Draft Report

DIESEL PARTICULATE MATTER MITIGATION PLAN FOR THE BNSF RAILROAD BARSTOW RAIL YARD

Prepared for
BNSF Railway
2650 Lou Menk Drive
Fort Worth, TX 76131-2830

Prepared by
Christian Lindhjem
ENVIRON International Corporation
773 San Marin Drive, Suite 2115
Novato, CA 94998

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1. INTRODUCTION

In accordance with the 2005 California Air Resources Board (CARB)/Railroad Statewide Agreement (MOU), ENVIRON on behalf of BNSF has prepared this Mitigation Plan for the Barstow Rail Yard. The purpose of this Plan is to outline the potential mitigation measures that can be used reduce diesel particulate matter (DPM) emissions from the Barstow Rail Yard. The Plan also contains sections detailing how the baseline and projected emissions were calculated and mechanisms that will be used to track progress. The baseline emissions were described in great detail in a series of reports that are publicly available at the following site: http://www.arb.ca.gov/railyard/hra/hra.htm

As discussed below, the proposed Mitigation Measures, when fully implemented, will reduce the DPM emissions from the Barstow Yard by about 45% from 2005 baseline. These emission reductions will concurrently lower any existing predicted health risk associated with the facility operations. Other federal, state, and local related air pollution control measures and plans, and existing railroad voluntary agreement measures will supplement the current and future emission reduction discussed in this Plan.

2. SUMMARY OF RAIL YARD OPERATIONS

The Barstow BNSF yard is a roughly 5 mile long yard in west-east exposure. It is bordered by a Y near highway 58 on the west side, the City of Barstow with West Main Street and National Trails Highway on the south side and Interstate Highway 15 on the east side. Barstow is the major BNSF hub for California. Most BNSF trains leaving or arriving in California pass through the Barstow yard. Many BNSF trains are reconfigured and reclassified in the Barstow yard, and all BNSF trains receive a crew change. Furthermore, Barstow is the major California location for BNSF service to cars and locomotives, including engine refueling and technical services.

The activities occur, to a large extent, in the western portion of the yard. It contains the hump and classification yard, the ready tracks, the administrative buildings and the locomotive inspection area. A small portion of switching activities occurs in the eastern portion of the yard.

The classification yard is located on the south side of the yard. Trains arrive using the tracks from west. Cars are then pushed over a hump yard into the classification yard. The hump yard activities are conducted by dedicated switcher engines and so called mother and slugs. Slugs are additional heavy accessories to the locomotive. They are equipped with electric motors but without own power sources. The purpose is to increase the traction for heavy pulling and breaking power. The classification yard itself does not use line-haul locomotive engines because it is operated as a hump yard using switchers to build trains.

Made-up trains (partially or fully) are pulled by switcher engines into the eastern portion of the Barstow yard and pushed back onto the ready tracks on the north-side of the western portion of the yard. This switching activity represents, besides trains passing, all of the activity in the eastern portion of the yard.

Switchers also pull ready line-haul locomotives to the ready tracks. Most of the line-haul engines have undergone a maintenance interval in the inspection area. Before departure, fueling and engine testing occurs. The crew collects the locomotives at these ready tracks.

The locomotive service is a key activity of the Barstow yard and includes fueling and locomotive inspections. Locomotives scheduled for inspection pull trains arriving in Barstow. The inspection area is located on the west end of the yard. Depending on the scheduled inspection, locomotives may enter full or partial inspection cycles before being pulled to the ready tracks for departure. Furthermore, depending on the inspection cycle, locomotives undergo different engine load and opacity testing.

Other activities in Barstow are trains that stop and conduct crew changes and refuel the locomotives at the same time. Passing trains all stop in Barstow for crew changes. Some will be refueled as well. Crew and administrative buildings are located near the inspection area. Crews are brought to the trains by on-road vehicles. Two fixed fueling stations utilize pipeline to deliver fuel to locomotives. Furthermore, several direct to locomotive (truck to locomotive) fueling sites are located throughout the yard.

In addition to BNSF operations there are some limited non-BNSF freight trains as well as passenger trains that use BNSF or adjacent tracks. The non-BNSF freight trains are described in the sections below as ‘foreign trains’. AMTRAK operates limited services on adjacent tracks. Just east of the yard is an AMTRAK station. Activities of passenger trains are also described in the foreign train section.

