COMMERCE-EASTERN RAILYARD
TAC EMISSIONS INVENTORY

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APPENDICES

TABLES

1.0 INTRODUCTION

This document describes the data and methods used in estimating toxic air contaminant (TAC) emissions resulting from facility operations and other activities in and around the Commerce-Eastern facility. The data describe activities grouped by like emission source and by spatial activity. The emission sources include:

- Locomotives
- Cargo Handling equipment
- On-road vehicles
- Off-road equipment
- Stationary sources

Emissions factors for diesel PM and organic gases (which are then speciated into other relevant toxic air contaminants) for each source are included, and emissions estimates provided.

2.0 OVERVIEW OF THE COMMERCE - EASTERN YARD

The Commerce - Eastern yard lies diagonally opposite across the BNSF mainline from the Commerce - Mechanical yard. The two yards have little in common and little interaction despite their proximity to one another. The Eastern yard is an intermodal and classification yard handling very few trains.

3.0 LOCOMOTIVE FACILITY OPERATIONS

The engine-on locomotive operations at the Commerce - Eastern facility do not include service or inspection activities (Sections 3.1 – 3.3), but do include switching (Section 3.4) and activities in the classification yard (Section 3.5) and on the operating tracks (Sections 3.6 and 3.7). Under each heading is a description of the operations.

Since different locomotive and engine models have different emissions characteristics, it is important to characterize the types and models of the locomotives that are being serviced in the Commerce - Eastern facility. ENVIRON estimated the locomotive fleet fractions for different locomotive types and models using data provided by BNSF. The operation descriptions below each include a uniquely applicable fleet characterization.

3.1 Basic Locomotive Service

No service or locomotive refueling activity occurs at Commerce – Eastern.

3.2 Basic Engine Inspection

No such activity occurs within the Commerce - Eastern facility.

3.3 Full Engine Service/Inspection

No such activity occurs within the Commerce - Eastern facility.

3.4 Switching Engine Activity

Switching engine fleet characteristics in the Commerce - Eastern area were determined by a roster of engines made available by BNSF in early 2006 and reflects the roster for Commerce – Mechanical and Hobart yards as each facility shares switching engines. The data are shown in Table 3-1. Most engines are of similar power and type. This fleet was used to describe the switching engine activity assuming equivalent use of all six engines in the fleet.

Table 3-1. Locomotive switching engine fleet characterization for service to the Commerce - Eastern facility.

Locomotive Model	Certification Tier	HP	Number of Engines	Engine Surrogate
GP-25	Precontrolled	2500	1	GP-3x
GP-30	Precontrolled	2500	3	GP-3x
GP-35	Precontrolled	2500	4	GP-3x
GP39-2	Precontrolled	2300	6	GP-3x
GP39E	Precontrolled	2300	1	GP-3x
SD39	Precontrolled	2300	1	GP-3x
MK1200G	Precontrolled	1200	2	Switcher

The time in mode for switching engine activity in Table 3-2 was determined from event recorder downloads of a sample of three engines operating in this yard and Commerce - Mechanical. The three engines chosen range from 2,300 - 2,500 hp, and are representative of the switching engines dedicated to the area. The time in mode from the event recorder downloads could not distinguish engine idling and engine off periods, so the idle mode was fixed at the EPA switching engine cycle estimate of 59.8% and the remaining notch settings renormalized so that the full cycle sums to 100% of the time. This adjustment has the effect of increasing the emissions estimate by placing more of the activity into the higher notch settings.

Table 3-2. Switching engine (~2,500 hp) relative time in mode.

Throttle Notch	Time in Mode
DB	0.03%
Idle	59.80%
1	12.66%
2	14.92%
3	7.14%
4	3.86%
5	0.85%
6	0.31%
7	0.18%
8	0.25%

The total switching engine activity consists of two shifts 5 days a week and one shift the other 2 days Engines operating about 4.5 hours per shift. This results in an estimate of 2808 hours per year

3.5 Train Arrival and Departures in and from the Yard

Trains arrive and depart from the Commerce-Eastern classification yard and have a distinct operating profile from other engines moving through or by the yard BNSF provided engine counts for arriving and departing trains based on a designation from the yard. However, all trains/engines noted as arriving and departing do not necessarily have business in the yard and may be using the yard tracks as an alternative route to the adjacent mainline. Trains/engines that arrive and depart within an hour were subtracted from the total number of the arrivals and departures

The number of engines listed as arriving and departing from the site was the larger of those labeled train arrival and train departure. A total number of engines that arrive and depart from the yard were estimated at 1515, with 100 short term stays most likely corresponding to trains only passing through the yard. Therefore, 1415 engines were used for this activity category. The fleet characteristics by model and emission tier level for arriving and departing trains is shown in Table 3-3.

Table 3-3. Fleet characteristics for arriving and departing engines

Tier	Model	Number	Fleet Fraction
Precntrl	Switchers	0	0%
Precntrl	GP-3x	7	1%
Precntrl	GP-4x	59	4%
Precntrl	GP-50	3	0%
Precntrl	GP-60	7	1%
Precntrl	SD-7x	0	0%
Precntrl	Dash-7	0	0%
Precntrl	Dash-9	118	8%
0	GP-60	10	1%
0	SD-7x	2	0%
0	Dash-8	87	6%
0	Dash-9	679	48%
1	Dash-9	338	24%
2	ES44/Dash-9	104	7%
Total		1415	

BNSF provided throttle position for a sample engine that arrived and departed out of the Hobart Yard and was considered to be representative of the Commerce-Eastern trains' activity. That data is shown in Table 3-4. The idle mode in the sample could not distinguish between idle with the engine on and idle with the engine off. A separate data set provided information on when the engine was turned on, but not when turned off. This sample engine indicated that the engine was cranked on twice upon arrival. Therefore, the engine must have been shut off during some periods while in the yard. A more in-depth study for Richmond showed that engines arriving and departing averaged 2.33 hours of idle, so the idle time for the arriving engines at Commerce-Eastern was adjusted so that the total arrival and departure idle time would be 2.33 hours

Table 3-4. Activity by mode for arriving and departing trains

Throttle Position	Arriving (Hours)	Departing (Hours)
DB	0.081	0.037
Idle	0.631	1.702
T1	0.223	0.160
T2	0.134	0.033
T3	0.066	0.011
T4	0.008	0.005
T5	0.000	0.000
T6	0.000	0.000
T7	0.000	0.000
T8	0.000	0.000

3.6. Freight Movements on Adjacent Mainline

The adjacent main line along the (primarily) north-northwest edge of the facility and runs approximately 0.7 miles, and corresponds to milepost 147.3 to 148. The Commerce-Eastern Avenue site is listed as milepost 147.3, and the track distance from Eastern Avenue to the southwest edge of the Commerce-Mechanical Facility is 0.7 miles.

Two subcategories of freight movements occur on the mainline BNSF and non-BNSF (foreign). All operations for both subcategories are assumed to occur throughout a 24-hour period. BNSF reads radio tags for most of the traffic along its mainline, cataloging every locomotive except most of the Metrolink engines operating commuter trains during weekdays at milepost 152, a few miles east of the facility.

3.6.1 BNSF Freight Movements

Data provided by BNSF showed a total of 57,124 locomotives at the Commerce-Eastern facility between May 1, 2005 and April 30, 2006. The fleet characteristics for these engines are shown in Table 3-5. From this list of all locomotives at the site, 1415 were estimated to have arrived and departed from Commerce-Eastern according to data from BNSF. Thus, the 1415 arriving and departing trains were subtracted out from the total for each arrival and departure because that train/engine activity was included under Section 3.5 and would be counted at milepost 152 when heading westbound (arriving) and eastbound (departing). Since only the total number of locomotives was available, ENVIRON assumed one-half (27,045) were traveling Eastbound, and one-half (27,045) were traveling Westbound. ENVIRON determined the time in mode distributions for Eastbound and Westbound mainline activity using computer simulation data provided by BNSF for a hypothetical locomotive traveling at approximately 30 mph past the Commerce-Eastern facility (milepost 147.3-148). These data are summarized in Table 3-6. Note that the total time to pass the Commerce - Eastern facility traveling eastbound amounts to 85 seconds, while the total time in the Westbound direction is only 82 seconds on average.

