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PUBLIC MEETING AGENDA

June 23rd, 2005
9:00 a.m.

Agenda Items to be heard;
05-6-1, 05-6-2
05-6-3, 05-6-4

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ELECTRONIC BOARD BOOK

California Environmental Protection Agency

Air Resources Board

PUBLIC MEETING AGENDA

MEETING LOCATION (In-Person)
San Joaquin Valley Unified Air Pollution Control District
1990 East Gettysburg Avenue, Fresno, California 93726

or VIA VIDEOCONFERENCE (2 Locations)
District Northern Region Office
4230 Kiernan Avenue, Suite 130
Modesto, California 95356

District Southern Region Office
2700 M Street, Suite 275
Bakersfield, California 93301

This facility is accessible by public transit. For transit information, call: (559) 621-1393, website faxtransit@fresno.gov (This facility is accessible to persons with disabilities.)

June 23, 2005
9:00 a.m.

05-6-1: Report to the Board on a Health Update: Studies of Health Impacts of Air Pollution in the San Joaquin Valley.

The San Joaquin Valley is known to have high levels of air pollutants. Asthma prevalence appears to be higher in the San Joaquin Valley than in the rest of California and asthmatics are known to be more sensitive to the impacts of air pollution. Due to the concern over the potential impacts of air pollution in the San Joaquin Valley, the Air Resources Board and other agencies have funded a number of studies to examine these effects. These studies include the Kaiser study of respiratory hospitalizations relative to air pollution levels in the Valley, and the FACES study of the progression of asthma and its relationship to air pollution, including biological components in children in Fresno.

05-6-2: Public Hearing to Consider the Definition of a Large Confined Animal Facility (Implementation of Senate Bill 700, Florez 2003.)

State law (SB 700, Florez, Statutes of 2003, Chapter 479) requires the Air Resources Board to develop a definition of "large" confined animal facilities (large CAF) by July 1, 2005. The large CAF definition will be used by the local air pollution control and air quality management districts in the development of rules to mitigate emissions from large CAFs.

TO SUBMIT WRITTEN COMMENTS ON AN AGENDA ITEM IN ADVANCE OF THE MEETING:

CONTACT THE CLERK OF THE BOARD, 1001 I Street, 23rd Floor, Sacramento, CA 95814 (916) 322-5594
FAX: (916) 322-3928
ARB Homepage: www.arb.ca.gov

To request special accommodation or language needs, please contact the following:

- TTY/TDD/Speech-to-Speech users may dial 7-1-1 for the California Relay Service.
- Assistance for Disability-related accommodations, please go to http://www.arb.ca.gov/html/ada/ada.htm or contact the Air Resources Board ADA Coordinator, at (916) 323-4916.
- Assistance in a language other than English, please go to http://inside.arb.ca.gov/as/eeo/languageaccess.htm or contact the Air Resources Board Bilingual Coordinator, at (916) 324-5049.

SMOKING IS NOT PERMITTED AT MEETINGS OF THE CALIFORNIA AIR RESOURCES BOARD

05-6-3: **Public Hearing to Consider Proposed Amendments to the California Off-Road Emissions Regulations for Large Spark-Ignition (LSI) Engines, the Adoption of Fleet Requirements for Operators of Off-Road LSI Engines, and the Adoption of a Retrofit Verification Protocol for Off-Road LSI Engines.**

Staff is proposing amendments to California's existing off-road large spark-ignition engine regulations to harmonize with existing U.S. EPA emission standard requirements in 2007, establish more stringent emission standard requirements in 2010, and establish fleet average requirements for operators of LSI fleets beginning in 2009 and becoming more stringent in 2011 and 2013. The proposal contains an alternative compliance option for agricultural fleets to address issues specific to this industry. It also contains a verification procedure for retrofit control systems that address in-use emissions and provide fleet owners with additional options to meet the proposed fleet average emission requirements.

05-6-4: **Biodiesel briefing to the Board.**

Staff will present a briefing to the Board on the use of biodiesel in California and staff activities in addressing biodiesel in ARB's regulatory programs.

OPEN SESSION TO PROVIDE AN OPPORTUNITY FOR MEMBERS OF THE PUBLIC TO ADDRESS THE BOARD ON SUBJECT MATTERS WITHIN THE JURISDICTION OF THE BOARD.

Although no formal Board action may be taken, the Board is allowing an opportunity to interested members of the public to address the Board on items of interest that are within the Board's jurisdiction, but that do not specifically appear on the agenda. Each person will be allowed a maximum of five minutes to ensure that everyone has a chance to speak.

THE AGENDA ITEMS LISTED ABOVE MAY BE CONSIDERED IN A DIFFERENT ORDER AT THE BOARD MEETING.

California Environmental Protection Agency

Air Resources Board

PUBLIC MEETING AGENDA

INDEX

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June 23, 2005
9:00 a.m.

TITLE 17. CALIFORNIA AIR RESOURCES BOARD

NOTICE OF PUBLIC HEARING TO CONSIDER THE ADOPTION OF A REGULATION ESTABLISHING A DEFINITION FOR "LARGE CONFINED ANIMAL FACILITY"

The Air Resources Board (the Board or ARB) will conduct a public meeting at the time and place noted below to consider the adoption of a definition for large confined animal facility. This definition was developed to meet the requirements of Senate Bill 700 (SB 700, Florez, Statutes of 2003, Chapter 479).

DATE: June 23, 2005

TIME: 9:00 a.m.

PLACE: San Joaquin Valley Air Pollution Control District
1990 East Gettysburg Avenue
Fresno, California 93726

or Via Videoconference (2 Locations)
District Northern Region Office
4230 Kiernan Avenue, Suite 130
Modesto, California 95356

District Southern Region Office
2700 M Street, Suite 275
Bakersfield, California 93301

This item will be considered at a two-day meeting of the Board, which will commence at 9:00 a.m., June 23, 2005, and may continue at 8:30 a.m., June 24, 2005. This item may not be considered until June 24, 2005. Please consult the agenda for the meeting, which will be available at least 10 days before June 23, 2005, to determine the day on which this item will be considered.

If you have a disability-related accommodation need, please go to http://www.arb.ca.gov/html/ada/ada.htm for assistance or contact the ADA Coordinator at (916) 323-4916. If you are a person who needs assistance in a language other than English, please contact the Bilingual Coordinator at (916) 324-5049. TTY/TDD/Speech-to-Speech users may dial 7-1-1 for the California Relay Service.

INFORMATIVE DIGEST OF PROPOSED ACTION AND POLICY STATEMENT OVERVIEW

Sections Affected: Proposed adoption of title 17, California Code of Regulations (CCR), sections 86500 and 86501.

Background:

State law (SB 700, Florez, Statutes of 2003, Chapter 479) requires ARB to develop a definition of "large" confined animal facilities (large CAFs) by July 1, 2005. In developing this definition, ARB is to review relevant scientific information, including air quality impacts, how confined animal facilities may affect the attainment and maintenance of ambient air quality standards, and livestock emission factors (Health & Safety Code (H&SC) section 40724.6(a)).

The large CAF definition will be used by the local air pollution control and air quality management districts (local air districts) in the development of rules to mitigate emissions from large CAFs. Local air districts designated as nonattainment for the federal one-hour ozone national ambient air quality standard (NAAQS) as of January 1, 2004, must adopt rules that include, among other things, a requirement that large CAFs develop and implement a mitigation plan (H&SC 40724.6(b) and (d)). Areas designated as attainment for the federal ozone standard are also required to develop a large CAF rule unless the local air district makes a determination that any large CAFs in the region will not contribute to a violation of any State or federal air quality standard (H&SC 40724.7(a)). Emission mitigation plans required for large CAFs must demonstrate reasonably available control technology in moderate and serious areas, and best available retrofit control technology in severe and extreme non-attainment areas.

The Proposed Regulation:

ARB staff has developed a proposed large CAF definition after an evaluation of the scientific information on emissions and air quality impacts of livestock facilities. Staff has also evaluated the needed air quality improvements in non-attainment areas and potential impacts to the livestock industry. The evaluation of the air quality impacts included looking at the relative severity of the air quality problem in different areas of California. The definition is based on the combined, aggregate air quality impacts of the livestock industry in California, with an emphasis on the San Joaquin Valley. There is a special focus on the San Joaquin Valley, due to the severity of its ozone problem and the concentration of animals, especially dairy cows, in this region. The San Joaquin Valley accounts for about 78 percent of the milk cows in California. About 15 percent of the cows are in the South Coast Air Basin and 7 percent are distributed in other parts of the State.

It is important that the large CAF definition include most of the livestock in the San Joaquin Valley because substantial new emission reductions are needed in this region to meet federal air quality standards by the required deadlines. Each category of emission sources in the San Joaquin Valley must be considered in the process of identifying new feasible and cost-effective measures needed for attainment. ARB's definition will trigger that process for CAFs through development of local air district rules that will require emission mitigation plans for facilities defined as large CAFs.

In terms of program effectiveness, one goal in developing the large CAF definition was to include most of the livestock animals in the definition, while affecting the fewest possible number of facilities. Data on the size of California facilities (number of animals) was evaluated to look for natural breakpoints in facility size distribution. ARB staff also considered the feasibility of establishing a definition based on individual facility emissions. The individual facility emissions approach was rejected as impractical and uncertain in part because of the developing state of livestock emissions estimation research. The proposed large CAF aggregate emissions approach instead uses the number of animals per facility as a surrogate for facility emissions, which on a district-wide basis will include most of the livestock emissions even if the emission factors change in the future. The aggregate approach was used for each livestock category based on information specific to that category.

The staff's large CAF definition proposal excludes most of the facilities that are clearly small and are typically less capable of absorbing the costs of regulations. The proposed definition provides clarity and certainty for the livestock industry and local air districts, and creates a productive environment for identifying the most cost effective and technically feasible emission reduction strategies.

In order to allow verification of the number of animals at a facility, beginning January 1, 2006, the owner or operator of a large confined animal facility would be required to keep records that specify the numbers of animals maintained daily and such other information as may be required by local air district rules. Such records would have to be maintained at a central place of business for a period of not less than three years and made available upon request to the Executive Officer or Air Pollution Control Officer or their representative.

The details of the proposed definition and the associated rationale are provided in the Initial Statement of Reasons prepared by staff. The full document is available as described in the Availability of Documents section below.

COMPARABLE FEDERAL REGULATIONS

Currently, there are no federal statutes regulating airborne emissions from livestock facilities. However, there are federal regulations related to liquid discharges from livestock facilities. These regulations were considered in the development of the large confined animal facility definition for California. The citation for the federal discharge rules is the National Pollutant Discharge Elimination System Permit Regulation and Effluent Limitation Guidelines and Standards for Concentrated Animal Feeding Operations, Part II, United States Environmental Protection Agency, 40 CFR Parts 9, 122, 123, and 412.

AVAILABILITY OF DOCUMENTS AND AGENCY CONTACT PERSONS

The ARB staff has prepared a Staff Report: Initial Statement of Reasons for Rulemaking: "Large Confined Animal Facility Definition (Implementation of Senate Bill

700, Florez 2003)" (ISOR) for the proposed regulatory action, which includes a summary of the economic and environmental impacts of adopting a regulation establishing a definition for large confined animal facility.

Copies of the ISOR and the full text of the proposed regulatory language may be accessed on the ARB's web site listed below, or may be obtained from the Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, 1st Floor, Sacramento, CA 95814, (916) 322-2990 at least 45 days prior to the scheduled hearing June 23, 2005.

Upon its completion, the Final Statement of Reasons (FSOR) will be available and copies may be requested from the agency contact persons in this notice, or may be accessed on the ARB's web site listed below.

Inquiries regarding the substance of the proposed regulatory action may be directed to the designated agency contact persons, Mr. Michael FitzGibbon, Manager of the Emission Inventory Analysis Section, Planning and Technical Support Division at (916) 445-6243 or by e-mail at mfitzgib@arb.ca.gov, or Mr. Patrick Gaffney, Staff Air Pollution Specialist, Planning and Technical Support Division at (916) 322-7303 or by e-mail at pgaffney@arb.ca.gov.

Further, the agency representative and designated back-up contact persons to who nonsubstantive inquiries concerning the proposed administrative action may be directed are Artavia Edwards, Manager, Board Administration & Regulatory Coordination Unit, (916) 322-6070, or Amy Whiting, Regulations Coordinator, (916) 322-6533. The Board has compiled a record for this rulemaking action, which includes all the information upon which the proposal is based. This material is available for inspection upon request to the contact persons.

This notice, the ISOR and all subsequent regulatory documents, including the FSOR, when completed, are available on the ARB Internet site for this rulemaking at: http://www.arb.ca.gov/regact/lcaf05/lcaf05.htm

COSTS TO PUBLIC AGENCIES AND TO BUSINESSES AND PERSONS AFFECTED

The determinations of the Board's Executive Officer concerning the costs or savings necessarily incurred by public agencies, private persons and businesses in reasonable compliance with the proposed regulations are presented below.

In defining a large confined animal facility, there are no immediate costs to local air districts and to owners and operators of large CAFs because the act of establishing the definition does not create any direct costs. However, once the definition has been established, each local air district that is designated as a federal nonattainment area for ozone and has large CAFs under its jurisdiction, will be required to adopt a regulation affecting the owners and operators of these facilities. Local air districts may incur costs related to the development and implementation of such regulations. Typically, local air

districts can recover any additional costs through fees. As part of the regulation development process, each local air district is required by SB 700 to conduct an impact assessment of rules developed under the legislation. This assessment is to include the impact on the region's employment and economy, among other factors. The range of probable costs to affected sources and businesses is also to be included in the local air district assessment. It is likely that facilities that meet the large confined animal facilities criteria will incur costs to develop and comply with mandated permits and emissions reduction plans. These costs will be incurred later in the process, and not as a result of this definition of large confined animal facilities.

Pursuant to Government Code sections 11346.5(a)(5) and 11346.5(a)(6), the Executive Officer has determined that the proposed regulatory action will not create costs or savings to any state agency or in federal funding to the state, costs or mandate to any local agency or school district whether or not reimbursable by the state pursuant to Part 7 (commencing with section 17500), Division 4, Title 2 of the Government Code, or other nondiscretionary costs or savings to state or local agencies.

In developing this regulatory proposal, the ARB staff evaluated the potential economic impacts on representative private persons or businesses. The ARB is not aware of any cost impacts that a representative private person or business would necessarily incur in reasonable compliance with the proposed action.

The Executive Officer has made an initial determination that the proposed regulatory action will not have a significant statewide adverse economic impact directly affecting businesses, including the ability of California businesses to compete with businesses in other states, or on representative private persons.

In accordance with Government Code section 11346.3, the Executive Officer has determined that the proposed regulatory action will not affect the creation or elimination of jobs within the State of California, the creation of new businesses or elimination of existing businesses within the State of California, or the expansion of businesses currently doing business within the State of California. A detailed assessment of the economic impacts of the proposed regulatory action can be found in the ISOR.

The Executive Officer has also determined, pursuant to title 1, CCR, section 4, that the proposed regulatory action will not affect small businesses. The proposed amendments would provide clarification and compliance flexibility and would improve the way the regulations are administered. No negative economic impacts on small businesses are expected.

In accordance with Government Code sections 11346.3(c) and 11346.5(a)(11), the ARB's Executive Officer has found that the large CAF definitions which apply to businesses are necessary for the health, safety, and welfare of the people of the State of California.

Before taking final action on the proposed regulatory action, the Board must determine that no reasonable alternative considered by the agency or that has otherwise been identified and brought to the attention of the Board, would be more effective in carrying out the purpose for which the action is proposed or would be as effective and less burdensome to affected private persons than the proposed action.

SUBMITTAL OF COMMENTS

The public may present comments relating to this matter orally or in writing at the hearing, and in writing or by e-mail before the hearing. To be considered by the Board, written submissions not physically submitted at the hearing must be received no later than 12:00 noon, June 22, 2005, and addressed to the following:

Postal mail is to be sent to:

Clerk of the Board
Air Resources Board
1001 I Street, 23rd Floor
Sacramento, California 95814

Electronic mail is to be sent to: lcaf05@listserv.arb.ca.gov and received at the ARB **no later than 12:00 noon, June 22, 2005**.

Facsimile transmissions are to be transmitted to the Clerk of the Board at (916) 322-3928 and received at the ARB **no later than 12:00 noon, June 22, 2005**.

Please note that the hearing will not be held at the ARB headquarters building. To ensure that your comment will be available for consideration it is important that your comment is received by the deadline.

The Board requests but does not require that 30 copies of any written statement be submitted and that all written statements be filed at least 10 days prior to the hearing so that ARB staff and Board Members have time to fully consider each comment. The Board encourages members of the public to bring to the attention of staff in advance of the hearing any suggestions for modification of the proposed regulatory action.

STATUTORY AUTHORITY AND REFERENCES

This regulatory action is proposed under that authority granted in Health and Safety Code, sections 39600, 39601 and 40724.6. This action is proposed to implement, interpret and make specific sections 39011.5 and 40724.6 of the Health and Safety Code.

HEARING PROCEDURES

The public hearing will be conducted in accordance with the California Administrative Procedure Act, Title 2, Division 3, Part 1, Chapter 3.5 (commencing with section 11340) of the Government Code.

Following the public hearing, the Board may adopt the regulatory language as originally proposed or with nonsubstantial or grammatical modifications. The Board may also adopt the proposed regulatory language with other modifications if the text as modified is sufficiently related to the originally proposed text that the public was adequately placed on notice that the regulatory language as modified could result from the proposed regulatory action. In such event the full regulatory text with the modifications clearly indicated, will be made available to the public, for written comment, at least 15 days before it is adopted.

The public may request a copy of the modified regulatory text from the ARB's Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, 1st Floor, Sacramento, CA 95814, (916) 322-2990.

CALIFORNIA AIR RESOURCES BOARD

Catherine Witherspoon
Executive Officer

Date: April 26, 2005

The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs see our Web –site at www.arb.ca.gov.

STATE OF CALIFORNIA

California Environmental Protection Agency

AIR RESOURCES BOARD

STAFF REPORT: INITIAL STATEMENT OF REASONS FOR RULEMAKING

PUBLIC HEARING TO CONSIDER THE LARGE CONFINED ANIMAL FACILITY DEFINITION

Release Date: May 6, 2005
Scheduled for Consideration: June 23-24, 2005

STAFF REPORT: INITIAL STATEMENT OF REASONS

PUBLIC HEARING TO CONSIDER THE LARGE CONFINED ANIMAL FACILITY DEFINITION
(Implementation of Senate Bill 700, Florez 2003)

Air Resources Board Meeting
Begins June 23, 2005 at 9:00 a.m.
and may continue June 24, 2005 at 8:30 a.m.
San Joaquin Valley Air Pollution Control District
1990 East Gettysburg Avenue
Fresno, California 93726

or Via Videoconference (2 Locations)

District Northern Region Office
4230 Kiernan Avenue, Suite 130
Modesto, California 95356

District Southern Region Office
2700 M Street, Suite 275
Bakersfield, California 93301

This report has been reviewed by the staff of the California Air Resources Board and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Air Resources Board, nor does the mention of trade names or commercial products constitute endorsement or recommendation for use.

This report and related materials are available for download from the Air Resources Board's Internet site at: http://www.arb.ca.gov/regact/lcaf05/lcaf05.htm. In addition, written copies may be obtained from the Board's Public Information Office, 1001 I Street, 1st Floor, Environmental Services Center, Sacramento, California 95814, (916) 322-2990.

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Questions
If you have questions concerning this report, please contact:

Mr. Mike FitzGibbon, Manager
Emission Inventory Analysis Section
Phone: (916) 445-6243
Email: mfitzgib@arb.ca.gov

or

Patrick Gaffney, Project Lead
Emission Inventory Analysis Section
Phone: (916) 322-7303
Email: pgaffney@arb.ca.gov

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EXECUTIVE SUMMARY

The California Air Resources Board (ARB/Board) is required by State law (SB 700, Florez, Statutes of 2003, Chapter 479) to develop a definition of "large" confined animal facilities (large CAFs) by July 1, 2005. This staff report and proposed regulation are presented to comply with this provision. The local air pollution control and air quality management districts (local air districts) will use the large CAF definition in the development of rules to mitigate emissions from large CAFs.

In developing the proposed definition, ARB is required to review all available scientific information, including emission factors for CAFs and the effect of these facilities on air quality in the State's various air basins. ARB is also directed to consider the impact of emissions from these facilities on attainment and maintenance of ambient air quality standards.

We focused our efforts primarily on two air basins – the San Joaquin Valley and the South Coast (Los Angeles region). These two regions represent California's most challenging air quality problems for both ozone and particulate matter pollution. Based on the available science, both areas will need substantial new reductions in emissions of reactive organic gases (ROG) in order to meet the new federal eight-hour ozone standard. Whether ammonia reductions will be a key part of the attainment strategy for the new federal particulate matter standard (PM2.5) is still an open question. For these reasons, our air quality analyses have focused on the contribution of livestock ROG emissions to ozone air quality.

As shown in Table ES-1, the federal eight-hour ozone standard has been exceeded in the San Joaquin Valley over 100 days in each of the past three years (ARB 2005a). The South Coast has had nearly as many annual exceedance days. These areas also exceed California's more stringent State air quality standards by an even larger margin. This makes the impact of emissions from CAFs in these regions a critical consideration in the development of the large CAF definition.

Table ES-1. Number of Days over the Federal Eight-Hour Ozone Standard

Year	Number of Days over the Federal Eight-Hour Ozone Standard	
	San Joaquin Valley	South Coast
2004	109	88
2003	134	109
2002	125	96

From the standpoint of attainment of ozone ambient air quality standards, ROG is the most important class of compounds emitted from CAFs. There is significant ongoing research associated with emissions factors of ROG from livestock operations, particularly with dairies and certain chicken operations. There is also a peer review process underway. ARB's current ROG emission factor of 12.8 lbs/year/head for dairies is within the range indicated by the research to date. When the evaluation of recent research results is completed, the emission factor may be higher or lower. However,

even if the emission factor were cut in half, the aggregate ROG emissions from dairies would continue to be significant.

Overall, livestock ROG emissions are most significant in the San Joaquin Valley. The current emission estimate is 29 tons per day – mostly from dairies. Table ES-2 shows that the San Joaquin Valley accounts for about 63% of the State's livestock ROG emissions, while the South Coast accounts for 12%. Collectively, these two regions account for about 75% of the total livestock ROG emissions in the State.

Table ES-2. Livestock ROG Emissions for 2004[a]

Region	Livestock ROG Emissions (tons/day)			% of Total Statewide ROG Emissions from Livestock
	Dairies	Other Livestock	Total Livestock	
San Joaquin Valley	23.5	5.5	29.0	63%
South Coast	4.6	0.7	5.3	12%
Statewide	35.7	10.1	45.8	100%

[a]Source: (ARB 2004a) and other methods incorporating emission factor scaling by manure output and new poultry research data.

Based on the current emission estimate of 23.5 tons/day, dairies are a significant source category of ROG emissions in the San Joaquin. Other top categories include light and medium duty trucks, passenger cars, and oil and gas production. Consumer products, paints and coatings, and gasoline marketing, are other important source categories. Each of these categories is subject to air quality regulations to reduce their emissions. Bringing dairies and other livestock categories into the mitigation plan process is an important step in reducing ROG emissions in the San Joaquin Valley.

Individually, livestock operations can also be significant sources of emissions. For example, Table ES-3 illustrates the magnitude of emissions from the 1,161 San Joaquin Valley dairies with 50 or more milking cows, compared to other facilities in the region (ARB 2005b, SJV 2005). The larger emitting facilities, those over 5 tons per year of ROG emissions, include refineries, power plants, and manufacturing facilities. The smaller facilities, those under 5 tons per year of ROG emissions, include auto body shops and gasoline service stations. These facilities, both large and small, are subject to local air district permitting and control requirements.

Table ES-3. Emissions from Dairies Compared to Other Facilities in the San Joaquin Valley

ROG Emissions (tons per year)	# of Other Facilities	# of Dairies
0 – 1	889	108
1 – 5	319	461
5 – 10	46	293
10 – 15	30	164
15 – 20	14	53
Greater than 20	44	82

The mitigation plan process that will be triggered upon ARB approval of a large CAF definition is to be implemented by local air districts. SB 700 specifies that local air

districts designated as nonattainment for the federal ozone standard as of January 1, 2004, adopt rules that require large CAFs to develop and implement a mitigation plan. Areas designated as attainment for the federal ozone standard as of January 1, 2004, are also required to develop a large CAF rule unless the local air district makes a determination that large CAFs will not contribute to a violation of any State or federal air quality standard. SB 700 requires that local air districts assess, and consider in a public hearing, the costs, cost-effectiveness, and technical feasibility of any proposed rule.

In developing the proposed definition for large CAFs, ARB staff considered input from the livestock industry, environmental and community representatives, local air districts, the public, other State and federal agencies, and academic researchers. Key factors the staff considered include the:

- severity and nature of the air quality problem in various local air districts;
- number of animals and their associated emissions per district;
- status of research on emission factors;
- efficiency in definition structure (number of animals relative to facility number); and,
- ability of local air districts to expand the definition if warranted.

After considering these factors, staff is proposing the thresholds shown in Table ES-4. The definition is designed to address the combined, aggregate air quality impacts of the livestock industry in California, with an emphasis on the San Joaquin Valley. We did not take an individual facility emissions approach in defining a large CAF because it is impractical and uncertain, in part due to the developing state of livestock emissions estimation research. At this time, facility emissions are calculated on a per animal basis pending completion and peer review of research on specific emission rates for various processes at a facility. Also, even if more comprehensive process-based emission factors were available, we would still take the head count approach in order to provide certainty in terms of the definition's applicability.

For dairies, the proposed definition is 1,000 milking cows in the ten federal nonattainment areas as defined in SB 700. In the San Joaquin Valley, this captures 72% of the milking cows and 36% of the dairies with 50 or more milking cows. There are an estimated 430 dairies of 1,000 or more milking cows in the San Joaquin Valley and 108 dairies in the South Coast. Federal attainment areas as defined in SB 700 would be subject to a threshold of 2,000 milking cows. This approach appropriately excludes the smaller farms, ranches, dairies, and other livestock facilities, while at the same time laying the groundwork for significant air quality benefits in the San Joaquin Valley and the South Coast Air Basin, the regions that need them the most.

Table ES-4. Large Confined Animal Facility Definition by Livestock Category

	Facilities at or Exceeding Threshold are Considered Large	
Livestock Category	**Nonattainment Areas***	**Attainment Areas***
Dairy	1,000 milk producing cows	2,000 milk producing cows
Beef Feedlots	2,500 beef cattle	5,000 beef cattle
Other Cattle Operations	7,500 calves, heifers, or other cattle	15,000 calves, heifers, or other cattle
Chickens – Broilers	650,000	1,300,000
Chickens – Egg Layers	650,000	1,300,000
Turkeys	100,000	200,000
Swine	3,000	6,000
Sheep and Goats	15,000	30,000
Horses	2,500	5,000
Ducks	650,000	1,300,000
Rabbits, Pheasants, Llamas, Others	30,000	60,000

*Federal 1-hour ozone designation as of January 1, 2004

The thresholds shown in Table ES-4 take into account population and operation information that highlight natural breaks in the distribution of facility sizes. These thresholds allow most of the animals to be included, while minimizing the number of facilities affected. The thresholds for all the livestock categories are also scaled to be approximately equivalent in terms of facility emissions.

Higher thresholds are proposed for the SB 700 federal ozone attainment areas primarily because livestock emissions are relatively small compared to other sources, and can be addressed by local air districts on a case by case basis. Under SB 700, local air districts retain their authority to establish requirements beyond staff's proposed thresholds and could bring in smaller sized livestock operations if warranted. We believe that allowing local air districts this discretion is appropriate since the relative importance of confined animal facilities emissions to nonattainment or other air quality problems can vary considerably. The details and complete rationale for each livestock category threshold are provided in the body of this report. The specific proposed regulatory language is provided in Appendix A.

1. INTRODUCTION AND BACKGROUND

Senate Bill 700 (SB 700, Chapter 479, Florez, Statutes of 2003) made agricultural sources of air pollution subject to air quality permitting and specified emission mitigation requirements. SB 700 requires the California Air Resources Board (ARB) to develop a definition for "large" confined animal facilities (CAFs) that will trigger the requirement for an emissions mitigation plan.

The objective of this staff report is to provide the definition of large confined animal facilities for California and the supporting rationale for the recommend definition. This definition is a key step in the framework to begin reducing livestock emissions from the livestock industry. The next, and more critical step following the definition of "large," is that the local air pollution control and air quality management districts (local air districts) must adopt rules that require large CAFs to submit emission mitigation plans. Emission reductions from the livestock industry, along with all important air pollution sources, are particularly needed in the San Joaquin Valley in order to meet health based air quality standards.

SB 700 Requirements for Confined Animal Facilities

Senate Bill 700 has numerous requirements related to agricultural air emissions and agricultural permitting. This staff report focuses specifically on the large confined animal facility provision of the legislation. Relative to CAFs, there are specific requirements for ARB, the local air districts, and the California Air Pollution Control Officers Association (CAPCOA). The following sections describe these responsibilities and the overall schedule for implementation.

California Air Resources Board Requirements

The ARB's key responsibility is to develop a definition for the source category of a "large confined animal facility" on or before July 1, 2005. In developing the large CAF definition, the ARB "shall review all available scientific information, including, but not limited to, emissions factors for confined animal facilities, and the effect of those facilities on air quality in the basin and other relevant scientific information," and "shall consider the emissions of air contaminants from those sources as they may affect the attainment and maintenance of ambient air quality standards" (HSC 40724.6(a)).

In a public hearing, the ARB must also approve livestock emission factors for use in the implementation of local air district rules on mitigation plans for CAFs (H&SC 40724.6(d)(1)(A). Due to the ongoing peer review of the research related to emission factors, the ARB staff is not proposing to consider the approval of emission factors as part of this public hearing and will consider emission factors at a later date.

Local Air District Requirements

Once ARB establishes the large CAF definition, local air districts designated as federal nonattainment for ozone as of January 1, 2004, must adopt, implement, and submit for inclusion in the SIP, a rule requiring large CAFs to submit a mitigation plan to reduce air contaminants to the extent feasible (HSC 40724.6(b)). For severe and extreme ozone attainment areas, best available retrofit control technology (BARCT) is required. In moderate and serious areas, large CAFs will need to use reasonably available control technology (HSC 40724.6(d)(1)(B)). In federal ozone attainment areas, districts must adopt a rule requiring large CAFs to reduce air contaminants to the extent feasible unless a district board makes a finding in public hearing that large CAFs will not contribute to a violation of any State or federal standard (HSC 40724.7(a) and 40724.6(b)).

In developing large CAF rules, local air districts are required to perform an assessment of the impacts of the rule or regulation. This assessment must include an evaluation of the number and size of affected sources, the nature and size of emissions, the emissions reduction potential, impacts on employment, probable costs of the rule, the availability and cost effectiveness of alternatives to the rule requirements, and the technical and practical feasibility of the rule requirements (HSC 40724.6 second (d)).

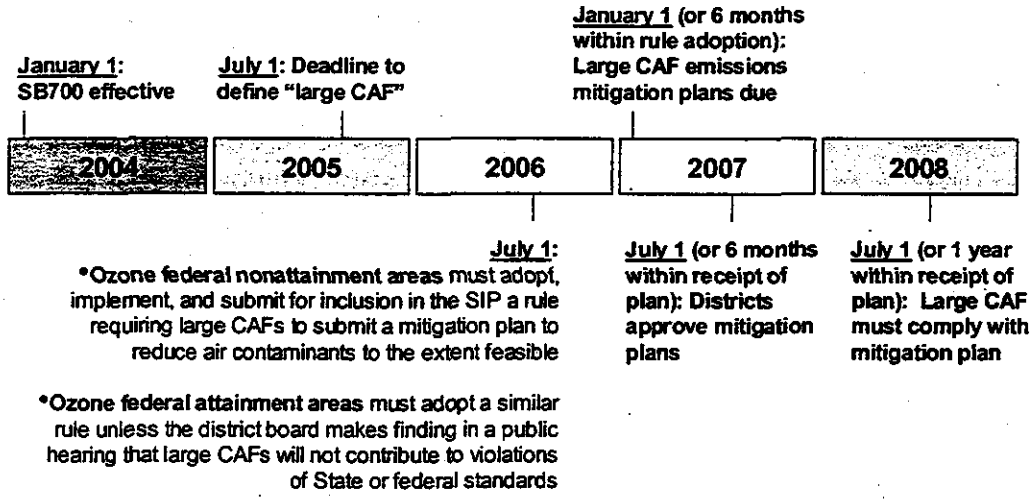
CAPCOA Requirements

SB 700 also requires the CAPCOA to develop a clearinghouse of available control measures and strategies for agricultural sources of air pollution and emissions from agricultural operations by January 1, 2005 (HSC 40731). The clearinghouse is available on CAPCOA's website (CAPCOA 2005) and includes control measures for operations that create fugitive dust emissions, measures for confined animal facilities, controls for internal combustion engines, and emission reduction strategies for other agricultural equipment. The website is located here: http://www.capcoa.org/AgClearinghouse.htm.

SB 700 Large CAF Implementation Schedule

Figure 1 illustrates the overall timeline of the SB 700 large CAF requirements. The legislation became effective on January 1, 2004. By July 1, 2005, the ARB must define a "large confined animal facility." The local air districts have until July 1, 2006 to adopt their large CAF mitigation rules. Large CAFs then have six months to submit their emission mitigation plans, and the local air districts have six additional months to approve submitted plans. One year after submitting their plans, large confined animal facilities must comply with the requirements of their mitigation plans no later than July 1, 2008.

Figure 1. SB 700 Large CAF Implementation Schedule



Description of Public Outreach

To develop the large confined animal facility (large CAF) definition, the ARB staff worked with many stakeholders over the past several years to understand the livestock industry and identify key issues. Stakeholders include the air quality regulatory agencies, livestock industry representatives, academic researchers, other State and federal agencies, environmental and community representatives, and others.

ARB staff held numerous workshops and meetings to develop the definition for large confined animal facilities. In August 2004, we held our initial series of large CAF public workshops in Modesto, Tulare, Chino, and Sacramento. In January 2005, we sponsored a livestock emissions research symposium in Fresno, which was broadcast via video to Modesto, Bakersfield, and Diamond Bar. In March 2005, we held a workshop in Fresno to discuss specific proposals for the large confined animal facility definition. This workshop was also video-conferenced to Modesto, Merced, Diamond Bar, and Sacramento, as well as providing telephone participation. In addition to the formal workshops, ARB staff participated in numerous formal and informal meetings with representatives of the livestock industry, environmental organizations, local air districts, researchers, or other governmental agencies.

Structure of the Staff Report

This staff report is divided into the following sections:

- Section 1. Introduction and Overview: Discusses Senate Bill 700, regulatory requirements, the implementation schedule, and the public process for developing the proposed regulation.
- Section 2. Characterization of Confined Animal Facilities: Discusses general information about livestock facilities, including the numbers, types, and sizes of facilities in different regions of the State.
- Section 3. Confined Animal Facility Impacts on Air Quality: Following an overview of the California air quality situation, provides information regarding emissions from confined animal facilities, how these emissions relate to regional air quality, and what environmental regulations are currently in place for the livestock industry.
- Section 4. Basis for the Staff's Proposed Regulation: Provides the rationale used to develop the large confined animal facility definition for California and the recommended proposal.
- Section 5. Environmental Impacts of Regulation: Describes what impacts the proposed regulation may have on the environment, including a discussion of environmental justice and ammonia emissions.
- Section 6. Economic Impacts of Regulation: Describes the economic impacts of the proposed regulation.
- Section 7. Alternatives to the Proposed Regulation: Describes other alternatives that were considered for the large CAF definition and why the alternatives are less effective.
- Section 8. References: Provides references used for the analyses.
- Appendices. Appendices are provided that include the proposed regulatory language, detailed California dairy information, a summary of the livestock air emissions research symposium, a discussion of activities to address livestock mitigation practices, the text of SB 700, the large CAF public workshop notices, and a summary of the major ROG sources in The San Joaquin Valley.

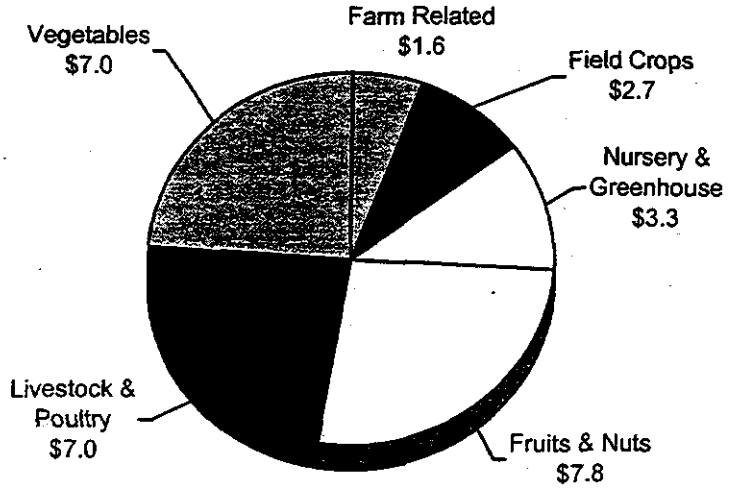
2. CHARACTERIZATION OF CONFINED ANIMAL FACILITIES

The California Agriculture Industry

The agricultural industry within California is very important, far exceeding the agricultural output of any other state in the nation. Agricultural marketings of California's farmers and ranchers reached $27.8 billion in 2003. There are approximately 78,500 farming operations within California that produce 13 percent of the nation's gross farming receipts, while including only four percent of the total farms in the nation. The top 10 agricultural counties within California from highest to lowest ranking are Fresno, Tulare, Monterey, Kern, Merced, San Joaquin, Stanislaus, San Diego, Kings, and Ventura (CASS 2003a).

California's top 20 crop and livestock commodities account for 74 percent of the State's gross farm income. At number one, milk and cream have a gross income of about $4 billion. California is the nation's largest dairy producer, producing one out of every five glasses of milk consumed in the nation. California has some of the largest dairies in the nation, with an average size of 800 milking cows, versus a national average size of less than 100 milking cows. Second in terms of agricultural sales are nursery products at $2.4 billion, and third are grapes at $2.3 billion, which accounts for 88 percent of all grapes grown in the nation. As shown in Figure 2, the combined income from the vegetable, field crop, and fruit and nut sectors are also substantial (CASS 2003a).

Figure 2. California Agricultural Cash Income, 2003 (billion $)



California Livestock Industry Overview

The livestock industry in California is continuing to grow. Livestock cash receipts during 2003 totaled $7 billion, which was up 12% from 2002. Cattle and calves marketed from California feedlots increased by 7% in 2003, with a 27% increase in cash income. Between 2002 and 2003, the chicken industry in California had a 19% increase in cash income, egg layers showed a 38% increase in income, and milk and cream a 5% increase in income. (CASS 2003b for all statistics).

Table 1 shows the number of livestock farms and animals within California. Because of the dynamic nature of the livestock industry, these numbers are constantly changing, but they provide a general snapshot of the number of animals within California. These data are from the 2002 United States Department of Agriculture (USDA) agricultural census data (USDA 2004). Note that in performing the census, USDA includes all farms in their census, including very small producers. For example, the number of dairy farms includes 918 dairies that have less than 50 cows. For layer chickens, 3,167 farms are included that have less than 3,200 chickens. To give an indication of the number of these small farms, the two right hand columns of the table show the number of small farms (and associated animals) included in the total number of farms listed. USDA does not provide farm size information for horse and goat operations so the number of small farms is not shown for these livestock categories.

Table 1. 2002 California Livestock Farms and Animal Populations

Livestock	Total Number of Farms	Total Number of Animals	Number of Very Small Farms Included	Number of Animals in Very Small Farms
Dairy	2,793	2,806,357[a]	918 (<50 head)	37,545
Feedlot	552	535,734	423 (<50 head)	3,492
Chicken – Broilers	338	39,245,511[b]	269 (<10,000 head)	92,243
Chicken – Layers	3,244	22,768,304	3,167 (<3200 head)	108,584
Turkeys	237	8,790,704[c]	157 (<1000 head)	2,569
Hogs	1,521	163,465	1,359 (<50 head)	11,345
Sheep	4,009	731,558	3,616 (<1000 head)	66,958
Horses and Ponies	16,446	131,951	Facility sizes not provided by USDA	
Goats	3,542	103,122	Facility sizes not provided by USDA	

(USDA 2004) [a]Dairy includes milk cows and support stock; [b]Based on a flock cycle time of 55 days, or 6.6 flocks per year; [c]Assumes 2 flocks per year

All of these animals produce substantial amounts of liquid and solid waste. A milk producing dairy cow can produce 150 pounds of manure a day (or 75 tons per day for 1,000 milking cows). A typical 20,000 head broiler chicken house produces over 2.25 tons of manure per day (ASAE 2004). Through biological decomposition process, these wastes produce emissions of reactive organic gases, ammonia, hydrogen sulfide, some nitrogen compounds, and methane. In addition, the activity of the animals and other facility operations can produce particulate matter emissions, oxides of nitrogen, and other pollutants.

Livestock Facility Size and Animal Population Summary

As will be shown in detail in the following sections, the majority of livestock animals within California are maintained in larger operations. For example, statewide there are approximately 2,800 dairies. Approximately 38% of the dairies have over 500 cows, housing about 87% of the total cows in the State. For cattle feedlots, 96% of the animals are in just 3% of the facilities. The trend is similar for the other livestock categories including broiler chickens, layer chickens, turkeys, and swine – most of the animals are in a relatively small number of larger livestock facilities.

Table 2 illustrates the general mix of facility sizes and the associated animal populations. The table shows the number of livestock facilities, the percent of facilities, the number of animals (or head), and the percentage of animals in various livestock facility size categories (USDA 2004). Also, because there are often a large number of very small livestock facilities in each category (see Table 1), the percentage of facilities in each category with these very small facilities removed is also provided. Because the number of animals in the very small facilities is minor, and because they generally do not make an important difference in the percentage of total animals, this adjustment is not shown for the percentage of head calculation.

The reason for providing facility size information versus animal populations is the relationship between livestock emissions and the number of animals at a facility. Using dairies as an example, if all other process are identical, the ARB staff assumes that a 1,000 cow dairy will produce twice as many emissions as a 500 head dairy. The basis for this assumption is twofold. First, the manure output produced at a dairy is directly related to the number of cows at the dairy, that is, two milk producing cows will produce twice as much manure as one milk producing cow. It is the output of this manure, the treatment and biological decomposition of the wastes, and emissions directly from the cow that produce the dairy air emissions. Each additional cow at the dairy produces more manure and more gas, and thus more emissions. Second, the current method of estimating cow, chicken, swine, or any other livestock animal emissions is expressed in terms of emissions per head per year. Using this method, the facility emissions are directly proportional to the number of animals at the facility.

Table 2. California Livestock Facility Sizes, Animals, and Size Ranges

	Total			Facilities Larger than "Size Cut"				
Livestock	Facilities	Head	Facility Size Cut	# of facilities	% of facilities	% of non-small facilities[d]	# of head	% of head
Dairy[a]	2,793	2,806,357	500	1075	38	57	2,435,647	87
			1,000	517	19	28	1,796,992	64
Feedlots	552	535,734	1,000	19	3	15	513,813	96
			2,500	16	3	12	509,109	95
Broilers[b]	338	39,245,511	55,000	45	13	65	38,598,215	98
			135,000	29	9	42	37,505,983	96
Layers	3,244	22,768,304	50,000	57	2	74	22,198,928	97
			100,000	44	1	57	21,236,253	93
Turkeys[c]	237	8,790,704	30,000	66	28	83	8,647,995	99
			100,000	57	24	71	8,320,812	95
Hogs	1,521	163,465	1,000	10	1	6	126,594	77
			2000	6	0.4	4	123,094	75
Sheep	4,009	731,558	5,000	39	1	10	477,615	65
Goats	3,542	103,122	10,000	Facility sizes not provided by USDA				
Horses	16,446	131,951	500	Facility sizes not provided by USDA				

USDA 2004. [a]Dairy includes milk cows and support stock; [b]Based on a flock cycle time of 55 days, or 6.6 flocks per year; [c]Assumes 2 flocks per year; [d]Facilities shown in the previous table, designated as "very small" are removed from the percentage of facilities calculation.

Dairies

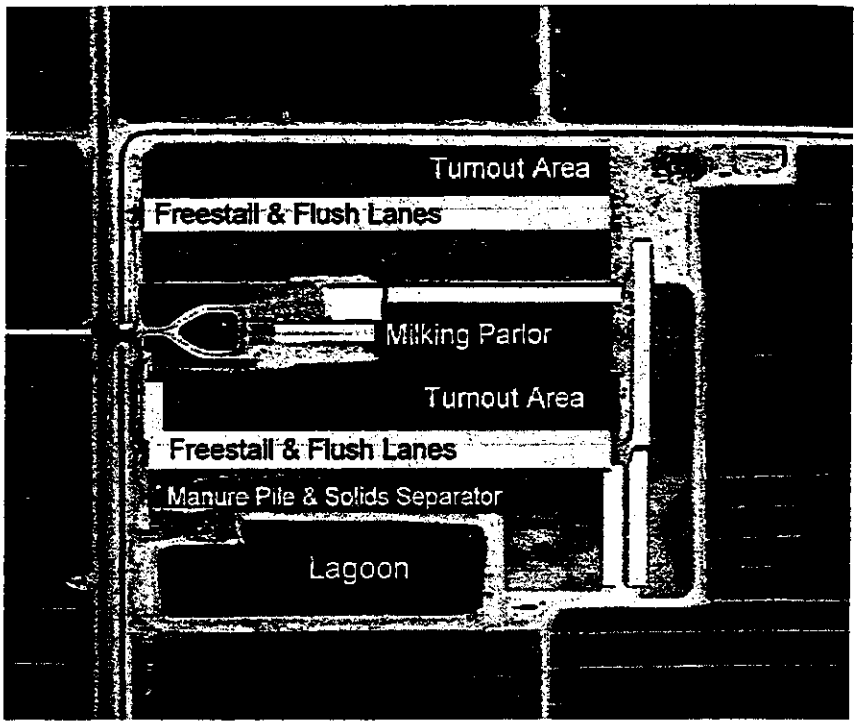
The dairy industry in California is the State's largest single source of agricultural revenue, generating over $4 billion in revenue each year. The latest USDA agricultural census for 2002 indicates that that there are about 2,800 dairies in California housing about 2,800,000 milking cows and support stock. Note that these statistics include 918 dairies that have fewer than 50 cows, accounting for about 1% of the total cows in the State (see Table 1). In this report, we generally use the USDA statistics for overview data because they provide data collected on a consistent basis and include all of the major animal types. However, for some of the specific animal classifications such as dairies and poultry discussed later, we were able to collect additional regional and facility size information.

Overview of a Dairy

Although every dairy within California is unique, Figure 3 shows an aerial view of a "typical" California San Joaquin Valley dairy. For scale, the vertical line on the left of the photo is a two-lane county road. This flush lane freestall dairy supports about 3,000 milking cows. The dairy has two main freestall housing barns, which are the two long horizontal structures shown, and a smaller barn in the center. Cows spend most of their time in these freestall areas eating, sleeping, and resting. The barns are surrounded by turnout areas (dirt corrals) for the cows to walk around and exercise. The center of the photo shows the milking parlor. To the bottom of the photo is the liquid waste storage lagoon, the manure dewatering area, and the dry manure storage

pile. The right hand side of the photo shows areas where dry, non milking, cows are maintained.

Figure 3. Aerial Photo of a Freestall Flush Lane Dairy.



Most dairies within the San Joaquin Valley (SJV) are of the flushed lane freestall design in which manure wastes are periodically flushed from concrete lanes in the freestall areas where the wastes collect. Manure also accumulates in the turnout corral areas and they are scraped periodically (e.g., monthly, semi-annually) using a tractor to remove the manure. As shown in the photo, most dairies in the SJV are also surrounded by agricultural acreage, which is used to grow crops used for feed and other uses. These crops are typically fertilized by some of the nutrients in the liquid and solid manure wastes created by the dairy.

In comparison to dairies in the SJV, most dairies in Southern California are of the dry lot design in which no flush water is used. Instead, the manure is periodically scraped or otherwise removed using a tractor or other equipment. These dairies generally do not have significant cropland associated with the dairy. Other parts of the State use a variety of practices including those mentioned, as well as various grazing scenarios used in Northern California.

Traditionally, in addition to the milk cows, dairies also include a variety of support stock on-site including calves, young heifers that have not started milk production, and dry cows that are not in their milk production phase. Statewide, approximately half of the dairy-related cows within California are milked and the other half of the dairy cows are support stock that ultimately will be used for milk production (ARB 2004b). With many newer dairies, as well as some of the older facilities, there is a trend to remove support stock from the dairy. In this way, the dairy operator can focus their efforts on milk production and optimize their land use by placing as many milk (and revenue) generating cows on the facility as possible. The support stock are then handled by separate businesses that specialize in particular animals such as calves or heifers.

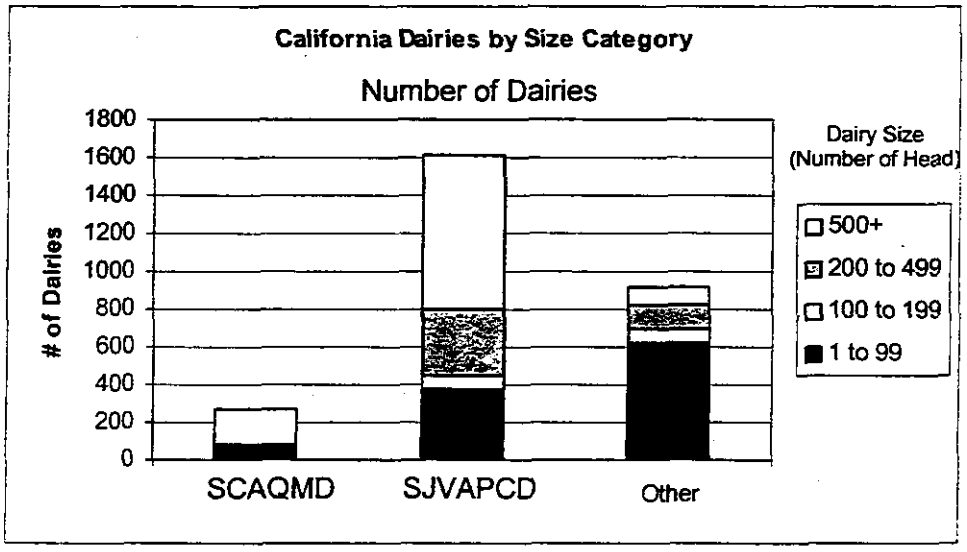
Emissions from a dairy can come from any and all of the locations mentioned including the flush water and manure in the freestalls and flush lanes, the turnout corrals, the lagoon(s), manure storage piles, manure applied to crops, emissions directly from the

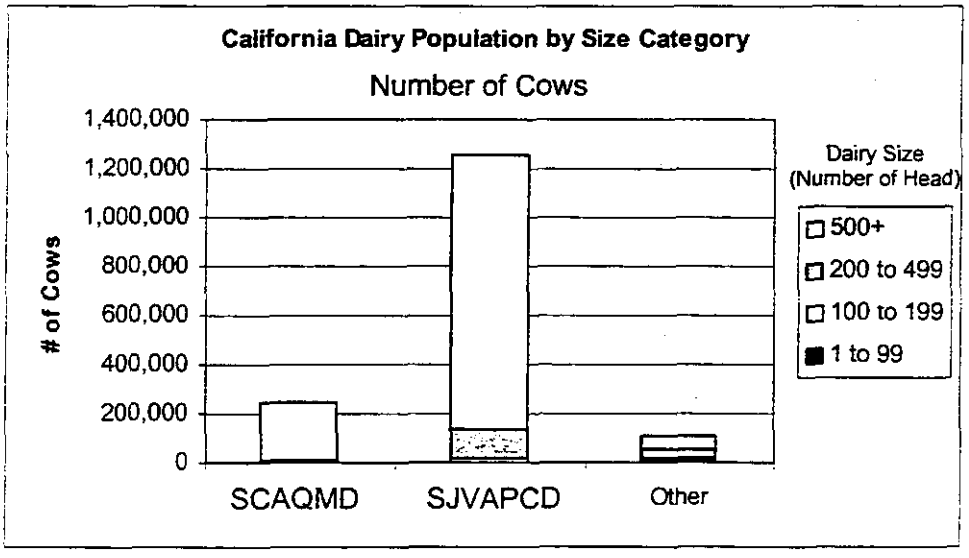
cows, and other sources. These dairy emissions are created by complex biological processes and are released through many diverse and dispersed emission sources, making them very difficult to effectively evaluate and quantify. More general information on California dairies can be found in Appendix B.