3. EMISSIONS SUMMARY

Tables 3-1 and 3-2 below, shows the DPM emissions from the Barstow Yard, by equipment category, for the 2005 baseline year and for future years as the mitigation measures proposed in this Plan are implemented over time. As shown in Table 3-1, when the proposed mitigation measures are implemented DPM emissions will be reduced by more than 40 percent. These emission reductions will concurrently lower any existing predicted health risk related to facility operations. A detailed discussion of the each mitigation measure and forecast is provided in Section 4.

The projected emission reduction calculations shown in Table 3-1 and 3-2 assume a gradual increase in freight handled at the Barstow Yard over time. The assumptions and methodologies used to predict the rate of growth are discussed in Section 5. In addition, the analysis takes into account certain other future regulatory measures and voluntary agreements, which will be implemented and effective by 2020 (e.g., CARB's Cargo Handling Equipment and Drayage Truck regulations, federal truck emission rules, 1998 and 2005 CARB MOUs).

In summary the emission totals for all rail yards were compiled using the adjustments to the emission inventory projecting fleet turnover and future year emission rates. The totals, by source category, are provided in Table 3-1 for Barstow. The 2005 cargo handling equipment was revised with new activity data, and the truck emissions were revised with the EMFAC version2.3 emission rates. A different growth rate was applied to the mainline freight and passenger traffic from that for the activity within the yard.

Table 3-1. Estimated total annual DPM emissions associated with the operations at the Barstow facility with 2005 activity levels. (Metric tonnes)

Facility Operations	2005 PM Emissions Metric Tonnes	2005 Revised PM Emissions Metric Tonnes	2010 PM Emissions Metric Tonnes	2015 PM Emissions Metric Tonnes	2020 PM Emissions Metric Tonnes
Basic Services	1.75	2.23	2.08	1.60	0.95
DTL fueling idling emissions	0.07	0.07	0.06	0.03	0.02
Basic Engine Inspection	0.30	0.28	0.27	0.22	0.14
Full Engine Service/Inspection	0.92	0.58	0.55	0.44	0.26
Switching Engines	4.23	4.23	3.22	2.13	1.71
Arriving and Departing Trains	13.40	13.40	11.91	7.12	4.75
Adjacent Freight Movements	3.89	3.89	3.67	2.37	1.60
Adjacent Passenger Rail Operations	0.02	0.02	0.02	0.02	0.02
Cargo Handling Equipment	0.02	0.02	0.01	0.005	0.002
On-Road Truck Operations, Contractors	0.01	0.01	0.00	0.00	0.00
On-Road Fleet Vehicle	0.03	0.03	0.03	0.02	0.02
Other Off-Road TRU	0.47	0.47	0.22	0.12	0.02
Other Off-Road Track Maintenance	0.10	0.10	0.09	0.06	0.04
Stationary Sources	0.10	0.10	0.10	0.10	0.10
Total	**25.32**	**25.43**	**22.23**	**14.24**	**9.63**
Reduction % (without growth)			13%	44%	62%
Total (with growth)			**25.15**	**18.22**	**13.95**
Reduction % with growth			1%	28%	45%

Table 3-2. Estimated total annual DPM emissions associated with the operations at the Barstow facility with 2005 activity levels. (Short tons)

Facility Operations	2005 PM Emissions Short Tons	2005 Revised PM Emissions Short Tons	2010 PM Emissions Short Tons	2015 PM Emissions Short Tons	2020 PM Emissions Short Tons
Basic Services	1.93	2.46	2.29	1.76	1.05
DTL fueling idling emissions	0.08	0.08	0.07	0.03	0.02
Basic Engine Inspection	0.33	0.31	0.30	0.24	0.15
Full Engine Service/Inspection	1.01	0.64	0.61	0.49	0.29
Switching Engines	4.66	4.66	3.55	2.35	1.88
Arriving and Departing Trains	14.77	14.77	13.13	7.85	5.24
Adjacent Freight Movements	4.29	4.29	4.05	2.61	1.76
Adjacent Passenger Rail Operations	0.02	0.02	0.02	0.02	0.02
Cargo Handling Equipment	0.02	0.02	0.01	0.01	0.00
On-Road Truck Operations, Contractors	0.01	0.01	0.00	0.00	0.00
On-Road Fleet Vehicle	0.03	0.03	0.03	0.02	0.02
Other Off-Road TRU	0.52	0.52	0.24	0.13	0.02
Other Off-Road Track Maintenance	0.11	0.11	0.10	0.07	0.04
Stationary Sources	0.11	0.11	0.11	0.11	0.11
Total	**27.90**	**28.03**	**24.50**	**15.69**	**10.62**

