8,212	TEU	Main	66,259	Y
TNV00576	Tanker - VLCC	2010	MLT	296,865	15.8	0	TEU	Aux	4,502	N
TNV00576	Tanker - VLCC	2010	MLT	296,865	15.8	0	TEU	Auxiliary Boiler	371	N
TNV00576	Tanker - VLCC	2010	MLT	296,865	15.8	0	TEU	Main	25,480	Y
TNC00233	Tanker - Chemical	2008	MLT	25,419	14.3	0	TEU	Aux	2,839	N
TNC00233	Tanker - Chemical	2008	MLT	25,419	14.3	0	TEU	Auxiliary Boiler	371	N
TNC00233	Tanker - Chemical	2008	MLT	25,419	14.3	0	TEU	Main	7,860	Y
TNC00118	Tanker - Chemical	2008	MLT	50,607	14.9	0	TEU	Aux	2,910	N
TNC00118	Tanker - Chemical	2008	MLT	50,607	14.9	0	TEU	Auxiliary Boiler	371	N
TNC00118	Tanker - Chemical	2008	MLT	50,607	14.9	0	TEU	Main	8,061	Y
TNC00010	Tanker - Chemical	2007	MLT	51,246	14.2	0	TEU	Aux	2,880	N
TNC00010	Tanker - Chemical	2007	MLT	51,246	14.2	0	TEU	Auxiliary Boiler	371	N
TNC00010	Tanker - Chemical	2007	MLT	51,246	14.2	0	TEU	Main	9,480	Y
BBB00766	Bulk	2009	CHN	53,484	14.2	0	TEU	Aux	2,310	N
BBB00766	Bulk	2009	CHN	53,484	14.2	0	TEU	Auxiliary Boiler	132	N
BBB00766	Bulk	2009	CHN	53,484	14.2	0	TEU	Main	9,480	Y
TNV00229	Tanker - VLCC	2006	LBR	297,950	15.6	0	TEU	Aux	4,502	N
TNV00229	Tanker - VLCC	2006	LBR	297,950	15.6	0	TEU	Auxiliary Boiler	371	N
TNV00229	Tanker - VLCC	2006	LBR	297,950	15.6	0	TEU	Main	25,480	Y
C1100570	Container11000	2008	PAN	131,489	24.8	11,312	TEU	Aux	11,000	N
C1100570	Container11000	2008	PAN	131,489	24.8	11,312	TEU	Auxiliary Boiler	600	N
C1100570	Container11000	2008	PAN	131,489	24.8	11,312	TEU	Main	68,639	Y
BBB00133	Bulk	2006	PAN	81,487	14.6	0	TEU	Aux	1,502	N
BBB00133	Bulk	2006	PAN	81,487	14.6	0	TEU	Auxiliary Boiler	132	N
BBB00133	Bulk	2006	PAN	81,487	14.6	0	TEU	Main	9,700	Y
C1100551	Container11000	2009	MLT	131,235	24.7	11,356	TEU	Aux	11,000	N
C1100551	Container11000	2009	MLT	131,235	24.7	11,356	TEU	Auxiliary Boiler	600	N
C1100551	Container11000	2009	MLT	131,235	24.7	11,356	TEU	Main	72,078	Y
TNC00456	Tanker - Chemical	2009	PAN	45,565	15	0	TEU	Aux	2,839	N
TNC00456	Tanker - Chemical	2009	PAN	45,565	15	0	TEU	Auxiliary Boiler	371	N
TNC00456	Tanker - Chemical	2009	PAN	45,565	15	0	TEU	Main	9,480	Y
C0400676	Container4000	2008	DEU	63,355	24	4,860	TEU	Aux	6,680	N
C0400676	Container4000	2008	DEU	63,355	24	4,860	TEU	Auxiliary Boiler	492	N
C0400676	Container4000	2008	DEU	63,355	24	4,860	TEU	Main	39,969	Y
C0600579	Container6000	2008	MLT	83,293	25.6	6,554	TEU	Aux	8,935	N

Vessel ID	Vessel Type	Model Year	Flag	DWT (tons)	Max Speed (knots)	Cap	Cap Units	Engine Type	Power (kW)	Slide Valve
C0600579	Container6000	2008	MLT	83,293	25.6	6,554	TEU	Auxiliary Boiler	565	N
C0600579	Container6000	2008	MLT	83,293	25.6	6,554	TEU	Main	57,198	Y
C1100659	Container11000	2008	PAN	131,346	24.8	11,312	TEU	Aux	11,000	N
C1100659	Container11000	2008	PAN	131,346	24.8	11,312	TEU	Auxiliary Boiler	600	N
C1100659	Container11000	2008	PAN	131,346	24.8	11,312	TEU	Main	68,639	Y
C1100749	Container11000	2008	PAN	131,356	24.8	11,312	TEU	Aux	11,000	N
C1100749	Container11000	2008	PAN	131,356	24.8	11,312	TEU	Auxiliary Boiler	600	N
C1100749	Container11000	2008	PAN	131,356	24.8	11,312	TEU	Main	68,639	Y
C0100751	Container1000	2008	BHS	23,324	19.5	1,740	TEU	Aux	5,916	N
C0100751	Container1000	2008	BHS	23,324	19.5	1,740	TEU	Auxiliary Boiler	241	N
C0100751	Container1000	2008	BHS	23,324	19.5	1,740	TEU	Main	16,660	Y
GCC00619	General Cargo	2006	PAN	54,274	14.5	256	TEU	Aux	2,305	N
GCC00619	General Cargo	2006	PAN	54,274	14.5	256	TEU	Auxiliary Boiler	137	N
GCC00619	General Cargo	2006	PAN	54,274	14.5	256	TEU	Main	8,208	Y
TNA00653	Tanker - Aframax	2009	MHL	115,600	14.8	0	TEU	Aux	2,432	N
TNA00653	Tanker - Aframax	2009	MHL	115,600	14.8	0	TEU	Auxiliary Boiler	371	N
TNA00653	Tanker - Aframax	2009	MHL	115,600	14.8	0	TEU	Main	12,193	Y
ACC00039	Auto Carrier	2008	PAN	18,758	20.6	0	TEU	Aux	4,723	N
ACC00039	Auto Carrier	2008	PAN	18,758	20.6	0	TEU	Auxiliary Boiler	253	N
ACC00039	Auto Carrier	2008	PAN	18,758	20.6	0	TEU	Main	14,315	N
ACC00745	Auto Carrier	2008	SGP	18,686	20.4	0	TEU	Aux	3,450	N
ACC00745	Auto Carrier	2008	SGP	18,686	20.4	0	TEU	Auxiliary Boiler	253	N
ACC00745	Auto Carrier	2008	SGP	18,686	20.4	0	TEU	Main	14,315	N
ACC00708	Auto Carrier	2007	SGP	12,853	20	0	TEU	Aux	4,723	N
ACC00708	Auto Carrier	2007	SGP	12,853	20	0	TEU	Auxiliary Boiler	253	N
ACC00708	Auto Carrier	2007	SGP	12,853	20	0	TEU	Main	11,620	Y
C1400087	Container14000	2008	PAN	165,644	24	14,000	TEU	Aux		N
C1400087	Container14000	2008	PAN	165,644	24	14,000	TEU	Auxiliary Boiler		N
C1400087	Container14000	2008	PAN	165,644	24	14,000	TEU	Main	72,239	Y
BBB00476	Bulk	2004	PAN	53,554	15	0	TEU	Aux	1,793	N
BBB00476	Bulk	2004	PAN	53,554	15	0	TEU	Auxiliary Boiler	132	N
BBB00476	Bulk	2004	PAN	53,554	15	0	TEU	Main	9,480	Y
TNC00526	Tanker - Chemical	2009	GRC	51,601	15.2	0	TEU	Aux	3,680	N
TNC00526	Tanker - Chemical	2009	GRC	51,601	15.2	0	TEU	Auxiliary Boiler	371	N
TNC00526	Tanker - Chemical	2009	GRC	51,601	15.2	0	TEU	Main	9,480	Y
TNC00177	Tanker - Chemical	2009	GRC	51,589	15.2	0	TEU	Aux	3,680	N
TNC00177	Tanker - Chemical	2009	GRC	51,589	15.2	0	TEU	Auxiliary Boiler	371	N
TNC00177	Tanker - Chemical	2009	GRC	51,589	15.2	0	TEU	Main	9,480	Y
TNP00151	Tanker - Panamax	2006	MHL	73,634	14.5	0	TEU	Aux	2,627	N
TNP00151	Tanker - Panamax	2006	MHL	73,634	14.5	0	TEU	Auxiliary Boiler	371	N
TNP00151	Tanker - Panamax	2006	MHL	73,634	14.5	0	TEU	Main	11,299	Y
BBB00517	Bulk	2008	PAN	55,411	14.6	0	TEU	Aux	1,793	N
BBB00517	Bulk	2008	PAN	55,411	14.6	0	TEU	Auxiliary Boiler	132	N
BBB00517	Bulk	2008	PAN	55,411	14.6	0	TEU	Main	8,201	Y
TNC00218	Tanker - Chemical	2009	USA	48,635	15	0	TEU	Aux	2,839	N
TNC00218	Tanker - Chemical	2009	USA	48,635	15	0	TEU	Auxiliary Boiler	371	N
TNC00218	Tanker - Chemical	2009	USA	48,635	15	0	TEU	Main	8,580	Y
TNC00279	Tanker - Chemical	2007	MHL	20,832	15.1	0	TEU	Aux	2,839	N
TNC00279	Tanker - Chemical	2007	MHL	20,832	15.1	0	TEU	Auxiliary Boiler	371	N
TNC00279	Tanker - Chemical	2007	MHL	20,832	15.1	0	TEU	Main	6,150	N

Vessel ID	Vessel Type	Model Year	Flag	DWT (tons)	Max Speed (knots)	Cap	Cap Units	Engine Type	Power (kW)	Slide Valve
C0900463	Container9000	2010	PAN	118,712	25.1	9,954	TEU	Aux	12,300	N
C0900463	Container9000	2010	PAN	118,712	25.1	9,954	TEU	Auxiliary Boiler	547	N
C0900463	Container9000	2010	PAN	118,712	25.1	9,954	TEU	Main	68,639	N
C0900546	Container9000	2009	PAN	118,800	25.1	9,954	TEU	Aux	11,447	N
C0900546	Container9000	2009	PAN	118,800	25.1	9,954	TEU	Auxiliary Boiler	547	N
C0900546	Container9000	2009	PAN	118,800	25.1	9,954	TEU	Main	68,639	N
C0900631	Container9000	2009	PAN	118,835	25.1	9,954	TEU	Aux	11,447	N
C0900631	Container9000	2009	PAN	118,835	25.1	9,954	TEU	Auxiliary Boiler	547	N
C0900631	Container9000	2009	PAN	118,835	25.1	9,954	TEU	Main	68,639	N
C0900710	Container9000	2009	PAN	118,814	25.1	9,954	TEU	Aux	11,447	N
C0900710	Container9000	2009	PAN	118,814	25.1	9,954	TEU	Auxiliary Boiler	547	N
C0900710	Container9000	2009	PAN	118,814	25.1	9,954	TEU	Main	68,639	N
TNC00545	Tanker - Chemical	2009	MHL	19,993	14	0	TEU	Aux	2,839	N
TNC00545	Tanker - Chemical	2009	MHL	19,993	14	0	TEU	Auxiliary Boiler	371	N
TNC00545	Tanker - Chemical	2009	MHL	19,993	14	0	TEU	Main	6,150	N
C1100457	Container11000	2009	GBR	128,550	24.7	11,356	TEU	Aux	11,000	N
C1100457	Container11000	2009	GBR	128,550	24.7	11,356	TEU	Auxiliary Boiler	600	N
C1100457	Container11000	2009	GBR	128,550	24.7	11,356	TEU	Main	72,239	Y
C1100031	Container11000	2009	GBR	128,550	24.7	11,356	TEU	Aux	11,000	N
C1100031	Container11000	2009	GBR	128,550	24.7	11,356	TEU	Auxiliary Boiler	600	N
C1100031	Container11000	2009	GBR	128,550	24.7	11,356	TEU	Main	72,239	Y
TNC00731	Tanker - Chemical	2009	ITA	53,116	15	0	TEU	Aux	4,480	N
TNC00731	Tanker - Chemical	2009	ITA	53,116	15	0	TEU	Auxiliary Boiler	371	N
TNC00731	Tanker - Chemical	2009	ITA	53,116	15	0	TEU	Main	11,620	N
BBB00564	Bulk	2006	CYP	86,949	14.5	0	TEU	Aux	2,120	N
BBB00564	Bulk	2006	CYP	86,949	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00564	Bulk	2006	CYP	86,949	14.5	0	TEU	Main	10,300	N
BBB00325	Bulk	2004	HKG	29,754	14	0	TEU	Aux	1,793	N
BBB00325	Bulk	2004	HKG	29,754	14	0	TEU	Auxiliary Boiler	132	N
BBB00325	Bulk	2004	HKG	29,754	14	0	TEU	Main	6,150	N
BBB00123	Bulk	2008	PAN	78,821	14.5	0	TEU	Aux	1,793	N
BBB00123	Bulk	2008	PAN	78,821	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00123	Bulk	2008	PAN	78,821	14.5	0	TEU	Main	9,560	Y
TNS00299	Tanker - Suezmax	2009	BEL	157,667	15.5	0	TEU	Aux	2,993	N
TNS00299	Tanker - Suezmax	2009	BEL	157,667	15.5	0	TEU	Auxiliary Boiler	371	N
TNS00299	Tanker - Suezmax	2009	BEL	157,667	15.5	0	TEU	Main	18,660	Y
TNC00358	Tanker - Chemical	2007	PAN	46,197	14.5	0	TEU	Aux	2,880	N
TNC00358	Tanker - Chemical	2007	PAN	46,197	14.5	0	TEU	Auxiliary Boiler	371	N
TNC00358	Tanker - Chemical	2007	PAN	46,197	14.5	0	TEU	Main	9,480	Y
TNU00095	Tanker - ULCC	2008	GRC	316,679	16	0	TEU	Aux	4,502	N
TNU00095	Tanker - ULCC	2008	GRC	316,679	16	0	TEU	Auxiliary Boiler	371	N
TNU00095	Tanker - ULCC	2008	GRC	316,679	16	0	TEU	Main	29,340	Y
TNC00408	Tanker - Chemical	2008	MLT	19,983	14	0	TEU	Aux	2,839	N
TNC00408	Tanker - Chemical	2008	MLT	19,983	14	0	TEU	Auxiliary Boiler	371	N
TNC00408	Tanker - Chemical	2008	MLT	19,983	14	0	TEU	Main	6,962	N
TNC00124	Tanker - Chemical	2008	MLT	19,984	15	0	TEU	Aux	2,839	N
TNC00124	Tanker - Chemical	2008	MLT	19,984	15	0	TEU	Auxiliary Boiler	371	N
TNC00124	Tanker - Chemical	2008	MLT	19,984	15	0	TEU	Main	6,962	N
TNS00186	Tanker - Suezmax	2009	LBR	158,070	15.2	0	TEU	Aux	3,240	N
TNS00186	Tanker - Suezmax	2009	LBR	158,070	15.2	0	TEU	Auxiliary Boiler	371	N

Vessel ID	Vessel Type	Model Year	Flag	DWT (tons)	Max Speed (knots)	Cap	Cap Units	Engine Type	Power (kW)	Slide Valve
TNS00186	Tanker - Suezmax	2009	LBR	158,070	15.2	0	TEU	Main	16,860	Y
TNA00691	Tanker - Aframax	2009	PAN	105,073	15.4	0	TEU	Aux	2,453	N
TNA00691	Tanker - Aframax	2009	PAN	105,073	15.4	0	TEU	Auxiliary Boiler	371	N
TNA00691	Tanker - Aframax	2009	PAN	105,073	15.4	0	TEU	Main	13,560	Y
TNA00140	Tanker - Aframax	2009	PAN	105,093	15.4	0	TEU	Aux	2,453	N
TNA00140	Tanker - Aframax	2009	PAN	105,093	15.4	0	TEU	Auxiliary Boiler	371	N
TNA00140	Tanker - Aframax	2009	PAN	105,093	15.4	0	TEU	Main	13,560	Y
TNS00345	Tanker - Suezmax	2009	LBR	158,097	15.7	0	TEU	Aux	2,993	N
TNS00345	Tanker - Suezmax	2009	LBR	158,097	15.7	0	TEU	Auxiliary Boiler	371	N
TNS00345	Tanker - Suezmax	2009	LBR	158,097	15.7	0	TEU	Main	18,621	Y
TNC00150	Tanker - Chemical	2008	PAN	19,999	14.6	0	TEU	Aux	2,839	N
TNC00150	Tanker - Chemical	2008	PAN	19,999	14.6	0	TEU	Auxiliary Boiler	371	N
TNC00150	Tanker - Chemical	2008	PAN	19,999	14.6	0	TEU	Main	6,480	N
BBB00562	Bulk	2010	PAN	58,500	14.5	0	TEU	Aux	1,793	N
BBB00562	Bulk	2010	PAN	58,500	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00562	Bulk	2010	PAN	58,500	14.5	0	TEU	Main	8,400	Y
ACC00598	Auto Carrier	2008	JPN	21,438	20	0	TEU	Aux	4,723	N
ACC00598	Auto Carrier	2008	JPN	21,438	20	0	TEU	Auxiliary Boiler	253	N
ACC00598	Auto Carrier	2008	JPN	21,438	20	0	TEU	Main	15,544	N
ACC00444	Auto Carrier	2008	JPN	21,462	20	0	TEU	Aux	4,723	N
ACC00444	Auto Carrier	2008	JPN	21,462	20	0	TEU	Auxiliary Boiler	253	N
ACC00444	Auto Carrier	2008	JPN	21,462	20	0	TEU	Main	15,544	N
GCC00522	General Cargo	2008	HKG	13,802	13.5	538	TEU	Aux	2,305	N
GCC00522	General Cargo	2008	HKG	13,802	13.5	538	TEU	Auxiliary Boiler	137	N
GCC00522	General Cargo	2008	HKG	13,802	13.5	538	TEU	Main	4,200	N
BBB00089	Bulk	2008	PAN	31,967	14.4	0	TEU	Aux	1,500	N
BBB00089	Bulk	2008	PAN	31,967	14.4	0	TEU	Auxiliary Boiler	132	N
BBB00089	Bulk	2008	PAN	31,967	14.4	0	TEU	Main	7,470	N
TNC00523	Tanker - Chemical	2009	MHL	25,175	14.3	0	TEU	Aux	2,839	N
TNC00523	Tanker - Chemical	2009	MHL	25,175	14.3	0	TEU	Auxiliary Boiler	371	N
TNC00523	Tanker - Chemical	2009	MHL	25,175	14.3	0	TEU	Main	7,860	Y
TNS00044	Tanker - Suezmax	2009	GRC	164,758	15.5	0	TEU	Aux	2,400	N
TNS00044	Tanker - Suezmax	2009	GRC	164,758	15.5	0	TEU	Auxiliary Boiler	371	N
TNS00044	Tanker - Suezmax	2009	GRC	164,758	15.5	0	TEU	Main	18,660	Y
BBB00208	Bulk	2006	PAN	55,582	14.5	0	TEU	Aux	1,793	N
BBB00208	Bulk	2006	PAN	55,582	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00208	Bulk	2006	PAN	55,582	14.5	0	TEU	Main	9,480	Y
TNA00268	Tanker - Aframax	2009	MHL	115,830	15	0	TEU	Aux	2,600	N
TNA00268	Tanker - Aframax	2009	MHL	115,830	15	0	TEU	Auxiliary Boiler	371	N
TNA00268	Tanker - Aframax	2009	MHL	115,830	15	0	TEU	Main	13,560	Y
C0400356	Container4000	2008	MHL	50,506	24.5	4,253	TEU	Aux	6,680	N
C0400356	Container4000	2008	MHL	50,506	24.5	4,253	TEU	Auxiliary Boiler	492	N
C0400356	Container4000	2008	MHL	50,506	24.5	4,253	TEU	Main	36,559	Y
GCC00040	General Cargo	2009	CYP	30,346	19.2	1,904	TEU	Aux	3,260	N
GCC00040	General Cargo	2009	CYP	30,346	19.2	1,904	TEU	Auxiliary Boiler	137	N
GCC00040	General Cargo	2009	CYP	30,346	19.2	1,904	TEU	Main	16,520	N
GCC00670	General Cargo	2009	HKG	30,330	19.2	1,904	TEU	Aux	2,305	N
GCC00670	General Cargo	2009	HKG	30,330	19.2	1,904	TEU	Auxiliary Boiler	137	N
GCC00670	General Cargo	2009	HKG	30,330	19.2	1,904	TEU	Main	16,520	N
GCC00747	General Cargo	2010	CYP	30,435	19.2	1,904	TEU	Aux	3,260	N

Vessel ID	Vessel Type	Model Year	Flag	DWT (tons)	Max Speed (knots)	Cap	Cap Units	Engine Type	Power (kW)	Slide Valve
GCC00747	General Cargo	2010	CYP	30,435	19.2	1,904	TEU	Auxiliary Boiler	137	N
GCC00747	General Cargo	2010	CYP	30,435	19.2	1,904	TEU	Main	16,520	N
GCC00067	General Cargo	2011	HKG	30,281	19.2	1,904	TEU	Aux	2,305	N
GCC00067	General Cargo	2011	HKG	30,281	19.2	1,904	TEU	Auxiliary Boiler	137	N
GCC00067	General Cargo	2011	HKG	30,281	19.2	1,904	TEU	Main	16,520	N
GCC00106	General Cargo	2006	PAN	62,942	14.5	270	TEU	Aux	2,305	N
GCC00106	General Cargo	2006	PAN	62,942	14.5	270	TEU	Auxiliary Boiler	137	N
GCC00106	General Cargo	2006	PAN	62,942	14.5	270	TEU	Main	8,605	Y
TNA00683	Tanker - Aframax	2008	GRC	112,984	15	0	TEU	Aux	2,432	N
TNA00683	Tanker - Aframax	2008	GRC	112,984	15	0	TEU	Auxiliary Boiler	371	N
TNA00683	Tanker - Aframax	2008	GRC	112,984	15	0	TEU	Main	15,820	Y
C0800532	Container8000	2010	MLT	101,433	25.8	8,533	TEU	Aux	11,205	N
C0800532	Container8000	2010	MLT	101,433	25.8	8,533	TEU	Auxiliary Boiler	525	N
C0800532	Container8000	2010	MLT	101,433	25.8	8,533	TEU	Main	68,519	Y
GCC00557	General Cargo	2007	ATG	7,786	15	532	TEU	Aux	2,305	N
GCC00557	General Cargo	2007	ATG	7,786	15	532	TEU	Auxiliary Boiler	137	N
GCC00557	General Cargo	2007	ATG	7,786	15	532	TEU	Main	4,320	N
C0500571	Container5000	2008	LBR	65,710	24.1	5,301	TEU	Aux	17,900	N
C0500571	Container5000	2008	LBR	65,710	24.1	5,301	TEU	Auxiliary Boiler	630	N
C0500571	Container5000	2008	LBR	65,710	24.1	5,301	TEU	Main	40,039	N
GCC00728	General Cargo	2007	LBR	12,628	14	665	TEU	Aux	2,305	N
GCC00728	General Cargo	2007	LBR	12,628	14	665	TEU	Auxiliary Boiler	137	N
GCC00728	General Cargo	2007	LBR	12,628	14	665	TEU	Main	6,000	N
TNA00350	Tanker - Aframax	2010	MLT	115,897	15.3	0	TEU	Aux	2,640	N
TNA00350	Tanker - Aframax	2010	MLT	115,897	15.3	0	TEU	Auxiliary Boiler	371	N
TNA00350	Tanker - Aframax	2010	MLT	115,897	15.3	0	TEU	Main	13,560	Y
TNA00271	Tanker - Aframax	2010	MLT	115,867	15.3	0	TEU	Aux	2,640	N
TNA00271	Tanker - Aframax	2010	MLT	115,867	15.3	0	TEU	Auxiliary Boiler	371	N
TNA00271	Tanker - Aframax	2010	MLT	115,867	15.3	0	TEU	Main	13,560	Y
TNC00426	Tanker - Chemical	2008	MHL	50,162	14.9	0	TEU	Aux	2,839	N
TNC00426	Tanker - Chemical	2008	MHL	50,162	14.9	0	TEU	Auxiliary Boiler	371	N
TNC00426	Tanker - Chemical	2008	MHL	50,162	14.9	0	TEU	Main	9,480	Y
TNC00413	Tanker - Chemical	2009	MHL	74,059	15.8	0	TEU	Aux	3,360	N
TNC00413	Tanker - Chemical	2009	MHL	74,059	15.8	0	TEU	Auxiliary Boiler	371	N
TNC00413	Tanker - Chemical	2009	MHL	74,059	15.8	0	TEU	Main	12,240	Y
BBB00534	Bulk	2008	PAN	58,707	14.5	0	TEU	Aux	1,793	N
BBB00534	Bulk	2008	PAN	58,707	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00534	Bulk	2008	PAN	58,707	14.5	0	TEU	Main	8,400	Y
C1400652	Container14000	2010	PAN	165,564	24	14,000	TEU	Aux		N
C1400652	Container14000	2010	PAN	165,564	24	14,000	TEU	Auxiliary Boiler		N
C1400652	Container14000	2010	PAN	165,564	24	14,000	TEU	Main	72,239	Y
BBB00508	Bulk	2006	PAN	55,638	14.5	0	TEU	Aux	1,793	N
BBB00508	Bulk	2006	PAN	55,638	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00508	Bulk	2006	PAN	55,638	14.5	0	TEU	Main	9,480	Y
BBB00205	Bulk	2010	PAN	83,416	14.5	0	TEU	Aux	1,793	N
BBB00205	Bulk	2010	PAN	83,416	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00205	Bulk	2010	PAN	83,416	14.5	0	TEU	Main	10,740	Y
BBB00500	Bulk	2010	PAN	83,454	14	0	TEU	Aux	1,793	N
BBB00500	Bulk	2010	PAN	83,454	14	0	TEU	Auxiliary Boiler	132	N
BBB00500	Bulk	2010	PAN	83,454	14	0	TEU	Main	10,740	Y

Vessel ID	Vessel Type	Model Year	Flag	DWT (tons)	Max Speed (knots)	Cap	Cap Units	Engine Type	Power (kW)	Slide Valve
BBB00385	Bulk	2006	PAN	82,514	14.5	0	TEU	Aux	0	N
BBB00385	Bulk	2006	PAN	82,514	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00385	Bulk	2006	PAN	82,514	14.5	0	TEU	Main	9,800	Y
C0300199	Container3000	2010	MLT	44,144	23.3	3,398	TEU	Aux	5,338	N
C0300199	Container3000	2010	MLT	44,144	23.3	3,398	TEU	Auxiliary Boiler	474	N
C0300199	Container3000	2010	MLT	44,144	23.3	3,398	TEU	Main	31,640	N
C0300331	Container3000	2010	MLT	44,012	23.3	3,398	TEU	Aux	5,338	N
C0300331	Container3000	2010	MLT	44,012	23.3	3,398	TEU	Auxiliary Boiler	474	N
C0300331	Container3000	2010	MLT	44,012	23.3	3,398	TEU	Main	31,640	N
BBB00148	Bulk	2009	HKG	32,919	13.7	0	TEU	Aux	1,640	N
BBB00148	Bulk	2009	HKG	32,919	13.7	0	TEU	Auxiliary Boiler	132	N
BBB00148	Bulk	2009	HKG	32,919	13.7	0	TEU	Main	6,480	N
GCC00302	General Cargo	2006	BHS	71,460	15.5	445	TEU	Aux	3,480	N
GCC00302	General Cargo	2006	BHS	71,460	15.5	445	TEU	Auxiliary Boiler	137	N
GCC00302	General Cargo	2006	BHS	71,460	15.5	445	TEU	Main	12,577	Y
GCC00023	General Cargo	2006	BHS	72,863	15.5	445	TEU	Aux	3,480	N
GCC00023	General Cargo	2006	BHS	72,863	15.5	445	TEU	Auxiliary Boiler	137	N
GCC00023	General Cargo	2006	BHS	72,863	15.5	445	TEU	Main	12,577	Y
BBB00324	Bulk	2007	HKG	28,333	14	0	TEU	Aux	1,793	N
BBB00324	Bulk	2007	HKG	28,333	14	0	TEU	Auxiliary Boiler	132	N
BBB00324	Bulk	2007	HKG	28,333	14	0	TEU	Main	5,850	Y
C0800249	Container8000	2009	HKG	102,834	25.6	8,500	TEU	Aux	11,761	N
C0800249	Container8000	2009	HKG	102,834	25.6	8,500	TEU	Auxiliary Boiler	525	N
C0800249	Container8000	2009	HKG	102,834	25.6	8,500	TEU	Main	68,529	Y
C0800161	Container8000	2009	HKG	102,710	25.6	8,500	TEU	Aux	11,761	N
C0800161	Container8000	2009	HKG	102,710	25.6	8,500	TEU	Auxiliary Boiler	525	N
C0800161	Container8000	2009	HKG	102,710	25.6	8,500	TEU	Main	68,529	Y
C0800681	Container8000	2009	HKG	101,200	25.6	8,500	TEU	Aux	11,480	N
C0800681	Container8000	2009	HKG	101,200	25.6	8,500	TEU	Auxiliary Boiler	525	N
C0800681	Container8000	2009	HKG	101,200	25.6	8,500	TEU	Main	68,529	Y
C0800397	Container8000	2010	HKG	102,834	25.6	8,500	TEU	Aux	11,761	N
C0800397	Container8000	2010	HKG	102,834	25.6	8,500	TEU	Auxiliary Boiler	525	N
C0800397	Container8000	2010	HKG	102,834	25.6	8,500	TEU	Main	68,529	Y
C0800512	Container8000	2010	HKG	101,200	25.6	8,500	TEU	Aux	11,480	N
C0800512	Container8000	2010	HKG	101,200	25.6	8,500	TEU	Auxiliary Boiler	525	N
C0800512	Container8000	2010	HKG	101,200	25.6	8,500	TEU	Main	68,529	Y
C0800219	Container8000	2010	HKG	101,200	25.6	8,500	TEU	Aux	11,480	N
C0800219	Container8000	2010	HKG	101,200	25.6	8,500	TEU	Auxiliary Boiler	525	N
C0800219	Container8000	2010	HKG	101,200	25.6	8,500	TEU	Main	68,529	Y
C0800550	Container8000	2010	HKG	102,742	25.6	8,500	TEU	Aux	11,833	N
C0800550	Container8000	2010	HKG	102,742	25.6	8,500	TEU	Auxiliary Boiler	525	N
C0800550	Container8000	2010	HKG	102,742	25.6	8,500	TEU	Main	68,529	Y
C0800280	Container8000	2010	HKG	102,875	25.6	8,500	TEU	Aux	11,833	N
C0800280	Container8000	2010	HKG	102,875	25.6	8,500	TEU	Auxiliary Boiler	525	N
C0800280	Container8000	2010	HKG	102,875	25.6	8,500	TEU	Main	68,529	Y
ACC00283	Auto Carrier	2009	GIB	11,174	19.6	0	TEU	Aux	4,483	N
ACC00283	Auto Carrier	2009	GIB	11,174	19.6	0	TEU	Auxiliary Boiler	253	N
ACC00283	Auto Carrier	2009	GIB	11,174	19.6	0	TEU	Main	11,620	Y
BBB00763	Bulk	2010	PAN	51,658	14.5	0	TEU	Aux	1,793	N
BBB00763	Bulk	2010	PAN	51,658	14.5	0	TEU	Auxiliary Boiler	132	N

Vessel ID	Vessel Type	Model Year	Flag	DWT (tons)	Max Speed (knots)	Cap	Cap Units	Engine Type	Power (kW)	Slide Valve
BBB00763	Bulk	2010	PAN	51,658	14.5	0	TEU	Main	7,686	Y
BBB00494	Bulk	2010	PAN	51,658	14.5	0	TEU	Aux	1,793	N
BBB00494	Bulk	2010	PAN	51,658	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00494	Bulk	2010	PAN	51,658	14.5	0	TEU	Main	7,686	Y
BBB00370	Bulk	2008	LBR	56,799	14.2	0	TEU	Aux	1,793	N
BBB00370	Bulk	2008	LBR	56,799	14.2	0	TEU	Auxiliary Boiler	132	N
BBB00370	Bulk	2008	LBR	56,799	14.2	0	TEU	Main	9,480	Y
BBB00586	Bulk	2011	CYP	87,340	14.5	0	TEU	Aux	2,089	N
BBB00586	Bulk	2011	CYP	87,340	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00586	Bulk	2011	CYP	87,340	14.5	0	TEU	Main	10,500	N
GCC00660	General Cargo	2008	LBR	12,696	15	665	TEU	Aux	2,305	N
GCC00660	General Cargo	2008	LBR	12,696	15	665	TEU	Auxiliary Boiler	137	N
GCC00660	General Cargo	2008	LBR	12,696	15	665	TEU	Main	5,400	N
C1300762	Container13000	2009	GBR	156,898	24.1	13,344	TEU	Aux	12,000	N
C1300762	Container13000	2009	GBR	156,898	24.1	13,344	TEU	Auxiliary Boiler	600	N
C1300762	Container13000	2009	GBR	156,898	24.1	13,344	TEU	Main	80,079	N
BBB00547	Bulk	2011	CYP	87,332	14	0	TEU	Aux	2,090	N
BBB00547	Bulk	2011	CYP	87,332	14	0	TEU	Auxiliary Boiler	132	N
BBB00547	Bulk	2011	CYP	87,332	14	0	TEU	Main	10,500	N
TNU00740	Tanker - ULCC	2010	GRC	321,300	15.3	0	TEU	Aux	4,320	N
TNU00740	Tanker - ULCC	2010	GRC	321,300	15.3	0	TEU	Auxiliary Boiler	371	N
TNU00740	Tanker - ULCC	2010	GRC	321,300	15.3	0	TEU	Main	29,340	N
BBB00752	Bulk	2010	HKG	56,777	14.2	0	TEU	Aux	1,793	N
BBB00752	Bulk	2010	HKG	56,777	14.2	0	TEU	Auxiliary Boiler	132	N
BBB00752	Bulk	2010	HKG	56,777	14.2	0	TEU	Main	9,480	Y
C0400171	Container4000	2011	SGP	57,830	23.2	4,532	TEU	Aux	6,680	N
C0400171	Container4000	2011	SGP	57,830	23.2	4,532	TEU	Auxiliary Boiler	492	N
C0400171	Container4000	2011	SGP	57,830	23.2	4,532	TEU	Main	36,559	N
C0400696	Container4000	2011	SGP	57,830	23.2	4,532	TEU	Aux	0	N
C0400696	Container4000	2011	SGP	57,830	23.2	4,532	TEU	Auxiliary Boiler	492	N
C0400696	Container4000	2011	SGP	57,830	23.2	4,532	TEU	Main	36,559	N
C0400231	Container4000	2012	SGP	57,830	23.2	4,532	TEU	Aux	6,680	N
C0400231	Container4000	2012	SGP	57,830	23.2	4,532	TEU	Auxiliary Boiler	492	N
C0400231	Container4000	2012	SGP	57,830	23.2	4,532	TEU	Main	36,559	N
TNC00473	Tanker - Chemical	2009	MHL	25,145	14.3	0	TEU	Aux	2,839	N
TNC00473	Tanker - Chemical	2009	MHL	25,145	14.3	0	TEU	Auxiliary Boiler	371	N
TNC00473	Tanker - Chemical	2009	MHL	25,145	14.3	0	TEU	Main	7,860	Y
C0400741	Container4000	2009	PAN	52,055	23.2	4,432	TEU	Aux	6,680	N
C0400741	Container4000	2009	PAN	52,055	23.2	4,432	TEU	Auxiliary Boiler	492	N
C0400741	Container4000	2009	PAN	52,055	23.2	4,432	TEU	Main	40,680	N
TNC00440	Tanker - Chemical	2011	PAN	45,498	15	0	TEU	Aux	2,340	N
TNC00440	Tanker - Chemical	2011	PAN	45,498	15	0	TEU	Auxiliary Boiler	371	N
TNC00440	Tanker - Chemical	2011	PAN	45,498	15	0	TEU	Main	9,480	N
GCC00234	General Cargo	2010	SGP	33,132	14.5	0	TEU	Aux	2,305	N
GCC00234	General Cargo	2010	SGP	33,132	14.5	0	TEU	Auxiliary Boiler	137	N
GCC00234	General Cargo	2010	SGP	33,132	14.5	0	TEU	Main	6,550	N
C0400075	Container4000	2009	ATG	54,325	24.3	4,380	TEU	Aux	6,680	N
C0400075	Container4000	2009	ATG	54,325	24.3	4,380	TEU	Auxiliary Boiler	492	N
C0400075	Container4000	2009	ATG	54,325	24.3	4,380	TEU	Main	36,559	Y
TNC00630	Tanker - Chemical	2008	MHL	17,596	15	0	TEU	Aux	2,839	N

Vessel ID	Vessel Type	Model Year	Flag	DWT (tons)	Max Speed (knots)	Cap	Cap Units	Engine Type	Power (kW)	Slide Valve
TNC00630	Tanker - Chemical	2008	MHL	17,596	15	0	TEU	Auxiliary Boiler	371	N
TNC00630	Tanker - Chemical	2008	MHL	17,596	15	0	TEU	Main	5,920	N
BBB00225	Bulk	2009	PAN	82,175	14.5	0	TEU	Aux	1,793	N
BBB00225	Bulk	2009	PAN	82,175	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00225	Bulk	2009	PAN	82,175	14.5	0	TEU	Main	9,710	Y
BBB00503	Bulk	2010	PAN	82,206	14.5	0	TEU	Aux	1,793	N
BBB00503	Bulk	2010	PAN	82,206	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00503	Bulk	2010	PAN	82,206	14.5	0	TEU	Main	9,710	Y
BBB00622	Bulk	2010	PAN	82,165	14.5	0	TEU	Aux	1,793	N
BBB00622	Bulk	2010	PAN	82,165	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00622	Bulk	2010	PAN	82,165	14.5	0	TEU	Main	9,710	Y
C1400437	Container14000	2012	PAN	165,966	24	14,000	TEU	Aux		N
C1400437	Container14000	2012	PAN	165,966	24	14,000	TEU	Auxiliary Boiler		N
C1400437	Container14000	2012	PAN	165,966	24	14,000	TEU	Main	72,239	N
C0800520	Container8000	2009	PAN	102,529	25.2	8,586	TEU	Aux	11,205	N
C0800520	Container8000	2009	PAN	102,529	25.2	8,586	TEU	Auxiliary Boiler	525	N
C0800520	Container8000	2009	PAN	102,529	25.2	8,586	TEU	Main	68,639	N
C0800154	Container8000	2010	PAN	102,455	25.2	8,586	TEU	Aux	11,205	N
C0800154	Container8000	2010	PAN	102,455	25.2	8,586	TEU	Auxiliary Boiler	525	N
C0800154	Container8000	2010	PAN	102,455	25.2	8,586	TEU	Main	68,639	N
C0400272	Container4000	2010	PAN	52,118	24.1	4,432	TEU	Aux	6,680	N
C0400272	Container4000	2010	PAN	52,118	24.1	4,432	TEU	Auxiliary Boiler	492	N
C0400272	Container4000	2010	PAN	52,118	24.1	4,432	TEU	Main	45,199	N
C0400006	Container4000	2010	PAN	52,089	24.1	4,432	TEU	Aux	6,680	N
C0400006	Container4000	2010	PAN	52,089	24.1	4,432	TEU	Auxiliary Boiler	492	N
C0400006	Container4000	2010	PAN	52,089	24.1	4,432	TEU	Main	45,199	N
C0400702	Container4000	2010	PAN	52,184	24.1	4,432	TEU	Aux	6,680	N
C0400702	Container4000	2010	PAN	52,184	24.1	4,432	TEU	Auxiliary Boiler	492	N
C0400702	Container4000	2010	PAN	52,184	24.1	4,432	TEU	Main	45,199	N
C0400414	Container4000	2010	PAN	52,118	23.3	4,430	TEU	Aux	6,680	N
C0400414	Container4000	2010	PAN	52,118	23.3	4,430	TEU	Auxiliary Boiler	492	N
C0400414	Container4000	2010	PAN	52,118	23.3	4,430	TEU	Main	40,680	N
C0400464	Container4000	2010	PAN	52,452	22.1	4,432	TEU	Aux	6,680	N
C0400464	Container4000	2010	PAN	52,452	22.1	4,432	TEU	Auxiliary Boiler	492	N
C0400464	Container4000	2010	PAN	52,452	22.1	4,432	TEU	Main	33,720	N
C0400633	Container4000	2010	PAN	52,452	24.1	4,432	TEU	Aux	6,680	N
C0400633	Container4000	2010	PAN	52,452	24.1	4,432	TEU	Auxiliary Boiler	492	N
C0400633	Container4000	2010	PAN	52,452	24.1	4,432	TEU	Main	33,720	N
BBB00786	Bulk	2004	PAN	76,596	15	0	TEU	Aux	1,793	N
BBB00786	Bulk	2004	PAN	76,596	15	0	TEU	Auxiliary Boiler	132	N
BBB00786	Bulk	2004	PAN	76,596	15	0	TEU	Main	12,240	Y
BBB00488	Bulk	2004	PAN	76,565	15	0	TEU	Aux	1,793	N
BBB00488	Bulk	2004	PAN	76,565	15	0	TEU	Auxiliary Boiler	132	N
BBB00488	Bulk	2004	PAN	76,565	15	0	TEU	Main	12,240	Y
ACC00278	Auto Carrier	2008	PAN	20,096	19.3	0	TEU	Aux	4,723	N
ACC00278	Auto Carrier	2008	PAN	20,096	19.3	0	TEU	Auxiliary Boiler	253	N
ACC00278	Auto Carrier	2008	PAN	20,096	19.3	0	TEU	Main	15,540	N
BBB00164	Bulk	2004	PAN	76,619	15	0	TEU	Aux	1,793	N
BBB00164	Bulk	2004	PAN	76,619	15	0	TEU	Auxiliary Boiler	132	N
BBB00164	Bulk	2004	PAN	76,619	15	0	TEU	Main	12,240	Y