Dairy Distribution by Size and Population

To give a sense of the California dairy industry, Figure 4 shows the size and regional distribution of dairies in California. The upper graph shows the number of dairies by region. The lower graph shows the number of milking cows contained in different sized dairies by region. In both the San Joaquin Valley Air Pollution Control District (San Joaquin Valley APCD or SJVAPCD) and South Coast Air Quality Management District (South Coast AQMD or SCAQMD), the majority of the dairies have over 500 milking head of cattle and the majority of the total animals are maintained in these larger dairies. (USDA 2004)

Figure 4. California Dairy Information for Specified Regions in California





San Joaquin Valley Dairies

Because the majority of dairies and cows in California are in the San Joaquin Valley (SJV), this section provides additional detailed dairy size information for this region. Table 3 shows the dairy size information for the SJV. This data set is a combination of data available from USDA and the San Joaquin Valley APCD. The USDA data (USDA 2004) subdivides dairies by size category, but the largest category provided is 500 or more milking head. The San Joaquin Valley APCD data (SJV 2005a) provides detailed dairy size information, but generally does not include dairies less than 500 head. To get a complete picture of both the larger and smaller dairies in the SJV, both data sets were combined.

Although different methods were used in compiling the two data sets, and the data should not be considered exact, the information does provide a general characterization of the SJV dairy industry. Using this approach, about 1,500 dairies are accounted for from the total 1608 tabulated by USDA. As Table 3 shows, there are 340 very small dairies with fewer than 50 milking cows. To provide comparisons, the table includes the percentages of dairies and cows both with and without the very small dairies.

Table 3. San Joaquin Valley Dairy Size Distribution

Dairy Size Category	# of Dairies	% of Dairies	% of Dairies >=50 Head	# of Milk Cows	% of Milk Cows	% of Cows >=50 Head
1 to 49	340	23%		1,977	<1%	NA
50 to 199	108	7%	9%	12,904	1%	1%
200 to 499	355	24%	31%	120,888	10%	10%
500 to 699	111	7%	10%	65,546	5%	5%
700 to 999	157	10%	14%	127,876	11%	11%
1000 to 1999	284	19%	24%	400,175	33%	33%
2000 to 3999	116	8%	10%	314,005	26%	26%
4000 to 5999	25	2%	2%	117,773	10%	10%
6000 or more	5	<1%	<1%	38,886	3%	3%
Total All Dairies	1501			1,200,030		
Total Dairies > 49 Head	1161			1,198,053		

Dairies <501 head from USDA 2004
Dairies >= 501 head from SJV 2005a

Table 4 shows the distribution of milking cows in the SJV in a different format. In the SJV, there are 430 dairies (36%) with 1,000 or more milking cows and 731 dairies (64%) with less than 1,000 milking cows. The dairies with 1,000 or more cows have about 72% of the milking herd and the dairies with less than 1,000 cows have about 28% of the total milking herd. Looking at 2,000 head dairies, there are about 146 dairies (13%) in the SJV with 2,000 or more milking cows and 1,015 dairies (87%) with less than 2000 head. About 39% of the cows are in dairies with 2,000 or more milking cows, with the remaining 61% in the smaller dairies.

Table 4. Distribution of SJV Milking Cows by Farm Size

Size of the Dairy (Number of Milking Cows per Dairy)	Percent of Total Milking Cows in the San Joaquin Valley	Dairies*	
		Number of Dairies	Percent of Dairies
> 50	100	1161	100
> 500	89	698	60
> 700	84	587	50
> 1000	72	430	36
> 2000	39	146	13

* Excludes the estimated 340 dairies < 50 Milking Cows

South Coast AQMD Dairies

The South Coast AQMD also has a concentration of dairies. Tables 5 and 6 provide detailed facility size data for the South Coast AQMD. These data are provided by the local air district, are based on locally collected information (SCAQMD 2004a), and include some of the non-milking cows, so it is not in exact agreement with the USDA data discussed previously. The South Coast AQMD data indicate that there are about 108 dairies (50%) with 1,000 or more cows on the dairy and 111 with less than 1,000 cows (50%). The dairies with 1,000 or more cows have 75% of the herd and the dairies with less than 1,000 cows have about 25% of the total herd. There are about 31 dairies (14%) with over 2,000 cows, which include about 38% of the cows.

Table 5. South Coast AQMD Dairy Size Distribution

Size Category	# of Dairies	% of Dairies	# of cows	% of Cows
1 to 499	30	14%	10,472	4%
500 to 699	36	16%	21,181	8%
700 to 999	45	21%	38,102	14%
1000 to 1999	77	35%	103,713	37%
2000+	31	14%	107,249	38%
Totals	219	100%	280,717	100%

Table 6. Distribution of South Coast AQMD Milking Cows by Farm Size

Size of the Dairy (Number of Cows per Dairy)	Percent of Total Cows	Dairies*	
		Number of Dairies	Percent of Dairies
> 50	100	219	100
> 500	96	189	86
> 700	89	153	70
> 1000	75	108	49
> 2000	38	31	14

Other Region Dairies

Based on USDA statistics (USDA 2004) for areas outside of the San Joaquin Valley APCD and South Coast AQMD, there are only 89 dairies in other parts of the State that have over 500 milking cows. These 89 dairies with over 500 head include about 4% of the milk cows in the State. To give a sense of the number of dairies and cows throughout California counties, Table 7 shows the number of cows in dairies that have 500 or more cows, the number of dairies with 500 or more cows, and the average size of the dairies with over 500 cows.

The table shows that in those counties with substantial numbers of milking cows, virtually all of the cows are in dairies with 500 or more milking cows. Also, the average size of all of these dairies with 500 or more milking head is 1,336 milking cows. Note that this information is based on the 2002 census, so it does not show the newest dairies that have been built over the past 2 to 3 years.

Table 7. County Dairy Size Distribution by Number of Cows and Dairies

	Number of Milking Cows				Number of Dairies		
County	# of Milking Cows in Dairies >= 500 head	% of Milking Cows in Dairies >= 500 head	Average # of Milking Cows in Dairies > 500 Head	# of Milking Cows in Dairies >=50 and < 500 head	# of Dairies >= 500 Milking Head	% of Dairies >= 500 head	# of Dairies >=50 and < 500 Milking Head
Tulare	396,858	96%	1,780	14,932	223	82%	48
Merced	183,679	82%	1,201	39,379	153	53%	138
San Bernardino	152,979	97%	1,319	4,958	116	88%	16
Stanislaus	127,425	79%	958	34,459	133	53%	119
Kings	127,280	92%	1,224	10,890	104	76%	33
Riverside	87,743	97%	1,350	2,279	65	86%	11
San Joaquin	86,284	84%	1,135	16,955	76	54%	64
Fresno	78,757	87%	1,313	11,556	60	59%	41
Kern	74,206	100%	2,394	0	31	97%	1
Madera	42,152	88%	1,686	5,621	25	57%	19
Sonoma	18,262	58%	730	13,338	25	31%	55
Glenn	9,550	56%	796	7,435	12	21%	45
Sacramento	9,473	53%	947	8,433	10	22%	35
San Diego	4,351	78%	725	1,245	6	60%	4
Marin	3,505	35%	584	6,616	6	23%	20
Humboldt	3,484	22%	697	12,627	5	5%	95
Tehama	3,154	66%	789	1,631	4	21%	15
Yuba	2,914	100%	971	0	3	60%	2

Counties where there are no dairies greater than or equal to 500 milking cows			
Alameda	Mariposa	Nevada	Shasta
Alpine	Inyo	Orange	Santa Cruz
Amador	Lake	Placer	Sierra
Butte	Lassen	Plumas	Siskiyou
Calaveras	Los Angeles	San Benito	Solano
Colusa	Mendocino	San Francisco	Sutter
Contra Costa	Modoc	San Luis Obispo	Trinity
Del Norte	Mono	San Mateo	Tuolumne
El Dorado	Monterey	Santa Barbara	Ventura
Imperial	Napa	Santa Clara	Yolo

Note: USDA reports 18 dairies in these counties with over 500 milking head, but lists the number of milking cows as zero.

Beef Cattle

As shown in Table 8, about 21% of California's feedlots with over 50 head have over 2,500 head of cattle. These 30 feedlots with over 2,500 head raise about 96% of California's beef feedlot cattle. The remaining feedlots with less than 2,500 cows include only 23,133 animals statewide. Information in the table is a combination of data from USDA and the California Farm Bureau (USDA 2004 and CFB), so it is not consistent with exclusive USDA data. Complete data were not provided for the larger facilities. Therefore, the number of head in the categories at 2,500 head and above are estimated based on the midpoint of the size category multiplied by the number of farms in the category. This creates inconsistencies in the total number of feedlot head, showing about 100,000 more feedlot animals than the USDA data would indicate. Nevertheless, the data gives an indication of the size distribution of larger feedlots.

Geographically, about half of the feedlot animals are located in the San Joaquin Valley (Fresno, Kern, Madera, Stanislaus, and Tulare Counties), and the other half are in Imperial County.

Table 8. California Feedlot Size Distribution

Size Category	Farms	% of Total Farms	Estimated Total Head	% of Total Head
50 to 99	56	39%	3,592	1%
100 to 199	26	18%	3,268	0%
200 to 499	20	14%	6,308	1%
500 to 999	8	6%	5,261	1%
1,000 to 2,499	3	2%	4,704	1%
2,500 to 4,999	4	3%	15,000	2%
5,000 to 9,999	8	6%	60,000	9%
10,000 to 19,999	7	5%	105,000	16%
20,000 to 39,999	9	6%	270,000	41%
40,000 to 74,999	0	0%	0	0%
75,000 to 99,999	1	1%	87,000	13%
100,000+	1	1%	100,000	15%
Total	143	100%	660,133	100%

Table 9 shows the distribution of feedlot animals in California by feedlot size. In the State there are 30 feedlots (21%) with 2,500 or more animals, and 113 feedlots (79%) with less than 2500 animals. The feedlots with 2,500 or more cows have about 96% of the animals and the feedlots with less than 2,500 cows have about 4% of the feedlot animals.

Table 9. Distribution of California Feedlots by Farm Size

Size of the Feedlot	Percent of Feedlot Animals	Feedlots	
		Number of Feedlots	Percent of Feedlots
> 50	100	143	100
> 500	98	38	29
> 1000	97	33	23
> 2,500	96	30	21
> 5,000	94	26	18
> 10,000	85	18	13
> 20,000	69	11	8

* Excludes the estimated 423 feedlots with < 50 animals

Other Cattle Operations (Calves, Heifers, Others)

In addition to cattle facilities that focus predominantly on milk or beef production, there are a variety of other cattle ranches that both support these industries and provide other products such as veal. For example, some ranches may specialize on raising young calves to reproductive age for dairy use; others may raise heifers or other young cattle for delivery to feedlots for fattening. In general, the animals at these facilities are substantially smaller than productive dairy or beef cattle. Because of this, on a per animal basis, they will produce lower manure waste output and lower emissions. For example, an average producing dairy cow produces 150 pounds of manure per day and a beef cow produces about 64 pounds per day. In contrast, a heifer produces 48 pounds of manure per day and a calf only produces 19 pounds per day (ASAE 2004). As the California cattle industry is currently configured, there are not yet tremendous numbers of animals in these types of other facilities. However, there are ongoing changes in the cattle industry towards increased facility specialization in raising and managing the various animal components (calves, heifers, etc.).

Poultry (Broilers, Layers, Turkeys)

Poultry facilities either specialize in meat production (broilers and turkeys) or egg production (layers). Enclosed houses, often on the order of 50 feet by 300 feet in size, are most commonly used to house the birds. A typical poultry broiler house will have in the range of 20,000 birds per house. A group of several houses constitutes a poultry farm and several related farms are often called a ranch. Broilers have a 55-day production cycle from initial placement, growth, harvest, and reconditioning of the house for the next flock (SJV 2005b). Turkeys have about a 6-month production cycle.

Poultry operations can create significant quantities of waste that can produce airborne emissions through biological decomposition processes, as well as particulate emissions due to movement of the birds. A 20,000 head broiler chicken house can produce over 2.25 tons of manure per day. A 20,000 head layer house can produce up to 2 tons of manure per day, and 20,000 turkeys can produce over 5.5 tons of manure per day (ASAE 2004). Because most of the larger poultry operations in California maintain the birds in ventilated houses on litter of rice hulls or other materials, and do not generally

use water to flush wastes, there are fewer open sources of emissions at poultry operations compared to some other livestock sources such as dairies or feedlots.

The majority of poultry facilities in California are in the San Joaquin Valley and Southern California. Broiler chicken farms are dispersed throughout the State, but nearly all of the chickens are in Fresno, Madera, Sacramento, San Joaquin, and Tulare counties. For egg layer chickens, facilities are also located throughout the State, but most of the layer chickens are in Merced, Riverside, San Bernardino, San Diego, San Joaquin, Sonoma, and Stanislaus Counties. Most of California's turkeys are raised in Fresno, Kings, Madera, Merced, Stanislaus, and Tuolumne Counties. (USDA 2004).

In understanding the number of California poultry operations and their sizes, two sources of data were available. The first is the USDA 2002 agricultural census data, which has been shown previously. In addition to this information, representatives from the poultry industry within California were able to provide additional data that more fully describes the industry than the USDA data. For example, the largest facility size category reported by USDA for broilers is 135,000 head. The broiler data supplied by the poultry industry data show that there are 72 farms with over 135,000 head, and that there are 24 farms with over 650,000 head, and 20 farms with over 1,000,000 head (CPF 2005a). The industry supplied broiler data reports about 48 million broilers. The USDA data provides reports about 39 million birds. The fact that the industry broiler data reports more total birds than the USDA data gives us a good indication that the industry data reasonably represents the California broiler industry. The industry did not attempt to account for the over 250 very small broiler farms reported by USDA, but the USDA data shows these farms house less than 0.3% of the total broilers. Table 10 shows the industry supplied broiler data

For the layer chickens, the USDA data has a maximum size category of 100,000 birds. The layer industry was able to provide additional information regarding the larger facilities. The USDA data shows 44 facilities over 100,000 head, with 21,236,253 birds (USDA 2004). The layer industry data shows 45 facilities over 100,000 head with 18,385,000 birds (CGFA). This is reasonable agreement and helps to validate the industry data. The industry also did not try to account for the over 3,000 very small layer farms counted by USDA that include less than 0.5% of the layers. Table 11 shows the industry supplied layer data.

The turkey data supplied by the poultry industry (CPF 2005b) also agrees well with USDA data. Table 12 shows the industry supplied data.

Table 10. California Broiler Chicken Facility Size and Animals

Size Category	# of Farms	% of Facilities	# of Broilers	% of Broilers
<100,000	8	10%	490,075	1%
100,000 to 299,999	21	26%	4,426,308	9%
300,000 to 499,999	17	21%	6,684,856	14%
500,000 to 649,999	11	14%	6,466,766	14%
650,000 to 999,999	4	5%	3,408,214	7%
> 1,000,000	20	25%	26,131,840	55%
Total	81	100%	47,608,059	100%

Table 11. California Layer Chicken Facility Size and Animals

Size Category	# of Farms	% of Farms	# of Layers	% of Layers
<100,000	52	54%	2,349,000	11%
100,000 to 299,999	29	30%	4,748,000	23%
250,000 to 499,999	4	4%	1,577,000	8%
500,000 to 649,999	0	0%	0	0%
650,000 to 999,999	1	1%	660,000	3%
>1,000,000	11	11%	11,400,000	55%
Total	97	100%	20,734,000	100%

Table 12. California Turkey Facility Size and Animals

Size Category	# of Farms	% of Facilities	# of Turkeys	% of Turkeys
< 25,000	11	12%	168,371	2%
25,000 to 49,999	15	16%	574,795	7%
50,000 to 79,999	24	26%	1,580,563	20%
80,000 to 99,999	12	13%	1,018,848	13%
100,000 to 199,999	24	26%	3,143,761	39%
200,000 to 299,999	6	6%	1,283,359	16%
> 300,000	1	1%	301,600	4%
Total	93	100%	8,071,297	100%

Table 13 provides some additional description of the poultry broiler, layer, and turkey industry within California. For broilers, statewide about 62% of the animals are in 24 farms over 650,000 head. The other 38% of the broilers are in the remaining 57 farms. For layers, about 58% of the animals are in 12 farms with over 650,000 head. The other 42% of the layers are in the remaining 85 farms. For turkeys, 59% of the animals are in 31 farms with over 100,000 turkeys. The other 41% of the turkeys are in the remaining 62 farms.

Table 13. Distribution of California Poultry Operations by Farm Size

Size of the Farm	Percent of Animals	Farms	
		Number of Farms	Percent of Farms
Broilers			
> 0	100	81	100
> 100,000	99	73	90
> 300,000	90	52	65
> 500,000	76	35	44
> 650,000	62	24	30
> 1,000,000	55	20	25
Layers			
> 0	100	97	100
> 100,000	89	45	46
> 250,000	66	16	16
> 500,000	58	12	12
> 650,000	58	12	12
> 1,000,000	55	11	11
Turkeys			
> 0	100	93	100
> 25,000	98	82	88
> 50,000	91	67	72
> 80,000	72	43	46
> 100,000	59	31	33
> 200,000	20	7	7
> 300,000	4	1	1

Other Livestock (Swine, Sheep, Goats, Horses, Others)

There are a variety of other smaller livestock operations throughout California including swine, sheep, goats, horses, rabbits, ducks, and others. Under SB 700, animals fed predominantly by grazing are specifically excluded from the regulation.

Tables 1 and 2, shown previously, tabulate the statewide number of facilities and animals for some of the additional livestock categories. As shown, the majority of the livestock animals are in the cattle and poultry industries, and the number of animals in the other categories is relatively small. For the other livestock categories including goats, horses, ducks, rabbits, or any other livestock, the USDA does not provide facility size information.

Table 14 provides the facility size breakdown for hog farms. As with the other livestock categories, the majority of hogs are in large facilities. About 75% of the 163,645 hogs are in just six facilities with 2000 or more swine. This includes only 3% of the 162 swine facilities with 50 more hogs. About 70% (over 110,000) of California's hogs are raised in Tulare County. Other counties with substantial hog populations are San Bernardino County with 10,000 head, and Stanislaus County with 23,000 head. The small number of remaining hogs not in these counties are distributed throughout the State, mostly in small farms with less than 100 hogs (USDA 2004).

Table 14. California Hog Farm Size Distribution

Size Category	# of Farms	% of Farms	# of Head	% of Total Head	% of Total Head >=50 hogs
1 to 99	1426	93.8%	15,886	10%	4%
100 to 499	78	5.1%	15,822	10%	10%
500 to 999	7	0.5%	5,163	3%	4%
1000 to 1999	4	0.3%	3,500	2%	2%
2000 to 4999	2	0.1%	9,680	6%	6%
5000 or more	4	0.3%	113,414	69%	74%
Totals	1521	100%	163,465	100%	100%

Table 15 provides some further description of the hog industry within California. For hogs, about 80% of the animals statewide in farms greater than 50 hogs are in 6 farms over 2,000 head. The other 20% of the hogs are in the remaining 156 farms.

Table 15. Distribution of California Hog Farms by Size

Size of the Farm	Percent of Hogs	Farms	
		Number of Farms	Percent of Farms
> 50	100	162	100
> 100	96	95	57
> 500	86	17	9
> 1000	82	10	5
> 2000	80	6	3
> 5000	74	4	2

* Excludes the estimated 1359 farms with < 50 animals

Table 16 lists the number of farms and animals for the miscellaneous livestock categories (USDA 2004). As shown, the number of animals in these other categories is relatively small compared to the primary livestock categories.

Table 16. Other California Livestock Farms and Population

Livestock Category	# of Farms	# of Animals
Goats	3,542	103,122
Sheep	4,009	731,558
Horses and Ponies	16,446	131,951
Ducks	826	956,606
Emus	207	2,051
Geese	643	7,641
Ostriches	111	3,388
Pheasants	165	170,388
Pigeons or Squab	262	168,532
Quail	109	190,102
Other Poultry	377	168,029
Bison	98	1,810
Deer	9	924
Elk	6	202
Llamas	1,022	12,059
Mules, Burros, Donkeys	693	2596
Rabbits	417	45,795

3. CONFINED ANIMAL FACILITY IMPACTS ON AIR QUALITY

Regional Ozone Attainment Status – Federal and State Exceedances

During 2001 through 2004, the highest number of exceedance days for both the State and federal 1-hour ozone standard occurred in the San Joaquin Valley Air Basin and the South Coast Air Basin. Both areas had more than 105 State ozone standard exceedance days, 9 or more federal 1-hour ozone standard exceedance days, and more than 86 exceedances of the federal 8-hour ozone standard during each of the four years. The Sacramento Metro Area, Mojave Desert Air Basin, and Salton Sea Air Basin all had more that 35 State ozone standard exceedances and more than 25 or more federal 8-hour ozone standard exceedances during the same period. The remaining five ozone nonattainment areas (Mountain Counties Air Basin, San Diego Air Basin, San Francisco Bay Area Air Basin, and the South Central Coast Air Basin) averaged from 7 to 62 State ozone standard exceedances.

Table 17 shows the local air districts designated as nonattainment of the federal ozone standard as of January 1, 2004. The table also shows the number of days above all State and federal ozone standards during the years 2001 through 2004 in each region (ARB 2005a, ARB 2005c, ARB 2005d). For all standards, the San Joaquin Valley APCD and South Coast AQMD have the greatest number of exceedance days. In these two areas in particular, all sources of air pollution produce air quality impacts and have some level of significance. In these regions, virtually all emission sources, even those that are very small, are regulated. In addition, emission sources that are very small individually, but in aggregate can produce substantial emissions, are regulated. Table 18 illustrates the magnitude of emissions from dairies relative to other facilities in the San Joaquin Valley. The larger emitting facilities, those over 5 tons per year of reactive organic gas (ROG) emissions include refineries, power plants, and manufacturing plants. The smaller facilities, those under 5 tons per year of ROG emissions, include auto body shops and gasoline service stations. Also, for comparison, based on current emission estimates one cow emits as much ROG emissions as two new cars.

Table 17. Federal 1-Hour Ozone Designation and Classification Areas as of January 1, 2004

District Name (Area Description)	Designation / Classification for Federal 1-Hour Ozone Standard	Total Days Above Ozone Standard From 2001 Through 2005		
		State 1-Hour	Federal 1-Hour	Federal 8-Hour
South Coast (South Coast Air Basin)	Nonattainment / Extreme	467	173	385
South Coast (Coachella Valley)	Nonattainment / Severe-17	216	13	176
Antelope Valley	Nonattainment / Severe-17	298	38	234
Mojave Desert (Central San Bernardino Co.)	Nonattainment / Severe-17			
San Joaquin Valley	Nonattainment / Severe-15	493	109	477
Ventura	Nonattainment / Severe-15	119	5	87
Sacramento Metro	Nonattainment / Severe-15	198	19	156
Yolo-Solano	Nonattainment / Severe-15			
El Dorado	Nonattainment / Severe-15			
Placer	Nonattainment / Severe-15			
Feather River (S. Sutter Co.)	Nonattainment / Severe-15			
Feather River (N. Sutter Co. & Yuba Co.)	Nonattainment / Sec.185A			
Kern (East Kern Co.)	Nonattainment / Serious	90	1	88
Butte	Nonattainment / Sec.185A	21	0	30
Imperial	Nonattainment / Sec.185A	103	16	40
Bay Area	Nonattainment / Other	57	4	21

* Severe 17 means that the area has 17 years to come into compliance; Severe 15 areas get 15 years.

Regions Designated as Attainment or Unclassified for the Federal 1-Hour Ozone Standard	
Attainment	
San Diego	Monterey Bay Unified
Santa Barbara	
Unclassified	
Lake	Great Basin Unified
Amador	Lassen
Calaveras	Modoc
Mariposa	Mojave Desert (East Riverside Co.)
Tuolumne	Mojave Desert (East San Bernardino Co.)
Northern Sierra	Siskiyou
Colusa	North Coast Unified
Glenn	Mendocino
Tehama	Northern Sonoma
Shasta	San Luis Obispo
El Dorado (Lake Tahoe)	South Coast (East of Coachella Valley)
Placer (Lake Tahoe)	

Table 18. Emissions from Dairies Compared to Other Regulated Facilities in the San Joaquin Valley

ROG Emissions (tons per year)	# of Other Facilities	# of Dairies
0 – 1	889	108
1 – 5	319	461
5 – 10	46	293
10 – 15	30	164
15 – 20	14	53
Greater than 20 tons	44	82

State Implementation Plan Commitments for Livestock Operations

The San Joaquin Valley APCD has a commitment in the Extreme Ozone Attainment Demonstration Plan (EOADP) that will require confined animal facilities to reduce emissions of ROG from livestock facilities. The EODAP anticipates a 10% reduction in livestock ROG emissions by 2008 and a 25% reduction by 2010 (SJV 2004a).

In the South Coast AQMD, the primary livestock emission reduction strategy is in the 2003 Air Quality Management Plan (SCAQMD 2003), and is addressed by Rule 1127 (SCAQMD 2004a). This rule applies to dairies with more than 50 cows, heifers, and/or calves. The rule, which increases in stringency over several years, requires dairies to remove and dispose of their dairy manure on a frequent basis, pave their feed lanes, and minimize excess water in corrals (SCAQMD 2004a). Rule 1127 anticipates a 45% reduction in livestock ROG and a 30% reduction in ammonia emissions by 2010.

Odor and Ammonia Emissions and Air Quality

Nearly all of the local air districts have rules prohibiting nuisance emissions, such as odors. In addition to odorous compounds, emissions of ammonia also pose air quality concerns. Ammonia contributes to the formation of ambient particulate matter, specifically ammonium nitrate or ammonium sulfate. These particles form to a varying degree in the presence of ammonia and oxides of nitrogen or sulfur. The particle formation is highly dependent on atmospheric temperature, humidity, concentrations of the precursor compounds, and other factors, so the particle formation is extremely variable and difficult to predict. Both the South Coast AQMD and San Joaquin Valley APCD sometimes have elevated ammonium nitrate levels. However, only in the South Coast AQMD has it been clearly established that reductions in ammonia levels will improve air quality. Current analysis indicates that ammonia reductions within the San Joaquin Valley APCD may improve air quality for only very limited parts of the SJV, but additional analysis is ongoing to better understand the role ammonia plays in the SJV particulate matter formation.

In addition to particle formation, there is also some concern about direct exposure to ammonia gas produced by livestock facilities or other sources. ARB staff performed a simplified modeling analysis to evaluate near-source exposure risks to ammonia. A summary of this analysis is provided in the section of this report on the Environmental Impacts of the Regulation.

Emissions from Confined Animal Facilities

The ARB and the local air districts estimate emissions from virtually all sources of air pollution. Some of the key sources of agriculturally-related air pollution include on-field land preparation and crop harvest activities, agricultural residue burning, agricultural tractors and equipment, agricultural internal combustion engines, fuel storage tanks, and livestock operations including dairies, feedlots, and poultry operations. The primary pollutants of concern for meeting ambient air quality standards and produced by the livestock industry include particulate matter (PM10 and PM2.5), ROG, ammonia, and oxides of nitrogen (NOx). Other pollutants of potential interest include toxic air contaminants, hydrogen sulfide, nitrous oxide (N2O), nitric oxide (NO), and methane.

Current Livestock Research and Emission Factors

The ARB has developed emission estimates for the livestock industry. It is important to recognize that the emission factors used to develop some of the livestock emission estimates are in a significant state of evolution, particularly for reactive organic gases (ROGs) from dairies. Dairy emissions research is ongoing by at least half a dozen researchers in California alone. As the research is completed, reviewed, and approved, the livestock emission estimates will be updated. The ARB livestock emission estimates are based on the current best available data as of March 2005. Other studies are forthcoming, but their results are not sufficiently reviewed and approved for incorporation in this report. For additional information regarding ongoing dairy emissions research, see Appendix C.

Evaluating the Range of Emission Estimates and Emission Factors

There is ongoing research that needs to be considered in the development of improved emission factors for estimating dairy ROG emissions. Table 19 shows estimated dairy emissions for different size dairies showing a range of emission factors. The range of emission factors was selected to illustrate the possible impacts of different emissions factors. To assist in evaluating the data, we have provided the dairy sizes as both number of milking cows, and an estimated number of total cows at a dairy. Based on ARB statistics and information from the dairy industry, at a typical dairy, about 65-71% of the cows may be support stock. This means that for a dairy with 1000 milking cows, on average, there may be about 1710 total cows on the dairy (using the 71% value from ARB analysis). The number of total head in Table 19 reflects this adjustment.

In computing emission estimates, it is generally accepted that cows that are not actively being milked or cows that are young produce less manure and therefore produce less net airborne emissions on a per head basis. The ranges of example emission factors shown in the table below are for an adult milking cow. The current emission factor is 12.8 pounds ROG per head per year. To provide an adjustment for the smaller cows, an emissions scaling factor was computed using manure production data for the various classifications of dairy cows (milking, dry, heifer, calf) (ASAE 2004). Based on the manure output of the various dairy animals and the animal population splits within the SJV, the base adult cow emission factor shown is multiplied to 0.66 to adjust for the less

emitting cows. This adjusted emission factor is then multiplied by the total number of cows, not just the milk cows.

Table 19. Dairy ROG Emissions Using Various Emission Factors

Dairy Size		ROG Emissions (tons/year)				Emission Factors (lbs ROG/head/year)			
# Milking Head	# Total Head	Using EF 1	Using EF 2	Using EF 3	Using EF 4	EF 1	EF 2	EF 3	EF 4
50	85	0.4	0.4	0.2	0.1	14.2	12.8	7.0	3.5
200	341	1.6	1.4	0.8	0.4	14.2	12.8	7.0	3.5
500	853	4.0	3.6	2.0	1.0	14.2	12.8	7.0	3.5
700	1,194	5.6	5.0	2.8	1.4	14.2	12.8	7.0	3.5
1000	1,705	8.0	7.2	3.9	2.0	14.2	12.8	7.0	3.5
2000	3,411	16.0	14.4	7.9	3.9	14.2	12.8	7.0	3.5
4000	6,821	32.0	28.8	15.8	7.9	14.2	12.8	7.0	3.5
6000	10,232	48.0	43.2	23.6	11.8	14.2	12.8	7.0	3.5

Estimated Statewide Livestock Emissions

Table 20 provides an estimate of the current statewide livestock emission estimates for livestock reactive organic gas (ROG), particulate matter 10 microns or less in size (PM10), and ammonia. As shown, estimates are provided for ROG and ammonia emissions for all livestock categories. PM10 data are not provided for all of the livestock categories due to lack of emissions data.

Table 20. Statewide Confined Animal Facility Emissions by Animal Type

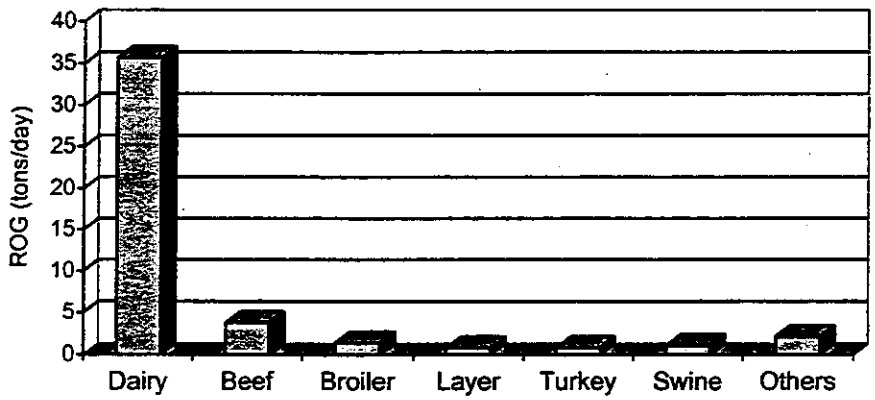
	Livestock Emissions (tons/day)		
	ROG[a]	PM10[a]	NH3[b]
Dairy	35.7	8.3	134
Beef Feedlots	3.8	11	48
Broilers	1.4	NA	22
Layers	0.8	NA	28
Turkeys	0.8	NA	23
Swine	1.1	NA	5.0
Sheep	1.1	NA	8.0
Goats	0.02	NA	0.1
Horses	1.0	NA	4.4
Statewide All Livestock Total	45.8	19	274
Statewide All Emission Sources	2479	2108	717

Notes: The base emission factor (EF) for dairy, beef, and other cattle operations is 12.8 lbs/head/year. The emissions for these categories are scaled based on manure output of various animal classes and the animal composition in the SJV. The layer, turkey, and duck EF are scaled based on the recently released broiler EF. Other EFs are from the ARB emission estimation methodology (ARB 2004a).
NA – The ARB has not yet estimated livestock emissions for these categories.

As Table 20 shows, on an overall statewide basis, non-range livestock ROG emissions are relatively small (about 2% of the total), as are PM10 emissions (about 1% of the total), and ammonia emissions are substantial (about 36% of the total). However, air pollution is a regional problem so it is also important to consider livestock emissions as they relate to regional emission sources and levels.

Figure 5 graphically shows the estimates of reactive organic gas emissions from livestock operations in California based on data and methods the ARB staff developed in 2004 (ARB 2004a).

Figure 5. California 2004 Livestock Reactive Organic Gas (ROG) Emissions



Estimated Regional Livestock Emissions

Both the South Coast AQMD and the San Joaquin Valley APCD have significant livestock populations. Table 21 shows ROG and ammonia emissions for the South Coast AQMD, the San Joaquin Valley APCD, and other local air districts. Particulate matter emissions from livestock are not shown here, but are estimated for some of the livestock categories. Dairy emissions are shown independently from other livestock emissions because they have some of the larger emission estimates and because there has been higher interest in dairies versus the other livestock categories. Appendix G provides a summary of major ROG sources in the San Joaquin Valley.

As Table 21 shows, the quantity of livestock ROG emissions in the South Coast AQMD are relatively small compared to the overall ROG emissions in the District. However, the South Coast AQMD is designated as an extreme ozone nonattainment area as of January 1, 2004. Because of the significant air quality problems in this region, all sources of emissions are important and warrant some level of emissions reduction. All of the sources in total must be considered, and the South Coast AQMD recognized this by requiring dairies that have 50 or more head to comply with local air district emissions mitigation rules (SCAQMD 2004b).

The San Joaquin Valley APCD was designated as a severe federal one-hour ozone nonattainment area as of January 1, 2004 and the ROG emissions from livestock

operations are more substantial. As an important source of air pollution, the majority of livestock facilities must begin to reduce their emissions. Within the SJV, even if the livestock emission estimates were cut in half, the emissions levels in aggregate are still significant and need to be considered in a strategy to improve the regional air quality. Without mitigation, livestock emissions will continue to grow while emissions from other ROG source categories will decrease as new emission standards are implemented.

The remainder of Table 21 shows livestock emissions of ROG for local air districts, sorted by dairy ROG emissions. Table 22 shows ammonia data.

Table 21. Livestock ROG Emissions for 2004

Air District	ROG (tons/day)			% of ROG Contributed by Livestock
	All ROG Sources	Dairy	Other Livestock	
San Joaquin Valley APCD	368.4	23.5	5.5	7%
South Coast AQMD	773.3	4.6	0.7	1%
Imperial County	30.2	3.3	1.9	16%
Bay Area	411.7	0.7	0.3	0%
Monterey Bay Unified	72.9	0.5	0.1	1%
Sacramento Metropolitan	69.7	0.4	0.1	1%
North Coast Unified	31.4	0.4	0.0	1%
Northern Sonoma County	12.0	0.3	0.1	4%
Glenn County	9.6	0.3	0.0	4%
Feather River	20.0	0.2	0.0	1%
Tehama County	8.5	0.2	0.0	3%
San Diego County	194.9	0.2	0.2	0%
San Luis Obispo County	26.7	0.2	0.1	1%
Santa Barbara County	44.4	0.2	0.1	0%
All Other Districts	405.1	0.9	0.9	0%
Statewide Total	2478.7	35.7	10.1	2%

Notes: The base emission factor (EF) for dairy, beef, and other cattle operations is 12.8 lbs/head/year. The emissions for these categories are scaled based on manure output of various animal classes and the animal composition in the SJV. The layer, turkey, and duck EF are scaled based on the recently released broiler EF. Other EFs are from the ARB emission estimation methodology (ARB 2004a).

Table 22. Livestock Ammonia Emissions for 2004[a]

Air District	Ammonia Emissions (tons/day)			% of Ammonia Contributed by Livestock
	All Ammonia Sources	Dairy	Other Livestock	
San Joaquin Valley APCD	235.0	85.96	80.51	71%
South Coast AQMD	109.6	14.06	15.53	27%
Imperial County	174.3	13.62	22.43	21%
Bay Area	47.5	2.67	3.54	13%
Monterey Bay Unified	11.9	2.00	1.77	32%
Sacramento Metropolitan	11.1	1.54	2.45	36%
North Coast Unified	4.2	1.47	0.16	39%
Northern Sonoma County	7.7	1.39	1.89	43%
Glenn County	4.0	1.36	0.16	38%
Feather River	4.3	0.81	0.25	25%
Tehama County	2.2	0.76	0.23	45%
San Diego County	24.4	0.67	4.21	20%
San Luis Obispo County	5.5	0.67	0.43	20%
Santa Barbara County	5.8	0.65	0.52	20%
All Other Districts	70.7	3.45	9.50	18%
Statewide Total	718.1	131.1	143.6	38%

[a]Source: ARB 2005a based on Environ 2002, and ARB methods.

Existing Regulations Applicable to Confined Animal Facilities

Local Air Districts

Several local air districts are already in the process of regulating emissions from the livestock industry. In the Joaquin Valley APCD, District Rule 4550 defines agricultural Conservation Management Practices (CMPs) for livestock particulate matter dust control. Facilities subject to the rule include agricultural operations over 100 acres and animal feeding operations with

- 500 or more mature dairy cows;
- 190 or more cattle other than milking cows or veal calves;
- 55,000 or more turkeys;
- 125,000 or more chickens, other than laying hens; or
- 82,000 or more laying hens.

The rule requires facility operators to implement a variety of options to reduce particulate matter in the areas of manure handling, feed handling, unpaved road, land preparation, harvesting, unpaved road dust, and other emission sources (SJV 2004a). In addition, livestock facilities within the San Joaquin Valley APCD that produce more than 12.5 tons per year of ROG are required to get permits. Using current emission estimates, this would include:

- Farming operations with 350 or more contiguous acreage irrigated using internal combustion engines,
- Dairy operations with 1,954 or more cattle,
- Feedlot operations with 3,086 or more heifers, or
- A broiler, laying hen, or turkey ranch with 130,211 or more birds

The San Joaquin Valley APCD is also in the process of developing Rule 4750, which will require large confined animal facilities to obtain permits and specify requirements for reducing emissions of ROG from livestock facilities. The District is now in the process of holding public workshops to gather input on the rule (SJV 2005b). This rule anticipates a 10% reduction in livestock ROG emissions by 2008 and a 25% emissions reduction by 2010.

In the South Coast AQMD, the primary livestock regulation is Rule 1127. This rule applies to dairies with more that 50 cows, heifers, and/or calves. The rule, which increases in stringency over several years, requires dairies to remove and dispose of their dairy manure on a frequent basis, pave their feed lanes, and minimize excess water in corrals (SCAQMD 2004b). Rule 1127 anticipates a 45% reduction in livestock ROG and a 30% reduction in ammonia emissions by 2010. In addition, South Coast AQMD Rule 403 for fugitive dust control is undergoing revisions that will include some commercial poultry ranches in the District.

Finally, Imperial County Air Pollution Control District has Rule 420 for livestock dust control (Imperial 2002). The rule requires any person using or operating a livestock feed yard to prepare a dust plan containing procedures for assuring a moisture content

between 20% to 40% for manure in the top three inches of occupied pens, and provide an outline of manure management practices, including manure removal plans.

U.S. Environmental Protection Agency

Under the United States Clean Water Act, the United States Environmental Protection Agency (U.S. EPA) requires confined animal feeding operations that produce discharges to water to apply for a National Pollutant Discharge Elimination System (NPDES) permit. Facilities above a specified size, for example 700 adult cows for dairies or 135,000 chickens for broiler ranches, are required to develop and implement a nutrient management plan identifying manure management practices. (EPA 2003). These plans and associated permits are administered by the California Regional Water Quality Control Boards.

State Water Resources Control Board

California's Regional Water Quality Control Boards (RWQCBs) imposes waste discharge requirements for individual livestock facilities. Violations of these requirements can lead to enforcement actions and facilities may be required to prepare a Report of Waste Discharge. The RWQCBs are also responsible for the implementation and enforcement of the requirements of the U.S. EPA confined animal feeding operation regulations mentioned previously.

4. BASIS FOR THE STAFF'S PROPOSED REGULATION

Overview

This section provides a discussion of how staff developed the recommended definition for large confined animal facilities (large CAFs). The definition is based on livestock emissions, how those emissions contribute to regional air pollution, and the need to include most of the livestock in the definition to provide the necessary scope to substantially reduce the emissions where feasible and cost effective. ARB's definition of a large CAF is only the first step in the SB 700 process. Following our definition, local air districts with large CAFs must then develop a rule that requires the facility operators to develop and submit emission mitigation plans. SB 700 requires that local air districts assess and consider in a public hearing the costs and technical feasibility of any proposed rule, among other requirements.

Large Confined Animal Facility Definition (Section 86500)

The basis for defining large confined animal facilities at a certain threshold or headcount is the understanding that it is necessary to reduce airborne emissions from the majority of animals in livestock facilities, particularly in regions with significant air quality problems. The definition is designed to address the combined, aggregate air quality impacts of the livestock industry in California, with an emphasis on the San Joaquin Valley. We did not take an individual facility emissions approach in defining a large CAF because it is impractical and uncertain, in part due to the developing state of livestock emissions estimation research. At this time, facility emissions are calculated on a per animal basis pending completion and peer review of research on specific emission rates for various processes at a facility. Also, even if more comprehensive process-based emission factors were available, we would still take the head count approach in order to provide certainty in terms of the definition's applicability. This approach provides a clear, consistent, equitable, and predictable large CAF definition. Other approaches considered have significant shortcomings for both the livestock industry and the local air districts responsible for developing rules to regulate the industry. Alternative options are discussed fully later in the report.

The thresholds chosen take into account population and operation information that highlight natural breaks in the distribution of facility sizes. These thresholds allow most of the animals to be included, while minimizing the number of facilities affected. The thresholds for all the livestock categories are also scaled to be approximately equivalent in terms of facility emissions.

Ozone Nonattainment Areas

After consideration of the types and numbers of facilities involved, in order for regions with the poorest air quality to meet their air quality goals and State Implementation Plan commitments, a majority of the livestock emissions need to be brought into the regulatory framework. This does not necessarily mean that a majority of the facilities will be regulated, but instead that most of the animals and their associated emissions will be included. Our proposal does this while minimizing the total number of affected livestock facilities. We are also proposing that the definition be less stringent in those

areas in which there are less significant air quality problems. These are the areas designated as attainment for the federal 1-hour federal ozone standard as of January 1, 2004. The details and complete rationale for each large confined animal facility definition by livestock category are provided on the following pages.

Table 23 provides the specific recommended definitions for large confined animal facilities. Facilities that have or exceed the specified number of animals on any day would be considered "large" confined animal facilities. In addition, separate thresholds are defined for those areas in which livestock operations are not significant sources of regional air emissions, and where emissions reductions from livestock operations are not necessarily needed to meet federally mandated air quality requirements. However, SB 700 provides mechanisms for local air districts to provide more stringent requirements if needed to meet other air quality goals.

Table 23. Large Confined Animal Facility Definition by Livestock Category

	Facilities at or Exceeding Threshold are Considered Large	
Livestock Category	**Nonattainment Areas***	**Attainment Areas***
Dairy	1,000 milk producing cows	2,000 milk producing cows
Beef Feedlots	2,500 beef cattle	5,000 beef cattle
Other Cattle Operations	7,500 calves, heifers, or other cattle	15,000 calves, heifers, or other cattle
Chickens -- Broilers	650,000	1,300,000
Chickens -- Egg Layers	650,000	1,300,000
Turkeys	100,000	200,000
Swine	3,000	6,000
Sheep and Goats	15,000	30,000
Horses	2,500	5,000
Ducks	650,000	1,300,000
Rabbits, Pheasants, Llamas, Others	30,000	60,000

*Federal 1-hour ozone designation as of January 1, 2004

In the next phase in the SB 700 large CAF process, local air districts will develop rules that take into account specific information related to facility sizes, practices, and other factors (as specified in HSC 40724.6 second (d)). We also expect that livestock facilities will be provided with a variety of reasonable and cost effective options for reducing emissions, and the facility operators will be able to select from the available options those practices or technologies that are the most effective and applicable to their unique situations. Appendix D provides some additional discussion about ongoing activities to identify effective processes and technologies that can be used to reduce livestock emissions.

This facility threshold approach, which is based on a fixed parameter (in this case number of head), and which varies by region, is consistent with other regulations to reduce air pollution. For another example, a rule to reduce boiler emissions is based on a size of 5 million BTU/hour, and internal combustion engine rules are based on engine

size range such as engines over 50 horsepower. In both these cases, the criteria for determining if the source is regulated are based on the size of the process, and not specifically the emissions. Also, the San Joaquin Valley APCD, when adopting Rule 4550, based the animal feeding operation sizes on capturing more than 70 percent of the animal populations (SJV 2004a). Due to many factors, the headcount based approach, which addresses the majority of the livestock emissions, is the most beneficial, reasonable, and effective method for defining large confined animal facilities.

One other consideration in establishing proposed facility size cuts was whether the natural break points resulted in equitable treatment between the different livestock categories. As Table 24 shows, the proposed thresholds generally result in similar amounts of emissions from the different types of livestock facilities, based on current emission estimates.

Table 24. Livestock Facility Emissions at Proposed Size Cuts

	Nonattainment Areas		Attainment Areas	
Livestock Category	Head	ROG (tons/year)	Head	ROG (tons/year)
Dairy	1,000 milking cows	7.2	2,000 milking cows	14.4
Beef Feedlots	2,500	6.9	5,000	13.8
Other Cattle Operations	7,500	8.0	15,000	15.9
Chickens -- Broilers	650,000	8.1	1,300,000	16.1
Chickens -- Egg Layers	500,000	6.2	1,000,000	12.4
Turkeys	100,000	3.2	200,000	6.4
Swine	3,000	6.9	6,000	13.8
Sheep	15,000	7.2	30,000	14.4
Goats	15,000	7.2	30,000	14.4
Horses	2,500	8.4	5,000	16.8
Ducks	650,000	8.1	1,300,000	16.2

Notes: The base emission factor (EF) for dairy, beef, and other cattle operations is 12.8 lbs/head/year. The emissions for these categories are scaled based on manure output of various animal classes and the animal composition in the SJV. The layer, turkey, and duck EF are scaled based on the recently released broiler EF. Other EFs are from the ARB emission estimation methodology (ARB 2004a).

Ozone Attainment Areas

Some regions within California have minimal livestock industries relative to other emission sources. The areas of the State that are attainment for the federal ozone standard as of January 1, 2004, fall in this category. In these regions, we recommend a head count of 2,000 or more milking cows on any day necessary to trigger the large threshold for dairies, with equivalent head counts for other livestock categories. This approach captures the very largest livestock facilities throughout the State, while reducing unnecessary burdens on livestock facilities in those regions where air emissions from the livestock industry are less critical to ozone attainment or maintenance. This approach in no way limits the local air districts' ability to regulate their livestock facilities more completely if warranted on a case-by-case basis. SB 700 includes provisions that allow the local air districts to develop more stringent livestock requirements than the State large CAF thresholds (HSC 40724.6(i), 40724.7(b)).

Basis for Dairies

Because of the structure of the dairy industry, developing a large CAF definition for dairies is more difficult than the other livestock categories. Unlike most of the other livestock facilities in California in which nearly all of the animals are concentrated in a small number of relatively large facilities, the dairy industry has significant numbers of dairies in a variety of size ranges. Returning to Figure 4, the charts show that the majority of California cows are in dairies in the South Coast AQMD and the San Joaquin Valley APCD. About 93% of California's dairy cows are in these two regions. As of January 1, 2004, the South Coast AQMD was classified as an extreme nonattainment area for the federal one-hour ozone standard and the San Joaquin Valley APCD was classified as severe, so both regions have significant air quality problems. In these two regions combined, about 90% of the cows are in dairies over 500 head, which includes about 65% of the total dairies (dairies <50 head excluded). The remaining 7% of California's dairy cows are outside of these areas, with about 4% in 89 dairies that have 500 or more milk cows. (USDA 2004).

For dairies, we recommend that facilities with 1,000 or more milking cows on any day be defined as large CAFs in areas designated as nonattainment for ozone as of January 1, 2004. This would mean that in the area with the most milking cows, the San Joaquin Valley, the majority of the cows and their emissions (about 72%) would be captured, while impacting the smallest number of facilities (430, around 36% of all dairies with 50 or more milking cows). Moving to a smaller size, such as 700 milking cows, brings in 37% more dairies but only 17% of additional emissions. Moving to a larger size, such as 2,000 milking cows would only capture around 39% of the emissions.

The definition of 1,000 head is designed to include only the milking cows. As mentioned previously, most dairies within California still include support stock on site such as calves and dry cows, increasing the total number of animals on site. The trend is towards moving the support stock off of the milking dairy to maximize land use so that the dairy operator can focus on the primary business of producing milk. We have deliberately not included the support stock in the large CAF definition for the following reasons:

1) The regulation is substantially simplified and clarified because a cow conversion calculator is not needed to determine how many calves, or heifers, or dry cows equal a milking cow;
2) Most dairy facilities will have exact information about the number of cows they milk at any time, but the number of support stock can fluctuate and may be tracked less completely;
3) Historically, a typical dairy includes about 50-75% support stock, meaning that a 1,000 head dairy may include about 1,500 to 1,750 total animals present. By nature of their diet and size, these support animals produce substantially less manure than milking cows, and will produce lower emissions than milking cows at a dairy;
4) Using a definition of 1,000 milking head, and not explicitly including the support stock in no way diminishes the effectiveness of the definition; the vast majority of the milking cows are included while minimizing impacts on the industry;
5) Local air district emissions mitigation rules will apply to all components of the dairy, including support stock. The support stock are only excluded for determining the large definition, but not intended to be excluded in required emission mitigation plans.

For all of these reasons, the large CAF definition for dairies is based on the number of milking cows at the dairy.