Table 3-5. Fleet characterization for locomotive mainline activity past the Commerce-Eastern facility.

Locomotive Model	Certification Tier	HP	Fleet Fraction	Engine Surrogate
C44-9W	0	4400	39.6%	Dash-9
C44-9W	1	4400	18.1%	Dash-9
C44-9W	Precontrolled	4400	7.7%	Dash-9
SD40-2	Precontrolled	2997	6.7%	GP-4x
ES44DC	2	4400	6.0%	ES44/Dash-9
C40-8W	0	4135	5.5%	Dash-8
GP35	Precontrolled	2500	2.2%	GP-3x
GP60M	0	3800	1.9%	GP-60
B40-8W	Precontrolled	4000	1.7%	Dash-8 Tier 0
SD40-2	0	3000	1.2%	GP-4x Precontrolled
GP39-2	Precontrolled	2300	1.1%	GP-3x
GP30	Precontrolled	2500	1.1%	GP-3x
B40-8	Precontrolled	4000	0.9%	Dash-8 Tier 0
GP60	0	3800	0.9%	GP-60
GP60B	0	3800	0.8%	GP-60
B40-8W	0	4000	0.8%	Dash-8

Locomotive Model	Certification Tier	HP	Fleet Fraction	Engine Surrogate
GP60	Precontrolled	3800	0.8%	GP-60
SD60M	Precontrolled	3800	0.5%	GP-60
SD60	Precontrolled	3800	0.3%	GP-60
SD45-2	Precontrolled	3345	0.3%	GP-4x
SD50	Precontrolled	3385	0.3%	GP-50
GP38-2	Precontrolled	2000	0.3%	GP-3x
SD39	Precontrolled	2300	0.2%	GP-3x
GP25	Precontrolled	2500	0.2%	GP-3x
GP38	Precontrolled	2000	0.1%	GP-3x
GP39M	Precontrolled	2300	0.1%	GP-3x
GP40M	Precontrolled	3000	0.1%	GP-4x
SD40	Precontrolled	2930	0.1%	GP-4x
SD45	Precontrolled	3480	0.1%	GP-4x
B23-7	Precontrolled	2250	0.1%	Dash-7
SD40-2T	Precontrolled	3000	0.1%	GP-4x
SD75M	0	4300	0.04%	SD-7x
SW1500	Precontrolled	1500	0.04%	Switcher
SD60M	0	3800	0.03%	GP-60
AC4400CW	1	4400	0.03%	Dash-9
SD40-2B	Precontrolled	3000	0.03%	GP-4x
SD40-2S	0	3000	0.02%	GP-4x Precontrolled
SD70MAC	Precontrolled	4000	0.02%	SD-7x
SD70MAC	0	4000	0.02%	SD-7x
GP39E	Precontrolled	2300	0.02%	GP-3x
GP50	Precontrolled	3300	0.02%	GP-50
GP9	Precontrolled	1750	0.02%	Switcher
SD45-2T	Precontrolled	3400	0.02%	GP-4x
SW1000N	Precontrolled	1000	0.02%	Switcher
SD45-2B	Precontrolled	3400	0.01%	GP-4x
ES44AC	2	4400	0.01%	ES44/Dash-9
SD40-3	Precontrolled	3000	0.01%	GP-4x
SD9	Precontrolled	1750	0.01%	Switcher
SD45-2BF	Precontrolled	3600	0.01%	GP-4x
GG-20B	Precontrolled	2000	0.003%	GP-3x
GP40E	Precontrolled	3000	0.003%	GP-4x
GP40X	Precontrolled	3600	0.003%	GP-4x
SD38-2	Precontrolled	2300	0.003%	GP-3x
SD60	0	3800	0.003%	GP-60

Table 3-6. Locomotive time in mode passing the Commerce - Eastern facility.

Throttle Notch	Westbound Est. Time (hours)	Eastbound Est. Time (hours)
DB	0.0229	0.0235

3.6.2 Foreign (non-BNSF) Freight Movements

Data provided by BNSF showed only 222 foreign (non-BNSF and non-Commuter) locomotives passing the Commerce - Eastern facility between May 1, 2005 and April 30, 2006. As with the BNSF freight, ENVIRON assumed one-half (111) were traveling Eastbound, and one-half (111) were traveling Westbound. Without engine model descriptions for these locomotives, ENVIRON made the assumption that the fleet mix and time in mode for these engines would be the same as what Tables 5 and 6 show for the BNSF engines.

3.7 Commuter Rail Operations on Adjacent Mainline

BNSF data show that AMTRAK operates 10,391 trains per year in both directions throughout the week along this line. BNSF also confirmed that Metrolink operates 7,280 trains per year along this line, with activity occurring only during weekdays. Although it does not occur throughout a 24-hour period, this operation is assumed to occur throughout a 24-hour period for modeling simplicity in this study.

Exact fleet characteristics are not known for the AMTRAK and Metrolink locomotives. However, both ARB and BNSF have indicated the predominance of F59PHI (EMD 710E3, 3000 hp) engines in the AMTRAK and Metrolink fleets, which for purposes of emissions estimates in this study are modeled using the average emission levels from the EPA (1997) study for the two 12 cylinder EMD 710G3 engines based on similarities in engine design, size, and power rating.

4.0 LOCOMOTIVE EMISSION FACTORS FOR DIESEL PARTICULATE MATTER

Emission factors used in this study were based primarily on the emission factors used in the California Air Resources Board (ARB)'s Risk Assessment Study for the Union Pacific Roseville facility, and the Southwest Research Institute (SwRI, 2000) study sponsored by ARB, entitled "Diesel Fuel Effects on Locomotive Exhaust Emissions." Since the publication date of the Roseville report, ARB provided ENVIRON with additional emission factors for criteria pollutants, and made some adjustments to the original Roseville data (ARB, 2006a). ENVIRON also received permission from the engine owners to obtain additional emission factor data from the Exhaust Plume Study performed by SwRI (2005). The PM emission factors relevant to all locomotives in the Commerce - Eastern facility are summarized in Tables 4-1a and 4-1b for several different locomotive model groups and certification tiers. Specific locomotives and engines in each locomotive model group can be inferred from the fleet characterization tables provided above.

Based on conversation with the principal researcher on all the locomotive studies (SwRI, 2006), ENVIRON learned that a default fuel sulfur content of 0.3% was used on all test results and certification data produced with locomotives to date (the emission rates in SwRI, 2000 were those with 0.3% sulfur fuel). The emission rates using this fuel are reflected in Table 4-1a.

Table 4-1a. PM emission factors for locomotives used in the study, assuming default fuel sulfur content (0.3%).