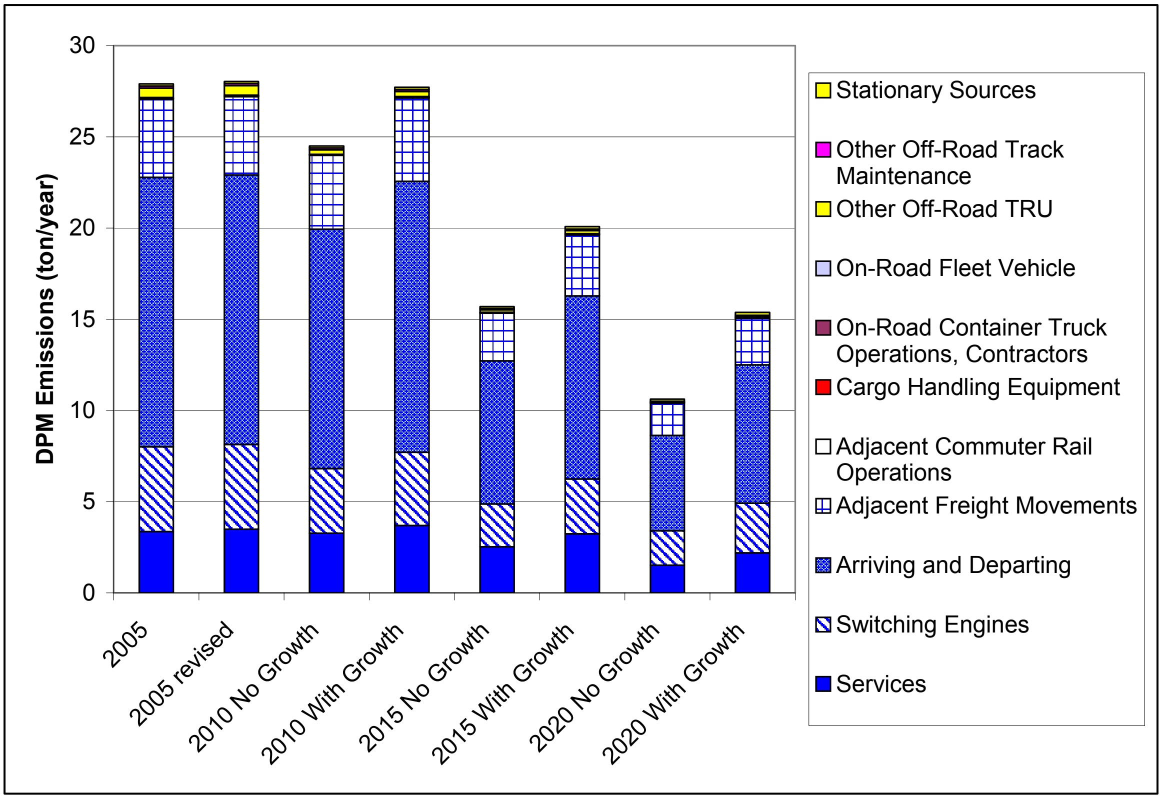

Figure 3-1. BNSF Barstow emission summary (with and without growth) by category in short tons.

4. EMISSION INVENTORY METHODOLOGY

In forecasting emissions at rail yards, ENVIRON projected the impact of several rulemakings and voluntary initiatives. These rulemakings and initiatives include emission reductions expected to result from Federal, State, and voluntary emission reduction strategies from all sources. These reductions will primarily result from normal and accelerated fleet turnover to engines meeting more stringent new engine emission standards. Normal fleet turnover is the fleet replacement expected due to retirement of older equipment for mechanical or other business reasons. Accelerated turnover of equipment is the centerpiece of many California rulemakings and some voluntary initiatives and is expected to result in emission reductions in years immediately after a change in the new engine emission standards. Retrofit of older equipment is often available as an alternative element to comply with accelerated turnover.

The emission sources affected include the following source categories:

- Locomotives (Line-Haul & Switching)
- HHD Diesel-Fueled Drayage Trucks
- Cargo Handling Equipment
- Heavy Equipment
- Transport Refrigeration Units (TRU) and Refrigerated Railcars
- Other Miscellaneous Diesel-Fueled Equipment

The emissions consider a constant 2005 level of activity and apply activity changes after the fact. Overall ENVIRON expects emissions from rail yards to have significant reductions in the years 2005 through 2020 as a result of Federal, State, and local initiatives affecting new engines and of replacement or retrofit of older equipment with engines and equipment using low emission technology. The projected emission reductions without considering growth range from 13% in 2010 to 62% in 2020, and adding the expected growth of 2.5% for all traffic results in emission reductions from 1% to 45%. With business conditions deteriorating in 2008, the forecast growth for 2010 of 13% is highly uncertain and may overestimate the actual growth. A no growth scenario was run to determine the emission reduction due to fleet turnover or other measures prior to applying any growth estimate. The growth rate was estimated at 2.5% per year of overall activity. The no growth and growth scenarios are shown in Table 4-1 and in Figure 4-1 for the Barstow rail yard.