As mentioned, in parts of the State other than the SJVUAPCD and SCAQMD, there are only 89 dairies that have over 500 head of cows, making up about 4% of the total dairy herd. These remaining dairies are primarily distributed in Sonoma, Glenn, Sacramento, San Diego, Marin, Humboldt, Tehama, and Yuba counties. In general, because there are a small number of these remaining dairies and they are widely dispersed, they are less likely to have significant impacts on regional air quality. For this reason, in areas that are attainment for the federal ozone air quality standard as of January 1, 2004, the definition for large CAFs is less stringent because these regions do not currently have the same urgency to begin the process of reducing livestock emissions. This approach also reduces regulatory burdens on existing facilities in these regions, but ensures that new large dairies would not be sited in areas for the express purpose of avoiding permitting and emissions mitigation plans required under SB 700. Therefore, for parts of the State designated as attainment areas for ozone as of January 1, 2004, dairies with 2,000 or more milking cows on any day are considered large CAFs. Also, note that under the authority of SB 700, the ARB definition of large confined animal facilities does not restrict local air districts from using more stringent definitions than the ARB develops.

Basis for Beef Feedlot Cattle

For beef feedlots, we recommend that facilities with 2,500 or more head on any day be defined as large CAFs in areas designated as nonattainment for ozone as of January 1, 2004. The majority of the cattle and their emissions (about 95%) would be captured, while impacting the smallest number of facilities (16, or only ~3% of all beef

feedlot operations). Moving to a smaller size, such as 1,000 head, brings in 19% more feedlots but only 1% of additional emissions. In keeping with the rationale for dairies, in attainment areas for the 1-hour ozone standard, the feedlot large CAF definition is 5,000 head or greater on any day. This definition brings in the vast majority of the feedlot cattle while excluding the large number of smaller facilities.

Basis for Other Cattle Operations

For the category of Other Cattle Operations, we recommend that facilities with 7,500 or more calves, heifers, or other cattle on any day be defined as large CAFs in areas designated as nonattainment for ozone as of January 1, 2004. In other regions of the State, the recommended definition is 15,000 or more calves, heifers, or other cattle on any day. There is very little information regarding the number and size of Other Cattle Operations. These operations generally exist to support the dairy and beef industries, so the animals often end up getting tabulated within these industries and are not clearly identified. Nevertheless, there are facilities that raise cattle that are not explicitly defined as dairies or feedlots. This Other Cattle Category is defined to include those facilities.

With the lack of facility information, it was not possible to identify the size of an Other Cattle facility that would include a specified number of animals in the large CAF definition. Instead, to ensure equity between the Other Cattle Operations and the dairy and feedlot operations, we compared manure output for the various types of animals. These Other Cattle facilities include a variety of animals ranging from calves that produce as little as 8 pounds of manure per day, to larger heifers that can produce up to 48 pounds of manure per day – ARB staff uses a figure of roughly 25 pounds of manure per head. This value is 2.6 times smaller than the manure produced by a beef cow (64 lbs/day) (ASAE 2004).

Scaling from the feedlot definition of 2,500 head to an Other Cattle definition, a value of around 7,500 head is obtained, based on the ratio of 64 to 25 pounds of manure per day. Thus, a definition of 7,500 or more head on any day was used in the nonattainment regions and 15,000 or more head on any day in other areas to ensure equity with other livestock categories under the large CAF definition.

Basis for Poultry

Broilers: For broiler chicken facilities, we recommend that facilities with 650,000 or more broiler chickens on any day be defined as large CAFs in areas designated as nonattainment for ozone as of January 1, 2004. A threshold of 1,300,000 or more head on any day is recommended for the remainder of the State. About 62% of the broiler chickens are in the 24 facilities (30%) with 650,000 or more chickens. Moving to a smaller size, such as 300,000, brings in 116% more facilities but only 45% of additional chickens. In addition, the majority of the facilities with 650,000 or more chickens are of the more modern tunnel-ventilated design houses, which can be more effectively updated to reduce emissions than the older style naturally ventilated houses used for most of the smaller facilities. Moving to a larger size, such as 1,000,000, only excludes 4 facilities, while excluding 13% of the broiler chickens.

Layers: For layer chickens, we recommend a threshold of 650,000 or more head on any day for the ozone nonattainment areas, and 1,300,000 or more head on any day for the remainder of the State. This definition would include about 58% of the layers and 12% of the total 97 layer facilities. Moving to a smaller size, such as 100,000, brings in 266% more facilities but only 54% of additional emissions. Raising the definition to 1,000,000 for the ozone nonattainment areas includes slightly fewer facilities and chickens. However, because the average layer facility size based on USDA data is about 480,000 head, we felt it best to not raise the level above 650,000.

Turkeys: For turkeys, we recommend a threshold of 100,000 or more head on any day for the ozone nonattainment areas, and 200,000 or more head on any day for the remainder of the State. This definition would include about 59% of the turkeys and 33% of the total 93 turkey facilities. Moving to a smaller size in the ozone nonattainment areas, such as 50,000, brings in 92% more facilities but only 54% of additional emissions. Moving to a larger size, such as 200,000 turkeys, would result in only 20% of the turkeys being included.

Basis for Other Livestock

For swine, the basis for determining large facilities is very similar to feedlots. Based on the earlier discussion of the hog industry, it is clear that a definition in the range of 2,000 to 5,000 head would capture the majority of the swine and their emissions (about 75%) while impacting the smallest number of facilities (4 to 6). Within the range specified, we have selected 3,000 or more head on any day as the large CAF threshold for areas designated as nonattainment for ozone as of January 1, 2004. In other areas of the State, the swine large CAF definition is 6,000 head or greater on any day. This definition brings in the vast majority of the hogs while excluding the large quantity of small and very small facilities that have only 25% of the remaining hogs widely dispersed throughout the State.

For the other animal classes, information is not readily available regarding the size distributions of the various facilities. However, the total number of animals in these other classifications is relatively minor compared to the beef and dairy facilities. So, it is important to set definitions for these animal classes, and a requirement under SB 700, but the air quality impact of these other facilities is expected to be extremely small compared to the major livestock classifications.

To help set large CAF definitions for the other animal types, we evaluated animal manure generation rates. Referring to Table 25 (ASAE 2005), horses produce about the same quantity of manure as beef feedlot cows. On average, horses produce around 56 pounds of manure per head per day and feedlot cows produce 64 pounds of manure per head per day. Although the digestive processes, feed, and waste characteristics are different for these two animals, for the purposes of defining large CAFs, the similarities are sufficient to use the same definition for both horses and feedlots. Therefore, the large CAF definition for horses is 2,500 or more head on any day in ozone nonattainment areas, and 5,000 or more head on any day in other parts of the State.

Table 25.
Livestock Manure Production

	Manure Production (lbs/head/day)
Lactating Cow	150
Dry Cow	83
Calf	8 to 19
Heifer	19 to 48
Beef Cow	64
Broiler	0.23
Layer	0.19
Turkey (male)	0.59
Turkey (female)	0.31
Duck	0.36
Swine	10
Horse	56

Because the quantity of duck manure output is relatively similar to broiler chicken manure output, the recommended large CAF definition for ducks is set to agree with the broiler chicken definition.

Manure output data was not located for sheep or goats. Instead, adult sheep and goats both weigh in the range of about 150 pounds. A beef cow weighs about 1,000 pounds (Penn State). Dividing the beef cow weight by the sheep and goat weight, we see that beef cattle are about 6 times heavier than sheep and goats. Making the assumption that animal weight has some relation to manure output, and further, assuming that manure output is related to the magnitude of air emissions, we can develop a large CAF definition for the sheep and goats. Using this information, we have defined a large CAF for sheep and goats as 15,000 or more head on any day in ozone nonattainment areas, and 30,000 or more head on any day in all other parts of the State. This value is effectively six times the beef cow definition to reflect the differences in animal weights.

For the other animal classes such as emus, geese, ostriches, pheasants, pigeons, squab, quail, bison, deer, elk, llamas, mules, burros, donkeys, gerbils, rabbits, or other animals raised in confined animal facilities, a size of 30,000 or more animals on any day is defined as a large CAF in ozone nonattainment regions. The large CAF definition for these animals is 60,000 or more animals on any day in all other parts of the State. Based on the information provided previously in Table 16, it appears extremely unlikely that facilities with these types of animals California will exceed these thresholds, which is appropriate considering the small number of animals, the small facilities, and the minor ambient air quality impacts they are likely to produce.

Recordkeeping and Reporting Requirements (Section 85601)

Beginning on January 1, 2006, a facility that is defined as a large confined animal facility under this proposed rulemaking shall be required to keep records that specify the daily number of animals maintained at the facility. The large CAF operator will be required to keep these records on site and readily accessible, and will submit these records to the local air districts consistent with compliance schedules set forth in any applicable local air district regulations. Most large confined animal facility operators already keep daily feed records and other information that would allow them to readily comply with this requirement.

5. ENVIRONMENTAL IMPACTS OF THE REGULATION

Air Quality and Environmental Impacts

California Environmental Quality Act Analysis

The California Environmental Quality Act (CEQA) and ARB policy require an analysis to determine the potential adverse environmental impacts of proposed regulations. Because the ARB's program involving the adoption of regulations has been certified by the Secretary of Resources (Public Resources Code, Section 21080.5, Exemption of specified regulatory programs), the CEQA environmental analysis requirements are allowed to be included in the ARB Staff Report (i.e. the Initial Statement of Reasons) in lieu of preparing an environmental impact report or negative declaration. In addition, the ARB will respond in writing to all significant environmental points raised by the public during the public review period or at the Board hearing. These responses will be contained in the Final Statement of Reasons for the regulation.

Staff evaluated the potential environmental impacts from the proposed regulation and determined that no significant adverse environmental impacts are likely to result from the proposal. This determination was made because the proposed regulation simply specifies a threshold by which a confined animal facility is considered "large", with no direct environmental impacts resulting from this action. However, the regulation will trigger actions by local air districts that should have a positive air quality impact. This is because large confined animal facilities as defined by this proposed regulation will be required to submit information that the district determines is necessary to prepare an emissions inventory of all regulated pollutants and to prepare and submit an emissions mitigation plan that identifies the emissions reduction strategies the facility will use to reduce emissions. The impact of these requirements is not currently quantifiable because the environmental benefits will depend on regulatory approaches developed by each local air district as a result of the adoption of their large CAF regulation. The local air districts will be required to perform their own environmental analyses when adopting the rules, thus ensuring that the requirements of the California Environmental Quality Act are met.

Discussion of Other Environmental Impacts of Livestock Facilities

Confined animal feeding operations can have potential environmental impacts on air, water, and soil. In addition, some animal feeding operations can create odor and fly impacts that can cause nuisance problems. Most confined animal facilities have several potential pathways for creating environmental impacts. Some of the key air emissions pathways include the treatment, decomposition, distribution, and disposal of the animal's wastes, emissions from equipment used at facilities, emissions produced directly by the animals, and other facility activities.

In general, the largest sources of air and water environmental impacts from confined animal facilities are due to the animal waste products. These products include excreted manure and urine, and can also include gaseous emissions directly from the animal. An average milking dairy cow produces between 80 to 150 pounds of manure per day. For a confined animal facility, substantial quantities of feed are brought to a single

location. This feed contains a variety of nutrients that are provided to the animals. Those nutrients and other components that are not utilized by the animal are excreted as wastes. The wastes are stockpiled within animal feeding operations and are periodically disposed of or otherwise utilized. Nitrogen compounds in the waste can provide valuable plant nutrients, but they can also produce ammonia gas and nitrates, which can have negative air and water quality impacts. Organic material in livestock waste is consumed by microbes that can produce a mix of volatile organic gases that can contribute to ozone formation. Salts in the livestock wastes can create soil and water problems.

Discharges of livestock wastes to water and land have historically been regulated within California to mitigate some of the environmental impacts of these activities. Until recently, the airborne emissions from livestock operations had been unregulated within the State. In part, this is because there was not a clear recognition of the potential significance of livestock emissions. However, as we continue progress in improving air quality, it important that all sources of air pollution, including livestock, are included in the regulatory framework. Throughout the State, emissions controls have become increasingly more stringent on currently regulated sources of air pollution such as factories, vehicles, consumer products, coatings, and other sources. To meet State and federally mandated requirements to improve air quality, emissions from all air pollution sources must be reduced whether they are large or small, industrial or agricultural, individually or in aggregate.

Environmental Justice

State law defines environmental justice as the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies (Senate Bill 115, Solis; Stats 1999, Ch. 690; Government Code § 65040.12(c)). The Board approved Environmental Justice Policies and Actions on December 13, 2001, to establish a framework for incorporating environmental justice into the ARB's programs consistent with the directives of State law. The policies subsequently developed apply to all communities in California, but they recognize that environmental justice issues have been raised more in the context of low income and minority communities, which sometimes experience higher exposures to some pollutants as a result of the cumulative impacts of air pollution from multiple mobile, commercial, industrial, areawide, and other sources.

Actions of the ARB, local air districts, and federal air pollution control programs have made substantial progress towards improving the air quality in California. However, some communities continue to experience higher exposures than others because of the cumulative impacts of air pollution from multiple sources. Adoption and implementation of this proposal will have no negative environmental impacts on environmental justice communities. Local air districts rules for large CAFs should result in air quality benefits for all residents in those local districts. In addition, to ensure that everyone has had an opportunity to stay informed and participate fully in the development of the large confined animal definition, staff has held workshops throughout the State, provided

opportunities to participate in meetings by videoconference and phone, widely distributed all materials, and maintained consistent contact with interested community and environmental representatives.

Livestock Ammonia Analysis

At several of our SB 700 Large CAF workshops, concerns were raised regarding exposure to gaseous ammonia emitted by dairies. To evaluate the potential significance of these emissions, ARB staff performed a simplified modeling analysis of dairy ammonia emissions. Using average meteorology for Fresno and assuming emissions of 74 pounds of ammonia per cow per year, a dairy size of 500 meters square, and 1,000 cows, on an annual average basis, ammonia concentrations of 1 to 5 micrograms/cubic meter (ug/m^3) might be observed. The Office of Environmental Health Hazard Assessment (OEHHA) ammonia health threshold for chronic exposure is 200 ug/m^3 (OEHHA 2005). Based on this, it would require a dairy size of 40,000 to 200,000 head to reach the chronic exposure level. There are no existing California dairies of this size.

This regulation does not directly address the potential impacts of ammonia emissions from multiple facilities that might be situated in close proximity to residential communities, schools, or other sensitive land uses. However, local air districts have the authority to address any such issues within their jurisdictions.

6. ECONOMIC IMPACTS OF THE REGULATION

Sections 11346.3 and 11346.5 of the Government Code require State agencies to assess the potential for adverse economic impacts on California business enterprises and individuals when proposing to adopt or amend any administrative regulation. The assessment shall include a consideration of the impact of the proposed regulation on California jobs, business expansion, elimination, or creation, and the ability of California business to compete.

State agencies are required to estimate the cost or savings to any State or local agency, and school districts. The estimate is to include any nondiscretionary cost or savings to local agencies and the cost or savings in federal funding to the State.

In developing any new regulatory program, it is important to ensure that any economic burdens on the industry are consistent with the environmental benefits that may be ultimately achieved. In addition, the livestock industry within California provides thousands of jobs and other benefits to the State, so it is important to maintain a vital California livestock industry while working to reduce the industry's air quality impacts.

For those facilities that are defined as large under the SB 700 large confined animal facility definition, there will be ultimately be additional costs to facilities to reduce their emissions. However, the large CAF definition itself does not impose any direct costs. The direct costs will occur in subsequent phases of the regulatory implementation as local air districts determine which emissions mitigation practices are reasonable and effective for "large" livestock operations, and the facilities develop and comply with emission mitigation plans that are consistent with local air district rules. As the local air districts develop their large CAF rules, they are required pursuant to SB 700 to perform an assessment of the impacts of the rule or regulation to include: the number and size of the affected sources, the nature and size of emissions, the emissions reduction potential, impacts on employment, probable costs, availability and cost effectiveness of alternatives, and the technical and practical feasibility of new rules and requirements.

Although a comprehensive cost analysis is not appropriate for this document, it is clear that as local air districts develop their large CAF rules, a relatively minor new cost to facilities will be additional permitting and administrative fees. Costs that are more significant may be incurred for improvements in waste facility management and other practices needed to reduce air emissions. In some cases, these costs may be relatively minimal if the facility has already incorporated much of the best available management practices. In other cases, costs could be substantial, ranging from tens to hundreds of thousands of dollars or more for some potential control technologies.

In developing the large CAF definition, the ARB staff has attempted to minimize future economic impacts to the extent feasible while still ensuring the most complete options for improving air quality. To minimize unnecessary economic burdens, we have focused the definition on those livestock facilities that include the vast majority of the animals and their associated aggregate emissions. This approach excludes most of the

facilities that are clearly small and are typically less capable of absorbing the costs of emissions mitigation regulations. In addition, the recommended large CAF definition is described based on facility animal counts, which definitively excludes the smaller facilities from being defined as "large" which could occur if the definition were based on facility process-based emissions. We have also developed a definition that excludes the vast majority of facilities from regulation in those areas where livestock emission reductions may be necessary to meet air quality goals.

7. ALTERNATIVES TO THE PROPOSED REGULATION

No alternatives considered by the agency would be more effective in carrying out the purpose for which the regulation is proposed or would be as effective or less burdensome to affected private persons than the proposed regulation. The staff evaluated various alternatives to the current proposal. A description of the alternatives considered and staff's rationale for finding them unsuitable follows below.

Take No Action

ARB is required under State law (HSC 40724.6(a)) to adopt a definition of large confined animal facility by July 1, 2005, so taking no action is not allowable under State law.

Base the Large CAF Definition on Facility Emissions

One approach discussed during the development of this regulation was to have a definition based on individual facility emissions at one-half the applicable emissions threshold for a major source. The rationale behind this approach is that it would be consistent with permitting requirements outlined in SB 700 (HSC 40724.6(c)). For the San Joaquin Valley APCD, the permitting threshold under SB 700 for a large confined animal facility is 12.5 tons per year of reactive organic gases (ROG), and in the South Coast AQMD, the permitting threshold under SB 700 is 5 tons per year of ROG. Most other areas of the State have permitting thresholds under SB 700 for large confined animal facility of 50 tons per year of ROG.

One of the key shortcomings of the approach is that the definition would be based on a foundation that is undergoing significant change – the data and methods used to estimate livestock emissions. Several million dollars of livestock emissions research is ongoing in California. From the preliminary livestock emissions research now available, the range of measured emissions estimates is substantial. This work will continue over the next several years to continue refining and better understanding livestock emissions. An important finding from this research is that there are measurable amounts of reactive organic gas emissions coming from confined animal facilities and that there are many different kinds of reactive organic gas compounds being emitted. As this report is being written, the San Joaquin Valley Dairy Permitting Advisory Group (DPAG) is working to identify a dairy ROG emission factor and ARB is evaluating ongoing research. The current emission factor is 12.8 lbs/head/year. The estimates under consideration by the DPAG are higher and lower than this estimate.

We did not take an individual facility emissions approach in defining a large CAF because it is impractical and uncertain, in part due to the developing state of livestock emissions estimation research. At this time, facility emissions are calculated on a per animal basis pending completion and peer review of research on specific emission rates for various processes at a facility. Also, even if more comprehensive process-based emission factors were available, we would still take the head count approach in order to provide certainty in terms of the definition's applicability.

To further illustrate, Table 26 shows the number of animals that would trigger the "large" definition using the current livestock emission estimates and an emissions threshold of 12.5 tons per year of ROG. The table only shows reactive organic gases, but is it possible that ammonia and particulate matter could also be considered in an emissions based definition. Using this approach, a facility operator would need to first estimate their overall emissions, ensuring that they were using approved emissions data. If they exceed the threshold, they would be considered large. If the emissions data are updated, or if there are changes to the facility that would affect emissions, the facility operator would need to recalculate their emissions and reevaluate if they are considered large under the new scenario. This would place a tremendous workload burden on local air districts, as they would need to expend considerable resources evaluating each facility on a case-by-case basis.

As shown, using facility specific emissions as a basis for defining large confined animal facilities creates uncertainties for local air districts, industry, and other stakeholders. It would also spur continuous debates regarding the "best" emissions data. A facility emissions based approach also creates unpredictability in the planning processes for developing State Implementation Plans for meeting air quality standards, and could create potential economic and competitive inequities between larger (generally newer) and smaller (generally older) livestock facilities. Finally, unless an emissions threshold lower than 12.5 tons per year of ROG were used for a facility emissions definition, significant portions of the dairy industry and their associated emissions will remain unregulated in California.

One argument made on behalf of the facility emissions approach is that it would allow the livestock industry to be regulated like other agricultural industries. However, the livestock industry is being treated like other agricultural operations. SB 700 requires all agricultural sources to mitigate their emissions, not just livestock facilities. Local air districts with significant air quality problems are required to identify and implement reasonable and cost effective emission reductions from all agricultural sources. For example, in the San Joaquin Valley APCD, rules are already in place to reduce particulate matter emissions from general crop-based agricultural operations and dairies with 500 or more cows. In the South Coast AQMD, dairies with 50 or more cows are permitted and required to reduce emissions. Rules are also being developed to reduce emissions from agricultural engines. Agricultural processing plants also have stringent emissions regulations on nearly all of their emission sources.

Table 26. Number of Head to Exceed 12.5 tons/year ROG

	ROG EF (lbs/head/year)	Number of Head to Exceed Emissions Threshold 12.5 tons ROG/year
Dairy	12.8	1,735 milk cows
Beef Feedlots	12.8	4,577
Broilers	0.025	1,008,065
Layers	0.025	1,008,065
Turkeys	0.064	392,947
Swine	4.64	5,388
Sheep	0.96	26,042
Goats	0.96	26,042
Horses	6.7	3,731

Notes: The base emission factor (EF) for dairy, beef, and other cattle operations is 12.8 lbs/head/year. The emissions for these categories are scaled based on manure output of various animal classes and the animal composition in the SJV. The layer, turkey, and duck EF are scaled based on the recently released broiler EF. Other EFs are from the ARB emission estimation methodology (ARB 2004a).

Provide Consistent Statewide Definition

The staff also considered the alternative of recommending a large CAF definition that is consistent statewide. After consulting with the local air districts, evaluating their air quality needs, and evaluating the distribution of livestock distribution throughout California, it was clear that many regions within California have relatively minimal livestock populations and less severe air quality problems than the San Joaquin Valley and the South Coast Air Basins. Providing a consistent statewide definition would not provide meaningful air quality improvements, while imposing unnecessary workloads on local air districts and industry. Therefore, for the areas of the State designated as attainment for the federal ozone standard as of January 1, 2004, the proposed large CAF definition is less stringent. In these regions, we recommend a head count of 2,000 milking cows at a dairy necessary to trigger the "large CAF" threshold, and equivalent thresholds for other livestock categories (twice the nonattainment area thresholds). This approach captures the very largest livestock facilities throughout the State while reducing unnecessary burdens on local air districts and livestock facilities in those regions where there is relatively good air quality and relatively minor air emissions from the livestock industry. It also ensures that large dairies would not be sited in areas for the express purpose of avoiding permitting and emissions mitigation plans required under SB 700. Also under SB 700, local air districts have the authority to develop more stringent requirements for bringing livestock facilities under regulation, so this approach does not limit a local air district's ability to regulate their livestock facilities more fully if they so choose (HSC 40724.6(i) and 40724.7(b)).

More or Less Inclusive Definition

The staff recommendation provides an optimal combination of bringing the fewest number of livestock facilities to get the most air quality benefit. Other options were considered, including bringing in more facilities or bringing in fewer facilities under the

large CAF definition. In all cases, bringing in more facilities under the large CAF definition would add a smaller number of livestock animals, providing very little additional air quality benefit while adding unnecessary workload burdens to local air districts and the livestock industry. On the other hand, bringing in fewer livestock facilities does have the potential to significantly minimize the potential for effectively reducing livestock emissions. This results from how the large CAF definition thresholds were determined. The majority of livestock animals are in the larger livestock facilities. The large CAF definition was developed to include the majority of the emissions, or animals, which are in these larger facilities. If additional facilities are excluded, it will include these larger facilities which confine significant portions of the livestock population. Therefore, bringing in fewer facilities can substantially reduce the overall air quality effectiveness of the large CAF definition. For these reasons, the alternatives of including fewer or more facilities were determined to be less effective than the proposed recommendation.

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APPENDIX A

PROPOSED REGULATION ORDER
DEFINITION OF LARGE CONFINED ANIMAL FACILITY
Title 17
Division 1
Chapter 1
New Subchapter 2.7
Large Confined Animal Facilities

A new Subchapter 2.7, commencing with section 86500 is added to Title 17, Division 1, Chapter 1 to read as follows:

Title 17, New Subchapter 2.7
§86500 Large Confined Animal Facility
A large confined animal facility shall mean:

(a) In any area designated as a federal ozone nonattainment area for ozone as of January 1, 2004, any confined animal facility that maintains on any one day:
- 1,000 or more milk-producing dairy cows;
- 2,500 or more beef cattle;
- 7,500 or more calves, heifers, or other cattle;
- 100,000 or more turkeys;
- 650,000 or more chickens other than laying hens
- 650,000 or more laying hens
- 3,000 or more swine;
- 15,000 or more sheep, lambs, or goats;
- 2,500 or more horses;
- 650,000 or more ducks;
- 30,000 or more rabbits or other animals.

(b) In any area other than an area described in subsection (a) above, any confined animal facility that maintains on any one day:
- 2,000 or more milk-producing dairy cows;
- 5,000 or more beef cattle;
- 15,000 or more calves, heifers, or other cattle;
- 200,000 or more turkeys;
- 1,300,000 or more chickens other than laying hens
- 1,300,000 or more laying hens
- 6,000 or more swine;
- 30,000 or more sheep, lambs, or goats;
- 5,000 or more horses;
- 1,300,000 or more ducks;
- 60,000 or more rabbits or other animals.

NOTE: Authority cited: Sections 39600, 39601, 40724.6 Health and Safety Code. Reference: Sections 39011.5 and 40724.6.

§86501 Recordkeeping and Reporting Requirements
Beginning January 1, 2006, the owner or operator of a large confined animal facility under Section 86500 shall be required to keep records that specify the numbers of animals maintained daily and such other information as may be required by air pollution control district or air quality management district rules. Such records shall be maintained at a central place of business for a period of not less than three years and shall be made available upon request to the Executive Officer or Air Pollution Control Officer or their representative.

NOTE: Authority cited: Sections 39600, 39601, 40724.6 Health and Safety Code. Reference: Sections 39011.5 and 40724.6.

APPENDIX B

DETAILED CALIFORNIA DAIRY INFORMATION

General California Dairy Information

The following section provides several descriptors of the dairy industry in California. In many cases, the factors described below are not explicitly used in the definition of a large CAF for dairies, but they were used to inform our decisions regarding the sizes and types of facilities that would be responsible for the majority of dairy emissions, and to give a clearer picture about what types of facilities would be affected.

Milk Output, Number of Dairies, Cows per Farm – Based on data from the California Department of Food and Agriculture (CDFA), in 1960, there were nearly 8,000 dairy farms in California producing about 10 billion pounds of milk per year. Based on the CDFA data (which does not count the very small farms), now there are about 2,100 dairies producing 35 billion pounds of milk per year. In 1960, the typical dairy farm had about 100 milking cows. Now, based on CDFA data, the average dairy size in California is about 800 milking cows. During this same period, the number of cows has roughly doubled in California, to the current estimate of about 1.7 million milking cows. An average cow in California now also produces nearly 21,000 pounds of milk per year, versus just 10,000 pounds of milk per year in 1960 (CDFA 2003). These CDFA statistics are collected and compiled differently than the previously discussed USDA data, which is why they vary from the earlier data.

Milk Output versus Number of Cows – Milk output is highly correlated to the number of milk cows within California. As the cow population changes, the milk output directly changes in direct relation to the population, particularly now that the per cow milk output seems to have leveled off. An average California cow produces about 21,000 pounds of milk per year (CDFA 2003). Most of California's cows are Holsteins, which produce an average of 22,700 lbs/year of milk, the highest of any breed. The other major breed in California is Jersey cows, which produce about 16,700 lbs/year of milk. Other breeds within California include Guernseys, cross breeds, Ayrshires, and Brown Swiss (CDC).

Dairy Size versus Dairy Product Sales – Based on USDA statistics, there are approximately 517 dairies in California with over 1,000 milking head. These dairies over 1,000 milking head bring in about $2.4 billion in dairy product sales, or about 63% of the total dairy product sales. A simple average of the number of dairies divided by the sales equates to about $4.5 million in sales per 1,000 milking head dairy. For dairies from 500 to 999 milking head, the average dairy product sales are $1.6 million (USDA 2004). Table B-1 provides this data for all of the dairy size categories. Of course, because the computed averages shown are simply an average of the number of dairies divided by the sales, it does not provide any indication about the sales of any specific dairy. In addition, because expenses are not show, this information does not reflect dairy profits. As with the other data in this report, the exact number of dairies does not

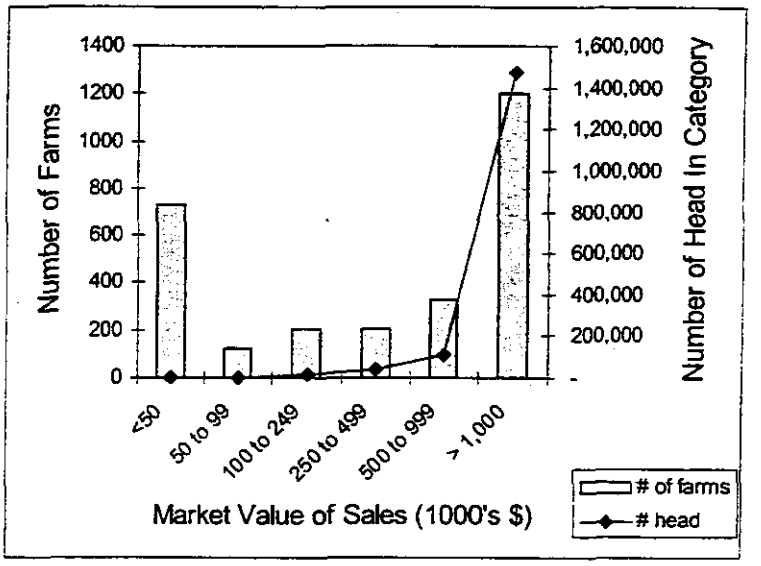
precisely agree with other data sets due to how the data were collected and compiled by the USDA. These minor differences do not affect the outcome of the analysis.

Table B-1. Dairy Product Sales by Dairy Size

Dairy Size Milk Cows	Number of Farms	Dairy Product Sales ($1000)	Percentage of Total Sales	Computed Average Sales ($)
1 to 9	167	2,504	0%	14,994
10 to 19	135	4,343	0%	32,170
20 to 49	104	7,191	0%	52,875
50 to 99	136	26,705	1%	196,360
100 to 199	159	44,712	1%	281,208
200 to 499	504	377,393	10%	748,796
500 to 999	558	901,930	24%	1,616,362
1,000 or more	517	2,359,291	63%	4,563,426
Total	2280	3,724,068		

Another way to look at this data is to compare the number of farms, the number of animals, and the market value of total facility sales. In Figure B-1, the bars show the number of facilities that have market value sales ranging from less than $50,000 to over $1,000,000. The line part of the graph shows the number of milking cows within each sales category. From this chart it is clear that the vast majority of the cows (over 90%) are in the 1,200 dairies with over a million dollars in sales; of these 1,200 dairies, 539 have sales over $2.5 million.

Figure B-1. Dairy Farms versus Sales and Milking



Production Costs – Operating a dairy has many of costs. Animal feed is on average 43% of the operating costs, replacement cows are 13% of costs, operating expenses are 13%, and labor is 11%. Additional costs include marketing (3%), taxes and insurance (1%), depreciation (3%), allowances for return on investment (7%), and return on management (3%). In terms of actual costs, the total Statewide average cost per cow per month is about $216, breaking down to $104 for feed, $26 for labor, $31 for herd replacement, $47 for operating costs such as supplies, veterinary services, fuel, utilities, etc., and about $8 for marketing costs. On a milk production basis, the production cost is about $12.44 per 100 pounds of milk production (CDFA 2003). This information, although not directly related to the large CAF definition, helps indicate those areas where a dairy operator incurs the largest expenses, and gives a sense of the overall operation.

On a industry-wide basis, the USDA census data indicates that there is a total of $4.1 billion in total dairy market value sales and government payments, which averages to $1,736,306 per dairy. For total dairy production expenses, $3.4 billion is shown, with an average of $1,532,128 per dairy. So, based on this, the industry on a whole could produce a profit of $669 million, or an average of about $204,000 profit per dairy. Naturally, these values are all industry-wide averages and do not reflect the financial performance of any specific dairy, which would vary substantially based on many factors.

Dairy Ownership – Nearly 2,000 of California's dairy farms, or about 70% are family owned. These family owned farms have about 49% of the cows. About 25% of the California dairies (about 700) are owned by partnerships, and have about 44% of the cows. The remaining 5% of the dairies (about 140) and 7% of the cows are in family corporations. (USDA 2004)

Manure Waste Handling – Based on a recent U.S. EPA study (EPA 2004), about 60% of California's dairy cow manure is processed through flush barn systems, 36% is processed using scrape barns, and the remaining facilities use a variety of methods. Based on knowledge of the distribution of dairies within California and the manure management practices, the U.S. EPA estimate for flush lane dairies is probably somewhat low. Instead, it if more likely that about 70 - 80% of the dairy manure is processed in flush lane dairies. These different manure treatment options will ultimately play a role in evaluating which manure management options are most effective for reducing dairy emissions.

APPENDIX C

SUMMARY OF LIVESTOCK AIR EMISSIONS RESEARCH SYMPOSIUM

To get a better understanding of the state of the science for livestock emissions, the California Air Resources Board (ARB) organized a Livestock Air Emissions Research Symposium to provide a forum for researchers to present their most current research findings on the airborne emissions from dairy, beef, and poultry operations. The symposium, held on January 26, 2005, in Fresno, California, was also videoconferenced to Southern California, Bakersfield, and Modesto, or participants could call-in via phone. Nine researchers presented their results to approximately 150 participants.

Each livestock research project provides a piece of the puzzle for understanding livestock air emissions. Much of the work presented, particularly for organic gas emissions from livestock, are among the first of its kind. The majority of the presentations focused on dairy and beef cattle. The presentations from the researchers are available on ARB's website at http://www.arb.ca.gov/ag/caf/lersymp.htm.
The following general conclusions can be drawn from the symposium presentations:

- All dairy and beef emissions results presented are preliminary. It is not possible to draw supportable conclusions regarding dairy or beef facility emissions based on information presented at the symposium.
- The research projects show that reactive organic gas (ROG) emissions are produced directly from the cow (Mitloehner), as well as from the livestock wastes, waste handling, waste decomposition, and animal feed (Krauter, Schmidt, Cassel, Goorahoo, Zhang, Mukhtar, Koziel).
- Each project focused on different components of the overall livestock emissions system. For example, Krauter focused on overall dairy emissions, Schmidt focused on process specific dairy emissions, and Mitloehner measured emissions directly from cows housed in an environmentally controlled chamber.
- In measuring ROG emissions from livestock, many different compounds were identified.
- There was substantial variability in the livestock ROG emissions estimates between the various research studies. This is likely due to the variability in the different measurement and analytical techniques, as well as the large emissions variability in complex biological systems such as a dairy facility or a cow.
- Additional work is needed to refine livestock emissions sampling and analysis methods to identify the full mass of reactive organic gases produced. Work is also needed to better understand the magnitude, sources, and variability of all important livestock emissions including ROG, ammonia, and particulate matter.
- The symposium underscored the need for the researchers to develop consistent reporting protocols so the results can be more easily understood and compared.

Summary of the Research Presented at the Symposium

The table below provides a summary of the research presented at the symposium. Studies were performed to evaluate full facility emissions (ambient) and specific processes at dairies (surface flux chamber), enteric emissions directly from cows and their fresh wastes (enclosure), emissions from different waste management practices (enclosure and laboratory), and emissions from a poultry house.

Table C-1. Summary of Research Presented at the Livestock Emissions Research Symposium

			Emission Sources Evaluated		
Researcher	**Measurement Type**	**Pollutants**	**Cow Enteric Emissions**	**Specific Facility Processes**	**Full Facility Emissions**
Cassel	Full facility ambient	Organics	Yes, included in ambient measurements	No	Yes
Mitloehner	Cows in enclosure	Organics, NH3, others	Yes	Enteric emissions and fresh manure	No
Schmidt	Surface flux chamber	Organics, NH3, others	No	Yes, multiple processes evaluated	No, enteric not included
Krauter	Full facility ambient	Organics, NH3, others	Yes, included in ambient measurements	Some process specific resolution	Yes
Goorahoo	Full facility ambient	NH3, CH4	Yes, included in ambient measurements	Some process specific resolution	Yes
Zhang	Laboratory	Organics, NH3, others	No	Manure decomposition in lab setting	No
Mukhtar	Surface flux chamber	NH3	No	Yes, multiple processes evaluated	No, enteric not included
Koziel	Surface flux and ambient	NH3, H2S	Yes, included in ambient measurements	Yes, multiple processes evaluated	Yes
Summers	Poultry house fan exhaust outlet	Organics, NH3	Measured emissions from a ducted fan outlet of a poultry house		

APPENDIX D

ONGOING ACTIVITIES TO ADDRESS LIVESTOCK EMISSION MITIGATION PRACTICES

There is significant work ongoing to gain a better understanding of activities and processes that can reduce livestock air emissions. Already, some local air districts have adopted, or are in the process of developing livestock rules to reduce particulate matter, reactive organic gas, and ammonia emissions from livestock facilities (SCAQMD 2004b, SJV 2004a, SJV 2005b). These rules and others have clearly recognized the benefits of providing the agricultural industry many options for reducing their emissions, and providing local flexibility for facility operators in selecting the practices that are most effective and applicable for each unique agricultural operation. We expect that this approach will also be used as air districts develop emission mitigation rules for large confined animal facilities.

As part of the implementation of SB 700, the California Air Pollution Control Officers Association (CAPCOA) was required to develop a clearinghouse of available control measures and strategies for agricultural sources of air pollution and emissions from agricultural operations by January 1, 2005 (HSC 40731). The clearinghouse is available on CAPCOA's website (CAPCOA 2005) and includes control measures for operations that create fugitive dust emissions, measures for confined animal facilities, controls for internal combustion engines, and emission reduction strategies for other agricultural equipment. The website is located here: http://www.capcoa.org/AgClearinghouse.htm.

Much of the effort to evaluate livestock emissions mitigation in California is currently focused on dairy emissions. There are two major groups within California directly focusing on identifying and categorizing practices, operations, and technologies for reducing dairy emissions. The Dairy Manure Technology Feasibility Assessment Panel, hosted by the California Air Resources Board and convened in February 2005, has a panel of experts drawn from government, industry, academia, and environmental and conservation groups. The goal of the group is to develop a report that provides:

- descriptions of technologies most likely to improve the management and treatment of dairy manure in the San Joaquin Valley;
- a list of technology providers with full contact information;
- an assessment of each technology based on its environmental and economic performance, and technology development status;
- discussion of knowledge gaps where additional research is needed; and
- recommendations about which types of technologies might hold the most promise for improving management and treatment of dairy manure in the San Joaquin Valley.

In evaluating technologies, the panel will consider reductions in air emissions, excess nutrients (nitrogen, etc.), salts, and others items such as odors and pathogens. The panel will also consider the economic performance, quality of supporting data,

development status of the technology, and the potential to create energy. The draft report is scheduled to be completed in Summer 2005. The website for the panel is located here: http://www.arb.ca.gov/ag/caf/dairypnl/dairypanel.htm

In addition, the San Joaquin Valley Dairy Permitting Advisory Group (DPAG) was formed to act as a clearinghouse and gather technical and scientific information that will be used as a resource in the permitting of dairy operations located in the San Joaquin Valley Air District. The DPAG includes scientists, regulators, industry, and environmental representatives. For more information, the DPAG website is located here: http://www.valleyair.org/busind/pto/dpag/dpag_idx.htm

In addition to these activities, several research studies are ongoing to evaluate promising livestock emission mitigation practices. Livestock emission mitigation research is being performed by the University of California at Davis, California State University Fresno, Purdue University, Texas A&M, and others. In the upcoming years, we will have a substantially better understanding of what approaches are effective, technologically feasible, and cost effective for reducing livestock emissions.

APPENDIX E

TEXT OF SENATE BILL 700

BILL NUMBER: SB 700 CHAPTERED
BILL TEXT

CHAPTER 479
FILED WITH SECRETARY OF STATE SEPTEMBER 22, 2003
APPROVED BY GOVERNOR SEPTEMBER 22, 2003
PASSED THE SENATE SEPTEMBER 11, 2003
PASSED THE ASSEMBLY SEPTEMBER 10, 2003
AMENDED IN ASSEMBLY SEPTEMBER 9, 2003
AMENDED IN ASSEMBLY SEPTEMBER 4, 2003
AMENDED IN ASSEMBLY AUGUST 21, 2003
AMENDED IN ASSEMBLY JULY 14, 2003
AMENDED IN ASSEMBLY JULY 2, 2003
AMENDED IN ASSEMBLY JUNE 26, 2003
AMENDED IN SENATE MAY 13, 2003
AMENDED IN SENATE MAY 7, 2003
AMENDED IN SENATE APRIL 24, 2003

INTRODUCED BY Senators Florez and Sher

FEBRUARY 21, 2003

An act to amend Section 42310 of, and to add Sections 39011.5, 39023.3, 40724, 40724.5, 40724.6, 40724.7, 40731, 42301.16, 42301.17, 42301.18, and 44559.9 to, the Health and Safety Code, relating to air quality.

LEGISLATIVE COUNSEL'S DIGEST

SB 700, Florez. Air quality: emissions: stationary sources: agricultural operations.

(1) Existing law authorizes the board of every air quality management district and air pollution control district to establish a permit system that requires any person that uses certain types of equipment that may cause the emission of air contaminants to obtain a permit. Existing law exempts vehicles and certain types of equipment from those permit requirements.

This bill would eliminate that exemption for any equipment used in agricultural operations in the growing of crops or the raising of fowl or animals. To the extent that the bill would increase the number of permits that a district board, electing to establish a permit system prior to January 1, 2004, would be required to issue, the bill would impose a state-mandated local program.

(2) Existing law defines various terms governing the construction of air pollution control laws in the state, and authorizes the state board to revise those definitions to conform with federal law.

This bill would define the terms "agricultural source of air pollution" and "fugitive emissions," and would prohibit, notwithstanding the existing authority, the state board from revising those definitions.

(3) The existing federal Clean Air Act requires districts to adopt local programs for issuing operating permits to major stationary sources of air pollutants. The existing act defines a stationary source as any building, structure, facility, or installation that emits or may emit any air pollutant.

This bill would require each district that is designated a serious federal nonattainment area for an applicable ambient air quality

standard for particulate matter as of January 1, 2004, to adopt, implement, and submit for inclusion in the state implementation plan, a rule or regulation requiring best available control measures (BACM) and best available retrofit control technology (BARCT) for agricultural practices at agricultural sources of air pollution to reduce air pollutants from those sources for which that technology is applicable for agricultural practices by the earliest feasible date, but not later than January 1, 2006, and would require each district subject to those requirements to comply with a schedule for public hearing, adoption, and implementation of the final rule.

The bill would require each district that is designated a moderate federal nonattainment area or an applicable ambient air quality standard for particulate matter as of January 1, 2004, to adopt and implement control measures necessary to reduce emissions from agricultural practices by the earliest feasible date, but no later than January 1, 2007, unless the district determines that those sources do not significantly cause or contribute to a violation of state or federal standards.

The bill would require, by January 1, 2005, the state board to review all available scientific information and develop a definition of a "large confined animal facility."

The bill would require, by July 1, 2006, each district that is designated as a federal nonattainment area for ozone as of January 1, 2004, to adopt, implement, and submit for inclusion in the state implementation plan, a rule or regulation that requires the owner or operator of a large confined animal facility as that term is defined by the state board to obtain a permit to reduce, to the extent feasible, emissions of air contaminants from the facility. The bill would require the district to perform an assessment of the impacts of the rule or regulation prior to its adoption. The bill would authorize a permitholder to appeal any district determination or decision related to that permit.

The bill would require a district that is designated as being in attainment for the federal ambient air quality standard for ozone as of January 1, 2004, to adopt the same rule or regulation required of nonattainment districts, by July 1, 2006, unless the district board makes a determination that large confined animal facilities will not contribute to a violation of any state or federal ambient air quality standard. The bill would provide the rule or regulation is not required to be submitted for inclusion into the state implementation plan.

The bill would require the California Air Pollution Control Officers Association, in consultation with the state board and other interested parties, by January 1, 2005, to develop a clearinghouse of available control measures and strategies for agricultural sources of air pollution and emissions of air contaminants from agriculture operations.

The additional duties for districts under the bill would impose a state-mandated local program.

(4) Existing law establishes the Capital Access Loan Program for Small Businesses, administered by the California Pollution Control Financing Authority, which provides loans through participating financial institutions to entities authorized to conduct business in the state and whose primary business location is in the state.

This bill would require the authority to expand the program to include outreach to financial institutions that service agricultural interests in the state for the purposes of funding air pollution

control measures.

(5) Under existing law, any person who violates a rule, regulation, permit, or order of a district is guilty of a misdemeanor. Because this bill would increase the number of people who are subject to that provision, it would expand the scope of a crime, thereby imposing a state-mandated local program.

(6) The California Constitution requires the state to reimburse local agencies and school districts for certain costs mandated by the state. Statutory provisions establish procedures for making that reimbursement.

This bill would provide that no reimbursement is required by this act for specified reasons.

THE PEOPLE OF THE STATE OF CALIFORNIA DO ENACT AS FOLLOWS:

SECTION 1. (a) The Legislature finds and declares all of the following:

(1) Agricultural operations necessary for growing crops or raising animals are a significant source of directly emitted particulates, and precursors of ozone and fine particulate matter. These emissions have a significant adverse effect on the ability of areas of the state, including, but not limited to, the San Joaquin Valley, to achieve health-based state and federal ambient air quality standards.

(2) Since 1999, the agriculture industry has reduced emissions of oxides of nitrogen (NOx) by more than 2000 tons per year, emissions of particulate matter of 10 microns in diameter (PM 10) by more than 500 tons per year, and emissions of volatile organic compounds (VOCs) from agricultural chemicals by more than 20 percent. According to the state board, however, agricultural sources of air pollution still contribute twenty-six percent of the smog-forming emissions in the San Joaquin Valley.

(3) In the San Joaquin Valley, a large portion of the sources of particulate emissions are areawide sources whose emissions are directly related to growth in population and the resulting vehicle miles traveled. According to the State Air Resources Board, however, agricultural sources of air pollution account for over fifty percent of the directly emitted particulate air pollution generated in the valley during the fall, amounting to over 170 tons per day of emissions.

(4) All parties living or operating a business in an area that has been classified as being a nonattainment area with respect to the attainment of federal or state ambient air quality standards share the responsibility of reducing emissions from air pollutants.

(5) The federal Clean Air Act (42 U.S.C. Sec. 7401 et seq.) prohibits the state from adopting emission standards or limitations less stringent than those established under the federal act, including limitations on emissions from agricultural sources.

(6) Division 26 (commencing with Section 39000) of the Health and Safety Code establishes numerous policies and programs to reduce air pollutants for the protection of public health.

(7) The purpose of the act adding this section is to establish a new set of programs at the state and regional levels to reduce air emissions from agricultural sources in order to protect public health and the environment.

(b) It is therefore the intent of the Legislature to require the State Air Resources Board and air quality management districts and

air pollution control districts in the state to regulate stationary, mobile, and area sources of agricultural air pollution.

SEC. 2. Section 39011.5 is added to the Health and Safety Code, to read:

39011.5. (a) "Agricultural source of air pollution" or "agricultural source" means a source of air pollution or a group of sources used in the production of crops, or the raising of fowl or animals located on contiguous property under common ownership or control that meets any of the following criteria:

(1) Is a confined animal facility, including, but not limited to, any structure, building, installation, barn, corral, coop, feed storage area, milking parlor, or system for the collection, storage, treatment, and distribution of liquid and solid manure, if domesticated animals, including, but not limited to, cattle, calves, horses, sheep, goats, swine, rabbits, chickens, turkeys, or ducks are corralled, penned, or otherwise caused to remain in restricted areas for commercial agricultural purposes and feeding is by means other than grazing.

(2) Is an internal combustion engine used in the production of crops or the raising of fowl or animals, including, but not limited to, an engine subject to Article 1.5 (commencing with Section 41750) of Chapter 3 of Part 4 except an engine that is used to propel implements of husbandry, as that term is defined in Section 36000 of the Vehicle Code, as that section existed on January 1, 2003. Notwithstanding subdivision (b) of Section 39601, the state board may not revise this definition for the purposes of this section.

(3) Is a Title V source, as that term is defined in Section 39053.5, or is a source that is otherwise subject to regulation by a district pursuant to this division or the federal Clean Air Act (42 U.S.C. Sec. 7401 et seq.).

(b) Any district rule or regulation affecting stationary sources on agricultural operations adopted on or before January 1, 2004, is applicable to an agriculture source.

(c) Nothing in this section limits the authority of a district to regulate a source, including, but not limited to, a stationary source that is an agricultural source, over which it otherwise has jurisdiction pursuant to this division, or pursuant to the federal Clean Air Act (42 U.S.C. Sec. 7401 et seq.) or any rules or regulations adopted pursuant to that act that were in effect on or before January 1, 2003, or to exempt an agricultural source from any requirement otherwise applicable under Sections 40724 or 42301.16, based upon a finding by the district in a public hearing that the aggregate emissions from that source do not exceed a de minimus level of more than one ton of particulate matter, nitrogen oxides or volatile organic compounds per year.

SEC. 3. Section 39023.3 is added to the Health and Safety Code, to read:

39023.3. "Fugitive emissions" mean those emissions that cannot reasonably pass through a stack, chimney, vent, or other functionally equivalent opening. Notwithstanding subdivision (b) of Section 39601, the state board may not revise this definition for the purposes of this section.

SEC. 4. Section 40724 is added to the Health and Safety Code, to read:

40724. (a) Each district that is designated as a serious federal nonattainment area for an applicable ambient air quality standard for particulate matter as of January 1, 2004, shall adopt, implement,

and submit for inclusion in the state implementation plan, a rule or regulation requiring best available control measures (BACM) for sources for which those measures are applicable and best available retrofit control technology (BARCT) to reduce air pollutants from sources for which that technology is applicable for agricultural practices, including, but not limited to, tilling, discing, cultivation, and raising of animals, and for fugitive emissions from those agricultural practices a manner similar to other source categories by the earliest feasible date, but not later than January 1, 2006. The rule or regulation shall also include BACM and BARCT to reduce precursor emissions in a manner commensurate to other source categories that the district show cause or contribute to a violation of an ambient air quality standard. Each district that is subject to this subdivision shall comply with the following schedule with respect to the rule or regulation imposing BACM and BARCT:

(1) On or before September 1, 2004, notice and hold at least one public workshop for the purpose of accepting public testimony on the proposed rule or regulation.

(2) On or before July 1, 2005, adopt the final rule or regulation at a noticed public hearing.

(3) On or before January 1, 2006, commence implementation of the rule or regulation.

(b) Nothing in this section shall delay or otherwise affect any action taken by a district to reduce emissions of air contaminants from agricultural sources, or any other requirements imposed on a district or a source of air pollution pursuant to the federal Clean Air Act (42 U.S.C. Sec. 7401 et seq.).

(c) In adopting a rule or regulation pursuant to this section, a district shall do all of the following:

(1) Ensure the size and duration of use of an internal combustion engine subject to BARCT pursuant to this section is commensurate to the size and duration of use of internal combustion engines subject to regulation by a district or the state board regulated at other stationary sources.

(2) Ensure that BARCT established pursuant to this section for an internal combustion engine is similar to BARCT for other stationary source engines subject to regulation by a district or the state board.

