

California Environmental Protection Agency



Air Resources Board

Update on the Implementation of the 2005 ARB/Railroad Statewide Agreement



*Union Pacific Line Haul Locomotive, EPA Tier-2 emissions certified
Electro-Motive Diesel (EMD), Model SD70ACe – 4,300 hp*

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**State of California
California Environmental Protection Agency
AIR RESOURCES BOARD
Stationary Source Division**

**Update on the Implementation of the
2005 ARB/Railroad Statewide Agreement**

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I. SUMMARY

A. Introduction

On June 24, 2005, the Executive Officer of the Air Resources Board (ARB or Board) entered into a statewide railroad pollution reduction agreement (Agreement) with Union Pacific Railroad (UP) and BNSF Railway (BNSF). This Agreement was developed to implement near term measures to reduce diesel particulate matter (PM) emissions in and around railyards by approximately 20 percent.

In response to concerns about the Agreement, the Board conducted two public meetings. On October 27, 2005, the Board received a staff report and public testimony about the Agreement. At this meeting, the Board directed staff to return to the Board in January with clarifications to the Agreement and a status report on its implementation. The Board also emphasized the need for staff to continue its efforts to work with railroads, community members, and local air districts in connection with railyard emissions. On January 27, 2006, the Board heard public testimony, accepted clarifications to the Agreement, and directed staff to return with status reports every six months.

On July 20, 2006, the Board received the second semi-annual status report on the implementation of the Agreement. This status report evaluated implementation efforts over the first year of the Agreement, with an emphasis on the prior six months. This document provides the third semi-annual status report on the implementation of the Agreement covering a period of eighteen months, with an emphasis on the implementation efforts that have occurred over the past six months.

B. Progress on the Implementation of the Agreement

Staff and the railroads began implementing the Agreement in July 2005. A summary of the status of the key implementation requirements is provided in Table 1. As Table 1 illustrates, the railroads and ARB staff have met, or are on schedule to meet, each of the requirements specified for the second year of implementation. Details on the progress made to implement the program elements are provided in Chapter II. Details on other efforts are provided in Chapter III.

1. Implementation Activities

Summarized below are the key implementation milestones that have been accomplished within the past six months.

Install Idle Reduction Devices on 70 Percent of Unequipped Intrastate Locomotives by June 30, 2007:

- Since June 30, 2006, 61 new idle reduction devices have been installed on UP and BNSF's California-based locomotives. Adding these additional idle reduction devices to those reported previously, represents 54 percent of the unequipped intrastate locomotive fleet. As of January 1, 2007, ARB staff believes both railroads are on schedule to meet the 70 percent requirement by June 30, 2007.
- To date, a total of 291 out of the California's 438 intrastate locomotives are now equipped with idle reduction devices, which represents 66 percent of California's intrastate locomotive fleet. This is more than twice the rate of installations that have occurred to date in the rest of the country.

Dispense CARB Diesel for all Intrastate Locomotives and a Minimum of 80 Percent Low Sulfur Diesel for Locomotives by January 1, 2007:

- ARB staff has reviewed diesel fuel data from both railroads and had conversations with California's major pipeline operator. Based on this information, both railroads complied with:
 - The CARB diesel fuel regulation for intrastate locomotives prior to the January 1, 2007, compliance date.
 - The Agreement's requirements to dispense a minimum of 80 percent low sulfur (15 ppmw) diesel fuel prior to the January 1, 2007, compliance date.
- ARB staff estimates that prior to January 1, 2007, both railroads' began dispensing about 95 percent or greater volumes¹ of low sulfur (15 ppmw) diesel fuel to their locomotives fueled in California.

Visible Emission Reduction

- Under the Agreement, the railroads are required to achieve a 99 percent compliance rate for visible emissions over a calendar year. Over the past six months, more than 12,000 visible emission inspections were performed by railroad personnel resulting more than 22,000 visible emission inspections performed in calendar year 2006. Both UP and BNSF have achieved a 99 percent compliance rate for 2006.
- Over the past six months, about 8,200 employees have received visible emission evaluation training. Overall, about 10,200 employees in numerous classifications (e.g., managers, supervisors, dispatchers, etc.) have received visible emission evaluation training.

Health Risk Assessments at Designated Yards

- Under the Agreement, sixteen new health risk assessments at designated railyards are to be completed. To facilitate this, draft health risk assessment

1. Volumes are expected to fluctuate based on fuel market conditions and business practices.

guidelines were submitted to the local air districts for comments. The health risk assessment guidelines were released to the public in July 2006 and public workshops were held in northern and southern California in August 2006. The guidelines were completed in September 2006.

- At the January 2006 Board meeting, ARB staff and the railroads proposed and agreed upon an accelerated schedule for completing the railyard health risk assessments. Under the accelerated schedule, nine draft railyard health risk assessments were scheduled to be completed by December 31, 2006, and an additional seven draft health risk assessments would be completed by December 31, 2007. To follow these schedules, the railroads agreed to complete the railyard emission inventory and modelling results no later than October 1 of each year, leaving ARB staff with three months to prepare the draft health risk assessments.
- Both railroads were on schedule when ARB staff made a significant request for a change in inventory methodology. In August 2006, ARB staff requested that both railroads update their railyard emission inventories with the ARB 2006 updates to EMFAC, Off-Road, and Cargo Handling Equipment emission inventory methodologies. ARB staff requested these emission inventory updates to ensure that the best and most current data were included in the railyard health risk assessments. The effect of the request was to delay the schedule by about two months.
- ARB staff now anticipates the completion of the first nine draft health risk assessments in March 2007. This was the original submittal date required under the Agreement.