Table 4-1. DPM emission (Short tons per year) projection summary for BNSF Barstow.

Yard (condition)	2005	2005 Revised	2010	2015	2020
No growth	27.90	28.03	24.50	15.69	10.62
With growth	---	---	27.72	20.09	15.38

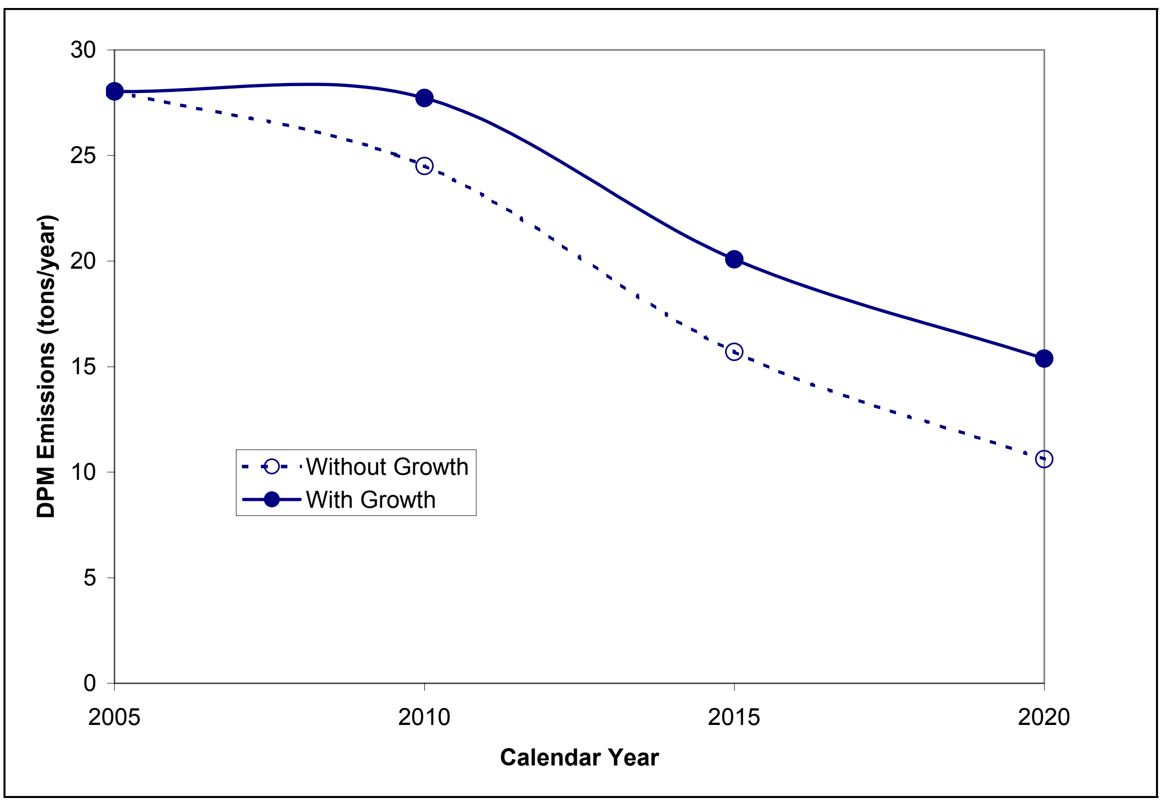

Figure 4-1. BNSF Barstow emission summary (with and without growth).

A general discussion of the analytical methodology and assumptions used to calculate the 2005 baseline emissions and to forecast emissions for calendar years 2010 through 2020, for each equipment category is provided below. Detailed emission calculations for the 2005 baseline year can be found in the Barstow Toxic Air Contaminants Emissions Inventory with modifications for the revised emission inventory methods described in this report.

4.1 Locomotives

BNSF has agreed in the MOU (ARB/Railroad Statewide Agreement, "Particulate Emission Reduction Program at California Rail Yards," June 2005) to reduce idling and to use lower sulfur fuels for locomotives based and refueled in California.