(3) Ensure that the cost-effectiveness of BARCT for an internal combustion engine subject to this section is similar to the cost-effectiveness of BARCT for other internal combustion engines subject to regulation by a district or the state board.

(4) Compare the cost-effectiveness of BARCT for an internal combustion engine subject to this section to the list of available and proposed control measures prepared pursuant to Section 40922.

(5) Adopt control measures pursuant to this section in order of their cost-effectiveness, unless a district determines that a different order of adoption is necessary due to the enforceability, public acceptability, or technological feasibility of a given control measure, or to expeditiously attain or maintain a national or state ambient air quality standard.

(6) Except as otherwise provided under this section, ensure that any rule or regulation adopted pursuant to this section complies with all applicable requirements of this division, including, but not limited to, any applicable requirements established pursuant to Sections 40703, 40727, 40728.5, and 40920.6.

(7) Hold at least one public meeting that is conducted at a time

and location that the district determines is convenient to the public at which the district reviews the comparison prepared pursuant to paragraph (4).

(d) Nothing in this section limits the authority of a district to regulate a source including, but not limited to, a stationary source that is an agricultural source over which it otherwise has jurisdiction pursuant to this division or the federal Clean Air Act (42 U.S.C. Sec. 7401 et seq.) or any rules or regulations adopted pursuant to that act. Nothing in this section shall delay or otherwise affect any action taken by a district to reduce emissions of air contaminants from agricultural sources, or any other requirements imposed upon a district or a source of air pollution pursuant to the federal Clean Air Act. This section may not be interpreted to delay or otherwise affect the adoption, implementation, or enforcement of any measure that was adopted, or included in a rulemaking calendar or air quality implementation plan that was adopted, by the district prior to January 1, 2004.

SEC. 5. Section 40724.5 is added to the Health and Safety Code, to read:

40724.5. (a) By the earliest feasible date, but no later than January 1, 2007, each district that is designated a moderate federal nonattainment area for an applicable ambient air quality standard for particulate matter as of January 1, 2004, and that is not subject to the requirements of Section 40724, shall adopt and implement control measures necessary to reduce emissions from agricultural practices, including, but not limited to, tilling, discing, cultivation, and raising of animals, and from fugitive emissions in a manner similar to other source categories from those activities by the earliest feasible date. Control measures adopted and implemented pursuant to this section shall also be implemented by the district to reduce precursor emissions in a manner commensurate to other source categories that the district show cause or contribute to a violation of an ambient air quality standard.

(b) A district is not required to adopt and implement control measures pursuant to this section if it determines in a public hearing that agricultural practices do not significantly cause or contribute to a violation of state or federal standards.

(c) In adopting a rule or regulation pursuant to this section, a district shall do all of the following:

(1) Ensure the size and duration of use of an internal combustion engine subject to BARCT pursuant to this section is commensurate to the size and duration of use of internal combustion engines subject to regulation by a district or the state board regulated at other stationary sources.

(2) Ensure that BARCT established pursuant to this section for an internal combustion engine is similar to BARCT for other stationary source engines subject to regulation by a district or the state board.

(3) Ensure that the cost-effectiveness of BARCT for an internal combustion engine subject to this section is similar to the cost-effectiveness of BARCT for other internal combustion engines subject to regulation by a district or the state board.

(4) Compare the cost-effectiveness of BARCT for an internal combustion engine subject to this section to the list of available and proposed control measures prepared pursuant to Section 40922.

(5) Adopt control measures pursuant to this section in order of their cost-effectiveness, unless a district determines that a

different order of adoption is necessary due to the enforceability, public acceptability, or technological feasibility of a given control measure, or to expeditiously attain or maintain a national or state ambient air quality standard.

(6) Except as otherwise provided under this section, ensure that any rule or regulation adopted pursuant to this section complies with all applicable requirements of this division, including, but not limited to, any applicable requirements established pursuant to Sections 40703, 40727, 40728.5, and 40920.6.

(7) Hold at least one public meeting that is conducted at a time and location that the district determines is convenient to the public at which the district reviews the comparison prepared pursuant to paragraph (4).

(d) Nothing in this section limits the authority of a district to regulate a source including, but not limited to, a stationary source that is an agricultural source over which it otherwise has jurisdiction pursuant to this division or the federal Clean Air Act (42 U.S.C. Sec. 7401 et seq.) or any rules or regulations adopted pursuant to that act. Nothing in this section shall delay or otherwise affect any action taken by a district to reduce emissions of air contaminants from agricultural sources, or any other requirements imposed upon a district or a source of air pollution pursuant to the federal Clean Air Act. This section may not be interpreted to delay or otherwise affect the adoption, implementation, or enforcement of any measure that was adopted, or included in a rulemaking calendar or air quality implementation plan that was adopted, by the district prior to January 1, 2004.

(e) Nothing in this section shall delay or otherwise affect any action taken by a district to reduce emissions of air contaminants from agricultural sources, or any requirements imposed on a district or a source of air pollution pursuant to the federal Clean Air Act (42 U.S.C. Sec. 7401 et seq.).

SEC. 6. Section 40724.6 is added to the Health and Safety Code, to read:

40724.6. (a) On or before July 1, 2005, the state board shall review all available scientific information, including, but not limited to, emissions factors for confined animal facilities, and the effect of those facilities on air quality in the basin and other relevant scientific information, and develop a definition for the source category of a "large confined animal facility" for the purposes of this section. In developing that definition, the state board shall consider the emissions of air contaminants from those sources as they may affect the attainment and maintenance of ambient air quality standards.

(b) Not later than July 1, 2006, each district that is designated as a federal nonattainment area for ozone as of January 1, 2004, shall adopt, implement, and submit for inclusion in the state implementation plan, a rule or regulation that requires the owner or operator of a large confined animal facility, as defined by the state board pursuant to subdivision (a), to obtain a permit from the district to reduce, to the extent feasible, emissions of air contaminants from the facility.

(c) A district may require a permit for a large confined animal facility with actual emissions that are less than one-half of any applicable emissions threshold for a major source in the district for any air contaminant, including, but not limited to, fugitive emissions in a manner similar to other source categories, if prior to

imposing that requirement the district makes both of the following determinations in a public hearing:

(1) A permit is necessary to impose or enforce reductions in emissions of air pollutants that the district show cause or contribute to a violation of a state or federal ambient air quality standard.

(2) The requirement for a source or category of sources to obtain a permit would not impose a burden on those sources that is significantly more burdensome than permits required for other similar sources of air pollution.

(d) The rule or regulation adopted pursuant to subdivision (b) shall do all of the following:

(1) Require the owner or operator of each large confined animal facility to submit an application for a permit within six months from the date the rule or regulation is adopted by the district that includes both of the following:

(A) The information that the district determines is necessary to prepare an emissions inventory of all regulated air pollutants emitted from the operation, including, but not limited to, precursor and fugitive emissions, using emission factors approved by the state board in a public hearing.

(B) An emissions mitigation plan that demonstrates that the facility will use reasonably available control technology in moderate and serious nonattainment areas, and best available retrofit control technology in severe and extreme nonattainment areas, to reduce emissions of pollutants that contribute to the nonattainment of any ambient air quality standard, and that are within the district's regulatory authority.

(2) Require the district to act upon an application for permit submitted pursuant to paragraph (1) within six months of a completed application, as determined by the district.

(3) Require the owner or operator to implement the plan contained in the permit approved by the district, and shall establish a reasonable period, of not more than three years, after which each permit shall be reviewed by the district and updated to reflect changes in the operation or the feasibility of mitigation measures. The updates required by this paragraph are not required to be submitted for inclusion into the state implementation plan.

(4) Establish a reasonable compliance schedule for facilities to implement control measures within one year of the date on which the permit is approved by the district, and shall provide for 30 days public notice and comment on any draft permit.

(d) Prior to adopting a rule or regulation pursuant to subdivision (b), a district shall, to the extent data are available, perform an assessment of the impacts of the rule or regulation. The district shall consider the impacts of the rule or regulation in a public hearing, and make a good faith effort to minimize any adverse impacts. The assessment shall include all of the following:

(1) The category of sources affected, including, but not limited to, the approximate number of affected sources, and the size of those sources.

(2) The nature and quantity of emissions from the category, and the significance of those emissions in adversely affecting public health and the environment and in causing or contributing to the violation of a state or federal ambient air quality standard.

(3) The emission reduction potential.

(4) The impact on employment in, and the economy of, the region

affected.

(5) The range of probable costs to affected sources and businesses.

(6) The availability and cost-effectiveness of alternatives.

(7) The technical and practical feasibility.

(8) Any additional information on impacts that is submitted to the district board for consideration.

(e) Nothing in this section shall delay or otherwise affect any action taken by a district to reduce emissions of air contaminants from agricultural sources, or any other requirements imposed on a district or a source of air pollution pursuant to the federal Clean Air Act (42 U.S.C. Sec. 7401 et seq.).

(f) In adopting a rule or regulation pursuant to this section, a district shall comply with all applicable requirements of this division, including, but not limited to, the requirements established pursuant to Section 40703, 40727, and 40728.5.

(g) A permitholder may appeal any district determination or decision required by this section pursuant to Section 42302.1, in addition to any other applicable remedy provided by law.

(h) Nothing in this section authorizes a district to adopt a rule or regulation that is duplicative of a rule or regulation adopted pursuant to Sections 40724 and 40724.5.

(i) Nothing in this section limits the authority of a district to regulate a source including, but not limited to, a stationary source that is an agricultural source over which it otherwise has jurisdiction pursuant to this division or the federal Clean Air Act (42 U.S.C. Sec. 7401 et seq.) or any rules or regulations adopted pursuant to that act. Nothing in this section shall delay or otherwise affect any action taken by a district to reduce emissions of air contaminants from agricultural sources, or any other requirements imposed upon a district or a source of air pollution pursuant to the federal Clean Air Act. This section may not be interpreted to delay or otherwise affect adoption, implementation, or enforcement of any measure that was adopted, or included in a rulemaking calendar or air quality implementation plan that was adopted, by the district prior to January 1, 2004.

SEC. 7. Section 40724.7 is added to the Health and Safety Code, to read:

40724.7. (a) A district that is designated as being in attainment for the federal ambient air standard for ozone shall adopt a rule or regulation as described in Section 40724.6 shall fulfill both of the following conditions:

(1) The regulation shall be adopted not later than July 1, 2006, unless a district board makes a determination in a public hearing, based on substantial scientific evidence in the record, that large confined animal facilities will not contribute to a violation of any state or federal ambient air quality standard.

(2) The regulation may not be submitted for inclusion in the state implementation plan.

(b) Nothing in this section shall delay or otherwise affect any action taken by a district to reduce emissions of air contaminants from agricultural sources, or any other requirements imposed on a district or a source of air pollution pursuant to the federal Clean Air Act (42 U.S.C. Sec. 7401 et seq.).

(c) In adopting a rule or regulation pursuant to this section, a district shall comply with all applicable requirements of this division, including, but not limited to, the requirements established

pursuant to Section 40703, 40727, and 40728.5.

(d) Nothing in this section authorizes a district to adopt a rule or regulation that is duplicative of a rule or regulation adopted pursuant to Section 40724.

(e) The rule or regulation adopted by a district pursuant to this section is not required to be submitted for inclusion into the state implementation plan.

SEC. 8. Section 40731 is added to the Health and Safety Code, to read:

40731. In order to assist in the development of the BACM, RACM, and BARCT measures specified in Sections 40724, 40724.5, and 40724.6, and to reduce or eliminate emissions of regulated air pollutants and their precursors, the California Air Pollution Control Officers Association, in consultation with the state board and other interested parties, shall, not later than January 1, 2005, develop a clearinghouse of available control measures and strategies for agricultural sources of air pollution and emissions from agricultural operations, including, but not limited to, the following sources:

(a) Operations that create fugitive dust emissions, including, but not limited to, discing, tilling, material handling and storage, and travel on unpaved roads.

(b) Confined animal facilities, including, but not limited to, any structure, building, installation, barn, corral, coop, feed storage area, or milking parlor, including, but not limited to, a system for the collection, storage, treatment, and distribution of liquid or solid manure from domestic animals, including, but not limited to, cattle, calves, horses, sheep, goats, swine, rabbits, chickens, turkeys, or ducks, if those animals are corralled, penned, or otherwise caused to remain in restricted areas for commercial agricultural purposes, and feeding is by means other than grazing.

(c) Internal combustion engines used in the production of crops or the raising of animals or fowl, except an engine that is used to propel an implement of husbandry, as that term is defined in Section 36000 of the Vehicle Code, as that section existed on January 1, 2003.

(d) Other equipment, operations, or activities associated with the growing of crops or the raising of fowl or animals, that emit, or cause to be emitted, any regulated air pollutant, or any precursor to any regulated air pollutant.

SEC. 9. Section 42301.16 is added to the Health and Safety Code, to read:

42301.16. (a) In addition to complying with the requirements of this chapter, a permit system established by a district pursuant to Section 42300 shall ensure that any agricultural source that is required to obtain a permit pursuant to Title I (42 U.S.C. Sec. 7401 et seq.) or Title V (42 U.S.C. Sec. 7661 et seq.) of the federal Clean Air Act is required by district regulation to obtain a permit in a manner that is consistent with the federal requirements.

(b) Except as provided in subdivision (c), a district shall require an agricultural source of air pollution to obtain a permit unless it makes all of the following findings in a public hearing:

(1) The source is subject to a permit requirement pursuant to Section 40724.6.

(2) A permit is not necessary to impose or enforce reductions of commissions of air pollutants that the district show cause or contribute to the violation of state or federal ambient air quality standard.

(3) The requirement for the source or category of sources to obtain a permit would impose a burden on those sources that is significantly more burdensome than permits required for other similar sources of air pollution.

(c) Prior to requiring a permit for an agricultural source of air pollution with actual emissions that are less than one-half of any applicable emissions threshold for a major source in the district, for any air contaminant, but excluding fugitive dust, a district shall, in a public hearing, make all of the following findings:

(1) The source is not subject to a permit requirement pursuant to Section 40724.6.

(2) A permit is necessary to impose or enforce reductions of emission of air pollutants that the district show cause or contribute to a violation of a state or federal ambient air quality standard.

(3) The requirement for a source or category of sources to obtain a permit would not impose a burden on those sources that is significantly more burdensome than permits required for other similar sources of air pollution.

SEC. 10. Section 42301.17 is added to the Health and Safety Code, to read:

42301.17. (a) A district may adopt by regulation a program under which the district does not require a permit to be obtained by an agricultural source of air pollution that the district may otherwise require to obtain a permit if the owner or operator of the source has taken the following actions to reduce emissions from the source:

(1) Removed all internal combustion engines used in the production of crops or the raising of fowl or animals, except an engine that is used to propel implements of husbandry, at the source and replaced them with engines that meet or exceed the most stringent standards adopted by the state board and the United States Environmental Protection Agency for new internal combustion engines.

(2) Reduced or mitigated emissions from all agricultural activities, including, but not limited to, tilling, discing, cultivation, the raising of livestock and fowl, and similar activities, to a level that the district determines does not cause, or contribute to, a violation of a state or federal ambient air standard, toxic air contaminant, or other air emission limitation.

(3) Reduced or mitigated all emissions from any farm equipment, underground petroleum fuel tanks, or other similar equipment used in agricultural activities to a level that the district determines does not cause or contribute to a violation of a state or federal ambient air standard, toxic air contaminant, or other air emission limitation.

(4) Complied with any other conditions required by state or federal law or district rule or regulation for the source.

(b) Subdivision (a) does not apply to those permits required to be issued pursuant to Title I (42 U.S.C. Sec. 7401 et seq.) or Title V (42 U.S.C. Sec. 7661 et seq.).

SEC. 11. Section 42301.18 is added to the Health and Safety Code, to read:

42301.18. (a) Any agricultural source that existed prior to January 1, 2004, that becomes subject to a permit requirement pursuant to a district rule or regulation that was adopted prior to that date shall be permitted as an existing source and not as a new source.

(b) Any agricultural source that is an existing source pursuant to

subdivision (a) shall be permitted by the district based upon its maximum potential to emit air contaminants, to the extent that level can be determined, as of January 1, 2004.

(c) A district may not require an agricultural source to obtain emissions offsets for criteria pollutants for that source if emissions reductions from that source would not meet the criteria for real, permanent, quantifiable, and enforceable emission reductions.

SEC. 12. Section 42310 of the Health and Safety Code is amended to read:

42310. (a) A permit shall not be required for any of the following:

(1) Any vehicle.

(2) Any structure designed for and used exclusively as a dwelling for not more than four families.

(3) An incinerator used exclusively in connection with a structure described in subdivision (b).

(4) Barbecue equipment that is not used for commercial purposes.

(5) (A) Repairs or maintenance not involving structural changes to any equipment for which a permit has been granted.

(B) As used in this subdivision, maintenance does not include operation.

(b) Nothing in this section shall affect any requirements imposed on a district or a source of air pollution, including, but not limited to, an agricultural source, pursuant to the federal Clean Air Act (42 U.S.C. Sec. 7401 et seq.).

SEC. 13. Section 44559.9 is added to the Health and Safety Code, to read:

44559.9. The authority shall expand the Capital Access Loan Program established by this article to include outreach to financial institutions that service agricultural interests in the state for the purpose of funding air pollution control measures.

SEC. 14. The provisions of the act adding this section are severable. If any provision of this act or its application is held invalid, that invalidity shall not affect other provisions or applications that can be given effect without the invalid provision or application.

SEC. 15. No reimbursement is required by this act pursuant to Section 6 of Article XIII B of the California Constitution for certain costs that may be incurred by a local agency or school district because in that regard this act creates a new crime or infraction, eliminates a crime or infraction, or changes the penalty for a crime or infraction, within the meaning of Section 17556 of the Government Code, or changes the definition of a crime within the meaning of Section 6 of Article XIII B of the California Constitution.

In addition, no reimbursement is required by this act pursuant to Section 6 of Article XIII B of the California Constitution for certain other costs that may be incurred by a local agency or school district because a local agency or school district has the authority to levy service charges, fees, or assessments sufficient to pay for the program or level of service mandated by this act, within the meaning of Section 17556 of the Government Code.

APPENDIX F

PUBLIC WORKSHOP NOTICES

Terry Tamminen
Agency Secretary

Air Resources Board

Alan C. Lloyd, Ph.D.
Chairman
1001 I Street • P.O. Box 2815
Sacramento, California 95812 • www.arb.ca.gov

Arnold Schwarzenegger
Governor

August 2, 2004

Dear Sir/Madam:

Senate Bill 700 (Florez, 2003) requires the California Air Resources Board (ARB or Board) to adopt a definition for a Large Confined Animal Facility (large CAF) by July 1, 2005. The staff of ARB invites your participation in a public workshop to solicit input for developing a large CAF definition. Working with stakeholders, ARB staff will review relevant scientific information, including emission factors for CAFs and how large CAFs may affect the attainment and maintenance of ambient air quality standards. A preliminary workshop agenda is attached as well as background information to provide some initial topics for discussion.

These workshops are the first in a series of stakeholder meetings. Our planned schedule for adopting the large CAF definition is as follows:

August 2004	Public workshops to solicit input on defining large CAF
January 2005	Public workshop to review livestock emissions research data
March 2005	Public workshops to discuss staff proposal to define large CAF
May 2005	Release staff report on proposed large CAF definition
June 2005	Public hearing on staff proposals to define large CAF

The first large CAF definition workshops will be held at the times and locations shown below:

Modesto	Tulare	Chino	Sacramento
August 24, 2004	August 25, 2004	August 26, 2004	September 2, 2004
10:00 – 12:30	10:00 –12:30	10:00 – 12:30	10:00 – 12:30
Stanislaus County Ag Commission 3800 Cornucopia Way Harvest Hall Modesto, CA	County Ag Commissioner's Building 4437 Laspina Street Tulare, CA	Inland Empire Utilities Agency Headquarters Board Room 6075 Kimball Avenue Bldg. A Chino, CA	Central Valley Auditorium Cal/EPA Building 1001 I Street Sacramento, CA (webcast available)

The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see our Website: http://www.arb.ca.gov.

The workshops in Modesto, Tulare, and Chino will have a call-in number for those unable to participate in person. The toll free call-in number is (888) 220-3084, the pass code is 41322, and the leader name is Sue Wyman. The Sacramento workshop will be webcast via the internet. You may access the webcast at ARB's homepage at http://www.arb.ca.gov, and then select webcasts. Questions can be submitted to onair@arb.ca.gov the day of the event. In addition, the meeting places are accessible to persons with disabilities. If you have special accommodation or language needs, please contact the Sue Wyman at (916) 445-9477 or swyman@arb.ca.gov as soon as possible. TTY/TDD/Speech-to-Speech users may dial 7-1-1-for the California Relay Service.

If you have any questions about the workshop, please contact Michael FitzGibbon, of my staff, at (916) 445-6243 or mfitzgib@arb.ca.gov.

Sincerely,

/s/

Robert D. Fletcher, Chief
Planning and Technical Support Division

Attachment

cc: Mr. Mike FitzGibbon, Manager
Emission Inventory Analysis Section
Planning and Technical Support Division

Ms. Sue Wyman
Meeting Coordinator
Planning and Technical Support Division

Attachment 1

PRELIMINARY
AGENDA

Workshop to Discuss Defining Large Confined Animal Facilities (CAFs) as Required by SB 700

I. Introductions

II. Summary of SB700 Requirements and Status of Research

III. Possible Concepts for Defining Large CAFs

IV. Stakeholder Comments and Discussion

V. Next Steps, Workshop & Meeting Schedules

VI. Adjourn

Note: A final agenda will be provided at the workshops.

Attachment 2

Background Information for Workshop to Discuss Defining Large Confined Animal Facilities as Required by SB 700

What are the California Air Resources Board's responsibilities under SB 700 related to large confined animal facilities?

The Air Resources Board (ARB/Board) is required to review scientific information, including emission factors, and develop and adopt a definition for "large confined animal facilities" by July 1, 2005. In developing the definition, the Board must consider emissions of air contaminants from these facilities as they may affect the attainment and maintenance of ambient air quality standards. (Health and Safety Code (H&SC) Section 40724.6(a))

Over the next few months, the ARB will host several stakeholder meetings regarding livestock emission factors and the definition of large CAFs. These meetings will provide an earlier opportunity for public comment on possible approaches before staff prepares a definition for consideration by the Board.

What is a confined animal facility?

In summary, a confined animal facility (CAF) is a facility in which domesticated animals are maintained in restricted areas for commercial agricultural purposes, and feeding is not by grazing. As specifically defined by Health and Safety Code (H&SC) section 39011.5(a)(1), a confined animal facility:

> "Is a confined animal facility, including, but not limited to, any structure, building, installation, barn, corral, coop, feed storage area, milking parlor, or system for the collection, storage, treatment, and distribution of liquid and solid manure, if domesticated animals, including, but not limited to, cattle, calves, horses, sheep, goats, swine, rabbits, chickens, turkeys, or ducks are corralled, penned, or otherwise caused to remain in restricted areas for commercial agricultural purposes and feeding is by means other than grazing."

What are the ramifications of being identified as a large CAF?

Large CAFs in regions designated as a federal ozone nonattainment area as of January 1, 2004 will be subject to an emissions mitigation plan requirement. There are some exemptions from the mitigation requirements for air districts that demonstrate that large CAFs in their region do not contribute to a violation of any State or federal ambient air quality standards.

What are the air districts responsibilities under SB 700 related to large confined animal facilities?

Air districts that are designated as federal ozone nonattainment areas as of January 1, 2004 must adopt, implement, and submit a rule for inclusion in the State Implementation Plan that addresses large CAFs as defined by ARB. The rule or regulation must require the facility to obtain a permit and to reduce to the extent feasible emissions of air contaminants. (H&SC Section 40724.6) SB 700 provides detailed district requirements for developing large CAF rules and criteria for removing facilities from the program. The full text of the bill is located here: http://www.leginfo.ca.gov/bilinfo.html. Once on the webpage, search for SB 700 (Florez).

What air pollutants will be considered in evaluating air quality impacts of CAFs?

The focus will be on emissions of pollutants that contribute to ozone and particulate matter pollution. This includes reactive organic gases, oxides of nitrogen, directly emitted particulate matter, and ammonia.

What opportunities will stakeholders and the public have to provide input?

The ARB staff will host regular stakeholder meetings to solicit input on the large CAF definition and to maintain an open exchange of the data, reasoning, and assumptions used in defining large CAFs. The first workshops are scheduled for August 2004. Additional workshops will be scheduled in January 2005 to discuss livestock emission research results, and March 2005 to discuss staff proposals for defining large CAFs. A draft staff report will be developed and released for comment.

In June 2005, the large CAF definition will then be presented to the Board for consideration, during which further comment may be provided to the Board. A summary of the schedule is shown below.

August 2004	Public workshops to solicit input on defining large CAF
January 2005	Public workshop to review livestock emissions research data
March 2005	Public workshops to discuss staff proposal to define large CAF
May 2005	Release staff report on proposed large CAF definition
May 2005	Stakeholder meetings to receive comments on staff report
June 2005	Public hearing on staff proposals to define large CAF

Who will be involved in developing the large CAF definition and identifying the most appropriate livestock emission factors?

ARB staff will coordinate a process that in includes all interested stakeholders. Stakeholders are expected to include local air districts, the California Air Pollution Control Officers Association, livestock industry groups, Farm Bureaus, UC Cooperative Extension staff, academic experts, U.S. EPA technical staff, environmental groups, and others.

What are some possible topics for identifying large confined animal facilities in California?

As a basis to start discussion, ARB staff has compiled topics to discuss for identifying large CAFs. During the workshop, we will seek input and feedback on these ideas, and any other options for identifying large CAFs.

1. Facility emissions

   This approach might establish facility emissions thresholds that are consistent throughout the State. If a confined animal facility exceeds the thresholds, then it would be considered a large CAF. Discussion items:

   - Would pollutants be treated individually, or collectively?
   - Should different animal types have different emissions thresholds?
   - Would livestock emissions thresholds be consistent with permitting thresholds for other industries producing similar pollutants?
   - What emissions data and methods are needed to effectively quantify facility livestock emissions?
   - Would consistent statewide thresholds be either too stringent, or too lenient for some regions?

2. Facility emissions considering attainment status

   Similar to A, above, except this approach would vary the large CAF emissions thresholds by air district or basin, based upon the attainment status of the district. If a confined animal facility located in a region exceeds the local thresholds, then they would be considered a large CAF.

   Discussion items:

   - Similar to A, above, plus,
   - If some regions have less stringent thresholds, could this encourage livestock facility migration?

3. Number of animals present at facilities

   Several agencies now use the number of animals present at a facility (i.e., 1000 milking cows) to determine which facilities are regulated. This approach could be used to define large CAFs under SB 700. Discussion items:

   - Would headcount thresholds be varied by region?
   - If emission factors or methods changed, would headcount thresholds also need to be updated?
   - If a facility has extensive emission controls, but exceeds the per-head threshold, would it still be defined as a large CAF?
   - Are facility-specific head count data reasonably available?
   - Using the per-head approach, how can we avoid inequities between livestock and other facilities regulated for their air emissions?

4. Economic or production information

   This approach could be based on either the facility revenue, production, or some other value. The approach includes an underlying assumption that facilities with higher revenue or production: a) create more air pollution and, b) are more capable of absorbing the costs of regulation. Discussion items:

   - Will it be feasible to collect facility and species specific economic and production information?
   - What data are needed to show a link between air quality and economic or production information?
   - Using this approach, how could we avoid inequities between livestock regulations and other regulated facility types?

5. Facility management practices

   Some livestock management practices may be inherently more polluting and more amenable to emission reductions. This approach would use information about facility manure management practices and other factors to identify which facilities are considered large CAFs. Discussion items:

   - If a large dairy and a small dairy used the same management practices, would they be treated the same?
   - There are many management practice variations for each livestock category. Will it be possible to catalog the various practices and associate them with air quality impacts?
   - Could existing facility operators avoid regulation by changing their management practices? What undesirable consequences could this produce?

What information will be evaluated to help define a large CAF?

This will be discussed with stakeholders during the workshop. Parameters used to define a large CAF may include, but are not limited to the following:

- Types and quantities of air pollutants from CAFs;
- Facility size and population data;
- Management practices of animal activities (e.g., waste handling, feed handling, housing) and non-animal activities (e.g., engines);
- Production information (head marketed, eggs produced, milk production);
- Economic information (gross & net receipts);
- Historical definitions of large CAFs or confined/concentrated animal feeding operations (CAFOs);
- Existing district or EPA permitting programs and applicability thresholds;
- Emission reduction potentials for livestock types or sources; and
- Air basin attainment status.

Alan C. Lloyd, Ph.D.
Agency Secretary

Air Resources Board

1001 I Street • P.O. Box 2815
Sacramento, California 95812 • www.arb.ca.gov

Arnold Schwarzenegger
Governor

January 6, 2005

Dear Sir/Madam:

The California Air Resources Board (ARB or Board) staff invites you to participate in a Livestock Emissions Research Symposium. At the Symposium, researchers will present their most current findings regarding the airborne emissions from dairy, beef, and poultry operations. A preliminary program of presenters is attached.

The Symposium is part of ARB's ongoing process to adopt a definition for a Large Confined Animal Facility (large CAF) by July 1, 2005 as required by Senate Bill 700 (Florez, 2003). Following this Symposium, we expect to have a public workshop in March 2005 to discuss the staff's proposed definition for large CAFs. We expect to release a staff report in May 2005 for consideration at the June 23, 2005 public hearing.

Details for the Symposium are as follows:

DATE: Wednesday, January 26, 2005

TIME: 9:00 a.m. to 4:00 p.m.

LOCATION: San Joaquin Valley Air Pollution Control District
Central Office
1990 East Gettysburg Avenue
Fresno, California 93726

In addition, the workshop will video teleconferenced to the following locations:

San Joaquin Valley Air Pollution Control District
Northern Office
4230 Kiernan Avenue, Suite 130
Modesto, California 95356

San Joaquin Valley Air Pollution Control District
Southern Office
2700 M Street, Suite 275
Bakersfield, California 93301

Sir/Madam

Page 6

In addition to presentations by researchers, there will be limited time available for others to provide 5-minute presentations regarding technologies or practices that may help reduce livestock emissions.

The meeting places are accessible to persons with disabilities. If you have special accommodation or language needs, please contact Ms. Heather Arias at (916) 323-2722 or harias@arb.ca.gov. TTY/TDD/Speech-to-Speech users may dial 7-1-1 for the California Relay Service.

Please also contact Mr. Mike FitzGibbon at (916) 445-6243 or mfitzgib@arb.ca.gov with any questions about the workshop or if you are interested in making a short technology presentation.

Sincerely,

Robert D. Fletcher, Chief
Planning and Technical Support Division

Attachment

cc: Mr. Mike FitzGibbon, Manager
Emission Inventory Analysis Section
Planning and Technical Support Division

Ms. Heather Arias
Transportation Strategies Section
Planning and Technical Support Division

Livestock Emissions Research Symposium

Wednesday, January 26, 2005
9:00 a.m. – 4:00 p.m.

WELCOME

9:00 a.m. *Bob Fletcher, Air Resources Board*

BEEF

9:15 a.m. *"Ammonia and Hydrogen Sulfide Emissions from Beef Cattle Feedlots"*

Dr. Jacek Koziel, Iowa State University

Research in air quality engineering and livestock odor. Measurements of gas, odor, particulate matter emissions from livestock operations. Development and evaluation of odor control technologies.

DAIRY

9:45 a.m. *"On Farm Measurements of Methane and Select Carbonyl Emission Factors for Dairy Cattle"*

Terry Cassel, University of California, Davis

Modeled emission factors for methane and select carbonyls measured in spring, summer, and fall at one dairy will be presented along with a description of total non-methane, non-ethane organic carbon measurements at dairies

10:15 a.m. *Break*

10:30 a.m. *"Reactive Organic Gases (ROG) and Amine Emissions from a Northern California, Flushed Lane Dairy: Technical Approach and Report of Emission Factors"*

Dr. CE Schmidt, Independent Environmental Consultant

Results are discussed from a field-sampling project to evaluate process-specific emissions at a Northern California Dairy. The United States Environmental Protection Agency (U.S. EPA) flux chamber method was used to collect emissions of ROG, amine, and other relevant compounds. Emissions are reported for each tested process, the full facility, and on a per cow basis.

FINAL PROGRAM – LIVESTOCK EMISSIONS RESEARCH SYMPOSIUM

11:00 a.m. *"Use of Laser Technology to Monitor Ammonia"*

Dr. Dave Goorahoo, Dr. Charles Krauter, B. Goodrich, and Matt Beene, California State University, Fresno

A review of the technology involved in the use of an open path tunable diode laser (OPTDL) for monitoring ammonia emissions at dairies. Results showing diurnal and seasonal fluctuations of ammonia during various dairy management practices and discussion of using the OPTDL for modeling downwind emission concentrations.

11:30 a.m. *"Monitoring and Modeling of ROG and Ammonia at Three California Dairies"*

Dr. Charles Krauter, Dr. Dave Goorahoo, B. Goodrich, and Matt Beene, California State University, Fresno

Dairy emissions data from a sampling program at dairies in Merced, Fresno, and Kings Counties that began in the fall of 2002. ROG samples were collected in canisters and analyzed Gas Chromatograph Mass Spectography (GCMS) and Gas Chromatograph Flame Ionization Detection (GCFID). The ammonia was sampled with active denuders and Tunable Diode Lasers. Samples were taken upwind and at several sites downwind of various dairy operations. Modeling of emissions was done using Industrial Source Complex Short-Term version 3 (ISC-STv3), a steady state Gaussian plume model.

12:00 p.m. *Break for Lunch*

1:00 p.m. *"Process-based Approach to Estimate Air Emissions from California Dairies"*

Dr. Frank Mitloehner, University of California, Davis

Discussion of projects designed to evaluate parameters such as animal housing and manure handling, under controlled conditions using environmental chambers, on emissions from livestock facilities. We will use these data to drive a process-based model to identify the flow of carbon, nitrogen, and sulfur through the different operational processes on a dairy (feeding, housing, manure storage, land application) to eventually predict emissions of volatile organic compounds, methane, ammonia, nitrous oxide, nitric oxide, nitrogen and hydrogen sulfide. This site-specific approach will significantly improve estimates of emissions from California dairies.

1:30 p.m. *"Treatment of Dairy Manure with Anaerobic Digestion and Aeration Technologies for Reducing Gaseous Emissions"*

Dr. Ruihong Zhang, University of California, Davis

This paper reports the findings of an on-going study at U.C. Davis in quantifying the emission reductions of several gases (ammonia, hydrogen sulfide, methane, and volatile organic compounds) by anaerobic digestion and aeration treatment processes for dairy manure. Anaerobic digestion and aeration technologies have proven to be effective in providing the necessary treatment of animal waste for the benefits of water pollution control. Anaerobic digesters could also provide dairies with the benefit of biogas-energy production as well. Such waste treatment technologies are expected to reduce the air emissions from manure management systems. However, how much emission reduction that can be achieved for dairies is not known.

2:00 p.m. *"A Process Based Approach to Measure Ammonia from Dairy Operations Using a Flux Chamber Protocol"*

Dr. Saqib Mukhtar, Texas A&M University

Report on the methods and results of using flux chambers to measure ammonia emissions at dairies.

2:30 p.m. *Break*

POULTRY

2:45 p.m. *"Emissions from Poultry Production"*

Matt D. Summers, California Department of Food and Agriculture

A collaborative effort to estimate the emissions from broiler production in California is discussed. Methodology and equipment was developed so that standardized U.S. EPA source test methods could be applied to a mechanically ventilated poultry house. Resulting emissions throughout the broiler cycle for ammonia, particulate matter, and volatile organic compounds are presented and analyzed.

FINAL PROGRAM – LIVESTOCK EMISSIONS RESEARCH SYMPOSIUM

TECHNOLOGY PRESENTATIONS

3:15 p.m. *"Five Minute Presentations Regarding Technologies or Practices that may Help Reduce Livestock Emissions"*

Moderated by Patrick Gaffney, Air Resources Board

CLOSING

4:00 p.m. *Bob Fletcher, Air Resources Board*

FINAL PROGRAM WILL BE AVAILABLE AT THE SYMPOSIUM

Alan C. Lloyd, Ph.D.
Agency Secretary

Air Resources Board

1001 I Street • P.O. Box 2815
Sacramento, California 95812 • www.arb.ca.gov

Arnold Schwarzenegger
Governor

February 11, 2005

Dear Sir/Madam:

The California Air Resources Board (ARB or Board) invites you to participate in a public workshop to discuss a proposed definition for a Large Confined Animal Facility (large CAF). The workshop details are as follows:

DATE: Wednesday, March 2, 2005

TIME: 1:30 p.m. to 3:30 p.m.

LOCATION: San Joaquin Valley Air Pollution Control District
Central Office
1990 East Gettysburg Avenue
Fresno, California 93726

Senate Bill 700 (Florez, 2003) requires ARB to adopt a large CAF definition by July 1, 2005. ARB staff held a series of workshops in August and September 2004 to solicit input for developing the large CAF definition. ARB staff also held a Livestock Emissions Research Symposium on January 26, 2005, at which researchers presented their most current findings regarding the airborne emissions from dairy, beef, and poultry operations.

Throughout the last year, ARB staff has been working with stakeholders to review relevant scientific information, including emission factors for CAFs and how large CAFs may affect the attainment and maintenance of ambient air quality standards. This information is being used to develop the draft definition proposals, which will be presented at the workshop.

Staff will use input received at the workshop in proposing the large CAF definition. The definition will be included in a staff report expected to be released in May 2005 for consideration by the Board at the June 23, 2005 public hearing.

The workshop will also be teleconferenced and video teleconferenced. You may send questions on-line during the workshop by e-mail to meetingquestion@valleyair.org. The workshop title should be placed in the subject line, followed by your questions in the body of the e-mail. To participate by teleconference, please call 888-549-9134, using the pass code 148277.

The following locations are available for video teleconference participation:

San Joaquin Valley Air Pollution Control District
Northern Office
4230 Kiernan Avenue, Suite 130
Modesto, California 95356

San Joaquin Valley Air Pollution Control District
Southern Office
2700 M Street, Suite 275
Bakersfield, California 93301

South Coast Air Quality Management District
21865 E. Copley Drive
Conference Room CC08
Diamond Bar, California 91765

The meeting places are accessible to persons with disabilities. If you have special accommodation or language needs, please contact Ms. Heather Arias at (916) 323-2722 or harias@arb.ca.gov. TTY/TDD/Speech-to-Speech users may dial 7-1-1 for the California Relay Service.

Please also contact Ms. Arias with any questions about the workshop.

Sincerely,

/s/

Robert D. Fletcher, Chief
Planning and Technical Support Division

Attachment

cc: Rich Burt
San Joaquin Valley Air Pollution Control District
1990 East Gettysburg Avenue
Fresno, California 93726

Heather Arias
Transportation Strategies Section
Planning and Technical Support Division

Large Confined Animal Facility Definition Workshop

Wednesday, March 2, 2005
1:30 p.m. – 3:30 p.m.

WELCOME
1:30 p.m. *Bob Fletcher, Air Resources Board*

SB 700 REQUIREMENTS
1:40 p.m. *Michael FitzGibbon, Air Resources Board*

RESEARCH SYMPOSIUM UPDATE
1:50 p.m. *Patrick Gaffney, Air Resources Board*

LARGE CAF DEFINITION DISCUSSION
2:00 p.m. *Patrick Gaffney, Air Resources Board*

NEXT STEPS
3:15 p.m. *Michael FitzGibbon, Air Resources Board*

CLOSING
3:30 p.m. *Bob Fletcher, Air Resources Board*

APPENDIX G

SAN JOAQUIN VALLEY MAJOR ROG SOURCE CATEGORIES

Major ROG Emissions Sources in the San Joaquin Valley for 2004

Emissions Rank	Source Category	ROG (tons/day)	% of Total
1	Light and Medium Duty Trucks	37.4	10%
2	Light Duty Passenger Cars	33.6	9%
3	Oil and Gas Production (Evaporative Losses)	29.6	8%
4	Pesticides	25.8	7%
5	Consumer Products	24.9	7%
6	Livestock Waste (Dairy Cattle)	23.5	6%
7	Prescribed Burning	17.7	5%
8	Off-Road Equipment (Lawn/Garden-Construction, etc)	15.4	4%
9	Aircraft	12.3	3%
10	Coatings (Paints and Thinners-Non-Architectural)	11.6	3%
11	Architectural Coatings (Paints and Thinners)	10.5	3%
12	Petroleum Marketing (Gasoline Evaporative Losses)	10.1	3%
13	Food and Agriculture (Crop Processing and Wineries)	10.1	3%
14	Recreational Boats	10.1	3%
15	Heavy Duty Gas Trucks	9.3	3%
16	Agricultural Burning	8.5	2%
17	Farm Equipment (Tractors)	8.3	2%
18	Residential Fuel Combustion	6.5	2%
19	Heavy Duty Diesel Trucks	5.1	1%
20	Off-road Recreational Vehicles	4.6	1%
-	All Other Sources	48.8	13%
Total		366.4	100%

ARB 2005e - Modified to reflect revised estimates for the livestock categories of diaries, poultry, and beef cattle.

TITLE 13. CALIFORNIA AIR RESOURCES BOARD

NOTICE OF PUBLIC HEARING TO CONSIDER ADOPTION OF EMISSION STANDARDS AND TEST PROCEDURS FOR NEW 2007 AND LATER OFF-ROAD LARGE SPARK-IGNITION (LSI) ENGINES AND FLEET REQUIREMENTS FOR USERS OF OFF-ROAD LSI ENGINES

The Air Resources Board (the Board or ARB) will conduct a public hearing at the time and place noted below to consider the adoption of new emission standards for 2007 and later off-road large spark-ignition (LSI) engines, requirements for fleet users of such equipment and verification procedures for retrofit control systems.

DATE: June 23, 2005

TIME: 9:00 a.m.

PLACE: San Joaquin Valley Air Pollution Control District
1990 East Gettysburg Avenue
Fresno, California 93726

or Via Videoconference (2 Locations)
District Northern Region Office
4230 Kiernan Avenue, Suite 130
Modesto, California 95356

District Southern Region Office
2700 M Street, Suite 275
Bakersfield, California 93301

This item will be considered at a two-day meeting of the Board, which will commence at 9:00 a.m., June 23, 2005, and may continue at 8:30 a.m., June 24, 2005. This item may not be considered until June 24, 2005. Please consult the agenda for the meeting, which will be available at least 10 days before June 23, 2005, to determine the day on which this item will be considered.

If you have a disability-related accommodation need, please go to http://www.arb.ca.gov/html/ada/ada.htm for assistance or contact the ADA Coordinator at (916) 323-4916. If you are a person who needs assistance in a language other than English, please contact the Bilingual Coordinator at (916) 324-5049. TTY/TDD/Speech-to-Speech users may dial 7-1-1 for the California Relay Service.

INFORMATIVE DIGEST OF PROPOSED ACTION AND POLICY STATEMENT OVERVIEW

Sections Affected: Proposed amendments and adoptions to title 13, California Code of Regulations, and the documents incorporated by reference therein: Amend sections 2430, 2433, and 2434. Amend the title of incorporated "California Exhaust Emission Standards and Test Procedures for New-2001 and Later Off-Road Large Spark-Ignition Engines," adopted September 1, 1999; and adopt incorporated "California Exhaust Emission Standards and Test Procedures for New 2007 and Later Off-Road Large Spark-ignition Engines." Adopt sections 2775, 2775.1, 2775.2, 2780, 2781, 2782, 2783 2784, 2785, 2786, 2787, 2788, and 2789.

Background: The California Clean Air Act in Health and Safety Code sections 43013 and 43018 grants the ARB authority to regulate off-road mobile source categories. Included are marine vessels, locomotives, utility engines, off-road motorcycles, and off-highway vehicles. Measures within the 2003 State Implementation Plan for Ozone directed ARB staff to develop regulations that continue efforts to reduce emissions from LSI engines above 25 horsepower. In crafting the proposal, the ARB staff developed an outreach program that involved LSI engine and equipment manufacturers, emission control system manufacturers, propane fuel refiners and distributors, end-user facility operators, federal regulatory agencies, environmental/pollution prevention and public health advocates and other interested parties. ARB staff also held five public workshops to solicit input as the proposed regulation was developed.

Over 90 percent of Californians breathe unhealthful air at times. To improve air quality and human health, the United States Environmental Protection Agency (U.S. EPA) and the ARB set ambient air quality standards for harmful air pollutants including ozone. Ozone is formed when hydrocarbons (HC) and oxides of nitrogen (NOx) combine through chemical reactions in the atmosphere in the presence of sunlight.

To reduce HC and NOx emissions from off-road vehicles, the ARB adopted regulations in late 1998 requiring that new LSI engines be certified to a standard of 3.0 grams per brake horsepower per hour (g/bhp-hr) HC+NOx starting in 2001. The regulation phased in the standard such that by 2004, all new engines must meet this requirement. The U.S. EPA later adopted its own LSI regulation incorporating test information obtained from the development of the 1998 ARB LSI regulation. The U.S. EPA regulation required all new LSI engines nationwide to meet the same 3.0 g/bhp-hr standard as of January 2004 and a 2.0 g/bhp-hr standard beginning in 2007.

As a result of these regulations, new LSI engines are now 75 percent cleaner than previously uncontrolled engines and engines meeting the 2007 standard will be approximately 85 percent cleaner. Opportunities exist, however, to further reduce emissions from LSI equipment. First, forklifts accounted for six percent of all off-road emissions in 2000 and this percentage is increasing. Second, there are large numbers of uncontrolled LSI engines still in use that contribute significantly to the overall emissions inventory in California. For example, a forklift with an uncontrolled engine

can produce as much emissions in three 8-hour shifts as one new car certified to California's lowest emission level would emit over its entire life. Finally, LSI engines are generally based upon automotive engine technology and there are opportunities to adapt advanced automotive-inspired emission control technologies into new and in-use LSI equipment to cost-effectively reduce emissions.

In recognition of these factors, the 2003 State Implementation Plan included two measures to further reduce emissions from LSI engines. The first measure proposed that the California program harmonize with the U.S. EPA regulations by adopting the 2.0 g/bhp-hr emission standard for 2007 and beyond. The second measure proposed that existing uncontrolled LSI engine emissions be reduced by 80 percent or to a 3.0 g/bhp-hr verification level. The later measure also proposed that zero and near-zero emission standards be developed for new LSI engines. The proposed regulation described below meets the objectives of the two SIP measures.

Proposed Provisions Applicable to Engine Manufacturers

The proposal has three components for manufacturers of LSI engines. The first component harmonizes the ARB standard with the more stringent U.S. EPA emission standards and test procedures that become effective in 2007. Under this requirement, manufacturers of 2007 and later model year engines must meet a nominal 2.0 g/bhp-hr HC+NOx and 3.3 g/bhp-hr carbon monoxide (CO) emission levels. The federal requirement allows manufacturers to optionally certify according to the following formula: $(HC+NOx) \times (CO)^{0.784} \leq 8.57$. This optional certification standard provides manufacturers the flexibility to let their CO emissions increase so that they may achieve lower HC+NOx levels. The proposed regulation would incorporate these provisions within the first component of the manufacturer lower emission standards.

The second proposed component would require that new 2010 and subsequent model year engines meet a 0.6 g/bhp-hr HC + NOx with a corresponding CO emission standard of 15.4 g/bhp-hr. The 0.6 g/bhp-hr level corresponds to the minimum HC+NOx level on the HC+NOx versus CO emission trade off curve established by the U.S. EPA optional certification formula noted above. As such, the proposed 2010 standard is consistent with the 2007 standard, but limits flexibility to the most stringent HC+NOx emission level to maximize ozone benefits.

The third proposed component establishes optional low emission standards below the 2007 and 2010 mandatory standards. Under this component, engines could be certified to optional tiered new engine standards of 0.1, 0.2, 0.4, 0.6, 1.0 and 1.5 g/bhp-hr HC+NOx through the 2009 model year, and 0.1, 0.2 and 0.4 g/bhp-hr HC+NOx in 2010 and beyond. The low emission standards provide fleet operators additional flexibility in meeting the proposed fleet average emission requirements.

Proposed Provisions Applicable to Fleet Operators

To address emissions from uncontrolled in-use (non-new) engines and encourage zero-emission and lower-emission equipment, the ARB staff is proposing fleet average emission requirements for large and mid-size fleets of equipment powered by LSI engines, including forklifts, industrial tow tractors, sweepers/scrubbers, and airport ground support equipment. Fleet size is determined by aggregating each operators equipment in the State of California. Large LSI fleets are defined as those with more than 25 pieces of equipment while mid-size fleets are defined as those with 4 to 25 pieces of equipment.

Large fleets would have to meet more stringent fleet averages than mid-size fleets because they have greater flexibility when incorporating combinations of emission-reduction strategies to achieve a prescribed level. Additionally, the fleet average would be more stringent for the forklift portion of the fleet than for the non-forklift portion of the fleet.

The fleet average would be determined using the certification levels of 2001 and newer LSI engines and the retrofit verification levels of engines with retrofit kits. These values are clearly indicated on the engine label. To make the proposal less complex and less intrusive for operators while maintaining cost effective emission benefits, the fleet average would not incorporate load factor, horsepower, or hours of use.

Small fleets, those with 1 to 3 pieces of equipment, would be exempt from the fleet average requirement and instead would be required to control all equipment by January 1, 2011. The proposal would allow small fleets until 2013 to comply with the requirements if the equipment has an hour of use meter and is used 250 hours per year or less.

The proposal provides LSI fleets with the flexibility to incorporate any combination of retrofits, low-emission purchases, and zero-emission electric purchases to meet the fleet average emission level. Voluntary low emission standards for manufacturers of new LSI engines will allow manufacturers to certify engines at levels significantly lower than current or pending standards. The following table summarizes the proposed fleet average emission levels for forklift and non-forklift LSI fleets.

Fleet Average Emission Level Requirement (g/bhp-hr)

LSI Fleet Type	Number of units	By 1/1/2009	By 1/1/2011	By 1/1/2013
Large fleet – forklift component	26 +	2.4	1.7	1.1
Mid-size fleet – forklift component	4-25	2.6	2.0	1.4
Mid-size or Large Non-forklift fleet	N/A	3.0	2.3	1.7
Small fleet	1-3	No uncontrolled equipment after 12/31/2010		

Alternative Compliance Option for Agricultural-Related Fleets

ARB staff is proposing an alternative compliance option for agricultural-related fleets that would allow additional time to control the highest emitting forklifts as long as steady documented progress is made. The proposal reflects the longer retention periods characteristic of agricultural operations. Under this option, agricultural fleet operators would be required to control (to a 3.0 g/bhp-hr level) ten percent of their uncontrolled forklift fleet each year for ten years through retrofit, repower, or retirement.

Verification Procedure

ARB staff is also proposing a verification procedure for retrofit control systems to address in-use emissions and to provide fleet operators with additional options to meet the proposed fleet average emission requirements. Such procedures will ensure that the retrofit systems deliver real and quantifiable emission reductions.

The proposed verification procedures would apply to manufacturers of retrofit systems sold in California. These systems include but are not limited to, closed-loop fuel control systems, fuel injections systems, and three-way catalysts.

COMPARABLE FEDERAL REGULATIONS

In 1998 California adopted emission standards for new LSI engines. Following California's lead, in 2002 U.S. EPA did the same (Volume 67, Federal Register, page 68242, November 8, 2002; title 40, Code of Federal Regulations, part 1048). As the preamble to the federal regulations notes, the federal regulations extend California's standards for new LSI engines to the rest of the United States in 2004 through 2006 and adopt more stringent standards for new LSI engines beginning in 2007.

In the staff's proposal, California would harmonize with the federal standards for new LSI engines in 2007 through 2009 and would adopt yet more stringent California

standards for 2010 and later. Optional reduced emission standards for new LSI engines would be established in California for 2007 and later.