Locomotive Model Group	Cert Tier[a]	Emission Factors (g/hr) by Throttle Notch									
		Idle	DB[b]	1	2	3	4	5	6	7	8
Switchers [1]	Precntl	31.0	56.0	23.0	76.0	138.0	159.0	201.0	308.0	345.0	448.0
GP-3x [1]	Precntl	38.0	72.0	31.0	110.0	186.0	212.0	267.0	417.0	463.0	608.0
GP-4x [1]	Precntl	47.9	80.0	35.7	134.3	226.4	258.5	336.0	551.9	638.6	821.3
GP-50 [1]	Precntl	26.0	64.1	51.3	142.5	301.5	311.2	394.0	663.8	725.3	927.8
GP-60 [1]	Precntl	48.6	98.5	48.7	131.7	284.5	299.4	375.3	645.7	743.6	941.6
SD-7x [1]	Precntl	24.0	4.8	41.0	65.7	156.8	243.1	321.1	374.8	475.2	589.2
Dash-7 [1]	Precntl	65.0	180.5	108.2	121.2	359.5	327.7	331.5	299.4	336.7	420.0
Dash-9 [2]	Precntl	32.1	53.9	54.2	108.1	219.9	289.1	370.6	437.7	486.1	705.7
EMD 12-710G3 [3]	Precntl	27.5	54.5	34.0	112.5	208.0	234.5	291.0	423.0	545.0	727.5
GP-60 [4]	0	21.1	25.4	37.6	75.5	239.4	352.2	517.8	724.8	1125.9	1319.8
SD-7x [1]	0	14.8	15.1	36.8	61.1	230.4	379.8	450.8	866.2	1019.1	1105.7
Dash-8 [1]	0	37.0	147.5	86.0	133.1	291.4	293.2	327.7	373.5	469.4	615.2
Dash-9 [5]	0	33.8	50.7	56.1	117.4	229.2	263.8	615.9	573.9	608.0	566.6
Dash-9 [4]	1	16.9	88.4	62.1	140.2	304.0	383.5	423.9	520.2	544.6	778.1
ES44/Dash-9 [4]	2	7.7	42.0	69.3	145.8	304.3	365.0	405.2	418.4	513.5	607.5

[1] Final locomotive emission factors (an update to the Roseville study emission factors Table B-1) received via email from Dan Donohue of ARB, May 9, 2006.

[2] "Diesel Fuel Effects on Locomotive Exhaust Emissions," Southwest Research Institute, October 2000.
[3] EPA, 1997.
[4] Confidential data from SwRI, 2006.
[5] Average of ARB and SwRI, 2006.
[a] Precntl: Precontrolled
[b] DB: DynamicBraking

Table 4-1b provides emission factors adjusted for fuel sulfur content of 0.105%. This adjustment was performed according to documented ARB procedures from the OFFROAD Modeling

Change Technical Memo (Wong, 2005). All locomotive emissions presented in this document utilized the emission factors from Table 4-1b.

Table 4-1b. Emission Factors for locomotives used in the study, adjusted for reduced fuel sulfur content (0.105%).

Locomotive Model Group	Cert Tier[a]	Emission Factors (g/hr) by Throttle Notch									
		Idle	DB[b]	1	2	3	4	5	6	7	8
Switchers [1]	Precntl	31.0	56.0	23.0	76.0	131.8	146.1	181.5	283.2	324.4	420.7
GP-3x [1]	Precntl	38.0	72.0	31.0	110.0	177.7	194.8	241.2	383.4	435.3	570.9
GP-4x [1]	Precntl	47.9	80.0	35.7	134.3	216.2	237.5	303.5	507.4	600.4	771.2
GP-50 [1]	Precntl	26.0	64.1	51.3	142.5	288.0	285.9	355.8	610.4	681.9	871.2
GP-60 [1]	Precntl	48.6	98.5	48.7	131.7	271.7	275.1	338.9	593.7	699.1	884.2
SD-7x [1]	Precntl	24.0	4.8	41.0	65.7	149.8	223.4	290.0	344.6	446.8	553.3
Dash-7 [1]	Precntl	65.0	180.5	108.2	121.2	322.6	302.9	307.7	268.4	275.2	341.2
Dash-9 [2]	Precntl	32.1	53.9	54.2	108.1	197.3	267.3	343.9	392.4	397.3	573.3
EMD 12-710G3 [3]	Precntl	27.5	54.5	34.0	112.5	186.6	216.8	270.1	379.3	445.4	591.0
GP-60 [4]	0	21.1	25.4	37.6	75.5	228.7	323.6	467.7	666.4	1058.5	1239.3
SD-7x [1]	0	14.8	15.1	36.8	61.1	220.1	349.0	407.1	796.5	958.1	1038.3
Dash-8 [1]	0	37.0	147.5	86.0	133.1	261.5	271.0	304.1	334.9	383.6	499.7
Dash-9 [5]	0	33.8	50.7	56.1	117.4	205.7	243.9	571.5	514.6	496.9	460.3
Dash-9 [4]	1	16.9	88.4	62.1	140.2	272.8	354.5	393.4	466.4	445.1	632.1
ES44/Dash-9 [4]	2	7.7	42.0	69.3	145.8	273.0	337.4	376.0	375.1	419.6	493.5

[1] Final locomotive emission factors (an update to the Roseville study emission factors Table B-1) received via email from Dan Donohue of ARB, May 9, 2006.

[2] "Diesel Fuel Effects on Locomotive Exhaust Emissions," Southwest Research Institute, October 2000.
[3] EPA, 1997.
[4] Confidential data from SwRI, 2006.
[5] Average of ARB and SwRI, 2006.
[a] Precntl: Precontrolled
[b] DB: 0ynamicBraking

The sulfur content value of 0.105% used for the adjustment was obtained by averaging data provided by BNSF for diesel fuel dispensed and corresponding sulfur level at all California sites and those near California. For sites outside of California, ENVIRON assumed that half of the fuel dispensed would be used in California, because trains moving in either direction may be fueled there. In reality, it is likely that less than half of the out-of-state fuel dispense will be used in California, because many of those sites are a significant distance from the state border. The data and overall estimates are shown in Table 4-2.

Table 4-2. Fuel sulfur and total annual fueling at various locomotive fueling locations.

Location	State	Total Gallons	% Sulfur
Holbrook	AZ	21,935	0.192
Phoenix	AZ	3,542,292	0.034
Flagstaff	AZ	2,019	0.192
Kingman	AZ	334,309	0.034
Vacaville	CA	33,074	0.034
Redding	CA	1,004	0.192
Summit	CA	1,750	0.192
San Diego	CA	530	0.192
Bakersfield	CA	240,976	0.034
Barstow	CA	1,946,092	0.015
Oakland	CA	1,762,993	0.034
Needles	CA	770,667	0.192

Location	State	Total Gallons	% Sulfur
Bakersfield	CA	131,075	0.034
Bakersfield	CA	11,070	0.034
Corona	CA	103,982	0.034
Fresno	CA	2,669,884	0.034
Kaiser	CA	460,390	0.034
Kings Park	CA	61,900	0.034
Pittsburg	CA	12,695	0.034
Riverbank	CA	2,070,244	0.034
San Bernardino	CA	9,940,295	0.034
San Diego	CA	111,369	0.192
Stockton	CA	1,018,965	0.034
Stuart Mesa	CA	41,509	0.192
Terminal Island	CA	14,816,643	0.192
Victorville	CA	66,042	0.034
Watson	CA	1,152,454	0.192
Bakersfield	CA	11,236	0.192
Winslow	AZ	3,496,072	0.170
Belen	NM	202,462,278	0.192
Barstow	CA	52,439,321	0.015
Commerce	CA	31,573,289	0.015
Richmond	CA	22,255,177	0.034
Klamath Falls	OR	3,070,865	0.381

The fuel sulfur correction methodology described by ARB (2005a) was used to adjust PM emission rates from an average fuel sulfur level of 0.3% to 0.105% using the fuel sulfur - PM relationship equation, A + B * (fuel sulfur, ppm). The emission reductions calculated for GE and EMD engines shown in Table 4-3 were applied to the base emission rates to calculate the emission rates at the in-use fuel sulfur levels.

Table 4-3. Fuel sulfur emission reductions by notch and engine type.

Notch	B	A	Fuel Sulfur 0.3% EF (g/hp-hr)	Fuel Sulfur 0.105% EF (g/hp-hr)	Reduction
GE 4-stroke Engine					
8	0.00001308	0.0967	0.13594	0.110434	18.76%
7	0.00001102	0.0845	0.11756	0.096071	18.28%
6	0.00000654	0.1037	0.12332	0.110567	10.34%
5	0.00000548	0.132	0.14844	0.137754	7.20%
4	0.00000663	0.1513	0.17119	0.1582615	7.55%
3	0.00000979	0.1565	0.18587	0.1667795	10.27%
EMD 2-stroke engine					
8	0.0000123	0.3563	0.3932	0.369215	6.10%
7	0.0000096	0.284	0.3128	0.29408	5.98%
6	0.0000134	0.2843	0.3245	0.29837	8.05%
5	0.000015	0.2572	0.3022	0.27295	9.68%
4	0.0000125	0.2629	0.3004	0.276025	8.11%
3	0.0000065	0.2635	0.283	0.270325	4.48%

5.0 LOCOMOTIVE DIESEL PM EMISSION ESTIMATES

5.1. Basic Service

No such activity occurs within the Commerce - Eastern facility.