The reduced idling agreement calls for engines based in California to be refit with idle shut-off devices, limiting each idle event to no more than 15 minutes. This will affect all switching engines at California yards and likely most line-haul engines operating in the South Coast where many line-haul engines may be dedicated to that area. ENVIRON assumed that all BNSF new engines are fitted with idle shutoff; so at least all Tier 2 engines were expected to use these devices.

BNSF agreed to accelerate the use of low sulfur fuel in California ahead of the Federal standard for 15 ppm sulfur starting in 2012. By agreement, BNSF will use 15 ppm sulfur in 80% of the California refueling gallons with the remaining assumed to be at the 2007 Federal standard of 500 ppm. Based on an assessment of the in-bound engines using Federal fuel and out-bound engines using California fuel along with refueling rates at locations inside and outside of California, ENVIRON calculated the average sulfur level to be no higher than 0.034% in 2007-2011 time frame compared with 0.105% in 2005 due to the agreement.

EPA announced final emission standards (EPA, 2008) that include an analysis of the expected benefit of normal fleet turnover and the additional benefit of the EPA rule. The emission standards include a retrofit of existing equipment as well as new engine emission standards. Existing Tier 0, 1, and 2 engines will be subjected to retrofit at the time of rebuild; so the engines will be rebuilt gradually throughout their remaining useful life.

The emissions standards and projected EPA emission factors are shown in Tables 4-2 and 4-3, depending on the duty cycle chosen to certify the engines - either line-haul or switching engine duty cycles. The duty cycle for line-haul engines typically leads to lower emission on a gram per horsepower-hour (hp-hr) basis because the switching engine duty cycle has a considerable idling time (no hp-hr generated). In some cases the uncontrolled emissions are much lower than some of the emission standards, so no emission reduction would be expected from those standards especially for HC and CO emissions. The relative emission factors provided by EPA were used to adjust the locomotive emission rates. For instance, for the Tier 2 remanufactured engines the PM emissions were reduced by 55.6% that reflect the expected emission reduction from 0.08 g/hp-hr for remanufactured locomotives compared to 0.18 g/hp-hr for the baseline Tier 2 locomotives in Table 4-2b.

Table 4-2a. Locomotive – Emission standards (g/hp-hr) for line-haul (duty cycle) engines.

Emission Standard	Applicable Year	HC (g/hp-hr)	CO (g/hp-hr)	NOx (g/hp-hr)	PM (g/hp-hr)
Uncontrolled Emissions	**Pre-1973**	**0.48**	**1.28**	**13.0**	**0.32**
Tier 0 – original	1973 – 2001	1.00	5.0	9.5	0.60
Tier 0 – final[1]	2008 / 2010	1.00	5.0	8.0	0.22
Tier 1 – original	2002 – 2004	0.55	2.2	7.4	0.45
Tier 1 – final[1]	2008 / 2010	0.55	5.0	7.4	0.22
Tier 2 – original	2005	0.30	1.5	5.5	0.20
Tier 2 – final[1]	2013	0.30	1.5	5.5	0.10
Tier 3	2012 – 2014	0.30	1.5	5.5	0.10
Tier 4 [2]	2015	0.14	1.5	1.3	0.03

[1] These are retrofit standards at the time of rebuild and phased in as retrofit kit availability.
[2] The Tier 4 NOx standard can be a 1.4 NOx + HC standard.

Table 4-2b. Locomotive – EPA projected emissions factors (g/hp-hr) for line-haul engines.

Engine Type	Applicable Year	HC (g/hp-hr)	CO (g/hp-hr)	NOx (g/hp-hr)	PM (g/hp-hr)
Uncontrolled Emissions	**Pre-1973**	**0.48**	**1.28**	**13.0**	**0.32**
Tier 0 – original	1973 – 2001	0.48	1.28	8.60	0.32
Tier 0 – final[1]	2008 / 2010	0.30	1.28	7.20	0.20
Tier 1 – original	2002 – 2004	0.47	1.28	6.70	0.32
Tier 1 – final[1]	2008 / 2010	0.29	1.28	6.70	0.20
Tier 2 – original	2005	0.26	1.28	5.50	0.18
Tier 2 – final[1]	2008 / 2013	0.13	1.28	4.95	0.08
Tier 3	2012 – 2014	0.13	1.28	4.95	0.08
Tier 4 [2]	2015	0.04	1.28	1.00	0.015

[1] These are estimated emissions with retrofit with some exceptions for older Tier 0 engines.
[2] The Tier 4 NOx standard would not apply until 2017, while the other standards would apply starting in 2015. The Tier 4 NOx standard would apply, however, at remanufacture for model year 2015 and 2016 locomotives.