To further reduce emissions from LSI engines, the proposal requires California LSI equipment operators to meet fleet average standards. To this end, the proposal allows for retrofitting of in-use (non-new) LSI engines and proposes a verification procedure for retrofit emission controls. The federal regulations do not impose requirements on fleet operators or on in-use engines.

AVAILABILITY OF DOCUMENTS AND AGENCY CONTACT PERSONS

The Board staff has prepared a Staff Report: Initial Statement of Reasons (ISOR) for the Proposed Regulatory Action, which includes a summary of the economic and environmental impacts of the proposal. The report entitled: Staff Report: Initial Statement of Reasons for Proposed Rulemaking, Public Hearing to Consider Adoption of Emissions Standards for New 2007 and Later Off-Road Large Spark Ignition (LSI) Engines and Fleet Requirements for Users of Off-Road LSI Engines.

Copies of the ISOR and the full text of the proposed regulatory language, in underline and strikeout format to allow for comparison with the existing regulations, may be accessed on the ARB's web site listed below, or may be obtained from the Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, 1st Floor, Sacramento, CA 95814, (916) 322-2990 at least 45 days prior to the scheduled hearing on June 23, 2005.

Upon its completion, the Final Statement of Reasons (FSOR) will be available and copies may be requested from the agency contact persons in this notice, or may be accessed on the ARB's web site listed below.

Inquiries concerning the substance of the proposed regulation may be directed to , Mr. Mark Williams by phone at (916) 327-5610 or by email at mwilliam@arb.ca.gov, or to Mr. Tom Evashenk by phone at (916) 445-8811 or by email at tevashen@arb.ca.gov.

Further, the agency representative and designated back-up contact persons to whom nonsubstantive inquiries concerning the proposed administrative action may be directed are Artavia Edwards, Manager, Board Administration & Regulatory Coordination Unit, (916) 322-6070, or Alexa Malik, Regulations Coordinator, (916) 322-4011. The Board has compiled a record for this rulemaking action, which includes all the information upon which the proposal is based. This material is available for inspection upon request to the contact persons.

This notice and the ISOR are available on the ARB Internet site for this rulemaking: http://www.arb.ca.gov/regact/lore2005/lore2005.htm. All subsequent regulatory documents, including the FSOR, will be available from the same Internet site when completed.

COSTS TO PUBLIC AGENCIES AND TO BUSINESSES AND PERSONS AFFECTED

The determination of the Board's Executive Officer concerning the costs or savings necessarily incurred by the public agencies and private persons and businesses in reasonable compliance with the proposed regulations are presented below.

Pursuant to Government Code sections 11346.5(a)(5) and 11346.5(a)(6), the Executive Officer has determined that the proposed regulatory action will not create costs or savings to any state agency or in federal funding to the state, costs or mandate to any local agency or school district whether or not reimbursable by the state pursuant to part 7 (commencing with section 17500), division 4, title 2 of the Government Code, or other nondiscretionary savings to state or local agencies.

In general, local and state agencies will need to take to comply with the regulatory standards by purchasing new low emission equipment or by retrofitting existing equipment. However, the staff analysis concludes that over the lifecycle of the equipment, a reduction in operating costs through improved fuel use and reduced maintenance can offset the increased initial cost.

In developing this regulatory proposal, the ARB staff evaluated the potential economic impacts on representative private persons or businesses. An assessment of the economic impacts of the proposed regulatory action can be found in the ISOR. The Executive Officer has also determined, pursuant to title 1, CCR, section 4, that the proposed regulatory action will affect small business.

The Executive Officer has also determined that adoption of the proposed regulatory action will not have a significant statewide adverse economic impact directly affecting businesses, including the ability of California businesses to compete with businesses in other states, or on representative private persons.

In accordance with Government Code section 11346.3, the Executive Officer has determined that the proposed regulatory action will not affect the creation or elimination of jobs within the State of California, the creation of new businesses or elimination of existing businesses within the State of California, or the expansion of businesses currently doing business within the State of California. An assessment of the economic impacts of the proposed regulatory action can be found in the ISOR.

In accordance with Government Code sections 11346.3(c) and 11346.5(a)(11), the Executive Officer has found that the reporting requirements of the regulation which apply to businesses are necessary for the health, safety, and welfare of the people of the State of California.

Before taking final action on the proposed regulatory action, the Board must determine that no reasonable alternative considered by the board or that has otherwise been identified and brought to the attention of the board would be more effective in carrying out the purpose for which the action is proposed or would be as effective and less

burdensome to affected private persons than the proposed action.

BENEFITS OF THE PROPOSAL

The staff analysis of the proposal indicates that the statewide emissions benefit associated with the new engine standards and operator fleet average emission level requirements will exceed 13 tons per day of HC+NOx in 2010 and 6 tons per day of HC+NOx in 2020. The emission benefit in the South Coast Air Basin (SCAB) will exceed 6 tons per day in 2010, which corresponds to the upper range of the Board's state implementation plan commitment for ozone. The cost-effectiveness of the proposal compares favorably with that of other mobile source regulations promulgated by the ARB.

SUBMITTAL OF COMMENTS

The public may present comments relating to this matter orally or in writing at the hearing, and in writing or by e-mail before the hearing. To be considered by the Board, written submissions not physically submitted at the hearing must be received **no later than 12:00 noon, June 22, 2005**, and addressed to the following:

Postal mail is to be sent to:

Clerk of the Board
Air Resources Board
1001 I Street, 23rd Floor
Sacramento, California 95814

Electronic mail is to be sent to: lore2005@listserv.arb.ca.gov and received at the ARB **no later than 12:00 noon, June 22, 2005.**

Facsimile transmissions are to be transmitted to the Clerk of the Board at (916) 322-3928 and received at the ARB **no later than 12:00 noon, June 22, 2005.**

The Board requests but does not require that 30 copies of any written statement be submitted and that all written statements be filed at least 10 days prior to the hearing so that ARB staff and Board Members have time to fully consider each document. The Board encourages members of the public to bring to the attention of staff in advance of the hearing any suggestions for modification of the proposed regulatory action.

STATUTORY AUTHORITY AND REFERENCES

This regulatory action is proposed under that authority granted in Health and Safety Code, sections39002, 39003, 39500, 39600, 39601,39650-39675, 43000, 43011, 43013, 43017, 43018, 43101, 43102, 43104, 43600, and 43700, and 43104. This action is proposed to implement, interpret and make specific Health and Safety Code sections43000, 43009.5, 43013, 43017, 43018, 43101, 43102, 43104, 43105, 43106,

43107, 43150, 43151, 43152, 43153, 43154,43204, 43205, 43205.5, 43210, 43210.5, 43211, and 43212.

HEARING PROCEDURES

The public hearing will be conducted in accordance with the California Administrative Procedure Act, title 2, division 3, Part 1, chapter 3.5 (commencing with section 11340) of the Government Code.

Following the public hearing, the Board may adopt the regulatory language as originally proposed or with nonsubstantial or grammatical modifications. The Board may also adopt the proposed regulatory language with other modifications if the text as modified is sufficiently related to the originally proposed text that the public was adequately placed on notice that the regulatory language as modified could result from the proposed regulatory action; in such event the full regulatory text, with the modifications clearly indicated, will be made available to the public, for written comment, at least 15 days before it is adopted.

The public may request a copy of the modified regulatory text from the ARB's Public Information Office, Air Resources Boar, 1001 I Street, Visitors and Environmental Services Center, 1st Floor, Sacramento, California 95814, (916) 322-2990.

CALIFORNIA AIR RESOURCES BOARD

Catherine Witherspoon
Executive Officer

Date: April 26, 2005

The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs see our Web –site at www.arb.ca.gov.

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY
AIR RESOURCES BOARD

STAFF REPORT:
INITIAL STATEMENT OF REASONS FOR PROPOSED RULEMAKING, PUBLIC HEARING TO CONSIDER ADOPTION OF EMISSION STANDARDS AND TEST PROCEDURES FOR NEW 2007 AND LATER OFF-ROAD LARGE SPARK-IGNITION (LSI) ENGINES AND FLEET REQUIREMENTS FOR USERS OF OFF-ROAD LSI ENGINES

This report has been reviewed by the staff of the California Air Resources Board and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Air Resources Board, nor does the mention of trade names or commercial products constitute endorsement or recommendation for use.

Date of Release: May 6, 2005
Scheduled for Consideration: June 23, 2005

EXECUTIVE SUMMARY

Air quality in California has improved dramatically over the past 30 years, due in large part to the continued progress in controlling pollution from mobile sources. Despite the achievements to date, many parts of the state still do not meet state or federal health-based ambient air quality standards. More people are driving, and those same people are driving more miles – ozone/smog is still a serious problem. Clearly, all sources of pollution must be addressed and controlled if California is going to meet and sustain its air quality goals.

In 1998 the California Air Resources Board (ARB or Board) first adopted emission standards for large spark ignition (LSI) engines of 25 horsepower or larger. These engines are used in off-road equipment including forklifts, airport ground support equipment, sweepers, and scrubbers. The full implementation of the emission standards in 2004 successfully required engine manufacturers and a variety of equipment that run on gasoline or propane to apply control technologies and strategies for light-duty on-road vehicles to engines in this category. As a result of the new standards, emissions from new engines were reduced by approximately 75 percent.

Building on this success, the United State Environmental Protection Agency (U.S. EPA) harmonized with California's standards and adopted more stringent requirements for new engines produced for the 2007 and later model years. The federal program demonstrated that additional reductions were technically feasible and cost-effective.

In evaluating the federal program, the state of technology, and the commitments made by the ARB within the 2003 State Implementation Plan for Ozone, ARB staff determined that further reductions from new and from in-use engines were achievable and necessary. Consequently, the ARB staff began the proposed rulemaking in 2004 to develop new requirements that would ultimately include new engine certification engine standards for equipment manufacturers and in-use fleet-average requirements for users of the equipment. The key elements of the proposal include:

Requirements for Engine Manufacturers

- Alignment with the engine certification standards adopted by the U.S. EPA beginning in 2007.

- Alignment with additional requirements of the federal rule including more vigorous test procedures and on board diagnostics.

- More stringent emissions standards for 2010 and later based on control technologies needed to meet the standard for 2007 but optimized to reduce hydrocarbon (HC) and oxides of nitrogen (NOx) emissions.

- Optional lower-emission standards that allow engine manufacturers to provide additional value to fleet users.

Requirements for Fleet Users

- Fleet average requirements for operators of specific LSI equipment: forklifts, sweeper/scrubbers, industrial tow tractors and airport ground support equipment.

- The operator is provided the flexibility to use a combination of retrofits, lower-emission purchases, and zero-emission electric purchases to meet the fleet average emission level beginning January 2009 and becoming progressively more stringent over time.

- An alternative compliance option for agricultural fleets to address issues specific to this industry.

Verification Procedure for Manufacturers of Retrofit Emission Control Systems

- A new procedure for verifying LSI retrofit emission control systems to address emissions from existing engines, consistent with adopted requirements for diesel retrofit systems.

Economic and Environmental Impacts

The proposed 2007 emission standards for engine manufacturers are not expected to create significant economic impacts as manufacturers are already developing engines to comply with the federal 2007 standards. The proposed standards for 2010 and later leverage work already being done to meet the federal program and thus provide extremely cost effective emission reductions of $0.13 per pound.

The proposed fleet standards will require operators to procure low- and zero-emission equipment and address uncontrolled equipment within their fleets. The use of compliant new engines and the retrofit of existing engines have been shown to reduce fuel use and improve engine life, thus creating cost savings for equipment users making the fleet standards also extremely cost effective. The cost-effectiveness ranges from $0.13 per pound for lower-emission equipment to $1.40 per pound for electric equipment. The proposed implementation date of January 2009 will provide time and flexibility to fleet operators as they work to comply with the standards.

The primary benefits of the proposed regulation will be a reduction in smog-forming pollutants to Californians. The ARB staff projects that the application of control systems to both existing and new engines will reduce hydrocarbon and oxides of nitrogen emissions by more than 13 tons per day in 2010 and 6 tons per day in 2020.

Staff Recommendation

The ARB staff recommends that the Board adopt the amendments and additions as proposed in this Initial Statement of Reasons. The proposed amendments provide significant flexibility to fleet users while addressing the highest-polluting equipment up front and putting in place cleaner engine standards for the longer term. The amendments meet ARB's commitments contained in the 2003 State Implementation Plan for Ozone and provide cost-effective emission reductions from both new and existing engines.

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1 INTRODUCTION

The California Clean Air Act (CCAA) as codified in the Health and Safety Code sections 43013 and 43018 grants the Air Resources Board (ARB) authority to regulate off-road mobile sources of emissions. These sources include, but are not limited to marine vessels, locomotives, utility engines, off-road motorcycles, and off-highway vehicles. Off-road large spark-ignition (LSI) engines are a subcategory of off-road engines subject to ARB regulation. The ARB estimates that there are approximately 88,000 LSI engines in 2004. Statewide hydrocarbon (HC) and oxides of nitrogen (NOx) emissions from LSI equipment are approximately 15 and 54 tons per day, respectively. Forklifts represent almost half of the LSI engine population and more than 85 percent of the HC+NOx emissions.

Typical applications for off-road LSI engines include forklifts, portable generators, large turf care equipment, irrigation pumps, welders, air compressors, scrubber/sweepers, airport service vehicles, and a wide array of other agricultural, construction and general industrial equipment. The engines used are typically derived from automobile engines, and are most commonly fueled by gasoline or liquefied petroleum gas (LPG).

The ARB first adopted emission standards for off-road LSI equipment over 25 horsepower (19 kilowatts) in 1998, with implementation beginning in the 2001 model year. The proposed amendments contained within this rulemaking continue the ARB's efforts to achieve the greatest cost-effective reductions possible from the category. The proposal would harmonize ARB's new engine emission standards to the federal program in 2007 and establish more stringent new engine emission standards in 2010. The proposal would also allow optional lower-emission standards and establish new requirements for operators to accelerate the introduction of cleaner engines and provide a procedure for certifying retrofit systems for engines already in-use.

1.1 Overview

This report presents the proposed regulation to further reduce HC+NOx emissions from off-road equipment with LSI engines of 25 horsepower or more (greater than 19 kilowatts). A summary of the requirements of the proposal is presented in Section 3 of the Staff Report.

This report also provides the information that ARB staff used to develop the proposal. This information includes:

- Current and pending requirements to reduce emissions from off-road LSI engines;
- Current emission inventory and operational characteristics of off-road LSI engines;
- A summary of the proposed regulation including a discussion of applicability, proposed requirements, and record keeping and reporting requirements;
- A summary of compliance options, including a discussion of available zero- and lower-emission technologies and compliance scenarios;

- A discussion of the environmental and economic impacts of implementing the proposal; and
- Additional considerations.

The regulatory text and other supporting information for the various elements of the proposal are found in the Appendices.

The manufacturer lower-emission standards will ensure that all new LSI engines and equipment achieve the most cost-effective emissions reductions possible. The operational requirements will ensure that users, owners, and operators of both new and in-use off-road LSI equipment reduce overall emissions to the maximum extent possible. Operational requirements are the fleet average emission level established for large and mid-size fleets, the proposed annual requirements established for fleets used in agricultural crop preparation services, and the requirement that small fleets address their uncontrolled equipment. Finally, record keeping and reporting requirements provide the ARB staff the ability to ensure compliance with the fleet average or draw down provisions of the regulation, while the labeling requirements provide operators with labeling information for determining compliance with their fleet average provisions.

In developing the proposal, there were a number of technical and policy issues that had to be addressed. These included defining a test method for verifying retrofit emissions, early new engine certification and retrofit emission control system verification procedures, and harmonization with federal LSI requirements developed by the United States Environmental Protection Agency (U.S. EPA). Additional issues are discussed in Section 9, Additional Considerations.

1.2 Regulatory Authority

The CCAA grants the ARB authority to regulate off-road mobile sources of emissions. These mobile sources include, but are not limited to marine vessels, locomotives, utility engines, off-road motorcycles, and off-highway vehicles. Off-road large spark-ignition engines are a subcategory of off-road engines subject to ARB regulation. The proposal addresses new and non-new off-road LSI equipment greater than 25 horsepower (19 kilowatts) for which California retains regulatory authority. Off-road LSI equipment with engines greater than 25 horsepower, but a displacement of less than one liter, are not included as part of this proposal.

The proposal does not address new equipment under 175 horsepower used primarily in farm equipment or vehicles and in construction equipment or vehicles as the U.S. EPA has sole authority to control emissions from this equipment. U.S. EPA's authority is based on federal Clean Air Act section 209(e)(1)(A) which preempts states from adopting or enforcing any standard or other requirement relating to the control of emissions of new engines in these categories. Because of this preemption, significant emissions from the subject engine category are beyond ARB's authority to regulate. However, as discussed in the summary of existing federal regulations in Section 2.2, the

ARB staff worked closely with the U.S. EPA in their development of a nationwide federal rule to cover all engines in this category.

To define the scope of the preemption, U.S. EPA adopted regulations at title 40, Code of Federal Regulations, section 85.1601, et seq. The federal regulations provide that a given type of equipment is treated as farm equipment if the equipment is "primarily used in the commercial production and/or commercial harvesting of food, fiber, wood, or commercial organic products or for the processing of such products for further use on the farm." A similar determination of primary use is applied for construction equipment, defined as equipment used in construction and located on commercial construction sites.

To further identify preempted equipment, ARB established a list of the types of equipment that did or did not constitute construction or farm equipment based on U.S. EPA regulations and discussions with various trade organizations. For equipment over 25 horsepower, all equipment was considered to be construction or farm equipment except for the 11 categories listed below. In ARB's initial 1998/1999 rulemaking to establish standards for large spark-ignition engines, the non-preempted types were refined and specified as:

- Airport Ground Power
- Baggage Handling
- Forklifts that are neither rough terrain nor powered by diesel engines
- Generator Sets
- Mining Equipment not otherwise primarily used in the construction industry
- Off-highway Recreational Vehicles
- Other Industrial Equipment
- Refrigeration Units less than 50 hp
- Scrubbers/Sweepers
- Tow/Push Equipment
- Turf Care Equipment

1.3 Applicability

The manufacturer lower-emission standards presented in Section 3.1 apply to engines greater than 25 horsepower used predominantly in the 11 categories of equipment listed above, just as the standards in the original LSI rule did. However, the proposed standards do not address the component of these engines with a displacement of less than or equal to 1 liter. This is a change from the original LSI rule, which established two sets of new engine emission standards – one for engines with a displacement greater than 1 liter, and one for engines with a displacement of less than or equal to 1 liter. The change reflects a feature of the U.S. EPA regulatory language for their Class II engines (less than 19 kW): when the U.S. EPA sets new standards for these engines, the same standards automatically apply to engines greater than 19 kW, but with a displacement of less than 1 liter. The U.S. EPA plans to propose new standards

for their Class II engines by the end of this year that are significantly lower than the current standards.

The fleet average emission level proposal (fleet average) presented in Section 3.2 applies to airport ground support equipment (GSE). Examples of GSE include forklifts, tugs, belt loaders, bobtails, cargo loaders, lifts, air conditioner, service trucks, de-icers, fuel delivery trucks, and ground power units. The fleet average also applies to sweeper/scrubbers, non-GSE forklifts, and non-GSE industrial tow tractors.

However, most, and possibly all GSE in the South Coast Air Basin would be exempt from the in-use requirements of this proposal through 2010 because their emissions are already addressed in a 2002 Memorandum of Understanding (MOU) between the ARB and the basin's airlines (GSE MOU, 2002). Staff is proposing that GSE in the South Coast Air Basin be phased into this regulation following expiration of the MOU. Any extension of the MOU or development of a similar agreement signed by the ARB to other locations within California could preempt the GSE fleet requirements of this proposal as well.

Additionally, 46 percent of the engines that were certified in the 2004 model year for sweeper/scrubber applications had a displacement of one liter or less (ARB, 2005a). These engines would not be subject to this proposal.

Diesel equipment, including diesel forklifts, would not be subject to the requirements of this proposal as the ARB typically regulates diesel or compression ignition engines separately from LSI engines. This is in part due to the different pollutants and measuring techniques. However, the particulate emissions from diesel-fueled engines have been identified as a toxic air contaminant (TAC). TACs are those air pollutants that may cause or contribute to an increase in death or serious illness or may pose a present or future hazard to human health. Consequently, the ARB is separately controlling emissions from diesel-fueled applications in an expedited timeframe, typically by establishing state-of-the-art technology requirements (e.g., a requirement to retrofit diesel engines with particulate filters). Proposed requirements for in-use diesel forklifts are expected in late 2005.

1.4 Air Quality Needs and the Emissions from LSI

The ARB is responsible for protecting public health and the environment in California from the harmful effects of air pollution. To carry out this responsibility, the ARB establishes health-based ambient air quality standards. These standards identify outdoor pollutant levels that are considered safe for the public – including those most sensitive to the effects of air pollution, such as children and the elderly. The ARB has set standards for eight criteria pollutants, including ozone. The ARB then works in cooperation with 35 local air districts and the U.S. EPA on strategies to attain the State and federal standards. Despite significant success in reducing overall pollution levels, air pollution continues to be an important public health problem. Air monitoring shows

that over 90 percent of Californians breathe unhealthy levels of one or more air pollutants during some part of the year.

1.4.1 Health Impacts of Exposure to Ozone

The proposed regulation will reduce the public's exposure to ground-level ozone by reducing NOx and HC emissions, which are precursors to the formation of ozone in the lower atmosphere. Ozone, an important ingredient of smog, is a highly reactive and unstable gas. Symptoms of ozone exposure include coughing, chest tightness, shortness of breath, and the worsening of asthma symptoms. Repeated exposure to ozone can make people more susceptible to respiratory infection, lung inflammation and tissue damage, and can aggravate preexisting respiratory diseases, such as asthma. It can damage the respiratory tract, causing inflammation and irritation, which can result in breathing difficulties.

Currently, the state's strategies for reducing emissions from all sources are contained within the State Implementation Plans or SIPs. The SIPs establish blueprints for California's efforts to achieve attainment of ambient ozone and particulate matter standards throughout the state. LSI emission reductions are part of both the ARB's ozone and particulate matter SIPs.

2 CURRENT REGULATIONS AND INVENTORY

2.1 California LSI Regulation

In 1998 the ARB adopted LSI regulations that addressed the state's obligations under the 1994 Ozone SIP. The regulations represented the first part of a collective effort by the ARB and the U.S. EPA to work together to develop a harmonized national program. The regulations required new LSI engines sold in California to be certified to a standard of 3.0 g/bhp-hr of HC+NOx phased in from 2001 to 2004.

2.2 Federal LSI Regulation

As mentioned in the discussion of regulatory authority, the federal Clean Air Act Amendments of 1990 preempt California from controlling emissions from farm and construction equipment under 175 horsepower. To ensure that this preemption did not result in significant levels of unaddressed emissions from the subject engine category, the ARB staff worked closely with the U.S. EPA in their development of a nationwide federal rule to cover all engines in this category.

The federal rule, which addressed the obligations of the California SIP for ozone, was finalized in 2002 (U.S. EPA, 2002). It regulated emissions from farm and construction equipment in California in the absence of ARB's authority to do so. The federal rule and California's 1998 regulations were harmonized as much as possible to minimize

confusion and expenses that would result from significantly different state and federal requirements.

The U.S. EPA regulation required that LSI engines nationwide meet the same 3.0 g/bhp-hr standard beginning in 2004 as required in California. The federal regulation also included a more stringent standard beginning in 2007, requiring that new LSI engines meet a 2.0 g/bhp-hr standard using a more rigorous transient testing protocol. It additionally contains evaporative emission and in-use requirements that were not contained in the 1998 California regulation. As with the California regulation, the federal rule contained a durability requirement.

2.3 2003 State Implementation Plan for Ozone

As a result of the State and federal regulations, new LSI engines are now 75 percent cleaner than an uncontrolled LSI engine, and will become even cleaner beginning in 2007. This is only one of numerous efforts that have allowed California's air quality program to achieve impressive clean air progress over the past decades. From 1980 to 2000, peak ozone concentrations in the Los Angeles area declined over fifty percent and the number of unhealthy days declined by almost half.

However, California still has a long way to go to achieve its clean air goals – over 90 percent of Californians still breathe unhealthy air at times each year. As a result, the ARB is now addressing the significant opportunity that exists to further reduce HC and NOx emissions from LSI equipment. There are several factors that contribute to this opportunity.

First, LSI equipment accounted for approximately six percent of all off-road emissions in 2000 and this percentage is increasing (ARB, 2003). Second, there are large numbers of uncontrolled LSI engines still in use. These engines can emit 12 g/bhp-hr or more of HC+NOx, contributing significantly to the smog problems in California. To put this in perspective, one uncontrolled LSI engine can emit as much pollution in three 8-hour shifts as one passenger car certified to California's cleanest standard during its entire life. Third, LSI engines are generally based on automotive engine technology and can thus incorporate advanced automotive-inspired emission control technologies to dramatically reduce emissions while still meeting operational requirements. Finally, zero-emission (electric now, and hydrogen fuel cell in the future) forklifts are available to provide even greater emission benefits while in many cases reducing overall life cycle costs.

In recognition of these opportunities, the 2003 SIP included two measures for LSI engines. The first measure proposed that California harmonize with the 2007 U.S. EPA 2.0 g/bhp-hr emission standard. The second measure proposed that emissions from existing or in-use LSI engines be reduced by 80% or to a 3.0 g/bhp-hr verification level. The latter measure also proposed that new standards be developed that reflected the availability of zero- and near-zero-emission technologies.

2.4 LSI Inventory

The ARB's OFFROAD emission inventory model, adopted in 1998 and updated continually, was used to estimate the emissions inventory for off-road LSI engines as well as for all other off-road mobile sources (ARB, 1998b). The emission inventory for off-road LSI engines includes total emissions of criteria pollutants and particulate matter. The OFFROAD model can be used to produce annual emission inventories as well as future year forecasts for the entire state or subtotals for each air basin and county in California.

2.4.1 Emission Inventory

The annual average statewide emissions inventory for certain off-road LSI equipment categories and the total off-road LSI category are provided in Table 2.0 below. As shown in the table, off-road LSI equipment contributed about 70 tons per day of HC and NOx in 2004. In 2010, the emissions inventory for these criteria pollutants is projected to be roughly 35 tons per day of HC and NOx. The emissions from off-road LSI are projected to decrease between 2004 and 2010 despite a projected five-percent increase in equipment population during this timeframe. This overall decrease in emissions from this equipment category can be attributed to the impact of the emission standards that were adopted in 1998 for 2001 and subsequent model year new off-road LSI engines. This trend, while certainly positive, does not match efforts to reduce emissions from other off-road categories.

Table 2.0: Off-Road LSI Equipment Emissions Inventory 2004, 2010, 2020 Statewide Annual Average[1] (tons per day)

Year	Population	HC	NOx
2004	87687	15.4	54.8
2010	92104	7.5	28.3
2020	96964	4.4	19.0

[1] The current OFFROAD inventory shown in Table 2.0 does not reflect the impact of U.S. EPA's lower-emission standards for non-preempt off-road LSI engines starting in 2007.

The equipment categories shown in Table 2.1 represent the largest contribution to the overall off-road LSI inventory and are the focus of the regulatory proposal for fleet users. As calculated from Table 2.1, emissions from these three categories account for greater than 80 percent of the total HC+NOx off-road LSI emission inventory in 2004, and almost 94 percent of the non-preempt HC+NOx emissions. In terms of equipment population, the categories account for 60 percent of the total off-road LSI equipment population in 2004.

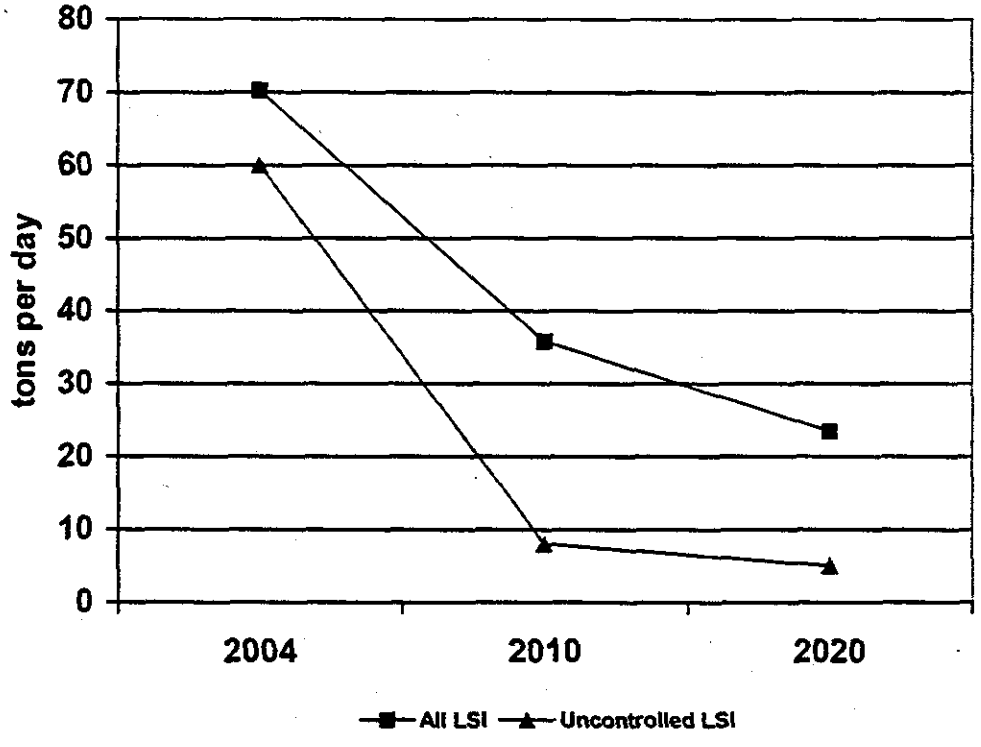
Table 2.1: Off-Road LSI Equipment Emissions Inventory for Certain Equipment Categories (tons per day)

Equipment Category	2004		2010		2020	
	HC	NOx	HC	NOx	HC	NOx
Industrial Forklifts	11.8	40.4	5.3	19.9	3.4	15.6
Airport Ground Support Equipment	0.6	3.3	0.3	1.5	0.2	1.0
Sweeper/Scrubbers	0.2	0.8	0.1	0.3	0.1	0.2

2.4.2 Uncontrolled Emissions Inventory

The emissions inventories presented in the previous section include both uncontrolled equipment and emission-certified equipment. Emission standards for off-road LSI engines were adopted by the ARB in 1998 and became effective through a phase-in schedule from 2001 through 2004. As such, uncontrolled equipment still accounts for a significant fraction of the total emission inventory from off-road LSI equipment. However, the emission contribution from uncontrolled equipment to the total LSI emission inventory will decrease as more new emission-certified equipment enters the fleets and older, uncontrolled equipment is retired. Figure 2.0 below shows the emissions inventory for uncontrolled equipment compared to the total LSI emissions inventory.

Figure 2.0: Emission Trends for Uncontrolled Off-Road LSI Equipment Compared to All Off-Road LSI Equipment Statewide Annual Average (HC + NOx, tons per day)



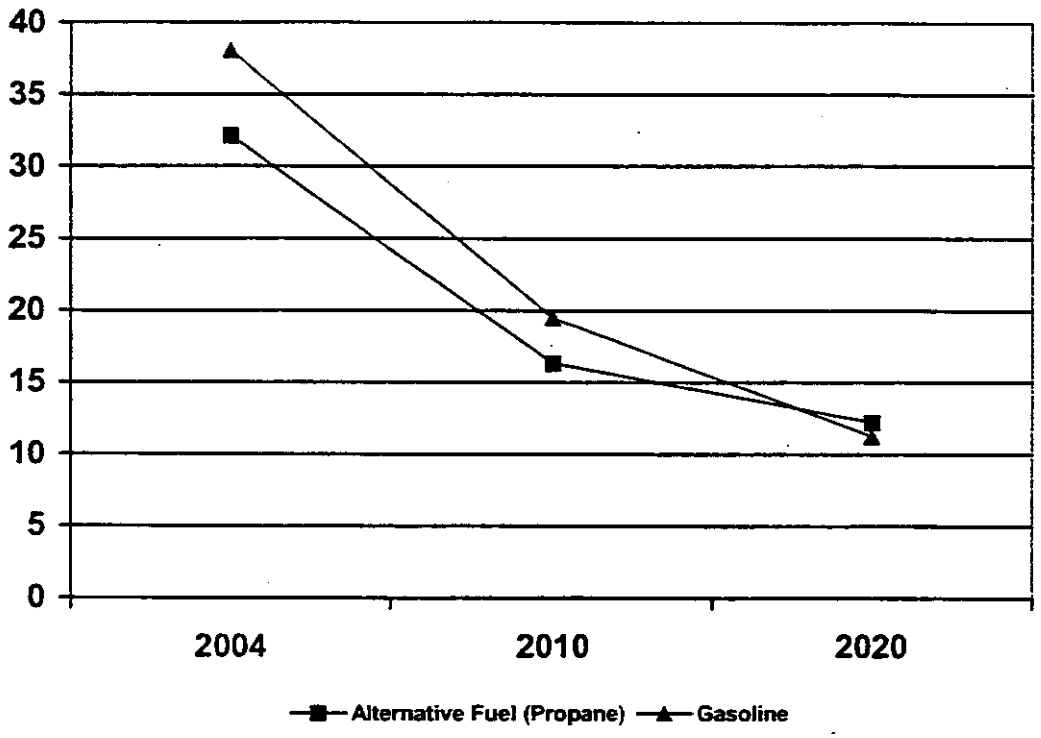
As discussed above, the 1998 regulations did not become fully effective until 2004. This effect can be seen in Figure 2.0 where the emissions from uncontrolled off-road LSI equipment represent the majority of the total emissions from all off-road LSI equipment. The relative emissions from uncontrolled off-road LSI engines are projected to decrease due to the expected retirement of older uncontrolled equipment and the increased penetration of emission-certified equipment. However, in the near term, the emissions from uncontrolled off-road equipment still remain significant at about 8 tons per day of HC+NOx statewide in 2010.

2.4.3 Gasoline and Alternative Fuels

The OFFROAD model distinguishes between gasoline LSI equipment and LSI equipment using alternative-fuels, mainly propane and some natural gas. Figure 2.1 shows the relative emissions contribution of gasoline and alternative-fuel off-road LSI equipment for 2004, 2010, and 2020. At the time of the 1998 OFFROAD emission inventory for LSI equipment, total propane emissions were slightly lower than total gasoline emissions because 38 percent (ARB, 1998c) of LSI forklifts and most other off-road LSI equipment such as generators and aerial lifts used gasoline. However, by 2020, emissions from propane-powered off-road LSI equipment are expected to be

greater than those from gasoline-powered off-road LSI equipment. This is due to the increasingly greater use of propane equipment by fleets.

Figure 2.1: Emission Trends for Gasoline and Alternative-Fuel Off-Road LSI Equipment Statewide Annual Average (HC+NOx, tons per day)



2.4.4 Typical Duty Cycle and Operational Characteristics

Off-road LSI engines are used in a wide variety of applications and duty cycles. The ARB's OFFROAD emissions inventory model for off-road LSI equipment includes the following major equipment categories: agricultural, airport ground support, construction, light-duty commercial, light-duty industrial, and lawn and garden. Within each of these equipment categories are equipment types separated according to horsepower rating, fuel type, and federal preemption designations.

The diverse nature of off-road LSI engine applications is reflected in the wide array of duty cycles that can be observed for this group of engines and equipment. Off-road LSI equipment operation can range from constant speed operation to operations requiring very rapid transient response. The OFFROAD model contains default load factors for different equipment types, ranging from 0.20 to 0.95. Likewise, the annual hours of operation for LSI equipment range from 22 hours per year to 8,500 hours per year. (ARB, 1998c)

The OFFROAD model does not track the number of owned equipment versus leased or rented equipment. Since the majority of off-road LSI engines are used in commercial applications, fleet operators sometimes prefer to lease their equipment, especially when packaged with an equipment maintenance program. This arrangement would minimize their capital outlay as well as reducing the need to acquire in-house expertise to service the equipment. Fleet operators could also rent additional equipment to help them fulfill shorter-term or peak work demand. At the time the ARB first adopted emission standards for off-road LSI equipment in 1998, industry data showed that about 50 percent of all forklifts are either leased or rented (Gas Research Institute, 1995). Although the large percentage of leased and rented equipment does not have a direct impact on the emission inventory, it does create issues regarding responsibility to comply with regulatory requirements.

3 REGULATORY PROPOSAL

Staff has been working with LSI engine and equipment manufacturers and distributors, emission control system manufacturers, propane fuel refiners and distributors, end-user facility operators, federal regulatory agencies, environmental/pollution prevention and public health advocates and other interested parties since January 2004 to identify tools for reducing emissions from LSI engines and equipment. Staff evaluated many tools and analyzed numerous regulatory options. The most promising options initially analyzed were manufacturer lower-emissions standards, fleet average requirements and the required use of zero-emission equipment. Staff conducted workshops in May and August 2004 on these three primary options and has developed a combined proposal that includes elements of the first two. This combined approach was then presented at two workshops held in March 2005.

The central element of the proposed regulation is a near- to mid-term fleet average requirement for fleet operators. The requirement would mitigate emissions from uncontrolled equipment and encourage fleets to procure lower-emission or electric equipment. The fleet requirements would be coupled with lower-emission standards for engine manufacturers to ensure that cleaner LSI equipment would be available. To further reduce emissions and to provide options to fleet operators, the proposal includes optional tiered lower-emission standards for new engines and verification levels for retrofit emission control systems. Before discussing the fleet average requirements, the next section provides a summary of the proposed new engine standards for manufacturers.

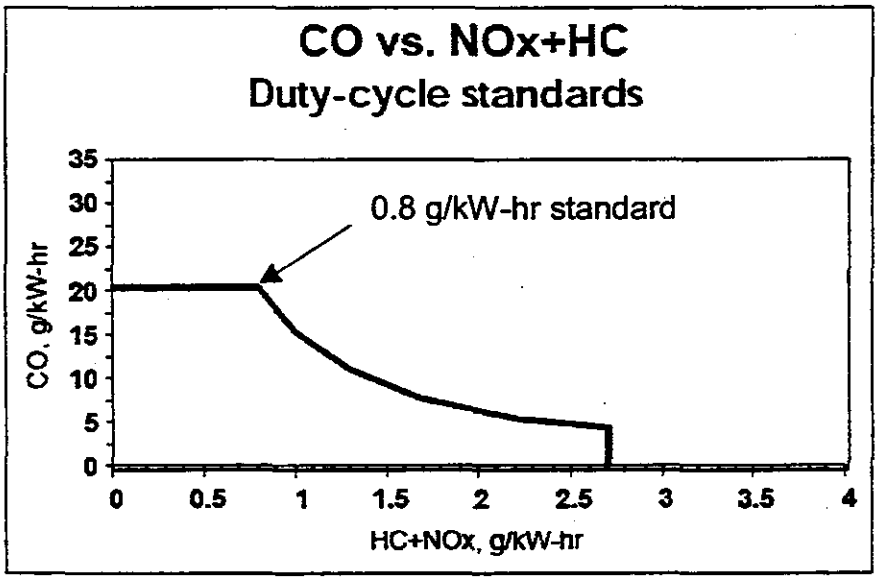
3.1 Manufacturer Lower-emission Standards Proposal

The proposed manufacturer lower-emission standards is comprised of three components as discussed below.

3.1.1 2007 Standard

The first component harmonizes the ARB standard for new LSI engines with the more stringent U.S. EPA emission standards and test procedures that become effective in 2007. Under this requirement, manufacturers of new 2007 and later model year engines would be required to meet nominal 2.0 g/bhp-hr (2.7 g/kW-hr) HC+NOx and 3.3 g/bhp-hr (4.4 g/kW-hr) carbon monoxide (CO) emission levels. The federal requirement also allows manufacturers to alternatively certify according to the following formula: $(HC+NOx) \times (CO)^{0.784} \leq 8.57$. This is shown in Figure 3.0. This alternative certification standard provides manufacturers the flexibility to let their CO emissions increase so that they may achieve lower HC+NOx levels.

Figure 3.0: Alternative Federal Certification



3.1.2 2010 Standard

The second manufacturer component would require that new 2010 and subsequent model year engines meet a 0.6 g/bhp-hr (0.8 g/kW-hr) HC+NOx standard with a corresponding CO emission standard of 15.4 g/bhp-hr (20 g/kW-hr). Staff does not believe that the 0.6 g/bhp-hr standard in 2010 is excessively stringent. In actuality, it mirrors the U.S. EPA's existing 2007 standard because it corresponds to the minimum HC+NOx level allowed by the U.S. EPA alternative certification formula above. Stated another way, the proposed 2010 standard is consistent with the 2007 standard, but limits calibration flexibility to the most stringent HC+NOx emission level to maximize ozone precursor benefits. The 0.6 g/bhp-hr (0.8 g/kW-hr) standard is represented graphically on the HC+NOx vs. CO emission trade-off curve in Figure 3.0 above by an arrow. Approximately three-quarters of the engine families that certified in 2004 for use in forklifts had combined tested HC+NOx emissions of 0.6 g/bhp-hr or below.

3.1.3 Optional Certification Standards

The third manufacturer component would establish **optional** lower-emission standards below the 2007 and 2010 mandatory standards. Under this component, model year 2007 through 2009 engines could be certified to optional tiered new engine standards of 0.1, 0.2, 0.4, 0.6, 1.0, and 1.5 g/bhp-hr HC+NOx (or the equivalent g/kW-hr standard). For model year 2010 and beyond, engines could be certified to optional standards of 0.1, 0.2, and 0.4 g/bhp-hr HC+NOx. These lower-emission standards provide fleet users additional flexibility in meeting the proposed fleet average emission level requirements discussed in the following section. The optional standards also provide those manufacturers that make their equipment less polluting an opportunity to certify at the lower standard and earn credit, thus providing additional incentives to develop cleaner LSI equipment.

3.1.4 Test Procedures

The regulatory proposal would incorporate by reference, with minor modifications, the test procedures adopted by the U.S. EPA as part of their regulations for LSI engines, finalized in 2002. In building on the efforts for ARB's 1998 regulation, EPA also added more stringent voluntary Blue Sky Series emission standards, new requirements for evaporative emissions, and engine diagnostics system. In most of the cases where individual provisions differ, the EPA language is more general than that adopted by ARB, rather than being incompatible. ARB staff has proposed that LSI regulations harmonize with EPA's language that will apply to 2007 model year and later LSI engines while maintaining ARB's current provisions, such as certification procedures and an in-use testing program. Appendix A.3 contains the regulatory amendments to U.S. EPA's test procedures.

3.2 Fleet Average Emission Level Proposal

ARB staff is proposing fleet average emission requirements (fleet averages) for large and mid-size fleets of forklifts, GSE, sweeper/scrubbers (with a displacement greater than one liter)[1], and non-GSE industrial tow tractors beginning January 1, 2009. Fleet size is determined by aggregating an operator's equipment in the State of California. Large LSI fleets as proposed are those with more than 25 pieces of equipment while mid-size LSI fleets would be those with 4 to 25 pieces of equipment.

Under the proposal, large fleets would have to meet a more stringent fleet average than mid-size fleets due to their greater flexibility in incorporating combinations of emission-reduction strategies. Likewise, the fleet average would be more stringent for the forklift portion of the fleet than for the non-forklift portion of the fleet.

[1] Forty-six percent of the engines that were certified in the 2004 model year for use in sweeper/scrubbers had a displacement of one liter or less (ARB, 2005). These engines are not subject to the LSI proposal and the equipment containing them is not subject to the fleet average requirement.

The fleet average would be determined using the certification levels of 2001 and newer LSI engines and the retrofit verification levels of engines with retrofit kits. To make the proposal less complex and less intrusive for the typical fleet operator while maintaining cost effective emission benefits, the fleet average will not incorporate load factor, horsepower, or hours of use.

The proposal provides the LSI fleet operator with the flexibility to use any combination of retrofits, lower-emission purchases, and zero-emission electric purchases to meet the fleet average emission level, which becomes progressively more stringent over time. The following table summarizes the proposed fleet average emission levels for forklift and non-forklift LSI fleets.

Table 3.0: Fleet Average Emission Level Requirements (g/bhp-hr (g/kW-hr) of HC+NOx)

LSI Fleet Type	Number of units	By 1/1/2009	By 1/1/2011	By 1/1/2013
Large fleet – forklift component	26 +	2.4 (3.2)	1.7 (2.3)	1.1 (1.5)
Mid-size fleet – forklift component	4-25	2.6 (3.5)	2.0 (2.7)	1.4 (1.9)
Non-forklift fleet	N/A	3.0 (4.0)	2.3 (3.1)	1.7 (2.3)
Small fleet	1-3	No uncontrolled equipment by 1/1/2011[1]		

[1] Exempts low-use equipment: (250 hours per year or less) with hours-of-use meter

As a result of growth, fleet operators may find themselves having to comply with a more stringent fleet average. The fleet average proposal provides additional flexibility to the fleet operator by instituting two-year transition periods that correspond with the fleet average compliance dates. Thus, a large fleet would only be required to comply with the corresponding mid-size fleet average if they were a mid-size fleet on the compliance date. For example, on January 1, 2009, a mid-size fleet would have to meet a 3.5 g/kW-hr standard. If that same fleet, through growth, becomes a large fleet, they would not have to meet the 3.2 g/kW-hr requirement. However, they would have to meet the 2.3 g/kW-hr requirement for large fleets, beginning on January 1, 2011.

Conversely, through retirement, fleets may move to a lower fleet average category. In this case, the fleet would not be constrained to meet the fleet average requirement that corresponded to their size on the initial fleet average compliance date, but instead would be allowed to comply with the fleet average that corresponds to their current size. For example, on January 1, 2009, a large fleet must comply with a 3.2 g/kW-hr fleet average. However, if through retirement or another mechanism, the fleet subsequently

becomes a mid-size fleet, then the mid-size requirement becomes effective immediately.

3.2.1 Hours of Use Exemption

Forklift and non-forklift equipment in medium and large fleets may be exempted from the fleet average emission level requirements if it meets the following provisions:

- The equipment is used, on average over any three year period, 250 hours per year or less,
- The equipment is equipped with an operational hours-of-use meter,
- The fleet operator maintains hours-of-use records for the piece of equipment, and
- The fleet operator addresses any uncontrolled emissions by January 1, 2011 by either retrofitting or repowering the equipment to a Level 2 verification level as described in Section 3.3.1 below or replacing the equipment with a new or used piece of equipment certified to a 3.0 g/bhp-hr HC+NOx emission standard or better.

3.2.2 Small Fleet Exemption

Small fleets with 1 to 3 pieces of equipment would be exempt from the fleet average requirement, but would be required to have no uncontrolled equipment by January 1, 2011. The proposal provides an hours-of-use exemption for equipment used by small fleets if the equipment meets the provisions noted in Section 3.2.1 above, except that the small fleet operator is provided until January 1, 2013, to address uncontrolled emissions from the small fleet.

3.2.3 Specialty Equipment Exemption

Specialty equipment is defined as equipment that has unique or specialized performance capabilities that perform prescribed tasks. Specialty equipment used in large and mid-size fleets is exempted from the fleet average requirements provided that:

- The Executive Officer approves the listing of the piece of equipment as specialty equipment,
- The cost of replacing or retrofitting the equipment is deemed by the Executive Officer to be excessive, and
- The equipment meets the first three provisions the hours of use exemption (see Section 3.2.1 above).

3.3 Proposed Verification Protocol for Retrofits

ARB staff is proposing a verification protocol for retrofit emission control systems to address in-use emissions and to provide fleet operators with additional options to meet the proposed fleet average emission level requirements. Such procedures will ensure that the retrofit systems deliver real and quantifiable emission reductions.

The proposed verification protocol (contained in Appendix B) would apply to manufacturers of retrofit systems sold in California. These systems include but are not limited to, closed-loop fuel control systems, fuel injections systems, and three-way catalysts.

3.3.1 Retrofit Emission Verification Levels

As shown in Table 3.1, the proposed verification protocol contains several LSI Retrofit Verification Levels that a manufacturer could choose to verify their systems. Depending on the level selected, a system could be verified on the basis of a percentage reduction or on the basis of an absolute emission level. This approach provides flexibility for manufacturers to determine the appropriate level of emission control that their technology achieves. The proposed LSI Retrofit Verification Levels would accommodate retrofit technologies that would reduce emissions from either uncontrolled engines or certified engines. Following is a brief discussion of the various LSI Retrofit Verification Levels allowed under the proposed verification test protocol.

LSI Level 1 is the minimum level that would be allowed for verification under the proposed protocol. This LSI Level applies to uncontrolled LSI engines and would require a minimum reduction of 25 percent of HC+NOx from the baseline uncontrolled emission level. LSI Level 2 requires that the system achieve either a 75 percent reduction of HC+NOx from baseline level, or an emission level of 3.0 g/bhp-hr of HC+NOx. Staff anticipates that the majority of retrofit technology would be able to achieve this level of emission reductions for LSI engines operating on LPG.

Table 3.1: Proposed LSI Engine Retrofit System Verification Levels

Classification	Percentage Reduction	Absolute Emission Level (g/bhp-hr HC+NOx)
LSI Level 1[1]	> 25%[2]	Not Applicable
LSI Level 2[1]	> 75%[3]	3.0
LSI Level 3a[1]	> 85%[4]	0.5, 1.0, 1.5, 2.0, 2.5
LSI Level 3b[5]	Not Applicable	0.5, 1.0, 1.5, 2.0

1 Applicable to uncontrolled engines only
2 The allowed verified emissions reduction is capped at 25 percent regardless of actual emission test values
3 The allowed verified percentage reduction for LSI Level 2 is capped at 75% or 3.0 g/bhp-hr regardless of actual emission test values
4 Verified in five percent increments, applicable to LSI Level 3a classifications only
5 Applicable to emission-controlled engines only

3.4 Alternative Compliance Option for Fleets used in Agricultural Crop Preparation Services

ARB staff is proposing an alternative compliance option for agricultural-related fleets that would allow additional time to control the highest emitting forklifts as long as steady verifiable progress is made. The proposal reflects the longer retention periods characteristic of agricultural-related operations, such as packing houses. Under this option, owners of agricultural-related fleets are required to control (to a 3.0 g/bhp-hr level or less) ten percent of their uncontrolled forklift fleet each year for ten years through retrofit, repower, replacement or retirement.

3.4.1 Hours of Use Exemption

Forklifts may be exempted from the agricultural fleet requirements if they meet the following provisions:

- The equipment is used 250 hours per year or less, on a three-year rolling average,
- The equipment is equipped with an operational hours-of-use meter, and
- The fleet operator maintains hours-of-use records for the piece of equipment.

3.4.2 Specialty Equipment Exemption

Forklifts having unique or specialized performance capabilities, as demonstrated to, and approved by, the Executive Officer of the ARB, are exempted from the agricultural fleet requirements provided that:

- The Executive Officer approves the listing of the piece of equipment as specialty equipment,
- The cost of replacing or retrofitting the equipment is deemed by the Executive Officer to be excessive, and
- The equipment meets the provisions of Section 3.4.1 above.

3.5 Fleet User Record Keeping Requirements

For enforcement purposes, the fleet average emission level proposal would require fleet operators to conduct a baseline inventory within six months of the operative date of the regulations under state law. Staff is requiring that baseline inventories be maintained beginning this early because of the three-year rolling averages that are built into the hours-of-use provisions of the regulation. The inventory would need to contain the following fleet average information: equipment type, make, model, serial number, and emission certification standard or retrofit verification standard at their facility. Users would be required to maintain records on file of their baseline inventory and subsequent inventories indicating acquisitions and retirements until June 30, 2016. The ARB will provide a simple electronic form for fleets to record their information.