Locomotive Remote Sensing Pilot Program

- Assembly Bill (AB) 1222, authored by Assemblyman Jones, was signed into law in 2005, and requires the ARB, in consultation with an advisory group, to develop a locomotive remote sensing pilot program.
- AB 1222 requires a report to the Legislature by December 31, 2006 on the feasibility and cost effectiveness of the use of remote sensing with locomotives. However, all members of the advisory group expressed a desire to take the time necessary to implement an effective and comprehensive pilot program. The existing remote sensing technology needed to be adapted to measure locomotive emissions and a three phase test program was identified as necessary to meet the intent of the legislation.
- In the fall of 2006, the Advisory Group agreed on the details for a three phase pilot program. Phase 1 will consist of remote sensing equipment calibration for use with locomotives and will be initiated at the TTCL facility in Pueblo, Colorado in February 2007. Phase 2 will consist of actual field testing in northern and southern California in the spring of 2007, and Phase 3 will consist of correlation and accuracy testing with the federal locomotive test procedure. These three phases are now scheduled for full implementation this spring, with the report to the Legislature completed this summer.

Ongoing Evaluation of Other, Medium Term, and Longer Term Emission Control Measures

- Staff and the railroads agreed to cooperatively evaluate the feasibility of developing diesel particulate filters or diesel oxidation catalysts for use on a typical switch locomotive representative of the current California switcher fleet. UP and BNSF indicated they would commit up to \$5 million towards this evaluation. About \$3.5 million of this funding has been expended on prototype and demonstration testing at Southwest Research Institute (SWRI) through January 1, 2007. The current status of efforts are summarized below.
 - SWRI just completed the retrofit of both a UP and BNSF switch locomotive with a diesel particulate filter (DPF). The UP DPF equipped switch locomotive arrived in Oakland, California, in December 2006. The BNSF DPF equipped switch locomotive is completing field testing at the SWRI facility in San Antonio, Texas, and is anticipated to arrive in Los Angeles, California, in early 2007.
 - If the in-use demonstration is successful, both UP and BNSF have committed to retrofit one additional switch locomotive each and operate these locomotives in California.
- Also, the U.S. EPA and UP recently began a test program to demonstrate and test a diesel oxidation catalyst with an existing line haul locomotive by:
 - Retrofitting a 3,800 horsepower line haul locomotive, built in 1992, with a diesel oxidation catalyst. This locomotive arrived in Roseville, California, in November 2006. In-use durability testing is currently underway in the Los Angeles area and is scheduled for approximately one year.
- Roseville Hood Project – This is a collaborative effort between Placer County Air Pollution Control District, UP, Sacramento Metropolitan Air Quality Management District, Advanced Cleanup Technologies, and participation by U.S. EPA, ARB, and many other entities. The Advanced Locomotive Emission Control System (ALECs) demonstration and testing was held at UP's railyard in Roseville, California. This project is designed to prove the concept to mitigate local emissions from large railyards or locomotive test facilities. The project can potentially provide substantial reductions in pollutants where large numbers of locomotives may congregate and idle or move slowly in congested areas of a railyard. Placer County Air Pollution Control District staff expects that the report for this demonstration project will be released in early 2007.
- ARB and the railroads conducted the first semi-annual technology symposium on April 25, 2006, at the ARB offices in El Monte. The second symposium occurred on July 13, 2006, at the Cal/EPA building in Sacramento. A report summarizing the two symposiums was released in December 2006. The next technology symposium is scheduled for the spring 2007.

Enforcement of the Agreement

- Since July 2006, the ARB Enforcement Division staff trained 25 local air district staff. For 2006, a total of 70 ARB and local air district staff were trained to conduct railyard inspections. In addition, 13 employees from BNSF and UP also received the same training.
- In October and November 2006, the ARB Enforcement Division staff visited the 31 designated and covered railyards and inspected 645 locomotives and issued nine notices of violations for improper idling. This compares favorably to the earlier May and June 2006 enforcement inspection where ARB Enforcement staff inspected 675 locomotives and issued 23 notices of violation for idling and one for notice of violation for visible emissions.
- In summary, for 2006, over 1,300 locomotives were inspected. As a result of these inspections, ARB staff issued 32 notice of violations for idling infractions and one notice of violation issued for a smoking locomotive. This is about a 98 percent compliance rate for the locomotives sampled.
- After the May and June inspections in 2006, both railroads worked with ARB Enforcement staff to determine final resolution on the issued notice of violations. Of the 24 notice of violations issued, the railroads accepted and paid for 13 notice of violations. For the remaining violations, there were legitimate safety and operational reasons provided by the railroads that resolved the apparent violations. For example, a locomotive equipped with an idle control device continued idling beyond the maximum 15 minute limit specified in the 2005 Agreement. An investigation by railroad mechanical personnel revealed the locomotive was unable to maintain required air brake pressure due to a leak in the system. Further, the idle control device was operating properly when it prevented engine shutdown in order to maintain adequate air brake pressure. As a result the locomotive idling in excess of 15 minutes was deemed essential.

2. Other Activities

As discussed in Chapter III, ARB staff and the railroads have been engaged in activities not specifically required in the 2005 Agreement. These are summarized below.

Modernization of Locomotive Fleet

Mostly in response to the 1998 Railroad Agreement to reduce locomotive NOx emissions in the South Coast, both UP and BNSF have made significant progress to transition to advanced technology line-haul and switch locomotives that have or will operate in California. Together, they have done the following:

- Acquired over 4,100 new Tier 0, 1, and 2 locomotives since 2000 (most installed with built-in idle reduction devices). Of those, over 800 are Tier 2 locomotives. In addition, both railroads have retrofitted nearly 3,500 locomotives to meet Tier 0

standards. In total, UP and BNSF have over 50 percent of their 14,300 national locomotive fleet meeting at least Tier 0 standards.