5.2. Basic Engine Inspection

No such activity occurs within the Commerce - Eastern facility.

5.3. Full Engine Service/Inspection

No such activity occurs within the Commerce - Eastern facility.

5.4. Switching Engine Activity

Estimated annual PM emissions for switching activities at the Commerce-Eastern facility are presented in Table 5-1. ENVIRON calculated these emissions using the engine-specific emission factors by notch in Table 4-1b, the fleet characteristics in Table 3-1, and the relative time in mode data from Table 3-2. The switching activity over 365 days per year was distributed equally across all 18 engines in the switching fleet. This category represents the switching engines activity that can occur any where in the yard. The switching engine activity is known only by the engine hours and selected downloads of the time in mode (notch) for the activity in the general area.

Table 5-1. Estimated annual PM emissions associated with movements of cars within the classification yard of the Commerce-Eastern facility.

Locomotive Model Group	Cert Tier	# of Loco	PM Emissions (grams)
Switchers	Precntl	2	**16,199**
GP-3x	Precntl	16	**171,586**
Total		**18**	**187,785**

5.5. Train Arrival and Departures in and from the Yard

Engines on trains that arrive and depart from the yard have a different activity profile than the switching engines or those that pass the yard. Emissions were derived based on the activity for an arriving and departing train and the emissions for all engines arriving and departing are shown in Tables 5-2 and 5-3.

Table 5-2. Arriving train's engine emissions for Commerce-Eastern

Model Group	Cert Tier	Emissions by Mode (g/year)						Total
		Idle	DB	1	2	3	4	
Switchers	Precntl	0	0	0	0	0	0	**0**
GP-3x	Precntl	453	18	35	25	13	6	**551**
GP-4x	Precntl	4,815	173	337	262	135	66	**5,788**
GP-50	Precntl	133	7	25	14	9	4	**192**
GP-60	Precntl	579	25	55	30	20	9	**719**
SD-7x	Precntl	0	0	0	0	0	0	**0**
Dash-7	Precntl	0	0	0	0	0	0	**0**
Dash-9	Precntl	6,450	233	1,024	422	246	149	**8,523**
GP-60	0	359	9	60	25	24	15	**493**
SD-7x	0	50	1	12	4	5	3	**75**
Dash-8	0	5,472	471	1,198	383	240	111	**7,875**
Dash-9	0	39,108	1,262	6,094	2,634	1,474	782	**51,353**
Dash-9	1	9,723	1,096	3,358	1,566	973	566	**17,283**
ES44/Dash-9	2	1,363	160	1,153	501	300	166	**3,643**
Total		68,506	3,455	13,349	5,867	3,439	1,878	**96,495**

Table 5-3. Departing train's engine emissions for Commerce-Eastern

Model Group	Cert Tier	Emissions by Mode (g/year)						Total
		Idle	DB	1	2	3	4	
Switchers	Precntl	0	0	0	0	0	0	**0**
GP-3x	Precntl	168	41	48	104	82	11	**453**
GP-4x	Precntl	1,784	380	470	1,065	836	117	**4,653**
GP-50	Precntl	49	15	34	57	57	7	**220**
GP-60	Precntl	215	56	76	124	125	16	**611**
SD-7x	Precntl	0	0	0	0	0	0	**0**
Dash-7	Precntl	0	0	0	0	0	0	**0**
Dash-9	Precntl	2,390	512	1,429	1,715	1,526	263	**7,835**
GP-60	0	133	20	84	102	150	27	**516**
SD-7x	0	19	2	16	16	29	6	**89**
Dash-8	0	2,028	1,034	1,672	1,557	1,491	196	**7,978**
Dash-9	0	14,492	2,772	8,506	10,713	9,155	1,380	**47,018**
Dash-9	1	3,603	2,407	4,688	6,371	6,044	999	**24,112**
ES44/Dash-9	2	505	352	1,610	2,039	1,862	292	**6,659**
Total		25,386	7,591	18,634	23,863	21,356	3,315	**100,145**

5.6. Freight Movements on Adjacent Mainline

The PM emission estimates for BNSF freight movements during the one-year period are presented in Table 5-4 and those for other railroad engines in Table 5-5. These engines operate primarily in dynamic braking mode as both east and westbound trains are not accelerating through this section.

Table 5-4. Estimated annual PM emissions associated with BNSF freight movements along the mainline adjacent to the Commerce - Eastern facility.

Locomotive Model Group	Cert Tier	# of Loco	Annual Total PM Emissions (grams)		Total
			Westbound	Eastbound	
Switchers	Precntl	47	30	31	**61**
GP-3x	Precntl	3025	2,493	2,561	**5,054**
GP-4x	Precntl	4790	4,388	4,508	**8,896**
GP-50	Precntl	163	120	123	**242**
GP-60	Precntl	866	976	1,002	**1,978**
SD-7x	Precntl	13	1	1	**1**
Dash-7	Precntl	46	95	98	**193**
Dash-9	Precntl	4166	2,570	2,640	**5,209**
GP-60	0	2042	594	610	**1,204**
SD-7x	0	32	6	6	**11**
Dash-8	0	4898	8,270	8,496	**16,766**
Dash-9	0	21155	12,269	12,604	**24,873**
Dash-9	1	9661	9,775	10,042	**19,817**
ES44/Dash-9	2	3187	1,532	1,574	**3,106**
Total		54,091	43,118	44,294	**87,413**

Table 5-5. Estimated annual PM emissions associated with non-BNSF freight movements along the mainline adjacent to the Commerce - Eastern facility.

Locomotive Model Group	Cert Tier	# of Loco	Annual Total PM Emissions (grams)		Total
			Westbound	Eastbound	
Switchers	Precntl	0	0	0	**0**
GP-3x	Precntl	12	10	10	**20**
GP-4x	Precntl	20	18	19	**37**
GP-50	Precntl	1	1	1	**1**
GP-60	Precntl	4	5	5	**9**
SD-7x	Precntl	0	0	0	**0**
Dash-7	Precntl	0	0	0	**0**
Dash-9	Precntl	17	10	11	**21**
GP-60	0	8	2	2	**5**
SD-7x	0	0	0	0	**0**
Dash-8	0	20	34	35	**68**
Dash-9	0	88	51	52	**103**
Dash-9	1	41	41	43	**84**
ES44/Dash-9	2	13	6	6	**13**
Total		224	179	184	**362**

5.7. Commuter Rail Operations on Adjacent Mainline

The annual PM emission estimates for commuter movements on the adjacent mainline are presented in Table 5-6. Time in notch for these locomotives was assumed to be the same as was modeled for the freight locomotives. AMTRAK and Metrolink estimates are kept separate, since Metrolink only operates on weekdays.

Table 5-6. Estimated annual PM missions associated with commuter movements along the mainline adjacent to the Commerce - Eastern facility.

Agency	Locomotive Model Group	Cert Tier	# of Loco	PM Emissions by Direction (grams)		Total
				Westbound	Eastbound	
AMTRAK	EMD 12 710G3	Precntl	10,469	6,482	6,659	**13,141**
Metrolink	EMD 12 710G3	Precntl	7,280	4,541	4,665	**9,207**
Total				11,023	11,324	**22,347**

6.0 NON-LOCOMOTIVE FACILITY OPERATIONS, EMISSION FACTORS AND EMISSION ESTIMATES

The operations at the Commerce - Eastern facility also include non-locomotive activity within the yard, as described in Sections 6.1 through 6.5. Under each heading is a description of the operations.