3.6 Diesel Equipment

As mentioned in the regulatory authority discussion (Section 1.3), the ARB typically regulates diesel or compression ignition engines separately from LSI engines. The ARB is beginning a regulatory effort, separate from this proposal, to address emissions from off-road in-use diesel equipment. That effort will focus on reducing toxic particulate matter emissions from diesel equipment, including forklifts, through required retrofits in an expedited time frame.

4 FLEET AVERAGE COMPLIANCE SCENARIOS

This section describes the fleet average concept and compliance strategies, an alternative compliance option for agricultural fleets, the mandatory and optional tiered manufacturer lower-emission standards, and the retrofit verification protocol.

As discussed, staff is proposing fleet average emission requirements for large and mid-size fleets. The most common example of a large fleet is a distribution facility/warehouse or a large manufacturing facility. Operators that have multiple facilities statewide will likely fall into the large fleet category as well (for example, a home improvement warehouse may only have three or four forklifts per site, but could have dozens of sites statewide). A mid-size manufacturing facility or agricultural packing warehouse is a typical example of a mid-size fleet operator.

Large fleets would have to meet more stringent fleet average emission levels than mid-size fleets because they have greater flexibility and financial ability when incorporating combinations of emission-reduction strategies to achieve a prescribed level. The strategies include zero-emission technologies (such as electric forklifts), lower-emission standards (such as new equipment certified to optional lower-emission standards), and in-use reductions (such as retrofit systems).

The fleet average emission level would be more stringent for the forklift portion of the fleet than for the non-forklift LSI portion of the fleet. This reflects two observations. First, electric-powered forklifts are readily available for use in many applications and already comprise a major market share. The availability of electric equipment is not as prevalent in other applications where LSI engines are used. Second, because forklifts are the most prevalent application in the LSI category, it is more likely that there will be retrofit kits and new equipment certified to optional lower-emission standards available for fleets to incorporate into their fleet average. Non-forklift equipment covered under the fleet average includes sweepers and scrubbers, industrial tugs, and airport ground support equipment. Under the staff proposal, other LSI equipment would not be included in the fleet average.

The fleet average would be determined for all LSI equipment, both forklift and non-forklift using the certification levels of 2001 and newer LSI engines and the retrofit verification levels of engines with retrofit kits. Low usage equipment (250 hours per

year or less) would be exempted from large and mid-size fleets for the purposes of the fleet average calculation. However, the emissions from this equipment would need to be addressed through retrofit, repower, replacement, or retirement by January 1, 2011.

Small fleets are defined as those fleets with one to three pieces of equipment. A small independent lumberyard is a good example of such a fleet. Small fleets would be exempt from the fleet average requirement, but would be required to have no uncontrolled equipment by January 1, 2011. Low usage equipment (250 hours per year or less) would not have to be addressed through retrofit, repower, replacement, or retirement until January 1, 2013.

4.1 Fleet Average Compliance Options

Equipment users can employ a variety of techniques to achieve prescribed fleet average emission levels. New procurement can be zero- or lower-emission LSI equipment. Existing or in-use equipment can be retrofitted with one or more of the same control technologies that have been incorporated into new lower-emission LSI equipment. Fleet owners may also repower older equipment with certified engines or purchase certified used equipment. Details of each of these options follow.

4.1.1 Zero-Emission Equipment

The simplest and most effective way to reduce a fleet's average emission level is through procurement of zero-emission equipment, especially forklifts. Electric forklifts are most typically used in indoor materials handling applications that do not require large lift capacities (i.e., warehouse/retail operations). Applications where electric forklifts are used extensively include confined spaces, cold storage and food retail (primarily grocery stores).

Although electric forklifts are primarily designed for indoor operations, a number of manufacturers are also including equipment features that enable electric models to be used in a wider variety of environments. These features include pneumatic tires (air filled) that allow the forklift to be used on unimproved surfaces, water proofing trucks or sealing the electronics compartment to make them water resistant for outdoor conditions, and alternating current motors that provide greater lift and travel speeds. Electric forklifts compete directly with LSI forklifts for many of the same work applications.

Electric forklifts have no exhaust emissions and extremely low upstream (power plant) emissions. Thus, electric forklifts can provide significant air quality benefits. The Electric Power Research Institute (EPRI) has prepared several reports (reference) on electric forklifts that identify other benefits in addition to improved air quality. Electric forklifts can have lower life-cycle costs when compared with LSI models. This is due to lower maintenance costs, lower fueling costs, and longer useful life. Although the initial capital cost of an electric forklift is higher than that of a comparable LSI forklift, the

incremental cost can be recovered during the useful life. Because of the financial benefits to the end user, electric forklifts are already prevalent in some markets.

Electric forklifts include electric motor trucks with cushion or pneumatic tires (referred to as Class 1 forklifts); electric motor narrow aisle trucks (Class 2); and electric hand trucks or hand/rider trucks (Class 3) (ITA, 2005). Class 1 electric forklifts are available in a wide variety of lift capacities from 3,000 pounds to 20,000 or more pounds. According to market data evaluated by the ARB, most Class 1 forklifts sold today in the U.S. are in the 3,000-6,000 pound lift capacity range. Class 1 forklifts typically perform duties similar to LPG-powered Class 4 and 5 forklifts. The use of Class 2 forklifts has the added benefit of allowing warehouses to more easily convert to cost-saving narrow aisle operation. For the purposes of calculating the fleet average, fleet owners would be able to assign an emission level of zero (0.0) to Class 1 and Class 2 forklifts. Fleet operators would not be allowed to count Class 3 trucks toward their fleet average, because Class 3 trucks do not traditionally supplant Class 4 or 5 forklifts.

In general, an electric forklift can operate from one to two shifts before needing to be recharged. Some multi-shift operations employ battery swapping or fast charging to support the use of a 100 percent electric fleet. Fast charging can have the additional benefit of eliminating dedicated battery charging rooms. However, staff recognizes that facility or duty cycle constraints may preclude some users from moving toward a 100 percent battery electric fleet. These fleets may want to consider another zero-emission power option - fuel cell forklifts. Numerous fuel cell, battery and traditional industrial truck manufacturers are partnering to develop programs that demonstrate how hydrogen fuel cells can be successfully integrated into industrial truck operations. Several of these partnerships are expecting to commercialize their technology in the next two to three years. Depending on lift truck power requirements and applications, a proton exchange membrane fuel cell stack is matched with an appropriate battery pack resulting in a clean, quiet and reliable operation. Benefits of fuel cell charging include time-savings from the elimination of battery changes, no loss in lift capacity or drop in power as the shift progresses, and longer battery life. Also, with fuel cell forklifts, dedicated battery-charging rooms can be eliminated, freeing up valuable floor space.

4.1.2 New Equipment Certified to Optional Lower-emission Standards

If neither of the zero-emission options discussed above meet the needs of a particular operator, they may want to consider reducing their fleet average and resulting emissions through procurement of new lower-emission equipment that is cleaner than both the current 3.0 g/bhp-hr HC+NOx standard and the 2007 2.0 g/bhp-hr standard. Based on current certification data as well as discussions with manufacturers, ARB staff believes that LSI manufacturers will be able to offer forklifts at emission levels significantly below these current standards. A discussion of the technologies expected to achieve even lower levels is contained in Section 5, Technology Review.

Under the proposal, model year 2007 and subsequent engines could be certified to optional tiered new engine standards of 0.1, 0.2, 0.4, 0.6, 1.0, and 1.5 g/bhp-hr. A

January 20, 2005, Manufacturers Advisory Correspondence already provides that manufacturers can voluntarily certify their 2005 and 2006 model year engines to these interim lower-emission standards up to 2.0 g/bhp-hr, and one major manufacturer has already submitted two engine applications to the ARB for early certification to the 2.0 g/bhp-hr level. These engines will provide equipment users with greater flexibility in meeting the proposed fleet average emission levels in Table 3.0.

4.1.3 In-Use Controls

One of the most expedient ways to reduce LSI fleet emissions is to retrofit in-use engines. This entails modifying or upgrading components on the engine and/or fuel system with ARB verified retrofit emission control systems. An example of a retrofit emission control system is a closed-loop fuel control system coupled with a three-way catalytic converter, which could be added at the time of scheduled engine maintenance. Such systems have demonstrated an ability to reduce emissions by 75 percent or more.

ARB staff is proposing a procedure for the optional verification of retrofit systems for in-use LSI engines. The proposed LSI retrofit verification procedure, contained in Appendix B, will ensure that the systems sold for use on existing engines and equipment are functional, durable, and meet claimed emissions reductions. The proposed procedure establishes the procedures that manufacturers must follow to demonstrate that their system provides real and durable HC+NOx reductions while at the same time, limiting CO emissions to existing acceptable levels. While developing the procedure, staff addressed important issues with industry groups, including verification of reduction claims, durability, warranty, and in-use emissions. The proposed procedure is consistent with existing diesel verification procedures but adapted to consider the unique issues related to LSI engines.

High-efficiency retrofit systems may not be available for all engines or equipment as anticipated in the 2002 SIP commitment. In recognition of this, and in order to facilitate the implementation of current emission control strategies, ARB staff is proposing multiple verification levels. These tiered levels provide a hierarchy for emission reduction technologies. The proposed levels should broaden both the spectrum of control technologies available and the number of applications that can be controlled.

As an alternative to retrofits, LSI equipment users may repower or replace existing engines or equipment with new engines or used equipment that are certified to lower-mission standards. By using this strategy the users would have the option to either replace their in-use uncontrolled engine with an engine that is certified to a 3.0 g/bhp-hr HC+NOx or lower-emissions standard, or purchase a used piece of certified equipment. Both of these are cost-effective strategies for lowering emissions from in-use equipment.

4.2 Fleet Average Compliance Scenarios

One of the main advantages of the proposed fleet average requirement is that it allows individual fleet users the flexibility to tailor their compliance strategy to the specific needs of their fleet. Some fleets may decide to purchase additional electric forklifts, others may prefer to modernize their fleet, and still others may pursue lower-emission equipment. Some fleets, primarily those with a substantial percentage of electric equipment, may not need to take any additional steps. This flexibility makes it impossible to precisely determine how fleets will comply. However, the staff has developed a few scenarios for illustrative purposes.

One factor that will significantly impact a fleet average value is the number of uncontrolled LSI engines. Uncontrolled forklifts have emissions of approximately 12 g/bhp-hr HC+NOx, while current LSI equipment meet a level of 3.0 g/bhp-hr (uncontrolled engines were available through 2003, and some uncontrolled equipment was available in 2004, even though it started being phased out in 2001). The scenarios discussed below assume that by 2009, fleets have no uncontrolled equipment, i.e., all uncontrolled equipment has been retrofitted, repowered, replaced, or retired. The scenarios also assume an average fleet turnover of seven years. According to ARB's inventory, over 88 percent of the forklifts within California are seven years old or newer. Fleets with a shorter fleet turnover rate (more modern fleets) would make it easier to comply with the requirements, while a longer turnover rate (older fleet) would require the fleet to take additional measures to comply.

By January 1, 2009, without being subject to fleet standards, a typical baseline fleet with a uniform seven-year turnover rate that has converted its uncontrolled equipment and has no electric equipment would have a fleet average of 2.7 g/bhp-hr HC+NOx. As proposed in Table 3.0, a large fleet would be required to meet a standard of 2.4 g/bhp-hr and a mid-sized fleet would be required to meet a standard of 2.6 g/bhp-hr.

4.2.1 Large Fleets

Under the staff proposal, large fleets would need to meet a fleet-average emission requirement of 2.4 g/bhp-hr by January 2009. The simplest and most effective way to meet the requirement would be to establish a modest electric equipment component. A fleet could achieve the 2.4 g/bhp-hr requirement by ensuring that approximately 11 percent of the equipment procured annually since 2002 is electric.

Fleets would not have to rely on electric equipment to meet the fleet average requirement - they can also comply by procuring lower-emission equipment. Newer fleets (those that more routinely replace older equipment) would have the easiest time complying with the requirements. Older fleets with longer turnover rates would have to be more aggressive in their procurement of lower-emission equipment to comply with the requirements. A fleet with a seven-year procurement cycle (and no electric equipment) could meet the proposed fleet average standard by procuring 2.0 g/bhp-hr

equipment one year early in 2006 in conjunction with cleaner 1.0 g/bhp-hr equipment in 2008.

To meet the proposed 2011 fleet average requirement of 1.7 g/bhp-hr, a fleet would have to reduce their fleet average by 23 percent over the 2011 baseline. Again, the easiest way for a fleet to achieve the requirement is to incorporate electric equipment. A fleet with uniform turnover and a 23 percent electric component beginning in 2004 would meet the requirement. A fleet choosing not to incorporate any electric equipment would need to be more aggressive in their purchasing of lower-emission equipment. In addition to what they had done to meet the 2009 fleet average requirement, a fleet with a typical seven-year turnover rate would have to procure 1.0 g/bhp-hr equipment in 2009.

Finally, to meet the proposed 2013 fleet average requirement of 1.1 g/bhp-hr, a fleet would have to reduce their fleet average emission level by 27 percent over the 2013 baseline. As such, a fleet that incorporated a 27 percent electric component into their normal procurement cycle beginning in 2006 could meet the requirement. A fleet choosing not to incorporate any electric equipment would need to continue being more aggressive in their procurement of lower-emission equipment. In addition to what they had done to meet the 2009 and 2011 fleet average requirements, the fleet with a seven-year procurement cycle would have to additionally procure 0.4 g/bhp-hr equipment in 2012.

4.2.2 Mid-Size Fleets

Under the proposal, mid-size fleets would need to meet a fleet average emission level requirement of 2.6 g/bhp-hr. As with large fleets, mid-size fleets may meet the requirement through procurement of electric or lower-emission equipment. Since mid-size fleets may have less flexibility than large fleets have, their requirements are less stringent. Thus, they can comply with a smaller electric component or longer procurement cycle.

A typical mid-size fleet may achieve the 2.6 g/bhp-hr requirement with a uniform seven-year turnover rate by procuring 4 percent electric equipment each year beginning in 2002. The same fleet may also meet the standard without incorporating any electric equipment as long as they are on a typical seven-year procurement cycle and procure 2.0 g/bhp-hr equipment in 2006 (one year early). A fleet choosing to be on a longer eight-year procurement cycle would have to be more aggressive, procuring 2.0 g/bhp-hr equipment in 2006 and 1.5 g/bhp-hr equipment in 2008.

To meet the proposed 2011 fleet average requirement of 2.0 g/bhp-hr, a fleet would have to reduce their fleet average by 9 percent over the 2011 baseline. A fleet with uniform turnover and a 9 percent electric component purchase beginning in 2004 would meet the requirement. A fleet choosing not to incorporate any electric equipment might need to be more aggressive in their purchasing of lower-emission equipment. In addition to what they had done to meet the 2009 fleet average requirement, the fleet

with a seven-year turnover rate would need to continue to procure complying equipment. The fleet with an eight-year turnover rate would have to procure 1.0 g/bhp-hr equipment in 2009 (in addition to what they had done to meet the 2009 fleet average requirement).

Finally, to meet the proposed 2013 fleet average requirement of 1.4 g/bhp-hr, a fleet would have to reduce their fleet average emission level by 7 percent over the 2013 baseline. As such, a fleet that incorporated a 7 percent electric component purchase into their normal procurement cycle beginning in 2006 could meet the requirement. A fleet on a six-, seven-, or eight-year procurement cycle could still comply with the requirement without incorporating any electric equipment and without procuring lower-emission equipment after 2009 as long as they had procured appropriate lower-emission equipment to meet the 2009 and 2011 requirements.

4.2.3 Non-Forklift Fleets

The fleet standards for non-forklifts are set to be conservative while still requiring the fleet to retrofit, repower, or retire uncontrolled equipment. This allows compliance with the fleet average through a steady turnover of the fleet with an eight-year life. It also allows for some non-availability of retrofit systems in the early years. Any availability of equipment meeting optional lower-emission standards in this category will make compliance with the proposed standards easier.

4.3 Alternative Compliance Option for LSI Equipment for Fleets used in Agricultural Crop Preparation Services (Agricultural Fleets)

The proposed fleet average emission levels for forklifts discussed above are predicated upon a seven-year fleet turnover. That turnover rate reflects the fact that 88 percent of the LSI equipment inventory is seven-years old or newer and 95 percent is nine years old or newer. It is acknowledged that some fleets will have older equipment than others – making the fleet average slightly more difficult for those with the oldest, dirtiest fleets. However, these are also the exact fleets that need to cleaned up the most. In addition, nearly all fleets should be able to reasonably incorporate retrofits into their fleet average, since retrofits are expected to be available for most forklifts newer than 1996. The retrofits are moderately-priced and even pay for themselves within four years through better fuel usage.

However, as the equipment gets older, several factors conspire to decrease the feasibility of retrofits. These include the general state of the equipment, availability of retrofit kits (kit manufacturers need economy of scale to offer reasonably priced kits), and value of the equipment relative to the cost of performing a retrofit. The average age of the forklifts owned in agricultural-related fleets, such as packinghouses, is 19 years. Retrofits will be available for some, but not the majority of these forklifts. Consequently, agricultural operations that own the equipment will not have a lower-cost retrofit option generally available and would have to either repower or replace their equipment. Consequently, even though these forklifts are the ones specifically targeted by these

regulations, staff believes it is appropriate to give the agriculture-related industries a relaxed standard and additional time as long as steady and verifiable progress can be demonstrated.

To address this issue, staff is proposing that owners of fleets that perform agricultural crop preparation services for market (packinghouses, cotton gins, nut hullers and processors, dehydrators, feed and grain mills, etc.) be allowed to concentrate their efforts on removing uncontrolled equipment from their baseline 2006 fleet over a longer term. Diesel forklifts and "in-field" forklifts are exempt from this proposal.

Under this proposal, agricultural-related fleets comprised of owned equipment would have until 2016 to completely address their uncontrolled equipment through retrofitting, where feasible, repowering or retirement. Fleets are required to make incremental progress on this goal; each year, 10 percent of a fleet's baseline of uncontrolled forklifts must be controlled to a 3.0 g/bhp-hr or lower HC+NOx level. A fleet may retain uncontrolled lifts in exceedance of their incremental progress provided that they are in compliance with an overall 3.0 g/bhp-hr fleet average through procurement of electric or lower-emission forklifts.

As discussed in Section 3.4.1, agricultural-related fleets would also be able to use the low-usage and specialty equipment exemptions. Specifically, forklifts that are used 250 hours per year or less, on a three-year rolling average, are not included in the incremental progress determinations provided that: (1) they have an hours-of-use meter, (2) their hours of use are logged and remain at or below 250 hours per year, and (3) the forklift is either controlled to a 3.0 g/bhp-hr HC+NOx level or replaced/retired by the final compliance date. In addition, specialty equipment is excluded from the incremental progress determinations provided that: (1) it is used 250 hours per year or less, on a three year rolling average, (2) it has an hours-of-use meter, and (3) the hours of use are logged. Staff has not established a date by which specialty equipment must be controlled to a 3.0 g/bhp-hr HC+NOx level or replaced/retired, but instead has committed to revisit the issue at a later date.

4.4 Manufacturer Lower-emission Standard Compliance

The proposed manufacturer lower-emission standard has three components. The first component harmonizes with more stringent U.S. EPA Tier 2 emission standards and test procedures that become effective in 2007. Under Tier 2, manufacturers of 2007 and later model year engines must meet a nominal 2.7 g/kW-hr (2.0 g/bhp-hr) HC+NOx emission standard and a 4.4 g/kW-hr (3.3 g/bhp-hr) carbon monoxide (CO) emission standard. Although these standards are nominally referred to as the 2007 "2.0 g/bhp-hr standard," the requirement actually allows manufacturers the flexibility to certify at any HC plus NOx (HC+NOx) level between 2.7 and 0.8 g/kW-hr. To do so, manufacturers may certify according to the following formula:

$$(HC+NOx) \times (CO)^{0.784} \leq 8.57$$

Thus, the certification standard provides manufacturers with the flexibility to increase CO emissions as they achieve lower HC+NOx levels. (This curve is shown graphically in Figure 3.0). The ARB is proposing to incorporate these provisions into the first component of our manufacturer lower-emission standards.

In general, U.S. EPA's analysis shows that any point along this curve is equally stringent (i.e, a high HC+NOx level with a low CO standard is equivalent to a low HC+NOx standard with a higher CO level). Once manufacturers incorporate the necessary technology to achieve a point on this curve, they can then move along this curve with calibration changes. As an alternative, manufacturers have the ability to lower all three pollutants with technology improvements, as discussed in Section 5, Technology Review.

ARB and U.S. EPA regulatory and certification staff are working together to ensure consistency between the two regulations to the extent possible, and to identify where the two regulations diverge. In general, the ARB's certification and testing requirements will not change, with the exception that manufacturers will have to certify 2007 and subsequent model year engines using the transient test cycle. Manufacturers have requested that the ARB allow the deterioration factors (DFs) to be determined using the previous steady-state test cycle. Consequently, ARB staff is proposing that this option be available for model year 2007-2009 engines.

The second component of the manufacturer requirement would lower the ARB emission standard for 2010 and subsequent model year engines to 0.6 g/bhp-hr HC+NOx with a corresponding CO emission standard of 15.4 g/bhp-hr, consistent with the U.S. EPA formula. This standard corresponds to the minimum HC+NOx level on the HC+NOx versus CO emission trade off curve established by the U.S. EPA optional certification formula. As such, the proposed 2010 standard is essentially equivalent to the 2007 U.S. EPA requirement, but without the flexibility to increase HC+NOx emissions. Because the ARB's proposal remains consistent with the U.S. EPA standards, manufacturers will still have the ability to certify one engine family to nationwide standards.

In California, reducing ozone is a high priority, therefore the ARB proposal is able to ensure the maximum emission benefits by choosing the lowest HC+NOx point on the U.S. EPA curve. Based on an analysis by the U.S. EPA, staff believes that by staying along the curve, manufacturers will be able to meet the proposed 2010 emission standards for most engines with calibration changes. This allows California to achieve reductions of smog-forming emissions in the quickest, most cost effective way. For some engines, calibration changes alone may not be enough and technology improvements (e.g. increased catalyst size and volume) may be necessary.

Staff proposes to extend the 0.6 g/bhp-hr emission standard compliance deadline for small volume manufacturers to the 2013 model year. By ARB definition, small volume manufacturers produce a total of less than 2,000 large spark-ignition engines annually for sale in the United States.

The third component of the manufacturer requirement establishes optional lower-emission standards and was discussed as a strategy for complying with the fleet average emission level requirements in Table 3.0. Under this component, model year 2007 and subsequent engines could be certified to optional tiered new engine standards of 0.1, 0.2, 0.4, 0.6, 1.0, and 1.5 g/bhp-hr HC+NOx. The January 20, 2005, Manufacturers Advisory Correspondence already provides that manufacturers may voluntarily certify their 2005 and 2006 model year engines to these standards plus 2.0 g/bhp-hr HC+NOx, and one of the major manufacturers has already submitted two engine applications to the ARB for 2.0 g/bhp-hr certification. These lower-emission standards provide fleet users additional flexibility in meeting the proposed fleet average emission level requirements discussed previously. These standards also provide those manufacturers that make their equipment less polluting an opportunity to certify at the lower standard, thus providing additional value to the fleet owner.

As outlined in earlier sections, staff is pursuing a fleet average approach as the most cost effective and flexible method of achieving reductions in the near and mid-term. However, as staff was developing the overall proposal, it became clear that relying entirely on the fleet average in the long-term would not be appropriate. As the fleet average emission levels become lower, the absolute difference between them, in grams, becomes very small and the fleet average provides less of its original flexibility. In addition, the fleet average approach is more resource intensive on the fleets, in terms of record keeping, and on the regulatory agencies, in terms of outreach and enforcement.

By focusing on the fleet average approach in the early years, the ARB is providing LSI engine and equipment manufacturers significant flexibility to establish their long-term planning. Several manufacturers have commented that their current focus is on complying with the upcoming 2007 emission standards of 2.0 g/bhp-hr, and the associated changes in test procedures. This proposal allows them to continue that focus and gives them sufficient time following the 2007 standard to design to the next level – the proposed 0.6 g/bhp-hr standard. However, other manufacturers have commented that they do not want to be continually redesigning their systems every three or four years and would like to design once for the long-term. This proposal allows them to design toward that emission level and to benefit by bringing that product to market under the optional lower-emission standards.

5 TECHNOLOGY REVIEW

Off-road LSI engines are similar to automotive engines, but have traditionally lacked some of the automotive-style emission controls that have been in use for more than 25 years. While off-road LSI engines are exposed to duty cycles that can be more strenuous than those of their automotive cousins, they are suitable candidates for control, and manufacturers are now applying automotive-style emission control

technologies to LSI engines to reduce emissions. These technologies include closed-loop fuel controls, fuel injection, and three-way catalytic converters.

5.1 Emission Control Strategies

Since 1980 automotive emission control systems have used a closed-loop fuel control system to help reduce emissions. These systems use sensors to monitor exhaust gas concentrations, and feed this information back to an electronic control module, which in turn keeps the air to fuel mixture at an optimum level. To help ensure more precise metering of fuel and optimum combustion, carburetors have been replaced by sequential fuel injection. Today's advanced systems maintain an extremely tight stoichmetric air to fuel balance during nearly all engine operations. This is important because wide fluctuations from the stoichiometric position will result in reduced efficiency in controlling HC, NOx, and CO as well as reduced durability of the control system.

Central to automotive emission control systems is the three-way catalytic converter. Automotive manufacturers have installed tens of millions of them each year for more than 25 years. They are an integral component of automotive emission control systems that have allowed the automotive fleet to meet progressively lower-emission standards – effectively reducing concentrations of HC+NOx and CO by more than 95 percent.

5.2 Emission Controls for LSI Engines

The advanced three-way catalysts are components of new LSI retrofit kits and new engines and have been demonstrated to be robust. Staff expects that LSI manufacturers will use a closed-loop fuel control system in conjunction with a three-way catalytic converter to achieve the 2007 standard of 2.0 g/bhp-hr (MECA, 2003). But there is still plenty of room for further reductions. After all, an engine that is certified to the 2.0 g/bhp-hr standard would still emit ten or more times the emissions of a new 2005 light-duty vehicle. This reflects the slower adoption of newer emission control technologies into LSI equipment.

Current light-duty vehicles have emissions that are less than one-tenth of forklift emissions while in use for several reasons. Today's light-duty vehicles have larger catalytic converters, with more precious metal loading, higher cell densities and more effective washcoats than LSI engines. These differences can lead to greater efficiency of the catalytic converter as well as improved durability.

Light-duty vehicles use catalysts that are larger, as a percent of engine displacement, typically 70 to 80 percent. In contrast, LSI catalyst volumes are much lower, between 40 to 60 percent of engine displacement. Precious metal loading of the catalytic converter in a current LSI application is typically half of that in automotive applications. Finally, LSI catalysts typically have an "older automotive grade" single layer washcoat using less sophisticated materials in contrast to today's multi-layered washcoats that increase precious metals performance (MECA, 2004).

Adaptation of the improved automotive technologies noted above to LSI application can provide significant emission reductions. Already, even with less-sophisticated emission control systems, more than fifty percent of the LSI engines certified by the ARB for the 2004 model year had test emission levels of less than 1.0 g/bhp-hr (less than one-third of the current standard), some less than 0.5 g/bhp-hr, with the lowest coming in at 0.1 g/bhp-hr due to the use of improved systems (ARB, 2005a).

5.3 Impact of Transient Testing

Some manufacturers have expressed concerns about the impact of the 2007 transient test cycle on these numbers. To date, information provided by the Southwest Research Institute indicates that, under the transient test cycle, hydrocarbon emissions from an LPG engine increased by about 30 percent, but NOx emissions remained relatively constant. In a review of 13 forklift engine families (of 19 total) in our 2004 certification test database, NOx constituted approximately 50 percent of the HC+NOx emissions.[2] At 50 percent HC, the new test cycle could lead to a potential emissions increase of 15 percent over those under the steady state test cycle. However, all but one of the 13 engine families would still have an HC+NOx certification level of less than 1.0 g/bhp-hr because in instances where the HC emissions were high, the corresponding NOx emissions were low.

To date, transient cycle test data has been limited and staff has not seen any test data to demonstrate that manufacturers will have difficulty achieving the proposed standards under transient testing. Meanwhile, test results from emission control device manufacturers using new catalysts and other emission control technologies, while not performed under the transient test cycle, show that emissions can be reduced by more than 90 percent when compared to the pending 2007 standard (SwRI, 2004).

5.4 Lead Time

As discussed in Section 4.4, for most engines, the proposed 2010 standard may be accomplished with calibration changes alone. However, for those manufacturers that need further reductions, the technology to reach these levels is clearly available from the automotive sector and is cost-effective. The proposed effective date of 2010 was established to provide manufacturers sufficient time, in the event it is necessary to design and adapt this technology into the LSI applications.

When the U.S. EPA promulgated their LSI standards they stated that they believed the three-year period between the 2004 Tier 1 and 2007 Tier 2 emission standards (3.0 and 2.0 g/bhp-hr, respectively) allowed manufacturers sufficient lead time to meet the more stringent standard. They went on to state that they expected the emission control technologies for the 2004 emission standard to be able to meet the 2007 standard with additional optimization and testing. Analogously, ARB staff expects that three years will be sufficient time for manufacturers to further optimize the emission control technologies

[2] Historically, NOx emissions constituted 80% of the total LSI emissions (September 1998 LSI Staff Report)

projected to meet the 2007 U.S. EPA 2.0 g/bhp-hr requirement so that it will also be able to meet the 2010 ARB 0.6 g/bhp-hr requirement.

6 ENVIRONMENTAL IMPACTS

6.1 Air Quality Impacts

The emissions benefits for the fleet average emission requirements incorporated input factors from the OFFROAD model (Table 6.0). Staff calculated the baseline fleet average emission level based on a typical fleet that purchases emission-compliant equipment according to a pre-determined rate of equipment turnover, assumed to be seven years for forklifts and nine years for all LSI equipment. The baseline fleet average emission level is the mean of the high and low baseline levels. The high baseline assumes that a fleet procures new equipment that is certified to the highest emission standard legally allowed, while the low baseline assumes that a fleet procures new equipment that is certified to the lowest emission standard available, even if that standard is cleaner than required by the regulation. The baseline fleet average emission level is then compared to the staff's proposed fleet average emission levels and extended to all affected fleets to estimate the amount of emission benefits.

For the requirement on small fleets to have no uncontrolled equipment, staff assumes that LSI retrofit systems would achieve a 75 percent reduction from baseline uncontrolled emission rates. This assumed level of control efficiency is then applied to the estimated number of pieces of LSI equipment in small fleets that would be addressed by the regulation to obtain the estimated emission benefits. Finally, the emission benefits that were estimated for implementing the proposed new lower-emission standards were determined based on the difference in emission levels between the current and the proposed new emission standards, new equipment sales volume, and average activity factors for LSI equipment.

Table 6.0: OFFROAD Model Input Factors

Input	Unit	LSI Forklifts	Non-Forklift LSI Equipment	All LSI Equipment[1]
Horsepower	hp	64	62	63
load factor	unitless	0.30	0.59	0.45
activity	hours/year	1,800	740	1,236
2010 population	unitless	43,265	49,242	92,507
2020 population	unitless	46,462	50,501	96,963
life	years	7.0	11.0	9.1

1 Population-weighted

Table 6.1 lists the 2010 and 2020 estimated emission benefits of the proposed regulation based on an analysis of available information, including industry market data, industry's input, and emission inventory data from the ARB's OFFROAD model.

Table 6.1: Estimated Statewide Emission Benefits

Staff Proposal Element	HC+NOx Emission Reductions (tons per day)	
	Year 2010	Year 2020
Fleet Average Emission Requirements [1]	11.1	0.0
Small Fleet Requirements [2]	0.6	0.0
0.6 g/bhp-hr Engine Standard and Optional Lower-emission Standards Requirements	1.9	6.6
Total	13.6	6.6

1 These requirements apply to fleets with 4 or more pieces of off-road LSI equipment.
2 These requirements apply to fleets with fewer than 4 pieces of off-road LSI equipment.

Table 6.2 shows the estimated 2010 and 2020 emission benefit in of the staff's proposal for the South Coast Air Basin, relative to the SIP emission reduction commitment for that region.

Table 6.2: Estimated South Coast Air Basin Emission Benefits

	HC+NOx Emission Reductions (tons per day)	
	Year 2010	Year 2020
2003 SIP Commitment	4.4[1]	3.3[1]
Staff's Proposal	6.3[2]	3.0[2]

1 The 2003 SIP provided an emission reduction range of 2.8 to 6.0 tons per day in 2010 and 1.5 to 5.1 tons per day in 2020. The mean is 4.4 tons per day in 2010 and 3.3 tons per day in 2020.
2 Assumes South Coast Air Basin LSI equipment population is 46 percent of the statewide LSI equipment population.

6.1.1 2010 Emission Benefit Calculations

The emission benefit numbers in Table 6.1 are averages of the high and low estimates for each of the three elements of the staff proposal. The fleet average high estimate is the difference between the emissions, in tons per day associated with a high baseline fleet average and the emissions from the fleet requirement, while the low is the difference between the low baseline fleet average and the fleet requirement. Both the high and low baseline fleet average emissions for medium and large forklift fleets and non-forklift fleets (greater than 3 units), are calculated based on the inputs in Table 6.0 and an estimated 2010 forklift fleet average high of 5.3 g/bhp-hr and low of 3.4 g/bhp-hr and a 2010 non-forklift fleet average high of 6.8 g/bhp-hr and low of 5.5 g/bhp-hr. The

fleet requirement emissions are based on the inputs in Table 6.0 and a fleet average of 2.4 for large fleets, 2.6 for medium fleets, and 3.0 for non-forklift fleets.

The small fleet high estimate assumes 20 percent of the population (equivalent to the percent of the population in fleets with 1-3 units), and a 75% control efficiency of the emissions from the uncontrolled LSI fleet (approximately 19% of the total HC+NOx emissions proportionate to the uncontrolled portion of the LSI fleet). We assume that all of the retrofits occur in 2010 in advance of the January 1, 2011 requirement, and that they are evenly distributed throughout the year. As a result, the assumed 2010 benefit is actually one-half of the estimated benefit. The 2011 benefit is actually twice the 2010 benefit. The benefit from retrofits in subsequent years declines to zero by 2020 as the longer-term requirements are fully implement. The small fleet low estimate assumes that 95 percent of LPG-powered LSI equipment and 75 percent of gasoline-powered LSI equipment would be retrofitted.

The benefit associated with the new engine and optional lower-emission standards assumes the "All LSI Equipment" inputs from Table 6.0. The high benefit assumes the difference between the 2.0 g/bhp-hr standard and a 0.6 g/bhp-hr standard. The low estimate assumes the same input factors but a difference between a 1.0 g/bhp-hr standard and the 0.6 g/bhp-hr standard, reflecting the fact that some fleets would have purchased lower-emission engines to comply with the fleet average. As with the small fleet benefit, the 2011 benefit is actually twice the 2010 benefit and continues to grow in subsequent years as the longer-term requirements are fully implement.

6.1.2 2020 Emission Benefit Calculations

By 2020, the 0.6 g/bhp-hr standard will have been in effect for 10 years, longer than the average turnover rate for fleets. As such, a fleet procuring new equipment each year will have a fleet average of 0.6 g/bhp-hr – well below the most stringent fleet average requirement in 2013. Therefore, there are no emission benefits attributable to the fleet average component of the proposal in 2020. Similarly, small fleets are required to address emissions from uncontrolled equipment by January 1, 2013. No additional requirements exist for small fleets between 2013 and 2020, so there are no emission benefits attributable to the small fleet component of the proposal in 2020.

The final component of the proposal are the 0.6 g/bhp-hr new engine and optional lower-emission standards and again assumes the "All LSI Equipment" inputs from Table 6.0. The high estimate assumes the difference between a 2.0 g/bhp-hr standard and a 0.6 g/bhp-hr standard, while the low estimate assumes a difference between a 1.0 g/bhp-hr standard and a 0.6 g/bhp-hr standard.

The calculated 2020 emission benefit of this proposal falls about 10 percent short of the ARB's SIP commitment. However, as discussed in Section 5, the 2010 standards are somewhat conservative and do not fully incorporate readily available automotive emissions control technology. Staff will revisit the potential and need for future

standards once the current standards have been fully implemented and after the impacts of LPG fuel quality have been evaluated.

6.2 Other Impacts

ARB staff has also assessed the impacts from the use of electric forklifts. An increase in their use would result in a corresponding increase in the electrical energy required to recharge the batteries on a regular basis and in turn, create a greater demand for electricity at generating facilities. The ARB is aware of the energy supply shortage that existed in California in the spring and summer of 2001.

To determine the relative impact from the use of electric forklifts, staff assumed that the population of Class 1 electric rider forklift trucks grew by 25 to 50 percent as a result of the regulation. Staff assumed that these electric forklifts had an average of 50 horsepower (37.3kW) and would be operated at a 30 percent load factor for 1,900 hours per year. Under these assumptions, the increased energy demand from the additional entire electric forklift fleet would be approximately 0.05 to 0.10 percent of the projected total energy demand in 2010. This increased demand, which includes losses associated with the distribution of electricity, will not have a significant impact on the overall system.

The use of electric forklifts will increase electricity demand and subsequently upstream emissions, primarily NOx, from power plants. The NOx emissions from power plants attributed to the increased energy demand of electric forklifts will be small in comparison to the NOx emissions from the LSI forklifts that are being replaced. Additionally, air district permitting programs are in place to minimize these emission increases and previous estimates have determined these upstream emissions to be extremely small compared to the benefits achieved.

While electrification of forklifts will result in the increased production and use of batteries, lead-acid batteries are well regulated and banned from municipal solid waste landfills. Additionally, California has an established recycling infrastructure, and the recycle rate for lead-acid batteries is currently over 95%. With these mitigation measures in place, battery disposal impacts should not be significant.

7 ECONOMIC IMPACTS – COST AND COST-EFFECTIVENESS

Section 11346.3 of the Government Code requires State agencies to assess the potential for adverse economic impacts on California business enterprises and individuals when proposing to adopt or amend any administrative regulation. The assessment shall include a consideration of the impact of the proposed regulation on California jobs, business expansion, elimination or creation, and the ability of California business to compete.

State agencies are also required to estimate the cost or savings to any state, local agency and school district in accordance with instructions adopted by the Department of

Finance. The estimate shall include any non-discretionary cost or savings to local agencies and the cost or savings in federal funding to the state.

Any business involved in the production or use of LSI engines would potentially be affected by the proposed regulation. Also potentially affected are manufacturers that supply components for engines and industrial equipment, and distributors and retailers that sell such equipment.

7.1 Potential Impact on Manufacturers

The proposed engine standards will impact manufacturers of off-road LSI engines and original equipment using such engines. Engine manufacturers are located mostly outside of California. As manufacturers are already developing engines to comply with the federal 2.0 g/bhp-hr standard for 2007, the proposed alignment of the California standards for 2007 to 2009 are not expected to result in significant additional work or costs. For reference, the U.S. EPA estimates that the additional cost to manufacturers meeting the 2007 standards is approximately $50.

As noted in Section 4.4, engines meeting the 2.0 g/bhp-hr standard are equipped with the necessary hardware to meet the 2010 requirement of 0.6 g/bhp-hr through calibration modifications. Even so, to provide a conservative cost analysis, ARB staff assumed that 25 percent of all engines would need improvements to the catalyst system (increased volume and/or precious metal loading) resulting in average hardware cost increases of 40 percent. This cost, as shown in Table 7.0, relies on the costs and assumptions contained within the U.S. EPA's rulemaking for 2007.

Table 7.0: Incremental Hardware Cost

	per engine
Base catalyst/muffler	$229
Markup (@ 29%)	$66
Total	$295
Improved catalyst/muffler	$320
Markup (@ 29%)	$92
Total	$415
Incremental cost (for the 25 percent of engines needing improvements)	$120
Average incremental cost	**$30**

Spreading the cost of the catalyst upgrade to all engines sold in California reduces the average incremental per engine cost to $30 for all engines meeting the 2010 standard.

The U.S. EPA analysis determined the fixed and variable costs for manufacturers producing LPG, CNG and gasoline engines to meet the 2.0 g/bhp-hr standard. ARB staff used the compliance costs from this analysis to determine the engineering and compliance costs for engines certified to the 0.6 gram standard. The incremental hardware costs noted above were then included to determine the overall cost presented in Table 7.1. As shown, the proposed new standards for 2010 are expected to add less than $100 to the cost of a new engine. This cost will be passed onto the fleet operator and is small enough to not significantly impact California competitiveness, employment or business status.

Table 7.1: Incremental Costs for the 2010

	per engine
Research and development	$20
In-Use Testing	$10
Certification	$20
Hardware improvements	$30
Total Incremental Cost	$80

The compliance costs in Table 7.1 assume that manufacturers will produce and sell most 0.6 g/bhp-hr engines nationwide and thus be able to spread the fixed costs over a larger volume of engines. The ARB staff believes that this is reasonable given that the engines expected in 2010 are essentially the same as those produced to meet the federal regulations. ARB staff did not, however, assume that the 25 percent of engines with more expensive and robust catalysts would be sold nationwide. Therefore, the per engine certification cost considers that these engines are only sold in California, and thus is greater than the per engine estimates presented by U.S. EPA.

The research and development costs in Table 7.1 reflect the calibration changes needed to meet the 2010 standards. A portion of the in-use testing cost derived by U.S. EPA is due to facility upgrades for transient testing to meet the federal 2007 standards. As these improvements will occur regardless of this proposed rulemaking, the in-use testing cost assumed by ARB staff is conservative.

7.2 Potential Impact on Distributors and Dealers

Most engine and equipment manufacturers sell their products through distributors and dealers. While distributors and dealers are not directly affected by the proposed standards, the proposed standards may affect them indirectly. An increase in price could potentially reduce sales. ARB staff believes that the proposed regulation is unlikely to cause significant impacts to dealers. The increase in cost is expected to be modest (less than 1 percent) and will be passed on to end-users since all competing equipment will increase in price.

7.3 Potential Impact on Equipment Operators

Under the staff proposal, fleets would have the flexibility to decide the mix of options to achieve the required fleet average emission levels. The fleet average approach will allow LSI fleet users to choose the lowest cost option for their particular application. Among the possible options are retrofit equipment, early purchase of certified cleaner equipment or purchase of zero emission electric equipment. To determine a range of potential cost, staff analyzed the potential impact to end users of the requirements applicable to fleets of different sizes. Consistent with the emission benefit analysis presented in Section 6, staff calculations incorporated the forklift input factors of the OFFROAD Model: a 64 horsepower engine operating 1,800 hours per year at a 30 percent load.

7.3.1 Lower-emission Engines

Staff believes that several manufacturers are well-positioned to offer lower-emission engines consistent with, or even better than, the scenarios presented in Section 4.2.1. ARB staff has assumed that there will be slight increases in hardware costs to produce lower-emission engines in advance of the proposed standards. As presented in Section 7.1, the additional hardware costs are expected to be average $30 per engine.

To determine cost-effectiveness, ARB staff based the benefits on equipment designed to meet the 0.6 g/bhp-hr standard. The emissions benefit, based on the forklift input factors of the OFFROAD Model is approximately 110 pounds per lift per year.

7.3.2 Retrofit

Retrofit systems provide emission reductions from older uncontrolled forklifts producing 12 g/bhp-hr HC+NOx to a level of 3.0 g/bhp-hr HC+NOx or lower. The cost of a retrofit system is estimated to be $3,000 installed (Lubrizol, 2005; Precision Governors, 2005). Staff expects that the cost may drop due to increased sales volume from this program. However, using $3,000 as a conservative value, these systems provide a typical benefit of approximately 690 pounds of HC+NOx reductions per forklift per year. It should also be noted that many of the 2001 through 2003 engines that were certified as uncontrolled during the phase in of the 3.0 g/bhp-hr standard already have some of the emission control components. Lower cost retrofit systems could be available for these engines.

The installation of a retrofit system will improve engine operation and reduce fuel use. Closed-loop fuel systems generally operate close to stoichiometry, improving the engine's efficiency. Information from retrofit control system manufacturers and data from the U.S. EPA indicates an estimated 10 to 20 percent reduction in fuel consumption with engines employing fuel management systems (U.S. EPA, 2002). For a typical LPG or gasoline forklift, the annual fuel savings for forklifts used in California will range from $800 to $1,200. Thus, the retrofit of existing uncontrolled engines can actually reduce overall costs. Table 7.2 provides an example of these fuel savings.

Table 7.2: Estimated Fuel Savings

	LPG
Horsepower	64
Load factor	0.30
Improved brake-specific fuel consumption (pound/hp-hour)	0.075
Fuel density (pound/gallon)	4.2
Fuel cost ($/gallon)	1.50
Annual savings	$930

7.3.3 Zero-Emission

A typical electric forklift may cost anywhere from $1,500 to 5,000 more than a comparable LSI forklift (EPRI, 2001). However, electric forklifts have a longer useful life and reduced fuel and maintenance costs compared to LSI forklifts, so they can actually be less expensive on a life-cycle basis, especially for those fleets that do not need to utilize the forklift for multiple shifts in a single day.

Electric forklifts can provide emission reductions from 2.0 g/bhp-hr to 12.0 g/bhp-hr depending on the level of equipment they replace. Assuming an average emission reduction of 7.0 g/bhp-hr and the same LSI horsepower, hours of use, and load factor as noted above yields an average emissions reduction of 500 pounds per year.

7.3.4 Incremental Capital Cost

Table 7.3 summarizes the estimated initial costs of each option available to fleet operators. These values were used to generate the estimated cost effectiveness presented below. It should be emphasized that there are significant life cycle benefits from the use of retrofit and zero-emission equipment due to reduced fuel and maintenance costs, both of which have the ability to more than pay for themselves over their life.

Table 7.3: Incremental Capital Cost

Compliance Option	
Retrofit	$3,000
Lower-Emission	$30 - $80
Zero-Emission	$1,500 - $5,000

7.4 Cost-Effectiveness

The capital cost estimates in Section 7.3 were amortized over the expected life of the equipment[3] with an interest rate of five percent. The amortization formula yields a capital recovery factor, which when multiplied with the initial capital cost, gives the annual cost of the compliance option over its expected lifetime. Dividing the annual cost of the compliance option by the emissions benefit in pounds for that option yields the cost-effectiveness. For both retrofit and electric forklifts, the cost-effectiveness is presented as range to reflect both the full incremental capital costs and the overall lifecycle costs.

For those businesses that can incorporate electric equipment without the need for battery-swapping or fast-charging, staff believes electric equipment provides a life cycle saving, as described in Section 4.1.1. However, many businesses are sensitive to the initial capitol costs, therefore the cost-effectiveness is also listed with the full capital cost. Staff did not estimate the full life-cycle cost of electric equipment if fast-charging or battery swapping were necessary. Because the proposed fleet average requirement provides flexibility, staff assumed that an operator would not choose to convert to electric equipment unless the operator could be reasonably and cost-effectively incorporate such equipment within the fleet or had other reasons for doing so.

Table 7.4: Cost-Effectiveness

Compliance Option	Dollars per pound
Retrofit	0 – 1.00
Lower-emission	0.13
Zero-Emission	0 – 1.40[1]

1. Cost-effectiveness based on replacement of both controlled and uncontrolled equipment.

Thus, as illustrated in Table 7.5 above, fleet operators have several cost-effective options to comply with the fleet standards. The cost-effectiveness for all options compares favorably with other regulatory programs adopted by the Board.

7.5 Potential Impact on Business Competitiveness, Employment, Business Creation and Elimination

The proposed regulation is not expected to have a significant impact on the ability of California businesses to compete with business in other states. Requirements for end users are not expected to be significant as new engines, electric equipment and retrofit kits all provide performance and cost benefits. The resale value of existing uncontrolled equipment that is not retrofitted will be reduced.

[3] Conservatively, the expected life of a retrofitted forklift is 5 years, while that of a lower-emission forklift is 7 years and an electric forklift is 9 years.

The proposed regulation is not expected to cause a noticeable change in California employment. California accounts for only a small share of the manufacturing employment in industrial equipment and components. Requirements for end users are not expected to be significant as new engines, electric equipment, and retrofit kits all provide performance and cost benefits.

The proposed regulations are not expected to cause any significant change in the status of California businesses. The regulation would potentially increase the retail price of LSI equipment. However, these costs are expected to be minor. The regulation will stimulate demand for fuel system components and retrofit systems, resulting in an increase in business for some California manufacturers.

8 PUBLIC OUTREACH AND ENVIRONMENTAL JUSTICE

Outreach and public participation are important components of ARB's regulatory development process. In preparing the proposed regulations, ARB staff developed an outreach program to involve LSI engine and equipment manufacturers and distributors, emission control system manufacturers, propane fuel refiners and distributors, end-user facility operators, federal regulatory agencies, environmental/pollution prevention and public health advocates and other interested parties.

Through these efforts, ARB staff has been able to obtain detailed information on the use and emissions from LSI equipment. Additionally, these entities participated in the development and review of the manufacturers advisory correspondence (MAC) for voluntary early certification of lower-emission engines, the interim retrofit verification procedure for retrofit emission control systems and the baseline survey for uncontrolled agricultural equipment.

As part of the outreach efforts, ARB staff made extensive personal contacts with industry and facility representatives as well as other affected parties through meetings, telephone calls, and mail-outs. These activities included:

- holding five public workshops;
- the formation of the off-road LSI equipment working group;
- 20 conference calls with the working group to discuss our activities;
- more than 100 telephone conversations with the working group and facility operators;
- electronic mailing, or making available on the ARB web site, working group agendas, minutes, draft proposals;
- electronic mailing of workshop notices to over 500 people on the LSI list serve;
- visiting 15 facilities to gather information on the type of equipment and the building parameters that would limit the use of zero-emission alternative equipment.

8.1 Environmental Justice

The ARB is committed to integrating environmental justice in all of its activities. On December 13, 2001, the Board approved "Policies and Actions for Environmental Justice," which formally established a framework for incorporating Environmental Justice into the ARB's programs, consistent with the directive of California state law. Environmental Justice is defined as the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies.

The proposed regulation is consistent with the environmental justice policy to reduce health risks by limiting criteria pollutants in all communities, including those with low-income and minority populations, regardless of location. The regulation will reduce HC+NOx emissions from all new and most uncontrolled in-use engines by requiring the use of the best available control technologies or by limiting the number of uncontrolled engines or their hours of operation. The proposal will provide air quality benefits for all communities proportional to the number of pieces of LSI equipment currently operating in those communities.

9 ADDITIONAL CONSIDERATIONS

9.1 Fuel Quality

Liquefied petroleum gas is a mixture of various hydrocarbons produced from crude oil refining or the processing of natural gas. Propane is the predominant component of LPG. LPG used for motor vehicles must meet a quality specification to ensure proper operation of motor vehicles and to achieve and maintain exhaust emission standards. LPG fuel that does not meet these motor vehicle specifications can harm engine fueling systems and components and can prevent an engine from complying with existing and future emissions standards.

In 1992 the ARB established motor vehicle fuel specifications for LPG limiting the propene content to 10% by volume. Other heavier hydrocarbons are also limited. Not all LPG produced meets the LPG motor vehicle specifications. LPG not meeting the motor vehicle specification is considered commercial grade propane and is used mostly for space heating and recreational purposes.

There are two separate concerns about the LPG motor vehicle fuel quality - fuel contamination and high olefin content. Contaminated fuel can have an immediate and sometimes catastrophic impact on the fuel delivery system and the emissions control system. Contamination typically occurs downstream of production during storage and distribution. One example of contamination can occur from fuel hose degradation.