Vessel ID	Vessel Type	Model Year	Flag	DWT (tons)	Max Speed (knots)	Cap	Cap Units	Engine Type	Power (kW)	Slide Valve
C1300497	Container13000	2011	LBR	141,184	24.7	13,092	TEU	Aux	12,000	N
C1300497	Container13000	2011	LBR	141,184	24.7	13,092	TEU	Auxiliary Boiler	600	N
C1300497	Container13000	2011	LBR	141,184	24.7	13,092	TEU	Main	72,239	N
C1300045	Container13000	2011	LBR	141,051	24.7	13,092	TEU	Aux	12,000	N
C1300045	Container13000	2011	LBR	141,051	24.7	13,092	TEU	Auxiliary Boiler	600	N
C1300045	Container13000	2011	LBR	141,051	24.7	13,092	TEU	Main	72,239	N
BBB00441	Bulk	2008	ITA	75,213	14	0	TEU	Aux	1,793	N
BBB00441	Bulk	2008	ITA	75,213	14	0	TEU	Auxiliary Boiler	132	N
BBB00441	Bulk	2008	ITA	75,213	14	0	TEU	Main	8,990	Y
TNC00196	Tanker - Chemical	2011	SGP	50,274	15	0	TEU	Aux	2,880	N
TNC00196	Tanker - Chemical	2011	SGP	50,274	15	0	TEU	Auxiliary Boiler	371	N
TNC00196	Tanker - Chemical	2011	SGP	50,274	15	0	TEU	Main	9,960	N
TNC00609	Tanker - Chemical	2010	DNK	50,247	15	0	TEU	Aux	2,880	N
TNC00609	Tanker - Chemical	2010	DNK	50,247	15	0	TEU	Auxiliary Boiler	371	N
TNC00609	Tanker - Chemical	2010	DNK	50,247	15	0	TEU	Main	9,960	Y
TNC00724	Tanker - Chemical	2011	SGP	50,246	15	0	TEU	Aux	2,880	N
TNC00724	Tanker - Chemical	2011	SGP	50,246	15	0	TEU	Auxiliary Boiler	371	N
TNC00724	Tanker - Chemical	2011	SGP	50,246	15	0	TEU	Main	9,960	N
TNC00514	Tanker - Chemical	2008	ATG	16,417	13.5	0	TEU	Aux	2,839	N
TNC00514	Tanker - Chemical	2008	ATG	16,417	13.5	0	TEU	Auxiliary Boiler	371	N
TNC00514	Tanker - Chemical	2008	ATG	16,417	13.5	0	TEU	Main	4,440	N
C1200088	Container12000	2010	PAN	139,324	23	12,400	TEU	Aux	11,500	N
C1200088	Container12000	2010	PAN	139,324	23	12,400	TEU	Auxiliary Boiler	600	N
C1200088	Container12000	2010	PAN	139,324	23	12,400	TEU	Main	72,239	Y
C1200222	Container12000	2011	PAN	139,466	23	12,400	TEU	Aux	11,500	N
C1200222	Container12000	2011	PAN	139,466	23	12,400	TEU	Auxiliary Boiler	600	N
C1200222	Container12000	2011	PAN	139,466	23	12,400	TEU	Main	72,239	N
BBB00402	Bulk	2010	PAN	95,790	14.5	0	TEU	Aux	1,793	N
BBB00402	Bulk	2010	PAN	95,790	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00402	Bulk	2010	PAN	95,790	14.5	0	TEU	Main	12,950	Y
TNC00758	Tanker - Chemical	2010	MHL	73,944	15.8	0	TEU	Aux	2,839	N
TNC00758	Tanker - Chemical	2010	MHL	73,944	15.8	0	TEU	Auxiliary Boiler	371	N
TNC00758	Tanker - Chemical	2010	MHL	73,944	15.8	0	TEU	Main	13,560	Y
TNC00462	Tanker - Chemical	2010	MHL	74,192	15.8	0	TEU	Aux	2,839	N
TNC00462	Tanker - Chemical	2010	MHL	74,192	15.8	0	TEU	Auxiliary Boiler	371	N
TNC00462	Tanker - Chemical	2010	MHL	74,192	15.8	0	TEU	Main	13,560	Y
BBB00572	Bulk	2008	HKG	33,345	13.7	0	TEU	Aux	1,793	N
BBB00572	Bulk	2008	HKG	33,345	13.7	0	TEU	Auxiliary Boiler	132	N
BBB00572	Bulk	2008	HKG	33,345	13.7	0	TEU	Main	6,480	N
BBB00307	Bulk	2008	HKG	33,344	13.7	0	TEU	Aux	1,793	N
BBB00307	Bulk	2008	HKG	33,344	13.7	0	TEU	Auxiliary Boiler	132	N
BBB00307	Bulk	2008	HKG	33,344	13.7	0	TEU	Main	6,480	N
BBB00723	Bulk	2009	HKG	32,544	13.7	0	TEU	Aux	1,793	N
BBB00723	Bulk	2009	HKG	32,544	13.7	0	TEU	Auxiliary Boiler	132	N
BBB00723	Bulk	2009	HKG	32,544	13.7	0	TEU	Main	6,480	N
TNC00712	Tanker - Chemical	2009	GBR	50,326	15	0	TEU	Aux	2,880	N
TNC00712	Tanker - Chemical	2009	GBR	50,326	15	0	TEU	Auxiliary Boiler	371	N
TNC00712	Tanker - Chemical	2009	GBR	50,326	15	0	TEU	Main	9,480	Y
CRU00707	Cruise	2008	BMU	7,685	21.7	0	TEU	Aux	1,278	N
CRU00707	Cruise	2008	BMU	7,685	21.7	0	TEU	Auxiliary Boiler	1,393	N

Vessel ID	Vessel Type	Model Year	Flag	DWT (tons)	Max Speed (knots)	Cap	Cap Units	Engine Type	Power (kW)	Slide Valve
CRU00707	Cruise	2008	BMU	7,685	21.7	0	TEU	Main	35,200	N
C0800029	Container8000	2010	HKG	101,588	25.8	8,528	TEU	Aux	11,205	N
C0800029	Container8000	2010	HKG	101,588	25.8	8,528	TEU	Auxiliary Boiler	525	N
C0800029	Container8000	2010	HKG	101,588	25.8	8,528	TEU	Main	68,519	Y
C0800742	Container8000	2010	HKG	101,411	25.8	8,528	TEU	Aux	11,205	N
C0800742	Container8000	2010	HKG	101,411	25.8	8,528	TEU	Auxiliary Boiler	525	N
C0800742	Container8000	2010	HKG	101,411	25.8	8,528	TEU	Main	68,519	Y
C0800447	Container8000	2012	HKG	101,566	25.8	8,528	TEU	Aux	11,205	N
C0800447	Container8000	2012	HKG	101,566	25.8	8,528	TEU	Auxiliary Boiler	525	N
C0800447	Container8000	2012	HKG	101,566	25.8	8,528	TEU	Main	68,519	N
BBB00617	Bulk	2010	HKG	55,650	14.5	0	TEU	Aux	1,793	N
BBB00617	Bulk	2010	HKG	55,650	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00617	Bulk	2010	HKG	55,650	14.5	0	TEU	Main	9,480	Y
GCC00032	General Cargo	2010	LBR	17,409	16.3	894	TEU	Aux	2,305	N
GCC00032	General Cargo	2010	LBR	17,409	16.3	894	TEU	Auxiliary Boiler	137	N
GCC00032	General Cargo	2010	LBR	17,409	16.3	894	TEU	Main	8,730	N
BBB00396	Bulk	2011	CYM	34,428	14	0	TEU	Aux	1,793	N
BBB00396	Bulk	2011	CYM	34,428	14	0	TEU	Auxiliary Boiler	132	N
BBB00396	Bulk	2011	CYM	34,428	14	0	TEU	Main	7,900	N
C1000322	Container10000	2010	LBR	122,962	24.8	10,114	TEU	Aux		N
C1000322	Container10000	2010	LBR	122,962	24.8	10,114	TEU	Auxiliary Boiler		N
C1000322	Container10000	2010	LBR	122,962	24.8	10,114	TEU	Main	68,639	N
C1000779	Container10000	2011	LBR	122,959	24.8	10,114	TEU	Aux		N
C1000779	Container10000	2011	LBR	122,959	24.8	10,114	TEU	Auxiliary Boiler		N
C1000779	Container10000	2011	LBR	122,959	24.8	10,114	TEU	Main	68,639	N
BBB00664	Bulk	2011	LBR	34,467	14	0	TEU	Aux	1,793	N
BBB00664	Bulk	2011	LBR	34,467	14	0	TEU	Auxiliary Boiler	132	N
BBB00664	Bulk	2011	LBR	34,467	14	0	TEU	Main	7,900	N
C0800223	Container8000	2012	HKG	101,543	25.8	8,528	TEU	Aux	11,205	N
C0800223	Container8000	2012	HKG	101,543	25.8	8,528	TEU	Auxiliary Boiler	525	N
C0800223	Container8000	2012	HKG	101,543	25.8	8,528	TEU	Main	68,519	N
BBB00535	Bulk	2009	HKG	37,302	14	0	TEU	Aux	2,090	N
BBB00535	Bulk	2009	HKG	37,302	14	0	TEU	Auxiliary Boiler	132	N
BBB00535	Bulk	2009	HKG	37,302	14	0	TEU	Main	7,368	N
BBB00443	Bulk	2010	MHL	37,152	14	0	TEU	Aux	2,090	N
BBB00443	Bulk	2010	MHL	37,152	14	0	TEU	Auxiliary Boiler	132	N
BBB00443	Bulk	2010	MHL	37,152	14	0	TEU	Main	7,368	N
GCC00446	General Cargo	2008	HKG	32,000	13.9	0	TEU	Aux	2,305	N
GCC00446	General Cargo	2008	HKG	32,000	13.9	0	TEU	Auxiliary Boiler	137	N
GCC00446	General Cargo	2008	HKG	32,000	13.9	0	TEU	Main	6,480	N
BBB00472	Bulk	2009	LBR	56,872	14.2	0	TEU	Aux	1,950	N
BBB00472	Bulk	2009	LBR	56,872	14.2	0	TEU	Auxiliary Boiler	132	N
BBB00472	Bulk	2009	LBR	56,872	14.2	0	TEU	Main	9,480	Y
BBB00128	Bulk	2009	KOR	33,144	13.9	0	TEU	Aux	1,725	N
BBB00128	Bulk	2009	KOR	33,144	13.9	0	TEU	Auxiliary Boiler	132	N
BBB00128	Bulk	2009	KOR	33,144	13.9	0	TEU	Main	6,480	N
BBB00134	Bulk	2010	PAN	78,400	14.5	0	TEU	Aux	1,793	N
BBB00134	Bulk	2010	PAN	78,400	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00134	Bulk	2010	PAN	78,400	14.5	0	TEU	Main	9,560	Y
TNC00129	Tanker - Chemical	2009	MHL	26,198	15.5	0	TEU	Aux	2,839	N

Vessel ID	Vessel Type	Model Year	Flag	DWT (tons)	Max Speed (knots)	Cap	Cap Units	Engine Type	Power (kW)	Slide Valve
TNC00129	Tanker - Chemical	2009	MHL	26,198	15.5	0	TEU	Auxiliary Boiler	371	N
TNC00129	Tanker - Chemical	2009	MHL	26,198	15.5	0	TEU	Main	7,450	Y
TNC00158	Tanker - Chemical	2009	MHL	26,198	15.5	0	TEU	Aux	2,839	N
TNC00158	Tanker - Chemical	2009	MHL	26,198	15.5	0	TEU	Auxiliary Boiler	371	N
TNC00158	Tanker - Chemical	2009	MHL	26,198	15.5	0	TEU	Main	7,470	N
TNC00292	Tanker - Chemical	2010	PAN	26,197	15.7	0	TEU	Aux	2,839	N
TNC00292	Tanker - Chemical	2010	PAN	26,197	15.7	0	TEU	Auxiliary Boiler	371	N
TNC00292	Tanker - Chemical	2010	PAN	26,197	15.7	0	TEU	Main	7,450	Y
BBB00296	Bulk	2010	IND	80,480	14.4	0	TEU	Aux	2,168	N
BBB00296	Bulk	2010	IND	80,480	14.4	0	TEU	Auxiliary Boiler	132	N
BBB00296	Bulk	2010	IND	80,480	14.4	0	TEU	Main	11,060	Y
C0400320	Container4000	2010	HKG	58,200	24.3	4,520	TEU	Aux	7,040	N
C0400320	Container4000	2010	HKG	58,200	24.3	4,520	TEU	Auxiliary Boiler	492	N
C0400320	Container4000	2010	HKG	58,200	24.3	4,520	TEU	Main	43,609	Y
C0400184	Container4000	2010	HKG	58,200	24.3	4,520	TEU	Aux	6,680	N
C0400184	Container4000	2010	HKG	58,200	24.3	4,520	TEU	Auxiliary Boiler	492	N
C0400184	Container4000	2010	HKG	58,200	24.3	4,520	TEU	Main	43,609	Y
ACC00245	Auto Carrier	2010	GBR	18,946	20	0	TEU	Aux	4,723	N
ACC00245	Auto Carrier	2010	GBR	18,946	20	0	TEU	Auxiliary Boiler	253	N
ACC00245	Auto Carrier	2010	GBR	18,946	20	0	TEU	Main	13,260	N
C0400587	Container4000	2010	HKG	58,200	24.3	4,520	TEU	Aux	6,680	N
C0400587	Container4000	2010	HKG	58,200	24.3	4,520	TEU	Auxiliary Boiler	492	N
C0400587	Container4000	2010	HKG	58,200	24.3	4,520	TEU	Main	43,609	Y
C0400481	Container4000	2012	LBR	58,027	23	4,620	TEU	Aux	6,680	N
C0400481	Container4000	2012	LBR	58,027	23	4,620	TEU	Auxiliary Boiler	492	N
C0400481	Container4000	2012	LBR	58,027	23	4,620	TEU	Main	28,879	N
GCC00460	General Cargo	2010	PAN	33,171	14.5	0	TEU	Aux	2,305	N
GCC00460	General Cargo	2010	PAN	33,171	14.5	0	TEU	Auxiliary Boiler	137	N
GCC00460	General Cargo	2010	PAN	33,171	14.5	0	TEU	Main	6,550	N
GCC00475	General Cargo	2009	MHL	32,124	16.8	2,029	TEU	Aux	2,305	N
GCC00475	General Cargo	2009	MHL	32,124	16.8	2,029	TEU	Auxiliary Boiler	137	N
GCC00475	General Cargo	2009	MHL	32,124	16.8	2,029	TEU	Main	11,640	N
ACC00048	Auto Carrier	2008	PAN	18,082	19.8	0	TEU	Aux	4,723	N
ACC00048	Auto Carrier	2008	PAN	18,082	19.8	0	TEU	Auxiliary Boiler	253	N
ACC00048	Auto Carrier	2008	PAN	18,082	19.8	0	TEU	Main	14,280	Y
BBB00411	Bulk	2010	MHL	56,155	14.5	0	TEU	Aux	1,793	N
BBB00411	Bulk	2010	MHL	56,155	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00411	Bulk	2010	MHL	56,155	14.5	0	TEU	Main	9,070	Y
BBB00403	Bulk	2010	MHL	55,733	14.5	0	TEU	Aux	0	N
BBB00403	Bulk	2010	MHL	55,733	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00403	Bulk	2010	MHL	55,733	14.5	0	TEU	Main	9,480	Y
TNU00720	Tanker - ULCC	2011	MHL	319,478	15.3	0	TEU	Aux	4,800	N
TNU00720	Tanker - ULCC	2011	MHL	319,478	15.3	0	TEU	Auxiliary Boiler	371	N
TNU00720	Tanker - ULCC	2011	MHL	319,478	15.3	0	TEU	Main	31,640	N
GCC00081	General Cargo	2007	ATG	12,746	15	665	TEU	Aux	2,305	N
GCC00081	General Cargo	2007	ATG	12,746	15	665	TEU	Auxiliary Boiler	137	N
GCC00081	General Cargo	2007	ATG	12,746	15	665	TEU	Main	5,400	N
TNU00361	Tanker - ULCC	2011	PAN	302,845	16	0	TEU	Aux	4,502	N
TNU00361	Tanker - ULCC	2011	PAN	302,845	16	0	TEU	Auxiliary Boiler	371	N
TNU00361	Tanker - ULCC	2011	PAN	302,845	16	0	TEU	Main	25,130	N

Vessel ID	Vessel Type	Model Year	Flag	DWT (tons)	Max Speed (knots)	Cap	Cap Units	Engine Type	Power (kW)	Slide Valve
ACC00061	Auto Carrier	2010	SWE	30,140	20.1	0	TEU	Aux	3,850	N
ACC00061	Auto Carrier	2010	SWE	30,140	20.1	0	TEU	Auxiliary Boiler	253	N
ACC00061	Auto Carrier	2010	SWE	30,140	20.1	0	TEU	Main	19,040	Y
ACC00114	Auto Carrier	2011	SWE	30,140	20.1	0	TEU	Aux	3,850	N
ACC00114	Auto Carrier	2011	SWE	30,140	20.1	0	TEU	Auxiliary Boiler	253	N
ACC00114	Auto Carrier	2011	SWE	30,140	20.1	0	TEU	Main	19,040	N
ACC00037	Auto Carrier	2011	MLT	30,907	20.1	0	TEU	Aux	3,850	N
ACC00037	Auto Carrier	2011	MLT	30,907	20.1	0	TEU	Auxiliary Boiler	253	N
ACC00037	Auto Carrier	2011	MLT	30,907	20.1	0	TEU	Main	19,040	N
ACC00739	Auto Carrier	2010	MLT	28,837	20	0	TEU	Aux	4,723	N
ACC00739	Auto Carrier	2010	MLT	28,837	20	0	TEU	Auxiliary Boiler	253	N
ACC00739	Auto Carrier	2010	MLT	28,837	20	0	TEU	Main	18,080	Y
TNC00632	Tanker - Chemical	2009	PAN	19,807	14.5	0	TEU	Aux	2,839	N
TNC00632	Tanker - Chemical	2009	PAN	19,807	14.5	0	TEU	Auxiliary Boiler	371	N
TNC00632	Tanker - Chemical	2009	PAN	19,807	14.5	0	TEU	Main	6,150	N
BBB00612	Bulk	2008	SGP	58,079	14.5	0	TEU	Aux	1,793	N
BBB00612	Bulk	2008	SGP	58,079	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00612	Bulk	2008	SGP	58,079	14.5	0	TEU	Main	8,400	Y
BBB00326	Bulk	2009	MHL	53,100	14.7	0	TEU	Aux	0	N
BBB00326	Bulk	2009	MHL	53,100	14.7	0	TEU	Auxiliary Boiler	132	N
BBB00326	Bulk	2009	MHL	53,100	14.7	0	TEU	Main	9,480	Y
BBB00380	Bulk	2006	PAN	29,567	14.3	0	TEU	Aux	1,793	N
BBB00380	Bulk	2006	PAN	29,567	14.3	0	TEU	Auxiliary Boiler	132	N
BBB00380	Bulk	2006	PAN	29,567	14.3	0	TEU	Main	6,150	N
BBB00155	Bulk	2010	PAN	82,099	14.5	0	TEU	Aux	1,793	N
BBB00155	Bulk	2010	PAN	82,099	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00155	Bulk	2010	PAN	82,099	14.5	0	TEU	Main	9,710	Y
BBB00607	Bulk	2010	SGP	56,141	14.5	0	TEU	Aux	1,793	N
BBB00607	Bulk	2010	SGP	56,141	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00607	Bulk	2010	SGP	56,141	14.5	0	TEU	Main	9,070	Y
ACC00086	Auto Carrier	2009	MLT	41,820	20.3	0	TEU	Aux	7,200	N
ACC00086	Auto Carrier	2009	MLT	41,820	20.3	0	TEU	Auxiliary Boiler	253	N
ACC00086	Auto Carrier	2009	MLT	41,820	20.3	0	TEU	Main	20,100	Y
ACC00583	Auto Carrier	2010	SGP	43,878	20.3	0	TEU	Aux	7,200	N
ACC00583	Auto Carrier	2010	SGP	43,878	20.3	0	TEU	Auxiliary Boiler	253	N
ACC00583	Auto Carrier	2010	SGP	43,878	20.3	0	TEU	Main	21,769	Y
ACC00336	Auto Carrier	2010	MLT	43,878	20.3	0	TEU	Aux	7,200	N
ACC00336	Auto Carrier	2010	MLT	43,878	20.3	0	TEU	Auxiliary Boiler	253	N
ACC00336	Auto Carrier	2010	MLT	43,878	20.3	0	TEU	Main	21,769	Y
ACC00275	Auto Carrier	2011	SGP	43,878	20.3	0	TEU	Aux	7,200	N
ACC00275	Auto Carrier	2011	SGP	43,878	20.3	0	TEU	Auxiliary Boiler	253	N
ACC00275	Auto Carrier	2011	SGP	43,878	20.3	0	TEU	Main	21,769	N
TNS00035	Tanker - Suezmax	2009	GRC	157,672	15.5	0	TEU	Aux	2,993	N
TNS00035	Tanker - Suezmax	2009	GRC	157,672	15.5	0	TEU	Auxiliary Boiler	371	N
TNS00035	Tanker - Suezmax	2009	GRC	157,672	15.5	0	TEU	Main	18,660	Y
TNS00240	Tanker - Suezmax	2010	GRC	159,600	15.5	0	TEU	Aux	2,993	N
TNS00240	Tanker - Suezmax	2010	GRC	159,600	15.5	0	TEU	Auxiliary Boiler	371	N
TNS00240	Tanker - Suezmax	2010	GRC	159,600	15.5	0	TEU	Main	18,660	Y
BBB00429	Bulk	2004	VUT	76,523	15.3	0	TEU	Aux	1,793	N
BBB00429	Bulk	2004	VUT	76,523	15.3	0	TEU	Auxiliary Boiler	132	N

Vessel ID	Vessel Type	Model Year	Flag	DWT (tons)	Max Speed (knots)	Cap	Cap Units	Engine Type	Power (kW)	Slide Valve
BBB00429	Bulk	2004	VUT	76,523	15.3	0	TEU	Main	12,240	Y
C0100159	Container1000	2011	LBR	23,369	19.8	1,740	TEU	Aux	5,916	N
C0100159	Container1000	2011	LBR	23,369	19.8	1,740	TEU	Auxiliary Boiler	241	N
C0100159	Container1000	2011	LBR	23,369	19.8	1,740	TEU	Main	16,660	N
BBB00369	Bulk	2010	PAN	82,224	14.5	0	TEU	Aux	1,793	N
BBB00369	Bulk	2010	PAN	82,224	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00369	Bulk	2010	PAN	82,224	14.5	0	TEU	Main	9,710	Y
ACC00166	Auto Carrier	2008	PAN	19,265	20	0	TEU	Aux	4,723	N
ACC00166	Auto Carrier	2008	PAN	19,265	20	0	TEU	Auxiliary Boiler	253	N
ACC00166	Auto Carrier	2008	PAN	19,265	20	0	TEU	Main	15,100	N
TNS00466	Tanker - Suezmax	2010	MHL	158,574	16	0	TEU	Aux	2,993	N
TNS00466	Tanker - Suezmax	2010	MHL	158,574	16	0	TEU	Auxiliary Boiler	371	N
TNS00466	Tanker - Suezmax	2010	MHL	158,574	16	0	TEU	Main	19,619	Y
TNS00093	Tanker - Suezmax	2010	MHL	158,601	16	0	TEU	Aux	2,993	N
TNS00093	Tanker - Suezmax	2010	MHL	158,601	16	0	TEU	Auxiliary Boiler	371	N
TNS00093	Tanker - Suezmax	2010	MHL	158,601	16	0	TEU	Main	19,619	Y
BBB00746	Bulk	2010	PAN	31,893	14.4	0	TEU	Aux	1,793	N
BBB00746	Bulk	2010	PAN	31,893	14.4	0	TEU	Auxiliary Boiler	132	N
BBB00746	Bulk	2010	PAN	31,893	14.4	0	TEU	Main	6,840	N
BBB00772	Bulk	2009	SGP	31,000	14.2	0	TEU	Aux	1,793	N
BBB00772	Bulk	2009	SGP	31,000	14.2	0	TEU	Auxiliary Boiler	132	N
BBB00772	Bulk	2009	SGP	31,000	14.2	0	TEU	Main	6,480	Y
GCC00649	General Cargo	2012	BHS	72,400	14.5	445	TEU	Aux	0	N
GCC00649	General Cargo	2012	BHS	72,400	14.5	445	TEU	Auxiliary Boiler	137	N
GCC00649	General Cargo	2012	BHS	72,400	14.5	445	TEU	Main	9,390	N
TNS00262	Tanker - Suezmax	2011	GRC	157,258	15.5	0	TEU	Aux	3,120	N
TNS00262	Tanker - Suezmax	2011	GRC	157,258	15.5	0	TEU	Auxiliary Boiler	371	N
TNS00262	Tanker - Suezmax	2011	GRC	157,258	15.5	0	TEU	Main	18,660	N
BBB00671	Bulk	2010	PAN	58,186	14.2	0	TEU	Aux	1,793	N
BBB00671	Bulk	2010	PAN	58,186	14.2	0	TEU	Auxiliary Boiler	132	N
BBB00671	Bulk	2010	PAN	58,186	14.2	0	TEU	Main	8,100	Y
ACC00011	Auto Carrier	2008	JPN	21,323	20.6	0	TEU	Aux	4,723	N
ACC00011	Auto Carrier	2008	JPN	21,323	20.6	0	TEU	Auxiliary Boiler	253	N
ACC00011	Auto Carrier	2008	JPN	21,323	20.6	0	TEU	Main	15,544	N
ACC00258	Auto Carrier	2008	JPN	21,385	20.6	0	TEU	Aux	4,723	N
ACC00258	Auto Carrier	2008	JPN	21,385	20.6	0	TEU	Auxiliary Boiler	253	N
ACC00258	Auto Carrier	2008	JPN	21,385	20.6	0	TEU	Main	15,544	N
BBB00764	Bulk	2010	LBR	74,962	14.5	0	TEU	Aux	1,433	N
BBB00764	Bulk	2010	LBR	74,962	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00764	Bulk	2010	LBR	74,962	14.5	0	TEU	Main	9,230	Y
BBB00167	Bulk	2011	HKG	93,758	14.5	0	TEU	Aux	1,793	N
BBB00167	Bulk	2011	HKG	93,758	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00167	Bulk	2011	HKG	93,758	14.5	0	TEU	Main	12,240	N
TNU00230	Tanker - ULCC	2010	GRC	320,780	15.7	0	TEU	Aux	4,423	N
TNU00230	Tanker - ULCC	2010	GRC	320,780	15.7	0	TEU	Auxiliary Boiler	371	N
TNU00230	Tanker - ULCC	2010	GRC	320,780	15.7	0	TEU	Main	29,260	Y
TNS00122	Tanker - Suezmax	2011	LBR	158,491	15.5	0	TEU	Aux	3,445	N
TNS00122	Tanker - Suezmax	2011	LBR	158,491	15.5	0	TEU	Auxiliary Boiler	371	N
TNS00122	Tanker - Suezmax	2011	LBR	158,491	15.5	0	TEU	Main	18,660	N
GCC00580	General Cargo	2010	PAN	33,158	14.5	0	TEU	Aux	2,305	N

Vessel ID	Vessel Type	Model Year	Flag	DWT (tons)	Max Speed (knots)	Cap	Cap Units	Engine Type	Power (kW)	Slide Valve
GCC00580	General Cargo	2010	PAN	33,158	14.5	0	TEU	Auxiliary Boiler	137	N
GCC00580	General Cargo	2010	PAN	33,158	14.5	0	TEU	Main	6,550	N
BBB00398	Bulk	2009	CHN	53,486	14.2	0	TEU	Aux	2,310	N
BBB00398	Bulk	2009	CHN	53,486	14.2	0	TEU	Auxiliary Boiler	132	N
BBB00398	Bulk	2009	CHN	53,486	14.2	0	TEU	Main	9,960	Y
ACC00070	Auto Carrier	2010	JPN	18,646	20.6	0	TEU	Aux	4,723	N
ACC00070	Auto Carrier	2010	JPN	18,646	20.6	0	TEU	Auxiliary Boiler	253	N
ACC00070	Auto Carrier	2010	JPN	18,646	20.6	0	TEU	Main	14,315	N
ACC00239	Auto Carrier	2010	LBR	18,529	20.6	0	TEU	Aux	4,723	N
ACC00239	Auto Carrier	2010	LBR	18,529	20.6	0	TEU	Auxiliary Boiler	253	N
ACC00239	Auto Carrier	2010	LBR	18,529	20.6	0	TEU	Main	14,315	N
ACC00073	Auto Carrier	2010	MHL	18,334	20.6	0	TEU	Aux	3,510	N
ACC00073	Auto Carrier	2010	MHL	18,334	20.6	0	TEU	Auxiliary Boiler	253	N
ACC00073	Auto Carrier	2010	MHL	18,334	20.6	0	TEU	Main	14,315	N
BBB00634	Bulk	2011	GRC	58,451	14.5	0	TEU	Aux	1,793	N
BBB00634	Bulk	2011	GRC	58,451	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00634	Bulk	2011	GRC	58,451	14.5	0	TEU	Main	9,960	N
GCC00227	General Cargo	2008	PAN	12,057	12.5	96	TEU	Aux	2,305	N
GCC00227	General Cargo	2008	PAN	12,057	12.5	96	TEU	Auxiliary Boiler	137	N
GCC00227	General Cargo	2008	PAN	12,057	12.5	96	TEU	Main	3,964	N
BBB00092	Bulk	2010	SGP	32,613	13.7	0	TEU	Aux	1,640	N
BBB00092	Bulk	2010	SGP	32,613	13.7	0	TEU	Auxiliary Boiler	132	N
BBB00092	Bulk	2010	SGP	32,613	13.7	0	TEU	Main	6,480	N
TNC00246	Tanker - Chemical	2011	SGP	52,300	15	0	TEU	Aux	2,880	N
TNC00246	Tanker - Chemical	2011	SGP	52,300	15	0	TEU	Auxiliary Boiler	371	N
TNC00246	Tanker - Chemical	2011	SGP	52,300	15	0	TEU	Main	9,480	N
BBB00120	Bulk	2004	PAN	76,619	15.3	0	TEU	Aux	1,793	N
BBB00120	Bulk	2004	PAN	76,619	15.3	0	TEU	Auxiliary Boiler	132	N
BBB00120	Bulk	2004	PAN	76,619	15.3	0	TEU	Main	12,240	Y
BBB00505	Bulk	2004	MHL	76,595	14.5	0	TEU	Aux	1,793	N
BBB00505	Bulk	2004	MHL	76,595	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00505	Bulk	2004	MHL	76,595	14.5	0	TEU	Main	12,240	Y
ACC00425	Auto Carrier	2010	LBR	16,416	19.8	0	TEU	Aux	4,723	N
ACC00425	Auto Carrier	2010	LBR	16,416	19.8	0	TEU	Auxiliary Boiler	253	N
ACC00425	Auto Carrier	2010	LBR	16,416	19.8	0	TEU	Main	15,090	N
TNH00679	Tanker - Handysize	2008	PAN	48,006	15.1	0	TEU	Aux	2,328	N
TNH00679	Tanker - Handysize	2008	PAN	48,006	15.1	0	TEU	Auxiliary Boiler	371	N
TNH00679	Tanker - Handysize	2008	PAN	48,006	15.1	0	TEU	Main	9,480	Y
GCC00667	General Cargo	2009	SGP	51,624	14.5	273	TEU	Aux	2,305	N
GCC00667	General Cargo	2009	SGP	51,624	14.5	273	TEU	Auxiliary Boiler	137	N
GCC00667	General Cargo	2009	SGP	51,624	14.5	273	TEU	Main	9,960	N
GCC00635	General Cargo	2010	PAN	61,860	14	270	TEU	Aux	2,305	N
GCC00635	General Cargo	2010	PAN	61,860	14	270	TEU	Auxiliary Boiler	137	N
GCC00635	General Cargo	2010	PAN	61,860	14	270	TEU	Main	9,960	Y
TNC00338	Tanker - Chemical	2008	PAN	17,091	14	0	TEU	Aux	2,839	N
TNC00338	Tanker - Chemical	2008	PAN	17,091	14	0	TEU	Auxiliary Boiler	371	N
TNC00338	Tanker - Chemical	2008	PAN	17,091	14	0	TEU	Main	5,180	N
TNP00714	Tanker - Panamax	2010	MHL	74,996	15.3	0	TEU	Aux	2,627	N
TNP00714	Tanker - Panamax	2010	MHL	74,996	15.3	0	TEU	Auxiliary Boiler	371	N
TNP00714	Tanker - Panamax	2010	MHL	74,996	15.3	0	TEU	Main	12,240	Y

Vessel ID	Vessel Type	Model Year	Flag	DWT (tons)	Max Speed (knots)	Cap	Cap Units	Engine Type	Power (kW)	Slide Valve
BBB00501	Bulk	2010	PAN	29,562	14.3	0	TEU	Aux	1,793	N
BBB00501	Bulk	2010	PAN	29,562	14.3	0	TEU	Auxiliary Boiler	132	N
BBB00501	Bulk	2010	PAN	29,562	14.3	0	TEU	Main	6,150	N
BBB00309	Bulk	2009	PAN	56,118	14.5	0	TEU	Aux	1,793	N
BBB00309	Bulk	2009	PAN	56,118	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00309	Bulk	2009	PAN	56,118	14.5	0	TEU	Main	9,480	Y
ACC00313	Auto Carrier	2010	PAN	21,616	20	0	TEU	Aux	4,723	N
ACC00313	Auto Carrier	2010	PAN	21,616	20	0	TEU	Auxiliary Boiler	253	N
ACC00313	Auto Carrier	2010	PAN	21,616	20	0	TEU	Main	13,200	Y
TNC00247	Tanker - Chemical	2009	PAN	19,854	14.5	0	TEU	Aux	2,839	N
TNC00247	Tanker - Chemical	2009	PAN	19,854	14.5	0	TEU	Auxiliary Boiler	371	N
TNC00247	Tanker - Chemical	2009	PAN	19,854	14.5	0	TEU	Main	6,230	N
TNC00471	Tanker - Chemical	2010	SGP	19,801	14.4	0	TEU	Aux	2,839	N
TNC00471	Tanker - Chemical	2010	SGP	19,801	14.4	0	TEU	Auxiliary Boiler	371	N
TNC00471	Tanker - Chemical	2010	SGP	19,801	14.4	0	TEU	Main	6,230	N
TNC00715	Tanker - Chemical	2009	PAN	23,451	14.6	0	TEU	Aux	2,839	N
TNC00715	Tanker - Chemical	2009	PAN	23,451	14.6	0	TEU	Auxiliary Boiler	371	N
TNC00715	Tanker - Chemical	2009	PAN	23,451	14.6	0	TEU	Main	7,560	N
BBB00264	Bulk	2009	PAN	28,351	14	0	TEU	Aux	1,793	N
BBB00264	Bulk	2009	PAN	28,351	14	0	TEU	Auxiliary Boiler	132	N
BBB00264	Bulk	2009	PAN	28,351	14	0	TEU	Main	5,850	Y
BBB00362	Bulk	2010	PAN	61,510	14.5	0	TEU	Aux	1,793	N
BBB00362	Bulk	2010	PAN	61,510	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00362	Bulk	2010	PAN	61,510	14.5	0	TEU	Main	8,450	Y
BBB00513	Bulk	2010	SGP	95,712	14.5	0	TEU	Aux	1,793	N
BBB00513	Bulk	2010	SGP	95,712	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00513	Bulk	2010	SGP	95,712	14.5	0	TEU	Main	12,950	Y
GCC00467	General Cargo	2012	PAN	72,871	14.5	0	TEU	Aux	3,255	N
GCC00467	General Cargo	2012	PAN	72,871	14.5	0	TEU	Auxiliary Boiler	137	N
GCC00467	General Cargo	2012	PAN	72,871	14.5	0	TEU	Main	9,450	N
BBB00638	Bulk	2010	MHL	35,921	14.5	0	TEU	Aux	1,793	N
BBB00638	Bulk	2010	MHL	35,921	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00638	Bulk	2010	MHL	35,921	14.5	0	TEU	Main	7,860	Y
TNC00713	Tanker - Chemical	2010	SGP	25,581	14.5	0	TEU	Aux	3,240	N
TNC00713	Tanker - Chemical	2010	SGP	25,581	14.5	0	TEU	Auxiliary Boiler	371	N
TNC00713	Tanker - Chemical	2010	SGP	25,581	14.5	0	TEU	Main	8,730	N
TNA00102	Tanker - Aframax	2011	IOM	116,715	15.1	0	TEU	Aux	2,797	N
TNA00102	Tanker - Aframax	2011	IOM	116,715	15.1	0	TEU	Auxiliary Boiler	371	N
TNA00102	Tanker - Aframax	2011	IOM	116,715	15.1	0	TEU	Main	13,560	N
TNP00780	Tanker - Panamax	2010	LBR	74,534	14.5	0	TEU	Aux	4,468	N
TNP00780	Tanker - Panamax	2010	LBR	74,534	14.5	0	TEU	Auxiliary Boiler	371	N
TNP00780	Tanker - Panamax	2010	LBR	74,534	14.5	0	TEU	Main	13,560	Y
TNP00308	Tanker - Panamax	2010	LBR	74,581	14.5	0	TEU	Aux	4,468	N
TNP00308	Tanker - Panamax	2010	LBR	74,581	14.5	0	TEU	Auxiliary Boiler	371	N
TNP00308	Tanker - Panamax	2010	LBR	74,581	14.5	0	TEU	Main	13,560	Y
TNS00685	Tanker - Suezmax	2011	LBR	157,787	15.5	0	TEU	Aux	3,610	N
TNS00685	Tanker - Suezmax	2011	LBR	157,787	15.5	0	TEU	Auxiliary Boiler	371	N
TNS00685	Tanker - Suezmax	2011	LBR	157,787	15.5	0	TEU	Main	18,170	N
BBB00669	Bulk	2010	PAN	83,478	14	0	TEU	Aux	1,793	N
BBB00669	Bulk	2010	PAN	83,478	14	0	TEU	Auxiliary Boiler	132	N

Vessel ID	Vessel Type	Model Year	Flag	DWT (tons)	Max Speed (knots)	Cap	Cap Units	Engine Type	Power (kW)	Slide Valve
BBB00669	Bulk	2010	PAN	83,478	14	0	TEU	Main	10,740	Y
TNC00297	Tanker - Chemical	2011	LBR	50,490	14.2	0	TEU	Aux	2,839	N
TNC00297	Tanker - Chemical	2011	LBR	50,490	14.2	0	TEU	Auxiliary Boiler	371	N
TNC00297	Tanker - Chemical	2011	LBR	50,490	14.2	0	TEU	Main	9,480	N
BBB00417	Bulk	2010	PAN	82,250	14.5	0	TEU	Aux	1,793	N
BBB00417	Bulk	2010	PAN	82,250	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00417	Bulk	2010	PAN	82,250	14.5	0	TEU	Main	9,710	Y
ACC00510	Auto Carrier	2010	BHS	18,436	20	0	TEU	Aux	4,723	N
ACC00510	Auto Carrier	2010	BHS	18,436	20	0	TEU	Auxiliary Boiler	253	N
ACC00510	Auto Carrier	2010	BHS	18,436	20	0	TEU	Main	15,130	Y
TNS00137	Tanker - Suezmax	2012	BMU	159,031	15.5	0	TEU	Aux	2,993	N
TNS00137	Tanker - Suezmax	2012	BMU	159,031	15.5	0	TEU	Auxiliary Boiler	371	N
TNS00137	Tanker - Suezmax	2012	BMU	159,031	15.5	0	TEU	Main	15,720	N
TNS00647	Tanker - Suezmax	2010	MHL	158,777	15.5	0	TEU	Aux	2,993	N
TNS00647	Tanker - Suezmax	2010	MHL	158,777	15.5	0	TEU	Auxiliary Boiler	371	N
TNS00647	Tanker - Suezmax	2010	MHL	158,777	15.5	0	TEU	Main	18,660	Y
TNC00721	Tanker - Chemical	2009	MHL	21,306	14.5	0	TEU	Aux	2,839	N
TNC00721	Tanker - Chemical	2009	MHL	21,306	14.5	0	TEU	Auxiliary Boiler	371	N
TNC00721	Tanker - Chemical	2009	MHL	21,306	14.5	0	TEU	Main	6,480	N
BBB00349	Bulk	2010	PAN	56,882	14.2	0	TEU	Aux	1,793	N
BBB00349	Bulk	2010	PAN	56,882	14.2	0	TEU	Auxiliary Boiler	132	N
BBB00349	Bulk	2010	PAN	56,882	14.2	0	TEU	Main	9,480	Y
BBB00590	Bulk	2010	PAN	28,392	14	0	TEU	Aux	1,793	N
BBB00590	Bulk	2010	PAN	28,392	14	0	TEU	Auxiliary Boiler	132	N
BBB00590	Bulk	2010	PAN	28,392	14	0	TEU	Main	5,850	N
BBB00789	Bulk	2010	PAN	95,740	14.5	0	TEU	Aux	1,793	N
BBB00789	Bulk	2010	PAN	95,740	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00789	Bulk	2010	PAN	95,740	14.5	0	TEU	Main	12,950	Y
TNA00455	Tanker - Aframax	2011	LBR	115,648	15.5	0	TEU	Aux	2,432	N
TNA00455	Tanker - Aframax	2011	LBR	115,648	15.5	0	TEU	Auxiliary Boiler	371	N
TNA00455	Tanker - Aframax	2011	LBR	115,648	15.5	0	TEU	Main	13,560	N
TNA00776	Tanker - Aframax	2011	LBR	115,669	15.5	0	TEU	Aux	2,432	N
TNA00776	Tanker - Aframax	2011	LBR	115,669	15.5	0	TEU	Auxiliary Boiler	371	N
TNA00776	Tanker - Aframax	2011	LBR	115,669	15.5	0	TEU	Main	13,560	N
TNA00206	Tanker - Aframax	2011	LBR	115,571	15.7	0	TEU	Aux	2,432	N
TNA00206	Tanker - Aframax	2011	LBR	115,571	15.7	0	TEU	Auxiliary Boiler	371	N
TNA00206	Tanker - Aframax	2011	LBR	115,571	15.7	0	TEU	Main	13,560	N
TNA00530	Tanker - Aframax	2011	GRC	115,674	15.7	0	TEU	Aux	2,432	N
TNA00530	Tanker - Aframax	2011	GRC	115,674	15.7	0	TEU	Auxiliary Boiler	371	N
TNA00530	Tanker - Aframax	2011	GRC	115,674	15.7	0	TEU	Main	13,560	N
BBB00552	Bulk	2010	PAN	55,848	14.5	0	TEU	Aux	1,793	N
BBB00552	Bulk	2010	PAN	55,848	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00552	Bulk	2010	PAN	55,848	14.5	0	TEU	Main	8,890	N
BBB00527	Bulk	2010	PAN	55,831	14.5	0	TEU	Aux	1,793	N
BBB00527	Bulk	2010	PAN	55,831	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00527	Bulk	2010	PAN	55,831	14.5	0	TEU	Main	8,890	N
BBB00511	Bulk	2011	PAN	81,305	14.5	0	TEU	Aux	1,793	N
BBB00511	Bulk	2011	PAN	81,305	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00511	Bulk	2011	PAN	81,305	14.5	0	TEU	Main	10,100	N
BBB00050	Bulk	2011	MHL	56,507	14.2	0	TEU	Aux	2,161	N