6.1 Cargo Handling Equipment Operations

Cargo handling equipment (CHE) is used to handle intermodal freight at the Commerce Eastern site and includes yard hostlers, cranes, and container handling equipment.

Activity

Equipment population data was received for BNSF for California sites CHE characteristics. CHE July 2004 to June 2005 diesel fuel consumption at the Commerce Eastern site was also obtained from BNSF (122,640 gallons diesel) and was the only activity data available for use for all equipment types to estimate 2005 CHE diesel fuel consumption, but hours per year was available for cranes and container handling equipment.

Table 6-1. Commerce-Eastern CHE characteristics and activity.

ID	Equipment Type	Number	Model Year	Fuel Type	Engine Rated HP	Annual Use (hrs)[1]
CE-1	Cranes	1	2003	D	225	4763
CE-2	Cranes	1	2003	D	225	4575
CE-3	Cranes	1	2003	D	225	4290
CE-4	Container Handling Equipment	1	1997	D	205	943
CE-5	Container Handling Equipment	1	1990	D	205	9
CE-6	Yard Trucks	3	2003	D	155	1289
CE-7	Yard Trucks	5	2004	D	155	1289
CE-8	Yard Trucks	1	2005	D	155	1289

[1] Yard Trucks Annual Use Estimates are ARB, 2005b defaults

Emissions

Emissions from CHE were estimated by ARB using their methodology and activity (hours and load factor) assumptions. Commerce Eastern facility CHE emissions are shown in Table 6-2.

Table 6-2. CHE Emissions Estimates (grams per year).

ID	Equipment Type	Fuel Type	Number	PM (gpy)
CE-1	Cranes	O	1	50,531
CE-2	Cranes	O	1	48,537
CE-3	Cranes	O	1	45,513
CE-4	Container Handling Equipment	O	1	18,774
CE-5	Container Handling Equipment	O	1	495
CE-6	Yard Trucks	O	3	70,401
CE-7	Yard Trucks	O	5	90,531

CE-8	Yard Trucks	0	1	14,850
Totals				**339,632**

6.2 On-road Container Truck Operations

The Commerce - Eastern site is characterized by container service where tractor-trailers receive or deliver containers to the container yard and by trailer on rail service where the entire trailer is delivered or shipped on a rail car.

BNSF determined the truck counts at the facility entrance and exit gates. However, these truck counts are conducted in such a manner that only tractor-trailer combination trucks are counted Therefore, summing the total truck entrances and exits will overestimate the total truck trips by the number of trips where trucks both enter and leave as a tractor-trailer combination. To address this problem, BNSF identified the trucks using tags that were counted as both an entrance and exit as tractor-only or tractor-trailer combinations within a period of time. But because many tractors may make several trips to the facility within a single day, a time limit for matching entrances and exits was used to limit the entrance and exit matches. Shown in Table 6-3 are the derived truck trip totals using 30 minutes, 1 hour, 1.5 hours, and 2 hours as the period for determining truck matches. Note how the estimated truck trips decrease as the matching period increases. Because the time a truck spends on site at Commerce - Eastern is nearly an hour on average, return trips cannot reasonably have been within one hour. Thus, one hour was used as the period of matching, but it is acknowledged that some trucks may spend more than an hour on site, and therefore would be counted at both the entrance and exit.

Table 6-3. Commerce - Eastern truck counts by matching time period for 4 months.

Truck Trip Description	30 Min	1 Hr	1.5 Hr	2 Hr
Total Trucks Logging In & Out Gates (Trailer-Truck In, Trailer-Truck Out) (Matches)	6,706	7,342	7,474	7,524
Trucks Logging In Without Logging Out (Trailer-Truck In, Bobtail Out)	31,381	30,745	30,613	30,563
Trucks Logging Out Without Logging In (Bobtail In, Trailer-Truck Out)	30,382	29,746	29,614	29,564
Total Truck Trips	68,469	67,833	67,701	67,651
Scaled to 12 months		**203,499**		

A sample chase truck study was conducted to determine entrance queuing time, average speed and distance on site, time on site (engine on or off noted), and exit queuing time. The results for eight trucks chased were used to estimate the average operation characteristics for all trucks at the Commerce - Eastern site. This information is summarized in Table 6-4.

Table 6-4. Average truck operation characteristics at the Commerce-Eastern site.

Mode	Time (min)	Speed (mph)	Distance (miles)
Entrance	15.3	--	--
Travel on site	4.2	11.5	0.8
Idle on Site	20.5	--	--
Exit Queue	2.9	--	--

The emissions for these trucks used the Ports (POLA 2005) truck age distribution using HHDDV truck emission rates for 2005 calculated using a draft version of EMFAC2005 supplied by ARB (2006c). Because this site largely serves containers from Ports and the South Coast area, the average age distribution at the Ports' gates was used. The emission rates were calculated for each aged engine by interpolating between 10 and 15 mph for an average speed of 11.5 mph emission factor as shown in Table 6-5.

Table 6-5. Emission rates calculations for Commerce-Eastern

Truck Age Distribution	Idle PM EF (g/hr)	10 mph PM EF (g/mile)	11.48 mph PM EF (g/mile)	15 mph PM EF (g/mile)
0.27%	1.03	0.54	0.50	0.42
0.36%	1.03	0.60	0.56	0.47
0.73%	1.03	0.67	0.62	0.52
0.94%	1.33	2.22	1.97	1.37
1.06%	1.33	2.43	2.15	1.50
2.62%	1.33	2.62	2.32	1.62
5.33%	1.33	2.80	2.49	1.73
7.18%	1.33	2.97	2.64	1.84
9.45%	1.93	3.18	2.82	1.97
9.27%	1.93	3.34	2.96	2.06
6.49%	1.93	3.49	3.09	2.15
6.91%	1.93	3.62	3.21	2.24
7.23%	2.57	5.19	4.61	3.21
8.52%	2.57	5.34	4.73	3.30
5.91%	2.57	5.47	4.85	3.38
4.37%	3.43	6.03	5.62	4.66
3.59%	3.43	6.13	5.72	4.74
6.19%	3.43	6.23	5.81	4.82
5.47%	4.28	6.39	5.96	4.94
1.84%	6.88	6.67	6.23	5.16
1.26%	6.88	6.76	6.31	5.23
1.02%	6.88	6.84	6.38	5.29
1.02%	6.88	6.92	6.45	5.35
0.84%	6.88	6.99	6.52	5.40
0.49%	6.88	7.05	6.58	5.45
0.36%	6.88	7.11	6.63	5.50
0.18%	6.88	7.16	6.68	5.54
0.25%	6.88	7.21	6.73	5.57
0.27%	6.88	7.25	6.76	5.60
0.17%	6.88	7.29	6.80	5.63
0.13%	6.88	7.32	6.82	5.65

Truck Age Distribution	Idle PM EF (g/hr)	10 mph PM EF (g/mile)	11.48 mph PM EF (g/mile)	15 mph PM EF (g/mile)
0.11%	6.88	7.34	6.85	5.67
0.10%	6.88	7.36	6.87	5.69
0.00%	6.88	7.38	6.89	5.70
0.00%	6.88	7.39	6.90	5.71
0.00%	6.88	7.41	6.91	5.72
0.03%	6.88	7.42	6.92	5.73
0.00%	6.88	7.43	6.93	5.75
0.00%	6.88	7.45	6.95	5.76
0.00%	6.88	7.46	6.96	5.77
0.06%	6.88	7.48	6.97	5.78

Combining the emission factor data with the age distribution data, emission values were calculated on a per truck basis and are shown in Table 6-6. The emissions labeled as On-site refer to trucks that are moving within the site boundary as a mobile source. Idle on site represents the idling done by trucks that are on site but away from the exit gate. Idle - entrance and Idle - exit represent the emissions at the entrance/exit gate queues. Table 6-6 also provides an approximation of the per site trip emissions by mode from all trucks at the Commerce - Eastern facility based on the estimated 203,499 truck trips in 2005.