There is information to suggest that LPG containing high olefins, such as propene, can accumulate on fueling components and can adversely affect the fuel delivery and

emission control systems. This accumulation is often the result of using commercial grade fuel in motor vehicles. Commercial grade fuel is intended primarily for heating, and has a higher olefin content than motor vehicle grade LPG. Olefins react to create a plastic-like coating in the vaporizers, carburetors, and injectors. This coating gums up these engine components, reducing the effectiveness of heat transfer and ultimately causing poor delivery of the fuel and inaccurate fuel to air ratios. Heavy hydrocarbon residue may also cause similar problems.

The ARB is committed to working with industry to determine if the existing specifications are adequate to support more stringent emission standards. The ARB will take the necessary steps to ensure that quality fuel is available to support existing and future LPG-fueled vehicles including developing appropriate specifications, if necessary.

The ARB is also following activities by the control device manufacturers, refiners and LPG distributors to make low olefin LPG fuel, advanced fuel filters, and fuel additives available to fleets, leading to reduced emissions and vehicle maintenance and improved fuel efficiency.

9.2 Impact on Rental Companies

Some of the largest owners of larger LSI fleets are forklift dealers. A high percentage of forklifts in use today are rented by end-users from these same dealers. For these dealers a large amount of their assets, debt and overall net worth is tied up in their rental fleets. In some cases, these fleets contain a significant percentage of relatively new uncontrolled LSI equipment. The proposed fleet requirements may impact the forklift dealers as fleet users are expected to request lower-emission compliant forklifts to meet their fleet average. Consequently, it may be more difficult to lease uncontrolled LSI equipment for any leases that continue through 2009.

Retrofit control systems provide added value to the owner because they provide significant savings in fuel costs that pay for the retrofit within four years. In addition, for those owners that apply early, retrofit costs could be mitigated through Carl Moyer incentive funds.

9.3 Agricultural Concerns

ARB staff has worked with agricultural-related businesses to discuss issues specific to that industry. After evaluating data on equipment age, type and use, ARB staff and industry representatives worked together to develop a proposal that provides greater flexibility. ARB staff believes this proposal is responsive to the specific needs of the industry. While the proposed regulation would allow additional time for compliance, the most significant issue remaining is to what extent the fleet operators would be eligible for incentive funds such as the Carl Moyer Program.

The most cost-effective approach to meet the proposal is to retrofit existing equipment. Agricultural fleets would be eligible for funding for retrofits systems if applied in advance

of the regulations. However, manufacturers of retrofit systems have indicated that the use of these systems on older equipment is questionable. For older equipment, several factors decrease the feasibility of retrofit, including the general state of the equipment, economy of scale to offer reasonably priced kits and value of the equipment relative to the cost of performing a retrofit. As such, it is unlikely that a good portion of the uncontrolled agricultural fleet will lend itself to retrofit. Consequently, agricultural operations that own the equipment will have to either repower or replace their equipment. Public incentive programs are not currently designed to provide assistance under these scenarios. However, ARB staff will continue to explore opportunities to reduce the overall costs to comply with the proposal.

9.4 UL Concerns

Underwriters Laboratories (UL) is an independent, not-for-profit, product-safety testing and certification organization. Their reputation for certifying the safety of machinery, equipment and consumer products is known worldwide. UL's Listing Service is the most widely recognized of UL's safety certification programs. The UL Listing Mark on a product is the manufacturer's representation that samples of that complete product have been tested by UL to nationally recognized Safety Standards and found to be free from reasonably foreseeable risk of fire, electric shock, excessively high surface temperatures, and related hazards.

During development of the first LSI regulation, several equipment manufacturers informed staff that their customers expect, and in cases require, the equipment they purchase to be UL listed. These manufacturers expressed concern that the presence of catalytic converters could make it difficult to meet UL requirements for fire safety and safety from exposure to high temperature surfaces. They also expressed concern about the expense of conducting the tests required by UL.

In response, staff discussed the issue with UL personnel. UL stated that they do certify catalysts, and that their catalytic converter requirements limit the temperatures of surfaces located adjacent to a muffler or catalytic converter, while maintaining the converter's structural capability to contain backfire pressures, etc. They also stated that certification may be conducted directly through testing of the complete converter and equipment configuration, or, alternatively, through testing of the converter as a component in a reference installation. UL's Component Recognition Service covers the testing and evaluation of component products that are incomplete or restricted in performance capabilities. These components will later be used in complete end products or systems Listed by UL. The reference installation usually represents a worst-case scenario in terms of engine size, converter proximity to sensitive surfaces, etc. The component evaluation ensures that all requirements (temperature, etc.) are met in that reference installation. The equipment manufacturer would then need to demonstrate to UL, through engineering evaluation, that its application is similar to, or inherently safer than, the reference installation. This process minimizes the actual testing for UL listing and shares the costs and responsibility for the listing between the equipment manufacturer and the catalytic converter manufacturer. Catalyst

manufacturers have stated that this process will minimize the costs associated with obtaining a UL listing.

During this rulemaking, manufacturers again expressed concerns about their ability to meet UL requirements, this time as a result of retrofit emission control systems – typically comprised of a catalytic converter and an electronic air/fuel control. Staff again spoke with UL personnel and hosted a conference call where manufacturers were provided an opportunity to question UL about the specific requirements for obtaining a UL Listing Mark for a retrofit emission control system. As before, UL personnel stated that the system could be certified and that the certification could be conducted directly through testing of the complete retrofit emission control system and equipment configuration, or, alternatively, through testing of the control system as a component in a reference installation (UL, 2004). If a retrofit emission control system manufacturer opts for the latter, then a UL evaluation of the complete product could be needed to determine how this component functions as part of the overall system. However, the use of Recognized Components reduces the complexity of the evaluation and can save the manufacturer time and money.

10 ALTERNATIVES AND RECOMMENDATION

10.1 Alternatives Considered

During the regulatory development process, ARB staff evaluated many tools and identified the following as having the most promise to reduce emissions from LSI engines.

- Lower Manufacturer Emission Standards
- Manufacturer Fleet Average Standards
- Owner or User Fleet Average Standards
- Near-Zero Emission Requirements
- Zero Emission Requirements
- In-Use Retrofit Requirement

Each of the elements noted was considered both independently and in combination. At one point, ARB staff pursued the requirement for electric purchase. This concept would have required medium and large fleets to meet a 10 percent electric component in 2007, 20 percent in 2008, 30 percent in 2009, and 40 percent in the years 2010 through 2015. ARB staff decided this concept would not provide the necessary flexibility to industry in meeting the requirements.

ARB staff also considered requiring that medium and large fleets reduce emissions from their existing uncontrolled LSI engines by the end of 2008 through the use of retrofit emission control systems. Small fleets of one to three units would have been provided until 2010 to retrofit their equipment, and would have been exempt from the electric

purchase requirement. Again, staff rejected this concept and instead developed a fleet average concept to allow fleets options for reducing fleet emissions.

10.2 Conclusion

The proposal described herein would reduce HC+NOx emissions in a cost-effective manner. No alternative considered by the agency would be more effective in carrying out the purpose for which the regulation is proposed or would be as effective or less burdensome to affected private persons than the proposed regulation.

11 REFERENCES

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UL, 2004. Discussion between Mark Williams and Christopher James of Underwriters Laboratories, June 15, 2004.

U.S. EPA, 2002. "Control of Emissions from Nonroad Large Spark-Ignition Engines, and Recreational Engines (Marine and Land Based); Final Rule," Federal Register, Volume 67, Number 217, pages 68242 - 68447, November 8, 2002.

APPENDIX A: PROPOSED STANDARDS

1. Proposed Regulation Order, Part 1: Amend California Code of Regulations, Title 13, Sections 2430, 2433, and 2434 for Off-Road Large Spark-Ignition Engines.

2. Proposed Regulation Order Part 2: Adopt California Code of Regulations, Title 13, Sections 2775, 2775.1, and 2775.2 for Large Spark-Ignition (LSI) Engine Fleet Requirements.

3. Proposed Regulation Order Part 3: Amendments to the incorporated "California Exhaust and Standards and Test Procedures for New 2001 and Later Off-Road Large Spark-Ignition Engines," and Adoption of incorporated "California Exhaust and Standards and Test Procedures for New 2007 and Later Off-Road Large Spark-Ignition Engines."

APPENDIX B: VERIFICATION PROCEDURE

1. Proposed Regulation Order Part 4: Adopt California Code of Regulations, Title 13, Sections 2780, 2781, 2782, 2783, 2784, 2785, 2786, 2787, 2788, and 2789 for Verification Procedures for Retrofit Systems Verification Procedure, Warranty, and In-Use Compliance Requirements for Retrofits to Control Emissions from Off-Road Large Spark-Ignition Engines.

2. Verification Process Flowchart

3. Verification Testing Flowchart

Appendix A

Proposed Standards

Proposed Regulation Order, Part 1

Proposed Regulation Order, Part 2

Proposed Regulation Order, Part 3

PROPOSED REGULATION ORDER, PART 1

Note: Amendments to the regulations are shown with underline text for additions and ~~strikeout text for deletions~~.

Amend California Code of Regulations, title 13, sections 2430, 2433, and 2434 to read:

Article 4.5. Off-Road Large Spark-Ignition Engines

§ 2430. Applicability.

(a) (1) This article applies to large off-road spark-ignition engines 25 horsepower and greater produced on or after January 1, 2001 and all equipment and vehicles produced on or after January 1, 2001 that use such engines.

(2) Every new off-road large spark-ignition (LSI) engine that is manufactured for sale, sold, or offered for sale in California, or that is introduced, delivered or imported into California for introduction into commerce and that is subject to any of the standards prescribed in this article and documents incorporated by reference therein, must be certified for use and sale by the manufacturer through the Air Resources Board and covered by an Executive Order, issued pursuant to Chapter 9, Article 4.5, Section 2433.

(3) This article does not apply to engines in vehicles that are subject to the U.S. Environmental Protection Agency Regulations in Title 40, Code of Federal Regulations, Part 1051. In California, such engines and vehicles are subject to requirements of Title 13, California Code of Regulations, Chapter 9, Article 3, Off-Highway Recreational Vehicles and Engines, including any related provisions and guidelines that are applicable to Off-Highway Recreational Vehicles and Engines.

(b) Each part of this article is severable, and in the event that any part of this chapter or article is held to be invalid, the remainder of the article remains in full force and effect.

(c) This article and documents incorporated by reference herein include provisions for emissions certification, labeling requirements, warranty, in-use compliance testing, and production line testing.

NOTE: Authority cited: Sections 39600, 39601, 43013, 43018, 43101, 43102 and 43104, Health and Safety Code. Reference: Sections 43013, 43017, 43018, 43101, 43102, 43104, 43105, 43150, 43151, 43152, 43153, 43154, 43205.5, ~~and~~ 43210, 43210.5, 43211 ~~and~~ 43212, Health and Safety Code.

§ 2433. ~~Exhaust~~ Emission Standards and Test Procedures - Off- Road Large Spark-ignition Engines.

(a) This section applies to new off-road large spark-ignition engines produced on or after January 1, 2001. For the purpose of this section, these engines are also referred to as "new off-road LSI engines."

(b) *Standards.*

(1) *Exhaust Emission Standards.* Exhaust emissions from off-road large spark-ignition engines manufactured for sale, sold, or offered for sale in California, or that are introduced, delivered or imported into California for introduction into commerce, must not exceed:

Exhaust Emission Standards
(grams per brake horsepower-hour)
[grams per kilowatt-hour](1)

Model Year	Engine Displacement	Durability Period	Hydrocarbon plus Oxides of Nitrogen	Carbon Monoxide
2002 and subsequent	<1.0 liter	1,000 hours or 2 years	9.0 [12.0]	410 [549]
2001 - 2003(2),(3)	> 1.0 liter	N/A	3.0 [4.0]	37.0 [49.6]
2004 - 2006(4)	> 1.0 liter	3500 hours or 5 years	3.0 [4.0]	37.0 [49.6]
2007 ~~and subsequent~~ - 2009	> 1.0 liter	5000 hours or 7 years	~~3.0~~ 2.0 ~~[4.0]~~ [2.7]	~~37.0~~ 15.5 ~~[49.6]~~ [20.8]
2010 and subsequent (5)	> 1.0 liter	5000 hours or 7 years	0.6 [0.8]	15.5 [20.8]

Note: (1) Standards in grams per kilowatt-hour are given only as a reference. Pollutant emissions reported to ARB by manufacturers must be in grams per brake horsepower-hour.
(2) Small volume manufacturers are not required to comply with these emission standards.
(3) Manufacturers must show that at least 25 percent of its California engine sales comply with the standards in 2001, 50 percent in 2002, and 75 percent in 2003.

(4) The standards for in-use compliance for engine families certified to the standards in the row noted are 4.0 g/bhp-hr (5.4 g/kW-hr) hydrocarbon plus oxides of nitrogen and 50.0 g/bhp-hr (67.0 g/kW-hr) carbon monoxide, with a useful life of 5000 hours or 7 years. In-use averaging, banking, and trading credits may be generated for engines tested in compliance with these in-use compliance standards. If the in-use compliance level is above 3.0 but does not exceed 4.0 g/bhp-hr hydrocarbon plus oxides of nitrogen or is above 37.0 but does not exceed 50.0 g/bhp-hr carbon monoxide, and based on a review of information derived from a statistically valid and representative sample of engines, the Executive Officer determines that a substantial percentage of any class or category of such engines exhibits within the warranty periods noted in Section 2435, an identifiable, systematic defect in a component listed in that section, which causes a significant increase in emissions above those exhibited by engines free of such defects and of the same class or category and having the same period of use and hours, then the Executive Officer may invoke the enforcement authority under Section 2439, Title 13, California Code of regulations to require remedial action by the engine manufacturer. Such remedial action is limited to owner notification and repair or replacement of defective components, without regard to the requirements set forth in Section 2439(b)(5) or Section 2439(c)(5)(B)(vi). As used in the section, the term "defect" does not include failures that are the result of abuse, neglect, or improper maintenance.

(5) Small volume manufacturers are required to comply with these emission standards in 2013.

Optional Exhaust Emission Standards
(grams per brake horsepower-hour)
[grams per kilowatt-hour]

Model Year	Engine Displacement	Durability Period	Hydrocarbon plus Oxides of Nitrogen	Carbon Monoxide
2007 - 2009	≥ 1.0 liter	5000 hours or 7 years	1.5 [2.0]	15.5 [20.8]
2007 - 2009	≥ 1.0 liter	5000 hours or 7 years	1.0 [1.3]	15.5 [20.8]
2007 - 2009	≥ 1.0 liter	5000 hours or 7 years	0.6 [0.8]	15.5 [20.8]
2007 - 2009	≥ 1.0 liter	5000 hours or 7 years	0.4 [0.5]	15.5 [20.8]
2007 - 2009	≥ 1.0 liter	5000 hours or 7 years	0.2 [0.3]	15.5 [20.8]
2007 - 2009	≥ 1.0 liter	5000 hours or 7 years	0.1 [0.1]	15.5 [20.8]
2010 and subsequent	≥ 1.0 liter	5000 hours or 7 years	0.4 [0.5]	15.5 [20.8]

2010 and subsequent	≥ 1.0 liter	5000 hours or 7 years	0.2 [0.3]	15.5 [20.8]
2010 and subsequent	≥ 1.0 liter	5000 hours or 7 years	0.1 [0.1]	15.5 [20.8]

(2) *Crankcase Emissions.* No crankcase emissions shall be discharged into the ambient atmosphere from any new 2001 or later model year off-road LSI engines.

(3) *Evaporative Emission Standards.*

(A) Starting in the 2007 model year, engines that run on a volatile liquid fuel (such as gasoline), must meet the following evaporative emissions standards and requirements:

(i) Evaporative hydrocarbon emissions may not exceed 0.2 grams per gallon of fuel tank capacity when measured with the test procedures for evaporative emissions as described in subpart F, Title 40 Code of Federal Regulations (CFR) Sec.1048.

(ii) For nonmetallic fuel lines, you must specify and use products that meet the Category 1 specifications in SAE J2260.

(iii) Liquid fuel in the fuel tank may not reach boiling during continuous engine operation in the final installation at an ambient temperature of 30° C. Note that gasoline with a Reid vapor pressure of 62 kPa (9 psi) begins to boil at about 53° C.

(c) *Test Procedures.* The test procedures for determining certification and compliance with the standards for exhaust emissions from new model year 2001 through 2006 off-road LSI engines with engine displacement greater than 1.0 liter sold in the state are set forth in "California Exhaust Emission Standards and Test Procedures for New 2001 ~~and Later~~ through 2006 Off-Road Large Spark-ignition Engines," adopted September 1, 1999, and as last amended [*insert date of amendment*]. The test procedures for determining certification and compliance with the standards for exhaust and evaporative emissions from new model year 2007 and subsequent off-road LSI engines with engine displacement greater than 1.0 liter sold in the state are set forth in "California Exhaust Emission Standards and Test Procedures for New 2007 and Later Off-Road Large Spark-ignition Engines," adopted *[Insert date of adoption]*.

(d) The test procedures for determining certification and compliance with the standards for exhaust emissions from new off-road LSI engines with engine displacement equal to or less than 1.0 liter sold in the state are set forth in "California Exhaust Emission Standards and Test Procedures for 1995 and Later Small Off-Road Engines," as last amended March 23, 1999.

(e) ~~Replacement Engines~~ *Replacement Engines*.

(1) [Reserved]

(2) (A) Beginning in 2004, a new off-road large spark-ignition engine intended solely to replace an engine in a piece of off-road equipment that was originally produced with an engine manufactured prior to the applicable implementation date as described in paragraph (b), shall not be subject to the emissions requirements of paragraph (b) provided that:

(i) The engine manufacturer has ascertained that no engine produced by itself or the manufacturer of the engine that is being replaced, if different, and certified to the requirements of this article, is available with the appropriate physical or performance characteristics to repower the equipment; and

(ii) Unless an alternative control mechanism is approved in advance by the Executive Officer, the engine manufacturer or its agent takes ownership and possession of the engine being replaced; and

(iii) The replacement engine is clearly labeled with the following language, or similar alternate language approved in advance by the Executive Officer:

THIS ENGINE DOES NOT COMPLY WITH CALIFORNIA OFF-ROAD OR ON-HIGHWAY EMISSION REQUIREMENTS. SALE OR INSTALLATION OF THIS ENGINE FOR ANY PURPOSE OTHER THAN AS A REPLACEMENT ENGINE IN AN OFF-ROAD VEHICLE OR PIECE OF OFF-ROAD EQUIPMENT WHOSE ORIGINAL ENGINE WAS NOT CERTIFIED IS A VIOLATION OF CALIFORNIA LAW SUBJECT TO CIVIL PENALTY.

(B) At the beginning of each model year, the manufacturer of replacement engines must provide, by engine model, an estimate of the number of replacement engines it expects to produce for California for that model year.

(C) At the conclusion of the model year, the manufacturer must provide, by engine model, the actual number of replacement engines produced for California during the model year, and a description of the physical or performance characteristics of those models that indicate that certified replacement engine(s) were not available as per paragraph (A).

NOTE: Authority cited: Sections 39600, 39601, 43013, 43018, 43101, 43102 and 43104, Health and Safety Code. Reference: Sections 43013, 43017, 43018, 43101, 43102, 43104, 43105, 43150, 43151, 43152, 43153, ~~and~~ 43154, 43205.5, ~~and~~ 43210, 43210.5, 43211 ~~and~~ 43212, Health and Safety Code.

2434. Emission Control Labels - 2001 and Later Off-Road Large Spark-ignition Engines

(a) Purpose.

The Air Resources Board recognizes that certain emissions-critical or emissions-related parts must be properly identified and maintained in order for engines to meet the applicable emission standards. The purpose of these specifications is to require engine manufacturers to affix a label (or labels) on each production engine (or equipment) to provide the engine or equipment owner and service mechanic with information necessary for the proper maintenance of these parts in customer use.

(b) Applicability. This section applies to:

(1) 2001 and later model year off-road LSI engines with engine displacement greater than 1.0 liter, that have been certified to the applicable emission standards pursuant to Section 2433(b).

(2) Engine manufacturers and original equipment manufacturers, as applicable, that have certified such engines.

(3) Original equipment manufacturers, regardless of whether they have certified the engine, if their equipment obscures the emission control labels of such certified engines.

(4) 2002 and later model year off-road LSI engines with engine displacement less than or equal to 1.0 liter must comply with the applicable labeling specifications set forth in the California Code of Regulations, Title 13, Section 2404.

(c) Label Content and Location.

(1) A tune-up label made of a permanent material must be welded, riveted or otherwise permanently attached to the engine block or other major component in such a way that it will be readily visible after installation of the engine in the equipment. If the equipment obscures the label on the engine, the equipment manufacturer must attach a supplemental label such that it is readily visible.

(2) In selecting an acceptable location, the manufacturer must consider the possibility of accidental damage (e.g., possibility of tools or sharp instruments coming in contact with the label). Each label must be affixed in such a manner that it cannot be removed without destroying or defacing the label, and must not be affixed to any part which is likely to be replaced during the equipment's useful life. The label(s) must not be affixed to any component which is easily detached from the engine.

(3) In addition, an engine serial number and date of engine manufacture (month and year) must be stamped on the engine block or stamped on a metal label riveted or permanently attached to the engine block. Engine manufacturers must keep records such that the engine serial number can easily be used to determine if an engine was certified for the applicable model year. Alternative engine serial number identification methods or tracking number may be allowed with prior approval from the Executive Officer.

(4) The label must be in the English language and use block letters and numerals which must be of a color that contrasts with the background of the label.

(5) The label must contain the following information:

(A) The label heading must read:

"Important Engine Information."

(B) Full corporate name and trademark of the manufacturer.

(C) "THIS ENGINE IS CERTIFIED TO OPERATE ON (specify operating fuel(s))."

(D) Identification of the Exhaust Emission Control System. Abbreviations may be used and must conform to the nomenclature and abbreviations found in the Society of Automotive Engineers document J1930 which is incorporated by reference in Section 1977, Title 13, CCR, entitled "Electrical/Electronic Systems Diagnostic Terms, Definitions, Abbreviations, and Acronyms."

(E) The maintenance specifications and adjustments recommended by the engine manufacturer, including, as applicable: spark plug gap width, valve lash, ignition timing, idle air/fuel mixture setting procedure and value (e.g., idle CO, idle speed drop), and high idle speed. These specifications must indicate the proper transmission position, (if applicable), during tune-up and what accessories, if any, should be in operation, and what systems, if any (e.g., vacuum advance, air pump), should be disconnected during the tune-up. If the manufacturer does not recommend adjustment of the foregoing specifications, the manufacturer must include in lieu of the "specifications" the single statement "No other adjustments needed." For all engines, the instructions for tune-up adjustments must be sufficiently clear on the label to preclude the need for a mechanic or equipment owner to refer to another document in order to correctly perform the adjustments.

(F) Any specific fuel or engine lubricant requirement (e.g., research octane number, engine lubricant type).

(G) An unconditional statement of compliance with the appropriate model year (for 2001-2003) or (2004 and subsequent) California regulations; for example, "This engine conforms to 2002 California regulations for off-road large spark-ignition engines and is certified to 3.0 g/bhp-hr HC+NOx and 37 g/bhp-hr CO." or "This engine conforms to 20067 California regulations for off-road large spark-ignition engines and is certified to 0.6 g/bhp-hr HC+NOx and 15.5 g/bhp-hr CO."

(H) Total engine displacement (in cubic inches and/or liters) of the engine upon which the engine label is attached.

(I) The engine family identification (i.e., engine family name and manufacturer's own engine group/code).

(6) (A) The manufacturer of any engine certified with a clean fuel (i.e. natural gas) must at the time of engine manufacture, affix a permanent legible label specifying the appropriate operating fuel(s).

(B) The label must be located immediately adjacent to each fuel tank filler inlet and outside of any filler inlet compartment. It must be located so that it is readily

visible to any person introducing fuel to such filler inlet; provided, however, that the Executive Officer must upon application from an engine manufacturer, approve other label locations that achieve the purpose of this paragraph. If the engine is manufactured separately from the equipment, the label must be affixed to the engine and located so that it is readily visible. Such labels must be in English and in block letters which must be of a color that contrasts with their background.

(d) An engine label may state that the engine or equipment conforms to any applicable federal emission standards for new engines, or any other information that such manufacturer deems necessary for, or useful to, the proper operation and satisfactory maintenance of the equipment or engine.

(e) Supplemental Engine Label Content and Location.

(1) When a final equipment assembly that is marketed to any ultimate purchaser is manufactured and the engine label attached by the engine manufacturer is obscured (i.e., not readily visible), the manufacturer of the final equipment assembly (i.e., original equipment manufacturer) must attach a supplemental engine label upon the engine or equipment. The supplemental engine label must be plastic or metal, and must be welded, riveted or otherwise attached permanently to an area of the engine or equipment assembly so as to be readily visible to the average person.

(2) The manufacturer required to attach a supplemental engine label must consider the possibility of accidental damage to the supplemental engine label in the determination of the label location. Such a label must not be attached to any engine or equipment component that is likely to be replaced during the useful life of the engine or equipment (as applicable). Such a label must not be attached to any engine or equipment component that is detached easily from the engine or equipment (as applicable).

(3) The supplemental engine label information must be written in the English language and use block letters and numerals (i.e., sans serif, upper-case characters) that must be of a color that contrasts with the background of the label.

(4) A supplemental engine label must contain the information as specified in Subsection (c)~~(4)~~(5), except that the date of engine manufacture specified in (c)(3) may be deleted from the supplemental engine label. When the date of engine manufacture does not appear on the supplemental engine label, the responsible original equipment manufacturer must display (e.g., label, stamp, etc.) the date elsewhere on the engine or equipment so as to be readily visible.

(f) As used in these specifications, readily visible to the average person means that the label must be readable from a distance of eighteen inches (46 centimeters) without any obstructions from equipment or engine parts (including all manufacturer available optional equipment) except for flexible parts (e.g., vacuum hoses, ignition wires) that can be moved out of the way without disconnection. Alternatively, information required by these specifications to be printed on the label must be no smaller than 8 point type size (2 millimeter in height) provided that no equipment or engine parts (including all manufacturer available optional equipment),

except for flexible parts, obstruct the label.

(g) The labels and any adhesives used must be designed to withstand, for the engine's or equipment's total expected life, typical equipment environmental conditions in the area where the label is attached. Typical equipment environmental conditions must include, but are not limited to, exposure to engine fuels, lubricants and coolants (e.g., gasoline, motor oil, water, ethylene glycol). The manufacturer must submit, with its certification application, a statement attesting that its labels comply with these requirements.

(h) The manufacturer must obtain approval from the Executive Officer for all label formats and locations prior to use. Approval of the specific maintenance settings is not required; however, the format for all such settings and tolerances, if any, is subject to review. If the Executive Officer finds that the information on the label is vague or subject to misinterpretation, or that the location does not comply with these specifications, he or she may require that the label or its location be modified accordingly.

(i) Samples of all actual production labels used within an engine family must be submitted to the Executive Officer within thirty days after the start of production. Engine manufacturers must provide samples of their own applicable production labels, and samples of applicable production original equipment manufacturer labels that are accessible to the engine manufacturer due to the direct market arrangement between such manufacturers.

(j) The Executive Officer may approve alternate label locations or may, upon request, waive or modify the label content requirements provided that the intent of these specifications is met.

(k) The manufacturer of any engine must furnish to the Executive Officer, at the beginning of the model year, any engine identification number coding system which identifies whether such engine(s) are covered by an Executive Order.

(l) (1) If the Executive Officer finds any engine manufacturer using labels that are different from those approved or that do not substantially comply with the readability or durability requirements set forth in these specifications, the engine manufacturer will be subject to revocation or suspension of Executive Orders for the applicable engine families, or enjoined from any further sales, or distribution, of such noncompliant engine families, or subgroups within the engine families, in the State of California pursuant to Section 43017 of the Health and Safety Code. Before seeking to enjoin an engine manufacturer, the Executive Officer will consider any information provided by the engine manufacturer. In addition, the engine manufacturer may be subject to, on a per engine basis, any and all remedies available under Part 5, Division 26 of the Health and Safety Code, sections 43000 et seq.

(2) If the Executive Officer finds any original equipment manufacturer using ɔels for which it has responsibility for attaching that are different from those approved or that do ɔt substantially comply with the readability or durability requirements set forth in these ecifications, the equipment manufacturer will be subject to being enjoined from any further sales, distribution, of the applicable equipment product line that uses such noncompliant labels in the ate of California pursuant to Section 43017 of the Health and Safety Code. Before seeking to ɨjoin an equipment manufacturer, the Executive Officer will consider any information provided ' the equipment manufacturer. In addition, the equipment manufacturer may be subject to, on a ɾ engine basis, any and all remedies available under Part 5, Division 26 of the Health and Safety ɔde, sections 43000 et seq.

NOTE: Authority cited: Sections 39600, 39601, 43013, 43018, 43101, 43102 and 43104, Health and Safety Code. Reference: Sections 43013, 43017, 43018, 43101, 43102, 43104, 43105, 43150, 43151, 43152, 43153, ~~-~~ 43154, 43205.5, ~~and~~ 43210, 43210.5, 43211 and ~~-~~43212, Health and Safety Code.

PROPOSED REGULATION ORDER, PART 2

NOTE: The entire text is new language proposed for addition to the California Code of Regulations.

Adopt Article 2, Large Sparks Ignition (LSI) Engine Fleet Requirements, within Chapter 15, Division 3, Title 13, California Code of Regulations, and new sections 2775, 2775.1, and 2775.2 to read as follows:

Article 2. Large Sparks Ignition (LSI) Engine Fleet Requirements

Section 2775. Applicability.

(a) General Applicability. This article applies to operators of off-road large spark-ignition (LSI) engine forklifts, sweepers/scrubbers, industrial tow tractors or airport ground support equipment operated within the State of California in the conduct of business with:

(1) 25 horsepower or more (greater than 19 kilowatts for 2005 and later model year engines), and

(2) greater than 1.0 liter displacement.

(b) Exemptions.

(1) Rental or lease equipment operated in California no more than 30 aggregated calendar days per year shall be exempt from the requirements of this article.

(2) Ground support equipment subject to the South Coast Ground Support Equipment Memorandum of Understanding, dated November 27, 2002 shall be exempt from the requirement of this article until January 1, 2012. Ground support equipment subject to any future ground support equipment agreement to which the California Air Resources Board is a signatory shall be exempt from the requirements of this article for the period specified in the agreement plus one year.

(3) Off-road military tactical vehicles or equipment exempt from regulation under the federal national security exemption, 40 CFR, subpart J, section 90.908, are exempt from the requirements of this article. Vehicles and equipment covered by the definition of military tactical vehicle that are commercially available and for which a federal certificate of conformity has been issued under 40 CFR Part 90, subpart B, shall also be exempt from the requirements of this article.

(c) Each part of this article is severable, and in the event that any part of this chapter or article is held to be invalid, the remainder of the article shall remain in full force and effect.

(d) Definitions. The definitions in Section 1900 (b), Chapter 1, and Section 2431 (a), Chapter 9 of Title 13 of the California Code of Regulations apply to this article. In addition, the following definitions apply to this article:

"Agricultural Crop Preparation Services" means packinghouses, cotton gins, nut hullers and processors, dehydrators, feed and grain mills, and other related activities.

"Airport Ground Support Equipment" means any large spark-ignition engine-powered equipment contained in the 24 categories of equipment included in section B.3. of Appendix 2 of the South Coast Ground Support Equipment Memorandum of Understanding, dated November 27, 2002.

"Baseline Inventory" means an inventory of equipment as defined in this subdivision that reflects all equipment owned at the time of the inventory.

"Certification Standard" means the level to which an LSI engine is certified, in grams per kilowatt-hour of hydrocarbon and oxides of nitrogen, combined, as identified in an Executive Order (EO) issued by the Executive Officer of the California Air Resources Board.

"Emission Control System" means any device or system employed with a new or in-use off-road LSI-engine vehicle or piece of equipment that is intended to reduce emissions. Examples of LSI emission control systems include, but are not limited to, closed-loop fuel control systems, fuel injection systems, three-way catalysts, and combinations of the above.

"Equipment" or "Pieces of Equipment" means one or more forklifts, industrial tow tractors, sweeper/scrubbers, or pieces of airport ground support equipment as defined in this section.

"Executive Officer" means the Executive Officer of the California Air Resources Board, or his or her delegate.

"Executive Order" means a document signed by the Executive Officer that specifies the standard to which a new LSI engine is certified or the level to which an LSI retrofit emission control system is verified.

"Facility" means any structure, appurtenance, installation, and improvement on land that operates and/or garages one or more pieces of equipment.

"Facility Sample" means the selection of one or more individual facilities from an operator's California facilities for comparison to the operator's aggregate fleet inventory for fleet average calculation.

"Fleet Average Emission Level" means the arithmetic mean of the combined hydrocarbon plus oxides of nitrogen emissions for each piece of applicable equipment comprising an operator's fleet.

"Forklift" means an electric Class 1, or 2 rider truck or a large spark-ignition engine-powered Class 4 or 5 rider truck as defined by the Industrial Truck Association. Electric Class 3 trucks are not forklifts for the purposes of this regulation.

"Industrial Tow Tractor" means an electric or large spark-ignition engine-powered Class 6 truck as defined by the Industrial Truck Association. Industrial tow tractors are designed primarily to push or pull non-powered trucks, trailers, or other mobile loads on roadways or improved surfaces. Industrial tow tractors are commonly referred to as tow motors or tugs. Industrial tow tractors are distinct from airport ground support equipment tugs for the purposes of this regulation.

"Label" means a permanent material that is welded, riveted or otherwise permanently attached to the engine block or other major component in such a way that it will be readily visible after installation of the engine in the equipment. If the equipment obscures the label on the engine, the equipment manufacturer must attach a supplemental label such that it is readily visible. The label will state the standard to which the engine or equipment was certified in accordance with the labeling provisions of Title 13, California Code of Regulations, section 2434(c)(5)(G).

"Large Fleet" means an operator's aggregated operations in California of 26 or more pieces of LSI equipment.

"LSI Retrofit Emission Control System" means an emission control system employed exclusively with an in-use off-road LSI-engine vehicle or piece of equipment.

"Manufacturer" means the manufacturer granted new engine certification or retrofit emission control system verification.

"Medium Fleet" means an operator's aggregated operations in California of 4 to 25 pieces of LSI equipment.

"Military tactical vehicles or equipment means vehicles or equipment owned by the U.S. Department of Defense and/or the U.S. military services and used in combat, combat support, combat service support, tactical or relief operations, or training for such operations.

["Model Year" means the manufacturer's annual production period, which includes January 1 of a calendar year or, if the manufacturer has no annual production period, the calendar year.][1]

["New Engine" means an engine's ownership has not been transferred to the ultimate consumer.]

"Non-forklift fleet" means an operator's aggregated operations in California of four (4) or more sweeper/scrubbers, industrial tow tractors, or pieces of airport ground support equipment, alone or in combination.

["Off-Road Large Spark-ignition Engines" or "LSI Engines" means any engine that produces a gross horsepower of 25 horsepower or greater (greater than 19 kilowatts for 2005 and later model year) or is designed (e.g., through fueling, engine calibrations, valve timing, engine speed modifications, etc.) to produce 25 horsepower or greater (greater than 19 kilowatts for 2005 and later model year). If an engine family has models at or above 25 horsepower (greater than 19 kilowatts) and models below 25 horsepower (at or below 19 kilowatts), only the models at or above 25 horsepower (above 19 kilowatts) would be considered LSI engines. The engine's operating characteristics are significantly similar to the theoretical Otto combustion cycle with the engine's primary means of controlling power output being to limit the amount of air that is throttled into the combustion chamber of the engine. LSI engines or alternate fuel-powered LSI internal combustion engines are designed for powering, but not limited to powering, forklift trucks, sweepers, generators, and industrial equipment and other miscellaneous applications. All engines and equipment that fall within the scope of the preemption of Section 209(e)(1)(A) of the Federal Clean Air Act, as amended, and as defined by regulation of the Environmental Protection Agency, are specifically excluded from this category. Specifically excluded from this category are: 1) engines operated on or in any device used exclusively upon stationary rails or tracks; 2) engines used to propel marine vessels; 3) internal combustion engines attached to a foundation at a location for at least 12 months; 4) off-road recreational vehicles and snowmobiles; and 5) stationary or transportable gas turbines for power generation.]

"Operator" means a person with legal right of possession and use of LSI engine equipment other than a person whose usual and customary business is the rental or leasing of LSI engine equipment. Operator includes a person whose usual and customary business is the rental or leasing of LSI engine equipment for any LSI engine equipment not solely possessed or used for rental or leasing.

"Repower" means a new or remanufactured engine and parts offered by the OEM or by a non-OEM rebuilder that has been demonstrated to the ARB to be

[1] Bracketed definitions are replicated for ease of use and presentation clarity from Section 1900 (b), Chapter 1, or Section 2431 (a), Chapter 9, of Title 13 of the California Code of Regulations.

functionally equivalent from a durability standpoint to the OEM engine and components being replaced.

"Retrofit" means the application of an emission control system to a non-new LSI engine.

"Serial Number" means an engine serial number and date of engine manufacture (month and year) that are stamped on the engine block or stamped on a metal label riveted or permanently attached to the engine block. Engine manufacturers must keep records such that the engine serial number can easily be used to determine if an engine was certified for the applicable model year, and beginning January 1, 2007, the standard to which the engine was certified in accordance with the labeling provisions of Title 13, California Code of Regulations, section 2434(c)(5)(G).

"Small Fleet" means an operator's aggregated operations in California of 1 to 3 LSI forklifts and/or 1 to 3 pieces of non-forklift LSI equipment.

"Sweeper/scrubber" means a large spark-ignition engine-powered piece of industrial floor cleaning equipment designed to brush and vacuum up small debris and litter and then scrub and squeegee the floor.

"Specialty Equipment" means a piece of equipment with unique or specialized performance capabilities that allow it to perform prescribed tasks and as approved by the Executive Officer.

["Ultimate Purchaser" means the first person who in good faith purchases a new LSI *engine or equipment using such engine for purposes other than resale.*]

"Uncontrolled LSI Engine" means pre-2001 uncertified engines and 2001-2003 certified uncontrolled LSI engines. The default emission rate for an uncontrolled LSI engine is 12.0 grams per brake horsepower-hour of hydrocarbon plus oxides of nitrogen.

"Verification" "Verification" means a determination by the Executive Officer that the LSI emission control system meets the requirements of this Procedure. This determination is based on both data submitted or otherwise known to the Executive Officer and engineering judgement.

"Verification Level" means one of four emission reduction classifications that apply to the performance capability of retrofit emission control systems as described in Title 13, California Code of Regulations, Section 2782(f), Table 1, as set forth in Table 1:

Table 1. LSI Engine Retrofit System Verification Levels

Classification	*Percentage Reduction (HC+NOx)*	*Absolute Emissions (HC+NOx)*
LSI Level 1 [(1)]	> 25% [(2)]	Not Applicable
LSI Level 2 [(1)]	> 75%[(3)]	3.0 g/bhp-hr [(3)]
LSI Level 3a [(1)]	> 85% [(4)]	0.5, 1.0, 1.5, 2.0, 2.5 g/bhp-hr
LSI Level 3b [(5)]	Not Applicable	0.5, 1.0, 1.5, 2.0 g/bhp-hr

Notes:

(1) Applicable to uncontrolled engines only

(2) The allowed verified emissions reduction is capped at 25% regardless of actual emission test values

(3) The allowed verified reduction for LSI Level 2 is capped at 75% or 3.0 g/bhp-hr regardless of actual emission test values

(4) Verified in 5% increments, applicable to LSI Level 3a classifications only

(5) Applicable to emission-controlled engines only

NOTE: Authority cited: Sections 39600, 39601, 43013, and 43018, Health and Safety Code. Reference: Sections 43013, 43017, and 43018, Health and Safety Code.

Section 2775.1. Standards.

(a) Except as provided in subdivisions (d), (e), (f), and (g), operators of medium and large forklift fleets and operators of non-forklift fleets with more than three pieces of equipment shall comply with the fleet average emission level standards in Table 2 by the specified compliance dates.

Table 2: Fleet Average Emission Level Standards in grams per kilowatt-hour (brake-horsepower-hour) of hydrocarbons plus oxides of nitrogen

	Initial Compliance Date		
Fleet Type	**1/1/2009**	**1/1/2011**	**1/1/2013**
Large Forklift Fleet	**3.2 (2.4)**	**2.3 (1.7)**	**1.5 (1.1)**
Medium Forklift Fleet	**3.5 (2.6)**	**2.7 (2.0)**	**1.9 (1.4)**
Non-forklift Fleet	**4.0 (3.0)**	**3.1 (2.3)**	**2.3 (1.7)**

(1) Fleet operators subject to the fleet average provisions shall include in their fleet average calculations any piece of equipment that the operator has rented or leased or reasonably expects to rent or lease for a period of one year or more.

(2) Fleet operators may exclude from the fleet average calculation rental or leased equipment if:

(A) the rental or lease is for a period of less than one year, and

(B) the rental or lease component comprises no more than 20 percent of the operator's equipment at any time, and

(C) the equipment rented or leased during the period from January 1, 2009 through December 31, 2010 is controlled to a 4.0 g/kW-hr (3.0 g/bhp-hr) standard or better and equipment rented or leased on or after January 1, 2011 is controlled to a 2.7 g/kW-hr (2.0 g/bhp-hr) standard or better.

(3) Fleet operators shall comply with the applicable fleet average standard in Table 2 with the following exceptions:

(A) if through business expansion, a fleet meets the definition of a larger size category, the fleet may continue to comply with the applicable fleet standard for the initial size category until the subsequent compliance date, at which time the fleet must meet the applicable fleet standard for the new fleet size category, or

(B) if through retirement or other fleet size reduction mechanism the fleet would otherwise be required to comply with a less stringent fleet standard, then the less stringent fleet standard becomes effective immediately.

(b) Operators of mixed fleets comprised of forklifts and non-forklift equipment shall determine fleet size individually for forklift fleets and non-forklift fleets; a mixed fleet with three or fewer forklifts and three or fewer non-forklift pieces of equipment shall be considered to be a small fleet and shall comply with the provisions specified in subdivision (c) below.

(c) Except as provided in subdivisions (d), (e), and (f), each small forklift, small non-forklift, and small mixed fleet shall address emissions from all uncontrolled LSI engines in that fleet as prescribed in subdivision (e)(1)(D)(i) or (ii) below by January 1, 2011.

(d) Except as provided in subdivisions (e), (f) and (g), by July 1, 2016, each operator of a fleet used in agricultural crop preparation services shall address emissions from all uncontrolled LSI engines in that fleet as prescribed in subdivision (e)(1)(D)(i) or (ii) below beginning July 1, 2006, as follows:

(1) Ten percent of their 2006 baseline uncontrolled LSI engine inventory shall be addressed each year for a period of ten years, and

(2) In determining the percentage in (d)(1), the operator of the agricultural crop preparation services fleet need only address the integer portion of the calculation each year.

(3) Operators of fleets used in agricultural crop preparation services may exclude from their 2006 baseline uncontrolled LSI engine inventory any rental or leased equipment. Any equipment rented or leased on or after January 1, 2009 must be controlled to a 4.0 g/kW-hr (3.0 g/bhp-hr) standard or better.

(e) Limited Hours of Use Provisions and Small Fleet Standards.

(1) Forklift and non-forklift equipment in small, medium, and large fleets shall be exempted from the provisions of subdivisions (a) and (c) of this section, and forklift equipment in agricultural crop preparation services shall be exempted from the provisions of subdivision (d) of this section provided that:

(A) the equipment is used, on average over any three year period, less than 251 hours per year, and

(B) the equipment is equipped with an operational hours of use meter, and

(C) the operator maintains hours of use records for the piece of equipment at a facility, and

(D) the operator addresses the emissions through option (i) or (ii) below by January 1, 2011, if a medium or large fleet, or by January 1, 2013, if a small fleet:

(i) retrofit or repower the equipment to a Level 2 or Level 3 verification level as described in Title 13, California Code of Regulations, Section 2782 (f), or

(ii) retire the equipment or replace the equipment with a new or used piece of equipment certified to a 3.0 g/bhp-hr hydrocarbon plus oxides of nitrogen emission standard.

(f) Specialty Equipment Exemption.

(1) Forklift and non-forklift specialty equipment shall be exempt from the requirements of subdivisions (a) through (d) of this section provided that:

(A) the replacement cost exceeds the replacement cost of a "typical" piece of equipment from that category by 50 percent or the retrofit cost exceeds the "typical" retrofit cost of a piece of equipment from that category by 100 percent, and

(B) they meet the requirements of subdivisions (e)(1)(A) through (e)(1)(C), and

(C) the Executive Officer approves the listing of the piece of equipment as specialty equipment.

(g) Alternate Compliance Option for Operators of Fleets used in Agricultural Crop Preparation Services.

(1) Forklift equipment in agricultural crop preparation services shall be exempted from the provisions of subdivision (d) of this section provided that the operator of the equipment complies with a 4.0 g/kW-hr fleet average emission level.

NOTE: Authority cited: Sections 39600, 39601, 43013, and 43018, Health and Safety Code. Reference: Sections 43013, 43017, and 43018, Health and Safety Code.

Section 2775.2. Compliance Requirements for Fleet Operators.

(a) Fleet operators shall conduct a baseline inventory of their fleet within six months of [insert operative date of regulations after filing with Secretary of State] and shall maintain records at their facilities of their baseline inventory and subsequent inventories indicating accessions and retirements until June 30, 2016.

(b) At a minimum, fleet operators shall record and maintain on file at their facilities, information on the equipment type, make, model, serial number, and emission certification standard or retrofit verification level. Equipment with model year 2001 through 2004 LSI engines is required to have an emissions label that states that the engine conforms to the applicable model year regulations for off-road large spark-ignition engines or is certified uncontrolled. Equipment without an emissions label identifying the certification standard or verification level shall be

deemed to have an uncontrolled LSI engine. Operators that maintain multiple facilities may aggregate the records at a centralized facility or headquarters. Records for all equipment at all facilities shall be made available to the Air Resources Board within 30 calendar days upon request. Compliance staff may then select a facility sample for inspection purposes.

(c) Medium and large fleets shall be required to demonstrate at any time between January 1, 2009 and December 31, 2015, based on actual inventory, and reconciled against inventory records, that they meet the applicable fleet average emission level standard in Section 2775.1(a).

(d) Small fleets shall be required to demonstrate at any time on or after January 1, 2013, based on actual inventory, and reconciled against inventory records, that they have addressed their uncontrolled LSI engines as prescribed in Section 2775.1 (e)(1)(D).

(e) Agricultural crop preparation services fleets shall be required to submit baseline inventory documentation on or before June 30, 2006 to the Air Resources Board.

(f) Agricultural crop preparation services fleets shall be required to demonstrate at any time on or after June 30, 2007, based on actual inventory, and reconciled against inventory records, that they have addressed their uncontrolled LSI engines as prescribed in Section 2775.1 (d) and (e)(1)(D) or (g).

(g) Compliance Extensions. An operator may be granted an extension to a compliance deadline specified in Section 2775.1 for one of the following reasons:

(1) Compliance Extension based on No Verified Retrofit Emission Control System. The Executive Officer shall grant a blanket one-year compliance extension if no retrofit emission control systems are verified prior to January 1, 2007. The Executive Officer may grant additional compliance extensions if no retrofit emission control systems are verified prior to January 1, 2008.

(2) Use of Experimental Emission Control Strategies. An operator may use an experimental emission control strategy provided by or operated by the manufacturer in no more than ten percent of his total fleet for testing and evaluation purposes. The operator shall keep documentation of this use in records as specified in subsection (b).

(3) If a compliance deadline extension is granted by the Executive Officer, the operator shall be deemed to be in compliance as specified by the Executive Officer's authorization.

(h) Continuous Compliance. An operator is required to keep his equipment in compliance with this regulation, once it is in compliance, so long as the operator is operating the equipment in California.

NOTE: Authority cited: Sections 39600, 39601, 43013, and 43018, Health and Safety Code. Reference: Sections 43013, 43017, and 43018, Health and Safety Code.

Test Procedures

PROPOSED CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR NEW 2001 ~~AND LATER~~ THROUGH 2006 OFF-ROAD LARGE SPARK-IGNITION ENGINES
PART I

PROPOSED CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR NEW 2001 ~~AND LATER~~ THROUGH 2006 OFF-ROAD LARGE SPARK-IGNITION ENGINES
PART II

State of California
AIR RESOURCES BOARD

CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR NEW 2001 ~~AND LATER~~ THROUGH 2006 OFF-ROAD LARGE SPARK-IGNITION ENGINES

PART I

Adopted: September 1, 1999
Amended: [insert date of amendment]

NOTE: The general provisions herein have been adapted and modified from similar provisions set forth in 40 CFR, Part 86, Subpart A - General Provisions for Emission Regulations for 1977 and Later Model Year New Light-Duty Vehicles, 1977 and Later Model Year New Light Duty Trucks, 1977 and Later Model Year New Heavy-Duty Engines, and for 1985 and Later Model Year New Gasoline-Fueled Heavy-Duty Vehicles.

~~This document is all newly adopted text.~~ The sole amendments are to the title and years of applicability of the regulations.

TABLE OF CONTENTS

I. Emission Regulations for New 2001 ~~and Later~~ through 2006 Off-Road Large Spark-Ignition Engines, General Provisions

1. General Applicability.

(a) These provisions apply to new off-road large spark-ignition engines with displacement greater than 1.0 liter, produced on or after January 1, 2001 through December 31, 2006.

(b) For any engine that is not a distinctly Otto cycle engine, the Executive Officer shall determine whether the engine shall be subject to these regulations, taking into consideration the relative similarity of the engine's basic characteristics with those of Otto cycle engines.

(c) Every new off-road large spark-ignition engine that is manufactured for sale, sold, offered for sale, introduced or delivered for introduction into commerce into California which is subject to any of the standards prescribed in these provisions, is required to meet California air pollution requirements as certified for use and sale by the manufacturer through the Air Resources Board and covered by an Executive Order issued under these provisions.

(d) The test procedures for determining certification and compliance with the standards for exhaust emissions from new off-road LSI engines with engine displacement equal to or less than 1.0 liter sold in the state are set forth in "California Exhaust Emission Standards and Test Procedures for 1995 and Later Small Off-Road Engines," as last amended March 23, 1999.

2. Definitions.

"Accuracy" means the difference between a measurement and true value.

"Alternate Fuel" means any fuel that will reduce non-methane hydrocarbons (on a reactivity-adjusted basis), NOx, CO, and the potential risk associated with toxic air contaminants as compared to gasoline or diesel fuel and would not result in increased deterioration of the engine. Alternate fuels include, but are not limited to, methanol, ethanol, liquefied petroleum gas, compressed natural gas, and electricity.

"ARB Enforcement Officer" means any officer or employee of the Air Resources Board so designated in writing by the Executive Officer or by the Executive Officer's designee.

"Auxiliary Emission Control Device (AECD)" means any element of design which senses temperature, vehicle speed, engine RPM, transmission gear, manifold vacuum, or any other parameter for the purpose of activating, modulating, delaying, or deactivating the operation of any of the emission control system.

"Basic Engine" means an engine manufacturer's description of their unique combination of engine displacement, number of cylinders, fuel system, emission control system, and other engine and emission control system characteristics as determined or specified by the Executive Officer.

"Calibrating gas" means a gas of known concentration that is used to establish the response curve of an analyzer.

"Calibration" means the set of specifications, including tolerances, unique to a particular design, version, or application of a component or components assembly capable of functionally

describing its operation over its working range.

"Configuration" means a subclassification of an engine-system combination on the basis of engine code, inertia weight class, transmission type and gear ratios, final drive ratio, and other parameters that may be designated by the Executive Officer.