- Operated four switch locomotives retrofitted to burn liquefied natural gas in southern California since the mid-1990's.
- Since 2005, 12 new electric-hybrid locomotives (Green Goats) have been placed into service in California. Location examples include BNSF Commerce, UP LATC, and UP Mira Loma railyards.
- UP ordered sixty new gen-set switch locomotives which are scheduled to arrive in early 2007. By mid-2007, an additional nine gen-set switch locomotives are anticipated to be located in northern California for both BNSF and UP. These nine locomotives were co-funded under ARB's Carl Moyer Program. These new ultra low-emitting switch locomotives will provide up to a 90 percent reduction in NOx and diesel PM emissions when compared to the higher emitting older switch locomotives that are replaced.
- The 81 new gen-set and Green Goat switch locomotives represent a replacement of nearly 20 percent of California's 438 intrastate locomotive fleet by late 2007. The balance is scheduled to be upgraded by 2010.

Community Complaint Process

- Both railroads have established and implemented procedures to process, handle, and respond to community complaints. The systems operate 24 hours a day and 365 days a year. Mechanisms are in place to track and forward complaints to appropriate company staff to respond.
- In the last six months, both railroads have received a combined average of 25 idling complaint calls per month. By comparison, for the first six months of 2006 both railroads received a combined average of 36 idling complaint calls per month.

**Table 1
Implementation Status of Individual Program Elements**

PROGRAM REQUIREMENTS	2005	2006						2007			
		Jan	Apr	Jun	Jul	Nov	Dec	Jan	Mar	Jun	Dec
IDLING REDUCTION											
Program Coordinators	✓										
Locomotive Inventories	✓		✓								
Community Reporting Process	✓										
Railroad Training Programs	✓										
Adjudicatory Appeal Process	✓										
Training Implementation Status	✓		✓								
35 percent Idle Devices				✓							
VISIBLE EMISSION (VE)											
Program Coordinators	✓										
Program Establishment	✓										
Community Reporting Process	✓										
Railroad Training Programs	✓										
VE Inspection Report	✓		✓								
Training Implementation Status	✓		✓								
Annual Program Review	✓			✓			✓				
EARLY REVIEW OF EMISSIONS / MITIGATION											
Emission Inventory	✓										
Community Meetings (Due Date 10/31/05)				✓							
Mitigation Plans	✓										
HEALTH RISK ASSESSMENTS											
Railroad Study Plan	✓										
Health Risk Assessment Guidelines					✓						
Draft Health Risk Assessments (two phases)									▪		▪
TECHNICAL ASSESSMENTS											
Continue Study of Diesel Particulate Filter and Diesel Oxidation Catalysts	✓										
Diesel Particulate Filters and Diesel Oxidation Catalysts Use -Europe & U.S.	✓										
Remote Sensing Pilot Program (Due Date 12/31/06) *	✓									▪	
Public Meetings (Due Date 12/31/05)	✓		✓	✓							
Joint Report on Public Meetings					✓						
COMPLIANCE											
Inspection / Program Review Protocols	✓										
Railyard Inspections - Idle Reduction Devices & Visible Emissions				✓			✓				

✓ = Satisfied or ongoing per Agreement requirements. (May have reoccurring future date requirements specified in Agreement), ▪ = Future milestone date.

* = AB 1222 Remote Sensing Pilot Program – Initiated by 12/31/05; Report to Legislature due 12/31/06, Estimate completion by June 2007.

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II. UPDATE ON THE IMPLEMENTATION OF THE AGREEMENT

Staff and the railroads began implementing the Agreement in July 2005. As presented in Table 1, the railroads and staff have met all of the requirements that are specified for the first year and a half of implementation of the Agreement. Key program elements are:

- Idle Reduction Program;
- Low Sulfur Diesel Fuel Program;
- Visible Emission Reduction Program;
- Health Risk Assessments at Designated Railyards Program;
- Ongoing Evaluation of Other, Medium-Term, and Longer-Term Emission Control Measures.

This chapter more fully describes the progress made to date with an emphasis on the last six months.

A. Idle Reduction Program

1. Requirements of the Agreement

Under the Agreement, intrastate and interstate locomotives must limit non-essential idling through the use of automated idle reduction devices or by manually shutting down engines to prevent non-essential idling in excess of 60 consecutive minutes. Essential idling is defined as idling necessary to:

- Ensure adequate air brake pressure for locomotive and railcars;
- Ensure other safety related purposes;
- Prevent freezing of engine coolant;
- Ensure compliance with federal guidelines for occupied locomotive cab temperatures; and
- Engage in necessary maintenance activities.

The preferred method of all parties to reduce non-essential idling is the use of automated idle reduction devices. Under the Agreement, where locomotives are equipped with idle reduction devices, non-essential idling is limited to no more than 15 consecutive minutes. For locomotives not equipped with idling reduction devices, locomotives are to be shutdown as soon as it is clear that essential idling is not required and, in no case, is non-essential idling to exceed more than 60 consecutive minutes. In those situations where there is uncertainty over the expected duration of idling, the railroads are obligated to make efforts to notify their train crews if the anticipated wait time could be greater than 60 consecutive minutes so that train crews can shut down their locomotive(s). Railroad training programs are required to inform and educate train crews and other railroad operational employees about the need to faithfully observe the restrictions on idling.