Table 6-6. PM emissions per truck trip and for 2005 at Commerce - Eastern.

Mode	Per Truck Trip (g)	Annual Emissions for 203,499 Truck Trips (g)
Travel on Site	3.31	674,370
Idle on Site	0.92	187,514
Idle - Entrance	0.69	139,464
Idle - Exit	0.13	26,292
Annual Estimate	---	1,027,640

6.3. On-road Fleet Vehicle Operations

There were 5 fleet vehicles based at the Commerce-Eastern facility according to records from BNSF and their on-site contractor. The draft version of the EMFAC model provided by ARB (2006c) was use to determine the average number of trips per year. The parking lots are at either end of the yard and close to the facility entrances, so 0.1 mile on site for each trip either beginning or ending on site.

Table 6-7. On-road fleet vehicle activity at the Commerce - Eastern facility.

EMFAC Vehicle Type	Fuel	# of Vehicles	Default Annual Trips	Est. Annual Mileage on Site
LDT2	Gasoline	3	2,276	228
LHDT1	Diesel	2	4,591	459

Annual PM and TOG emission factors from the draft version of the EMFAC model for on-site emissions estimates for the fleet vehicles are presented in Table 6-8. Note that gasoline and

diesel vehicle estimates were kept separate, so that gasoline TOG exhaust and evaporative emissions could be speciated into TACs differently. ARB Speciate Profile #2105 will be used for the gasoline TOG exhaust emissions, and Profile #422 will be used for the gasoline TOG evaporative emissions.

Table 6-8. On-road fleet vehicle emissions at the Commerce - Eastern facility.

EMFAC Vehicle Type	Fuel	PM Emissions (grams)	TOG Exhaust Emissions (grams)	TOG Evap Emissions (grams)
L0T2	Gasoline	8	309	303
LH0T1	0iesel	39	N/A	0

6.4. Other Off-Road Equipment

6.4.1. Transport Refrigeration Unit Operations

Transportation Refrigeration units (TRUs) are typically used to regulate temperatures during the transport of products with temperature requirements. In BNSF operations, temperatures are regulated by TRUs in shipping containers and in railcars when the material being ship requires such temperature regulation.

TRU emissions were estimated in accordance with the methodology presented by an early version of the OFFROAD model provided by ARB (2006c). TRU yearly activity was estimated using the time onsite by TRU configuration (either railcar or shipping container) and mode of transport was provided by BNSF This activity data was used along with ARB default age, horsepower, and load factor input estimates in the OFFROAD model to estimate TRU emissions All TRUs are assumed to use diesel fuel.

6.4.1.1. Boxcars

No such activity occurs within the Commerce Eastern facility.

6.4.1.2. Containers

Commerce Eastern site container TRU activity and emissions are shown in Table 6-9. As TRUs are not expected to be operating when a shipping container is not loaded, the TRU activity presented here represents loaded TRU shipping containers only.

Table 6-9. Commerce Eastern site shipping container TRU yearly activity and emissions.

Yearly Visits	Average Time Onsite / Visit (hours)	PM (gpy)
4,124	15	876,504

Table 6-10. Hobart site shipping container TRU yearly activity and emissions (grams per year).

Yearly Visits	Total Time Onsite (hours)	Average Time Onsite / Visit (hours)	TOG (gpy)	PM (gpy)
17,604	228,852	13	15,937,586	3,242,640

6.4.2. Track Maintenance Equipment Operations

Track maintenance equipment includes equipment used to service tracks anywhere in California though it may be housed at any given facility. This equipment category includes large and small engines and equipment.

Activity

BNSF California track maintenance equipment can be used on any or all tracks within California to maintain the network. Therefore, the approach used to determine the activity and emissions for a given facility was to estimate emissions from all track maintenance equipment and apportion those emissions by site using the relative track mileage (including all tracks, main line and other tracks) at the site to the California total track mileage .

The Commerce Eastern site has 5.25 miles of track within its boundaries compared with the California regional total of 3,779 miles. This represents 0.1% of the total California track mileage that is maintained.

Appendix I shows a list of all BNSF track maintenance equipment located in California with horsepower and operational parameters. Based on BNSF staff knowledge of equipment characteristics, it was assumed that all track maintenance equipment was diesel powered except two forklifts (equipment IDs TM1 and TM2) which were assumed to be powered by 4-stroke gasoline engines. Forklifts TM1 and TM2 could not be assumed to be diesel powered because diesel forklifts of 16 to 25 horsepower diesel forklifts were not included in the ARB OFFROAD model.

If rated horsepower was not available, horsepower was assumed to be ARB default (ARB, 2006c) for the most populous horsepower range for the assigned ARB equipment category and type. Load factors were assumed to be ARB OFFROAD model default (ARB, 2006b).

Emissions

Exhaust emissions from track maintenance equipment were estimated using the draft version of the OFFROAD model supplied by ARB (2006c). Emissions from track maintenance equipment at the Commerce Eastern facility along with California totals are shown in Table 6-11.

Table 6-11. Track maintenance equipment emissions estimates (grams per year).

Site	Gasoline			Diesel
	Evaporative TOG	Exhaust TOG	PM	PM
Commerce Eastern	30	169	5	6,258
California Totals	21,469	121,981	3,525	4,504,844

6.4.3. Other Off-road Equipment (including Portable Engine) Operations

No such activity occurs within the Commerce Eastern facility.

6.5. Stationary Sources

There are no stationary sources at Commerce - Eastern either permitted or otherwise.

7.0 TOTAL TAC EMISSIONS FROM THE COMMERCE - EASTERN FACILITY

The estimated total annual diesel PM (DPM) emissions associated with the operations in the Commerce - Eastern facility are summarized in Table 7-1.

Table 7-1. Estimated total annual 0PM emissions associated with the operations in the Commerce - Eastern facility.

Facility Operations	PM Emissions		Percentage
	Grams	Metric Tons	
Basic Services	0	0.00	0%
Basic Engine Inspection	0	0.00	0%
Full Engine Service/Inspection	0	0.00	0%
Switching	187,785	0.19	7%
Arriving and Departing Trains	196,640	0.20	7%
Adjacent Freight Movements	87,775	0.09	3%
Adjacent Commuter Rail Operations	22,347	0.02	1%
Cargo Handling Equipment Operations	339,632	0.34	12%
On-Road Container Truck Operations	1,027,640	1.03	37%
On-Road Fleet Vehicle	39	0.00	0%
Other Off-Road TRU	876,504	0.88	32%
Other Off-Road Track Maintenance	6,258	0.01	0%
Other Off-Road Other Portable Engines	0	0.00	0%
Stationary Sources	0	0.00	0%
Total	**2,744,620**	**2.74**	

The estimated total annual emissions of total organic gases (TOG) (for speciation into the other TACs) associated with gasoline, LPG, and CNG operations in the Commerce-Eastern facility are summarized in Table 7-2. The only emissions were from gasoline fleet vehicles and two track maintenance forklifts. Diesel TOG is not included in the tabulation.

Table 7-2. Estimated total annual TOG emissions from gasoline/LPG/NG fueled engines associated with the operations in the Commerce - Eastern facility.