Vessel ID	Vessel Type	Model Year	Flag	DWT (tons)	Max Speed (knots)	Cap	Cap Units	Engine Type	Power (kW)	Slide Valve
BBB00050	Bulk	2011	MHL	56,507	14.2	0	TEU	Auxiliary Boiler	132	N
BBB00050	Bulk	2011	MHL	56,507	14.2	0	TEU	Main	9,480	N
TNA00491	Tanker - Aframax	2011	LBR	115,594	15.7	0	TEU	Aux	2,432	N
TNA00491	Tanker - Aframax	2011	LBR	115,594	15.7	0	TEU	Auxiliary Boiler	371	N
TNA00491	Tanker - Aframax	2011	LBR	115,594	15.7	0	TEU	Main	13,560	N
TNS00195	Tanker - Suezmax	2011	MHL	158,510	15.5	0	TEU	Aux	3,268	N
TNS00195	Tanker - Suezmax	2011	MHL	158,510	15.5	0	TEU	Auxiliary Boiler	371	N
TNS00195	Tanker - Suezmax	2011	MHL	158,510	15.5	0	TEU	Main	18,215	N
BBB00294	Bulk	2011	MHL	34,062	13.9	0	TEU	Aux	1,793	N
BBB00294	Bulk	2011	MHL	34,062	13.9	0	TEU	Auxiliary Boiler	132	N
BBB00294	Bulk	2011	MHL	34,062	13.9	0	TEU	Main	6,480	N
TNS00767	Tanker - Suezmax	2011	MHL	159,068	15.7	0	TEU	Aux	2,993	N
TNS00767	Tanker - Suezmax	2011	MHL	159,068	15.7	0	TEU	Auxiliary Boiler	371	N
TNS00767	Tanker - Suezmax	2011	MHL	159,068	15.7	0	TEU	Main	18,625	N
BBB00060	Bulk	2012	GRC	81,251	14.5	0	TEU	Aux	1,793	N
BBB00060	Bulk	2012	GRC	81,251	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00060	Bulk	2012	GRC	81,251	14.5	0	TEU	Main	10,100	N
BBB00672	Bulk	2010	PAN	74,940	14.5	0	TEU	Aux	1,793	N
BBB00672	Bulk	2010	PAN	74,940	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00672	Bulk	2010	PAN	74,940	14.5	0	TEU	Main	9,230	Y
BBB00175	Bulk	2011	HKG	32,663	14	0	TEU	Aux	1,793	N
BBB00175	Bulk	2011	HKG	32,663	14	0	TEU	Auxiliary Boiler	132	N
BBB00175	Bulk	2011	HKG	32,663	14	0	TEU	Main	7,150	N
ACC00304	Auto Carrier	2010	CYM	18,448	20	0	TEU	Aux	4,723	N
ACC00304	Auto Carrier	2010	CYM	18,448	20	0	TEU	Auxiliary Boiler	253	N
ACC00304	Auto Carrier	2010	CYM	18,448	20	0	TEU	Main	15,130	Y
BBB00639	Bulk	2010	LBR	28,253	14	0	TEU	Aux	1,793	N
BBB00639	Bulk	2010	LBR	28,253	14	0	TEU	Auxiliary Boiler	132	N
BBB00639	Bulk	2010	LBR	28,253	14	0	TEU	Main	5,850	Y
TNS00395	Tanker - Suezmax	2011	MHL	158,322	16	0	TEU	Aux	2,993	N
TNS00395	Tanker - Suezmax	2011	MHL	158,322	16	0	TEU	Auxiliary Boiler	371	N
TNS00395	Tanker - Suezmax	2011	MHL	158,322	16	0	TEU	Main	19,619	N
TNA00020	Tanker - Aframax	2011	LBR	115,764	15.7	0	TEU	Aux	2,432	N
TNA00020	Tanker - Aframax	2011	LBR	115,764	15.7	0	TEU	Auxiliary Boiler	371	N
TNA00020	Tanker - Aframax	2011	LBR	115,764	15.7	0	TEU	Main	13,560	N
BBB00661	Bulk	2011	HKG	36,845	14.5	0	TEU	Aux	2,118	N
BBB00661	Bulk	2011	HKG	36,845	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00661	Bulk	2011	HKG	36,845	14.5	0	TEU	Main	7,860	N
BBB00382	Bulk	2011	NOR	57,970	14.3	0	TEU	Aux	1,875	N
BBB00382	Bulk	2011	NOR	57,970	14.3	0	TEU	Auxiliary Boiler	132	N
BBB00382	Bulk	2011	NOR	57,970	14.3	0	TEU	Main	9,960	N
ACC00735	Auto Carrier	2010	PAN	18,884	20	0	TEU	Aux	4,723	N
ACC00735	Auto Carrier	2010	PAN	18,884	20	0	TEU	Auxiliary Boiler	253	N
ACC00735	Auto Carrier	2010	PAN	18,884	20	0	TEU	Main	13,260	N
GCC00216	General Cargo	2012	BHS	72,800	14.5	0	TEU	Aux	3,255	N
GCC00216	General Cargo	2012	BHS	72,800	14.5	0	TEU	Auxiliary Boiler	137	N
GCC00216	General Cargo	2012	BHS	72,800	14.5	0	TEU	Main	9,450	N
TNS00677	Tanker - Suezmax	2011	GRC	164,751	15.3	0	TEU	Aux	2,880	N
TNS00677	Tanker - Suezmax	2011	GRC	164,751	15.3	0	TEU	Auxiliary Boiler	371	N
TNS00677	Tanker - Suezmax	2011	GRC	164,751	15.3	0	TEU	Main	19,619	N

Vessel ID	Vessel Type	Model Year	Flag	DWT (tons)	Max Speed (knots)	Cap	Cap Units	Engine Type	Power (kW)	Slide Valve
ACC00730	Auto Carrier	2010	PAN	18,384	20.6	0	TEU	Aux	4,723	N
ACC00730	Auto Carrier	2010	PAN	18,384	20.6	0	TEU	Auxiliary Boiler	253	N
ACC00730	Auto Carrier	2010	PAN	18,384	20.6	0	TEU	Main	15,130	Y
ACC00185	Auto Carrier	2010	LBR	18,377	20	0	TEU	Aux	4,723	N
ACC00185	Auto Carrier	2010	LBR	18,377	20	0	TEU	Auxiliary Boiler	253	N
ACC00185	Auto Carrier	2010	LBR	18,377	20	0	TEU	Main	15,130	Y
ACC00110	Auto Carrier	2010	MHL	18,143	20	0	TEU	Aux	4,723	N
ACC00110	Auto Carrier	2010	MHL	18,143	20	0	TEU	Auxiliary Boiler	253	N
ACC00110	Auto Carrier	2010	MHL	18,143	20	0	TEU	Main	15,130	Y
BBB00071	Bulk	2011	PAN	32,451	13.6	0	TEU	Aux	1,793	N
BBB00071	Bulk	2011	PAN	32,451	13.6	0	TEU	Auxiliary Boiler	132	N
BBB00071	Bulk	2011	PAN	32,451	13.6	0	TEU	Main	6,480	N
GCC00215	General Cargo	2010	PAN	7,760	13.2	0	TEU	Aux	2,305	N
GCC00215	General Cargo	2010	PAN	7,760	13.2	0	TEU	Auxiliary Boiler	137	N
GCC00215	General Cargo	2010	PAN	7,760	13.2	0	TEU	Main	3,250	N
BBB00771	Bulk	2011	MHL	34,737	14.2	0	TEU	Aux	1,793	N
BBB00771	Bulk	2011	MHL	34,737	14.2	0	TEU	Auxiliary Boiler	132	N
BBB00771	Bulk	2011	MHL	34,737	14.2	0	TEU	Main	7,500	N
BBB00645	Bulk	2011	HKG	75,474	14.5	0	TEU	Aux	1,793	N
BBB00645	Bulk	2011	HKG	75,474	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00645	Bulk	2011	HKG	75,474	14.5	0	TEU	Main	8,833	N
C0300516	Container3000	2012	LBR	48,997	20	3,614	TEU	Aux	9,240	N
C0300516	Container3000	2012	LBR	48,997	20	3,614	TEU	Auxiliary Boiler	474	N
C0300516	Container3000	2012	LBR	48,997	20	3,614	TEU	Main	27,180	N
C0300407	Container3000	2012	LBR	52,040	21	3,614	TEU	Aux	9,240	N
C0300407	Container3000	2012	LBR	52,040	21	3,614	TEU	Auxiliary Boiler	474	N
C0300407	Container3000	2012	LBR	52,040	21	3,614	TEU	Main	27,180	N
BBB00489	Bulk	2011	PAN	58,689	14.5	0	TEU	Aux	1,790	N
BBB00489	Bulk	2011	PAN	58,689	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00489	Bulk	2011	PAN	58,689	14.5	0	TEU	Main	8,630	N
C0400410	Container4000	2012	PAN	62,448	21.6	4,622	TEU	Aux	6,680	N
C0400410	Container4000	2012	PAN	62,448	21.6	4,622	TEU	Auxiliary Boiler	492	N
C0400410	Container4000	2012	PAN	62,448	21.6	4,622	TEU	Main	23,899	N
C0300694	Container3000	2012	SGP	45,542	21.5	3,560	TEU	Aux	7,710	N
C0300694	Container3000	2012	SGP	45,542	21.5	3,560	TEU	Auxiliary Boiler	474	N
C0300694	Container3000	2012	SGP	45,542	21.5	3,560	TEU	Main	22,889	N
C0300594	Container3000	2012	SGP	45,349	21.5	3,560	TEU	Aux	7,560	N
C0300594	Container3000	2012	SGP	45,349	21.5	3,560	TEU	Auxiliary Boiler	474	N
C0300594	Container3000	2012	SGP	45,349	21.5	3,560	TEU	Main	22,889	N
C0300478	Container3000	2012	SGP	45,349	21.5	3,560	TEU	Aux	5,338	N
C0300478	Container3000	2012	SGP	45,349	21.5	3,560	TEU	Auxiliary Boiler	474	N
C0300478	Container3000	2012	SGP	45,349	21.5	3,560	TEU	Main	22,889	N
C0300355	Container3000	2013	SGP	45,542	21.5	3,560	TEU	Aux	7,560	N
C0300355	Container3000	2013	SGP	45,542	21.5	3,560	TEU	Auxiliary Boiler	474	N
C0300355	Container3000	2013	SGP	45,542	21.5	3,560	TEU	Main	22,889	N
BBB00788	Bulk	2010	PAN	95,750	15	0	TEU	Aux	1,793	N
BBB00788	Bulk	2010	PAN	95,750	15	0	TEU	Auxiliary Boiler	132	N
BBB00788	Bulk	2010	PAN	95,750	15	0	TEU	Main	12,950	Y
BBB00084	Bulk	2011	PAN	56,048	14.5	0	TEU	Aux	1,793	N
BBB00084	Bulk	2011	PAN	56,048	14.5	0	TEU	Auxiliary Boiler	132	N

Vessel ID	Vessel Type	Model Year	Flag	DWT (tons)	Max Speed (knots)	Cap	Cap Units	Engine Type	Power (kW)	Slide Valve
BBB00084	Bulk	2011	PAN	56,048	14.5	0	TEU	Main	9,480	N
TNC00353	Tanker - Chemical	2011	SGP	49,999	14.5	0	TEU	Aux	3,098	N
TNC00353	Tanker - Chemical	2011	SGP	49,999	14.5	0	TEU	Auxiliary Boiler	371	N
TNC00353	Tanker - Chemical	2011	SGP	49,999	14.5	0	TEU	Main	8,910	N
BBB00305	Bulk	2012	HKG	63,800	14.3	0	TEU	Aux	0	N
BBB00305	Bulk	2012	HKG	63,800	14.3	0	TEU	Auxiliary Boiler	132	N
BBB00305	Bulk	2012	HKG	63,800	14.3	0	TEU	Main	11,900	N
BBB00409	Bulk	2012	SGP	58,609	14.5	0	TEU	Aux	1,793	N
BBB00409	Bulk	2012	SGP	58,609	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00409	Bulk	2012	SGP	58,609	14.5	0	TEU	Main	8,630	N
BBB00585	Bulk	2011	HKG	32,318	13.7	0	TEU	Aux	1,793	N
BBB00585	Bulk	2011	HKG	32,318	13.7	0	TEU	Auxiliary Boiler	132	N
BBB00585	Bulk	2011	HKG	32,318	13.7	0	TEU	Main	6,480	N
ACC00757	Auto Carrier	2010	PAN	19,227	20.6	0	TEU	Aux	4,723	N
ACC00757	Auto Carrier	2010	PAN	19,227	20.6	0	TEU	Auxiliary Boiler	253	N
ACC00757	Auto Carrier	2010	PAN	19,227	20.6	0	TEU	Main	15,100	N
BBB00744	Bulk	2010	JPN	95,712	14.5	0	TEU	Aux	1,793	N
BBB00744	Bulk	2010	JPN	95,712	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00744	Bulk	2010	JPN	95,712	14.5	0	TEU	Main	12,950	Y
GCC00337	General Cargo	2010	HKG	56,023	14.5	2,002	TEU	Aux	2,920	N
GCC00337	General Cargo	2010	HKG	56,023	14.5	2,002	TEU	Auxiliary Boiler	137	N
GCC00337	General Cargo	2010	HKG	56,023	14.5	2,002	TEU	Main	9,474	N
ACC00474	Auto Carrier	2010	PAN	19,013	20	0	TEU	Aux	4,723	N
ACC00474	Auto Carrier	2010	PAN	19,013	20	0	TEU	Auxiliary Boiler	253	N
ACC00474	Auto Carrier	2010	PAN	19,013	20	0	TEU	Main	13,260	N
BBB00321	Bulk	2010	PAN	61,425	14.5	0	TEU	Aux	1,793	N
BBB00321	Bulk	2010	PAN	61,425	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00321	Bulk	2010	PAN	61,425	14.5	0	TEU	Main	8,450	Y
BBB00575	Bulk	2011	HKG	55,923	15	0	TEU	Aux	1,793	N
BBB00575	Bulk	2011	HKG	55,923	15	0	TEU	Auxiliary Boiler	132	N
BBB00575	Bulk	2011	HKG	55,923	15	0	TEU	Main	7,135	N
BBB00733	Bulk	2011	PAN	78,228	14.5	0	TEU	Aux	1,793	N
BBB00733	Bulk	2011	PAN	78,228	14.5	0	TEU	Auxiliary Boiler	132	N
BBB00733	Bulk	2011	PAN	78,228	14.5	0	TEU	Main	9,170	N

APPENDIX C

HARBOR CRAFT

Table C.1: Zero Hour Emission Factors

(Table presented on following pages due to size)

Engine Type	Engine Year min	Engine Year max	Engine Power (kW) min	Engine Power (kW) max	Zero Hour Emission Factor (g/kw-hr) PM	NO_x	SO_2	CO	HC	CO_2	N_2O	CH_4
propulsion	0	1998	0	38	0.97	10.91	0.17	4.89	2.47	652	0.031	0.049
propulsion	1998	2000	0	38	0.97	10.91	0.17	4.89	2.41	652	0.031	0.048
propulsion	2000	2005	0	38	0.97	9.8	0.17	4.89	2.41	652	0.031	0.048
propulsion	2005	2009	0	38	0.4	7.13	0.17	5	2.41	652	0.031	0.048
propulsion	2009	2040	0	38	0.29	7.13	0.17	5	2.41	652	0.031	0.048
propulsion	0	1997	38	90	1.07	20.56	0.17	4.69	1.93	of Long I	0.031	0.039
propulsion	1997	2000	38	90	0.88	13.85	0.17	3.42	1.33	652	0.031	0.027
propulsion	2000	2005	38	90	0.88	9.8	0.17	3.42	1.33	652	0.031	0.027
propulsion	2005	2009	38	90	0.4	7.13	0.17	5	1.33	652	0.031	0.027
propulsion	2009	2040	38	90	0.29	7.13	0.17	5	1.33	652	0.031	0.027
propulsion	0	1971	90	131	0.98	22.14	0.17	4.3	1.77	652	0.031	0.035
propulsion	1971	1979	90	131	0.84	20.56	0.17	4.3	1.47	652	0.031	0.029
propulsion	1979	1984	90	131	0.7	18.98	0.17	4.3	1.34	652	0.031	0.027
propulsion	1984	1987	90	131	0.7	17.4	0.17	4.21	1.26	652	0.031	0.025
propulsion	1987	1996	90	131	0.7	17.4	0.17	4.12	1.18	652	0.031	0.024
propulsion	1996	2000	90	131	0.48	12.92	0.17	2.64	0.91	652	0.031	0.018
propulsion	2000	2004	90	131	0.48	9.8	0.17	2.64	0.91	652	0.031	0.018
propulsion	2004	2013	90	131	0.29	6.84	0.17	5	0.91	652	0.031	0.018
propulsion	2013	2040	90	131	0.12	5.09	0.17	5	0.91	652	0.031	0.018
propulsion	0	1971	131	187	0.98	22.14	0.17	4.3	1.77	652	0.031	0.035
propulsion	1971	1979	131	187	0.84	20.56	0.17	4.3	1.47	652	0.031	0.029
propulsion	1979	1984	131	187	0.7	18.98	0.17	4.3	1.34	652	0.031	0.027
propulsion	1984	1987	131	187	0.7	17.4	0.17	4.21	1.26	652	0.031	0.025
propulsion	1987	1995	131	187	0.7	17.4	0.17	4.12	1.18	652	0.031	0.024
propulsion	1995	2000	131	187	0.48	12.92	0.17	2.64	0.91	652	0.031	0.018
propulsion	2000	2004	131	187	0.48	9.8	0.17	2.64	0.91	652	0.031	0.018
propulsion	2004	2014	131	187	0.2	6.84	0.17	5	0.91	652	0.031	0.018
propulsion	2014	2040	131	187	0.11	5.35	0.17	5	0.91	652	0.031	0.018
propulsion	0	1971	187	374	0.94	22.14	0.17	4.12	1.69	652	0.031	0.034
propulsion	1971	1979	187	374	0.8	20.56	0.17	4.12	1.41	652	0.031	0.028
propulsion	1979	1984	187	374	0.67	18.98	0.17	4.12	1.27	652	0.031	0.025
propulsion	1984	1987	187	374	0.67	17.4	0.17	4.12	1.21	652	0.031	0.024
propulsion	1987	1995	187	374	0.67	17.4	0.17	4.01	1.13	652	0.031	0.023
propulsion	1995	2000	187	374	0.48	12.92	0.17	2.64	0.91	652	0.031	0.018
propulsion	2000	2004	187	374	0.48	9.8	0.17	2.64	0.91	652	0.031	0.018
propulsion	2004	2014	187	374	0.2	6.84	0.17	5	0.91	652	0.031	0.018
propulsion	2014	2040	187	374	0.11	5.35	0.17	5	0.91	652	0.031	0.018
propulsion	0	1971	374	560	0.94	22.14	0.17	4.12	1.69	652	0.031	0.034
propulsion	1971	1979	374	560	0.8	20.56	0.17	4.12	1.41	652	0.031	0.028
propulsion	1979	1984	374	560	0.67	18.98	0.17	4.12	1.27	652	0.031	0.025
propulsion	1984	1987	374	560	0.67	17.4	0.17	4.12	1.21	652	0.031	0.024
propulsion	1987	1995	374	560	0.67	17.4	0.17	4.01	1.13	652	0.031	0.023
propulsion	1995	2000	374	560	0.48	12.92	0.17	2.64	0.91	652	0.031	0.018
propulsion	2000	2007	374	560	0.48	9.8	0.17	2.64	0.91	652	0.031	0.018
propulsion	2007	2013	374	560	0.2	6.84	0.17	5	0.91	652	0.031	0.018
propulsion	2013	2040	374	560	0.11	5.35	0.17	5	0.91	652	0.031	0.018

Engine Type	Engine Year min	Engine Year max	Engine Power (kW) min	Engine Power (kW) max	Zero Hour Emission Factor (g/kw-hr) PM	NO_x	SO_2	CO	HC	CO_2	N_2O	CH_4
propulsion	0	1971	560	1,418	0.94	22.14	0.17	4.12	1.69	652	0.031	0.034
propulsion	1971	1979	560	1,418	0.8	20.56	0.17	4.12	1.41	652	0.031	0.028
propulsion	1979	1984	560	1,418	0.67	18.98	0.17	4.12	1.27	652	0.031	0.025
propulsion	1984	1987	560	1,418	0.67	17.4	0.17	4.12	1.21	652	0.031	0.024
propulsion	1987	1999	560	1,418	0.67	17.4	0.17	4.01	1.13	652	0.031	0.023
propulsion	1999	2000	560	1,418	0.48	12.92	0.17	2.64	0.91	652	0.031	0.018
propulsion	2000	2007	560	1,418	0.48	9.8	0.17	2.64	0.91	652	0.031	0.018
propulsion	2007	2012	560	1,418	0.27	7.41	0.17	5	0.91	652	0.031	0.018
propulsion	2012	2017	560	1,418	0.11	5.48	0.17	5	0.91	652	0.031	0.018
propulsion	2017	2040	560	1,418	0.04	1.74	0.17	5	0.24	652	0.031	0.005
propulsion	0	1971	1,418	2,462	0.94	22.14	0.17	4.12	1.69	652	0.031	0.034
propulsion	1971	1979	1,418	2,462	0.8	20.56	0.17	4.12	1.41	652	0.031	0.028
propulsion	1979	1984	1,418	2,462	0.67	18.98	0.17	4.12	1.27	652	0.031	0.025
propulsion	1984	1987	1,418	2,462	0.67	17.4	0.17	4.12	1.21	652	0.031	0.024
propulsion	1987	1999	1,418	2,462	0.67	17.4	0.17	4.01	1.13	652	0.031	0.023
propulsion	1999	2000	1,418	2,462	0.48	12.92	0.17	2.64	0.91	652	0.031	0.018
propulsion	2000	2007	1,418	2,462	0.48	9.8	0.17	2.64	0.91	652	0.031	0.018
propulsion	2007	2013	1,418	2,462	0.27	7.41	0.17	5	0.91	652	0.031	0.018
propulsion	2013	2016	1,418	2,462	0.13	5.86	0.17	5	0.91	652	0.031	0.018
propulsion	2016	2040	1,418	2,462	0.04	1.74	0.17	5	0.24	652	0.031	0.005
propulsion	0	1971	2,462	7,456	0.94	22.14	0.17	4.12	1.69	652	0.031	0.034
propulsion	1971	1979	2,462	7,456	0.8	20.56	0.17	4.12	1.41	652	0.031	0.028
propulsion	1979	1984	2,462	7,456	0.67	18.98	0.17	4.12	1.27	652	0.031	0.025
propulsion	1984	1987	2,462	7,456	0.67	17.4	0.17	4.12	1.21	652	0.031	0.024
propulsion	1987	1999	2,462	7,456	0.67	17.4	0.17	4.01	1.13	652	0.031	0.023
propulsion	1999	2000	2,462	7,456	0.48	12.92	0.17	2.64	0.91	652	0.031	0.018
propulsion	2000	2007	2,462	7,456	0.48	9.8	0.17	2.64	0.91	652	0.031	0.018
propulsion	2007	2014	2,462	7,456	0.27	7.41	0.17	5	0.91	652	0.031	0.018
propulsion	2014	2016	2,462	7,456	0.34	6.62	0.17	5	0.91	652	0.031	0.018
propulsion	2016	2040	2,462	7,456	0.04	1.74	0.17	5	0.24	652	0.031	0.005
auxiliary	0	1998	0	38	0.86	9.25	0.17	6.9	2.94	652	0.031	0.059
auxiliary	1998	2000	0	38	0.86	9.25	0.17	6.9	2.87	652	0.031	0.057
auxiliary	2000	2005	0	38	0.86	9.25	0.17	6.9	2.87	652	0.031	0.057
auxiliary	2005	2009	0	38	0.4	7.13	0.17	5	2.87	652	0.031	0.057
auxiliary	2009	2040	0	38	0.29	7.13	0.17	5	2.87	652	0.031	0.057
auxiliary	0	1997	38	90	0.95	17.43	0.17	6.62	2.29	652	0.031	0.046
auxiliary	1997	2000	38	90	0.78	11.73	0.17	4.81	1.58	652	0.031	0.032
auxiliary	2000	2005	38	90	0.78	9.8	0.17	4.81	1.58	652	0.031	0.032
auxiliary	2005	2009	38	90	0.4	7.13	0.17	5	1.58	652	0.031	0.032
auxiliary	2009	2040	38	90	0.29	7.13	0.17	5	1.58	652	0.031	0.032
auxiliary	0	1971	90	131	0.87	18.77	0.17	6.07	2.1	652	0.031	0.042
auxiliary	1971	1979	90	131	0.74	17.43	0.17	6.07	1.76	652	0.031	0.035
auxiliary	1979	1984	90	131	0.62	16.09	0.17	6.07	1.6	652	0.031	0.032
auxiliary	1984	1987	90	131	0.62	14.75	0.17	5.94	1.5	652	0.031	0.030
auxiliary	1987	1996	90	131	0.62	14.75	0.17	5.8	1.41	652	0.031	0.028
auxiliary	1996	2000	90	131	0.43	10.95	0.17	3.73	1.09	652	0.031	0.022

Engine Type	Engine Year min	Engine Year max	Engine Power (kW) min	Engine Power (kW) max	Zero Hour Emission Factor (g/kw-hr) PM	NO_x	SO_2	CO	HC	CO_2	N_2O	CH_4
auxiliary	2000	2004	90	131	0.43	9.8	0.17	3.73	1.09	652	0.031	0.022
auxiliary	2004	2013	90	131	0.29	6.84	0.17	5	1.09	652	0.031	0.022
auxiliary	2013	2040	90	131	0.12	5.09	0.17	5	1.09	652	0.031	0.022
auxiliary	0	1971	131	187	0.87	18.77	0.17	6.07	2.1	652	0.031	0.042
auxiliary	1971	1979	131	187	0.74	17.43	0.17	6.07	1.76	652	0.031	0.035
auxiliary	1979	1984	131	187	0.62	16.09	0.17	6.07	1.6	652	0.031	0.032
auxiliary	1984	1987	131	187	0.62	14.75	0.17	5.94	1.5	652	0.031	0.030
auxiliary	1987	1995	131	187	0.62	14.75	0.17	5.8	1.41	652	0.031	0.028
auxiliary	1995	2000	131	187	0.43	10.95	0.17	3.73	1.09	652	0.031	0.022
auxiliary	2000	2004	131	187	0.43	9.8	0.17	3.73	1.09	652	0.031	0.022
auxiliary	2004	2014	131	187	0.2	6.84	0.17	5	1.09	652	0.031	0.022
auxiliary	2014	2040	131	187	0.11	5.35	0.17	5	1.09	652	0.031	0.022
auxiliary	0	1971	187	374	0.83	18.77	0.17	5.8	2.01	652	0.031	0.040
auxiliary	1971	1979	187	374	0.71	17.43	0.17	5.8	1.68	652	0.031	0.034
auxiliary	1979	1984	187	374	0.6	16.09	0.17	5.8	1.51	652	0.031	0.030
auxiliary	1984	1987	187	374	0.6	14.75	0.17	5.8	1.43	652	0.031	0.029
auxiliary	1987	1995	187	374	0.6	14.75	0.17	5.66	1.34	652	0.031	0.027
auxiliary	1995	2000	187	374	0.43	10.95	0.17	3.73	1.09	652	0.031	0.022
auxiliary	2000	2004	187	374	0.43	9.8	0.17	3.73	1.09	652	0.031	0.022
auxiliary	2004	2014	187	374	0.2	6.84	0.17	5	1.09	652	0.031	0.022
auxiliary	2014	2040	187	374	0.11	5.35	0.17	5	1.09	652	0.031	0.022
auxiliary	0	1971	374	560	0.83	18.77	0.17	5.8	2.01	652	0.031	0.040
auxiliary	1971	1979	374	560	0.71	17.43	0.17	5.8	1.68	652	0.031	0.034
auxiliary	1979	1984	374	560	0.6	16.09	0.17	5.8	1.51	652	0.031	0.030
auxiliary	1984	1987	374	560	0.6	14.75	0.17	5.8	1.43	652	0.031	0.029
auxiliary	1987	1995	374	560	0.6	14.75	0.17	5.66	1.34	652	0.031	0.027
auxiliary	1995	2000	374	560	0.43	10.95	0.17	3.73	1.09	652	0.031	0.022
auxiliary	2000	2007	374	560	0.43	9.8	0.17	3.73	1.09	652	0.031	0.022
auxiliary	2007	2013	374	560	0.2	6.84	0.17	5	1.09	652	0.031	0.022
auxiliary	2013	2040	374	560	0.11	5.35	0.17	5	1.09	652	0.031	0.022
auxiliary	0	1971	560	1,418	0.83	18.77	0.17	5.8	2.01	652	0.031	0.040
auxiliary	1971	1979	560	1,418	0.71	17.43	0.17	5.8	1.68	652	0.031	0.034
auxiliary	1979	1984	560	1,418	0.6	16.09	0.17	5.8	1.51	652	0.031	0.030
auxiliary	1984	1987	560	1,418	0.6	14.75	0.17	5.8	1.43	652	0.031	0.029
auxiliary	1987	1999	560	1,418	0.6	14.75	0.17	5.66	1.34	652	0.031	0.027
auxiliary	1999	2000	560	1,418	0.43	10.95	0.17	3.73	1.09	652	0.031	0.022
auxiliary	2000	2007	560	1,418	0.43	9.8	0.17	3.73	1.09	652	0.031	0.022
auxiliary	2007	2012	560	1,418	0.27	7.41	0.17	5	1.09	652	0.031	0.022
auxiliary	2012	2017	560	1,418	0.11	5.48	0.17	5	1.09	652	0.031	0.022
auxiliary	2017	2040	560	1,418	0.04	1.74	0.17	5	0.24	652	0.031	0.005
auxiliary	0	1971	1,418	2,462	0.83	18.77	0.17	5.8	2.01	652	0.031	0.040
auxiliary	1971	1979	1,418	2,462	0.71	17.43	0.17	5.8	1.68	652	0.031	0.034
auxiliary	1979	1984	1,418	2,462	0.6	16.09	0.17	5.8	1.51	652	0.031	0.030
auxiliary	1984	1987	1,418	2,462	0.6	14.75	0.17	5.8	1.43	652	0.031	0.029
auxiliary	1987	1999	1,418	2,462	0.6	14.75	0.17	5.66	1.34	652	0.031	0.027
auxiliary	1999	2000	1,418	2,462	0.43	10.95	0.17	3.73	1.09	652	0.031	0.022

Engine Type	Engine Year min	Engine Year max	Engine Power (kW) min	Engine Power (kW) max	Zero Hour Emission Factor (g/kw-hr) PM	NO_x	SO_2	CO	HC	CO_2	N_2O	CH_4
auxiliary	2000	2007	1,418	2,462	0.43	9.8	0.17	3.73	1.09	652	0.031	0.022
auxiliary	2007	2013	1,418	2,462	0.27	7.41	0.17	5	1.09	652	0.031	0.022
auxiliary	2013	2016	1,418	2,462	0.13	5.86	0.17	5	1.09	652	0.031	0.022
auxiliary	2016	2040	1,418	2,462	0.04	1.74	0.17	5	0.24	652	0.031	0.005
auxiliary	0	1971	2,462	7,456	0.83	18.77	0.17	5.8	2.01	652	0.031	0.040
auxiliary	1971	1979	2,462	7,456	0.71	17.43	0.17	5.8	1.68	652	0.031	0.034
auxiliary	1979	1984	2,462	7,456	0.6	16.09	0.17	5.8	1.51	652	0.031	0.030
auxiliary	1984	1987	2,462	7,456	0.6	14.75	0.17	5.8	1.43	652	0.031	0.029
auxiliary	1987	1999	2,462	7,456	0.6	14.75	0.17	5.66	1.34	652	0.031	0.027
auxiliary	1999	2000	2,462	7,456	0.43	10.95	0.17	3.73	1.09	652	0.031	0.022
auxiliary	2000	2007	2,462	7,456	0.43	9.8	0.17	3.73	1.09	652	0.031	0.022
auxiliary	2007	2014	2,462	7,456	0.27	7.41	0.17	5	1.09	652	0.031	0.022
auxiliary	2014	2016	2,462	7,456	0.34	6.62	0.17	5.03	1.09	652	0.031	0.022
auxiliary	2016	2040	2,462	7,456	0.04	1.74	0.17	5.03	0.24	652	0.031	0.005

APPENDIX D

CARGO HANDLING EQUIPMENT

Table D.1: Cargo Handling Equipment Data

(Table presented on following pages due to size)

Port Equip Type	Equip ID	Equip Make	Equip Model	Engine Type	Engine Make	Engine Model	Year	HP	Annual Hours	Category	DOC	DPF level 2	DPF level 3	Vycon	Blue Cat
Bulldozer	403001	Caterpillar	D8N	Diesel	Caterpillar	3406	1995	285	0	CHE Diesel					
Bulldozer	owned1	Caterpillar	D4	Diesel	Caterpillar	D4K2	2012	92	400	CHE Diesel					
Bulldozer	AEP00545	Caterpillar		Diesel			2004	200	1500	CHE Diesel					
Bulldozer	BLD2	Caterpillar		Diesel			2005	200	0	CHE Diesel					
Crane	203002	American	325	Electric			1980	0	0	CHE Electric					
Crane	217002	Gottwald	330EG	Electric			2006	0	0	CHE Electric					
Crane	218001	Linkbelt	HSP-8015	Diesel	GMC	50435001	1985	334	85	CHE Diesel					
Crane	#1C	Lorain	LRT400	Diesel	Cummins	6BTA5.9	1991	177	262	CHE Diesel					
Electric Pallet Jac	#2	Raymond	112TM-FRE	Electric	Raymond	AC drive m	1997	0	73	CHE Electric					
Electric Pallet Jac	#31	Toyota	8HBE30	Electric	Toyota	AC drive m	2013	0	14	CHE Electric					
Electric Pallet Jac	#32	Toyota	8HBE30	Electric	Toyota	AC drive m	2013	0	39	CHE Electric					
Excavator	108019	Caterpillar	345B	Diesel	Caterpillar	3176C	2002	322	42	CHE Diesel					
Excavator	108020	Caterpillar	345B	Diesel	Caterpillar	3176C	2004	322	116	CHE Diesel					
Excavator	108021	Caterpillar	345CL	Diesel	Caterpillar	C13	2005	371	383	CHE Diesel					
Forklift	#10	Toyota	5FBCH25	Electric	Toyota	AC drive m	1997	0	708	CHE Electric					
Forklift	#11	Toyota	7FBEU15	Electric	Toyota	AC drive m	1995	0	466	CHE Electric					
Forklift	#12	Toyota		Electric	Taylor-Dun	DC Drive M	1995	0	300	CHE Electric					
Forklift	#13	Toyota	7FBEU20	Electric	Toyota	AC drive m	1995	0	343	CHE Electric					
Forklift	#27	Toyota	42-6FGCU18	LPG	Toyota	Toyota 4Y	1995	100	57	CHE Propane					
Forklift	#29	Toyota	42-6FGCU18	LPG	Toyota	Toyota 4Y	1995	100	47	CHE Propane					
Forklift	#30	Toyota	7FBEU15	Electric	Toyota	AC drive m	2013	0	32	CHE Electric					
Forklift	#34	Toyota	8FGU30	LPG	Toyota	4Y ECS	2013	100	2	CHE Propane					
Forklift	#35	Toyota	8FGU30	LPG	Toyota	4Y ECS	2013	100	2	CHE Propane					
Forklift	#4F	Toyota	5FG30	LPG	Toyota	Toyota 4Y	1995	100	291	CHE Propane					
Forklift	#6	Toyota	5FG30	LPG	Toyota	Toyota 4Y	1995	100	255	CHE Propane					
Forklift	#8	Toyota	42-6FGCU18	LPG	Toyota	Toyota 4Y	1995	100	42	CHE Propane					
Forklift	#9	Toyota	5FBE15	Electric	Toyota	AC drive m	1997	0	420	CHE Electric					
Forklift	#33	Raymond		Electric	Raymond	AC drive m	2012	0	293	CHE Electric					
Forklift	601021	Caterpillar	DP150	Diesel	Deutz	TCD2012L0	2010	131	251	CHE Diesel					
Forklift	601022	Caterpillar	DP40	Diesel	Mitsubishi	673Y	1999	60	486	CHE Diesel					
Forklift	601051	Caterpillar	PD10000	Diesel	Mitsubishi	SS-DP	2011	75	260	CHE Diesel					
Forklift	601052	Caterpillar	PD10000	Diesel	Mitsubishi	SS-DP	2011	75	455	CHE Diesel					
Forklift	17501	Mitsubishi	FD80	Diesel	Mitsubishi	6D16-TLE2	2006	117	100	CHE Diesel			1/1/2012		
Forklift	17502	Mitsubishi	FD80	Diesel	Mitsubishi	6D16-TLE2	2006	117	100	CHE Diesel			1/1/2012		
Forklift	40207	Otek	4PC12FS	Diesel	Caterpillar	3126	2006	176	170	CHE Diesel			1/1/2012		
Forklift	40209	Otek	4PC12FS	Diesel	Caterpillar	3126	2006	176	180	CHE Diesel			1/1/2012		
Forklift	40210	Magna Lift	40OB412FS	Diesel	Caterpillar	Tier III	2007	176	150	CHE Diesel			1/1/2012		
Forklift	40211	Magna Lift	40PBL12FS	Diesel	Cummins	OSB 6.7	2007	117	150	CHE Diesel			1/1/2012		
Forklift	40212	Magna Lift	40PBL12FS	Diesel	Cummins	OSB 6.7	2007	117	150	CHE Diesel			1/1/2012		
Forklift	65201	Otek	65RR	Diesel	Caterpillar	3116	2001	176	300	CHE Diesel			1/1/2012		
Forklift	10117	Mitsubishi	FG45K1	LPG	Nissan	TB845L	2006	117	60	CHE Propane					
Forklift	10118	Mitsubishi	FG45K1	LPG	Nissan	TB845L	2006	117	50	CHE Propane					

Port Equip Type	Equip ID	Equip Make	Equip Model	Engine Type	Engine Make	Engine Model	Year	HP	Annual Hours	Category	DOC	DPF level 2	DPF level 3	Vycon	Blue Cat
Forklift	10119	Mitsubishi	FG45K1	LPG	Nissan	TB845L	2006	117	20	CHE Propane					
Forklift	10120	Mitsubishi	FG45K1	LPG	Nissan	TB845L	2006	117	40	CHE Propane					
Forklift	10121	Mitsubishi	FG45K1	LPG	Nissan	TB845L	2006	117	50	CHE Propane					
Forklift	10122	Mitsubishi	FG45K1	LPG	Nissan	TB845L	2006	117	20	CHE Propane					
Forklift	10123	Mitsubishi	FG45K1	LPG	Nissan	TB845L	2006	117	20	CHE Propane					
Forklift	10124	Mitsubishi	FG45K1	LPG	Nissan	TB845L	2006	117	20	CHE Propane					
Forklift	10125	Mitsubishi	FG45K1	LPG	Nissan	TB845L	2006	117	30	CHE Propane					
Forklift	10126	Mitsubishi	FG45K1	LPG	Nissan	TB845L	2006	117	30	CHE Propane					
Forklift	30290	Taylor	THD 300	Diesel	Cummins	B5.9	1990	183	100	CHE Diesel					
Forklift	33000	Taylor	tx-330m	Diesel	Cummins	QSB 6.7	2011	117	200	CHE Diesel					
Forklift	33001	Taylor	tx-330m	Diesel	Cummins	QSB 6.7	2011	117	200	CHE Diesel					
Forklift	33002	Taylor	tx-330m	Diesel	Cummins	QSB 6.7	2011	117	200	CHE Diesel					
Forklift	33003	Taylor	tx-330m	Diesel	Cummins	QSB 6.7	2011	117	200	CHE Diesel					
Forklift	33004	Taylor	tx-330m	Diesel	Cummins	QSB 6.7	2011	117	200	CHE Diesel					
Forklift	33005	Taylor	tx-330m	Diesel	Cummins	QSB 6.7	2011	117	200	CHE Diesel					
Forklift	33006	Taylor	tx-330m	Diesel	Cummins	QSB 6.7	2012	117	200	CHE Diesel					
Forklift	33007	Taylor	tx-330m	Diesel	Cummins	QSB 6.7	2012	117	200	CHE Diesel					
Forklift	33008	Taylor	tx-330m	Diesel	Cummins	QSB 6.7	2012	117	200	CHE Diesel					
Forklift	33009	Taylor	tx-330m	Diesel	Cummins	QSB 6.7	2012	117	200	CHE Diesel					
Forklift	33010	Taylor	tx-330m	Diesel	Cummins	QSB 6.7	2012	117	200	CHE Diesel					
Forklift	33011	Taylor	tx-330m	Diesel	Cummins	QSB 6.7	2012	117	200	CHE Diesel					
Forklift	33012	Taylor	tx-330m	Diesel	Cummins	QSB 6.7	2012	117	200	CHE Diesel					
Forklift	33013	Taylor	tx-330m	Diesel	Cummins	QSB 6.7	2012	117	200	CHE Diesel					
Forklift	40213	Taylor	TXH400L	Diesel	Cummins	6.7	2008	117	150	CHE Diesel					
Forklift	40214	Taylor	TXH400L	Diesel	Cummins	6.7	2008	117	150	CHE Diesel					
Forklift	52208	Otek	52sb12f	Diesel	Caterpillar	3116	1999	175	50	CHE Diesel					
Forklift	55202	Otek	55SC	Diesel	Caterpillar	3116	2000	176	150	CHE Diesel					
Forklift	55203	Otek	55SC	Diesel	Caterpillar	3116	2001	176	100	CHE Diesel					
Forklift	55204	Otek	55SC	Diesel	Caterpillar	3116	2001	176	100	CHE Diesel					
Forklift	29	Hyster	H 210HD	Diesel	Perkins		2005	125	880	CHE Diesel			11/1/2012		
Forklift	30	Hyster	H210D	Diesel			2005	120	1095	CHE Diesel					
Forklift	25F	Hyster	H 210HD	Diesel	Perkins		2005	125	1120	CHE Diesel					
Forklift	26F	Hyster	H210D	Diesel			2005	120	950	CHE Diesel					
Forklift	27	Hyster	H210D	Diesel			2005	120	450	CHE Diesel					
Forklift	31	Hyster	H210D	Diesel			2005	120	990	CHE Diesel					
Forklift	33	Hyster	H 210HD	Diesel	Perkins		2005	125	650	CHE Diesel					
Forklift	24F	Hyster	H210D	Diesel			2005	120	700	CHE Diesel					
Forklift	3E	Hyster	H155XL2D	LPG			2007	120	390	CHE Propane					
Forklift	8D	Hyster	H155XL2D	LPG			2007	120	410	CHE Propane					
Forklift	FL6		H155XL2D	LPG			2007	120	470	CHE Propane					
Forklift	L-1	Linde	H80D	Diesel			2008	125	750	CHE Diesel					
Forklift	L-2	Linde	H80D	Diesel			2008	125	590	CHE Diesel					
Forklift	L-3	Linde	H80D	Diesel			2008	125	660	CHE Diesel					