2. Installation of Idle Reduction Devices

The railroads are on schedule to meet their commitments to install idle reduction devices on their intrastate locomotive fleet. Table 2 depicts the required rate of progress for calendar years 2006 through 2008. Based on the information provided by the railroads, of the 438 intrastate locomotives operating in the State, 230 were equipped with idle reduction devices prior to June 30, 2006. By December 2006 this number had increased to 291. This leaves an additional 67 to be installed for the railroads to meet the June 30, 2007, requirement.

Table 2
Annual Requirements for Installation of Idle Reduction Devices

Number of Intrastate Locomotives (Fleet Total)	Number Equipped By June 30, 2005	Number Unequipped as of June 30, 2006	Additional Number to be Equipped by		
			June 30, 2006 (35% required)	June 30, 2007 (70% required)	June 30, 2008 (>99% required)
438	117	321	113	112	93
Progress as of January 2007 ►			Installed - 113	Installed - 61	

As can be seen in Table 3, 66 percent of the 438 intrastate locomotives (switch and local locomotives) in California operation are equipped with idle reduction devices. This is more than twice the rate of installations that have occurred to date in the rest of the country. Staff expects that the Agreement will ensure that progress in California is accelerated relative to the rest of the nation.

Table 3
Installation of Idle-Reduction Devices in California Switcher and Local Locomotives Relative to National Fleet

California Switcher & Local Fleet			National Switcher & Local Fleet		
Current Inventory	Installed By December 30, 2006	Percent of Fleet*	Current Inventory	Installed By December 30, 2006	Percent of Fleet*
438	291	66%	3,556	1,089	31%

3. Idle Reduction Training Programs

In 2006, both railroads began the process of training locomotive operators and other appropriate railroad employees on the idling provisions and requirements of the Agreement. Since some employees, such as dispatchers and potentially some train crews, are impacted by the Agreement but may not be stationed in California, a

significant number of railroad employees outside of California that have also been trained on the idling provisions and requirements of the Agreement is included in this total. In the last six months 3,383 were trained. Nearly 8,000 railroad employees have been trained or have been scheduled for training by December 30, 2006, as provided in Table 4.

**Table 4
Number of Railroad Employees Trained Regarding
the Idle Reduction Program**

Employee Classification	Idle Training by 12/30/06
Managers	182
Supervisors	136
Dispatchers	39
Response Center	21
Train Crews	6,647
Mechanical	677
Other	83
Total Trained	7,785

B. Low Sulfur Diesel Fuel Program

Under ARB regulations approved in November 2004, both railroads are required to dispense CARB diesel fuel for intrastate locomotives by January 1, 2007. Under the 2005 Agreement, the railroads agreed to dispense a minimum of 80 percent of low sulfur level (15 ppmw) diesel fuels, either CARB or U.S. EPA onroad, to locomotives fueled in California. This low sulfur diesel fuel requirement in the 2005 Agreement is also effective on January 1, 2007. Based on ARB staff’s review of both railroad’s diesel fueling records, and based on conversations with California’s major pipeline operator, ARB staff estimates that the railroads complied with both sets of California’s locomotive diesel fuel requirements prior to January 1, 2007. ARB staff estimates that prior to January 1, 2007, both railroads' began dispensing about 95 percent or greater volumes of low sulfur (15 ppmw) diesel fuel to all their locomotives fueled in California. The volumes are expected to fluctuate based on fuel market conditions and business practices.

C. Visible Emission Reduction Program

The railroads have been conducting visible emission inspections over the past year as specified under their visible emission reduction and repair programs as shown in Table 5. Locomotives operating in California and exceeding a steady state opacity measurement of 20 percent must be sent to maintenance facilities to determine whether repairs are needed to comply with applicable visible emission standards as set forth in the national railroad regulation.

Under the Agreement, the railroads are required to achieve a 99 percent compliance rate for visible emissions over a calendar year. The railroads became subject to the opacity compliance level on January 1, 2006. In the last six months, over 13,800 visible emission inspections were performed by BNSF and UP. Visible emission inspections for both BNSF and UP from January 1, 2006 through November 30, 2006, are compiled in Table 5. The overall compliance rate for the three types of visible emission inspections performed is 99 percent. The locomotives that failed were repaired to meet Federal opacity standards.

**Table 5
Results of Visible Emission Inspections
Performed January 1, 2006 – November 30, 2006**

BNSF & UP	Certified Opacity Meter	Certified U.S. EPA Method 9	Non-certified Visible	Total	Overall Compliance Rate
# Inspected	3,122	13,712	5,376	22,210	99%
# passed*	3,045	13,609	5,344	21,998	

* Opacity not greater than 20 percent

1. Visible Emission Reduction Training Programs

Similar to the idle reduction program, both railroads have submitted information on the development of their visible emission reduction and repair training programs, and their plans to train appropriate railroad staff regarding the programs. Both railroads have been conducting their training programs over the past year. The railroads have indicated they intend to train the same staff (i.e., managers, supervisors, dispatchers, response center, train crews, mechanical, and other) as trained on the provisions of the idle reduction program. Information on the railroads' visible emission reduction and repair training programs has been posted on the ARB railyard website under "Railroad Submittals" (www.arb.ca.gov/railyard/ryagreement/rsubmittal.htm).

The number of employees trained by December 30, 2006, for both railroads is shown in Table 6. Employees outside of California are also being trained because they either work with or operate locomotives that operate in the State. In the last six months of 2006 over 8,200 employees have received training. Overall, about 10,200 employees in numerous classifications (e.g., managers, supervisors, dispatchers, etc.) have received visible emission evaluation training.