Table 4-3a. Locomotive – Emission standards for switching (duty cycle) engines.

Emission Standard	Applicable Year	HC (g/hp-hr)	CO (g/hp-hr)	NOx (g/hp-hr)	PM (g/hp-hr)
Uncontrolled Emissions	**Pre-1973**	**1.01**	**1.83**	**17.4**	**0.44**
Tier 0 – original	1973 – 2001	2.10	8.0	14.00	0.72
Tier 0 – final[1]	2008 / 2010	2.10	8.0	11.80	0.26
Tier 1 – original	2002 – 2004	1.20	2.5	11.00	0.54
Tier 1 – final[1]	2008 / 2010	1.20	2.5	11.00	0.26
Tier 2 – original	2005	0.60	2.4	8.10	0.24
Tier 2 – final[1]	2008 / 2013	0.60	2.4	8.10	0.13
Tier 3	2011 - 2015	0.60	2.4	5.00	0.10
Tier 4 [2]	2015	0.14	2.4	1.30	0.03

1 These are retrofit standards at the time of rebuild and phased in as retrofit kit availability allows.
2 The Tier 4 NOx standard can be a 1.3 NOx + HC standard.

Table 4-3b. Locomotive – EPA projected emission factors for switching (duty cycle) engines.

Engine Type	Applicable Year	HC (g/hp-hr)	CO (g/hp-hr)	NOx (g/hp-hr)	PM (g/hp-hr)
Uncontrolled Emissions	**Pre-1973**	**1.01**	**1.83**	**17.4**	**0.44**
Tier 0 – original	1973 – 2001	1.01	1.83	14.0	0.44
Tier 0 – final[1]	2008 / 2010	0.57	1.83	10.62	0.23
Tier 1 – original	2002 – 2004	1.01	1.83	9.9	0.43
Tier 1 – final[1]	2008 / 2010	0.57	1.83	9.9	0.23
Tier 2 – original	2005	0.51	1.83	7.3	0.19
Tier 2 – final[1]	2008 / 2013	0.26	1.83	7.3	0.11
Tier 3	2011 - 2015	0.26	1.83	5.4	0.08
Tier 4 [2]	2015	0.08	1.83	1.00	0.015

1 These are estimated emissions with retrofit with some exceptions for older Tier 0 engines.
2 The Tier 4 NOx standard would not apply until 2017, while the other standards would apply starting in 2015. The Tier 4 NOx standard would apply, however, at remanufacture for model year 2015 and 2016 locomotives.

4.1.1 Line-haul Locomotives

Line-haul locomotives are responsible for long-haul trips that pass rail yards on the mainline tracks and also enter classification and intermodal yard pulling arriving and departing trains (TA/TD). The two types of activities, passing and TA/TD, are treated uniquely in the assessment of the rail yards because the spatial allocation of the activity and the engine duty cycles are unique to each type of train. For Barstow, a train type was introduced to address trains that enter the yard but merely change the crew, and so it has a duty cycle different from engines serving either TA/TD or passing trains.

For 2010, 2015 and 2020, ENVIRON estimated the fleet turnover to Tier 2, 3, and 4 engines to be 3% per year with the equivalent fleet replacement of Tier 0 and Tier 1 engines with Tier 2, Tier 3 and Tier 4 engines. ENVIRON assumed that the rebuild standards and the Tier 3 and 4 engines percentage emissions reductions would occur equivalently for all modes (idle and notches) from the Tier 2 engines. The Tier 3 PM emission standard is essentially the same as the rebuilt Tier 2, but the engines meeting Tier 4 standards have a lower PM emission standard.

BNSF estimated that the remaining Tier 0 and Tier 1 engines would undergo engine rebuilds every 6 years or 17% of the fleet per year. Likewise because Tier 2 engines would be rebuilt every 8 years, 12.5% of the Tier 2 fleet would be rebuilt per year. The final rebuild kits would be available for all engines starting in 2010 for Tier 0 and Tier 1, and 2013 for Tier 2. Some emission reductions could occur earlier, but ENVIRON chose to ignore the phase-in period for rebuild kits. The emission reduction was calculated to be 37.5% for Tier 0 and 1 rebuilds (0.20 g/hp-hr compared to the baseline PM emission rate of 0.32 g/hp-hr) and 50% for Tier 2 rebuilds from Tier 2 base emissions (0.20 to 0.10 g/hp-hr PM emission rate reduction) for line-haul engines. The emission reduction for Tier 0 switching engines with rebuild is 48% (0.23 compared with 0.44 g/hp-hr base emission rates).