Port Equip Type	Equip ID	Equip Make	Equip Model	Engine Type	Engine Make	Engine Model	Year	HP	Annual Hours	Category	DOC	DPF level 2	DPF level 3	Vycon	Blue Cat
Forklift	NFLA		H 210HD	LPG			2007	120	610	CHE Propane					
Forklift	LAFL1166	Taylor	25T	Diesel			1979	200	0	CHE Diesel					
Forklift	LAFL1172	Toyota		LPG			1987	122	1	CHE Propane					
Forklift	LAFL1173	Toyota		LPG			1987	122	1	CHE Propane					
Forklift	LAFL1174	Toyota		LPG			1987	122	0	CHE Propane					
Forklift	LAFL1175	Toyota		LPG			1987	122	0	CHE Propane					
Forklift	LAFL1176	Toyota		LPG			1987	122	140	CHE Propane					
Forklift	LAFL1177	Toyota		LPG			1987	122	25	CHE Propane					
Forklift	LAFL1178	Toyota		LPG			1987	122	0	CHE Propane					
Forklift	LAFL1179	Toyota		LPG			1987	122	0	CHE Propane					
Forklift	LAFL1180	Toyota		LPG			1987	122	9	CHE Propane					
Forklift	LAFL1181	Toyota		LPG			1987	122	0	CHE Propane					
Forklift	LAFL1182	Toyota		LPG			1987	122	0	CHE Propane					
Forklift	LAFL1183	Toyota		LPG			1987	122	0	CHE Propane					
Forklift	LAFL1184	Toyota		LPG			1987	122	0	CHE Propane					
Forklift	LAFL1185	Toyota		LPG			1987	122	187	CHE Propane					
Forklift	LAFL1186	Toyota		LPG			1987	122	0	CHE Propane					
Forklift	LAFL1191			LPG			1993	122	146	CHE Propane					
Forklift	LAFL1192			LPG			1995	122	87	CHE Propane					
Forklift	LAFL1193		5000 lb	LPG			1995	122	149	CHE Propane					
Forklift	LAFL3024	TAYLOR	40,000#	Diesel			2008		166	CHE Diesel					
Forklift	LAFL3025	TAYLOR	40,000#	Diesel			2008		297	CHE Diesel					
Forklift	LAFL3026	Toyota	15,000#	LPG			2008		89	CHE Propane					
Forklift	LAFL3027	Toyota	15.000#	LPG			2008		166	CHE Propane					
Forklift	LAFL3028	Toyota	15,000#	LPG			2008		167	CHE Propane					
Forklift	70FP1	Hyster	XL2	Diesel	Hyster	7.5 T	1995	120	250	CHE Diesel					
Forklift	224	Caterpillar	V330B	Diesel	Caterpillar	3208	1985	117	156	CHE Diesel			1/1/2010		
Forklift	523	Toyota	42-3FGC-15	LPG	Toyota	5R	1981	50	12	CHE Propane					
Forklift	3001	Caterpillar	P33000D	Diesel	Caterpillar	6M60-TLA3	2008	148	918	CHE Diesel					
Forklift	3002	Caterpillar	P33000D	Diesel	Caterpillar	6M60-TLA3	2008	148	890	CHE Diesel					
Forklift	3063	Caterpillar	18 F4	Electric			2007	0	0	CHE Electric					
Forklift	6028	Caterpillar	P6000	LPG	Nissan	K21	2004	62	772	CHE Propane					
Forklift	6029	Caterpillar	P6000	LPG	Nissan	K21	2004	62	814	CHE Propane					
Forklift	6032	Caterpillar	P6000	LPG	Nissan		2004	62	604	CHE Propane					
Forklift	6045	Caterpillar	P6000	LPG	Nissan	K21	2004	43	308	CHE Propane					
Forklift	6046	Caterpillar	P6000	LPG	Nissan	K21	2004	43	459	CHE Propane					
Forklift	F-105-30	Mitsubishi	FD135D	Diesel	Mitsubishi	6D16 TLE2(	2005	131	123	CHE Diesel			1/1/2010		
Forklift	F128.35			Diesel		QSB 6.7	2013	173	166	CHE Diesel			1/1/2010		
Forklift	F-93.11	Caterpillar	DP50K-D	Diesel	Mitsubishi	S6S	2004	84	295	CHE Diesel			1/1/2010		
Forklift	F-94.11	Caterpillar	DP50K-D	Diesel	Mitsubishi	S6S	2004	84	257	CHE Diesel			1/1/2010		
Forklift	F95.11	Caterpillar	DP50K-D	Diesel	Mitsubishi	S6S	2004	84	329	CHE Diesel			1/1/2010		
Forklift	F96.11	Caterpillar	DP50K-D	Diesel	Mitsubishi	S6S	2004	84	194	CHE Diesel			1/1/2010		
Forklift	F-98.30	Kalmar	DCE140-6	Diesel	Cummins	QSB-185C	2004	185	69	CHE Diesel			1/1/2010		

Port Equip Type	Equip ID	Equip Make	Equip Model	Engine Type	Engine Make	Engine Model	Year	HP	Annual Hours	Category	DOC	DPF level 2	DPF level 3	Vycon	Blue Cat
Forklift	F99.11	Caterpillar	DP50K-D	Diesel	Mitsubishi	S6S	2004	84	421	CHE Diesel			1/1/2010		
Forklift	F100.11	Caterpillar	DP50K-D	Diesel	Mitsubishi	S6S	2004	84	263	CHE Diesel			1/1/2013		
Forklift	F-106-30	Mitsubishi	FD135D	Diesel	Mitsubishi	6D16 TLE2(	2005	131	303	CHE Diesel			1/1/2013		
Forklift	F118.11	Catepillar		Diesel	Mitsubishi	DP50K-2	2008	64	151	CHE Diesel			1/1/2013		
Forklift	F-88.30	Taylor	QSB-155C	Diesel	Cummins	QSB-155C	2003	155	0	CHE Diesel			1/1/2013		
Forklift	F-89.30	Taylor	QSB-155C	Diesel	Cummins	QSB-155C	2003	155	1205	CHE Diesel			1/1/2013		
Forklift	F-97.30	Kalmar	DCE140-6	Diesel	Cummins	QSB-185C	2004	185	1286	CHE Diesel			8/2/2007		
Forklift	F-117.36	Taylor		Diesel	Cummins	QSB 6.7	2007	160	1613	CHE Diesel					
Forklift	F129.5			LPG		QSB 6.7	2013	74	208	CHE Propane					
Forklift	F130.5			LPG		QSB 6.7	2013	74	84	CHE Propane					
Forklift	F131.5			LPG		QSB 6.7	2013	74	72	CHE Propane					
Forklift	F132.5			LPG		QSB 6.7	2013	74	100	CHE Propane					
Forklift	F133.5			LPG		QSB 6.7	2013	74	95	CHE Propane					
Forklift	F-42.8	Toyota		LPG	Toyota		1976	120	20	CHE Propane					
Forklift	F-44.5	Toyota		LPG	Toyota		1983	120	21	CHE Propane					
Forklift	F-45.5	Toyota		LPG	Toyota		1983	120	3	CHE Propane					
Forklift	F-46.5	Toyota		LPG	Toyota		1983	120	13	CHE Propane					
Forklift	F-48.4	Toyota		LPG	Toyota		1984	120	10	CHE Propane					
Forklift	F-49.4	Toyota		LPG	Toyota		1985	120	18	CHE Propane					
Forklift	F-55.4	Toyota		LPG	Toyota		1984	120	0	CHE Propane					
Forklift	F-56.5	Toyota	FECO6001	LPG	Toyota		1984	120	7	CHE Propane					
Forklift	F-57.5	Toyota	FECO6055	LPG	Toyota		1988	120	20	CHE Propane					
Forklift	F-61.40	Taylor	TE450	Diesel	Cummins	6CT8.3-C	1992	210	17	CHE Diesel					
Forklift	F-78.25	Hyster		Diesel	Perkins	T6.3544	1999	135	14	CHE Diesel					
Forklift	F-79.10	Toyota	7FGCU45	LPG	Toyota		2001	120	34	CHE Propane					
Forklift	6001			Gasoline			2013		0	CHE Gasoline					
Forklift	7001			Gasoline			2013		0	CHE Gasoline					
Forklift	8012			Diesel			1990		0	CHE Diesel					
Forklift	8029			Diesel					124	CHE Diesel					
Forklift	8031			Diesel					351	CHE Diesel					
Forklift	8032			Diesel					438	CHE Diesel					
Forklift	8101	Mitsubishi	FG35	LPG			1983		87	CHE Propane					
Forklift	8210			Gasoline			2012		213	CHE Gasoline					
Forklift	30292	Taylor	TY300M	Diesel	Cummins	B5.9C	1999	165	415	CHE Diesel					
Forklift	30294	Taylor	T300M	Diesel	Cummins	B5.9C	2003	165	463	CHE Diesel	12/31/2006				
Forklift	30296	Taylor	T300M	Diesel	Cummins	QSB5.9	2004	165	506	CHE Diesel					
Forklift	30298	Taylor	TX-300M	Diesel			2007	117	100	CHE Diesel					
Forklift	L8021			Diesel			1991	117	76	CHE Diesel					
Forklift	30202	Taylor	TE300M	Diesel	Cummins	B5.9	2001	165	813	CHE Diesel					
Forklift	30203	Taylor	TE300M	Diesel	Cummins	B5.9	2006	165	2347	CHE Diesel					
Forklift	30204			Diesel			2012	165	1460	CHE Diesel					
Forklift	5240			LPG			1990		72	CHE Propane					
Forklift	6002			Gasoline			2013		1	CHE Gasoline					

Port Equip Type	Equip ID	Equip Make	Equip Model	Engine Type	Engine Make	Engine Model	Year	HP	Annual Hours	Category	DOC	DPF level 2	DPF level 3	Vycon	Blue Cat
Forklift	6003			Gasoline			2013		1	CHE Gasoline					
Forklift	6004			Gasoline			2013		1	CHE Gasoline					
Forklift	7005			Gasoline			2013		2	CHE Gasoline					
Forklift	7006			Gasoline			2013		2	CHE Gasoline					
Forklift	7008			Gasoline			2013		1	CHE Gasoline					
Forklift	7010			Gasoline			2013		3	CHE Gasoline					
Forklift	8020			Gasoline			2012		510	CHE Gasoline					
Forklift	8023			Diesel					515	CHE Diesel					
Forklift	8024	Mitsubishi	FD40	Diesel	Mitsubsihi	S6E	2004	81	516	CHE Diesel					
Forklift	6412			Diesel					89	CHE Diesel					
Forklift	6413			Diesel					284	CHE Diesel					
Forklift	8025			Diesel					669	CHE Diesel					
Forklift	8026			Diesel					141	CHE Diesel					
Forklift	8027			Diesel					388	CHE Diesel					
Forklift	8030			Diesel					77	CHE Diesel					
Forklift	30291	Taylor	TY300M	Diesel	Cummins	6BT 5.9L-C	1999	165	2221	CHE Diesel	6/26/2005				
Forklift	30293	Taylor	TY300M	Diesel	Cummins	6BT 5.9L-C	2003	156	1609	CHE Diesel	6/26/2005				
Forklift	30295	Taylor	T-300M	Diesel			2004	160	2073	CHE Diesel	6/26/2005				
Forklift	30297	Taylor	T-300M	Diesel			2005	160	2174	CHE Diesel	6/26/2005				
Forklift	35201			Diesel			2010		492	CHE Diesel					
Forklift	68	Mitsubishi	FG30B	LPG	Mitsubishi	FG 30	2000	54	191	CHE Propane					
Forklift	69	Mitsubishi	FG30B	LPG	Mitsubishi	FG 30	2000	54	380	CHE Propane					
Forklift	70	Mitsubishi	FG30B	LPG	Mitsubishi	FG 30	2000	54	585	CHE Propane					
Forklift	71	Mitsubishi	FG30B	LPG	Mitsubishi	FG 30	2000	54	237	CHE Propane					
Forklift	72	Mitsubishi	FG30B	LPG	Mitsubishi	FG 30	2000	54	89	CHE Propane					
Forklift	73	Mitsubishi	FD30N-D	Diesel	Mitsubishi		2006	50	746	CHE Diesel					
Forklift	74	Mitsubishi	FD30N-D	Diesel	Mitsubishi		2006	50	787	CHE Diesel					
Forklift	306	Taylor	THD300	Diesel	Cummins	C 5.9-C (6 E	2000	160	143	CHE Diesel	10/2/2003				
Forklift	307	Taylor	THDH350	Diesel	Cummins	C 5.9-C (6 E	2001	160	156	CHE Diesel	10/5/2003				
Forklift	308	Taylor	TH350L	Diesel	Cummins	C 5.9-C (6 E	2005	160	1551	CHE Diesel	10/2/2003				
Forklift	309	Taylor	TH350L	Diesel	Cummins	C 5.9-C (6 E	2006	160	1345	CHE Diesel	10/5/2003				
Forklift	2069	Taylor	TX360M	Diesel			2007		181	CHE Diesel			12/1/2011		
Forklift	3016	Taylor	T520M	Diesel			2008		132	CHE Diesel			12/1/2011		
Forklift	1005	Hyster	H100XM	Diesel		5 tons	2002	117	419	CHE Diesel					
Forklift	1006	Hyster	H100XM	Diesel		5 tons	2002	117	190	CHE Diesel					
Forklift	1007	Hyster	H100XM	LPG			2002	117	431	CHE Propane					
Forklift	1008	Hyster	H100XM	LPG			2002	117	527	CHE Propane					
Forklift	1012	Yale		Diesel			2003	117	52	CHE Diesel					
Forklift	1313	Toyota		Diesel			1994	117	65	CHE Diesel					
Forklift	1801	Yale	GLP100	Diesel		5 tons	2005	117	575	CHE Diesel					
Forklift	1802	Yale	GLP100	Diesel		5 tons	2005	117	200	CHE Diesel					
Forklift	2009	Taylor		Diesel	Cummins	B5.9L	2002	173	1619	CHE Diesel	6/25/2005				
Forklift	2010	Taylor	THD360L	Diesel	Cummins	B5.9L	2002	173	611	CHE Diesel	6/25/2005				

Port Equip Type	Equip ID	Equip Make	Equip Model	Engine Type	Engine Make	Engine Model	Year	HP	Annual Hours	Category	DOC	DPF level 2	DPF level 3	Vycon	Blue Cat
Forklift	2793	Taylor	TH350L	Diesel		18 tons	2005	150	937	CHE Diesel					
Forklift	2794	Taylor	TH350L	Diesel		18 tons	2005	150	823	CHE Diesel					
Forklift	30101	Yale	GLP100	Diesel			2012	117	0	CHE Diesel					
Forklift	H80XM	Hyster	H80XM	LPG	GM	6 cyl	2004	94	120	CHE Propane					
Forklift	1421	Wiggins	WD 520YXL-	Diesel	Cummins	6BTA5.9	1998	177	203	CHE Diesel			12/31/2009		
Forklift	1085	Taylor	TE1555	Diesel	Isuzu	4BD1PW	1993	31	214	CHE Diesel			4/1/2010		
Forklift	426	Allis Chalm	ACC 120 L2P	LPG			1987	78	55	CHE Propane					
Forklift	521	Toyota	42-4FCC15 (	LPG			1985	60	55	CHE Propane					
Forklift	544	Toyota	42-4FCC20 (	LPG			1985	60	78	CHE Propane					
Forklift	6016	Caterpillar	GP30K	LPG			2000	62	194	CHE Propane					
Forklift	6017	Caterpillar	GP30K	LPG			2000	62	109	CHE Propane					
Forklift	6043	Catepillar	P6000-LP	LPG			2004	62	84	CHE Propane					
Forklift	6057	Daewoo	G30P	LPG			1999	46	276	CHE Propane					
Forklift	leased3	Toyota	8FGU30	LPG	Toyota	4Y	2010	47	1150	CHE Propane					
Forklift	owned2	Toyota	7FGU25	LPG	Toyota	F2	2006	46	300	CHE Propane					
Forklift	owned3	Toyota	7FGU25	LPG	Toyota	F2	2006	46	900	CHE Propane					
Forklift	owned5	Toyota	8FGU30	LPG	Toyota	4Y-ECS	2008	62	1400	CHE Propane					
Forklift	FL100			Electric			2006	0	0	CHE Electric					
Forklift	FLBD100A	Hyster	S155XL	LPG		11.5 T	2000	100	200	CHE Propane					
Forklift	FLBD100B	Hyster	S155XL	LPG		11.5 T	2000	100	200	CHE Propane					
Forklift	FLBD100C	Komatsu		LPG			2004	50	1500	CHE Propane					
Forklift	LGB17	Hyster	S80XM	LPG		7.5T	2002	80	500	CHE Propane					
Forklift	LGB18	Hyster	S80XM	LPG		7.5T	2002	80	500	CHE Propane					
Forklift	LGB19	Hyster	S80XM	LPG		7.5T	2002	80	500	CHE Propane					
Forklift	LGB20	Hyster	S80XM	LPG		7.5T	2002	80	500	CHE Propane					
Forklift	LGB21	Hyster	S80XM	LPG		7.5T	2002	80	500	CHE Propane					
Forklift	LGB22	Hyster	S120XM	LPG		5 T	2002	50	1500	CHE Propane					
Forklift	LGB23	Hyster	S120XM	LPG		5 T	2002	50	1500	CHE Propane					
Forklift	LGB24	Hyster	S120XM	LPG		5 T	2002	50	1500	CHE Propane					
Forklift	LGB25	Hyster	S120XM	LPG		5 T	2002	50	1500	CHE Propane					
Forklift	LGB26	Hyster	S120XM	LPG		5 T	2002	50	1500	CHE Propane					
Forklift	LGB27	Hyster	S120XM	LPG		5 T	2002	50	1500	CHE Propane					
Forklift	LGB28	Hyster	S120XM	LPG		5 T	2002	50	1500	CHE Propane					
Forklift	1	Hyster	S60XL	LPG		3T	1995	50	0	CHE Propane					
Forklift	2	Hyster	S60XM	LPG		7T	1999	80	0	CHE Propane					
Forklift	3	Hyster	S135XL	LPG		7.5T	1995	80	0	CHE Propane					
Forklift	4	Hyster	S155XL	LPG		7.5T	1999	80	0	CHE Propane					
Forklift	5	Hyster	S155XL	LPG		7.5T	1999	80	0	CHE Propane					
Forklift	6	Hyster	S155XL	LPG		7.5T	1996	80	0	CHE Propane					
Forklift	7	Hyster	S155XL	LPG		7.5T	1999	80	0	CHE Propane					
Forklift	8	Hyster	S155XL	LPG		7.5T	1996	80	0	CHE Propane					
Forklift	10	Hyster	S155XL	LPG		7.5T	1999	80	0	CHE Propane					
Forklift	15	Hyster	S155XL	LPG		7.5T	1998	80	0	CHE Propane					

Port Equip Type	Equip ID	Equip Make	Equip Model	Engine Type	Engine Make	Engine Model	Year	HP	Annual Hours	Category	DOC	DPF level 2	DPF level 3	Vycon	Blue Cat
Forklift	16	Toyota	355	LPG		2.5T	2005	50	0	CHE Propane					
Forklift	17	Hyster	S155XL2	LPG			2006	80	0	CHE Propane					
Forklift	25	Hyster	S80FTBCS	LPG			2007	50	0	CHE Propane					
Forklift	115	Hyster	S60XH	LPG		3T	1999	50	0	CHE Propane					
Forklift	931	Bobcat	742	LPG			1988	100	0	CHE Propane					
Forklift	11F	Hyster	H110XL	LPG		5.5T	1999	50	0	CHE Propane					
Forklift	12F	Hyster	S155XL	LPG		7.5T	2001	80	0	CHE Propane					
Forklift	13F	Hyster	S155XL	LPG		7.5T	1996	80	0	CHE Propane					
Forklift	FL4500		4,500 lbs	Diesel			1996	50	15	CHE Diesel					
Forklift	FLBL20			LPG			1995	120	624	CHE Propane					
Forklift	FLBL	Hyster		Diesel			1995	60	520	CHE Diesel					
Forklift	FLBL50A	Hyster	H35xm	LPG	Case	5T	1995	45	52	CHE Propane					
Forklift	FLBL50B	Toyota	7Fgu25	LPG	Toyota	5T	2004	50	52	CHE Propane					
Forklift	Sause2	Hyster	H210HD	Diesel			2003	155	560	CHE Diesel			1/1/2013		
Forklift	Sause3	Hyster	H210HD	Diesel			2003	155	560	CHE Diesel			1/1/2013		
Loader	306019	Caterpillar	966G	Diesel	Caterpillar	3176C	2005	259	81	CHE Diesel			9/8/2010		
Loader	308009	Caterpillar	980H	Diesel	Caterpillar	C15	2008	349	389	CHE Diesel					
Loader	70L1	Catepillar	950B	Diesel	Caterpillar		1985	200	250	CHE Diesel					
Loader	70L2	Catepillar	980G	Diesel	Caterpillar		2002	200	2000	CHE Diesel					
Loader	#4LD	Catepillar	980H	Diesel	Caterpillar	3406E	2006	318	1171	CHE Diesel			6/10/2010		
Loader	#3LD	Catepillar	980H	Diesel	Caterpillar	3406E	2006	318	1221	CHE Diesel			8/17/2010		
Loader	#5LD	Catepillar	980H	Diesel	Caterpillar	C15	2008	349	1098	CHE Diesel			1/12/2011		
Loader	#6LD	Catepillar	980H	Diesel	Caterpillar	C15	2008	349	1096	CHE Diesel			1/21/2011		
Loader	#7LD	Catepillar	980H	Diesel	Caterpillar	C15	2008	349	1901	CHE Diesel			1/27/2011		
Loader	#8LD	Caterpillar	980K	Diesel	Caterpillar	C13	2012	402	2101	CHE Diesel					
Loader	leased5	Caterpillar	972H	Diesel	Caterpillar	3136	2009	270	1700	CHE Diesel			12/31/2010		
Loader	10059	Kubota	R520S	Diesel			2003	50	1500	CHE Diesel					
Loader	933	Caterpillar	IT12	Diesel			1989	200	0	CHE Diesel					
Man Lift	1004004	JLG	600S	Diesel	Perkins	404-22T	2009	62	160	CHE Diesel					
Man Lift	1004011	JLG	1200SJP	Diesel	Deutz	TD2011L04	2008	75	130	CHE Diesel					
Man Lift	SC-139			Diesel			2013	62	462	CHE Diesel					
Man Lift	SC-99			Diesel			2013	74	339	CHE Diesel					
Man Lift	2600001	JLG	600S	Diesel	Deutz	F4M-1011F	2005	48	269	CHE Diesel					
Man Lift	ML	Genie	S-85	Diesel			2009			CHE Diesel					
Material Handler	123007	Liebherr	R954C-HD	Diesel	Liebherr	D936L	2008	322	489	CHE Diesel			4/11/2011		
Material Handler	110003	Caterpillar	375-L	Diesel	Caterpillar	C15	2008	717	183	CHE Diesel			6/22/2011		
Material Handler	108031	Caterpillar	345CMH	Diesel	Caterpillar	C13	2005	371	717	CHE Diesel			9/15/2011		
Material Handler	110006	Caterpillar	375 L	Diesel	Caterpillar	3406B	2001	428	95	CHE Diesel					
Material Handler	110008	Caterpillar	375L	Electric	Reliance		1995	0	0	CHE Electric					
Miscellaneous	#19	JLG	600S	LPG	JLG	GM Vortec	1998		246	CHE Propane					
Miscellaneous	#20	JLG	1932E2	Electric	JLG	AC drive m	2000	0	0	CHE Electric					
Miscellaneous	#21	JLG	1932E2	Electric	JLG	AC drive m	2001	0	0	CHE Electric					
Miscellaneous	#22	JLG	1930ES	Electric	JLG	AC drive m	2003	0	0	CHE Electric					

Port Equip Type	Equip ID	Equip Make	Equip Model	Engine Type	Engine Make	Engine Model	Year	HP	Annual Hours	Category	DOC	DPF level 2	DPF level 3	Vycon	Blue Cat
Miscellaneous	3201005	Lindeman	PA75	Electric			1994	0		CHE Electric					
Miscellaneous	3701006	Al John		Electric			2008	0	0	CHE Electric					
Miscellaneous	SC-123	Peco		Diesel	Kubota		2010	13	131	CHE Diesel					
Miscellaneous	SC-124	Peco		Diesel	Kubota		2010	13	715	CHE Diesel					
Rail pusher	3501011	RailKing	RK 330	Diesel	Cummins	QSB6.7 195	2013	195		CHE Diesel					
Rail pusher	SC-138			Diesel			2013	150	512	CHE Diesel					
Rail pusher	SC-140			Diesel			2013	260	163	CHE Diesel					
Rail pusher	SC-58	TRKMOB	TA 855-13	Diesel	Cummins	TA 855-13	1997	100	76	CHE Diesel					
Rail pusher	SC-68	SHTLWGN	SWX605BE	Diesel	Caterpillar	3126	2003	300	585	CHE Diesel					
Rub-trd Gantry C	TT-28	MIT-Pacec	KTA 19	Diesel	Deutz	BF8M 105	2005	553	1592	CHE Diesel		1/1/2012			
Rub-trd Gantry C	TT-29	MIT-Pacec	KTA 19	Diesel	Deutz	KTA 19	2005	553	2538	CHE Diesel		1/1/2012			
Rub-trd Gantry C	TT-30	MIT-Pacec	KTA 19	Diesel	Deutz	KTA 19	2005	553	1941	CHE Diesel		1/1/2012			
Rub-trd Gantry C	TT-31	MIT-Pacec	KTA 19	Diesel	Deutz	KTA 19	2005	553	2415	CHE Diesel		1/1/2012			
Rub-trd Gantry C	TT-32	MIT-Pacec	KTA 19	Diesel	Deutz	KTA 19	2005	553	2468	CHE Diesel		1/1/2012		1/1/2010	
Rub-trd Gantry C	TT-33	MIT-Pacec	KTA 19	Diesel	Deutz	KTA 19	2005	553	3596	CHE Diesel		1/1/2012		1/1/2010	
Rub-trd Gantry C	TT-34	MIT-Pacec	KTA 19	Diesel	Deutz	KTA 19	2005	553	3400	CHE Diesel		1/1/2012		1/1/2010	
Rub-trd Gantry C	TT-35	MIT-Pacec	KTA 19	Diesel	Deutz	KTA 19	2005	553	3462	CHE Diesel		1/1/2012		9/1/2006	
Rub-trd Gantry C	TT-36	MIT-Pacec	KTA 19	Diesel	Deutz	KTA 19	2005	553	3920	CHE Diesel		1/1/2012		1/1/2010	
Rub-trd Gantry C	TT-37	MIT-Pacec	KTA 19	Diesel	Deutz	KTA 19	2005	553	3869	CHE Diesel		1/1/2012		1/1/2010	
Rub-trd Gantry C	TT-38	Mitsui		Diesel	Caterpillar	C15	2011	528	2984	CHE Diesel					
Rub-trd Gantry C	TT-39	Mitsui		Diesel	Caterpillar	C15	2011	528	2948	CHE Diesel					
Rub-trd Gantry C	TT-40	Mitsui		Diesel	Caterpillar	C15	2011	528	2918	CHE Diesel					
Rub-trd Gantry C	ZT35	ZPMC	RC50.8/66	Diesel	Caterpillar	3412	2005	1043	1529	CHE Diesel			2/15/2013		
Rub-trd Gantry C	ZT34	ZPMC	RC50.8/66	Diesel	Caterpillar	3412	2005	1043		CHE Diesel			3/15/2013		
Rub-trd Gantry C	ZT14	ZPMC	RC50.8/66	Diesel	Caterpillar	3412	2004	1043	2584	CHE Diesel			3/20/2013		
Rub-trd Gantry C	ZT15	ZPMC	RC50.8/66	Diesel	Caterpillar	3412	2004	1043	2766	CHE Diesel			3/26/2013		
Rub-trd Gantry C	ZT13	ZPMC	RC50.8/66	Diesel	Caterpillar	3412	2004	1043	1891	CHE Diesel			3/29/2013		
Rub-trd Gantry C	ZT20	ZPMC	RC50.8/66	Diesel	Caterpillar	2WJ1-UP	2002	946	1091	CHE Diesel			4/25/2013		
Rub-trd Gantry C	ZT04	ZPMC	RC50.8/66	Diesel	Caterpillar	2WJ1-UP	2002	946	199	CHE Diesel			4/29/2013		
Rub-trd Gantry C	ZT05	ZPMC	RC50.8/66	Diesel	Caterpillar	2WJ1-UP	2002	946	301	CHE Diesel			4/30/2013		
Rub-trd Gantry C	ZT12	ZPMC	RC50.8/66	Diesel	Caterpillar	3412	2004	1043	3057	CHE Diesel					
Rub-trd Gantry C	ZT37	ZPMC	RC50.8/66	Diesel	Caterpillar	3412	2005	1043	2013	CHE Diesel			4/22/2013		
Rub-trd Gantry C	ZT36	ZPMC	RC50.8/66	Diesel	Caterpillar	3412	2005	1043	2560	CHE Diesel			4/24/2013		
Rub-trd Gantry C	ZT11	ZPMC	RC50.8/66	Diesel	Caterpillar	3412	2004	1043	1644	CHE Diesel			4/26/2013		
Rub-trd Gantry C	ZT19			Diesel			2002		2560	CHE Diesel			4/26/2013		
Rub-trd Gantry C	ZT06	ZPMC	RC50.8/66	Diesel	Caterpillar	3412	2003	946	1918	CHE Diesel					
Rub-trd Gantry C	ZT07	ZPMC	RC50.8/66	Diesel	Caterpillar	3412	2003	946	1191	CHE Diesel					
Rub-trd Gantry C	ZT08	ZPMC	RC50.8/66	Diesel	Caterpillar	3412	2004	1043	2333	CHE Diesel					
Rub-trd Gantry C	ZT09	ZPMC	RC50.8/66	Diesel	Caterpillar	3412	2004	1043	2356	CHE Diesel					
Rub-trd Gantry C	ZT10	ZPMC	RC50.8/66	Diesel	Caterpillar	3412	2004	1043	2865	CHE Diesel					
Rub-trd Gantry C	02-014	ZPMC	RC40	Diesel	Cummins	KTA 19 G4	2001	680	0	CHE Diesel					
Rub-trd Gantry C	02-015	ZPMC	RC40	Diesel	Cummins	KTA 19 G4	2012	680	1908	CHE Diesel					
Rub-trd Gantry C	02-016	ZPMC	RC40	Diesel	Cummins	KTA 19 G4	2012	680	1956	CHE Diesel					

Port Equip Type	Equip ID	Equip Make	Equip Model	Engine Type	Engine Make	Engine Model	Year	HP	Annual Hours	Category	DOC	DPF level 2	DPF level 3	Vycon	Blue Cat
Rub-trd Gantry C	02-017	ZPMC	RC40	Diesel	Cummins	KTA 19 G4	2011	680	886	CHE Diesel					
Rub-trd Gantry C	02-018	ZPMC	RC40	Diesel	Cummins	KTA 19 G4	2012	680	1450	CHE Diesel					
Rub-trd Gantry C	02-019	ZPMC	RC40	Diesel	Cummins	KTA 19 G4	2011	680	670	CHE Diesel					
Rub-trd Gantry C	02-024	ZPMC	RC6156	Diesel	Cummins	QSK23-G1	2012	815	1496	CHE Diesel					
Rub-trd Gantry C	02-025	ZPMC	RC6156	Diesel	Cummins	QSK23-G1	2012	815	1180	CHE Diesel					
Rub-trd Gantry C	02-026	ZPMC	RC6156	Diesel	Cummins	QSK23-G1	2012	815	1191	CHE Diesel					
Rub-trd Gantry C	02-027	ZPMC	RC6156	Diesel	Cummins	QSK23-G1	2012	815	967	CHE Diesel					
Rub-trd Gantry C	02-028	ZPMC	RC6156	Diesel	Cummins	QSK23-G1	2012	815	1264	CHE Diesel					
Rub-trd Gantry C	02-029	ZPMC	RC6156	Diesel	Cummins	QSK23-G1	2012	815	1204	CHE Diesel					
Rub-trd Gantry C	3RTG	ZPMC	RC40.6/64	Diesel	Cummins	KTA19	1999	615	56	CHE Diesel			6/24/2013		
Rub-trd Gantry C	8RTG	ZPMC	RC40.6/64	Diesel	Cummins	KTA19	1998	615	1553	CHE Diesel			10/21/2013		
Rub-trd Gantry C	7RTG	ZPMC	RC40.6/64	Diesel	Cummins	KTA19	1998	615	1928	CHE Diesel			11/1/2013		
Rub-trd Gantry C	6RTG	ZPMC	RC40.6/64	Diesel	Cummins	KTA19	1998	615	1841	CHE Diesel			11/4/2013		
Rub-trd Gantry C	11RTG	ZPMC	RC40.6/64	Diesel	Cummins	KTA19	1998	615	1075	CHE Diesel			11/22/2013		
Rub-trd Gantry C	10RTG	ZPMC	RC40.6/64	Diesel	Cummins	KTA19	1998	615	1572	CHE Diesel			12/27/2013		
Rub-trd Gantry C	14RTG	ZPMC	RC40.6/64	Diesel	Cummins	NTA855	2005	515	2524	CHE Diesel					
Rub-trd Gantry C	15RTG	ZPMC	RC40.6/64	Diesel	Cummins	NTA855	2005	515	2168	CHE Diesel					
Rub-trd Gantry C	18RTG	Paceco	RT 4023-81-	Diesel	Cummins	NTA855	2005	515	2721	CHE Diesel					
Rub-trd Gantry C	1RTG	ZPMC	RC40.6/64	Diesel	Cummins	KTA19	1998	615	1325	CHE Diesel					
Rub-trd Gantry C	20RTG	Paceco	RT 4023-81-	Diesel	Cummins	NTA855	2005	515	3484	CHE Diesel					
Rub-trd Gantry C	21RTG	Paceco	RT 4023-81-	Diesel	Cummins	NTA855	2005	515	3596	CHE Diesel					
Rub-trd Gantry C	22RTG	Paceco	RT 4023-81-	Diesel	Cummins	NTA855	2005	515	3606	CHE Diesel					
Rub-trd Gantry C	23RTG	Paceco	RT 4023-81-	Diesel	Cummins	NTA855	2005	515	3449	CHE Diesel					
Rub-trd Gantry C	24RTG	Paceco	RT 4023-81-	Diesel	Cummins	NTA855	2006	515	3606	CHE Diesel					
Rub-trd Gantry C	25RTG	Paceco	RT 4023-81-	Diesel	Cummins	NTA855	2006	515	3272	CHE Diesel					
Rub-trd Gantry C	26RTG	Paceco	RT 4023-81-	Diesel	Cummins	NTA855	2006	515	4070	CHE Diesel					
Rub-trd Gantry C	27RTG	Paceco	RT 4023-81-	Diesel	Cummins	NTA855	2006	515	3430	CHE Diesel					
Rub-trd Gantry C	2RTG	ZPMC	RC40.6/64	Diesel	Cummins	KTA19	1999	615	1457	CHE Diesel					
Rub-trd Gantry C	4RTG	ZPMC	RC40.6/64	Diesel	Cummins	KTA19	2007	615	1850	CHE Diesel					
Rub-trd Gantry C	5RTG	ZPMC	RC40.6/64	Diesel	Cummins	KTA19	2007	615	1479	CHE Diesel					
Rub-trd Gantry C	9RTG	ZPMC	RC40.6/64	Diesel	Cummins	KTA19	1998	615	923	CHE Diesel					
Side pick	F-58.12.5	Taylor	C 5.9-C	Diesel	Detroit	453	1982	120	22	CHE Diesel	6/1/2004				
Side pick	15264	Taylor	TECSP157/8	Diesel	Cummins	B5.9C	2002	205	456	CHE Diesel			3/2/2013		
Side pick	15260	Taylor	TECSP157/8	Diesel	Cummins	B5.9C	2000	205	345	CHE Diesel			4/4/2013		
Side pick	15262	Taylor	TECSP157/8	Diesel	Cummins	B5.9C	2000	205	173	CHE Diesel			4/4/2013		
Side pick	15263	Taylor		Diesel				205	140	CHE Diesel			5/2/2013		
Side pick	15265	Taylor	TECSP157/8	Diesel	Cummins	QSBB5.9C	2006	205	1089	CHE Diesel			5/2/2013		
Side pick	15266	Taylor	TECSP157/8	Diesel	Cummins	QSBB5.9C	2006	205	449	CHE Diesel			5/2/2013		
Side pick	15251	Taylor	TECSP157-8	Diesel	Cummins	B5.9C	2000	205	278	CHE Diesel			5/13/2013		
Side pick	15255	Taylor	TECSP157-8	Diesel	Cummins	QSB5.9	2003	205	1157	CHE Diesel			6/6/2013		
Side pick	15256	Taylor	TECSP157-8	Diesel	Cummins	QSB5.9	2005	205	123	CHE Diesel			6/6/2013		
Side pick	15252	Taylor	TECSP157-8	Diesel	Cummins	B5.9C	2000	205	763	CHE Diesel			6/21/2013		
Side pick	15253	Taylor	TECSP157-8	Diesel	Cummins	B5.9C	2000	205	1430	CHE Diesel			6/21/2013		

Port Equip Type	Equip ID	Equip Make	Equip Model	Engine Type	Engine Make	Engine Model	Year	HP	Annual Hours	Category	DOC	DPF level 2	DPF level 3	Vycon	Blue Cat
Side pick	15254	Taylor	TECSP157-8	Diesel	Cummins	B5.9C	2000	205	1937	CHE Diesel			6/21/2013		
Side pick	15257	Taylor	TECSP157-8	Diesel			2011	205	2778	CHE Diesel					
Side pick	317	Fantuzzi	FDC 25K7	Diesel	Cummins	C 5.9-C (6 E	2003	152	1191	CHE Diesel			12/2/2010		
Side pick	318	Fantuzzi	FDC 25K7	Diesel	Cummins	QSC 8.3	2003	240	1048	CHE Diesel			12/10/2010		
Side pick	319	Fantuzzi	FDC 25K7	Diesel	Cummins	QSC 8.3	2003	240	1528	CHE Diesel			12/15/2010		
Side pick	320	Fantuzzi	FDC 25K7	Diesel	Cummins	QSC 8.3	2005	240	2375	CHE Diesel			12/17/2010		
Side pick	321	Fantuzzi	FDC 25K7	Diesel	Cummins	QSC 8.3	2005	240	2268	CHE Diesel			12/22/2010		
Skid Steer Loade	705035	Caterpillar	252B	Diesel	Mitsubishi	3044C	2007	70	60	CHE Diesel					
Skid Steer Loade	#2S	Bobcat	S130	Diesel	Kubota	V2403	2008	49	2576	CHE Diesel					
Sweeper	#25	Tennant	800	LPG	Tennant	Gas/LP Ford 2.3 liter			37	CHE Propane					
Sweeper	#26	Tennant	5700XP	Electric	Tennant	AC drive motor		0	50	CHE Electric					
Sweeper	1208001	TYMCO	210	Diesel	Caterpillar		2004	39		CHE Diesel					
Sweeper	SW18	Edgen		LPG			1982	135	20	CHE Propane					
Sweeper	SW#2			LPG			2004	125	600	CHE Propane					
Sweeper	SC-65	Elgin	LT 10-C	Diesel	Cummins	ISB205	2001	100	0	CHE Diesel					
Sweeper	SC-93	International		Diesel	Maxxforce		2009	230	552	CHE Diesel					
Sweeper	SW-21	Schwarze	S3481	Diesel	Isuzu	4HEZXS	2002	190		CHE Diesel					
Sweeper	63	Mitsubishi	FG30B	Gasoline	Mitsubishi	FG 30	1994			CHE Gasoline					
Sweeper	102	Tennant	810	Diesel			2001	114	500	CHE Diesel					
Sweeper	103	Elgin	Pelican	Diesel	John Deere	4045TE270	2006	114	500	CHE Diesel					
Sweeper	23007	Tennant	Centurion	Diesel			2005	180	105	CHE Diesel					
Sweeper	SW20DN	Elgin	Internationa	Diesel	Internation	Max Force	2009	210	540	CHE Diesel					
Sweeper	V541	Johnson	VT650	Diesel	Cummins	ISB 200	2006	200		CHE Diesel					
Sweeper	owned6	Tennant	S30	LPG	GM	1.6L	2013	55	120	CHE Propane					
Sweeper	SW100	Tennant		LPG			2005	50	200	CHE Propane					
Sweeper	14S	Tennant	355	LPG			1996	50	0	CHE Propane					
Sweeper	21SW	Tennant	8410	LPG			2005	50	0	CHE Propane					
Top handler	TH1000	TAYLOR	75000#	Diesel			1979	174	50	CHE Diesel					
Top handler	F-101.88	Kalmar	DCD450-12(	Diesel	Cummins	QSMII-C	2004	330	2907	CHE Diesel			1/1/2010		
Top handler	F-102.88	Kalmar	DCD450-12(	Diesel	Cummins	QSMII-C	2004	330	334	CHE Diesel			1/1/2010		
Top handler	F-103.88	Kalmar	DCD450-12(	Diesel	Cummins	QSMII-C	2004	330	136	CHE Diesel			1/1/2010		
Top handler	F-108.88	Kalmar	DCD450-12(	Diesel	Cummins	QSMII-C	2005	375	351	CHE Diesel			1/1/2010		
Top handler	F-109.88	Kalmar	DCD450-12(	Diesel	Cummins	QSMII-C	2005	375	442	CHE Diesel			1/1/2010		
Top handler	F126.95			Diesel		TAD 1360V	2013	343	1544	CHE Diesel			1/1/2010		
Top handler	F127.95			Diesel		TAD 1360V	2013	343	1573	CHE Diesel			1/1/2010		
Top handler	F-74.80	Taylor	L10-C-250	Diesel	Cummins	L10-C-250	2004	260	273	CHE Diesel			1/1/2010		
Top handler	F-77.80	Taylor	M-11	Diesel	Cummins	M-11	2004	260	714	CHE Diesel			1/1/2010		
Top handler	F-80.80	Taylor	M 11-C	Diesel	Cummins	M 11-C	2001	260	1323	CHE Diesel			1/1/2010		
Top handler	F-82.88	Kalmar	M 11-C	Diesel	Cummins	M 11-C	2001	275	1268	CHE Diesel			1/1/2010		
Top handler	F-84-88	Kalmar	M 11-C	Diesel	Cummins	M 11-C	2002	275	1114	CHE Diesel			1/1/2010		
Top handler	F-87-88	Kalmar	M 11-C	Diesel	Cummins	M 11-C	2002	275	1463	CHE Diesel			1/1/2010		
Top handler	F-90.88	Kalmar	DCD450-12(	Diesel	Cummins	QSM11-C3	2003	330	816	CHE Diesel			1/1/2010		
Top handler	F-91.88	Kalmar	DCD450-12(	Diesel	Cummins	QSMII-C	2003	330	543	CHE Diesel			1/1/2010		