**Table 6
Number of UP and BNSF Employees Trained**

Time Period	Certified U.S. EPA Method 9	Non-Certified VE Training	General Awareness Training	Total
1/1 – 6/30	128	205	1,588	1,921
7/1-12/30	No change	192	8,090	8,282
2006	Overall Total			10,203

D. Health Risk Assessments at Designated Yards Program

1. Requirements of the Agreement

Under the Agreement, 16 new health risk assessments at the designated railyards will be completed. The Agreement identifies which railyards are to be completed first and those that are to be completed within an additional year. The Agreement specifies that the railyard health risk assessments be completed within 18 and 30 months of approval of the railroads study plans. The railroads submitted study plans by October 1, 2005, as required in the Agreement, and ARB staff approved both sets of study plans by January 1, 2006. However, the ARB and the railroads agreed that it would be appropriate to produce draft risk assessments within 18 months and 30 months, respectively, from the date the Agreement was signed. As a result, at the January 2006 Board meeting, the ARB staff and railroads proposed and committed to an accelerated schedule for completing the railyard health risk assessments. Under the accelerated schedule, nine draft health risk assessments would be completed by December 31, 2006, and the remaining seven designated yards by December 31, 2007.

2. Health Risk Assessment Guidance

To ensure that consistent data and methodologies are used, staff developed draft statewide guidelines for the preparations of railyard health risk assessments. This process took somewhat longer than then originally expected. These guidelines were then submitted to the affected local air districts for comments in June 2006 and were released to the public in July 2006. Public workshops were held in northern and southern California in August 2006. The guidelines were completed in September 2006.

The guidelines will help ensure that the emission inventory development and air dispersion modeling performed for each railyard meet the requirements in the Agreement. The railyard health risk assessments will also be consistent with the Air Toxic Hot Spots Program Risk Assessment Guidelines (Risk Assessment Guidelines) published by Office of Environmental Health Hazard Assessment (OEHHA), and be consistent with the Roseville Railyard Study performed by staff in 2004.

3. Revised Schedule for Completion of Draft Health Risk Assessments

The accelerated HRA schedule approved by the Board last January required the railroads to submit all of the necessary data for the first 9 HRA's to ARB by September 30, 2006. ARB staff was then to conduct the actual risk assessments and publish the draft results. In August 2006, both railroads were on schedule when ARB staff made a significant request for a change in inventory methodology. ARB staff requested both railroads update their railyard emission inventories with the ARB 2006 updates to EMFAC, Off-Road, and Cargo Handling Equipment emission inventory methodologies. ARB staff requested these emission inventory updates to ensure that

the best and most current data were included in the railyard health risk assessments. Because of these adjustments, more time was needed to develop emission inventories and air dispersion modeling and this information was not available to ARB staff until eight weeks later than originally scheduled. Due to the delay caused by changes in the railyard emission inventories, the ARB staff anticipates the completion of the first nine draft health risk assessments will be delayed by about two months, until March 2007. The second group of draft risk assessments are scheduled to be completed by the end of 2007. Table 7 identifies the tentative schedule for completion of the health risk assessments at the 16 designated railyards.

**Table 7
Schedule for Completing Health Risk Assessments**

Draft Health Risk Assessments to be Completed by March 2007		Draft Health Risk Assessments to be Completed by the end of 2007	
Railyard	Company	Railyard	Company
Commerce (Eastern/Sheila)	BNSF	Barstow	BNSF
Hobart	BNSF	San Bernardino	BNSF
Richmond	BNSF	San Diego	BNSF
Stockton	BNSF	Colton	UP
Wilmington (Watson)	BNSF	Dolores (ICTF)	UP
Commerce	UP	Industry	UP
LA (LATC)	UP	Oakland	UP
Mira Loma	UP		
Stockton	UP		

E. Locomotive Remote Sensing Pilot Program

Assembly Bill 1222 became law in January 2006. Under the provisions of AB 1222, the ARB is required to design and implement a remote sensing pilot program in consultation with an advisory group consisting of up to 14 specified members. These members were appointed by the South Coast Air Quality Management District, Sacramento Metropolitan Air Quality Management District, UP, and BNSF. AB 1222 required a report to the legislature by December 31, 2006 on the feasibility and cost effectiveness of the use of remote sensing with locomotives.

The objectives of AB 1222 are to determine whether remote sensing devices can accurately and reliably determine, with a reasonable level of precision:

1. The levels of nitrogen oxides, particulate matter, and carbon monoxide emissions from locomotives;
2. Whether a locomotive is subject to tier 0, 1, or 2 federal certification standards; and
3. Whether the measured results can be calibrated to determine compliance with applicable federal emission certification levels.

There have been 16 Advisory Group meetings. The members of the advisory group expressed a desire to take the time necessary to implement an effective and comprehensive pilot program. The design of the test program was more challenging than anticipated and the existing remote sensing technology needed to be adapted to measure locomotive emissions.

The ARB, in consultation with the Advisory Group, developed a three phase approach towards implementing and achieving the objectives of this bill. Phase 1 involves an initial field test to determine the ability of remote sensing devices to measure the emissions from locomotive exhaust stacks. This part of Phase 1 will be implemented at the Transportation Technology Center Inc. in Pueblo, Colorado, in February 2007. Phase 2 includes installation of the remote sensing devices at several locations in Northern and Southern California and monitoring emissions of locomotives that travel through these monitoring locations. The objective of Phase 2 is to assess the ability of the devices to evaluate locomotive emissions in the real world. Phase 3 is designed to compare measurements from remote sensing devices against U.S. EPA locomotive certification emission testing pursuant to 40 CFR Part 92. This phase is designed to determine the accuracy and precision of remote sensing devices as compared with the measurement of locomotive emissions required under the federal locomotive test procedures.