Table 4-4 provides expected fleet composition with and without introduction of the Tier 2, Tier 3 and Tier 4 engines replacing the average Barstow fleet. ENVIRON assumed that the introduction of Tier 3 and 4 engines could replace the fleet of Tier 0 / 1 / 2 engines in equal proportion and so the fleet fraction of remaining Tier 0, 1, and 2 engines were proportionally reduced.

Table 4-4. Fleet composition estimate at Barstow in future years.

Engine Tier	Engine Model	2005	2010	2015	2020
Precontrolled	Switcher	0.11%			
	GP-3x	5.56%			
	GP-4x	12.32%	3.52%		
	GP-50	0.18%			
	GP-60	0.29%			
	Dash-7	0.06%			
Tier 0	GP-60	3.30%	3.30%		
	SD-7x	0.23%	0.23%		
	Dash-8	9.11%	9.11%		
	Dash-9	45.53%	45.53%	6.55%	
Tier 0 rebuild	Dash-9			37.14%	28.69%
Tier 1	Dash-9	17.34%	17.34%	2.60%	
Tier 1 rebuild	Dash-9			14.74%	17.34%
Tier 2	ES44	5.97%	20.97%	20.23%	
Tier 2 rebuild	ES44			6.74%	26.97%
Tier 3	ES44			9.00%	9.00%
Tier 4	ES44			3.00%	18.00%

Idle emission reductions are difficult to predict. Passing locomotive idle times were found to be short and result from main line congestion and speed limits forcing engineers to back off power, but no idle emission reductions are expected for this activity category. The TA/TD engines however do spend more time in the yard where engines can idle a significant amount of time. ENVIRON assumed that the idle shut-off devices would reduce TA/TD engines idle time to 1 hour (15 minutes for each event; arrival and train cut out, move to refueling area, arrival at ready track awaiting assignment, and prior to leaving with a new train) per arrival of new Tier 2 and later engines with factory installed idle limiting timers.

4.1.2 Switching Locomotives

Based on conversations with BNSF, Barstow will continue to use Tier 0 GP-3x and smaller sized switch engines. EPA projected the proposed rebuilt GP-3x to have an emissions reduction of 48% from the EPA estimate of emission factors for pre and post rebuild Tier 0 engines.

It will take a study to determine the idle reduction due to idle shut off devices installed on these engines. Because some emission reduction will be realized with these devices, ENVIRON assumed 30% reduction of the idle mode.

4.1.3 Locomotive Service

The locomotive service types include some load testing and a number of idle modes that total typically an hour per service mode. This idle period can occur at several locations as the locomotive is shifted from one service station to another. Because the Tier 2 and later engines will have factory installed idle limiting devices, the service idle time was estimated to be reduced by half that of the original activity estimate.

4.2 HHD Diesel-Fueled Drayage Trucks (Private Truck Fleets)

Locomotives are refueled on site from tanker trucks driving into the yard. These trucks by and large are a relatively minor source category. BNSF has little control over private owner/operators who supply fuel and other goods to Barstow. The vehicle types are the heaviest trucks on the road and often are not the most modern or recent model years. The emission reduction for these trucks was assumed similar to the general fleet of vehicles in the Barstow area.

4.3 Cargo Handling Equipment (CHE)

There is little cargo handling equipment operating at Barstow and only used for emergencies to remove damaged cargo. However, ARB (http://www.arb.ca.gov/regact/cargo2005/cargo2005.htm) projected the CHE equipment to be reduced as the equipment is normally replaced. The projected emission reduction for the pick used to off-load damaged containers is 57% in 2010, 72% in 2015, and 88% in 2020, but really when that piece of equipment is replaced there will be a step change in emission rates.

4.4 Heavy Equipment (Other Yard Based Fleets)

Other on-road vehicle fleets based at the site are used by BNSF and contractor staff for crew changes, errands, and other general uses. The vehicle types are mostly fuel by gasoline with a few smaller (e.g. pickup trucks) vehicles. The vehicle mileage on site for these vehicles is a very small portion of the vehicle's annual mileage and therefore results in little emissions in 2005. To estimate the emission reduction in future years, the EMFAC model was run to determine the expected emission reduction percentage using the default age distribution and fleet turnover in the county. For light-heavy duty diesel trucks, the minimum emission reduction that occurs from normal fleet turnover is 11% for 2005 to 2010, about 21% to 2015, and 24% to 2020.