Port Equip Type	Equip ID	Equip Make	Equip Model	Engine Type	Engine Make	Engine Model	Year	HP	Annual Hours	Category	DOC	DPF level 2	DPF level 3	Vycon	Blue Cat
Top handler	F-92.88	Kalmar	DCD450-12(	Diesel	Cummins	QSMII-C	2003	330	1243	CHE Diesel			1/1/2010		
Top handler	F-112.95	Taylor		Diesel	Cummins	QSM11	2007	350	2223	CHE Diesel			1/1/2013		
Top handler	F-113.95	Taylor		Diesel	Cummins	QSM11	2007	350	2737	CHE Diesel			1/1/2013		
Top handler	F-114.95	Taylor		Diesel	Cummins	QSM11	2007	350	2906	CHE Diesel			1/1/2013		
Top handler	F-115.95	Taylor		Diesel	Cummins	QSM11	2007	350	2666	CHE Diesel			1/1/2013		
Top handler	F-116.95	Taylor		Diesel	Cummins	QSM11	2007	350	2729	CHE Diesel			1/1/2013		
Top handler	-119.95 (32	Taylor		Diesel	Cummins	QSM11	2010	350	3608	CHE Diesel			1/1/2013		
Top handler	-120.95 (33	Taylor		Diesel	Cummins	QSM11	2010	350	3299	CHE Diesel			1/1/2013		
Top handler	-123.95 (36	Taylor		Diesel	Volvo	TAD 1360V	2011	350	2814	CHE Diesel					
Top handler	-124.95 (37	Taylor		Diesel	Volvo	TAD 1360V	2011	350	2753	CHE Diesel					
Top handler	-125.95 (38	Taylor		Diesel	Volvo	TAD 1360V	2011	350	2736	CHE Diesel					
Top handler	F-70.80	Taylor	LT 10-C	Diesel	Cummins	LT 10-C	1994	250	3	CHE Diesel	7/1/2004				
Top handler	80215	Taylor	THDC 955	Diesel	Cummins	QSMII-C	2005	335	623	CHE Diesel			12/1/2012		
Top handler	80207	Taylor	THDC 955	Diesel	Cummins	QSMII-C	2006	335	1412	CHE Diesel			1/28/2013		
Top handler	80211	Taylor	THDC 955	Diesel	Cummins	QSMII-C	2006	335	1834	CHE Diesel			2/13/2013		
Top handler	80206	Taylor	THDC 955	Diesel	Cummins	QSMII-C	2006	335	1636	CHE Diesel			4/27/2013		
Top handler	80210	Taylor	THDC 955	Diesel	Cummins	QSMII-C	2005	330	2278	CHE Diesel			4/27/2013		
Top handler	80216	Taylor	THDC 955	Diesel	Cummins	QSMII-C	2005	335	1936	CHE Diesel			4/27/2013		
Top handler	80257	Taylor	THDC 955	Diesel	Cummins	QSM11-C	2002	300	1853	CHE Diesel			4/27/2013		
Top handler	80261	Taylor	THDC 955	Diesel	Cummins	QSM11-C	2002	300	1725	CHE Diesel			4/27/2013		
Top handler	80262	Taylor	THDC 955	Diesel	Cummins	QSM11-C	2002	300	1698	CHE Diesel			4/27/2013		
Top handler	80265	Taylor	THDC 955	Diesel	Cummins	QSM11-C	2004	300	1775	CHE Diesel			4/27/2013		
Top handler	80266	Taylor	THDC 955	Diesel	Cummins	QSM11-C	2004	300	1720	CHE Diesel			4/27/2013		
Top handler	80268	Taylor	THDC 955	Diesel	Cummins	QSM11-C	2004	330	835	CHE Diesel			6/12/2013		
Top handler	80267	Taylor	THDC 955	Diesel	Cummins	QSM11-C	2004	330	692	CHE Diesel			6/21/2013		
Top handler	80202	Taylor		Diesel			2011	330	1422	CHE Diesel					
Top handler	80203	Taylor	THDC 955	Diesel	Cummins	QSMII-C	2007	335	1993	CHE Diesel					
Top handler	80204	Taylor	THDC 955	Diesel	Cummins	QSMII-C	2007	335	800	CHE Diesel					
Top handler	80205	Taylor	THDC 955	Diesel	Cummins	QSMII-C	2007	335	621	CHE Diesel					
Top handler	80269	Taylor	THDC 955	Diesel	Cummins	QSMII-C	2004	330	307	CHE Diesel			6/12/2013		
Top handler	80291	Taylor		Diesel			2011	330	1485	CHE Diesel					
Top handler	80292	Taylor		Diesel			2011	330	1531	CHE Diesel					
Top handler	80293	Taylor		Diesel			2011	330	887	CHE Diesel					
Top handler	80294	Taylor		Diesel			2011	330	1347	CHE Diesel					
Top handler	80295	Taylor		Diesel			2011	330	1337	CHE Diesel					
Top handler	80296	Taylor		Diesel			2011	330	1330	CHE Diesel					
Top handler	80297	Taylor		Diesel			2011	330	2130	CHE Diesel					
Top handler	80298	Taylor		Diesel			2011	330	1147	CHE Diesel					
Top handler	80299	Taylor		Diesel			2011	330	1579	CHE Diesel					
Top handler	80300	Taylor		Diesel			2011	330	1696	CHE Diesel					
Top handler	80308	Taylor		Diesel			2011	330	1120	CHE Diesel					
Top handler	80309	Taylor		Diesel			2011	330	1086	CHE Diesel					
Top handler	80314	Taylor		Diesel			2012	330	1026	CHE Diesel					

Port Equip Type	Equip ID	Equip Make	Equip Model	Engine Type	Engine Make	Engine Model	Year	HP	Annual Hours	Category	DOC	DPF level 2	DPF level 3	Vycon	Blue Cat
Top handler	80277	Taylor	THDC 955	Diesel	Cummins	QSM11-C	2005	275	1581	CHE Diesel			1/1/2013		
Top handler	80278	Taylor	THDC 955	Diesel	Cummins	QSM11-C	2005	335	2187	CHE Diesel			1/28/2013		
Top handler	80279	Taylor	THDC 955	Diesel	Cummins	QSM11-C	2006	335	1305	CHE Diesel			1/28/2013		
Top handler	80270	Taylor	THDC 955	Diesel	Cummins	M11-C	2001	275	934	CHE Diesel			7/25/2013		
Top handler	80271	Taylor	THDC 955	Diesel	Cummins	M11-C	2001	275	1313	CHE Diesel			7/25/2013		
Top handler	80272	Taylor	THDC 955	Diesel	Cummins	M11-C	2001	275	719	CHE Diesel			7/25/2013		
Top handler	80273	Taylor	THDC 955	Diesel	Cummins	M11-C	2001	275	728	CHE Diesel			7/25/2013		
Top handler	80274	Taylor	THDC 955	Diesel	Cummins	M11-C	2001	275	1015	CHE Diesel			7/25/2013		
Top handler	80275	Taylor	THDC 955	Diesel	Cummins	M11-C	2001	275	940	CHE Diesel			7/25/2013		
Top handler	80276	Taylor	THDC 955	Diesel	Cummins	M11-C	2001	275	1143	CHE Diesel			7/26/2013		
Top handler	80280			Diesel			2006	335	1891	CHE Diesel					
Top handler	80247	Taylor	THDC 955	Diesel	Cummins	QSM11-C	2006	335	3451	CHE Diesel			12/1/2012		
Top handler	80248	Taylor	THDC 955	Diesel	Cummins	QSM11-C	2006	335	3232	CHE Diesel			12/1/2012		
Top handler	80250	Taylor	THDC 955	Diesel	Cummins		2000	275	2715	CHE Diesel			12/1/2012		
Top handler	80258	Taylor	THDC 955	Diesel	Cummins	QSM11-C	2002	300	2250	CHE Diesel			12/1/2012		
Top handler	80259	Taylor	THDC 955	Diesel	Cummins	QSM11-C	2002	300	2884	CHE Diesel			12/1/2012		
Top handler	80246	Taylor	THDC 955	Diesel	Cummins	QSM11-C	2006	335	2783	CHE Diesel			1/3/2013		
Top handler	80238	Taylor	THDC 955	Diesel	Cummins	QSM11-C	2003	300	3178	CHE Diesel			4/19/2013		
Top handler	80240	Taylor	THDC 955	Diesel	Cummins	QSM11-C	2004	300	3395	CHE Diesel			4/22/2013		
Top handler	80241	Taylor	THDC 955	Diesel	Cummins	QSM11-C	2004	335	2010	CHE Diesel			4/22/2013		
Top handler	80229	Taylor	THDC 955	Diesel	Cummins	QSM11-C	2001	275	3082	CHE Diesel			4/24/2013		
Top handler	80231	Taylor	THDC 955	Diesel	Cummins	QSM11-C	2001	275	1458	CHE Diesel			4/25/2013		
Top handler	80234	Taylor	THDC 955	Diesel	Cummins	QSM11-C	2001	275	2167	CHE Diesel			4/25/2013		
Top handler	80239	Taylor	THDC 955	Diesel	Cummins	QSM11-C	2004	300	2542	CHE Diesel			4/27/2013		
Top handler	80242	Taylor	THDC 955	Diesel	Cummins	QSM11-C	2004	335	2235	CHE Diesel			4/27/2013		
Top handler	80243	Taylor	THDC 955	Diesel	Cummins	QSM11-C	2004	335	3615	CHE Diesel			4/27/2013		
Top handler	80244	Taylor	THDC 955	Diesel	Cummins	QSM11-C	2004	335	2481	CHE Diesel			4/27/2013		
Top handler	80245	Taylor	THDC 955	Diesel	Cummins	QSM11-C	2005	335	2049	CHE Diesel			4/27/2013		
Top handler	80260	Taylor	THDC 955	Diesel	Cummins	QSM11-C	2002	300	2745	CHE Diesel			4/27/2013		
Top handler	80230	Taylor	THDC 955	Diesel	Cummins	QSM11-C	2001	275	2811	CHE Diesel			4/29/2013		
Top handler	80236	Taylor	THDC 955	Diesel	Cummins	QSM11-C	2003	300	2134	CHE Diesel			4/29/2013		
Top handler	80237	Taylor	THDC 955	Diesel	Cummins	QSM11-C	2003	300	2219	CHE Diesel			4/29/2013		
Top handler	80235	Taylor	THDC 955	Diesel	Cummins	QSM11-C	2002	300	1909	CHE Diesel			4/30/2013		
Top handler	80218	Taylor	THDC 955	Diesel	Cummins	M11-C	1998	275	977	CHE Diesel			7/26/2013		
Top handler	80223	Taylor	THDC 955	Diesel	Cummins	M11-C	1999	275	1882	CHE Diesel			7/26/2013		
Top handler	80224	Taylor	THDC 955	Diesel	Cummins	M11-C	1999	275	2309	CHE Diesel			7/29/2013		
Top handler	80225	Taylor	THDC 955	Diesel	Cummins	M11-C	2000	275	1165	CHE Diesel			7/29/2013		
Top handler	80222	Taylor	THDC 955	Diesel	Cummins	M11-C	1999	275	1402	CHE Diesel			7/30/2013		
Top handler	80226	Taylor	THDC 955	Diesel	Cummins	M11-C	2000	275	1396	CHE Diesel			7/30/2013		
Top handler	80227	Taylor	THDC 955	Diesel	Cummins	M11-C	2000	275	1249	CHE Diesel			7/30/2013		
Top handler	80228	Taylor	THDC 955	Diesel	Cummins	M11-C	2000	275	2025	CHE Diesel			7/30/2013		
Top handler	80219	Taylor	THDC 955	Diesel	Cummins	M11-C	1998	275	1561	CHE Diesel			7/31/2013		
Top handler	80221	Taylor	THDC 955	Diesel	Cummins	M11-C	1999	275	2179	CHE Diesel			7/31/2013		

Port Equip Type	Equip ID	Equip Make	Equip Model	Engine Type	Engine Make	Engine Model	Year	HP	Annual Hours	Category	DOC	DPF level 2	DPF level 3	Vycon	Blue Cat
Top handler	80252	Taylor	THDC 955	Diesel	Cummins	M11-C	2000	275	2481	CHE Diesel			7/31/2013		
Top handler	80249	Taylor	THDC 955	Diesel	Cummins	QSM11-C	2007	275	1385	CHE Diesel					
Top handler	80251	Taylor	THDC 955	Diesel	Cummins	QSM11-C	2007	275	1290	CHE Diesel					
Top handler	80290	Taylor	THDC 955	Diesel	Cummins	QSM11-C	2007	275	3459	CHE Diesel					
Top handler	03-958	Fantuzzi	FDC 500G5	Diesel	Cummins	QSMII-C	2004	260	1843	CHE Diesel			8/17/2011		
Top handler	03-955	Fantuzzi	FDC 500G5	Diesel	Cummins	QSMII-C	2004	260	2564	CHE Diesel			8/19/2011		
Top handler	03-956	Fantuzzi	FDC 500G5	Diesel	Cummins	QSMII-C	2004	260	2005	CHE Diesel			8/22/2011		
Top handler	03-957	Fantuzzi	FDC 500G5	Diesel	Cummins	QSMII-C	2004	260	2246	CHE Diesel			8/24/2011		
Top handler	03-954	Fantuzzi	FDC 500G5	Diesel	Cummins	QSMII-C	2004	260	2352	CHE Diesel			8/26/2011		
Top handler	03-953	Fantuzzi	FDC 500G5	Diesel	Cummins	QSMII-C	2003	260	369	CHE Diesel			8/29/2011		
Top handler	03-959	Fantuzzi	FDC 500G5	Diesel	Cummins	QSMII-C	2005	260	2602	CHE Diesel			8/30/2011		
Top handler	03-960	Fantuzzi	FDC 500G5	Diesel	Cummins	QSMII-C	2005	260	2789	CHE Diesel	8/5/2005				
Top handler	03-961	Linde	C400	Diesel			2005	260	741	CHE Diesel					
Top handler	03-962	Linde	C400	Diesel			2006	260	1662	CHE Diesel					
Top handler	03-963	Hyster	HY	Diesel			2013	335	0	CHE Diesel					
Top handler	03-964	Hyster	HY	Diesel			2013	335	0	CHE Diesel					
Top handler	03-965	Hyster	HY	Diesel			2013	335	0	CHE Diesel					
Top handler	6196	Taylor	TXC976	Diesel			2008		2660	CHE Diesel			2/1/2011		
Top handler	6197	Taylor	TXC976	Diesel			2008		3674	CHE Diesel			2/1/2011		
Top handler	6198	Taylor	TXC976	Diesel			2008		3708	CHE Diesel			2/1/2011		
Top handler	6123	Taylor	TEC950L	Diesel	Cummins	M 11-C	1997	260	49	CHE Diesel			9/1/2011		
Top handler	6823	Taylor	TEC950L	Diesel	Cummins	M 11-C	2000	260	651	CHE Diesel			9/1/2011		
Top handler	6159	Taylor	THDC-9555	Diesel	Cummins	QSM-11	2004	300	2879	CHE Diesel			3/29/2012		
Top handler	6182	Taylor	THDC-9555	Diesel	Cummins	LT 10-C	2006	250	2607	CHE Diesel			4/5/2012		
Top handler	6179	Taylor	THDC-9555	Diesel	Cummins	LT 10-C	2006	250	2170	CHE Diesel			4/9/2012		
Top handler	6158	Taylor	THDC-9555	Diesel	Cummins	QSM-11	2002	300	1142	CHE Diesel			4/11/2012		
Top handler	6160	Taylor	THDC-9555	Diesel	Cummins	QSM-11	2004	300	2421	CHE Diesel			4/13/2012		
Top handler	6161	Taylor	THDC-9555	Diesel	Cummins	QSM-11	2004	300	2686	CHE Diesel			4/17/2012		
Top handler	6168	Taylor	THDC-9555	Diesel	Cummins	QSM-11	2006	300	1745	CHE Diesel			4/20/2012		
Top handler	6163	Taylor	THDC-9555	Diesel	Cummins	QSM-11	2005	300	3008	CHE Diesel			4/26/2012		
Top handler	6164	Taylor	THDC-9555	Diesel	Cummins	QSM-11	2005	300	2217	CHE Diesel			5/3/2012		
Top handler	6162	Taylor	THDC-9555	Diesel	Cummins	QSM-11	2004	300	3038	CHE Diesel			5/7/2012		
Top handler	36001	Taylor	TXLC976	Diesel			2012	260	3170	CHE Diesel					
Top handler	36002	Taylor	TXLC976	Diesel			2012	260	2799	CHE Diesel					
Top handler	36003	Taylor	TXLC976	Diesel			2012	260	2827	CHE Diesel					
Top handler	36004	Taylor	TXLC976	Diesel			2012	260	2872	CHE Diesel					
Top handler	36005	Taylor	TXLC976	Diesel			2012	260	2906	CHE Diesel					
Top handler	36006	Taylor	TXLC976	Diesel			2012	260	2671	CHE Diesel					
Top handler	36007	Taylor	TXLC976	Diesel			2012	260	2980	CHE Diesel					
Top handler	36008	Taylor	TXLC976	Diesel			2012	260	2765	CHE Diesel					
Top handler	36009	Taylor	TXLC976	Diesel			2012	260	2546	CHE Diesel					
Top handler	36010	Taylor	TXLC976	Diesel			2012	260	3071	CHE Diesel					
Top handler	36011	Taylor	TXLC976	Diesel			2012	260	3274	CHE Diesel					

Port Equip Type	Equip ID	Equip Make	Equip Model	Engine Type	Engine Make	Engine Model	Year	HP	Annual Hours	Category	DOC	DPF level 2	DPF level 3	Vycon	Blue Cat
Top handler	36012	Taylor	TXLC976	Diesel			2012	260	2889	CHE Diesel					
Top handler	36013	Taylor	TXLC976	Diesel			2012	260	2533	CHE Diesel					
Top handler	36014	Taylor	TXLC976	Diesel			2012	260	2631	CHE Diesel					
Top handler	36015	Taylor	TXLC976	Diesel			2012	260	3732	CHE Diesel					
Top handler	36016	Taylor	TXLC976	Diesel			2012	260	2729	CHE Diesel					
Top handler	36017	Taylor	TXLC976	Diesel			2012	260	3104	CHE Diesel					
Top handler	36018	Taylor	TXLC976	Diesel			2012	260	2931	CHE Diesel					
Top handler	36019	Taylor	TXLC976	Diesel			2012	260	3186	CHE Diesel					
Top handler	36020	Taylor	TXLC976	Diesel			2012	260	2722	CHE Diesel					
Top handler	36021	Taylor	TXLC976	Diesel			2012	260	2836	CHE Diesel					
Top handler	36022	Taylor	TXLC976	Diesel			2012	260	1988	CHE Diesel					
Top handler	36023	Taylor	TXLC976	Diesel			2012	260	1983	CHE Diesel					
Top handler	36024	Taylor	TXLC976	Diesel			2012	260	1683	CHE Diesel					
Top handler	36025	Taylor	TXLC976	Diesel			2012	260	1530	CHE Diesel					
Top handler	36026	Taylor	TXLC976	Diesel			2012	260	1472	CHE Diesel					
Top handler	36027	Taylor	TXLC976	Diesel			2012	260	1247	CHE Diesel					
Top handler	36028	Taylor	TXLC976	Diesel			2012	260	1146	CHE Diesel					
Top handler	36029	Taylor	TXLC976	Diesel			2012	260	1262	CHE Diesel					
Top handler	36030	Taylor	TXLC976	Diesel			2012	260	1046	CHE Diesel					
Top handler	36031	Taylor	TXLC976	Diesel			2012	260	975	CHE Diesel					
Top handler	36032	Taylor	TXLC976	Diesel			2012	260	889	CHE Diesel					
Top handler	36033	Taylor	TXLC976	Diesel			2012	260	859	CHE Diesel					
Top handler	36034	Taylor	TXLC976	Diesel			2012	260	306	CHE Diesel					
Top handler	36035	Taylor	TXLC976	Diesel			2012	260	359	CHE Diesel					
Top handler	36036	Taylor	TXLC976	Diesel			2012	260	233	CHE Diesel					
Top handler	36037	Taylor	TXLC976	Diesel			2012	260	267	CHE Diesel					
Top handler	3600L	Hyster	TXLC976	Diesel			2009	260		CHE Diesel					
Top handler	360L1	Hyster	TXLC976	Diesel			2012	260	2473	CHE Diesel					
Top handler	360L2	Hyster	TXLC976	Diesel			2012	260	2413	CHE Diesel					
Tractor	1366	United Tra	SM-50F	LPG	Ford	CSG6491	1996	101	595	CHE Propane					8/22/2012
Tractor	1370	United Tra	SM-50F	LPG	Ford	CSG6491	1996	101	595	CHE Propane					3/20/2012
Tractor	1371	United Tra	SM-50F	LPG	Ford	CSG6491	1996	101	595	CHE Propane					8/23/2012
Tractor	1373	United Tra	SM-50F	LPG	Ford	CSG6491	1996	101	595	CHE Propane					8/23/2010
Tractor	1375	United Tra	SM-50F	LPG	Ford	CSG6491	1996	101	595	CHE Propane					8/21/2012
Tractor	1376	United Tra	SM-50F	LPG	Ford	CSG6491	1996	101	595	CHE Propane					4/27/2010
Tractor	TRC20	Kubota	M59	Diesel	Kubota	2403M	2009	59	80	CHE Diesel					
Tractor	1372	United Tra	SM-50-F	LPG			1997	101	494	CHE Propane					
Tractor	1374	United Tra	SM-50-F	LPG			1997	101	705	CHE Propane					
Truck	#14	Taylor-Dun	B0-210-36	Electric	Taylor-Dun	DC Drive M	2008	0	1336	CHE Electric					
Truck	#15	Taylor-Dun	B0-210-36	Electric	Taylor-Dun	DC Drive M	2008	0	422	CHE Electric					
Truck	#16	Taylor-Dun	MX-016-00	Electric	Taylor-Dun	DC Drive M	2008	0	108	CHE Electric					
Truck	#17	Taylor-Dun	MX-016-00	Electric	Taylor-Dun	DC Drive M	2009	0	1315	CHE Electric					
Truck	#18	Taylor-Dun	MX-016-00	Electric	Taylor-Dun	DC Drive M	2009	0	102	CHE Electric					

Port Equip Type	Equip ID	Equip Make	Equip Model	Engine Type	Engine Make	Engine Model	Year	HP	Annual Hours	Category	DOC	DPF level 2	DPF level 3	Vycon	Blue Cat
Truck	1304008	Freightling	ISB6.7	Diesel	Cummins	M2106	2011	300	174	CHE On Road Diesel					
Truck	1306017	Internatior	8100	Diesel	Caterpillar		1994	300	174	CHE On Road Diesel					
Truck	1315001	Terex	TR45	Diesel	Cummins	QSK19	2009	525	520	CHE Diesel					
Truck	1315002	Terex	TR45	Diesel	Cummins	QSK19	2009	525	103	CHE Diesel					
Truck	1315003	Terex	TR45	Diesel	Cummins	QSK19	2009	525	822	CHE Diesel					
Truck	1316001	Caterpillar	TA30	Diesel	Cummins	QSM11	2006	350	429	CHE On Road Diesel					
Truck	19002	Ford	F700	Diesel			1995	207	180	CHE On Road Diesel					
Truck	19014	Sterling	LT8500	Diesel			2004	207	1547	CHE On Road Diesel					
Truck	19023	Sterling	LT7051	Diesel			2005	207	1230	CHE On Road Diesel					
Truck	19025	Sterling	LT8500	Diesel			2008	207	1281	CHE On Road Diesel					
Truck	V536	GMC	Top Kick	Diesel	Caterpillar	3116	1990	165		CHE Diesel			3/11/2010		
Truck	V0301	Internatior	A170	Diesel	Navistar	A170	1997	170		CHE Diesel			6/23/2010		
Truck	V138	Ford	LN 600	Gasoline	Ford	361CID	1977			CHE Gasoline					
Truck	22680	Ford	F-750	Diesel	Caterpillar	3126	2006	210	250	CHE On Road Diesel					
Yard tractor	LAYT0021	Ottawa		Diesel			2008		55	CHE Diesel					
Yard tractor	LAYT0022	Ottawa		Diesel			2008		31	CHE On Road Diesel					
Yard tractor	LAYT0023	Ottawa		Diesel			2008		64	CHE On Road Diesel					
Yard tractor	T139	Ottawa	Commando	LPG	Ford V10		2009	173	0	CHE Propane					
Yard tractor	T140	Ottawa	Commando	LPG	Ford V10		2009	173	0	CHE Propane					
Yard tractor	T141	Ottawa	Commando	LPG	Ford V10		2009	173	0	CHE Propane					
Yard tractor	T142	Ottawa	Commando	LPG	Ford V10		2009	173	0	CHE Propane					
Yard tractor	T143	Ottawa	Commando	LPG	Ford V10		2009	173	0	CHE Propane					
Yard tractor	T144	Ottawa	Commando	LPG	Ford V10		2009	173	0	CHE Propane					
Yard tractor	T145	Ottawa	Commando	LPG	Ford V10		2009	173	0	CHE Propane					
Yard tractor	T146	Ottawa	Commando	LPG	Ford V10		2009	173	0	CHE Propane					
Yard tractor	T202	Kalmar		Diesel	Cummins	ISB 200	2007	200	1318	CHE On Road Diesel					
Yard tractor	T203	Kalmar		Diesel	Cummins	ISB 200	2007	200	940	CHE On Road Diesel					
Yard tractor	T204	Kalmar		Diesel	Cummins	ISB 200	2007	200	491	CHE On Road Diesel					
Yard tractor	T205	Kalmar		Diesel	Cummins	ISB 200	2007	200	1288	CHE On Road Diesel					
Yard tractor	T206	Kalmar		Diesel	Cummins	ISB 200	2007	200	625	CHE On Road Diesel					
Yard tractor	T207	Kalmar		Diesel	Cummins	ISB 200	2007	200	1072	CHE On Road Diesel					
Yard tractor	T208	Kalmar		Diesel	Cummins	ISB 200	2007	200	1015	CHE On Road Diesel					
Yard tractor	T209	Kalmar		Diesel	Cummins	ISB 200	2007	200	1130	CHE On Road Diesel					
Yard tractor	T210	Kalmar		Diesel	Cummins	ISB 200	2007	200	1465	CHE On Road Diesel					
Yard tractor	T211	Kalmar		Diesel	Cummins	ISB 200	2007	200	1509	CHE On Road Diesel					
Yard tractor	T212	Kalmar		Diesel	Cummins	ISB 200	2007	200	1706	CHE On Road Diesel					
Yard tractor	T213	Kalmar		Diesel	Cummins	ISB 200	2007	200	1555	CHE On Road Diesel					
Yard tractor	T214	Kalmar		Diesel	Cummins	ISB 200	2007	200	976	CHE On Road Diesel					
Yard tractor	T215	Kalmar		Diesel	Cummins	ISB 200	2008	200	1539	CHE On Road Diesel					
Yard tractor	T216	Kalmar		Diesel	Cummins	ISB 200	2008	200	1602	CHE On Road Diesel					
Yard tractor	T217	Kalmar		Diesel	Cummins	ISB 200	2008	200	1863	CHE On Road Diesel					
Yard tractor	T218	Kalmar		Diesel	Cummins	ISB 200	2008	200	1328	CHE On Road Diesel					
Yard tractor	T219	Kalmar		Diesel	Cummins	ISB 200	2008	200	1733	CHE On Road Diesel					

Port Equip Type	Equip ID	Equip Make	Equip Model	Engine Type	Engine Make	Engine Model	Year	HP	Annual Hours	Category	DOC	DPF level 2	DPF level 3	Vycon	Blue Cat
Yard tractor	T220	Kalmar		Diesel	Cummins	ISB 200	2008	200	1755	CHE On Road Diesel					
Yard tractor	T221	Kalmar		Diesel	Cummins	ISB 200	2008	200	1587	CHE On Road Diesel					
Yard tractor	T222	Kalmar		Diesel	Cummins	ISB 200	2008	200	915	CHE On Road Diesel					
Yard tractor	T223	Kalmar		Diesel	Cummins	ISB 200	2008	200	664	CHE On Road Diesel					
Yard tractor	T224	Kalmar		Diesel	Cummins	ISB 200	2008	200	1790	CHE On Road Diesel					
Yard tractor	T225	Kalmar		Diesel	Cummins	ISB 200	2008	200	1859	CHE On Road Diesel					
Yard tractor	T226	Kalmar		Diesel	Cummins	ISB 200	2008	200	1957	CHE On Road Diesel					
Yard tractor	T227	Kalmar		Diesel	Cummins	ISB 200	2008	200	2203	CHE On Road Diesel					
Yard tractor	T228	Kalmar		Diesel	Cummins	ISB 200	2008	200	1753	CHE On Road Diesel					
Yard tractor	T229	Kalmar		Diesel	Cummins	ISB 200	2008	200	2029	CHE On Road Diesel					
Yard tractor	T230	Kalmar		Diesel	Cummins	ISB 200	2008	200	1747	CHE On Road Diesel					
Yard tractor	T231	Kalmar		Diesel	Cummins	ISB 200	2008	200	2075	CHE On Road Diesel					
Yard tractor	T232	Kalmar		Diesel	Cummins	ISB 200	2008	200	1842	CHE On Road Diesel					
Yard tractor	T233	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	1826	CHE On Road Diesel					
Yard tractor	T234	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	2735	CHE On Road Diesel					
Yard tractor	T235	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	1968	CHE On Road Diesel					
Yard tractor	T236	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	1972	CHE On Road Diesel					
Yard tractor	T237	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	1779	CHE On Road Diesel					
Yard tractor	T238	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	1133	CHE On Road Diesel					
Yard tractor	T239	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	1917	CHE On Road Diesel					
Yard tractor	T240	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	1426	CHE On Road Diesel					
Yard tractor	T241	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	1912	CHE On Road Diesel					
Yard tractor	T242	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	1116	CHE On Road Diesel					
Yard tractor	T243	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	2184	CHE On Road Diesel					
Yard tractor	T244	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	2144	CHE On Road Diesel					
Yard tractor	T245	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	1445	CHE On Road Diesel					
Yard tractor	T246	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	2005	CHE On Road Diesel					
Yard tractor	T247	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	1608	CHE On Road Diesel					
Yard tractor	T248	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	1642	CHE On Road Diesel					
Yard tractor	T249	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	1624	CHE On Road Diesel					
Yard tractor	T250	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	1977	CHE On Road Diesel					
Yard tractor	T251	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	2157	CHE On Road Diesel					
Yard tractor	T252	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	1953	CHE On Road Diesel					
Yard tractor	T253	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	2130	CHE On Road Diesel					
Yard tractor	T254	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	1845	CHE On Road Diesel					
Yard tractor	T255	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	2638	CHE On Road Diesel					
Yard tractor	T256	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	2001	CHE On Road Diesel					
Yard tractor	T257	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	1984	CHE On Road Diesel					
Yard tractor	T258	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	1792	CHE On Road Diesel					
Yard tractor	T259	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	889	CHE On Road Diesel					
Yard tractor	T260	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	1841	CHE On Road Diesel					
Yard tractor	T261	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	1967	CHE On Road Diesel					
Yard tractor	T262	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	1637	CHE On Road Diesel					

Port Equip Type	Equip ID	Equip Make	Equip Model	Engine Type	Engine Make	Engine Model	Year	HP	Annual Hours	Category	DOC	DPF level 2	DPF level 3	Vycon	Blue Cat
Yard tractor	T263	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	1775	CHE On Road Diesel					
Yard tractor	T264	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	2124	CHE On Road Diesel					
Yard tractor	T265	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	2061	CHE On Road Diesel					
Yard tractor	T266	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	1777	CHE On Road Diesel					
Yard tractor	T267	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	693	CHE On Road Diesel					
Yard tractor	T268	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	2028	CHE On Road Diesel					
Yard tractor	T269	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	1657	CHE On Road Diesel					
Yard tractor	T270	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	2253	CHE On Road Diesel					
Yard tractor	T271	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	2234	CHE On Road Diesel					
Yard tractor	T272	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	2303	CHE On Road Diesel					
Yard tractor	T273	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	1903	CHE On Road Diesel					
Yard tractor	T274	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	1507	CHE On Road Diesel					
Yard tractor	T275	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	1927	CHE On Road Diesel					
Yard tractor	T276	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	1666	CHE On Road Diesel					
Yard tractor	T277	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	1720	CHE On Road Diesel					
Yard tractor	T278	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	2430	CHE On Road Diesel					
Yard tractor	T279	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	2299	CHE On Road Diesel					
Yard tractor	T280	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	1996	CHE On Road Diesel					
Yard tractor	T281	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	1853	CHE On Road Diesel					
Yard tractor	T282	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	2174	CHE On Road Diesel					
Yard tractor	T283	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	2182	CHE On Road Diesel					
Yard tractor	T284	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	1938	CHE On Road Diesel					
Yard tractor	T285	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	2183	CHE On Road Diesel					
Yard tractor	T286	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	2281	CHE On Road Diesel					
Yard tractor	T287	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	2150	CHE On Road Diesel					
Yard tractor	T288	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	2350	CHE On Road Diesel					
Yard tractor	T289	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	2380	CHE On Road Diesel					
Yard tractor	T290	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	2332	CHE On Road Diesel					
Yard tractor	T291	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	2143	CHE On Road Diesel					
Yard tractor	T292	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	2862	CHE On Road Diesel					
Yard tractor	T293	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	1631	CHE On Road Diesel					
Yard tractor	T294	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	2132	CHE On Road Diesel					
Yard tractor	T295	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	0	CHE On Road Diesel					
Yard tractor	T296	Kalmar	ISB200	Diesel	Cummins	ISB 200	2009	200	2836	CHE On Road Diesel					
Yard tractor	H-280	Capacity	TJ7000	Diesel	Cummins	ISB Tier 3	2007	200	2170	CHE On Road Diesel					
Yard tractor	H-281	Capacity	TJ7000	Diesel	Cummins	ISB Tier 3	2007	200	0	CHE On Road Diesel					
Yard tractor	H-282	Capacity	TJ7000	Diesel	Cummins	ISB Tier 3	2007	200	2400	CHE On Road Diesel					
Yard tractor	H-283	Capacity	TJ7000	Diesel	Cummins	ISB Tier 3	2007	200	1966	CHE On Road Diesel					
Yard tractor	H-375	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1313	CHE Diesel	7/29/2004				
Yard tractor	H-376	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1517	CHE Diesel	7/29/2004				
Yard tractor	H-377	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1245	CHE Diesel	7/29/2004				
Yard tractor	H-378	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1148	CHE Diesel	7/29/2004				
Yard tractor	H-379	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1162	CHE Diesel	7/29/2004				

Port Equip Type	Equip ID	Equip Make	Equip Model	Engine Type	Engine Make	Engine Model	Year	HP	Annual Hours	Category	DOC	DPF level 2	DPF level 3	Vycon	Blue Cat
Yard tractor	H-380	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1236	CHE Diesel	7/29/2004				
Yard tractor	H-381	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1332	CHE Diesel	7/29/2004				
Yard tractor	H-382	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1336	CHE Diesel	8/12/2004				
Yard tractor	H-383	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	944	CHE Diesel	8/12/2004				
Yard tractor	H-384	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1251	CHE Diesel	8/12/2004				
Yard tractor	H-385	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1612	CHE Diesel	8/12/2004				
Yard tractor	H-386	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1170	CHE Diesel	8/12/2004				
Yard tractor	H-387	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1256	CHE Diesel	8/12/2004				
Yard tractor	H-388	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1494	CHE Diesel	8/12/2004				
Yard tractor	H-389	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1539	CHE Diesel	12/8/2004				
Yard tractor	H-390	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1291	CHE Diesel	12/8/2004				
Yard tractor	H-392	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1451	CHE Diesel	12/7/2004				
Yard tractor	H-393	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1422	CHE Diesel	12/8/2004				
Yard tractor	H-396	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1477	CHE Diesel	12/8/2004				
Yard tractor	H-397	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1203	CHE Diesel	12/8/2004				
Yard tractor	H-398	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1612	CHE Diesel	12/10/2004				
Yard tractor	H-399	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1361	CHE Diesel	12/10/2004				
Yard tractor	H-400	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	495	CHE Diesel	12/10/2004				
Yard tractor	H-401	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1355	CHE Diesel	12/10/2004				
Yard tractor	H-407	Capacity	TJ7000	Diesel	Cummins	B5.9C	2005	173	538	CHE Diesel					
Yard tractor	H-408	Capacity	TJ7000	Diesel	Cummins	B5.9C	2005	173	1345	CHE Diesel					
Yard tractor	H-409	Capacity	TJ7000	Diesel	Cummins	B5.9C	2005	173	1464	CHE Diesel					
Yard tractor	H-410	Capacity	TJ7000	Diesel	Cummins	B5.9C	2005	173	1017	CHE Diesel					
Yard tractor	H-411	Capacity	TJ7000	Diesel	Cummins	B5.9C	2005	173	1405	CHE Diesel					
Yard tractor	H-412	Capacity	TJ7000	Diesel	Cummins	B5.9C	2006	173	1466	CHE Diesel					
Yard tractor	H-413	Capacity	TJ7000	Diesel	Cummins	B5.9C	2006	173	1679	CHE Diesel					
Yard tractor	H-414	Capacity	TJ7000	Diesel	Cummins	B5.9C	2006	173	1637	CHE Diesel					
Yard tractor	H-415	Capacity	TJ7000	Diesel	Cummins	B5.9C	2006	173	768	CHE Diesel					
Yard tractor	H-416	Capacity	TJ7000	Diesel	Cummins	B5.9C	2006	173	1591	CHE Diesel					
Yard tractor	H-417	Capacity	TJ7000	Diesel	Cummins	ISB Tier 3	2007	200	1581	CHE On Road Diesel					
Yard tractor	H-418	Capacity	TJ7000	Diesel	Cummins	ISB Tier 3	2007	200	761	CHE On Road Diesel					
Yard tractor	H-419	Capacity	TJ7000	Diesel	Cummins	ISB Tier 3	2007	200	1102	CHE On Road Diesel					
Yard tractor	H-420	Capacity	TJ7000	Diesel	Cummins	ISB Tier 3	2007	200	1272	CHE On Road Diesel					
Yard tractor	H-421	Capacity	TJ7000	Diesel	Cummins	ISB Tier 3	2007	200	895	CHE On Road Diesel					
Yard tractor	H-422	Capacity	TJ7000	Diesel	Cummins	ISB Tier 3	2007	200	2592	CHE On Road Diesel					
Yard tractor	H-423	Capacity	TJ7000	Diesel	Cummins	ISB Tier 3	2007	200	1882	CHE On Road Diesel					
Yard tractor	H-424	Capacity	TJ7000	Diesel	Cummins	ISB Tier 3	2007	200	1689	CHE On Road Diesel					
Yard tractor	H-425	Capacity	TJ7000	Diesel	Cummins	ISB Tier 3	2007	200	2102	CHE On Road Diesel					
Yard tractor	H-426	Capacity	TJ7000	Diesel	Cummins	ISB Tier 3	2007	200	2320	CHE On Road Diesel					
Yard tractor	H-427	Capacity	TJ7000	Diesel	Cummins	ISB Tier 3	2007	200	1821	CHE On Road Diesel					
Yard tractor	H-428	Capacity	TJ7000	Diesel	Cummins	ISB Tier 3	2007	200	1878	CHE On Road Diesel					
Yard tractor	H-429	Capacity	TJ7000	Diesel	Cummins	ISB Tier 3	2007	200	1961	CHE On Road Diesel					
Yard tractor	H-430	Capacity	TJ7000	Diesel	Cummins	ISB Tier 3	2007	200	1417	CHE On Road Diesel					