Facility Operations	TOG Emissions		Percentage
	Grams	Metric Tons	
Basic Services	0	0	0%
Basic Engine Inspection	0	0	0%
Full Engine Service/Inspection	0	0	0%
Switching	0	0	0%
Arriving and Departing Trains	0	0	0%
Adjacent Freight Movements)	0	0	0%
Adjacent Commuter Rail Operations	0	0	0%
Cargo Handling Equipment Operations	0	0	0%
On-Road Container Truck Operations	0	0	0%
On-Road Fleet Vehicle Exhaust	309	0	38%
On-Road Fleet Vehicle Evaporative	303	0	37%
Other Off-Road TRU	0	0	0%
Other Off-Road Track Maintenance Exhaust	169	0	21%
Other Off-Road Track Maintenance	30	0	4%

Facility Operations	TOG Emissions		Percentage
	Grams	Metric Tons	
Evaporative			
Other Off-Road Other Portable Engines	0	0	0%
Stationary Sources	0	0	0%
Total	**811**	**0**	

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APPENDIX A

TRACK MAINTENANCE EQUIPMENT

Equipment ID	Equipment Type	ARB Category	ARB Equipment type	Engine Model Year	Engine Horsepower	Dual Engine (Y/N)	Operating Hours Per week	Average Operating Hours Per Year
TM1	FORKLIFT	Industrial	Forklifts	1998	17	N	30	1440
TM2	FORKLIFT	Industrial	Forklifts	1985	17	N	30	1440
TM3	ANCHOR APPLICATOR	Industrial	Other General Industrial	1988	50	N	25	1200
TM4	ANCH REMVR	Industrial	Other General Industrial	1994	90	N	15	720
TM5	ANCHOR BOXER	Industrial	Other General Industrial	1987	76	N	25	1200
TM6	ANCHOR BOXER	Industrial	Other General Industrial	1987	76	N	25	1200
TM7	ANCHOR REMOVER	Industrial	Other General Industrial	1995	50	N	20	960
TM8	ANCHOR APP/REM	Industrial	Other General Industrial	2004	50	N	25	1200
TM9	ANCHOR APP/REM	Industrial	Other General Industrial	2004	50	N	25	1200
TM10	ANCHOR APP/REM	Industrial	Other General Industrial	2004	50	N	25	1200
TM11	AIR COMPRESSOR	Commercial	Air Compressors	1989	35	N	12	576
TM12	AIR COMPRESSOR	Commercial	Air Compressors	1989[a]	35	N	15	720
TM13	AIR COMPRESSOR	Commercial	Air Compressors	1989[a]	35	N	10	480
TM14	AIR COMPRESSOR	Commercial	Air Compressors	1989[a]	35	N	10	480
TM15	ADZ/CRIB-DCF	Industrial	Other General Industrial	2002	90	N	15	720
TM16	DBL BRM	Industrial	Other General Industrial	1983	100	N	0	0
TM17	DBL BRM	Industrial	Other General Industrial	1985	100	N	0	0
TM18	DBL BRM TRLR	Industrial	Other General Industrial	2000	100	N	25	1200
TM19	BALLAST REGULATOR	Industrial	Other General Industrial	1981	64	N	17.29	829.92
TM20	BALLAST REGULATOR	Industrial	Other General Industrial	1991	64	N	0	0
TM21	BALLAST REGULATOR	Industrial	Other General Industrial	1986	64	N	0	0
TM22	BALLAST REGULATOR	Industrial	Other General Industrial	1979	64	N	45	2160
TM23	BALLAST REGULATOR	Industrial	Other General Industrial	1984	175	N	45	2160
TM24	BALLAST REGULATOR	Industrial	Other General Industrial	1983	175	N	0	0
TM25	BALLAST REGULATOR	Industrial	Other General Industrial	1985	175	N	0	0
TM26	BALLAST REGULATOR	Industrial	Other General Industrial	1996	175	N	10.2	489.6
TM27	BALLAST REGULATOR	Industrial	Other General Industrial	1996	175	N	31.33	1503.84
TM28	BALLAST REGULATOR	Industrial	Other General Industrial	1996	175	N	0	0
TM29	BALLAST REGULATOR	Industrial	Other General Industrial	2003	175	N	15	720
TM30	LOCOMOTIVE CRANE	Construction	Cranes	1979	250	N	0	0
TM31	TRUCK CRANE	Construction	Cranes	1986	175	Y	0	0
TM32	RUBBER TIRED CRANE	Construction	Cranes	1982	175	N	0	0
TM33	RUBBER TIRED CRANE	Construction	Cranes	1999	175	N	0	0
TM34	RUBBER TIRED CRANE	Construction	Cranes	2001	175	N	0	0

Equipment ID	Equipment Type	ARB Category	ARB Equipment type	Engine Model Year	Engine Horsepower	Dual Engine (Y/N)	Operating Hours Per week	Average Operating Hours Per Year
TM35	WHL LDR	Construction	Rubber Tired Loaders	1974	300	N	3.06	146.88
TM36	CRN/LDR HR	Construction	Cranes	1974	100	N	0	0
TM37	CRN/LDR HR	Construction	Cranes	1984	100	N	0	0
TM38	CRN/LDR HR	Construction	Cranes	1984	100	N	3.36	161.28
TM39	CRN/LDR HR	Construction	Cranes	1984	100	N	28.8	1382.4
TM40	WHL LDR*GP	Construction	Rubber Tired Loaders	1995	120	N	0	0
TM41	SKID-LDR FBHTAH	Construction	Skid Steer Loaders	2003	74	N	0	0
TM42	CRN/LDR HR	Construction	Cranes	2004	100	N	26.56	1274.88
TM43	BK-HO/LDR	Construction	Tractors/Loaders/Backhoes	1992	75.5	N	2	96
TM44	BK-HO/LDR	Construction	Tractors/Loaders/Backhoes	1992	75.5	N	0	0
TM45	BK-HO/LDR EH	Construction	Tractors/Loaders/Backhoes	1995	69	N	12.37	593.76
TM46	BK-HO/LDR EH	Construction	Tractors/Loaders/Backhoes	1995	69	N	46.38	2226.24
TM47	BK-HO/LDR EF	Construction	Tractors/Loaders/Backhoes	1998	78	N	0	0
TM48	BK-HO/LDR EF	Construction	Tractors/Loaders/Backhoes	1999	78	N	0	0
TM49	BK-HO/LDR EF	Construction	Tractors/Loaders/Backhoes	1999	78	N	12.88	618.24
TM50	BK-HO/LDR EF	Construction	Tractors/Loaders/Backhoes	1999	78	N	7.31	350.88
TM51	BK-HO/LDR EF	Construction	Tractors/Loaders/Backhoes	1999	78	N	8.91	427.68
TM52	BK-HO/LDR EF	Construction	Tractors/Loaders/Backhoes	2000	78	N	0	0
TM53	BK-HO/LDR EF	Construction	Tractors/Loaders/Backhoes	2003	88	N	0	0
TM54	BK-HO/LDR EF	Construction	Tractors/Loaders/Backhoes	2004	88	N	1.65	79.2
TM55	BK-HO/LDR EF	Construction	Tractors/Loaders/Backhoes	2004	88	N	9.93	476.64
TM56	BK-HO/LDR EF	Construction	Tractors/Loaders/Backhoes	2004	88	N	6.13	294.24
TM57	BK-HO/LFR EF	Construction	Tractors/Loaders/Backhoes	1989[a]	119	N	15	720
TM58	BK-HO/LFR EF	Construction	Tractors/Loaders/Backhoes	1989[a]	85	N	15	720
TM59	BK-HO/LFR EF	Construction	Tractors/Loaders/Backhoes	1989[a]	74	N	15	720
TM60	BK-HO/LFR EF	Construction	Tractors/Loaders/Backhoes	1989[a]	74	N	15	720
TM61	BK-HO/LFR EF	Construction	Tractors/Loaders/Backhoes	1989[a]	74	N	15	720
TM62	BK-HO/LFR EF	Construction	Tractors/Loaders/Backhoes	1989[a]	74	N	15	720
TM63	BK-HO/LFR EF	Construction	Tractors/Loaders/Backhoes	1989[a]	74	N	15	720
TM64	BK-HO/LFR EF	Construction	Tractors/Loaders/Backhoes	1989[a]	74	N	15	720
TM65	BK-HO/LFR EF	Construction	Tractors/Loaders/Backhoes	1989[a]	74	N	15	720
TM66	BK-HO/LFR EF	Construction	Tractors/Loaders/Backhoes	1989[a]	85	N	15	720
TM67	BK-HO/LFR EF	Construction	Tractors/Loaders/Backhoes	1989[a]	99	N	15	720
TM68	BK-HO/LFR EF	Construction	Tractors/Loaders/Backhoes	1989[a]	74	N	15	720
TM69	BK-HO/LFR EF	Construction	Tractors/Loaders/Backhoes	1989[a]	74	N	15	720
TM70	BK-HO/LFR EF	Construction	Tractors/Loaders/Backhoes	1989[a]	85	N	15	720