4.5 Transport Refrigeration Units (TRUs) and Refrigerated Railcars (Reefer)

Transport refrigeration units (TRU) use small diesel generators to run refrigeration compressors on containers and refrigerated boxcars. Barstow was different in that more emissions were derived from boxcars than from containers waiting in the yard.

ARB has written a rulemaking to address TRU emissions (2003). From this rulemaking, ARB estimated TRU emission reductions.

2005 BNSF TRU PM emission estimates were projected to 2010, 2015, 2020 based on emission factor reduction estimates drawn from the 2003 TRU ATCM ISOR, Figure VII-2 (ARB, ATCM ISOR, Figure VII-2, October 2003, website: http://www.arb.ca.gov/regact/trude03/trude03.htm). The emission reduction control factors are shown in Table 4-5.

Table 4-5. ENVIRON estimated ARB PM emission reductions for TRU.

Year	<25 HP	25-50HP	Combined
2000 to 2010	-18%	-70%	-66%
2010 to 2020	-28%	-91%	-79%

For each site, future year activity and population were assumed to be equivalent to 2005 activity and population. ENVIRON estimated the emission reduction for TRU for the years 2010, 2015 (through interpolation), and 2020.

4.6 Other Miscellaneous Diesel-Fueled Equipment (Other Offroad Equipment)

Other offroad equipment primarily consists of track maintenance equipment with portable engines occasionally used for general industrial purposes. Track maintenance equipment is comprised of any number of various equipment types from small pumps and generators to larger, specially designed equipment for rail line maintenance. However, equipment based at each site is used over the entire rail network, so a low fraction of this equipment activity and emissions occur on site.

To estimate emission reductions from this equipment, an OFFROAD model run using construction and industrial equipment was made to determine the relative emission reduction. The emission reduction equipment with rated power of 50 – 500 hp (the breadth of the equipment found at rail yards) are typically similar even though the standards and phase-in schedules for new emission standards vary by engine power. ENVIRON estimated the average emission reduction for 2010 at 14%, 2015 at 36%, and 2020 at 59%.

5. PROJECTED GROWTH RATES

Historic activity data from calendar years 2000 through the first half of 2008 were reviewed to determine the expected activity growth rate for the Barstow Yard. Table 5-1 summarized the historic activity data for the Barstow Yard. The gross tonnage was derived from all tonnage in either direction through the three main directions into Barstow (from Northern California, Southern California, and from the east). The number of locomotive serviced each year since 2005 was reviewed, and the 2005 base year figures were revised. The recent trend for locomotive service was not used to forecast activity because the recent trend has been affected by a change in the operations by consolidating the service at Barstow, and so the long-term trend was expected to revert to the overall business forecasted here at 2.5% per year.

As shown in Table 5-1, based on historic actual data activity, the Barstow Yard activity has flattened in the past few years. The forecast for all of the Barstow Yard activity however was set at the rate of about 2.5% per year based on data from 2000 through 2007.

Table 5-1. Historic activity data for locomotives at the Barstow Rail Yard.

Activity	Historic Actual Data										Growth Rate (%)
	2000	2001	2002	2003	2004	2005 Original	2005 Revised	2006	2007	2008 (most of year extrapolated)	
All Gross Tonnage (MGT)	331	331	336	368	358	375	375	415	394	N/A	2.5
Basic Service*						19,915	25,335	26,744	28,833	29,489	
Basic Inspection*						523	496	680	879	845	
Full Inspection*						1,164	737	920	725	766	

* Number of locomotives

6. MITIGATION MEASURES

6.1 Current Mitigation Measures

The current measures being implemented at the Barstow yard include fleet turnover of locomotives as well as implementation of the ARB rules for on-road vehicles and off-road equipment.

6.2 Proposed Future Mitigation Measures

BNSF will work with local and state authorities to determine additional measures that could be implemented.

7. EVALUATION OF ADDITIONAL MITIGATION MEASURES

The evaluation of the current and proposed mitigation measures will be conducted once the mitigation measures have been specifically defined.

8. MECHANISMS FOR TRACKING PROGRESS

BNSF will work with state officials to determine a method for tracking the emissions reductions achieved through the implementation of the Mitigation Measures.

9. CONCLUSIONS

According to the forecasts, the emissions at the Barstow yard will be reduced by 45% by 2020 considering the mitigation measures described in this plan.