The Phase 1 work in Pueblo, Colorado is expected to be completed by March 2007. Phase 2 will use the remote sensing devices at several field locations in Northern and Southern California and is expected to begin in spring 2007. Phase 1 and 2 will be performed under contract with Environmental Systems Products (ESP). Phase 3 will be conducted jointly by ESP and Southwest Research Institute (SWRI). Current plans are to complete all phases of the test program this spring. A final report is anticipated by this summer.

F. Ongoing Evaluation of Other, Medium-Term, and Longer-Term Emission Control Measures

1. Requirements of the Agreement

Under the Agreement, the ARB and railroads agreed to continue to evaluate and implement other feasible mitigation measures. These measures included funding and research of diesel particulate filters and diesel oxidation catalysts studies and demonstrations for switch locomotives and additional measures to evaluate and demonstrate advanced technologies for locomotives and the use of alternative fuels. In addition, the ARB and railroads committed to conduct semi-annual technical evaluation meetings with the public to evaluate future potential emission reduction measures.

2. Diesel Particulate Filters and Oxidation Catalysts

Staff and the railroads have been cooperatively evaluating the feasibility of developing diesel particulate filters or diesel oxidation catalysts for use on a typical locomotive representative of the current California switcher fleet. UP and BNSF indicated they would commit up to \$5 million towards this evaluation. About \$3.5 million of this money had already been expended for prototype and demonstration testing of a locomotive diesel particulate filter through January 1, 2007.

The next step in the diesel particulate filter locomotive demonstration is in-use durability testing in California. As part of the demonstration both BNSF and UP agreed to retrofit a California switch locomotive. The UP DPF equipped switch locomotive arrived in Oakland, California, in December 2006. The BNSF DPF equipped switch locomotive is scheduled to arrive in Los Angeles, California, in the first half of 2007. SwRI will evaluate the performance of the DPF configuration during the second half of 2007. If the in-use demonstration is successful, both UP and BNSF have committed to retrofit one additional locomotive each for a total of four DPF switcher locomotives operating in California.

In a separate test program UP recently began to collaborate with the U.S. EPA to test older freight locomotives retrofitted with a diesel oxidation catalyst to reduce diesel PM emissions. A 3,800 horsepower line haul locomotive, originally built in January 1992, was retrofitted with a diesel oxidation catalyst. This locomotive arrived in California in November 2006 and will be tested in the Los Angeles area for approximately one year starting in early 2007.

3. Roseville Hood Project

The Roseville Hood Project is a collaborative effort between Placer County Air Pollution Control District, UP, Sacramento Metropolitan Air Quality Management District, and Advanced Cleanup Technologies, with participation by U.S. EPA, ARB, and many other entities. The Advanced Locomotive Emission Control System (ALECs) demonstration and testing was conducted at UP's railyard in Roseville, California from August through September 2006.

This demonstration is designed to evaluate the use of a stationary emission control technology to mitigate locomotive emissions at large railyards or test facilities. This technology may potentially provide substantial reductions in pollutants where large numbers of locomotives may congregate, idle, or move slowly in congested areas of a railyard. In concept, a production unit can be designed to accommodate up to eight side-by-side tracks, each with two locomotives per track idling or moving slowly, with coverage up to one mile. This system incorporates selective catalytic reduction behind a scrubber which allows removal of sulfur dioxide and particulate matter prior to the gas stream entering the selective catalytic reduction. The pollutant reduction performance is 95 percent for oxides of nitrogen, 99 percent for particulate matter (PM₁₀, PM_{2.5} sub-micron, and PM_{1.0} ultra-fine), 99 percent for sulfur dioxide, and 50 to 90 percent for

volatile organic compounds. A public demonstration of this device in operation was held in August of 2006, and testing of this technology occurred at the UP Roseville railyard from August to September, 2006. At the completion of the testing, the device was dismantled at the UP Roseville railyard and moved to the Port of Long Beach to be tested with ocean going marine vessels. The report on the UP Roseville Hood Project demonstration and testing project is scheduled for release by early 2007.

4. Symposiums to Evaluate Future Potential Measures

Under the Agreement, the ARB and railroads are required to conduct public semi-annual technical evaluation symposiums to identify and evaluate future emission reduction measures for locomotive and railyard emissions. The initial technical evaluation symposium was held on April 25, 2006 at the ARB offices in El Monte. This meeting included brief presentations and discussions by manufacturers on the capabilities of new and retrofitted idle reduction devices and advanced new switch locomotive technologies. The second symposium was held on July 13, 2006 at the Cal/EPA building in Sacramento provided information on advanced locomotive technology use and demonstrations in Europe and the United States, and research and development and demonstration projects. Under the Agreement, after the second symposium, the ARB and railroads prepared a written report on progress and findings from the symposiums. This report as posted on the ARB railyard website in December 2006 and is available at:

http://www.arb.ca.gov/railyard/ryagreement/102006rpt_rrtech.pdf

5. U.S. EPA Activity Update

The U.S. EPA continues to develop its proposed draft Tier 3 locomotive and marine rulemaking. The Tier 3 draft rulemaking is scheduled for release in early 2007.

G. ARB Enforcement Training and Inspections

Consistent with the Agreement, ARB staff began development and implementation of an idling enforcement training program for ARB and local air district enforcement personnel, and coordination with the railroads to provide visible emission training to railroad employees. ARB staff conducted railyard inspections to evaluate compliance with the requirements specified in the Agreement.