Equipment ID	Equipment Type	ARB Category	ARB Equipment type	Engine Model Year	Engine Horsepower	Dual Engine (Y/N)	Operating Hours Per week	Average Operating Hours Per Year
TM71	0irectionaL Boring Machine	Construction	Bore/Drill Rigs	2002[a]	82[b]	N	15	720
TM72	Manlift	Industrial	Aerial Lifts	1989[a]	34[b]	N	15	720
TM73	Trencher	Construction	Trenchers	1998[a]	39	N	15	720
TM74	Trencher	Construction	Trenchers	1998[a]	39	N	15	720
TM75	Trencher	Construction	Trenchers	1998[a]	39	N	15	720
TM76	Trencher Rider	Construction	Trenchers	1998[a]	79	N	15	720
TM77	RAIL LIFTER	Industrial	Other General Industrial	1997	19	N	20	960
TM78	TIE SPIKER	Industrial	Other General Industrial	1986	19	N	0	0
TM79	TIE SPIKER	Industrial	Other General Industrial	1986	19	N	0	0
TM80	TIE SPIKER	Industrial	Other General Industrial	1991	19	N	3.1	148.8
TM81	TIE SPIKER	Industrial	Other General Industrial	2002	90	N	10	480
TM82	TIE SPIKER	Industrial	Other General Industrial	2002	90	N	10	480
TM83	TIE SPIKER	Industrial	Other General Industrial	2002	90	N	10	480
TM84	SPIKE PULLER	Industrial	Other General Industrial	1984	35	N	10	480
TM85	SPIKE PULLER	Industrial	Other General Industrial	1995	35	N	10	480
TM86	SPIKE PULLER	Industrial	Other General Industrial	1995	35	N	10	480
TM87	SPIKE PULLER	Industrial	Other General Industrial	1986	35	N	0	0
TM88	DITCHER/SPREA0ER	Industrial	Other General Industrial	1980	97[b]	N	15	720
TM89	TIE TAMPER	Industrial	Other General Industrial	1985	175	N	20	960
TM90	TIE TAMPER	Industrial	Other General Industrial	1985	175	N	3.74	179.52
TM91	TIE TAMPER	Industrial	Other General Industrial	1989	250	N	22.4	1075.2
TM92	TIE TAMPER	Industrial	Other General Industrial	1995	250	N	40	1920
TM93	TIE TAMPER	Industrial	Other General Industrial	1996	250	N	40	1920
TM94	TIE TAMPER	Industrial	Other General Industrial	1996	250	N	90	4320
TM95	TIE TAMPER	Industrial	Other General Industrial	1996	250	N	40	1920
TM96	TIE TAMPER	Industrial	Other General Industrial	1997	250	N	0.92	44.16
TM97	TIE TAMPER	Industrial	Other General Industrial	2000	250	N	35	1680
TM98	TIE TAMPER	Industrial	Other General Industrial	2000	300	N	40	1920
TM99	TIE TAMPER	Industrial	Other General Industrial	2001	250	N	31	1488
TM100	TIE TAMPER	Industrial	Other General Industrial	2002	300	N	35	1680
TM101	TIE TAMPER	Industrial	Other General Industrial	2003	250	N	0	0
TM102	TIE TAMPER	Industrial	Other General Industrial	1995	175	N	0	0
TM103	TIE TAMPER	Industrial	Other General Industrial	1987	175	N	0	0
TM104	TIE TAMPER	Industrial	Other General Industrial	1985	150	N	15	720
TM105	TIE CRANE	Construction	Cranes	1982	64	N	15	720

Equipment ID	Equipment Type	ARB Category	ARB Equipment type	Engine Model Year	Engine Horsepower	Dual Engine (Y/N)	Operating Hours Per week	Average Operating Hours Per Year
TM106	TIE CRANE	Construction	Cranes	1982	64	N	0	0
TM107	TIE CRANE	Construction	Cranes	1985	64	N	0	0
TM108	TIE CRANE	Construction	Cranes	1986	64	N	0	0
TM109	TIE PLUGGER	Industrial	Other General Industrial	2000	90	N	20	960
TM110	TIE PLUGGER	Industrial	Other General Industrial	2002	90	N	20	960
TM111	TIE PLUGGER	Industrial	Other General Industrial	2003	90	N	20	960
TM112	TIE INSERT/EXTRACT	Industrial	Other General Industrial	1985	175	N	0	0
TM113	TIE INSERT/EXTRACT	Industrial	Other General Industrial	1985	175	N	0	0
TM114	TIE INSERT/EXTRACT	Industrial	Other General Industrial	1987	175	N	41.58	1995.84
TM115	DOZER	Construction	Crawler Tractors	1985	145	N	0	0
TM116	WELDER	Commercial	Welders	1984	64	N	25	1200
TM117	WELDER	Commercial	Welders	1984	64	N	25	1200
TM118	WELDER	Commercial	Welders	1986	64	N	25	1200
TM119	WELDER	Commercial	Welders	1987	64	N	25	1200
TM120	WELDER	Commercial	Welders	1988	40	N	25	1200
TM121	WELDER	Commercial	Welders	1988	64	N	25	1200
TM122	WELDER	Commercial	Welders	1988	64	N	25	1200
TM123	WELDER	Commercial	Welders	1998	64	N	25	1200
TM124	WELDER	Commercial	Welders	1999	64	N	25	1200
TM125	WELDER	Commercial	Welders	1999	64	N	25	1200
TM126	WELDER	Commercial	Welders	1999	64	N	25	1200
TM127	WELDER	Commercial	Welders	2000	64	N	25	1200
TM128	WELDER	Commercial	Welders	2000	64	N	25	1200
TM129	WELDER	Commercial	Welders	2000	40	N	25	1200
TM130	WELDER	Commercial	Welders	2000	40	N	25	1200
TM131	WELDER	Commercial	Welders	2001	64	N	25	1200
TM132	WELDER	Commercial	Welders	2003	40	N	25	1200
TM133	WELDER	Commercial	Welders	2003	64	N	25	1200
TM134	WELDER	Commercial	Welders	2003	40	N	25	1200
TM135	WELDER	Commercial	Welders	2004	64	N	25	1200
TM136	WELDER	Commercial	Welders	2004	64	N	25	1200
TM137	WELDER	Commercial	Welders	2004	64	N	25	1200
TM138	WELDER	Commercial	Welders	2004	40	N	25	1200
TM139	WELDER	Commercial	Welders	2005	40	N	25	1200
TM140	WELDER	Commercial	Welders	2005	40	N	25	1200
TM141	WELDER	Commercial	Welders	2005	40	N	25	1200

Equipment ID	Equipment Type	ARB Category	ARB Equipment type	Engine Model Year	Engine Horsepower	Dual Engine (Y/N)	Operating Hours Per week	Average Operating Hours Per Year
TM142	WELDER	Commercial	Welders	2005	40	N	25	1200
TM143	RAIL HEATER	Industrial	Other General Industrial	1982	90	N	25	1200
TM144	RAIL HEATER	Industrial	Other General Industrial	1995	90	N	25	1200
TM145	SPIKE RECLAIMER	Industrial	Other General Industrial	1992	90	N	25	1200
TM146	TIE PLATE RETRIEVER	Industrial	Other General Industrial	2003	25	N	25	1200
TM147	TRACK STABILIZER	Industrial	Other General Industrial	1989	300	N	9.26	444.48
TM148	TRACK STABILIZER	Industrial	Other General Industrial	2000	300	N	45	2160
TM149	TRACK STABILIZER	Industrial	Other General Industrial	2001	300	N	45	2160

[a] Model year estimated as 2005 minus ARB default useful life.
[b] Horsepower estimated as ARB default for the most populous horsepower range for the associated equipment type