Port Equip Type	Equip ID	Equip Make	Equip Model	Engine Type	Engine Make	Engine Model	Year	HP	Annual Hours	Category	DOC	DPF level 2	DPF level 3	Vycon	Blue Cat
Yard tractor	H-431	Capacity	TJ7000	Diesel	Cummins	ISB Tier 3	2007	200	1838	CHE On Road Diesel					
Yard tractor	H-432	Capacity	TJ7000	Diesel	Cummins	ISB Tier 3	2007	200	1794	CHE On Road Diesel					
Yard tractor	H-433	Capacity	TJ7000	Diesel	Cummins	ISB Tier 3	2007	200	1684	CHE On Road Diesel					
Yard tractor	H-434	Capacity	TJ7000	Diesel	Cummins	ISB Tier 3	2007	200	1689	CHE On Road Diesel					
Yard tractor	H-435	Capacity	TJ7000	Diesel	Cummins	ISB Tier 3	2007	200	1948	CHE On Road Diesel					
Yard tractor	H-436	Capacity	TJ7000	Diesel	Cummins	ISB Tier 3	2007	200	2107	CHE On Road Diesel					
Yard tractor	H-437	Capacity	TJ7000	Diesel	Cummins	ISB Tier 3	2007	200	2275	CHE On Road Diesel					
Yard tractor	H-438	Capacity	TJ7000	Diesel	Cummins	ISB Tier 3	2007	200	1957	CHE On Road Diesel					
Yard tractor	H-439	Capacity	TJ7000	Diesel	Cummins	ISB Tier 3	2007	200	2345	CHE On Road Diesel					
Yard tractor	H-522			Gasoline	Chevy	454-FI	2011	335	159	CHE Gasoline					
Yard tractor	H-619			Gasoline	Chevy	454-FI	2011	335	915	CHE Gasoline					
Yard tractor	H-620			Gasoline	Chevy	454-FI	2011	335	861	CHE Gasoline					
Yard tractor	H-627			Gasoline	Chevy	454-FI	2011	335	900	CHE Gasoline					
Yard tractor	H-628			Gasoline	Chevy	454-FI	2011	335	996	CHE Gasoline					
Yard tractor	H-629			Gasoline	Chevy	454-FI	2011	335	975	CHE Gasoline					
Yard tractor	H-630			Gasoline	Chevy	454-FI	2011	335	1113	CHE Gasoline					
Yard tractor	H-631			Gasoline	Chevy	454-FI	2011	335	772	CHE Gasoline					
Yard tractor	H-632			Gasoline	Chevy	454-FI	2011	335	715	CHE Gasoline					
Yard tractor	H-633			Gasoline	Chevy	454-FI	2011	335	933	CHE Gasoline					
Yard tractor	H-634			Gasoline	Chevy	454-FI	2011	335	964	CHE Gasoline					
Yard tractor	H-635			Gasoline	Chevy	454-FI	2011	335	720	CHE Gasoline					
Yard tractor	H-636			Gasoline	Chevy	454-FI	2011	335	1173	CHE Gasoline					
Yard tractor	H-639			Gasoline	Chevy	454-FI	2011	335	891	CHE Gasoline					
Yard tractor	H-640			Gasoline	Chevy	454-FI	2011	335	1381	CHE Gasoline					
Yard tractor	H-643			Gasoline	Chevy	454-FI	2011	335	796	CHE Gasoline					
Yard tractor	H-644			Gasoline	Chevy	454-FI	2011	335	1114	CHE Gasoline					
Yard tractor	H-645			Gasoline	Chevy	454-FI	2011	335	1055	CHE Gasoline					
Yard tractor	H-646			Gasoline	Chevy	454-FI	2011	335	1027	CHE Gasoline					
Yard tractor	H-649			Gasoline	Chevy	454-FI	2011	335	908	CHE Gasoline					
Yard tractor	H-650			Gasoline	Chevy	454-FI	2011	335	1120	CHE Gasoline					
Yard tractor	H-653			Gasoline	Chevy	454-FI	2011	335	1086	CHE Gasoline					
Yard tractor	H-654			Gasoline	Chevy	454-FI	2011	335	1234	CHE Gasoline					
Yard tractor	H-655			Gasoline	Chevy	454-FI	2011	335	1138	CHE Gasoline					
Yard tractor	H-656			Gasoline	Chevy	454-FI	2011	335	1065	CHE Gasoline					
Yard tractor	H-657			Gasoline	Chevy	454-FI	2011	335	1059	CHE Gasoline					
Yard tractor	H-658			Gasoline	Chevy	454-FI	2011	335	1227	CHE Gasoline					
Yard tractor	H-663			Gasoline	Chevy	454-FI	2011	335	1527	CHE Gasoline					
Yard tractor	H-664			Gasoline	Chevy	454-FI	2011	335	1182	CHE Gasoline					
Yard tractor	H-665			Gasoline	Chevy	454-FI	2011	335	1094	CHE Gasoline					
Yard tractor	H-666			Gasoline	Chevy	454-FI	2011	335	1132	CHE Gasoline					
Yard tractor	H-667			Gasoline	Chevy	454-FI	2011	335	1124	CHE Gasoline					
Yard tractor	H-668			Gasoline	Chevy	454-FI	2011	335	1252	CHE Gasoline					
Yard tractor	H-669			Gasoline	Chevy	454-FI	2011	335	940	CHE Gasoline					

Port Equip Type	Equip ID	Equip Make	Equip Model	Engine Type	Engine Make	Engine Model	Year	HP	Annual Hours	Category	DOC	DPF level 2	DPF level 3	Vycon	Blue Cat
Yard tractor	H-695			Gasoline	Chevy	454-FI	2011	335	848	CHE Gasoline					
Yard tractor	H-696			Gasoline	Chevy	454-FI	2011	335	881	CHE Gasoline					
Yard tractor	H-697			Gasoline	Chevy	454-FI	2011	335	1022	CHE Gasoline					
Yard tractor	H-698			Gasoline	Chevy	454-FI	2011	335	1058	CHE Gasoline					
Yard tractor	H-088			Gasoline	Chevy	454-FI	2011	335	1321	CHE Gasoline					
Yard tractor	H-089			Gasoline	Chevy	454-FI	2011	335	1642	CHE Gasoline					
Yard tractor	H-090			Gasoline	Chevy	454-FI	2011	335	1560	CHE Gasoline					
Yard tractor	H-091			Gasoline	Chevy	454-FI	2011	335	1507	CHE Gasoline					
Yard tractor	H-092			Gasoline	Chevy	454-FI	2011	335	1331	CHE Gasoline					
Yard tractor	H-093			Gasoline	Chevy	454-FI	2011	335	1619	CHE Gasoline					
Yard tractor	H-094			Gasoline	Chevy	454-FI	2011	335	1584	CHE Gasoline					
Yard tractor	H-095			Gasoline	Chevy	454-FI	2011	335	1678	CHE Gasoline					
Yard tractor	H-096			Gasoline	Chevy	454-FI	2011	335	1613	CHE Gasoline					
Yard tractor	H-097			Gasoline	Chevy	454-FI	2011	335	1400	CHE Gasoline					
Yard tractor	H-098			Gasoline	Chevy	454-FI	2011	335	1706	CHE Gasoline					
Yard tractor	H-099			Gasoline	Chevy	454-FI	2011	335	1501	CHE Gasoline					
Yard tractor	H-100			Gasoline	Chevy	454-FI	2011	335	1581	CHE Gasoline					
Yard tractor	H-101			Gasoline	Chevy	454-FI	2011	335	1726	CHE Gasoline					
Yard tractor	H-102			Gasoline	Chevy	454-FI	2011	335	1636	CHE Gasoline					
Yard tractor	H-103			Gasoline	Chevy	454-FI	2011	335	1723	CHE Gasoline					
Yard tractor	H-104			Gasoline	Chevy	454-FI	2011	335	1350	CHE Gasoline					
Yard tractor	H-105			Gasoline	Chevy	454-FI	2011	335	1622	CHE Gasoline					
Yard tractor	H-106	Capacity	TJ7000	Diesel	Cummins	ISB6.7	2008	173	1955	CHE On Road Diesel					
Yard tractor	H-107	Capacity	TJ7000	Diesel	Cummins	ISB6.7	2008	173	2376	CHE On Road Diesel					
Yard tractor	H-108	Capacity	TJ7000	Diesel	Cummins	ISB6.7	2008	173	1629	CHE On Road Diesel					
Yard tractor	H-109	Capacity	TJ7000	Diesel	Cummins	ISB6.7	2008	173	1864	CHE On Road Diesel					
Yard tractor	H-110	Capacity	TJ7000	Diesel	Cummins	ISB6.7	2008	173	2456	CHE On Road Diesel					
Yard tractor	H-111	Capacity	TJ7000	Diesel	Cummins	ISB6.7	2008	173	2374	CHE On Road Diesel					
Yard tractor	H-112	Capacity	TJ7000	Diesel	Cummins	ISB6.7	2008	173	2437	CHE On Road Diesel					
Yard tractor	H-113	Capacity	TJ7000	Diesel	Cummins	ISB6.7	2008	173	2624	CHE On Road Diesel					
Yard tractor	H-114	Capacity	TJ7000	Diesel	Cummins	QSB6.7	2007	173	1964	CHE On Road Diesel					
Yard tractor	H-115	Capacity	TJ7000	Diesel	Cummins	QSB6.7	2007	173	2534	CHE On Road Diesel					
Yard tractor	H-116	Capacity	TJ7000	Diesel	Cummins	QSB6.7	2007	173	2263	CHE On Road Diesel					
Yard tractor	H-117	Capacity	TJ7000	Diesel	Cummins	B5.9C	2005	173	2172	CHE Diesel					
Yard tractor	H-118	Capacity	TJ7000	Diesel	Cummins	B5.9C	2005	173	1731	CHE Diesel					
Yard tractor	H-119			Diesel			2002		537	CHE Diesel					
Yard tractor	H-120			Diesel			2005		1070	CHE Diesel					
Yard tractor	H-121			Diesel			2001		1592	CHE Diesel					
Yard tractor	H-253	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1364	CHE Diesel	5/19/2004				
Yard tractor	H-259	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1383	CHE Diesel	9/3/2004				
Yard tractor	H-311	Capacity	TJ7000	Diesel	Cummins	B5.9C	2003	173	121	CHE Diesel	5/24/2004				
Yard tractor	H-312	Capacity	TJ7000	Diesel	Cummins	B5.9C	2003	173	2274	CHE Diesel	5/12/2004				
Yard tractor	H-315	Capacity	TJ7000	Diesel	Cummins	B5.9C	2003	173	890	CHE Diesel	10/27/2003				

Port Equip Type	Equip ID	Equip Make	Equip Model	Engine Type	Engine Make	Engine Model	Year	HP	Annual Hours	Category	DOC	DPF level 2	DPF level 3	Vycon	Blue Cat
Yard tractor	H-316	Capacity	TJ7000	Diesel	Cummins	B5.9C	2003	173	1023	CHE Diesel	5/18/2004				
Yard tractor	H-322	Capacity	TJ7000	Diesel	Cummins	B5.9C	2003	173	977	CHE Diesel	5/12/2004				
Yard tractor	H-324	Capacity	TJ7000	Diesel	Cummins	B5.9C	2003	173	1208	CHE Diesel	5/11/2004				
Yard tractor	H-325	Capacity	TJ7000	Diesel	Cummins	B5.9C	2003	173	763	CHE Diesel	5/21/2004				
Yard tractor	H-327	Capacity	TJ7000	Diesel	Cummins	B5.9C	2003	173	1043	CHE Diesel	5/31/2004				
Yard tractor	H-328	Capacity	TJ7000	Diesel	Cummins	B5.9C	2003	173	39	CHE Diesel	6/3/2004				
Yard tractor	H-329	Capacity	TJ7000	Diesel	Cummins	B5.9C	2003	173	1246	CHE Diesel	5/27/2004				
Yard tractor	H-330	Capacity	TJ7000	Diesel	Cummins	B5.9C	2003	173	1084	CHE Diesel	8/4/2004				
Yard tractor	H-331	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1255	CHE Diesel	8/5/2004				
Yard tractor	H-332	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1291	CHE Diesel	8/6/2004				
Yard tractor	H-333	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1330	CHE Diesel	8/6/2004				
Yard tractor	H-334	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1261	CHE Diesel	8/7/2004				
Yard tractor	H-335	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1248	CHE Diesel	8/10/2004				
Yard tractor	H-336	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1066	CHE Diesel	8/12/2004				
Yard tractor	H-337	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1404	CHE Diesel	8/11/2004				
Yard tractor	H-338	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1090	CHE Diesel	8/13/2004				
Yard tractor	H-339	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1346	CHE Diesel	8/16/2004				
Yard tractor	H-340	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1141	CHE Diesel	8/16/2004				
Yard tractor	H-341	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	723	CHE Diesel	8/17/2004				
Yard tractor	H-342	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1450	CHE Diesel	8/18/2004				
Yard tractor	H-343	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1662	CHE Diesel	8/28/2004				
Yard tractor	H-344	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1632	CHE Diesel	8/26/2004				
Yard tractor	H-345	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1276	CHE Diesel	10/14/2004				
Yard tractor	H-346	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1142	CHE Diesel	8/30/2004				
Yard tractor	H-347	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1228	CHE Diesel	10/5/2004				
Yard tractor	H-348	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	851	CHE Diesel	10/19/2004				
Yard tractor	H-349	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1441	CHE Diesel	10/7/2004				
Yard tractor	H-440	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1577	CHE Diesel	11/30/2004				
Yard tractor	H-441	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1430	CHE Diesel	11/30/2004				
Yard tractor	H-445	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1784	CHE Diesel					
Yard tractor	H-446	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1641	CHE Diesel					
Yard tractor	H-447	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1491	CHE Diesel					
Yard tractor	H-448	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1487	CHE Diesel					
Yard tractor	H-449	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1535	CHE Diesel					
Yard tractor	H-450	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1581	CHE Diesel					
Yard tractor	H-451	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1810	CHE Diesel					
Yard tractor	H-452	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1495	CHE Diesel					
Yard tractor	H-453	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1045	CHE Diesel					
Yard tractor	H-454	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1564	CHE Diesel					
Yard tractor	H-455	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1643	CHE Diesel					
Yard tractor	H-456	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1213	CHE Diesel					
Yard tractor	H-457	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1386	CHE Diesel					
Yard tractor	H-458	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1531	CHE Diesel					

Port Equip Type	Equip ID	Equip Make	Equip Model	Engine Type	Engine Make	Engine Model	Year	HP	Annual Hours	Category	DOC	DPF level 2	DPF level 3	Vycon	Blue Cat
Yard tractor	H-459	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1549	CHE Diesel					
Yard tractor	H-460	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	772	CHE Diesel					
Yard tractor	H-461	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1233	CHE Diesel					
Yard tractor	H-462	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1292	CHE Diesel					
Yard tractor	H-463	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1564	CHE Diesel					
Yard tractor	H-464	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1562	CHE Diesel					
Yard tractor	H-465	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1296	CHE Diesel					
Yard tractor	H-466	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1648	CHE Diesel					
Yard tractor	H-467	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1794	CHE Diesel					
Yard tractor	H-468	Capacity	TJ7000	Diesel	Cummins	B5.9C	2004	173	1201	CHE Diesel					
Yard tractor	H-469	Capacity	TJ7000	Diesel	Cummins	B5.9C	2005	173	1514	CHE Diesel					
Yard tractor	H-470	Capacity	TJ7000	Diesel	Cummins	B5.9C	2005	173	1401	CHE Diesel					
Yard tractor	H-471	Capacity	TJ7000	Diesel	Cummins	B5.9C	2005	173	1505	CHE Diesel					
Yard tractor	H-472	Capacity	TJ7000	Diesel	Cummins	B5.9C	2005	173	1680	CHE Diesel					
Yard tractor	H-473	Capacity	TJ7000	Diesel	Cummins	B5.9C	2005	173	1744	CHE Diesel					
Yard tractor	H-474	Capacity	TJ7000	Diesel	Cummins	B5.9C	2005	173	2062	CHE Diesel					
Yard tractor	H-475	Capacity	TJ7000	Diesel	Cummins	B5.9C	2005	173	1570	CHE Diesel					
Yard tractor	H-476	Capacity	TJ7000	Diesel	Cummins	B5.9C	2005	173	1621	CHE Diesel					
Yard tractor	H-477	Capacity	TJ7000	Diesel	Cummins	B5.9C	2005	173	1768	CHE Diesel					
Yard tractor	H-478	Capacity	TJ7000	Diesel	Cummins	B5.9C	2005	173	1626	CHE Diesel					
Yard tractor	H-479	Capacity	TJ7000	Diesel	Cummins	B5.9C	2005	173	1809	CHE Diesel					
Yard tractor	H-480	Capacity	TJ7000	Diesel	Cummins	B5.9C	2005	173	1016	CHE Diesel					
Yard tractor	H-481	Capacity	TJ7000	Diesel	Cummins	B5.9C	2005	173	1448	CHE Diesel					
Yard tractor	H-482	Capacity	TJ7000	Diesel	Cummins	B5.9C	2005	173	1383	CHE Diesel					
Yard tractor	H-483	Capacity	TJ7000	Diesel	Cummins	B5.9C	2005	173	1463	CHE Diesel					
Yard tractor	H-484	Capacity	TJ7000	Diesel	Cummins	B5.9C	2005	173	1182	CHE Diesel					
Yard tractor	H-485	Capacity	TJ7000	Diesel	Cummins	B5.9C	2005	173	1653	CHE Diesel					
Yard tractor	H-486	Capacity	TJ7000	Diesel	Cummins	B5.9C	2005	173	2410	CHE Diesel					
Yard tractor	H-487	Capacity	TJ7000	Diesel	Cummins	B5.9C	2005	173	1340	CHE Diesel					
Yard tractor	H-488	Capacity	TJ7000	Diesel	Cummins	B5.9C	2005	173	1700	CHE Diesel					
Yard tractor	H-489	Capacity	TJ7000	Diesel	Cummins	B5.9C	2006	173	1964	CHE Diesel					
Yard tractor	H-490	Capacity	TJ7000	Diesel	Cummins	B5.9C	2006	173	2116	CHE Diesel					
Yard tractor	H-491	Capacity	TJ7000	Diesel	Cummins	B5.9C	2006	173	1552	CHE Diesel					
Yard tractor	H-492	Capacity	TJ7000	Diesel	Cummins	B5.9C	2006	173	1794	CHE Diesel					
Yard tractor	H-493	Capacity	TJ7000	Diesel	Cummins	B5.9C	2006	173	2515	CHE Diesel					
Yard tractor	H-494	Capacity	TJ7000	Diesel	Cummins	QSB6.7	2007	173	2700	CHE On Road Diesel					
Yard tractor	H-495	Capacity	TJ7000	Diesel	Cummins	QSB6.7	2007	173	2470	CHE On Road Diesel					
Yard tractor	H-496	Capacity	TJ7000	Diesel	Cummins	QSB6.7	2007	173	1833	CHE On Road Diesel					
Yard tractor	H-497	Capacity	TJ7000	Diesel	Cummins	QSB6.7	2007	173	3100	CHE On Road Diesel					
Yard tractor	H-498	Capacity	TJ7000	Diesel	Cummins	QSB6.7	2007	173	2457	CHE On Road Diesel					
Yard tractor	H-499	Capacity	TJ7000	Diesel	Cummins	QSB6.7	2007	173	2780	CHE On Road Diesel					
Yard tractor	H-500	Capacity	TJ7000	Diesel	Cummins	QSB6.7	2007	173	2611	CHE On Road Diesel					
Yard tractor	H-501	Capacity	TJ7000	Diesel	Cummins	QSB6.7	2007	173	3122	CHE On Road Diesel					

Port Equip Type	Equip ID	Equip Make	Equip Model	Engine Type	Engine Make	Engine Model	Year	HP	Annual Hours	Category	DOC	DPF level 2	DPF level 3	Vycon	Blue Cat
Yard tractor	H-502	Capacity	TJ7000	Diesel	Cummins	QSB6.7	2007	173	0	CHE On Road Diesel					
Yard tractor	H-503	Capacity	TJ7000	Diesel	Cummins	QSB6.7	2007	173	2860	CHE On Road Diesel					
Yard tractor	H-504	Capacity	TJ7000	Diesel	Cummins	QSB6.7	2007	173	3045	CHE On Road Diesel					
Yard tractor	H-505	Capacity	TJ7000	Diesel	Cummins	QSB6.7	2007	173	2707	CHE On Road Diesel					
Yard tractor	H-506	Capacity	TJ7000	Diesel	Cummins	QSB6.7	2007	173	2397	CHE On Road Diesel					
Yard tractor	H-507	Capacity	TJ7000	Diesel	Cummins	ISB6.7	2007	173	2806	CHE On Road Diesel					
Yard tractor	H-508	Capacity	TJ7000	Diesel	Cummins	ISB6.7	2007	173	1902	CHE On Road Diesel					
Yard tractor	H-509	Capacity	TJ7000	Diesel	Cummins	ISB6.7	2007	173	3053	CHE On Road Diesel					
Yard tractor	H-510	Capacity	TJ7000	Diesel	Cummins	ISB6.7	2007	173	1748	CHE On Road Diesel					
Yard tractor	H-511	Capacity	TJ7000	Diesel	Cummins	ISB6.7	2007	173	2620	CHE On Road Diesel					
Yard tractor	H-512	Capacity	TJ7000	Diesel	Cummins	ISB6.7	2007	173	1626	CHE On Road Diesel					
Yard tractor	H-513	Capacity	TJ7000	Diesel	Cummins	ISB6.7	2007	173	2688	CHE On Road Diesel					
Yard tractor	H-514	Capacity	TJ7000	Diesel	Cummins	ISB6.7	2007	173	3011	CHE On Road Diesel					
Yard tractor	H-515	Capacity	TJ7000	Diesel	Cummins	ISB6.7	2007	173	2736	CHE On Road Diesel					
Yard tractor	H-516	Capacity	TJ7000	Diesel	Cummins	ISB6.7	2007	173	2571	CHE On Road Diesel					
Yard tractor	H-517	Capacity	TJ7000	Diesel	Cummins	ISB6.7	2007	173	2884	CHE On Road Diesel					
Yard tractor	H-518	Capacity	TJ7000	Diesel	Cummins	ISB6.7	2007	173	2097	CHE On Road Diesel					
Yard tractor	H-519	Capacity	TJ7000	Diesel	Cummins	ISB6.7	2007	173	2441	CHE On Road Diesel					
Yard tractor	H-520	Capacity	TJ7000	Diesel	Cummins	ISB6.7	2007	173	2926	CHE On Road Diesel					
Yard tractor	H-521			Gasoline	Chevy	454-FI	2011	335	20	CHE Gasoline					
Yard tractor	H-603			Gasoline	Chevy	454-FI	2011	335	1380	CHE Gasoline					
Yard tractor	H-604			Gasoline	Chevy	454-FI	2011	335	1283	CHE Gasoline					
Yard tractor	H-605			Gasoline	Chevy	454-FI	2011	335	1238	CHE Gasoline					
Yard tractor	H-606			Gasoline	Chevy	454-FI	2011	335	1072	CHE Gasoline					
Yard tractor	H-607			Gasoline	Chevy	454-FI	2011	335	1379	CHE Gasoline					
Yard tractor	H-608			Gasoline	Chevy	454-FI	2011	335	1249	CHE Gasoline					
Yard tractor	H-609			Gasoline	Chevy	454-FI	2011	335	1032	CHE Gasoline					
Yard tractor	H-610			Gasoline	Chevy	454-FI	2011	335	1110	CHE Gasoline					
Yard tractor	H-6101			Gasoline	Chevy	454-FI	2011	335	1029	CHE Gasoline					
Yard tractor	H-6102			Gasoline	Chevy	454-FI	2011	335	1881	CHE Gasoline					
Yard tractor	H-6103			Gasoline	Chevy	454-FI	2011	335	1372	CHE Gasoline					
Yard tractor	H-6104			Gasoline	Chevy	454-FI	2011	335	1360	CHE Gasoline					
Yard tractor	H-6106			Gasoline	Chevy	454-FI	2011	335	2015	CHE Gasoline					
Yard tractor	H-6107			Gasoline	Chevy	454-FI	2011	335	1809	CHE Gasoline					
Yard tractor	H-6108			Gasoline	Chevy	454-FI	2011	335	1311	CHE Gasoline					
Yard tractor	H-611			Gasoline	Chevy	454-FI	2011	335	1368	CHE Gasoline					
Yard tractor	H-613			Gasoline	Chevy	454-FI	2011	335	374	CHE Gasoline					
Yard tractor	H-614			Gasoline	Chevy	454-FI	2011	335	1052	CHE Gasoline					
Yard tractor	H-659			Gasoline	Chevy	454-FI	2011	335	1529	CHE Gasoline					
Yard tractor	H-660			Gasoline	Chevy	454-FI	2011	335	1428	CHE Gasoline					
Yard tractor	H-661			Gasoline	Chevy	454-FI	2011	335	1340	CHE Gasoline					
Yard tractor	H-662			Gasoline	Chevy	454-FI	2011	335	1860	CHE Gasoline					
Yard tractor	H-670			Gasoline	Chevy	454-FI	2011	335	1507	CHE Gasoline					

Port Equip Type	Equip ID	Equip Make	Equip Model	Engine Type	Engine Make	Engine Model	Year	HP	Annual Hours	Category	DOC	DPF level 2	DPF level 3	Vycon	Blue Cat
Yard tractor	H-671			Gasoline	Chevy	454-FI	2011	335	1393	CHE Gasoline					
Yard tractor	H-693			Gasoline	Chevy	454-FI	2011	335	1408	CHE Gasoline					
Yard tractor	H-694			Gasoline	Chevy	454-FI	2011	335	1683	CHE Gasoline					
Yard tractor	04-127	Ottawa	YT-50	Diesel	Cummins	C8.3 TAA (6	2003	205	1562	CHE Diesel	11/5/2003				
Yard tractor	04-128	Ottawa	YT-50	Diesel	Cummins	C8.3 TAA (6	2003	205	1777	CHE Diesel	10/29/2003				
Yard tractor	04-129	Ottawa	YT-50	Diesel	Cummins	C8.3 TAA (6	2003	205	1834	CHE Diesel	10/31/2003				
Yard tractor	04-130	Ottawa	YT-50	Diesel	Cummins	C8.3 TAA (6	2003	205	1868	CHE Diesel	10/30/2003				
Yard tractor	04-131	Ottawa	YT-50	Diesel	Cummins	C8.3 TAA (6	2003	205	1003	CHE Diesel	10/31/2003				
Yard tractor	04-132	Ottawa	YT-50	Diesel	Cummins	C8.3 TAA (6	2005	245	1340	CHE Diesel	10/29/2003				
Yard tractor	04-133	Ottawa	YT-50	Diesel	Cummins	C8.3 TAA (6	2005	245	1194	CHE Diesel	10/29/2003				
Yard tractor	04-134	Ottawa	YT-50	Diesel	Cummins	C8.3 TAA (6	2005	245	1372	CHE Diesel	10/22/2003				
Yard tractor	04-135	Ottawa	YT-50	Diesel	Cummins	C8.3 TAA (6	2005	245	1430	CHE Diesel	10/22/2003				
Yard tractor	04-136	Ottawa	YT-50	Diesel	Cummins	C8.3 TAA (6	2005	245	1446	CHE Diesel	10/14/2003				
Yard tractor	04-137	Ottawa	YT-50	Diesel	Cummins	C8.3 TAA (6	2005	245	1708	CHE Diesel	10/14/2003				
Yard tractor	04-138	Ottawa	YT-50	Diesel	Cummins	C8.3 TAA (6	2005	245	1643	CHE Diesel	10/14/2003				
Yard tractor	04-139	Ottawa	YT-50	Diesel	Cummins	C8.3 TAA (6	2005	245	1657	CHE Diesel	10/10/2003				
Yard tractor	04-140	Ottawa	YT-50	Diesel	Cummins	ISB02	2005	245	1683	CHE On Road Diesel	6/3/2005				
Yard tractor	04-141	Ottawa	YT-50	Diesel	Cummins	ISB02	2005	245	1921	CHE On Road Diesel	6/3/2005				
Yard tractor	04-142	Ottawa	YT-50	Diesel	Cummins	ISB02	2005	245	1975	CHE On Road Diesel	6/3/2005				
Yard tractor	04-143	Ottawa	YT-50	Diesel	Cummins	ISB02	2005	245	1506	CHE On Road Diesel	6/3/2005				
Yard tractor	04-144	Ottawa	YT-50	Diesel	Cummins	ISB02	2005	245	1634	CHE On Road Diesel	6/3/2005				
Yard tractor	04-145	Ottawa	YT-50	Diesel	Cummins	ISB02	2005	245	1813	CHE On Road Diesel	6/3/2005				
Yard tractor	04-146	Ottawa	YT-50	Diesel	Cummins	ISB02	2005	245	1659	CHE On Road Diesel	6/3/2005				
Yard tractor	04-147	Ottawa	YT-50	Diesel	Cummins	ISB02	2005	245	1932	CHE On Road Diesel	6/3/2005				
Yard tractor	04-148	Ottawa	YT-50	Diesel	Cummins	ISB02	2005	245	1860	CHE On Road Diesel	6/3/2005				
Yard tractor	04-149	Ottawa	YT-50	Diesel	Cummins	ISB02	2005	245	2049	CHE On Road Diesel	6/3/2005				
Yard tractor	04-150	Ottawa	YT-50	Diesel	Cummins	ISB02	2005	245	1473	CHE On Road Diesel	6/3/2005				
Yard tractor	04-151	Ottawa	YT-50	Diesel	Cummins	ISB02	2005	245	1381	CHE On Road Diesel	6/3/2005				
Yard tractor	04-152	Ottawa	YT-50	Diesel	Cummins	ISB02	2005	245	965	CHE On Road Diesel	6/3/2005				
Yard tractor	04-153	Ottawa	YT-50	Diesel	Cummins	ISB02	2005	245	1204	CHE On Road Diesel	6/3/2005				
Yard tractor	04-154	Ottawa	YT-50	Diesel	Cummins	ISB02	2005	245	1199	CHE On Road Diesel	6/3/2005				
Yard tractor	04-155	Ottawa	YT-50	Diesel	Cummins	ISB02	2005	245	1043	CHE On Road Diesel	6/3/2005				
Yard tractor	04-156	Ottawa	YT-50	Diesel	Cummins	ISB02	2005	245	1179	CHE On Road Diesel	6/3/2005				
Yard tractor	04-157	Ottawa	YT-50	Diesel	Cummins	ISB02	2005	245	1288	CHE On Road Diesel	6/3/2005				
Yard tractor	04-158	Ottawa	YT-50	Diesel	Cummins	ISB02	2005	245	1003	CHE On Road Diesel	6/3/2005				
Yard tractor	04-159	Ottawa	YT-50	Diesel	Cummins	ISB02	2005	245	1599	CHE On Road Diesel	6/3/2005				
Yard tractor	04-160	Ottawa	YT-50	Diesel	Cummins	ISB02	2005	245	1154	CHE On Road Diesel	6/3/2005				
Yard tractor	04-161	Ottawa	YT-50	Diesel	Cummins	ISB02	2005	245	325	CHE On Road Diesel	6/3/2005				
Yard tractor	04-162	Ottawa	YT-50	Diesel	Cummins	ISB2040	2007	240	2437	CHE On Road Diesel					
Yard tractor	04-163	Ottawa	YT-50	Diesel	Cummins	ISB2040	2007	240	1793	CHE On Road Diesel					
Yard tractor	04-164	Ottawa	YT-50	Diesel	Cummins	ISB2040	2007	240	1802	CHE On Road Diesel					
Yard tractor	04-165	Ottawa	YT-50	Diesel	Cummins	ISB2040	2007	240	1827	CHE On Road Diesel					
Yard tractor	04-166	Ottawa	YT-50	Diesel	Cummins	ISB2040	2007	240	1904	CHE On Road Diesel					

Port Equip Type	Equip ID	Equip Make	Equip Model	Engine Type	Engine Make	Engine Model	Year	HP	Annual Hours	Category	DOC	DPF level 2	DPF level 3	Vycon	Blue Cat
Yard tractor	04-167	Ottawa	YT-50	Diesel	Cummins	ISB2040	2007	240	1659	CHE On Road Diesel					
Yard tractor	04-168	Ottawa	YT-50	Diesel	Cummins	ISB2040	2007	240	1641	CHE On Road Diesel					
Yard tractor	04-169	Ottawa	YT-50	Diesel	Cummins	ISB2040	2007	240	1452	CHE On Road Diesel					
Yard tractor	04-170	Ottawa	YT-50	Diesel	Cummins	ISB2040	2007	240	1390	CHE On Road Diesel					
Yard tractor	04-171	Ottawa	YT-50	Diesel	Cummins	ISB2040	2007	240	1118	CHE On Road Diesel					
Yard tractor	04-172	Ottawa	YT-50	Diesel	Cummins	ISB2040	2007	240	1302	CHE On Road Diesel					
Yard tractor	04-173	Ottawa	YT-50	Diesel	Cummins	ISB2040	2007	240	1590	CHE On Road Diesel					
Yard tractor	04-174	Ottawa	YT-50	Diesel	Cummins	ISB	2008	240	1864	CHE On Road Diesel					
Yard tractor	04-175	Ottawa	YT-50	Diesel	Cummins	ISB	2008	240	1968	CHE On Road Diesel					
Yard tractor	04-176	Ottawa	YT-50	Diesel	Cummins	ISB	2008	240	1797	CHE On Road Diesel					
Yard tractor	04-177	Ottawa	YT-50	Diesel	Cummins	ISB	2008	240	1761	CHE On Road Diesel					
Yard tractor	04-178	Ottawa	YT-50	Diesel	Cummins	ISB	2008	240	1778	CHE On Road Diesel					
Yard tractor	04-179	Ottawa	YT-50	Diesel	Cummins	ISB	2008	240	1728	CHE On Road Diesel					
Yard tractor	04-180	Ottawa	YT-50	Diesel	Cummins	ISB	2008	240	1926	CHE On Road Diesel					
Yard tractor	04-181	Ottawa	YT-50	Diesel	Cummins	ISB6	2012	250	1227	CHE On Road Diesel					
Yard tractor	04-182	Ottawa	YT-50	Diesel	Cummins	ISB6	2012	250	1387	CHE On Road Diesel					
Yard tractor	04-183	Ottawa	YT-50	Diesel	Cummins	ISB6	2012	250	1454	CHE On Road Diesel					
Yard tractor	04-184	Ottawa	YT-50	Diesel	Cummins	ISB6	2012	250	1472	CHE On Road Diesel					
Yard tractor	04-185	Ottawa	YT-50	Diesel	Cummins	ISB6	2012	250	1466	CHE On Road Diesel					
Yard tractor	04-186	Ottawa	YT-50	Diesel	Cummins	ISB6	2012	250	1784	CHE On Road Diesel					
Yard tractor	04-187	Ottawa	YT-50	Diesel	Cummins	ISB6	2012	250	1194	CHE On Road Diesel					
Yard tractor	04-188	Ottawa	YT-50	Diesel	Cummins	ISB6	2012	250	1185	CHE On Road Diesel					
Yard tractor	04-189	Ottawa	YT-50	Diesel	Cummins	ISB6	2012	250	1232	CHE On Road Diesel					
Yard tractor	04-190	Ottawa	YT-50	Diesel	Cummins	ISB6	2012	250	1331	CHE On Road Diesel					
Yard tractor	04-191	Ottawa	YT-50	Diesel	Cummins	ISB6	2012	250	1208	CHE On Road Diesel					
Yard tractor	04-192	Ottawa	YT-50	Diesel	Cummins	ISB6	2012	250	1171	CHE On Road Diesel					
Yard tractor	04-193	Ottawa	YT-50	Diesel	Cummins	ISB6	2012	250	1086	CHE On Road Diesel					
Yard tractor	04-194	Ottawa	YT-50	Diesel	Cummins	ISB6	2012	250	1024	CHE On Road Diesel					
Yard tractor	04-195	Ottawa	YT-50	Diesel	Cummins	ISB6	2012	250	744	CHE On Road Diesel					
Yard tractor	5046	Capacity	TJ9000	Diesel			2008	195	1208	CHE On Road Diesel					
Yard tractor	5047	Capacity	TJ9000	Diesel			2008	195	1208	CHE On Road Diesel					
Yard tractor	5048	Capacity	TJ9000	Diesel			2008	195	1208	CHE On Road Diesel					
Yard tractor	5049	Capacity	TJ9000	Diesel			2008	195	1208	CHE On Road Diesel					
Yard tractor	5301	Capacity	TJ9000	Diesel			2008	195	1208	CHE On Road Diesel					
Yard tractor	5302	Capacity	TJ9000	Diesel			2008	195	1208	CHE On Road Diesel					
Yard tractor	5303	Capacity	TJ9000	Diesel			2008	195	1208	CHE On Road Diesel					
Yard tractor	5304	Capacity	TJ9000	Diesel			2008	195	1208	CHE On Road Diesel					
Yard tractor	5305	Capacity	TJ9000	Diesel			2008	195	1208	CHE On Road Diesel					
Yard tractor	5306	Capacity	TJ9000	Diesel			2008	195	1208	CHE On Road Diesel					
Yard tractor	5307	Capacity	TJ9000	Diesel			2008	195	1208	CHE On Road Diesel					
Yard tractor	5308	Capacity	TJ9000	Diesel			2008	195	1208	CHE On Road Diesel					
Yard tractor	5309	Capacity	TJ9000	Diesel			2008	195	1208	CHE On Road Diesel					
Yard tractor	5505	Kalmar	PT 122	Diesel	Cummins	ISB 5.9	2005	195	0	CHE On Road Diesel					

Port Equip Type	Equip ID	Equip Make	Equip Model	Engine Type	Engine Make	Engine Model	Year	HP	Annual Hours	Category	DOC	DPF level 2	DPF level 3	Vycon	Blue Cat
Yard tractor	5506	Kalmar	PT 122	Diesel	Cummins	ISB 5.9	2005	195	1031	CHE On Road Diesel					
Yard tractor	5507	Kalmar	PT 122	Diesel	Cummins	ISB 5.9	2005	195	1001	CHE On Road Diesel					
Yard tractor	5508	Kalmar	PT 122	Diesel	Cummins	ISB 5.9	2005	195	772	CHE On Road Diesel					
Yard tractor	5509	Kalmar	PT 122	Diesel	Cummins	ISB 5.9	2005	195	0	CHE On Road Diesel					
Yard tractor	5510	Kalmar	PT 122	Diesel	Cummins	ISB 5.9	2005	195	1124	CHE On Road Diesel					
Yard tractor	5511	Kalmar	PT 122	Diesel	Cummins	ISB 5.9	2005	195	1567	CHE On Road Diesel					
Yard tractor	5520	Capacity	TJ7000	Diesel	Caterpillar	C-7	2004	195	1710	CHE On Road Diesel					
Yard tractor	5521	Capacity	TJ7000	Diesel	Caterpillar	C-7	2004	195	1893	CHE On Road Diesel					
Yard tractor	5529	Capacity	TJ7000	Diesel	Caterpillar	C-7	2005	205	1536	CHE On Road Diesel					
Yard tractor	5530	Capacity	TJ7000	Diesel	Caterpillar	C-7	2005	205	1643	CHE On Road Diesel					
Yard tractor	5531	Capacity	TJ7000	Diesel	Caterpillar	C-7	2005	205	2071	CHE On Road Diesel					
Yard tractor	5532	Capacity	TJ7000	Diesel	Caterpillar	C-7	2005	205	1826	CHE On Road Diesel					
Yard tractor	5533	Capacity	TJ7000	Diesel	Caterpillar	C-7	2005	205	1606	CHE On Road Diesel					
Yard tractor	5534	Capacity	TJ7000	Diesel	Caterpillar	C-7	2005	205	2153	CHE On Road Diesel					
Yard tractor	5535	Capacity	TJ7000	Diesel	Caterpillar	C-7	2005	205	1641	CHE On Road Diesel					
Yard tractor	5536	Capacity	TJ7000	Diesel	Caterpillar	C-7	2005	205	1718	CHE On Road Diesel					
Yard tractor	5537	Capacity	TJ7000	Diesel	Caterpillar	C-7	2005	205	1833	CHE On Road Diesel					
Yard tractor	5538	Capacity	TJ7000	Diesel	Caterpillar	C-7	2005	205	2170	CHE On Road Diesel					
Yard tractor	5545	Capacity	TJ9000	Diesel	Caterpillar	C-7	2007	205	1004	CHE On Road Diesel					
Yard tractor	5546	Capacity	TJ9000	Diesel	Caterpillar	C-7	2007	205	1072	CHE On Road Diesel					
Yard tractor	5547	Capacity	TJ9000	Diesel	Caterpillar	C-7	2007	205	1905	CHE On Road Diesel					
Yard tractor	5548	Capacity	TJ9000	Diesel	Caterpillar	C-7	2007	205	1850	CHE On Road Diesel					
Yard tractor	5549	Capacity	TJ9000	Diesel	Caterpillar	C-7	2007	205	2147	CHE On Road Diesel					
Yard tractor	5550	Capacity	TJ9000	Diesel	Caterpillar	C-7	2007	205	2281	CHE On Road Diesel					
Yard tractor	5551	Capacity	TJ9000	Diesel	Caterpillar	C-7	2007	205	1377	CHE On Road Diesel					
Yard tractor	5552	Capacity	TJ9000	Diesel	Caterpillar	C-7	2007	205	2136	CHE On Road Diesel					
Yard tractor	5553	Capacity	TJ9000	Diesel	Caterpillar	C-7	2007	205	2263	CHE On Road Diesel					
Yard tractor	5554	Capacity	TJ9000	Diesel	Caterpillar	C-7	2007	205	2116	CHE On Road Diesel					
Yard tractor	5555	Capacity	TJ9000	Diesel	Caterpillar	C-7	2007	205	1917	CHE On Road Diesel					
Yard tractor	5556	Capacity	TJ9000	Diesel	Caterpillar	C-7	2007	205	2183	CHE On Road Diesel					
Yard tractor	5557	Capacity	TJ9000	Diesel	Caterpillar	C-7	2007	205	1968	CHE On Road Diesel					
Yard tractor	5559	Capacity	TJ9000	Diesel	Caterpillar	C-7	2007	205	2202	CHE On Road Diesel					
Yard tractor	5560	Capacity	TJ9000	Diesel	Caterpillar	C-7	2007	205	1906	CHE On Road Diesel					
Yard tractor	5601	Capacity	TJ9000	Diesel	Caterpillar	C-7	2007	205	2017	CHE On Road Diesel					
Yard tractor	5602	Capacity	TJ9000	Diesel	Caterpillar	C-7	2007	205	1833	CHE On Road Diesel					
Yard tractor	5603	Capacity	TJ9000	Diesel	Caterpillar	C-7	2007	205	1931	CHE On Road Diesel					
Yard tractor	5604	Capacity	TJ9000	Diesel	Caterpillar	C-7	2007	205	2026	CHE On Road Diesel					
Yard tractor	5605	Capacity	TJ9000	Diesel	Caterpillar	C-7	2007	205	2067	CHE On Road Diesel					
Yard tractor	5606	Capacity	TJ9000	Diesel	Caterpillar	C-7	2007	205	2146	CHE On Road Diesel					
Yard tractor	5607	Capacity	TJ9000	Diesel	Caterpillar	C-7	2007	205	1907	CHE On Road Diesel					
Yard tractor	5608	Capacity	TJ9000	Diesel	Caterpillar	C-7	2007	205	1834	CHE On Road Diesel					
Yard tractor	5609	Capacity	TJ9000	Diesel	Caterpillar	C-7	2007	205	1965	CHE On Road Diesel					
Yard tractor	5610	Capacity	TJ9000	Diesel	Caterpillar	C-7	2007	205	2214	CHE On Road Diesel					