1. Training

As part of the development of the idling and visible emissions enforcement training program, ARB Enforcement Division conducted training on the Agreement. This training includes:

- An overview of the Agreement, with a specific focus on the idling, visible emission, and fuel components;

- Information on the California locomotive fleet, including descriptive and visual information on “typical” locomotives; and
- Reviewing the railroads’ idling reduction and visible emission reduction and repair programs.

Training for the locomotive idling and visible emission enforcement program began in February 2006, and has been given to a total of 70 ARB and local air district enforcement staff as of December 2006 with 25 district staff trained since July 2006. In addition, 13 UP and BNSF staff have participated in the training to improve their understanding of the ARB enforcement program.

2. Inspections

To evaluate the effectiveness of the Agreement, the ARB staff conducted the first of two rounds of statewide inspections during May and June of 2006. The second round of statewide inspections occurred in October and November of 2006. ARB staff inspected 31 designated and covered railyards twice during calendar year 2006. Table 8 summarizes the results for 2006.

**Table 8
Inspection Results Summary 2006**

Air Basin	# of Railyards Visited	Total Number of Locomotives Inspected	Non-Idling Locomotives Observed	Idling Locomotives Observed	Notice of Violations
May / June (Round 1)					
Mojave Desert	3	57	24	33	3
Mountain Counties	2	124	83	41	1*
San Diego	1	8	7	1	0
San Joaquin Valley	6	99	78	21	2
SF Bay Area	5	35	26	9	3
South Coast	14	352	274	78	15
May/June subtotal	31	675	492	183	24
October / November (Round 2)					
Mojave Desert	3	66	44	22	
Mountain Counties	2	103	88	15	2
San Diego	1	9	6	3	
San Joaquin Valley	6	106	76	30	5
SF Bay Area	5	55	46	9	1
South Coast	14	306	196	110	1
Oct/Nov subtotal	31	645	456	189	9
2006 Total					
		1,320	948	372	33

* Visible Emissions Violation

3. Inspection Results and Preliminary Findings

As shown in Table 8, two statewide inspections were completed by ARB Enforcement Division staff during 2006. During each round of inspections, ARB Enforcement Division staff visited 31 designated and covered railyards and inspected almost 700 locomotives. In the first round of inspections ARB Enforcement staff inspected 675 locomotives and issued 23 notices of violation for idling and one visible emissions notice of violation. In the second round of inspections ARB Enforcement staff inspected 645 locomotives and issued nine notices of violation for idling. For 2006 over 1,300 locomotives were inspected, which surpasses the estimated 1,000 Class I freight locomotives operating in California on any given day. As a result of these inspections, ARB staff issued 32 notice of violations for idling infractions and one notice of violation issued for a smoking locomotive. This is about a 98 percent compliance rate for the locomotives sampled.

In the first round of inspections conducted by the ARB during May and June of 2006, ARB staff identified implementation issues that required further investigation. For example, there were situations where idle reduction devices exhibited unexpected behaviors during in-service operation. ARB inspectors and railroad employees have discovered that idle reduction devices have been programmed by the manufacturer to limit the number of shutdown and restart cycles (8 for General Electric and 12 for EMD) cycles within a 24 hour period. If the number of shutdown and restart cycles is exceeded within a 24 hour period, the idle reduction device programming prohibits further engine shutdowns until 24 hours have elapsed. Further investigation indicated this was done to minimize wear and tear on engine components (e.g., starter and battery). A locomotive equipped with such a device would not be in violation of the idling restrictions if it failed to shutdown. After 15 minutes, however if this is a common occurrence, much more idling than anticipated could occur, reducing the benefits of the idling reduction devices. Staff is continuing to work with the railroads to determine how often these system limitations are occurring and how the number of these occurrences can be reduced.

Also, most trains operate with multiple locomotives, referred to as a consist. For some trains, in addition to the main or lead locomotives, the train includes other locomotives that can be placed at the middle and rear of long trains to help climb steep grades. This is also known as distributed power or distributed power units (DPU). These additional locomotives (lead remote) are capable of remote-controlled operation via radio link in conjunction with the controlling lead locomotive. In discussions with idle control manufacturers (e.g., GE, EMD, and ZTR), staff has learned that idle reduction device operation is inhibited for a train in a distributed power configuration. The rationale is that once a distributed power configuration is established via radio link among participating locomotives they are interconnected or networked together. The shut down of any locomotive that is radio linked in a DPU configuration will cause radio link loss and disrupt communication with the controlling lead locomotive or lead remote locomotive. Staff will continue to work with the railroads to determine how often these system limitations are occurring.

ARB staff will monitor both idle reduction device system limitations described above. After a sufficient amount of in-use history is compiled changes will be considered as appropriate.

III. OTHER IMPLEMENTATION EFFORTS

A. Modernization of the Locomotive Fleet

ARB and others have taken a number of actions to address the impacts of locomotive emissions throughout the State. This includes the 1998 Memorandum of Understanding with the railroads to reduce locomotive oxides of nitrogen (NOx) emissions in the South Coast, requirements for the use of cleaner fuel in intrastate locomotives, Carl Moyer funding by some local air districts, and the current Agreement. As a result, the railroads have undertaken a number of steps that will provide significant reductions in the emission impacts of railyards on local communities.

UP and BNSF Acquired over 4,100 new Tier 0, 1, and 2 locomotives since 2000 (most installed with built-in idle reduction devices). Of those over 800 are Tier 2 locomotives. In addition, both railroads have retrofitted nearly 3,500 locomotives to meet Tier 0 standards. In total UP and BNSF have over 50 percent of their 14,300 national locomotive fleet meeting at least Tier 0 standards.