Port Equip Type	Equip ID	Equip Make	Equip Model	Engine Type	Engine Make	Engine Model	Year	HP	Annual Hours	Category	DOC	DPF level 2	DPF level 3	Vycon	Blue Cat
Yard tractor	5626	Capacity	TJ9000	Diesel	Caterpillar	C-7	2007	205	1040	CHE On Road Diesel					
Yard tractor	5627	Capacity	TJ9000	Diesel	Caterpillar	C-7	2007	205	1095	CHE On Road Diesel					
Yard tractor	5628	Capacity	TJ9000	Diesel	Caterpillar	C-7	2007	205	1099	CHE On Road Diesel					
Yard tractor	5629	Capacity	TJ9000	Diesel	Caterpillar	C-7	2007	205	929	CHE On Road Diesel					
Yard tractor	5799	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	108	CHE On Road Diesel					
Yard tractor	5800	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	1489	CHE On Road Diesel					
Yard tractor	5801	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	1690	CHE On Road Diesel					
Yard tractor	5802	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2216	CHE On Road Diesel					
Yard tractor	5803	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2425	CHE On Road Diesel					
Yard tractor	5804	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	1966	CHE On Road Diesel					
Yard tractor	5805	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2184	CHE On Road Diesel					
Yard tractor	5806	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	1896	CHE On Road Diesel					
Yard tractor	5807	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2126	CHE On Road Diesel					
Yard tractor	5808	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	1941	CHE On Road Diesel					
Yard tractor	5809	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2091	CHE On Road Diesel					
Yard tractor	5810	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2328	CHE On Road Diesel					
Yard tractor	5811	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	1727	CHE On Road Diesel					
Yard tractor	5812	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	1755	CHE On Road Diesel					
Yard tractor	5813	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2401	CHE On Road Diesel					
Yard tractor	5814	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2553	CHE On Road Diesel					
Yard tractor	5849	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2269	CHE On Road Diesel					
Yard tractor	5850	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2232	CHE On Road Diesel					
Yard tractor	5851	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	1490	CHE On Road Diesel					
Yard tractor	5852	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2472	CHE On Road Diesel					
Yard tractor	5853	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2198	CHE On Road Diesel					
Yard tractor	5854	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2589	CHE On Road Diesel					
Yard tractor	5855	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2748	CHE On Road Diesel					
Yard tractor	5856	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2548	CHE On Road Diesel					
Yard tractor	5857	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2460	CHE On Road Diesel					
Yard tractor	5858	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2497	CHE On Road Diesel					
Yard tractor	5859	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2268	CHE On Road Diesel					
Yard tractor	5860	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2184	CHE On Road Diesel					
Yard tractor	5861	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2758	CHE On Road Diesel					
Yard tractor	5862	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2428	CHE On Road Diesel					
Yard tractor	5863	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2101	CHE On Road Diesel					
Yard tractor	5864	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2463	CHE On Road Diesel					
Yard tractor	5865	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2491	CHE On Road Diesel					
Yard tractor	5866	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2359	CHE On Road Diesel					
Yard tractor	5867	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2705	CHE On Road Diesel					
Yard tractor	5868	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2486	CHE On Road Diesel					
Yard tractor	5869	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	1677	CHE On Road Diesel					
Yard tractor	5870	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2481	CHE On Road Diesel					
Yard tractor	5871	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2152	CHE On Road Diesel					

Port Equip Type	Equip ID	Equip Make	Equip Model	Engine Type	Engine Make	Engine Model	Year	HP	Annual Hours	Category	DOC	DPF level 2	DPF level 3	Vycon	Blue Cat
Yard tractor	5872	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2619	CHE On Road Diesel					
Yard tractor	5873	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2654	CHE On Road Diesel					
Yard tractor	5874	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2641	CHE On Road Diesel					
Yard tractor	5875	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2414	CHE On Road Diesel					
Yard tractor	5876	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2467	CHE On Road Diesel					
Yard tractor	5877	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2676	CHE On Road Diesel					
Yard tractor	5878	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2195	CHE On Road Diesel					
Yard tractor	5879	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2806	CHE On Road Diesel					
Yard tractor	5880	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2417	CHE On Road Diesel					
Yard tractor	5881	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2667	CHE On Road Diesel					
Yard tractor	5882	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2703	CHE On Road Diesel					
Yard tractor	5883	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2757	CHE On Road Diesel					
Yard tractor	5884	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2761	CHE On Road Diesel					
Yard tractor	5885	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2480	CHE On Road Diesel					
Yard tractor	5886	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2277	CHE On Road Diesel					
Yard tractor	5887	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2625	CHE On Road Diesel					
Yard tractor	5888	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2655	CHE On Road Diesel					
Yard tractor	5889	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2499	CHE On Road Diesel					
Yard tractor	5890	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2620	CHE On Road Diesel					
Yard tractor	5891	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	1923	CHE On Road Diesel					
Yard tractor	5892	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2262	CHE On Road Diesel					
Yard tractor	5893	Capacity	TJ9000	Diesel	Caterpillar	C-7	2008	205	2616	CHE On Road Diesel					
Yard tractor	35001	Capacity	TJ9000	Diesel			2011	205	569	CHE On Road Diesel					
Yard tractor	35002	Capacity	TJ9000	Diesel			2011	205	2825	CHE On Road Diesel					
Yard tractor	35003	Capacity	TJ9000	Diesel			2011	205	2596	CHE On Road Diesel					
Yard tractor	35004	Capacity	TJ9000	Diesel			2011	205	2831	CHE On Road Diesel					
Yard tractor	35005	Capacity	TJ9000	Diesel			2011	205	2897	CHE On Road Diesel					
Yard tractor	35006	Capacity	TJ9000	Diesel			2011	205	2648	CHE On Road Diesel					
Yard tractor	35007	Capacity	TJ9000	Diesel			2011	205	1986	CHE On Road Diesel					
Yard tractor	35008	Capacity	TJ9000	Diesel			2011	205	613	CHE On Road Diesel					
Yard tractor	35009	Capacity	TJ9000	Diesel			2011	205	2689	CHE On Road Diesel					
Yard tractor	35010	Capacity	TJ9000	Diesel			2011	205	1779	CHE On Road Diesel					
Yard tractor	35011	Capacity	TJ9000	Diesel			2011	205	2879	CHE On Road Diesel					
Yard tractor	35012	Capacity	TJ9000	Diesel			2011	205	2457	CHE On Road Diesel					
Yard tractor	35013	Capacity	TJ9000	Diesel			2011	205	2815	CHE On Road Diesel					
Yard tractor	35014	Capacity	TJ9000	Diesel			2011	205	2080	CHE On Road Diesel					
Yard tractor	35015	Capacity	TJ9000	Diesel			2011	205	2908	CHE On Road Diesel					
Yard tractor	35016	Capacity	TJ9000	Diesel			2011	205	2905	CHE On Road Diesel					
Yard tractor	35017	Capacity	TJ9000	Diesel			2011	205	3171	CHE On Road Diesel					
Yard tractor	35018	Capacity	TJ9000	Diesel			2011	205	2427	CHE On Road Diesel					
Yard tractor	35019	Capacity	TJ9000	Diesel			2011	205	2680	CHE On Road Diesel					
Yard tractor	35020	Capacity	TJ9000	Diesel			2011	205	3009	CHE On Road Diesel					
Yard tractor	35021	Capacity	TJ9000	Diesel			2011	205	2315	CHE On Road Diesel					

Port Equip Type	Equip ID	Equip Make	Equip Model	Engine Type	Engine Make	Engine Model	Year	HP	Annual Hours	Category	DOC	DPF level 2	DPF level 3	Vycon	Blue Cat
Yard tractor	35022	Capacity	TJ9000	Diesel			2011	205	2265	CHE On Road Diesel					
Yard tractor	35023	Capacity	TJ9000	Diesel			2011	205	2586	CHE On Road Diesel					
Yard tractor	35024	Capacity	TJ9000	Diesel			2011	205	2547	CHE On Road Diesel					
Yard tractor	35025	Capacity	TJ9000	Diesel			2011	205	882	CHE On Road Diesel					
Yard tractor	35026	Capacity	TJ9000	Diesel			2011	205	2687	CHE On Road Diesel					
Yard tractor	35027	Capacity	TJ9000	Diesel			2012	205	2819	CHE On Road Diesel					
Yard tractor	35028	Capacity	TJ9000	Diesel			2012	205	3170	CHE On Road Diesel					
Yard tractor	35029	Capacity	TJ9000	Diesel			2012	205	2910	CHE On Road Diesel					
Yard tractor	35030	Capacity	TJ9000	Diesel			2012	205	2958	CHE On Road Diesel					
Yard tractor	35031	Capacity	TJ9000	Diesel			2012	205	2880	CHE On Road Diesel					
Yard tractor	35032	Capacity	TJ9000	Diesel			2012	205	3131	CHE On Road Diesel					
Yard tractor	35033	Capacity	TJ9000	Diesel			2012	205	3153	CHE On Road Diesel					
Yard tractor	35034	Capacity	TJ9000	Diesel			2012	205	2652	CHE On Road Diesel					
Yard tractor	35035	Capacity	TJ9000	Diesel			2012	205	3336	CHE On Road Diesel					
Yard tractor	35036	Capacity	TJ9000	Diesel			2012	205	2904	CHE On Road Diesel					
Yard tractor	35037	Capacity	TJ9000	Diesel			2012	205	1508	CHE On Road Diesel					
Yard tractor	35038	Capacity	TJ9000	Diesel			2012	205	2223	CHE On Road Diesel					
Yard tractor	35039	Capacity	TJ9000	Diesel			2012	205	2749	CHE On Road Diesel					
Yard tractor	35040	Capacity	TJ9000	Diesel			2012	205	3124	CHE On Road Diesel					
Yard tractor	35041	Capacity	TJ9000	Diesel			2012	205	3281	CHE On Road Diesel					
Yard tractor	35042	Capacity	TJ9000	Diesel			2012	205	2889	CHE On Road Diesel					
Yard tractor	35043	Capacity	TJ9000	Diesel			2012	205	2675	CHE On Road Diesel					
Yard tractor	35044	Capacity	TJ9000	Diesel			2012	205	2375	CHE On Road Diesel					
Yard tractor	35045	Capacity	TJ9000	Diesel			2012	205	2860	CHE On Road Diesel					
Yard tractor	35046	Capacity	TJ9000	Diesel			2012	205	2963	CHE On Road Diesel					
Yard tractor	35047	Capacity	TJ9000	Diesel			2012	205	3254	CHE On Road Diesel					
Yard tractor	35048	Capacity	TJ9000	Diesel			2012	205	3400	CHE On Road Diesel					
Yard tractor	35049	Capacity	TJ9000	Diesel			2012	205	2930	CHE On Road Diesel					
Yard tractor	35050	Capacity	TJ9000	Diesel			2012	205	2765	CHE On Road Diesel					
Yard tractor	35051	Capacity	TJ9000	Diesel			2012	205	3422	CHE On Road Diesel					
Yard tractor	35052	Capacity	TJ9000	Diesel			2012	205	3096	CHE On Road Diesel					
Yard tractor	35053	Capacity	TJ9000	Diesel			2012	205	3287	CHE On Road Diesel					
Yard tractor	35054	Capacity	TJ9000	Diesel			2012	205	3182	CHE On Road Diesel					
Yard tractor	35055	Capacity	TJ9000	Diesel			2012	205	2812	CHE On Road Diesel					
Yard tractor	35056	Capacity	TJ9000	Diesel			2012	205	2865	CHE On Road Diesel					
Yard tractor	35057	Capacity	TJ9000	Diesel			2012	205	2757	CHE On Road Diesel					
Yard tractor	35058	Capacity	TJ9000	Diesel			2012	205	2914	CHE On Road Diesel					
Yard tractor	35059	Capacity	TJ9000	Diesel			2012	205	3083	CHE On Road Diesel					
Yard tractor	35060	Capacity	TJ9000	Diesel			2012	205	2554	CHE On Road Diesel					
Yard tractor	35061	Capacity	TJ9000	Diesel			2012	205	3262	CHE On Road Diesel					
Yard tractor	35062	Capacity	TJ9000	Diesel			2012	205	2545	CHE On Road Diesel					
Yard tractor	35063	Capacity	TJ9000	Diesel			2012	205	2977	CHE On Road Diesel					
Yard tractor	35064	Capacity	TJ9000	Diesel			2012	205	2913	CHE On Road Diesel					

Port Equip Type	Equip ID	Equip Make	Equip Model	Engine Type	Engine Make	Engine Model	Year	HP	Annual Hours	Category	DOC	DPF level 2	DPF level 3	Vycon	Blue Cat
Yard tractor	35065	Capacity	TJ9000	Diesel			2012	205	2695	CHE On Road Diesel					
Yard tractor	35066	Capacity	TJ9000	Diesel			2012	205	1828	CHE On Road Diesel					
Yard tractor	35067	Capacity	TJ9000	Diesel			2012	205	1452	CHE On Road Diesel					
Yard tractor	35068	Capacity	TJ9000	Diesel			2012	205	1978	CHE On Road Diesel					
Yard tractor	35069	Capacity	TJ9000	Diesel			2012	205	1660	CHE On Road Diesel					
Yard tractor	35070	Capacity	TJ9000	Diesel			2012	205	1838	CHE On Road Diesel					

Table D.2: Zero Hour Emission Factors

(Table presented on following pages due to size)

Engine Type	Engine Year min	Engine Year max	Engine Power (kW) min	Engine Power (kW) max	PM ZH	PM DR	$PM_{2.5}$ ZH	$PM_{2.5}$ DR	DPM ZH	DPM DR	NO_x ZH	NO_x DR	SO_2 ZH	SO_2 DR	CO ZH	CO DR	HC ZH	HC DR	CO_2 ZH	CO_2 DR	N_2O ZH	N_2O DR	CH_4 ZH	CH_4 DR
					Zero Hour Emission Factor (g/kW-hr) and Deterioration Rate (gm/kW-hr^2)																			
Diesel	0	1988	0	38	1.0200	0.00007899	0.9380	0.00007267	1.0200	0.00007899	9.3872	0.00014081	0.0920	0.0	6.7051	0.00068794	2.4700	0.00031514	762	0.0	0.0270	0.0	0.0610	0.0
Diesel	1988	1997	0	38	1.0200	0.00007899	0.9380	0.00007267	1.0200	0.00007899	9.2500	0.00013947	0.0920	0.0	6.7051	0.00068794	2.4100	0.00030844	762	0.0	0.0270	0.0	0.0610	0.0
Diesel	1997	1999	0	38	1.0200	0.00007899	0.9380	0.00007267	1.0200	0.00007899	9.2500	0.00013947	0.0920	0.0	6.7051	0.00068794	2.4100	0.00030844	762	0.0	0.0270	0.0	0.0610	0.0
Diesel	1999	2004	0	38	0.8000	0.00006236	0.7360	0.00005737	0.8000	0.00006236	7.4400	0.00013813	0.0920	0.0	5.4982	0.00056323	1.9400	0.00024809	762	0.0	0.0270	0.0	0.0610	0.0
Diesel	2004	2005	0	38	0.5800	0.00004506	0.5340	0.00004145	0.5800	0.00004506	6.8392	0.00012512	0.0920	0.0	4.3851	0.00044790	0.8600	0.00013142	762	0.0	0.0270	0.0	0.0610	0.0
Diesel	2005	2006	0	38	0.5100	0.00003929	0.4690	0.00003615	0.5100	0.00003929	6.6381	0.00012968	0.0920	0.0	4.0200	0.00040901	0.5000	0.00009253	762	0.0	0.0270	0.0	0.0610	0.0
Diesel	2006	2008	0	38	0.4700	0.00003648	0.4320	0.00003356	0.4700	0.00003648	6.5400	0.00013182	0.0920	0.0	3.8353	0.00038890	0.3200	0.00007309	762	0.0	0.0270	0.0	0.0610	0.0
Diesel	2008	2013	0	38	0.2100	0.00001636	0.1930	0.00001505	0.2100	0.00001636	6.4369	0.00013410	0.0920	0.0	3.6476	0.00037012	0.1300	0.00005364	762	0.0	0.0270	0.0	0.0610	0.0
Diesel	2013	2040	0	38	0.0134	0.00000149	0.0120	0.00000137	0.0134	0.00000149	3.8890	0.00008100	0.0920	0.0	3.6476	0.00037012	0.1300	0.00005364	762	0.0	0.0270	0.0	0.0610	0.0
Diesel	0	1988	38	56	1.1265	0.00008194	1.0360	0.00007538	1.1265	0.00008194	17.4333	0.00040365	0.0800	0.0	6.4369	0.00017031	1.9300	0.00008931	762	0.0	0.0240	0.0	0.0560	0.0
Diesel	1988	1997	38	56	0.9300	0.00006732	0.8560	0.00006193	0.9300	0.00006732	11.7300	0.00027089	0.0800	0.0	4.6800	0.00012378	1.3300	0.00006142	762	0.0	0.0240	0.0	0.0560	0.0
Diesel	1997	1998	38	56	0.9300	0.00006732	0.8560	0.00006193	0.9300	0.00006732	11.7300	0.00027089	0.0800	0.0	4.6800	0.00012378	1.3300	0.00006142	762	0.0	0.0240	0.0	0.0560	0.0
Diesel	1998	2004	38	56	0.9300	0.00006732	0.8560	0.00006193	0.9300	0.00006732	9.2500	0.00021456	0.0800	0.0	4.6800	0.00012378	1.3300	0.00006142	762	0.0	0.0240	0.0	0.0560	0.0
Diesel	2004	2005	38	56	0.5200	0.00003822	0.4780	0.00003516	0.5200	0.00003822	7.5600	0.00013813	0.0800	0.0	4.3300	0.00011466	0.6200	0.00004466	762	0.0	0.0240	0.0	0.0560	0.0
Diesel	2005	2006	38	56	0.3900	0.00002843	0.3590	0.00002616	0.3900	0.00002843	7.0000	0.00011265	0.0800	0.0	4.2100	0.00011171	0.3800	0.00003916	762	0.0	0.0240	0.0	0.0560	0.0
Diesel	2006	2008	38	56	0.3200	0.00002360	0.2940	0.00002171	0.3200	0.00002360	6.7185	0.00009991	0.0800	0.0	4.1400	0.00011010	0.2600	0.00003634	762	0.0	0.0240	0.0	0.0560	0.0
Diesel	2008	2013	38	56	0.1877	0.00001381	0.1730	0.00001271	0.1877	0.00001381	3.8756	0.00005096	0.0800	0.0	4.0900	0.00010862	0.1300	0.00003353	762	0.0	0.0240	0.0	0.0560	0.0
Diesel	2013	2040	38	56	0.0134	0.00000125	0.0120	0.00000115	0.0134	0.00000125	3.8756	0.00005096	0.0800	0.0	4.0900	0.00010862	0.1300	0.00003353	762	0.0	0.0240	0.0	0.0560	0.0
Diesel	0	1988	56	75	1.1300	0.00008194	1.0400	0.00007538	1.1300	0.00008194	17.4333	0.00040365	0.0800	0.0	6.4369	0.00017031	1.9300	0.00008931	762	0.0	0.0240	0.0	0.0560	0.0
Diesel	1988	1997	56	75	0.9300	0.00006732	0.8560	0.00006193	0.9300	0.00006732	11.7300	0.00027089	0.0800	0.0	4.6800	0.00012378	1.3300	0.00006142	762	0.0	0.0240	0.0	0.0560	0.0
Diesel	1997	1998	56	75	0.9300	0.00006732	0.8560	0.00006193	0.9300	0.00006732	11.7300	0.00027089	0.0800	0.0	4.6800	0.00012378	1.3300	0.00006142	762	0.0	0.0240	0.0	0.0560	0.0
Diesel	1998	2004	56	75	0.9300	0.00006732	0.8560	0.00006193	0.9300	0.00006732	9.2500	0.00021456	0.0800	0.0	4.6800	0.00012378	1.3300	0.00006142	762	0.0	0.0240	0.0	0.0560	0.0
Diesel	2004	2005	56	75	0.5200	0.00003822	0.4780	0.00003516	0.5200	0.00003822	7.5600	0.00013813	0.0800	0.0	4.3300	0.00011466	0.6200	0.00004466	762	0.0	0.0240	0.0	0.0560	0.0
Diesel	2005	2006	56	75	0.3900	0.00002843	0.3590	0.00002616	0.3900	0.00002843	7.0000	0.00011265	0.0800	0.0	4.2100	0.00011171	0.3800	0.00003916	762	0.0	0.0240	0.0	0.0560	0.0
Diesel	2006	2008	56	75	0.3200	0.00002360	0.2940	0.00002171	0.3200	0.00002360	6.7185	0.00009991	0.0800	0.0	4.1400	0.00011010	0.2600	0.00003634	762	0.0	0.0240	0.0	0.0560	0.0
Diesel	2008	2012	56	75	0.2548	0.00001877	0.2340	0.00001727	0.2548	0.00001877	3.8756	0.00005096	0.0800	0.0	4.0900	0.00010862	0.1300	0.00003353	762	0.0	0.0240	0.0	0.0560	0.0
Diesel	2012	2015	56	75	0.0134	0.00000063	0.0120	0.00000058	0.0134	0.00000063	0.1332	0.00000175	0.0800	0.0	4.0900	0.00010862	0.1207	0.00002910	762	0.0	0.0240	0.0	0.0560	0.0
Diesel	2015	2040	56	75	0.0134	0.00000063	0.0120	0.00000058	0.0134	0.00000063	0.1332	0.00000175	0.0800	0.0	4.0900	0.00010862	0.0671	0.00001569	762	0.0	0.0240	0.0	0.0560	0.0
Diesel	0	1970	75	131	1.0300	0.00007510	0.9480	0.00006909	1.0300	0.00007510	18.7743	0.00043449	0.0800	0.0	5.9000	0.00015556	1.7700	0.00008194	762	0.0	0.0240	0.0	0.0530	0.0
Diesel	1970	1972	75	131	0.8851	0.00006437	0.8140	0.00005922	0.8851	0.00006437	17.4333	0.00040365	0.0800	0.0	5.9000	0.00015556	1.4751	0.00006826	762	0.0	0.0240	0.0	0.0530	0.0
Diesel	1972	1979	75	131	0.7400	0.00005364	0.6810	0.00004935	0.7400	0.00005364	16.0923	0.00037280	0.0800	0.0	5.9000	0.00015556	1.3400	0.00006209	762	0.0	0.0240	0.0	0.0530	0.0
Diesel	1979	1980	75	131	0.7400	0.00005364	0.6810	0.00004935	0.7400	0.00005364	16.0923	0.00037280	0.0800	0.0	5.9000	0.00015556	1.3400	0.00006209	762	0.0	0.0240	0.0	0.0530	0.0
Diesel	1980	1985	75	131	0.7400	0.00005364	0.6810	0.00004935	0.7400	0.00005364	14.7512	0.00034062	0.0800	0.0	5.7664	0.00015288	1.2600	0.00005833	762	0.0	0.0240	0.0	0.0530	0.0
Diesel	1985	1988	75	131	0.7400	0.00005364	0.6810	0.00004935	0.7400	0.00005364	14.7512	0.00034062	0.0800	0.0	5.6300	0.00014885	1.1800	0.00005458	762	0.0	0.0240	0.0	0.0530	0.0
Diesel	1988	1997	75	131	0.5100	0.00003701	0.4690	0.00003405	0.5100	0.00003701	10.9561	0.00025345	0.0800	0.0	3.6200	0.00009575	0.9100	0.00004224	762	0.0	0.0240	0.0	0.0530	0.0
Diesel	1997	2003	75	131	0.5100	0.00003701	0.4690	0.00003405	0.5100	0.00003701	9.2500	0.00021456	0.0800	0.0	3.6200	0.00009575	0.9100	0.00004224	762	0.0	0.0240	0.0	0.0530	0.0
Diesel	2003	2004	75	131	0.3200	0.00002280	0.2940	0.00002097	0.3200	0.00002280	7.0500	0.00012927	0.0800	0.0	3.6200	0.00009575	0.4400	0.00003741	762	0.0	0.0240	0.0	0.0530	0.0
Diesel	2004	2005	75	131	0.2548	0.00001810	0.2340	0.00001666	0.2548	0.00001810	6.3300	0.00010084	0.0800	0.0	3.6200	0.00009575	0.3000	0.00003527	762	0.0	0.0240	0.0	0.0530	0.0
Diesel	2005	2007	75	131	0.2100	0.00001582	0.1930	0.00001456	0.2100	0.00001582	5.9500	0.00008663	0.0800	0.0	3.6200	0.00009575	0.2100	0.00003446	762	0.0	0.0240	0.0	0.0530	0.0
Diesel	2007	2012	75	131	0.1900	0.00001341	0.1750	0.00001234	0.1900	0.00001341	3.2855	0.00004291	0.0800	0.0	3.6200	0.00009575	0.1300	0.00003353	762	0.0	0.0240	0.0	0.0530	0.0
Diesel	2012	2015	75	131	0.0134	0.00000063	0.0120	0.00000058	0.0134	0.00000063	3.0441	0.00003969	0.0800	0.0	3.6200	0.00009575	0.1207	0.00002910	762	0.0	0.0240	0.0	0.0530	0.0
Diesel	2015	2040	75	131	0.0134	0.00000063	0.0120	0.00000058	0.0134	0.00000063	0.3621	0.00000477	0.0800	0.0	3.6200	0.00009575	0.0671	0.00001569	762	0.0	0.0240	0.0	0.0530	0.0
Diesel	0	1970	131	224	1.0300	0.00007510	0.9480	0.00006909	1.0300	0.00007510	18.7743	0.00043449	0.0800	0.0	5.9000	0.00015556	1.7700	0.00008194	762	0.0	0.0240	0.0	0.0530	0.0
Diesel	1970	1972	131	224	0.8851	0.00006437	0.8140	0.00005922	0.8851	0.00006437	17.4333	0.00040365	0.0800	0.0	5.9000	0.00015556	1.4751	0.00006826	762	0.0	0.0240	0.0	0.0530	0.0
Diesel	1972	1979	131	224	0.7400	0.00005364	0.6810	0.00004935	0.7400	0.00005364	16.0923	0.00037280	0.0800	0.0	5.9000	0.00015556	1.3400	0.00006209	762	0.0	0.0240	0.0	0.0530	0.0
Diesel	1979	1980	131	224	0.7400	0.00005364	0.6810	0.00004935	0.7400	0.00005364	16.0923	0.00037280	0.0800	0.0	5.9000	0.00015556	1.3400	0.00006209	762	0.0	0.0240	0.0	0.0530	0.0
Diesel	1980	1985	131	224	0.7400	0.00005364	0.6810	0.00004935	0.7400	0.00005364	14.7512	0.00034062	0.0800	0.0	5.7664	0.00015288	1.2600	0.00005833	762	0.0	0.0240	0.0	0.0530	0.0
Diesel	1985	1988	131	224	0.7400	0.00005364	0.6810	0.00004935	0.7400	0.00005364	14.7512	0.00034062	0.0800	0.0	5.6300	0.00014885	1.1800	0.00005458	762	0.0	0.0240	0.0	0.0530	0.0
Diesel	1988	1996	131	224	0.5100	0.00003701	0.4690	0.00003405	0.5100	0.00003701	10.9561	0.00025345	0.0800	0.0	3.6200	0.00009575	0.9100	0.00004224	762	0.0	0.0240	0.0	0.0530	0.0
Diesel	1996	1997	131	224	0.2000	0.00001067	0.1840	0.00000982	0.2000	0.00001067	8.3800	0.00019445	0.0800	0.0	1.2300	0.00003259	0.4300	0.00001985	762	0.0	0.0240	0.0	0.0530	0.0
Diesel	1997	2003	131	224	0.2000	0.00001067	0.1840	0.00000982	0.2000	0.00001067	8.3800	0.00019445	0.0800	0.0	1.2300	0.00003259	0.4300	0.00001985	762	0.0	0.0240	0.0	0.0530	0.0
Diesel	2003	2004	131	224	0.1600	0.00000873	0.1470	0.00000803	0.1600	0.00000873	6.7051	0.00012136	0.0800	0.0	1.2300	0.00003259	0.2548	0.00002803	762	0.0	0.0240	0.0	0.0530	0.0
Diesel	2004	2005	131	224	0.1500	0.00000809	0.1380	0.00000744	0.1500	0.00000809	6.1400	0.00009696	0.0800	0.0	1.2300	0.00003259	0.1900	0.00003084	762	0.0	0.0240	0.0	0.0530	0.0

Engine Type	Engine Year min	Engine Year max	Engine Power (kW) min	Engine Power (kW) max	PM ZH	PM DR	$PM_{2.5}$ ZH	$PM_{2.5}$ DR	DPM ZH	DPM DR	NO_x ZH	NO_x DR	SO_2 ZH	SO_2 DR	CO ZH	CO DR	HC ZH	HC DR	CO_2 ZH	CO_2 DR	N_2O ZH	N_2O DR	CH_4 ZH	CH_4 DR
					Zero Hour Emission Factor (g/kW-hr) and Deterioration Rate (gm/kW-hr^2)																			
Diesel	2005	2007	131	224	0.1500	0.00000776	0.1380	0.00000714	0.1500	0.00000776	5.8700	0.00008489	0.0800	0.0	1.2300	0.00003259	0.1600	0.00003218	762	0.0	0.0240	0.0	0.0530	0.0
Diesel	2007	2011	131	224	0.1500	0.00000744	0.1380	0.00000685	0.1500	0.00000744	3.2855	0.00004264	0.0800	0.0	1.2300	0.00003259	0.1300	0.00003353	762	0.0	0.0240	0.0	0.0530	0.0
Diesel	2011	2014	131	224	0.0134	0.00000050	0.0120	0.00000046	0.0134	0.00000050	1.8238	0.00002374	0.0800	0.0	1.2300	0.00003259	0.0939	0.00002454	762	0.0	0.0240	0.0	0.0530	0.0
Diesel	2014	2040	131	224	0.0134	0.00000050	0.0120	0.00000046	0.0134	0.00000050	0.3621	0.00000477	0.0800	0.0	1.2300	0.00003259	0.0671	0.00001569	762	0.0	0.0240	0.0	0.0530	0.0
Diesel	0	1970	224	448	0.9900	0.00005270	0.9110	0.00004849	0.9900	0.00005270	18.7743	0.00031246	0.0700	0.0	5.6300	0.00111573	1.6900	0.00005887	762	0.0	0.0200	0.0	0.0470	0.0
Diesel	1970	1972	224	448	0.8400	0.00004479	0.7730	0.00004121	0.8400	0.00004479	17.4333	0.00028966	0.0700	0.0	5.6300	0.00111573	1.4100	0.00004908	762	0.0	0.0200	0.0	0.0470	0.0
Diesel	1972	1979	224	448	0.7100	0.00003768	0.6530	0.00003467	0.7100	0.00003768	16.0923	0.00026820	0.0700	0.0	5.6300	0.00111573	1.2700	0.00004439	762	0.0	0.0200	0.0	0.0470	0.0
Diesel	1979	1980	224	448	0.7100	0.00003768	0.6530	0.00003467	0.7100	0.00003768	16.0923	0.00026820	0.0700	0.0	5.6300	0.00111573	1.2700	0.00004439	762	0.0	0.0200	0.0	0.0470	0.0
Diesel	1980	1985	224	448	0.7100	0.00003768	0.6530	0.00003467	0.7100	0.00003768	14.7512	0.00024541	0.0700	0.0	5.6300	0.00111573	1.2100	0.00004211	762	0.0	0.0200	0.0	0.0470	0.0
Diesel	1985	1988	224	448	0.7100	0.00003768	0.6530	0.00003467	0.7100	0.00003768	14.7512	0.00024541	0.0700	0.0	5.4982	0.00108891	1.1300	0.00003929	762	0.0	0.0200	0.0	0.0470	0.0
Diesel	1988	1996	224	448	0.5100	0.00002709	0.4690	0.00002492	0.5100	0.00002709	10.9561	0.00018238	0.0700	0.0	3.6200	0.00007174	0.9100	0.00003178	762	0.0	0.0200	0.0	0.0470	0.0
Diesel	1996	1997	224	448	0.2000	0.00001067	0.1840	0.00000982	0.2000	0.00001067	8.3800	0.00013947	0.0700	0.0	1.2300	0.00002441	0.4300	0.00001502	762	0.0	0.0200	0.0	0.0470	0.0
Diesel	1997	2001	224	448	0.2000	0.00001067	0.1840	0.00000982	0.2000	0.00001067	8.3800	0.00013947	0.0700	0.0	1.2300	0.00002441	0.4300	0.00001502	762	0.0	0.0200	0.0	0.0470	0.0
Diesel	2001	2002	224	448	0.1600	0.00000873	0.1470	0.00000803	0.1600	0.00000873	6.6381	0.00009843	0.0700	0.0	1.2300	0.00002441	0.2548	0.00002615	762	0.0	0.0200	0.0	0.0470	0.0
Diesel	2002	2003	224	448	0.1500	0.00000809	0.1380	0.00000744	0.1500	0.00000809	6.0480	0.00008475	0.0700	0.0	1.2300	0.00002441	0.1900	0.00002977	762	0.0	0.0200	0.0	0.0470	0.0
Diesel	2003	2005	224	448	0.1500	0.00000776	0.1380	0.00000714	0.1500	0.00000776	5.7500	0.00007791	0.0700	0.0	1.2300	0.00002441	0.1600	0.00003165	762	0.0	0.0200	0.0	0.0470	0.0
Diesel	2005	2006	224	448	0.1500	0.00000744	0.1380	0.00000685	0.1500	0.00000744	5.3600	0.00007107	0.0700	0.0	1.2300	0.00002441	0.1300	0.00003353	762	0.0	0.0200	0.0	0.0470	0.0
Diesel	2006	2011	224	448	0.1500	0.00000744	0.1380	0.00000685	0.1500	0.00000744	3.2855	0.00004264	0.0700	0.0	1.2300	0.00002441	0.1300	0.00003353	762	0.0	0.0200	0.0	0.0470	0.0
Diesel	2011	2014	224	448	0.0134	0.00000050	0.0120	0.00000046	0.0134	0.00000050	1.8238	0.00002374	0.0700	0.0	1.2300	0.00002441	0.0939	0.00002454	762	0.0	0.0200	0.0	0.0470	0.0
Diesel	2014	2040	224	448	0.0134	0.00000050	0.0120	0.00000046	0.0134	0.00000050	0.3621	0.00000477	0.0700	0.0	1.2300	0.00002441	0.0671	0.00001569	762	0.0	0.0200	0.0	0.0470	0.0
Diesel	0	1970	448	560	0.9900	0.00005270	0.9110	0.00004849	0.9900	0.00005270	18.7743	0.00031246	0.0700	0.0	5.6300	0.00111573	1.6900	0.00005887	762	0.0	0.0210	0.0	0.0480	0.0
Diesel	1970	1972	448	560	0.8400	0.00004479	0.7730	0.00004121	0.8400	0.00004479	16.0923	0.00028966	0.0700	0.0	5.6300	0.00111573	1.4100	0.00004908	762	0.0	0.0210	0.0	0.0480	0.0
Diesel	1972	1979	448	560	0.7100	0.00003768	0.6530	0.00003467	0.7100	0.00003768	16.0923	0.00026820	0.0700	0.0	5.6300	0.00111573	1.2700	0.00004439	762	0.0	0.0210	0.0	0.0480	0.0
Diesel	1979	1980	448	560	0.7100	0.00003768	0.6530	0.00003467	0.7100	0.00003768	16.0923	0.00026820	0.0700	0.0	5.6300	0.00111573	1.2700	0.00004439	762	0.0	0.0210	0.0	0.0480	0.0
Diesel	1980	1985	448	560	0.7100	0.00003768	0.6530	0.00003467	0.7100	0.00003768	14.7512	0.00024541	0.0700	0.0	5.6300	0.00111573	1.2100	0.00004211	762	0.0	0.0210	0.0	0.0480	0.0
Diesel	1985	1988	448	560	0.7100	0.00003768	0.6530	0.00003467	0.7100	0.00003768	14.7512	0.00024541	0.0700	0.0	5.4982	0.00108891	1.1300	0.00003929	762	0.0	0.0210	0.0	0.0480	0.0
Diesel	1988	1996	448	560	0.5096	0.00002709	0.4690	0.00002492	0.5096	0.00002709	10.9561	0.00018238	0.0700	0.0	3.6200	0.00007174	0.9119	0.00003178	762	0.0	0.0210	0.0	0.0480	0.0
Diesel	1996	1999	448	560	0.2000	0.00001067	0.1840	0.00000982	0.2000	0.00001067	8.3800	0.00013947	0.0700	0.0	1.2300	0.00002441	0.4291	0.00001502	762	0.0	0.0210	0.0	0.0480	0.0
Diesel	1999	2002	448	560	0.2000	0.00001067	0.1840	0.00000982	0.2000	0.00001067	8.3800	0.00013947	0.0700	0.0	1.2300	0.00002441	0.4300	0.00001502	762	0.0	0.0210	0.0	0.0480	0.0
Diesel	2002	2003	448	560	0.1600	0.00000873	0.1470	0.00000803	0.1600	0.00000873	6.6381	0.00009843	0.0700	0.0	1.2300	0.00002441	0.2548	0.00002615	762	0.0	0.0210	0.0	0.0480	0.0
Diesel	2003	2004	448	560	0.1500	0.00000809	0.1380	0.00000744	0.1500	0.00000809	6.0480	0.00008475	0.0700	0.0	1.2300	0.00002441	0.1900	0.00002977	762	0.0	0.0210	0.0	0.0480	0.0
Diesel	2004	2006	448	560	0.1500	0.00000776	0.1380	0.00000714	0.1500	0.00000776	5.7500	0.00007791	0.0700	0.0	1.2300	0.00002441	0.1600	0.00003165	762	0.0	0.0210	0.0	0.0480	0.0
Diesel	2006	2011	448	560	0.1500	0.00000744	0.1380	0.00000685	0.1500	0.00000744	3.2855	0.00004264	0.0700	0.0	1.2300	0.00002441	0.1300	0.00003353	762	0.0	0.0210	0.0	0.0480	0.0
Diesel	2011	2014	448	560	0.0134	0.00000050	0.0120	0.00000046	0.0134	0.00000050	1.8238	0.00002374	0.0700	0.0	1.2300	0.00002441	0.0939	0.00002454	762	0.0	0.0210	0.0	0.0480	0.0
Diesel	2014	2040	448	560	0.0134	0.00000050	0.0120	0.00000046	0.0134	0.00000050	0.3621	0.00000477	0.0700	0.0	1.2300	0.00002441	0.0671	0.00001569	762	0.0	0.0210	0.0	0.0480	0.0
Diesel	0	1970	560	999	0.9900	0.00005270	0.9110	0.00004849	0.9900	0.00005270	18.7743	0.00031246	0.0720	0.0	5.6300	0.00111573	1.6900	0.00005887	762	0.0	0.0210	0.0	0.0480	0.0
Diesel	1970	1972	560	999	0.8400	0.00004479	0.7730	0.00004121	0.8400	0.00004479	17.4333	0.00028966	0.0720	0.0	5.6300	0.00111573	1.4100	0.00004908	762	0.0	0.0210	0.0	0.0480	0.0
Diesel	1972	1979	560	999	0.7100	0.00003768	0.6530	0.00003467	0.7100	0.00003768	16.0923	0.00026820	0.0720	0.0	5.6300	0.00111573	1.2700	0.00004439	762	0.0	0.0210	0.0	0.0480	0.0
Diesel	1979	1980	560	999	0.7100	0.00003768	0.6530	0.00003467	0.7100	0.00003768	16.0923	0.00026820	0.0720	0.0	5.6300	0.00111573	1.2700	0.00004439	762	0.0	0.0210	0.0	0.0480	0.0
Diesel	1980	1985	560	999	0.7100	0.00003768	0.6530	0.00003467	0.7100	0.00003768	14.7512	0.00024541	0.0720	0.0	5.6300	0.00111573	1.2100	0.00004211	762	0.0	0.0210	0.0	0.0480	0.0
Diesel	1985	1988	560	999	0.7100	0.00003768	0.6530	0.00003467	0.7100	0.00003768	14.7512	0.00024541	0.0720	0.0	5.4982	0.00108891	1.1300	0.00003929	762	0.0	0.0210	0.0	0.0480	0.0
Diesel	1988	2000	560	999	0.5100	0.00000271	0.4690	0.00000249	0.5100	0.00000271	10.9561	0.00018238	0.0720	0.0	3.6200	0.00007174	0.9100	0.00001502	762	0.0	0.0210	0.0	0.0480	0.0
Diesel	2000	2006	560	999	0.2000	0.00001067	0.1840	0.00000982	0.2000	0.00001067	8.3800	0.00013947	0.0720	0.0	1.2300	0.00002441	0.4300	0.00001502	762	0.0	0.0210	0.0	0.0480	0.0
Diesel	2006	2007	560	999	0.1600	0.00000873	0.1470	0.00000803	0.1600	0.00000873	6.6381	0.00009843	0.0720	0.0	1.2300	0.00002441	0.2548	0.00002615	762	0.0	0.0210	0.0	0.0480	0.0
Diesel	2007	2008	560	999	0.1500	0.00000809	0.1380	0.00000744	0.1500	0.00000809	6.0480	0.00008475	0.0720	0.0	1.2300	0.00002441	0.1900	0.00002977	762	0.0	0.0210	0.0	0.0480	0.0
Diesel	2008	2010	560	999	0.1500	0.00000776	0.1380	0.00000714	0.1500	0.00000776	5.7500	0.00007791	0.0720	0.0	1.2300	0.00002441	0.1600	0.00003165	762	0.0	0.0210	0.0	0.0480	0.0
Diesel	2010	2011	560	999	0.1475	0.00000744	0.1360	0.00000685	0.1475	0.00000744	5.4714	0.00007107	0.0720	0.0	1.2300	0.00002441	0.1300	0.00003353	762	0.0	0.0210	0.0	0.0480	0.0
Diesel	2011	2015	560	999	0.0800	0.00000373	0.0740	0.00000343	0.0800	0.00000373	3.1600	0.00004104	0.0720	0.0	1.2300	0.00002441	0.1300	0.00003353	762	0.0	0.0210	0.0	0.0480	0.0
Diesel	2015	2040	560	999	0.0268	0.00000149	0.0250	0.00000137	0.0268	0.00000149	3.1600	0.00004104	0.0720	0.0	1.2300	0.00002441	0.0671	0.00001569	762	0.0	0.0210	0.0	0.0480	0.0
Gasoline	0	1996	0	38	0.0800	0.00000000	0.0700	0.00000000	0.0000	0.00000000	10.7400	0.00010000	0.0100	0.0	120.5600	0.00740000	5.0400	0.00060000	1050	0.0	0.0340	0.0	0.0760	0.0
Gasoline	1996	2001	0	38	0.0800	0.00000000	0.0700	0.00000000	0.0000	0.00000000	10.7400	0.00010000	0.0100	0.0	120.5600	0.00740000	5.0400	0.00060000	1050	0.0	0.0340	0.0	0.0760	0.0
Gasoline	2001	2002	0	38	0.0800	0.00000000	0.0700	0.00000000	0.0000	0.00000000	9.2700	0.00020000	0.0100	0.0	104.7200	0.02700000	3.9700	0.00050000	1050	0.0	0.0340	0.0	0.0760	0.0
Gasoline	2002	2003	0	38	0.0800	0.00000000	0.0700	0.00000000	0.0000	0.00000000	7.4000	0.00040000	0.0100	0.0	109.6700	0.02640000	3.1400	0.00050000	1050	0.0	0.0340	0.0	0.0760	0.0