Green Goats are electric hybrid switch locomotives that operate primarily through energy provided by over 300 lead acid batteries. Both railroads combined have placed twelve Green Goats into service in California over the past couple of years.

In January 2006, UP held a public event at the Roseville railyard to present a low emissions gen-set switch locomotive. The deployment of significant numbers of these locomotives in California is underway. UP ordered sixty new gen-set switch locomotives which are scheduled to arrive in early 2007. UP has invited public input on which railyards to locate the gen-set switch locomotives in the South Coast Air Basin. By mid-2007, an additional nine gen-set switch locomotives are anticipated to be located in northern California for both BNSF and UP which were co-funded under ARB's Carl Moyer Program.

B. Community Complaint Process

This section discusses the railroads' implementation efforts to establish and implement a community complaint process for idling and smoking locomotives.

1. Pre-existing Railroad Complaint Process

Prior to the implementation of the Agreement, each railroad had established procedures to process, handle, and respond to community complaints. Under these procedures, each railroad utilizes a national phone call center to receive and record complaints regarding its operations instead of individual local phone centers. The national phone systems allow the railroads to utilize a centrally trained staff and existing mechanisms that allows the public to register complaints about idling or smoking locomotives from all locations in the state at any time. The systems operate 24 hours a day and 365 days a

year, and utilizes computerized mechanisms to track and forward complaints to the appropriate company staff to respond.

The call center phone numbers for each railroad are:

- **Union Pacific Railroad**

1-888-UPRR COP or 1-888-877-7267

- **BNSF Railway**

1-800-832-5452

While each railroads call center system is different, they are similarly structured in that calls received are logged and appropriate railroad employees are directed to respond.

2. Establishment of Railroad Complaint Process Under the Agreement

By August 31, 2005, both railroads submitted their plans to develop a process for informing members of the community on the results of their investigations of complaints. Under their programs, the railroads utilize their existing call centers and phone numbers for community members to report locomotive complaints by augmenting their national systems to be able to respond to and provide complaint resolution information to complainants. Each complaint is logged in a central database upon receipt, and generates a complaint report, which is forwarded to the appropriate railroad operations, environmental, or safety management personnel. Management reviews the complaints and based on the type of complaint and need for action, assigns the appropriate local railroad staff to investigate the complaint and correct the problem. Daily emails are now being automatically generated to environmental staff that must follow-up on the incidents and, in some cases, provide a response back to the individual who reported the complaint. The transition to the new system-wide protocols has been developed and implemented. It will take time to evaluate and make any necessary program adjustments.

Staff continues to work with the railroads to evaluate the existing processes, and develop recommendations on how the system can be more responsive and accountable. This includes the establishment of protocols for better system tracking and recording of the complaint investigation process at the local level, and protocols for notifying individuals who file a complaint on the findings of the railroads' investigations, including any corrective actions taken.

3. Status of Railroad Complaint Process Under the Agreement

In the five month period from July 2006 through November 2006, Union Pacific and BNSF received a combined average of 25 calls per month to their 800 numbers

reporting idling locomotives. By comparison, in the preceding six month period according to railroad data, there were approximately 36 calls per month. During this same period, the railroads would have had thousands of locomotives operating in California each month.

Since the July staff report, both railroads have continued to track and improve on how the community 800 number calls are processed. Citizens, the ARB, local air quality districts, and other local government agencies have been using the call center phone numbers to register complaints they have regarding specific locomotive events. Each railroad has been utilizing this information source to address identified problems. As outlined in the MOU, both railroads have developed a follow-up process so that citizens who want to know how their complaints were addressed are contacted once the railroad personnel identify and whenever possible, address the cause of the problem.

When an idling complaint is received, if follow-up has been requested by the caller, both railroads place follow-up calls to explain the reason for the idling event and how it was resolved. Since September 2006 BNSF updated its overall program by assuring that a consultant contacts all callers who leave contact information. The combined rate of contact for both railroads is close to 100%. Both railroads are working to further improve by gathering necessary information to ensure prompt caller resolution.

4. Development of an ARB Railyard Website

On August 1, 2005, staff established a "Railyard Emission Reduction" website at: <http://www.arb.ca.gov/railyard/railyard.htm>. This website is intended to provide information to the public about the ARB's ongoing efforts to reduce the emission impacts of railyard operations, including staff's activities to implement the Agreement and other related railroad information.

C. Other Outreach Efforts

Besides the community meetings required under the Agreement, the railroads have initiated a number of other outreach activities and events with the public. Table 9 lists some examples of these outreach activities.

Table 9
UP and BNSF Railroads' Other Outreach Events

Date	Outreach Event
6/27/06	City of Commerce railroad task force meeting – BNSF
7/13/06	Community meeting in West Oakland on RR 101 and Bay Area rail yards – UP and BNSF
7/13/06	Technology Symposium – The second public meeting to discuss potential future emission control measures to reduce railroad emissions as part of the Statewide Rail Yard Agreement – UP and BNSF
7/25/06	City of Commerce railroad task force meeting – UP
7/22/2006	Fiesta Wilmington – UP sponsored Community Festival
8/2/06	Placer County APCD and UP Roseville Hood Demonstration
8/22/06	City of Commerce railroad task force meeting – BNSF
9/14/06	Meetings with Inland Empire local elected officials – UP
9/26/06	City of Commerce railroad task force meeting – UP
10/24/06	City of Commerce railroad task force meeting – BNSF
10/30/06	Mobility 21 – UP sponsored information table
10/28/06	Booths at City of Commerce health fair – UP and BNSF
12/14/06	UP demonstration of experimental diesel particulate filter technology at Oakland, California, railyard.

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