Engine Type	Engine Year min	Engine Year max	Engine Power (kW) min	Engine Power (kW) max	PM ZH	PM DR	$PM_{2.5}$ ZH	$PM_{2.5}$ DR	DPM ZH	DPM DR	NO_x ZH	NO_x DR	SO_2 ZH	SO_2 DR	CO ZH	CO DR	HC ZH	HC DR	CO_2 ZH	CO_2 DR	N_2O ZH	N_2O DR	CH_4 ZH	CH_4 DR
					Zero Hour Emission Factor (g/kW-hr) and Deterioration Rate (gm/kW-hr^2)																			
Gasoline	2003	2004	0	38	0.0800	0.00000000	0.0700	0.00000000	0.0000	0.00000000	6.0600	0.00050000	0.0100	0.0	95.2500	0.02590000	2.1700	0.00040000	1050	0.0	0.0340	0.0	0.0760	0.0
Gasoline	2004	2007	0	38	0.0800	0.00000000	0.0700	0.00000000	0.0000	0.00000000	1.7800	0.00060000	0.0100	0.0	51.2100	0.02550000	0.9500	0.00020000	1050	0.0	0.0340	0.0	0.0760	0.0
Gasoline	2007	2040	0	38	0.0800	0.00000000	0.0700	0.00000000	0.0000	0.00000000	1.7800	0.00040000	0.0100	0.0	51.2100	0.02550000	0.9500	0.00020000	1050	0.0	0.0340	0.0	0.0760	0.0
Gasoline	0	1996	38	91	0.0800	0.00000000	0.0700	0.00000000	0.0000	0.00000000	15.8800	0.00010000	0.0100	0.0	58.7400	0.00390000	3.5300	0.00040000	1038	0.0	0.0270	0.0	0.0600	0.0
Gasoline	1996	2001	38	91	0.0800	0.00000000	0.0700	0.00000000	0.0000	0.00000000	15.8800	0.00010000	0.0100	0.0	58.7400	0.00390000	3.5300	0.00040000	1038	0.0	0.0270	0.0	0.0600	0.0
Gasoline	2001	2002	38	91	0.0800	0.00000000	0.0700	0.00000000	0.0000	0.00000000	12.8500	0.00020000	0.0100	0.0	55.0900	0.00540000	2.7900	0.00030000	1038	0.0	0.0270	0.0	0.0600	0.0
Gasoline	2002	2003	38	91	0.0800	0.00000000	0.0700	0.00000000	0.0000	0.00000000	9.8200	0.00040000	0.0100	0.0	53.2700	0.00610000	2.0700	0.00030000	1038	0.0	0.0270	0.0	0.0600	0.0
Gasoline	2003	2004	38	91	0.0800	0.00000000	0.0700	0.00000000	0.0000	0.00000000	6.7900	0.00050000	0.0100	0.0	51.4400	0.00680000	1.3300	0.00030000	1038	0.0	0.0270	0.0	0.0600	0.0
Gasoline	2004	2007	38	91	0.0800	0.00000000	0.0700	0.00000000	0.0000	0.00000000	2.3900	0.00030000	0.0100	0.0	11.7500	0.00760000	0.3500	0.00010000	1038	0.0	0.0270	0.0	0.0600	0.0
Gasoline	2007	2040	38	91	0.0800	0.00000000	0.0700	0.00000000	0.0000	0.00000000	2.3900	0.00020000	0.0100	0.0	11.7500	0.00760000	0.3500	0.00010000	1038	0.0	0.0270	0.0	0.0600	0.0
Gasoline	0	1996	91	999	0.0800	0.00000000	0.0700	0.00000000	0.0000	0.00000000	17.3500	0.00020000	0.0100	0.0	27.8900	0.00110000	2.1600	0.00010000	981	0.0	0.0270	0.0	0.0600	0.0
Gasoline	1996	2001	91	999	0.0800	0.00000000	0.0700	0.00000000	0.0000	0.00000000	17.3500	0.00020000	0.0100	0.0	27.8900	0.00110000	2.1600	0.00010000	981	0.0	0.0270	0.0	0.0600	0.0
Gasoline	2001	2002	91	999	0.0800	0.00000000	0.0700	0.00000000	0.0000	0.00000000	13.8000	0.00010000	0.0100	0.0	27.8900	0.00110000	1.7800	0.00010000	981	0.0	0.0270	0.0	0.0600	0.0
Gasoline	2002	2003	91	999	0.0800	0.00000000	0.0700	0.00000000	0.0000	0.00000000	10.2500	0.00010000	0.0100	0.0	27.8900	0.00110000	1.4200	0.00010000	981	0.0	0.0270	0.0	0.0600	0.0
Gasoline	2003	2004	91	999	0.0800	0.00000000	0.0700	0.00000000	0.0000	0.00000000	6.6800	0.00010000	0.0100	0.0	27.8900	0.00110000	1.0500	0.00000000	981	0.0	0.0270	0.0	0.0600	0.0
Gasoline	2004	2007	91	999	0.0800	0.00000000	0.0700	0.00000000	0.0000	0.00000000	2.6000	0.00040000	0.0100	0.0	27.8900	0.00110000	0.2100	0.00010000	981	0.0	0.0270	0.0	0.0600	0.0
Gasoline	2007	2040	91	999	0.0800	0.00000000	0.0700	0.00000000	0.0000	0.00000000	2.6000	0.00010000	0.0100	0.0	27.8900	0.00110000	0.2100	0.00000000	981	0.0	0.0270	0.0	0.0600	0.0
LNG	2004	2007	0	999	0.0000	0.00000000	0.0000	0.00000000	0.0000	0.00000000	3.5500	0.00000000	0.0000	0.0	0.0900	0.00000000	2.9400	0.00000000	662	0.0	0.0000	0.0	0.0000	0.0
On Road Diesel	0	1970	76	131	0.7228	0.00005257	0.6650	0.00004836	0.7228	0.00005257	8.2607	0.00019118	0.0800	0.0	5.9005	0.00015556	0.5841	0.00002704	762	0.0	0.0106	0.0	0.0175	0.0
On Road Diesel	1970	1972	76	131	0.6196	0.00004506	0.5700	0.00004145	0.6196	0.00004506	7.6706	0.00017760	0.0800	0.0	5.9005	0.00015556	0.4868	0.00002253	762	0.0	0.0106	0.0	0.0175	0.0
On Road Diesel	1972	1979	76	131	0.5163	0.00003755	0.4750	0.00003454	0.5163	0.00003755	7.0806	0.00016403	0.0800	0.0	5.9005	0.00015556	0.4425	0.00002049	762	0.0	0.0106	0.0	0.0175	0.0
On Road Diesel	1979	1980	76	131	0.5163	0.00003755	0.4750	0.00003454	0.5163	0.00003755	7.0806	0.00016403	0.0800	0.0	5.9005	0.00015556	0.4425	0.00002049	762	0.0	0.0106	0.0	0.0175	0.0
On Road Diesel	1980	1985	76	131	0.5163	0.00003755	0.4750	0.00003454	0.5163	0.00003755	6.4905	0.00014987	0.0800	0.0	5.7664	0.00015288	0.4160	0.00001925	762	0.0	0.0106	0.0	0.0175	0.0
On Road Diesel	1985	1988	76	131	0.5163	0.00003755	0.4750	0.00003454	0.5163	0.00003755	6.4905	0.00014987	0.0800	0.0	5.6323	0.00014885	0.3894	0.00001801	762	0.0	0.0106	0.0	0.0175	0.0
On Road Diesel	1988	1997	76	131	0.3567	0.00002591	0.3280	0.00002384	0.3567	0.00002591	4.8207	0.00011152	0.0800	0.0	3.6208	0.00009575	0.3009	0.00001394	762	0.0	0.0106	0.0	0.0175	0.0
On Road Diesel	1997	2003	76	131	0.3567	0.00002591	0.3280	0.00002384	0.3567	0.00002591	4.0713	0.00009441	0.0800	0.0	3.6208	0.00009575	0.3009	0.00001394	762	0.0	0.0106	0.0	0.0175	0.0
On Road Diesel	2003	2004	76	131	0.2253	0.00001596	0.2070	0.00001468	0.2253	0.00001596	3.1037	0.00005688	0.0800	0.0	3.6208	0.00009575	0.1460	0.00001235	762	0.0	0.0106	0.0	0.0175	0.0
On Road Diesel	2004	2005	76	131	0.1784	0.00001267	0.1640	0.00001166	0.1784	0.00001267	2.7850	0.00004437	0.0800	0.0	3.6208	0.00009575	0.0974	0.00001164	762	0.0	0.0106	0.0	0.0175	0.0
On Road Diesel	2005	2007	76	131	0.1502	0.00001108	0.1380	0.00001019	0.1502	0.00001108	2.6198	0.00003812	0.0800	0.0	3.6208	0.00009575	0.0708	0.00001137	762	0.0	0.0106	0.0	0.0175	0.0
On Road Diesel	2007	2012	76	131	0.0131	0.00000094	0.0120	0.00000086	0.0131	0.00000094	1.3799	0.00001802	0.0800	0.0	3.6208	0.00009575	0.0443	0.00001106	762	0.0	0.0106	0.0	0.0175	0.0
On Road Diesel	2012	2015	76	131	0.0090	0.00000042	0.0080	0.00000039	0.0090	0.00000042	0.3957	0.00000516	0.0800	0.0	3.6208	0.00009575	0.0398	0.00000960	762	0.0	0.0106	0.0	0.0175	0.0
On Road Diesel	2015	2040	76	131	0.0090	0.00000042	0.0080	0.00000039	0.0090	0.00000042	0.2426	0.00000320	0.0800	0.0	3.6208	0.00009575	0.0221	0.00000518	762	0.0	0.0106	0.0	0.0175	0.0
On Road Diesel	0	1970	131	224	0.7228	0.00005257	0.6650	0.00004836	0.7228	0.00005257	8.2607	0.00019118	0.0800	0.0	5.9005	0.00015556	0.5841	0.00002704	762	0.0	0.0106	0.0	0.0175	0.0
On Road Diesel	1970	1972	131	224	0.6196	0.00004506	0.5700	0.00004145	0.6196	0.00004506	7.6706	0.00017760	0.0800	0.0	5.9005	0.00015556	0.4868	0.00002253	762	0.0	0.0106	0.0	0.0175	0.0
On Road Diesel	1972	1979	131	224	0.5163	0.00003755	0.4750	0.00003454	0.5163	0.00003755	7.0806	0.00016403	0.0800	0.0	5.9005	0.00015556	0.4425	0.00002049	762	0.0	0.0106	0.0	0.0175	0.0
On Road Diesel	1979	1980	131	224	0.5163	0.00003755	0.4750	0.00003454	0.5163	0.00003755	7.0806	0.00016403	0.0800	0.0	5.9005	0.00015556	0.4425	0.00002049	762	0.0	0.0106	0.0	0.0175	0.0
On Road Diesel	1980	1985	131	224	0.5163	0.00003755	0.4750	0.00003454	0.5163	0.00003755	6.4905	0.00014987	0.0800	0.0	5.7664	0.00015288	0.4160	0.00001925	762	0.0	0.0106	0.0	0.0175	0.0
On Road Diesel	1985	1988	131	224	0.5163	0.00003755	0.4750	0.00003454	0.5163	0.00003755	6.4905	0.00014987	0.0800	0.0	5.6323	0.00014885	0.3894	0.00001801	762	0.0	0.0106	0.0	0.0175	0.0
On Road Diesel	1988	1996	131	224	0.3567	0.00002591	0.3280	0.00002384	0.3567	0.00002591	4.8207	0.00011152	0.0800	0.0	3.6208	0.00009575	0.3009	0.00001394	762	0.0	0.0106	0.0	0.0175	0.0
On Road Diesel	1996	1997	131	224	0.1408	0.00000747	0.1300	0.00000687	0.1408	0.00000747	3.6878	0.00008556	0.0800	0.0	1.2337	0.00003259	0.1416	0.00000655	762	0.0	0.0106	0.0	0.0175	0.0
On Road Diesel	1997	2003	131	224	0.1408	0.00000747	0.1300	0.00000687	0.1408	0.00000747	3.6878	0.00008556	0.0800	0.0	1.2337	0.00003259	0.1416	0.00000655	762	0.0	0.0106	0.0	0.0175	0.0
On Road Diesel	2003	2004	131	224	0.1126	0.00000611	0.1040	0.00000562	0.1126	0.00000611	2.9502	0.00005340	0.0800	0.0	1.2337	0.00003259	0.0841	0.00000925	762	0.0	0.0106	0.0	0.0175	0.0
On Road Diesel	2004	2005	131	224	0.1033	0.00000566	0.0950	0.00000521	0.1033	0.00000566	2.7024	0.00004266	0.0800	0.0	1.2337	0.00003259	0.0620	0.00001018	762	0.0	0.0106	0.0	0.0175	0.0
On Road Diesel	2005	2007	131	224	0.1033	0.00000544	0.0950	0.00000500	0.1033	0.00000544	2.5844	0.00003735	0.0800	0.0	1.2337	0.00003259	0.0531	0.00001062	762	0.0	0.0106	0.0	0.0175	0.0
On Road Diesel	2007	2011	131	224	0.0103	0.00000052	0.0090	0.00000048	0.0103	0.00000052	1.3799	0.00001791	0.0800	0.0	1.2337	0.00003259	0.0443	0.00001106	762	0.0	0.0106	0.0	0.0175	0.0
On Road Diesel	2011	2014	131	224	0.0090	0.00000033	0.0080	0.00000031	0.0090	0.00000033	0.2371	0.00000309	0.0800	0.0	1.2337	0.00003259	0.0310	0.00000810	762	0.0	0.0106	0.0	0.0175	0.0
On Road Diesel	2014	2040	131	224	0.0090	0.00000033	0.0080	0.00000031	0.0090	0.00000033	0.2426	0.00000320	0.0800	0.0	1.2337	0.00003259	0.0221	0.00000518	762	0.0	0.0106	0.0	0.0175	0.0
On Road Diesel	0	1970	224	448	0.6946	0.00003689	0.6390	0.00003394	0.6946	0.00003689	8.2607	0.00013748	0.0700	0.0	5.6323	0.00111573	0.5576	0.00001943	762	0.0	0.0088	0.0	0.0155	0.0
On Road Diesel	1970	1972	224	448	0.5914	0.00003135	0.5440	0.00002884	0.5914	0.00003135	7.6706	0.00012745	0.0700	0.0	5.6323	0.00111573	0.4647	0.00001620	762	0.0	0.0088	0.0	0.0155	0.0
On Road Diesel	1972	1979	224	448	0.4975	0.00002638	0.4580	0.00002427	0.4975	0.00002638	7.0806	0.00011801	0.0700	0.0	5.6323	0.00111573	0.4204	0.00001465	762	0.0	0.0088	0.0	0.0155	0.0
On Road Diesel	1979	1980	224	448	0.4975	0.00002638	0.4580	0.00002427	0.4975	0.00002638	7.0806	0.00011801	0.0700	0.0	5.6323	0.00111573	0.4204	0.00001465	762	0.0	0.0088	0.0	0.0155	0.0
On Road Diesel	1980	1985	224	448	0.4975	0.00002638	0.4580	0.00002427	0.4975	0.00002638	6.4905	0.00010798	0.0700	0.0	5.6323	0.00111573	0.3983	0.00001390	762	0.0	0.0088	0.0	0.0155	0.0

Engine Type	Engine Year min	Engine Year max	Engine Power (kW) min	Engine Power (kW) max	PM ZH	PM DR	$PM_{2.5}$ ZH	$PM_{2.5}$ DR	DPM ZH	DPM DR	NO_x ZH	NO_x DR	SO_2 ZH	SO_2 DR	CO ZH	CO DR	HC ZH	HC DR	CO_2 ZH	CO_2 DR	N_2O ZH	N_2O DR	CH_4 ZH	CH_4 DR
					Zero Hour Emission Factor (g/kW-hr) and Deterioration Rate (gm/kW-hr^2)																			
On Road Diesel	1985	1988	224	448	0.4975	0.00002638	0.4580	0.00002427	0.4975	0.00002638	6.4905	0.00010798	0.0700	0.0	5.4982	0.00108891	0.3717	0.00001297	762	0.0	0.0088	0.0	0.0155	0.0
On Road Diesel	1988	1996	224	448	0.3567	0.00001896	0.3280	0.00001745	0.3567	0.00001896	4.8207	0.00008025	0.0700	0.0	3.6208	0.00007174	0.3009	0.00001049	762	0.0	0.0088	0.0	0.0155	0.0
On Road Diesel	1996	1997	224	448	0.1408	0.00000747	0.1300	0.00000687	0.1408	0.00000747	3.6878	0.00006137	0.0700	0.0	1.2337	0.00002441	0.1416	0.00000496	762	0.0	0.0088	0.0	0.0155	0.0
On Road Diesel	1997	2001	224	448	0.1408	0.00000747	0.1300	0.00000687	0.1408	0.00000747	3.6878	0.00006137	0.0700	0.0	1.2337	0.00002441	0.1416	0.00000496	762	0.0	0.0088	0.0	0.0155	0.0
On Road Diesel	2001	2002	224	448	0.1126	0.00000611	0.1040	0.00000562	0.1126	0.00000611	2.9207	0.00004331	0.0700	0.0	1.2337	0.00002441	0.0841	0.00000863	762	0.0	0.0088	0.0	0.0155	0.0
On Road Diesel	2002	2003	224	448	0.1033	0.00000566	0.0950	0.00000521	0.1033	0.00000566	2.6611	0.00003729	0.0700	0.0	1.2337	0.00002441	0.0620	0.00000982	762	0.0	0.0088	0.0	0.0155	0.0
On Road Diesel	2003	2005	224	448	0.1033	0.00000544	0.0950	0.00000500	0.1033	0.00000544	2.5313	0.00003428	0.0700	0.0	1.2337	0.00002441	0.0531	0.00001044	762	0.0	0.0088	0.0	0.0155	0.0
On Road Diesel	2005	2006	224	448	0.1033	0.00000521	0.0950	0.00000479	0.1033	0.00000521	2.3602	0.00003127	0.0700	0.0	1.2337	0.00002441	0.0443	0.00001106	762	0.0	0.0088	0.0	0.0155	0.0
On Road Diesel	2006	2011	224	448	0.1033	0.00000521	0.0950	0.00000479	0.1033	0.00000521	2.2670	0.00002942	0.0700	0.0	1.2337	0.00002441	0.0443	0.00001106	762	0.0	0.0088	0.0	0.0155	0.0
On Road Diesel	2011	2014	224	448	0.0090	0.00000033	0.0080	0.00000031	0.0090	0.00000033	0.2371	0.00000309	0.0700	0.0	1.2337	0.00002441	0.0310	0.00000810	762	0.0	0.0088	0.0	0.0155	0.0
On Road Diesel	2014	2040	224	448	0.0090	0.00000033	0.0080	0.00000031	0.0090	0.00000033	0.2426	0.00000320	0.0700	0.0	1.2337	0.00002441	0.0221	0.00000518	762	0.0	0.0088	0.0	0.0155	0.0
On Road Diesel	0	1970	448	560	0.6944	0.00003697	0.6390	0.00003401	0.6944	0.00003697	8.2574	0.00013743	0.0700	0.0	5.6300	0.00111573	0.5574	0.00001942	762	0.0	0.0092	0.0	0.0158	0.0
On Road Diesel	1970	1972	448	560	0.5912	0.00003152	0.5440	0.00002900	0.5912	0.00003152	7.6676	0.00013802	0.0700	0.0	5.6300	0.00111573	0.4645	0.00001617	762	0.0	0.0100	0.0	0.0158	0.0
On Road Diesel	1972	1979	448	560	0.4973	0.00002639	0.4580	0.00002428	0.4973	0.00002639	7.0777	0.00011796	0.0700	0.0	5.6300	0.00111573	0.4202	0.00001469	762	0.0	0.0092	0.0	0.0159	0.0
On Road Diesel	1979	1980	448	560	0.4973	0.00002639	0.4580	0.00002428	0.4973	0.00002639	7.0777	0.00011796	0.0700	0.0	5.6300	0.00111573	0.4202	0.00001469	762	0.0	0.0092	0.0	0.0159	0.0
On Road Diesel	1980	1985	448	560	0.4973	0.00002639	0.4580	0.00002428	0.4973	0.00002639	6.4879	0.00010794	0.0700	0.0	5.6300	0.00111573	0.3981	0.00001385	762	0.0	0.0092	0.0	0.0158	0.0
On Road Diesel	1985	1988	448	560	0.4973	0.00002639	0.4580	0.00002428	0.4973	0.00002639	6.4879	0.00010794	0.0700	0.0	5.4900	0.00108729	0.3716	0.00001292	762	0.0	0.0092	0.0	0.0158	0.0
On Road Diesel	1988	1996	448	560	0.3566	0.00001896	0.3280	0.00001744	0.3566	0.00001896	4.8188	0.00008022	0.0700	0.0	3.6200	0.00007174	0.3008	0.00001048	762	0.0	0.0092	0.0	0.0158	0.0
On Road Diesel	1996	1999	448	560	0.1408	0.00000751	0.1300	0.00000691	0.1408	0.00000751	3.6863	0.00006135	0.0700	0.0	1.2300	0.00002441	0.1416	0.00000496	762	0.0	0.0092	0.0	0.0158	0.0
On Road Diesel	1999	2002	448	560	0.1408	0.00000751	0.1300	0.00000691	0.1408	0.00000751	3.6863	0.00006135	0.0700	0.0	1.2300	0.00002441	0.1416	0.00000495	762	0.0	0.0092	0.0	0.0158	0.0
On Road Diesel	2002	2003	448	560	0.1126	0.00000614	0.1040	0.00000565	0.1126	0.00000614	2.9196	0.00004329	0.0700	0.0	1.2300	0.00002441	0.0840	0.00000862	762	0.0	0.0092	0.0	0.0158	0.0
On Road Diesel	2003	2004	448	560	0.1032	0.00000556	0.0950	0.00000512	0.1032	0.00000556	2.6601	0.00003728	0.0700	0.0	1.2300	0.00002441	0.0619	0.00000970	762	0.0	0.0092	0.0	0.0156	0.0
On Road Diesel	2004	2006	448	560	0.1032	0.00000534	0.0950	0.00000491	0.1032	0.00000534	2.5303	0.00003429	0.0700	0.0	1.2300	0.00002441	0.0531	0.00001050	762	0.0	0.0092	0.0	0.0159	0.0
On Road Diesel	2006	2011	448	560	0.1032	0.00000512	0.0950	0.00000471	0.1032	0.00000512	1.4450	0.00001876	0.0700	0.0	1.2300	0.00002441	0.0442	0.00001140	762	0.0	0.0092	0.0	0.0163	0.0
On Road Diesel	2011	2014	448	560	0.0099	0.00000037	0.0090	0.00000034	0.0099	0.00000037	1.4450	0.00001881	0.0700	0.0	1.2300	0.00002441	0.0310	0.00000810	762	0.0	0.0166	0.0	0.0159	0.0
On Road Diesel	2014	2040	448	560	0.0099	0.00000037	0.0090	0.00000034	0.0099	0.00000037	1.4450	0.00001905	0.0700	0.0	1.2300	0.00002441	0.0221	0.00000517	762	0.0	0.0838	0.0	0.0158	0.0
On Road Diesel	0	1970	560	999	0.6944	0.00003697	0.6390	0.00003401	0.6944	0.00003697	8.2574	0.00013743	0.0720	0.0	5.6300	0.00111573	0.5574	0.00001942	762	0.0	0.0092	0.0	0.0158	0.0
On Road Diesel	1970	1972	560	999	0.5912	0.00003152	0.5440	0.00002900	0.5912	0.00003152	7.6676	0.00012740	0.0720	0.0	5.6300	0.00111573	0.4645	0.00001617	762	0.0	0.0092	0.0	0.0158	0.0
On Road Diesel	1972	1979	560	999	0.4973	0.00002639	0.4580	0.00002428	0.4973	0.00002639	7.0777	0.00011796	0.0720	0.0	5.6300	0.00111573	0.4202	0.00001469	762	0.0	0.0092	0.0	0.0159	0.0
On Road Diesel	1979	1980	560	999	0.4973	0.00002639	0.4580	0.00002428	0.4973	0.00002639	7.0777	0.00011796	0.0720	0.0	5.6300	0.00111573	0.4202	0.00001469	762	0.0	0.0092	0.0	0.0159	0.0
On Road Diesel	1980	1985	560	999	0.4973	0.00002639	0.4580	0.00002428	0.4973	0.00002639	6.4879	0.00010794	0.0720	0.0	5.6300	0.00111573	0.3981	0.00001385	762	0.0	0.0092	0.0	0.0158	0.0
On Road Diesel	1985	1988	560	999	0.4973	0.00002639	0.4580	0.00002428	0.4973	0.00002639	6.4879	0.00010794	0.0720	0.0	5.4900	0.00108729	0.3716	0.00001292	762	0.0	0.0092	0.0	0.0158	0.0
On Road Diesel	1988	2000	560	999	0.3566	0.00000189	0.3280	0.00000174	0.3566	0.00000189	4.8188	0.00008022	0.0720	0.0	3.6200	0.00007174	0.3008	0.00000496	762	0.0	0.0092	0.0	0.0159	0.0
On Road Diesel	2000	2006	560	999	0.1408	0.00000751	0.1300	0.00000691	0.1408	0.00000751	3.6863	0.00006135	0.0720	0.0	1.2300	0.00002441	0.1416	0.00000495	762	0.0	0.0092	0.0	0.0158	0.0
On Road Diesel	2006	2007	560	999	0.1126	0.00000614	0.1040	0.00000565	0.1126	0.00000614	2.9196	0.00004329	0.0720	0.0	1.2300	0.00002441	0.0840	0.00000862	762	0.0	0.0092	0.0	0.0158	0.0
On Road Diesel	2007	2008	560	999	0.0099	0.00000053	0.0090	0.00000049	0.0099	0.00000053	1.5477	0.00002169	0.0720	0.0	1.2300	0.00002441	0.0619	0.00000970	762	0.0	0.0054	0.0	0.0156	0.0
On Road Diesel	2008	2010	560	999	0.0099	0.00000051	0.0090	0.00000047	0.0099	0.00000051	1.4722	0.00001995	0.0720	0.0	1.2300	0.00002441	0.0531	0.00001050	762	0.0	0.0054	0.0	0.0159	0.0
On Road Diesel	2010	2011	560	999	0.0099	0.00000050	0.0090	0.00000046	0.0099	0.00000046	0.2352	0.00000306	0.0720	0.0	1.2300	0.00002441	0.0442	0.00001140	762	0.0	0.0009	0.0	0.0163	0.0
On Road Diesel	2011	2015	560	999	0.0099	0.00000046	0.0090	0.00000042	0.0099	0.00000046	0.2352	0.00000305	0.0720	0.0	1.2300	0.00002441	0.0442	0.00001140	762	0.0	0.0016	0.0	0.0163	0.0
On Road Diesel	2015	2040	560	999	0.0038	0.00000021	0.0030	0.00000019	0.0038	0.00000021	0.2352	0.00000305	0.0720	0.0	1.2300	0.00002441	0.0221	0.00000517	762	0.0	0.0016	0.0	0.0158	0.0
On Road LNG	2007	2010	0	999	0.0000	0.00000000	0.0000	0.00000000	0.0000	0.00000000	2.1300	0.00000000	0.0000	0.0	0.0900	0.00000000	2.9400	0.00000000	662	0.0	0.0000	0.0	0.0000	0.0
On Road LNG	2010	2040	0	999	0.0000	0.00000000	0.0000	0.00000000	0.0000	0.00000000	0.3550	0.00000000	0.0000	0.0	0.0900	0.00000000	2.9400	0.00000000	662	0.0	0.0000	0.0	0.0000	0.0
Propane	0	1983	0	38	0.0800	0.00000000	0.0800	0.00000000	0.0000	0.00000000	17.6800	0.00010000	0.0000	0.0	9.5400	0.00100000	1.8800	0.00020000	904	0.0	0.0000	0.0	0.0000	0.0
Propane	1983	1984	0	38	0.0800	0.00000000	0.0800	0.00000000	0.0000	0.00000000	17.6800	0.00010000	0.0000	0.0	9.5400	0.00100000	1.8800	0.00020000	904	0.0	0.0000	0.0	0.0000	0.0
Propane	1984	2001	0	38	0.0800	0.00000000	0.0800	0.00000000	0.0000	0.00000000	14.1400	0.00020000	0.0000	0.0	9.5400	0.00100000	1.5800	0.00020000	904	0.0	0.0000	0.0	0.0000	0.0
Propane	2001	2002	0	38	0.0800	0.00000000	0.0800	0.00000000	0.0000	0.00000000	10.5900	0.00030000	0.0000	0.0	9.5400	0.00100000	1.2600	0.00020000	904	0.0	0.0000	0.0	0.0000	0.0
Propane	2002	2003	0	38	0.0800	0.00000000	0.0800	0.00000000	0.0000	0.00000000	7.0600	0.00050000	0.0000	0.0	9.5400	0.00100000	0.9700	0.00020000	904	0.0	0.0000	0.0	0.0000	0.0
Propane	2003	2006	0	38	0.0800	0.00000000	0.0800	0.00000000	0.0000	0.00000000	2.6500	0.00040000	0.0000	0.0	9.5400	0.00100000	0.1900	0.00010000	904	0.0	0.0000	0.0	0.0000	0.0
Propane	2006	2009	0	38	0.0800	0.00000000	0.0800	0.00000000	0.0000	0.00000000	2.3700	0.00090000	0.0000	0.0	3.2200	0.00000000	0.1500	0.00010000	904	0.0	0.0000	0.0	0.0000	0.0
Propane	2009	2041	0	38	0.0800	0.00000000	0.0800	0.00000000	0.0000	0.00000000	1.5500	0.00100000	0.0000	0.0	3.2200	0.00000000	0.0700	0.00000000	904	0.0	0.0000	0.0	0.0000	0.0
Propane	0	1983	38	91	0.0800	0.00000000	0.0800	0.00000000	0.0000	0.00000000	14.3200	0.00010000	0.0000	0.0	26.8100	0.00200000	2.1100	0.00020000	904	0.0	0.0000	0.0	0.0000	0.0
Propane	1983	1984	38	91	0.0800	0.00000000	0.0800	0.00000000	0.0000	0.00000000	14.3200	0.00010000	0.0000	0.0	26.8100	0.00200000	2.1100	0.00020000	904	0.0	0.0000	0.0	0.0000	0.0

Engine Type	Engine Year min	Engine Year max	Engine Power (kW) min	Engine Power (kW) max	PM ZH	PM DR	$PM_{2.5}$ ZH	$PM_{2.5}$ DR	DPM ZH	DPM DR	NO_x ZH	NO_x DR	SO_2 ZH	SO_2 DR	CO ZH	CO DR	HC ZH	HC DR	CO_2 ZH	CO_2 DR	N_2O ZH	N_2O DR	CH_4 ZH	CH_4 DR
					Zero Hour Emission Factor (g/kW-hr) and Deterioration Rate (gm/kW-hr^2)																			
Propane	1984	2001	38	91	0.0800	0.00000000	0.0800	0.00000000	0.0000	0.00000000	11.6100	0.00020000	0.0000	0.0	26.8100	0.00200000	1.7400	0.00020000	904	0.0	0.0000	0.0	0.0000	0.0
Propane	2001	2002	38	91	0.0800	0.00000000	0.0800	0.00000000	0.0000	0.00000000	8.9200	0.00030000	0.0000	0.0	26.8100	0.00200000	1.3900	0.00020000	904	0.0	0.0000	0.0	0.0000	0.0
Propane	2002	2003	38	91	0.0800	0.00000000	0.0800	0.00000000	0.0000	0.00000000	6.2100	0.00050000	0.0000	0.0	26.8100	0.00200000	1.0200	0.00020000	904	0.0	0.0000	0.0	0.0000	0.0
Propane	2003	2006	38	91	0.0800	0.00000000	0.0800	0.00000000	0.0000	0.00000000	2.1500	0.00050000	0.0000	0.0	26.8100	0.00200000	0.2200	0.00010000	904	0.0	0.0000	0.0	0.0000	0.0
Propane	2006	2009	38	91	0.0800	0.00000000	0.0800	0.00000000	0.0000	0.00000000	1.4100	0.00000000	0.0000	0.0	3.2200	0.00000000	0.1400	0.00010000	904	0.0	0.0000	0.0	0.0000	0.0
Propane	2009	2041	38	91	0.0800	0.00000000	0.0800	0.00000000	0.0000	0.00000000	0.4200	0.00010000	0.0000	0.0	3.2200	0.00400000	0.0400	0.00000000	904	0.0	0.0000	0.0	0.0000	0.0
Propane	0	1983	91	131	0.0800	0.00000000	0.0800	0.00000000	0.0000	0.00000000	14.2900	0.00010000	0.0000	0.0	22.3900	0.00100000	1.8800	0.00000000	904	0.0	0.0000	0.0	0.0000	0.0
Propane	1983	1984	91	131	0.0800	0.00000000	0.0800	0.00000000	0.0000	0.00000000	14.2900	0.00010000	0.0000	0.0	22.3900	0.00100000	1.8800	0.00000000	904	0.0	0.0000	0.0	0.0000	0.0
Propane	1984	2001	91	131	0.0800	0.00000000	0.0800	0.00000000	0.0000	0.00000000	11.6000	0.00010000	0.0000	0.0	22.3900	0.00100000	1.5800	0.00000000	904	0.0	0.0000	0.0	0.0000	0.0
Propane	2001	2002	91	131	0.0800	0.00000000	0.0800	0.00000000	0.0000	0.00000000	8.8900	0.00010000	0.0000	0.0	22.3900	0.00100000	1.2800	0.00000000	904	0.0	0.0000	0.0	0.0000	0.0
Propane	2002	2003	91	131	0.0800	0.00000000	0.0800	0.00000000	0.0000	0.00000000	6.2000	0.00010000	0.0000	0.0	22.3900	0.00100000	0.9700	0.00000000	904	0.0	0.0000	0.0	0.0000	0.0
Propane	2003	2006	91	131	0.0800	0.00000000	0.0800	0.00000000	0.0000	0.00000000	2.1500	0.00040000	0.0000	0.0	22.3900	0.00100000	0.1900	0.00010000	904	0.0	0.0000	0.0	0.0000	0.0
Propane	2006	2009	91	131	0.0800	0.00000000	0.0800	0.00000000	0.0000	0.00000000	1.4100	0.00000000	0.0000	0.0	3.2200	0.00000000	0.1400	0.00010000	904	0.0	0.0000	0.0	0.0000	0.0
Propane	2009	2041	91	131	0.0800	0.00000000	0.0800	0.00000000	0.0000	0.00000000	0.4200	0.00010000	0.0000	0.0	3.2200	0.00400000	0.0400	0.00000000	904	0.0	0.0000	0.0	0.0000	0.0
Propane	0	1983	131	187	0.0800	0.00000000	0.0800	0.00000000	0.0000	0.00000000	14.2900	0.00010000	0.0000	0.0	22.3900	0.00100000	1.8800	0.00000000	904	0.0	0.0000	0.0	0.0000	0.0
Propane	1983	1984	131	187	0.0800	0.00000000	0.0800	0.00000000	0.0000	0.00000000	14.2900	0.00010000	0.0000	0.0	22.3900	0.00100000	1.8800	0.00000000	904	0.0	0.0000	0.0	0.0000	0.0
Propane	1984	2001	131	187	0.0800	0.00000000	0.0800	0.00000000	0.0000	0.00000000	11.6000	0.00010000	0.0000	0.0	22.3900	0.00100000	1.5800	0.00000000	904	0.0	0.0000	0.0	0.0000	0.0
Propane	2001	2002	131	187	0.0800	0.00000000	0.0800	0.00000000	0.0000	0.00000000	8.8900	0.00010000	0.0000	0.0	22.3900	0.00100000	1.2800	0.00000000	904	0.0	0.0000	0.0	0.0000	0.0
Propane	2002	2003	131	187	0.0800	0.00000000	0.0800	0.00000000	0.0000	0.00000000	6.2000	0.00010000	0.0000	0.0	22.3900	0.00100000	0.9700	0.00000000	904	0.0	0.0000	0.0	0.0000	0.0
Propane	2003	2006	131	187	0.0800	0.00000000	0.0800	0.00000000	0.0000	0.00000000	2.1500	0.00040000	0.0000	0.0	22.3900	0.00100000	0.1900	0.00010000	904	0.0	0.0000	0.0	0.0000	0.0
Propane	2006	2009	131	187	0.0800	0.00000000	0.0800	0.00000000	0.0000	0.00000000	1.4100	0.00000000	0.0000	0.0	3.2200	0.00000000	0.1400	0.00010000	904	0.0	0.0000	0.0	0.0000	0.0
Propane	2009	2041	131	187	0.0800	0.00000000	0.0800	0.00000000	0.0000	0.00000000	0.4200	0.00010000	0.0000	0.0	3.2200	0.00400000	0.0400	0.00000000	904	0.0	0.0000	0.0	0.0000	0.0
Propane	0	1983	187	999	0.0800	0.00000000	0.0800	0.00000000	0.0000	0.00000000	14.2900	0.00010000	0.0000	0.0	22.3900	0.00100000	1.8800	0.00000000	904	0.0	0.0000	0.0	0.0000	0.0
Propane	1983	1984	187	999	0.0800	0.00000000	0.0800	0.00000000	0.0000	0.00000000	14.2900	0.00010000	0.0000	0.0	22.3900	0.00100000	1.8800	0.00000000	904	0.0	0.0000	0.0	0.0000	0.0
Propane	1984	2001	187	999	0.0800	0.00000000	0.0800	0.00000000	0.0000	0.00000000	11.6000	0.00010000	0.0000	0.0	22.3900	0.00100000	1.5800	0.00000000	904	0.0	0.0000	0.0	0.0000	0.0
Propane	2001	2002	187	999	0.0800	0.00000000	0.0800	0.00000000	0.0000	0.00000000	8.8900	0.00010000	0.0000	0.0	22.3900	0.00100000	1.2800	0.00000000	904	0.0	0.0000	0.0	0.0000	0.0
Propane	2002	2003	187	999	0.0800	0.00000000	0.0800	0.00000000	0.0000	0.00000000	6.2000	0.00010000	0.0000	0.0	22.3900	0.00100000	0.9700	0.00000000	904	0.0	0.0000	0.0	0.0000	0.0
Propane	2003	2006	187	999	0.0800	0.00000000	0.0800	0.00000000	0.0000	0.00000000	2.1500	0.00040000	0.0000	0.0	22.3900	0.00100000	0.1900	0.00010000	904	0.0	0.0000	0.0	0.0000	0.0
Propane	2006	2009	187	999	0.0800	0.00000000	0.0800	0.00000000	0.0000	0.00000000	1.4100	0.00000000	0.0000	0.0	3.2200	0.00000000	0.1400	0.00010000	904	0.0	0.0000	0.0	0.0000	0.0
Propane	2009	2041	187	999	0.0800	0.00000000	0.0800	0.00000000	0.0000	0.00000000	0.4200	0.00010000	0.0000	0.0	3.2200	0.00400000	0.0400	0.00000000	904	0.0	0.0000	0.0	0.0000	0.0

APPENDIX E

HEAVY-DUTY DIESEL TRUCKS

Table E.1: Truck and Engine Model Year Distribution

Engine Model Year	Number of Calls	Percentage of Calls
2014	13,185	0.2%
2013	90,434	1.6%
2012	171,181	3.0%
2011	366,861	6.5%
2010	520,113	9.2%
2009	2,015,651	35.6%
2008	1,412,058	24.9%
2007	1,055,997	18.7%
2006	61	0.0%
2005	149	0.0%
2004	1,172	0.0%
2003	876	0.0%
2002	368	0.0%
2001	1,379	0.0%
2000	4,135	0.1%
1999	1,010	0.0%
1998	1,660	0.0%
1997	612	0.0%
1996	2	0.0%
1995	2,086	0.0%
1994	23	0.0%
1993	847	0.0%
1992	10	0.0%
1991	0	0.0%
1990	20	0.0%
1989-	311	0.0%