"Confirmatory testing" means ARB directed emissions tests and inspections of the test engines and/or test vehicles used by the manufacturer to obtain test data for submittal with the certification application. The emissions tests may be conducted at ARB, contracted facilities, or at the manufacturer's facility. The testing will be done at the expense of the manufacturer.

"Conveniently available service facility and spare parts for small- volume manufacturers" means that the engine manufacturer has a qualified service facility at or near the authorized point of sale or delivery of its engines and maintains an inventory of all emission-related spare parts or has made arrangements for the part manufacturers to supply the parts by expedited shipment (e.g., using overnight express delivery service, UPS, etc.).

"Crankcase emissions" means airborne substances emitted to the atmosphere from any portion of the engine crankcase ventilation or lubrication systems.

"Critical emission-related components" are those components that are designed primarily for emission control, or whose failure may result in a significant increase in emissions accompanied by no significant impairment (or perhaps even an improvement) in performance, driveability, and/or fuel economy as determined by the Executive Officer.

"Critical emission-related maintenance" means that maintenance to be performed on critical emission-related components.

"Curb-idle" means: (1) For manual transmission code engines, the manufacturer's recommended engine speed with the clutch disengaged. (2) For automatic transmission code engines, curb idle means the manufacturer's recommended engine speed with the automatic transmission in gear and the output shaft stalled.

"Defeat Device" means an AECD that reduces the effectiveness of the emission control system under conditions that may reasonably be expected to be encountered in normal operation and use, unless (1) such conditions are substantially included in the emission test procedure, (2) the need for the AECD is justified in terms of protecting the engine against damage or accident, or (3) the AECD does not go beyond the requirements of engine starting.

"Deterioration Factor" means the calculated or assigned number that represents the certification engine's emissions change over the durability period. It is multiplied by zero hour (new) engine test results to determine the engine family compliance level. The deterioration factor is determined as per the Test Procedures. See "Emission Durability Period" below.

"Emission-related maintenance" means that maintenance that substantially affects emissions or is likely to affect the emissions deterioration of the equipment, vehicle, or engine during normal in-use operation, even if the maintenance is performed at some time other than that which is recommended.

"Emissions Durability Period" is the period over which, for purposes of certification, a manufacturer must demonstrate compliance with the standards set forth in Section 2433(b), Title 13, of the California Code of Regulations. The durability periods are also noted in the table in Section 2433 (b). The emissions durability period is used to determine an engine family's deterioration factors.

"Engine code" means a unique combination, within an engine-system combination, of displacement, air/fuel calibration, spark/timing calibration, distributor calibration, auxiliary emission control devices, and other engine and emission control system components specified by the Executive Officer.

"Engine family" is a subclass of a basic engine based on similar emission characteristics. The engine family is the grouping of engines that is used for the purposes of certification and determined in accordance with Section 11.

"Engine family group" means a collection of similar engine families used for the purpose of off-road certification and determined in accordance with Section 11. Generally, the engine family group concept is used to determine the deterioration factors for one or more engine families as determined in accordance with Section 11.

"Engine-system combination" means an engine family-exhaust emission control system combination.

"Executive Officer" means the Executive Officer of the Air Resources Board or an authorized representative.

"Exhaust emissions" means substances emitted to the atmosphere from any opening downstream from the exhaust port of an engine.

"Flexible fuel engine (or equipment or vehicle)" means any engine (or equipment or vehicle) engineered and designed to be operated on a petroleum fuel, a methanol fuel, a gaseous fuel, or any mixture of the above.

"Fuel system" means the combination of fuel tank(s), fuel pump, fuel lines, and carburetor or fuel injection components, and includes all fuel system vents and fuel evaporative emission control system components.

"Gross Power" means the power measured at the crankshaft or its equivalent, the engine being equipped only with the standard auxiliaries necessary for its operation on the test bed.

"Malfunction" means not operating according to specifications (e.g. those specifications listed in the application for certification).

"Maximum rated horsepower" means the maximum brake horsepower output of an engine as stated by the manufacturer in his sales and service literature and his application for certification under Section 8.

"Maximum rated torque" means the maximum torque produced by an engine as stated by the manufacturer in his sales and service literature and his application for certification under Section 8.

"Methanol-fueled" means any equipment, motor vehicle or engine that is engineered and designed to be operated using methanol fuel (i.e., a fuel that contains at least 50 percent methanol (CH_3OH) by volume) as fuel. Flexible fuel engines are methanol-fueled engines.

"Military engine" means any engine manufactured solely for the Department of Defense to meet military specifications.

"New Engine Compliance testing" means ARB directed emissions tests and inspections of a reasonable number of production engines and/or equipment that are offered for sale, or manufactured for sale, in California in order to verify compliance with the applicable certification emission standards. The emissions tests must be conducted at a qualified testing facility. The testing facility is chosen by the manufacturer and approved by the Executive

Officer. This may include ARB facilities, contracted facilities, or at the manufacturer's facility. The testing will be done at the expense of the manufacturer.

"Non-emission-related maintenance" means that maintenance that does not substantially affect emissions and that does not have a lasting effect on the emissions deterioration of the equipment, vehicle, or engine during normal in-use operation once the maintenance is performed.

"Non-oxygenated hydrocarbon" means organic emissions measured by a flame ionization detector excluding methanol.

"Off-Road Large Spark-ignition Engines" or "LSI Engines" means any engine that produces a gross horsepower 25 and greater horsepower or is designed (e.g., through fueling, engine calibrations, valve timing, engine speed modifications, etc.) to produce 25 and greater horsepower. If an engine family has models at or above 25 horsepower and models below 25 horsepower, only the models at or above 25 horsepower would be considered LSI engines. The engine's operating characteristics are significantly similar to the theoretical Otto combustion cycle with the engine's primary means of controlling power output being to limit the amount of air that is throttled into the combustion chamber of the engine. LSI engines or alternate fuel powered LSI internal combustion engines are designed for powering, but not limited to powering, forklift trucks, sweepers, generators, and industrial equipment and other miscellaneous applications. All engines and equipment that fall within the scope of the preemption of Section 209(e)(1)(A) of the Federal Clean Air Act, as amended, and as defined by regulation of the Environmental Protection Agency, are specifically excluded from this category.

Specifically excluded from this category are: 1) engines operated on or in any device used exclusively upon stationary rails or tracks; 2) engines used to propel marine vessels; 3) internal combustion engines attached to a foundation at a location for at least 12 months; 4) off-road recreational vehicles and snowmobiles; and 5) stationary or transportable gas turbines for power generation

"Option" means any available equipment or feature not standard equipment on a model.

"Organic Material Hydrocarbon Equivalent" means the sum of the carbon mass contributions of non-oxygenated hydrocarbons, methanol and formaldehyde as contained in a gas sample, expressed as gasoline fueled engine hydrocarbons. In the case of exhaust emissions, the hydrogen-to-carbon ratio of the equivalent hydrocarbon is 1.85:1.

"Oxides of nitrogen" means the sum of the nitric oxide and nitrogen dioxide contained in a gas sample as if the nitric oxide was in the form of nitrogen dioxide.

"Peak torque speed" means the speed at which an engine develops maximum torque.

"Percent load" means the fraction of the maximum available torque at a specified engine speed.

"Precision" means the standard deviation of replicated measurements.

"Rated speed" means the speed at which the manufacturer specifies the maximum rated horsepower of an engine.

"Reconfigured emission-data engine" means an emission-data engine obtained by modifying a previously used emission-data engine to represent another emission-data engine.

"Scheduled maintenance" means any adjustment, repair, removal, disassembly, cleaning, or replacement of equipment or engine components or systems required by the manufacturer that

is performed on a periodic basis to prevent part failure or equipment or engine malfunction, or anticipated as necessary to correct an overt indication of equipment or engine malfunction or failure for which periodic maintenance is not appropriate.

"Similar systems" are engine, fuel metering and emission control system combinations that use the same fuel (e.g., gasoline, LPG, etc.), combustion cycle (i.e., two or four stroke), general type of fuel system (i.e., carburetor or fuel injection), catalyst system (e.g., none, oxidation, three-way only, etc.), fuel control system (i.e., feedback or non-feedback), secondary air system (i.e., equipped or not equipped) and EGR (i.e., equipped or not equipped).

"Small Volume Manufacturer" means an engine manufacturer that produces a total of less than 2000 large spark-ignition engines annually for sale in the United States.

"Span gas" means a gas of known concentration that is used routinely to set the output level of an analyzer.

"Specific emissions" means emissions expressed on the basis of observed gross power or net power in grams per brake horsepower hour. For many engine types the auxiliaries that will be fitted to the engine in service are not known at the time of manufacture or certification. For this reason the emissions shall be expressed on the basis of gross power. When it is not convenient to test the engine in the gross conditions, e.g., if the engine and transmission form a single integral unit, the engine may be tested in the net condition.

"Standard equipment" means those features or equipment that are marketed on a product over which the purchaser can exercise no choice.

"System" includes any engine modification that controls or causes the reduction of substances emitted from an engine or piece of equipment.

"Test engine" means any engine used in certification, production line testing, quality audit, or compliance testing. A test engine can be a prototype engine or a production engine depending on the testing program in which it is used.

"Test Procedures" means the procedures specified in both Part I and Part II of the "California Exhaust Emission Standards and Test Procedures for New 2001 ~~and Later~~ through 2006 Off-Road Large Spark-Ignition Engines."

"Throttle" means a device used to control an engines power output by limiting the amount of air entering the combustion chamber.

"Transmission class" means the basic type of transmission, e.g. manual, automatic, semiautomatic.

"Transmission configuration" means a unique combination, within a transmission class, of a number of the forward gears and, if applicable, overdrive. The Executive Officer may further subdivide a transmission configuration (based on such criteria as gear ratios, torque converter multiplication ratio, stall speed and shift calibration, etc.), if he determines that significant fuel economy or exhaust emission differences exist within that transmission configuration.

"Unscheduled maintenance" means any inspection, adjustment, repair, removal, disassembly, cleaning, or replacement of engine, equipment, or vehicle components or systems that is performed to correct or diagnose a part failure or equipment or vehicle (if the engine were installed in a vehicle) malfunction that was not anticipated.

"Useful life" means a period of 7 years or 5000 hours of operation, whichever first occurs

for engines having engine displacement greater than 1.0-liter, and 2 years or 1,000 hours of operations, whichever occurs first, for engines having engine displacement equal to or less than 1.0-liter. However, in no case may this period be less than the manufacturer's basic mechanical warranty period for the engine family.

"Zero (0) hours" means that point after normal assembly line operations and adjustments are completed and before fifty (50) additional operating hours have been accumulated, including emission testing, if performed.

3. Abbreviations.

(a) The abbreviations in this section apply to these provisions and have the following meanings:

AECD--Auxiliary emission control device.
API--American Petroleum Institute.
ARB--California Air Resources Board.
ASTM--American Society for Testing and Materials.
BHP--Brake horsepower.
BSCO--Brake specific carbon monoxide.
BSHC--Brake specific hydrocarbons.
BSNO --Brake specific oxides of nitrogen.
C--Celsius.
CFV--Critical flow venturi.
CFV-CVS--Critical flow venturi-constant volume sampler.
CH_4--Methane.
CL--Chemiluminescence.
CLD--Unheated chemiluminescence detector.
CO_2 --Carbon dioxide.
CO--Carbon monoxide.
conc.--concentration.
cfm--cubic feet per minute.
CVS--Constant volume sampler.
ECS--Electro-chemical sensor.
F--Fahrenheit.
FID--Flame ionization detector.
ft.--feet.
g--gram(s).
gal.--U.S.gallon(s).
GC--Gas chromatograph.
GVW--Gross vehicle weight.
GVWR--Gross vehicle weight rating.
h--hour(s).
hr--hour(s).

H_2O--water.
HC--Hydrocarbon(s).
HCLD--Heated chemiluminescence detector.
HCHO--Formaldehyde.
HFID--Heated flame ionization detector.
hp.--horsepower.
IBP--Initial boiling point.
ID--Internal diameter.
in.--inch(es).
K--Kelvin.
kg--kilogram(s).
kPa--kilopascal(s).
lb.--pound(s).
lb.-ft.--pound-feet.
m--meter(s).
max.--maximum.
MeOH--Methanol (CH_3OH).
mg--milligram(s).
mi.--mile(s).
min.--minute(s).
ml--milliliter(s).
mm--millimeter(s).
mph--miles per hour.
mv--millivolt(s).
N_2--Nitrogen.
NDIR-Nondispersive infrared.
NH_3--Ammonia.
NMC--Non-methane cutter.
NMHC--Non-methane hydrocarbons.
NO--nitric oxide.
NO_2--nitrogen dioxide.
NOx--oxides of nitrogen.
No.--Number.
O_2 --oxygen.
OMHCE--Organic Material Hydrocarbon Equivalent.
PDP-CVS--Positive displacement pump-constant volume sampler.
PMD--Paramagnetic detector.
ppm--parts per million by volume.
ppm C--parts per million, carbon.
psi--pounds per square inch.
R--Rankin.
rpm--revolutions per minute.
s--second(s).

SAE--Society of Automotive Engineers.
SI--International system of units.
SO_2 --Sulfur dioxide.
V--volt(s).
W--watt(s).
WF--Weighting factor.
wt.--weight.
ZROD--Zirconium dioxide sensor.
'--feet.
"--inch(es).
°--degree(s).
Σ--summation.

(b) The symbols defined in this section apply to this part and have the following meanings and units:

Symbol	Meaning	Unit
A_p	Cross sectional area of the isokinetic sampling probe	m^2
A_T	Cross sectional area of the exhaust pipes	m^2
F	Engine specific parameter considering atmospheric conditions	
F_{FCB}	Fuel specific factor for the carbon balance calculation	
F_{FD}	Fuel specific factor for exhaust flow calculation on dry basis	
F_{FH}	Fuel specific factor representing the hydrogen to carbon ratio	
F_{FW}	Fuel specific factor for exhaust flow calculation on wet basis	
G_{AIRW}	Intake air mass flow rate on wet basis	kg/h
G_{AIRD}	Intake air mass flow rate on dry basis kg/h	
G_{DIL}	Dilution air mass flow rate	kg/h
G_{EDF}	Equivalent diluted mass flow rate	kg/h
G_{EDFW}	Equivalent diluted mass flow rate wet basis	kg/h
G_{EXHW}	Exhaust gas mass flow rate on wet basis	kg/h
G_{Fuel}	Fuel mass flow rate	kg/h
G_{TOT}	Diluted exhaust gas mass flow rate	kg/h
H	Absolute humidity (water content related to dry air)	g/kg
i	Subscript denoting an individual mode	
K_H	Humidity correction factor	
K_{HDIE}	Humidity correction factor for diesel engines.	
K_{HPET}	Humidity correction factor for gasoline engines.	
L	Percent torque related to max. torque for the test mode	%
mass	Pollutant mass flow	g/h
M_{SAM}	Mass of sample through particulate sampling filters	kg
p_s	Dry Atmospheric pressure	kPa
P	Gross power output uncorrected	kW
p_d	Test ambient saturation vapor pressure at ambient temperature	kPa
P_{AUX}	Declared total power absorbed by auxiliaries fitted for the test	kW

P_M	Maximum power measured at the test speed under test conditions	kW
q	Dilution ratio	-
r	Ratio of cross sectional areas of sampling probe and exhaust pipe	-
R_a	Relative humidity of the ambient air	%
S	Dynamometer setting	kW
T	Absolute temperature at air inlet	K
V_{SAM}	Volume of sample through particulate sampling filters	m^3
T_{Dd}	Absolute dewpoint temperature	K
V_{EXHD}	Exhaust gas volume flow rate on dry basis	m^3/h
V_{AIRW}	Intake air volume flow rate on wet basis	m^3/h
V_{DILW}	Dilution air volume flow rate on wet basis	m^3/h
V_{EDFW}	Equivalent diluted volume flow rate on wet basis	m^3/h
p_B	Total barometric pressure	kPa
V_{EXHW}	Exhaust gas volume flow rate on wet basis	m^3/h
V_{TOTW}	Diluted exhaust gas volume flow rate on wet basis	m^3/h
WF	Weighting factor	
WF_E	Effective weighting factor	

4. General Standards; Increase in Emissions; Unsafe Conditions.

(a) Any system installed on or incorporated in a new off-road large spark-ignition engine to enable such engine to conform to standards imposed by these procedures:

(1) Shall not in its operation or function cause the emission into the ambient air of any noxious or toxic substance that would not be emitted in the operation of such engine without such system, except as specifically permitted by regulation; and

(2) Shall not in its operation, function or malfunction result in any unsafe condition endangering the engine, its operator, or persons or property in close proximity to the engine.

(b) In establishing the physically adjustable range of each adjustable parameter on a new off-road large spark-ignition engine, the manufacturer shall take into consideration the production tolerances and ensure that safe operability characteristics are available within that range.

(c) Every manufacturer of new off-road large spark-ignition engines subject to any of the standards imposed by these procedures shall, prior to selling or offering for sale any engines, test or cause to be tested off-road large spark-ignition engines in accordance with good engineering practices to ascertain that such test engines will meet the requirements of this section for the useful life of the engine as defined in these Test Procedures.

5. **Adjudicatory Hearing.**

Parties affected by an Executive Officer's determination may file a request for an adjudicatory hearing under Title 17, Division 3, Chapter 1, California Code of Regulations Subchapter 1.25. If, after reviewing the request and supporting data, the Executive Officer finds that the request raises a substantial issue of fact, a hearing in accordance with Subchapter 1.25 shall be granted.

6. **Maintenance of Records; Submittal of Information; Right of Entry.**

(a) The manufacturer of any new large spark-ignition off-road engine subject to any of the standards or procedures prescribed herein shall establish, maintain and retain the following adequately organized and indexed records.

(1) **General records.**

(i) The records required to be maintained by this paragraph shall consist of:

(A) Identification and description of all certification engines for which testing is required under these procedures.

(B) A description of all emission control systems that are installed on or incorporated in each certification engine.

(C) A description of all procedures used to test each such certification engine.

(ii) A properly filed application for certification, following the format prescribed by the ARB for the appropriate model year, fulfills each of the requirements of this paragraph (a)(1)(i).

(2) **Individual records.**

(i) A brief history of each off-road large spark-ignition engine used for certification under these procedures including:

(A) In the case where a current production engine is modified for use as a certification engine, a description of the process by which the engine was selected and of the modification made. In the case where the certification engine is not derived from a current production engine, a general description of the buildup of the engine (e.g., experimental heads, air intake manifolds, cams, and valves were cast and machined according to supplied drawings, etc.). In both cases above, a description of the origin and selection process for the closed-loop air/fuel system components (carburetor and/or fuel injection components and feedback sensor(s)), auxiliary emission control system components, exhaust emission control system components, and exhaust aftertreatment devices as applicable, shall be included. The required descriptions shall specify the steps taken to assure that the engine used for certification with respect to air/fuel system, emission control system components, exhaust aftertreatment devices, exhaust emission control system components, or any other devices or components, as applicable that can reasonably be expected to influence exhaust emissions, as applicable, will be representative of production engines, and that all components and/or engine construction processes, component inspection and selection techniques, and assembly techniques employed in the construction of the certification engines are reasonably likely to be implemented for

production engines, or that they are as closely analogous as practicable to planned construction and assembly processes.

(B) A complete record of all emission tests performed (except tests performed by ARB directly), including test results, the date and purpose of each test, and the number of hours accumulated on the engine.

(C) The date of each required service accumulation run, listing the number of operating hours accumulated, individual emission test data and results.

(D) [Reserved]

(E) A record and description of all maintenance and other service performed, giving the date of the maintenance or service and the reason for it.

(F) A record and description of each test performed to diagnose engine or emission control system performance, giving the date and time of the test and the reason for it.

(G) [Reserved]

(H) A brief description of any significant events affecting the engine during any time in the period covered by the history not described by an entry under one of the previous headings including such extraordinary events as accidents involving the engine or dynamometer runaway.

(ii) Each such history shall be started on the date that the first of any of the selection or buildup activities in paragraph (a)(2)(i)(A) of this section occurred with respect to the certification engine, shall be updated each time the operational status of the engine changes or additional work is done on it, and shall be kept in a designated location.

(3) All records, other than routine emission test records, required to be maintained under these procedures shall be retained by the manufacturer for a period of eight (8) years after issuance of all Executive Orders to which they relate. Routine emission test records shall be retained by the manufacturer for a period of two (2) year after issuance of all Executive Orders to which they relate. Records may be retained as hard copy or reduced to microfilm, electronic format, punch cards, etc., depending on the record retention procedures of the manufacturer, **provided,** which in every case all the information contained in the hard copy shall be retained.

(b) At the time of issuance of any instructions or explanations regarding the use, repair, adjustment, maintenance, or testing relevant to the control of crankcase or exhaust emissions of any new off-road large spark-ignition engine subject to any of the standards prescribed in these procedures, the engine manufacturer shall submit to the Executive Officer copies of all such instructions issued by the engine manufacturer for use by other manufacturers, assembly plants, distributors, dealers, and ultimate purchasers. However, the manufacturer need not submit any material not translated into the English language unless specifically requested by the Executive Officer.

(c) (1) Any manufacturer who has applied for certification of a new off-road large spark-ignition engine subject to certification testing under these procedures shall admit, or cause to be admitted, to any of the following facilities during operating hours, any ARB Enforcement Officer upon presentation of credentials or if necessary, an inspection warrant obtained pursuant to the California Code of Civil Procedures, Section 1822.50 et seq.

(i) Any facility where any such tests or procedures or activities connected

with such tests are or were performed.

(ii) Any facility warehousing any new off-road large spark-ignition engine that has been, is being, or will be tested.

(iii) Any facility where any construction process or assembly process used in the modification or buildup of such an engine into a certification engine is taking place or has taken place.

(iv) Any facility where any record or other document relating to any of the above is located.

(2) Upon admission to any facility referred to in paragraph (c)(1) of this section, any ARB Enforcement Officer shall be allowed:

(i) To inspect and monitor any part or aspect of such procedures, activities and testing facilities, including, but not limited to, monitoring engine preconditioning, emissions tests and service accumulation, maintenance, and engine storage procedures, and to verify correlation or calibration of test equipment;

(ii) To inspect and make copies of any such records, designs, or other documents; and

(iii) To inspect and/or photograph any part or aspect of any such certification engine and any components to be used in the construction thereof.

(3) In order to allow the Executive Officer to determine whether or not production off-road large spark-ignition engines conform in all material respects to the design specifications that applied to those engines described in the application for certification for which an Executive Order has been issued, any manufacturer shall admit, or cause to be admitted, to any of the following facilities any ARB Enforcement Officer upon presentation of credentials or if necessary, an inspection warrant obtained pursuant to the California Code of Civil Procedures, Section 1822.50 et seq.

(i) Any facility where any document, design, or procedure relating to the translation of the design and construction of engines and emission related components described in the application for certification testing into production engines is located or carried on; and

(ii) Any facility where any off-road large spark-ignition engines, or equipment, to be introduced into commerce are manufactured or assembled.

(4) On admission to any such facility referred to in paragraph (c)(3) of this section, any ARB Enforcement Officer shall be allowed:

(i) To inspect and monitor any aspect of such manufacture or assembly and other procedures;

(ii) To inspect and make copies of any such records, documents or design; and

(iii) To inspect and photograph any part or aspect of any such new off-road large spark-ignition engines (or new off-road equipment powered by a new off-road large spark-ignition engine) and any component used in the assembly thereof that is reasonably related to the purpose of his entry.

(5) Any ARB Enforcement Officer shall be furnished by those in charge of a facility being inspected with such reasonable assistance as he may request to help him discharge any function listed in this paragraph. Each applicant for or recipient of certification is required to cause those in charge of a facility operated for its benefit to furnish such reasonable assistance without charge to ARB whether or not the applicant controls the facility.

(6) The duty to admit or cause to be admitted any ARB Enforcement Officer applies whether or not the applicant owns or controls the facility in question and applies both to domestic and foreign manufacturers and facilities. ARB will not attempt to make any inspection that it has been informed that local law forbids. However, if local law makes it impossible to do what is necessary to insure the accuracy of data generated at a facility, no informed judgement that an engine is certifiable or is covered by an Executive Order can properly be based on those data. It is the responsibility of the manufacturer to locate its testing and manufacturing facilities in jurisdictions where this situation will not arise.

(7) For the purposes of this paragraph (c):

(i) "Presentation of credentials" shall mean display of the document designating a person as an ARB Enforcement Officer.

(ii) Where equipment, vehicle, component, or engine storage areas or facilities are concerned, "operating hours" shall mean all times during which personnel other than custodial personnel are at work in the vicinity of the area or facility and have access to it.

(iii) Where facilities or areas other than those covered by paragraph (c)(7)(ii) of this section are concerned, "operating hours" shall mean all times during which an assembly line is in operation or all times during which testing, maintenance, service accumulation, production or compilation of records, or any other procedure or activity related to certification testing, to translation of designs from the test stage to the production stage, or to engine (or equipment) manufacture or assembly is being carried out in a facility.

(iv) "Reasonable assistance" includes, but is not limited to, clerical, copying, interpretation and translation services, the making available on request of personnel of the facility being inspected during their working hours to inform the ARB Enforcement Officer of how the facility operates and to answer his questions, and the performance on request of emission tests on any engine that is being, has been, or will be used for certification testing. Such tests shall be nondestructive, but may require appropriate service accumulation. The Executive Officer of the ARB may compel a manufacturer to cause the personal appearance of any employee at such a facility before an ARB Enforcement Officer by signing a written request for the employee's appearance and serving it on the manufacturer. Any such employee who has been instructed by the manufacturer to appear will be entitled to be accompanied, represented, and advised by counsel.

(v) Any entry without 24 hour prior written or oral notification to the affected manufacturer shall be authorized in writing by the Executive Officer.

7. Emission Standards for 2001 ~~and Later~~ through 2006 Model Year Off-Road Large Spark-Ignition Engines.

(a) (1) Exhaust emissions from new 2001 ~~and later~~ through 2006 model year off-road large spark-ignition engines shall not exceed the following:

(i)

Exhaust Emission Standards
(grams per brake horsepower-hour)
[grams per kilowatt-hour][1]

Model Year	Engine Displacement	Durability Period	Hydrocarbon plus Oxides of Nitrogen	Carbon Monoxide
2002 and subsequent	≤1.0 liter	1,000 hours or 2 years	9.0 [12.0]	410 [549]
2001 - 2003[2],[3]	> 1.0 liter	N/A	3.0 [4.0]	37.0 [49.6]
2004 - 2006[4]	> 1.0 liter	3500 hours or 5 years	3.0 [4.0]	37.0 [49.6]
~~2007 and subsequent~~	~~> 1.0 liter~~	~~5000 hours or 7 years~~	~~3.0 [4.0]~~	~~37.0 [49.6]~~

Note: (1) Standards in grams per kilowatt-hour are given only as a reference. Pollutant emissions reported to ARB by manufacturers must be in grams per brake horsepower-hour.

(2) Small volume manufacturers are not required to comply with these emission standards.

(3) Manufacturers must show that at least 25 percent of its California engine sales comply with the standards in 2001, 50 percent in 2002, and 75 percent in 2003.

(4) The standards for in-use compliance for engine families certified to the standards in the row noted are 4.0 g/bhp-hr (5.4 g/kW-hr) hydrocarbon plus oxides of nitrogen and 50.0 g/bhp-hr (67.0 g/kW-hr) carbon monoxide, with a useful life of 5000 hours or 7 years. In-use averaging, banking, and trading credits may be generated for engines tested in compliance with these in-use compliance standards. If the in-use compliance level is above 3.0 but does not exceed 4.0 g/bhp-hr hydrocarbon plus oxides of nitrogen or is above 37.0 but does not exceed 50.0 g/bhp-hr carbon monoxide, and based on a review of information derived from a statistically valid and representative sample of engines, the Executive Officer determines that a substantial percentage of any class or category of such engines exhibits within the warranty periods noted in Section 2435, Title 13, California Code of Regulations, an identifiable, systematic defect in a component listed in that section, which causes a significant increase in emissions above those exhibited by engines free of such defects and of the same class or category and having the same period of use and hours, then the Executive Officer may invoke the enforcement authority under Section 2439, Title 13, California Code of regulations to require remedial action by the engine manufacturer. Such

to inhibit adjustment, are effective in preventing adjustment of parameters on in-use engines to settings outside the manufacturer's intended physically adjustable ranges. This may include results of any tests to determine the difficulty of gaining access to an adjustment or exceeding a limit as intended or recommended by the manufacturer.

(C) The Executive Officer may require to be provided detailed drawings and descriptions of the various emission-related components and/or hardware samples of such components, for the purpose of making his determination of which engine parameter will be subject to adjustment for new certification and new engine compliance testing and of the physically adjustable range for each such engine parameter.

(2) Projected California sales data sufficient to enable the Executive Officer to select a test fleet representative of the engines for which certification is requested.

(3) A description of the test equipment and fuel proposed to be used.

(4) (i) For each engine family, a statement of recommended maintenance and procedures necessary to assure that the engines covered by a Executive Order in operation conform to the regulations, and a description of the program for training of personnel for such maintenance, and the equipment required.

(ii) At the option of the manufacturer, the proposed composition of the emission-data test fleet.

(c) The manufacturers shall submit to the Executive Officer the original application, any amendments thereto, and all notifications under Sections 17, 18, and 19. The Executive Officer may require that manufacturers submit additional copies of all required information up to a maximum of three copies.

9. Approval of Application for Certification; Test Fleet Selections; Determinations of Parameters Subject to Adjustment for Certification and New Engine Compliance Testing, Adequacy of Limits, and Physically Adjustable Ranges.

(a) After a review of the application for certification and any other information that the Executive Officer may require, the Executive Officer may approve the application and select a test fleet in accordance with Section 11.

(b) The Executive Officer may disapprove in whole or in part an application for certification for reasons including incompleteness, inaccuracy, inappropriate proposed service accumulation procedures, test equipment, or fuel, and incorporation of defeat devices on engines described by the application.

(c) Where any part of an application is rejected, the Executive Officer shall notify the manufacturer in writing and set forth the reasons for such rejection. Within 30 days following receipt of such notification, the manufacturer may request a hearing on the Executive Officer's determination in accordance with Section 5. The request shall be in writing, signed by an authorized representative of the manufacturer and shall include a statement specifying the manufacturer's objections to the Executive Officer's determinations, and data in support of such objections.

(d) When the Executive Officer selects emission-data engines for the test fleet, he will at

the same time determine those engine parameters that will be subject to adjustment for certification, quality-audit and new engine compliance testing, the adequacy of the limits, stops, seals, or other means used to inhibit adjustment, and the resulting physically adjustable ranges for each such parameter and notify the manufacturer of his determinations.

(1) (i) Except as noted in paragraph (d)(1)(iv) of this section, the Executive Officer may determine that any parameter on any engine is subject to adjustment if it is physically capable of being adjusted, may significantly affect emissions, and was not present on the manufacturer's engines in the previous model year in the same form and function.

(ii) The Executive Officer may, in addition, determine that any other parameter on any engine that is physically capable of being adjusted and that may significantly affect emissions is subject to adjustment. However, the Executive Officer may make a determination only if he has previously notified the manufacturer that he might require such adjustments and has found, at the time he gave this notice that the intervening period would be adequate to permit the development and application of the requisite technology, giving appropriate consideration to the cost of compliance within such period.

(iii) In determining the parameters subject to adjustment, the Executive Officer shall consider the likelihood that, for each of the parameters listed in paragraphs (d)(1)(i) and (d)(1)(ii) of this section, settings other than the manufacturer's recommended setting will occur on in- use engines. In determining likelihood, the Executive Officer may consider such factors as, but not limited to, information contained in the application, surveillance information from similar in-use engines, the difficulty and cost of gaining access to an adjustment, damage to the engine if an attempt is made to gain such access and the need to replace parts following such attempt, and the effect of settings other than the manufacturer's recommended setting on engine performance characteristics including emission characteristics.

(iv) The Executive Officer shall not consider manual chokes of engines to be a parameter subject to adjustment under the parameter adjustment requirements.

(2) (i) The Executive Officer shall determine a parameter to be adequately inaccessible or sealed if:

(A) In the case of an idle mixture screw, the screw is recessed within the carburetor casting and sealed with lead, thermosetting plastic, or an inverted elliptical spacer; or the screw is sheared off after adjustment at the factory, and the inaccessibility is such that the screw cannot be accessed and/or adjusted with simple tools in one-half hour or for $52 (1998 dollars) or less.

(B) In the case of a choke bimetal spring, the plate covering the bimetal spring is riveted or welded in place, or held in place with nonreversible screws.

(C) In the case of a parameter that may be adjusted by elongating or bending adjustable members (e.g., the choke vacuum break), the elongation of the adjustable member is limited by design or, in the case of a bendable member, the member is constructed of a material that when bent would return to its original shape after the force is removed (plastic or spring steel materials).

(D) In the case of any other parameter, the manufacturer demonstrates that adjusting the parameter to settings other than the manufacturer's recommended setting cannot be performed in one-half hour or costs more than $52 (1998 dollars).

(ii) The Executive Officer shall determine a physical limit or stop to be an adequate restraint on adjustability if:

(A) In the case of a threaded adjustment, the threads are terminated, pinned or crimped so as to prevent additional travel without breakage or need for repairs that cannot be performed in one-half hour or for $52 (1998 dollars) or less.

(B) The adjustment is ineffective at the end of the limits of travel regardless of additional forces or torques applied to the adjustment.

(C) The manufacturer demonstrates that travel or rotation limits cannot be exceeded with the use of simple and common tools (screwdriver, pliers, cutters, drills, open-end or box wrenches, etc.) without incurring significant and costly damage to the engine, equipment, vehicle or control system or without taking more than one-half hour or costing more than $52 (1998 dollars).

(iii) If the manufacturer service manuals or bulletins describe routine procedures for gaining access to a parameter or for removing or exceeding a physical limit, stop, seal or other means used to inhibit adjustment, or if surveillance data indicate that gaining access, removing, or exceeding is likely, paragraphs (d)(2)(i) and (d)(2)(ii) of this section shall not apply for that parameter.

(iv) In determining the adequacy of a physical limit, stop, seal, or other means used to inhibit adjustment of a parameter not covered by paragraph (d)(2)(i) or (d)(2)(ii) of this section, the Executive Officer will consider the likelihood that it will be circumvented, removed, or exceeded on in-use engines. In determining likelihood, the Executive Officer may consider such factors as, but not limited to, information contained in the application; surveillance information from similar in-use engines; the difficulty and cost of circumventing, removing or exceeding the limit, stop, seal, or other means; damage to the engine if an attempt is made to circumvent, remove, or exceed it and the need to replace parts following such attempt; and the effect of settings beyond the limit, stop, seal, or other means on engine performance characteristics other than emission characteristics.

(3) The Executive Officer shall determine two physically adjustable ranges for each parameter subject to adjustment;

(i) (A) In the case of a parameter determined to be adequately inaccessible or sealed, the Executive Officer may include within the physically adjustable range applicable to testing under these procedures (certification testing) all settings within the production tolerance associated with the nominal setting for that parameter, as specified by the manufacturer in the application for certification.

(B) In the case of other parameters, the Executive Officer shall include within this range all settings within physical limits or stops determined to be adequate restraints on adjustability. The Executive Officer may also include the production tolerances on the location of these limits or stops when determining the physically adjustable range.

(ii) (A) In the case of a parameter determined to be adequately inaccessible or sealed, the Executive Officer shall include within the physically adjustable range applicable to testing under the Production-Line Testing Procedure, only the actual settings to which the parameter is adjusted during production.

(B) In the case of other parameters, the Executive Officer shall

include within this range all settings within physical limits or stops determined to be adequate restraints on adjustability, as they are actually located on the test engine.

(e) (1) If the manufacturer submits the information specified in Section 8(b)(1)(ii) in advance of its application for certification, the Executive Officer shall review the information and make the determinations required in paragraph (d) of this section within 90 days of the manufacturer's submittal as required by Section 60030, Title 17, California Code of Regulations.

(2) The 90-day decision period is exclusive of the elapsed time during which ARB may request additional information from manufacturers regarding an adjustable parameter and the receipt of the manufacturers' response(s).

(f) Within 30 days following receipt of notification of the Executive Officer's determinations made under paragraph (d) of this section, the manufacturer may request a hearing on the Executive Officer's determinations in accordance with Section 5. The request shall be in writing, signed by an authorized representative of the manufacturer, and shall include a statement specifying the manufacturer's objections to the Executive Officer's determinations, and data in support of such objections.

10. Required data for certification.

(a) The manufacturer shall perform the tests required by the applicable test procedures, and submit to the Executive Officer the following information:

(1) **A record of all pertinent maintenance.** Such testing shall be designed and conducted in accordance with good engineering practice to assure that the engines covered by an Executive Order issued under Section 16 will meet the emission standards in Section 7 in actual use for the useful life of the engine as designated in these Test Procedures.

(2) **Emission data from certification engines.** Emission data on such engines tested in accordance with applicable emission test procedures herein and in such numbers as specified. These data shall include zero-hour data, if generated, and emission data generated for certification as required under Section 13(a)(2).

(3) A statement that the engines for which certification is requested conform to the requirements in Section 4, and that the descriptions of tests performed to ascertain compliance with the general standards in Section 4, and the data derived from such tests, are available to the Executive Officer upon request.

(4) A statement that the test engines with respect to which data are submitted to demonstrate compliance with the applicable standards of these procedures are in all material respects as described in the manufacturer's application for certification, have been tested in accordance with the applicable test procedures utilizing the fuels and equipment described in the application for certification and that on the basis of such tests the engines conform to the requirements of this part. If such statements cannot be made with respect to any engine tested, the engine shall be identified, and all pertinent data relating thereto shall be supplied to the Executive Officer. If, on the basis of the data supplied and any additional data as required by the Executive Officer, the Executive Officer determines that the test engine was not as described in the application for certification or was not tested in accordance with the applicable test procedures utilizing the fuels and equipment as described in the application for certification, the

Executive Officer may make the determination that the engine does not meet the applicable standards. The provisions of Section 16(b) shall then be followed.

(b) The above information must be provided unless the Executive Officer, upon request of the manufacturer, waives the requirement. The Executive Officer may waive any requirement of this section for testing of an engine for which emission data are available or will be available under the provisions of Section 15.

(c) If the manufacturer elects to use a measurement procedure other than the applicable Test Procedures to determine compliance with the standards, the manufacturer shall:

(1) Determine the correlation between the alternative measurement procedure chosen and the procedure set forth in the Test Procedures.

(2) Maintain a description of the procedure and test(s) used to determine the correlation and the data derived from such tests.

(3) Make available to the Executive Officer, upon request, any of the information or data required in paragraphs (c)(1) and (2); and

(4) For each engine family for which a certificate is requested:

(i) Provide a statement that the results obtained by the alternative measurement procedure correlate with the results that would be expected when determined by the Test Procedures and

(ii) Provide these results, adjusted if necessary with the applicable correlation offset, to be compared with the standards of Section 7(a).

11. Test Engines.

(a) **Engine Families and Engine Family Groups.**

(1) The engines covered by an application for certification will be divided into groupings of engines that are expected to have similar emission characteristics throughout their useful life. Each group of engines with similar emission characteristics shall be defined as a separate engine family group. An engine family group is defined similarly to an engine family, with the exception that the displacement per cylinder is used as a criterion for grouping the engines rather than the cylinder block configuration.

(2) (i) To be classed in the same engine family, engines must be identical in all the following respects:

(A) The cylinder bore center-to-center dimensions.
(B)-(C) [Reserved]
(D) The cylinder block configuration (air cooled or liquid cooled; L-6, 90° V-8, etc.).
(E) The location of the intake and exhaust valves (or ports).
(F) The method of air aspiration.
(G) The combustion cycle.
(H) Catalytic converter characteristics.
(I) Thermal reactor characteristics.
(J) Type of air inlet cooler (e.g., intercoolers and after-coolers).

(ii) To be classed in the same engine family group for off- road

certification, engines must have the same displacement per cylinder (within 15 percent) and must be identical in all the following respects:

(A) The cylinder bore center-to-center dimensions.

(B)-(C) [Reserved]

(D) [Reserved]

(E) The location of the intake and exhaust valves (or ports).

(F) The method of air aspiration.

(G) The combustion cycle.

(H) Catalytic converter characteristics.

(I) Thermal reactor characteristics.

(J) Type of air inlet cooler (e.g., intercoolers and after-coolers).

(3) Engines identical in all the respects listed in paragraph (a)(2) of this section may be further divided into different engine families if the Executive Officer determines that they may be expected to have different emission characteristics. This determination will be based upon a consideration of the following features of each engine:

(i) The bore and stroke.

(ii) The surface-to-volume ratio of the nominally dimensioned cylinder at the top dead center positions.

(iii) The intake manifold induction port size and configuration.

(iv) The exhaust manifold induction port size and configuration.

(v) The intake and exhaust valve sizes.

(vi) The fuel system.

(vii) The camshaft timing and ignition or injection timing characteristics.

(4) Where engines are of a type that cannot be divided into engine families based upon the criteria listed in paragraphs (a)(2) and (a)(3) of this section, the Executive Officer shall establish families for those engines based upon those features most related to their emission characteristics. Engines that are eligible to be included in the same engine family based on the criteria in paragraphs (a)(2) and (a)(3) of this section may be further divided into different engine families if the manufacturer determines that they may be expected to have different emission characteristics. This determination will be based upon a consideration of the following features of each engine:

(i) The dimension from the center line of the crankshaft to the center line of the camshaft.

(ii) The dimension from the center line of the crankshaft to the top of the cylinder block head face.

(iii) The size of the intake and exhaust valves (or ports).

(5) Engines identical in all the respects listed in paragraph (a)(2) of this section but which use differing fuels may be certified as one engine family, provided the engine family is certified using the fuel that would yield the worst-case emission scenario.

(b) **Emission-data engines.**

(1) Engines will be chosen to be run for emission data based upon engine family groups. Within each engine family group, the requirements of this paragraph must be met.

(2) Engines of each engine family group will be divided into groups based upon

their exhaust emission control systems. One engine of each system combination shall be run for gaseous emission data. The complete gaseous emission test must be conducted. Within each combination, the engine that features the highest horsepower, primarily at or near the rated speed, will usually be selected. The engine manufacturer may elect to test the worst-case emissions engine within each combination with prior approval from the Executive Officer. The engine with the highest horsepower will usually be selected. For engine families that contain multiple fuel systems, the engine manufacturer shall conduct separate individual gaseous emission test based on the worst-case emissions configuration for each different fuel system within the engine family's engine configuration.

(3) The Executive Officer may select a maximum of one additional engine within each engine-system combination based upon features indicating that it may have the highest emission levels of the engines of that combination. In selecting this engine, the Executive Officer will consider such features as the injection system, fuel system, engine control system, rated speed, rated horsepower, peak torque speed, and peak torque.

(4) Within an engine family control system combination, the manufacturer may alter any emission-data engine (or other engine including current or previous model year emission-data engines and development engines provided they meet the emission-data engines' protocol) to represent more than one selection under paragraph (b)(2) and (3) of this section.

(c) In lieu of testing an emission-data engine selected under paragraph (b) of this section, and submitting data therefore, a manufacturer may, with the prior written approval of the Executive Officer, submit exhaust emission data as applicable on a similar engine, for which certification has previously been obtained or for which all applicable data required under Section 10 has previously been submitted.

(d) **Durability-data Engine**

(1) The engine manufacturer shall select the engine configuration that best represents the entire engine family or groups of engine families to demonstrate engine and emission durability. The duration of the engine durability demonstration for the purpose of generating deterioration factors for the emission calculation shall be equivalent to the emissions durability period as defined in these Test Procedures.

(2) (i) The engine manufacturer shall use good engineering practice to determine engine and emission durability.

(ii) The engine manufacturer shall provide the Executive Officer with a written plan of the method used to determine engine and emission durability. The Executive Officer shall approve the plan if it demonstrates, according to good engineering judgement, the development of reasonable deterioration factors. The engine manufacturer shall not proceed with testing until the Executive Officer has approved the plan.

(iii) In the absence of a manufacturer's specific service accumulation cycle, engine durability demonstration shall be conducted using multiple runs of the ISO 8178, Part IV, test cycle C-2, or for constant speed engines using multiple runs of the ISO 8178, Part IV, D-2 test cycle. The engine manufacturer may request, with the advanced approval of the Executive Officer, to reduce the total amount of service accumulation hours for any durability / service accumulation engine. The engine manufacturer may make such request only after an engine has accumulated at a minimum one half of the engine's defined useful life period. The

Executive Officer shall base such approval on engine's durableness, maintenance events, emission test results, and the stability of engine out emissions.

(3) Regardless of which service accumulation cycle is used for generating the deterioration factors for emissions certification, the Executive Officer shall accept the manufacturer's deterioration factors for certification the first year; but, may deny the use of the manufacturer's deterioration factors for subsequent certification based on incorrect or inaccurate representativeness of actual in-use emissions test results.

12. Maintenance.

(a) This section specifies the maintenance schedule for emission-related parts that manufacturers shall include in the maintenance instructions furnished under Section 22 to purchasers of new off-road large spark-ignition engines and new off-road equipment powered by a off-road large spark-ignition engine.

(1) Any emission-related maintenance that is performed on equipment, vehicles, engines, subsystems, or components must be technologically necessary to assure in-use compliance with the emission standards. The manufacturer must submit data that demonstrate to the Executive Officer that all of the emission-related scheduled maintenance that is to be performed is technologically necessary. Scheduled maintenance must be approved by the Executive Officer prior to being performed or being included in the maintenance instructions provided to purchasers under Section 22. As provided below, ARB has determined that emission-related maintenance at shorter intervals than that outlined in paragraphs (a)(2)(i), (a)(2)(ii) and (a)(2)(iii) of this section is not technologically necessary to ensure in-use compliance. However, the Executive Officer may determine what maintenance intervals are technologically necessary.

(2) For off-road large spark-ignition engines, emission-related maintenance in addition to, or at shorter intervals than, the following will not be accepted as technologically necessary, except as provided in paragraph (a)(4) of this section.

(i) Fuel injector tips (cleaning **only**).

(ii) The adjustment, cleaning, repair, or replacement of the following parts and components, at 4,500 hours of use and at 4,500-hour intervals thereafter:

(A) Fuel injectors.

(B) Turbocharger.

(C) Electronic engine control unit and its associated sensors and actuators.

(D) Reserved

(3) (i) The following components are currently defined as critical emission-related components:

(A) Catalytic converter.

(B) Air injection system components.

(C) Electronic engine control unit and its associated sensors (including oxygen sensor if installed) and actuators.

(D) Exhaust gas recirculation system (including all related filters

and control valves).

(E) Positive crankcase ventilation valve.

(F) Fuel system (carburetor, throttle-body, port injection system)

(ii) Scheduled maintenance on critical emission-related components must have a reasonable likelihood of being performed in-use. The manufacturer shall be required to show the reasonable likelihood of such maintenance being performed in-use. Critical emission-related scheduled maintenance items that satisfy one of the following conditions shall be accepted by the Executive Officer as showing a reasonable likelihood that the maintenance has been performed in-use:

(A) Data demonstrating a connection between emissions and equipment, engine, or vehicle performance by showing that as emissions increase due to lack of maintenance, its performance will simultaneously deteriorate to a point unacceptable for typical operation.

(B) Survey data which adequately demonstrates that, at an 80 percent confidence level, 80 percent of such engines already have this critical maintenance item performed in-use at the recommended interval(s).

(C) A clearly displayed visible signal system approved by the Executive Officer is installed to alert the engine or equipment operator or vehicle driver that maintenance is due. A signal bearing the message "maintenance needed" or "check engine," or a similar message approved by the Executive Officer, shall be actuated at the appropriate hours of usage point or by component failure. This signal must be continuous while the engine is in operation, and not easily eliminated without performance of the required maintenance. Resetting the signal shall be a required step in the maintenance operation. The method for resetting the signal system shall be approved by the Executive Officer.

(D) A survey, approved by the Executive Officer, showing that a critical maintenance item is likely to be performed without a visible signal on a maintenance item for which there is no prior in-use experience without the signal. To that end, the manufacturer may in a given model year market up to 200 randomly selected engines per critical emission-related maintenance item without such visible signals, and monitor the performance of the critical maintenance item by the owners to show compliance with paragraph (a)(3)(ii)(B) of this section. This option is restricted to two consecutive model years and may not be repeated until any previous survey has been completed. If the critical maintenance involves more than one engine family, the sample will be sales weighted to ensure that it is representative of all the families in question.

(E) The manufacturer provides the maintenance free of charge, and clearly informs the customer that the maintenance is free in the instructions provided under Section 22.

(F) Any other method that the Executive Officer approves as establishing a reasonable likelihood that the critical maintenance will be performed in-use.

(iii) Visible signal systems used under paragraph (a)(3)(ii)(C) of this section are considered an element of design of the emission control system. Therefore, disabling, resetting, or otherwise rendering such signals inoperative without also performing the indicated maintenance procedure is prohibited.

(4) (i) In the case of any new scheduled maintenance, the manufacturer must submit a request for approval to the Executive Officer for any maintenance that it wishes to recommend to purchasers. New scheduled maintenance is that maintenance which did not exist prior to the 2001 model year, including that which is a direct result of the implementation of new technology not found in production prior to the 2001 model year. The manufacturer must also include its recommendation as to the category (**i.e.**, emission-related or non-emission-related, critical or non-critical) of the subject maintenance and, for suggested emission-related maintenance, the maximum feasible maintenance interval. Such request must include detailed evidence supporting the need for the maintenance requested, and supporting data or other substantiation for the recommended maintenance category and for the interval suggested for emission-related maintenance. Requests for new scheduled maintenance must be approved prior to the introduction of the new maintenance. The Executive Officer will then designate the maintenance as emission-related or non-emission-related. For maintenance items established as emission-related, the Executive Officer will further designate the maintenance as critical if the component that receives the maintenance is a critical component under paragraph (a)(3) of this section. For each maintenance item designated as emission-related, the Executive Officer will also establish a technologically necessary maintenance interval, based on industry data and other information available to ARB. Designations of emission-related maintenance items, along with their identification as critical or non-critical, and establishment of technologically necessary maintenance intervals, will be announced through the certification process.

(ii) Any manufacturer may request a hearing in accordance with Section 5 on the Executive Officer's determinations in paragraph (a)(4) of this section. The request shall be in writing, and shall include a statement specifying the manufacturer's objections to the Executive Officer's determinations, and data in support of such objections.

(b) **Maintenance on emission-data engines.**

(1) Adjustment of idle speed on emission data engines may be performed once before the certification emission test point. Any other engine, emission control system, or fuel system adjustment, repair, removal, disassembly, cleaning, or replacement on emission-data engines shall be performed only with the advance approval of the Executive Officer.

(2) Repairs to engine components, other than the emission control system or the fuel system, on an emission-data engine, shall be performed only as a result of part failure, system malfunction, or with the advance approval of the Executive Officer.

(c) Equipment, instruments or tools may not be used to identify malfunctioning, maladjusted, or defective engine components unless the same or equivalent equipment, instruments, or tools will be available to dealerships and other service outlets and:

(1) Are used in conjunction with scheduled maintenance on such components, or

(2) Are used subsequent to the identification of an engine malfunction, as provided in paragraph (c)(1) of this section for emission- data engines, or

(3) Unless specifically authorized by the Executive Officer.

(d) **Durability-data Engine**

(1) The manufacturer may conduct scheduled (routine/scheduled maintenance items as normally appears in the engine owner's manual) engine maintenance during the

durability / service accumulation cycle test. The maintenance shall be consistent with the maintenance requirements set forth in Section 12(a).

(2) Manufacturer must receive advanced approval from the Executive Officer for any unscheduled maintenance on the durability engine. Engine components, sensors, or emission related components' maintenance conducted without the Executive Officer's approval may disqualify the engine and all related test results.

(e) All test data, maintenance reports, and required engineering reports shall be compiled and provided to the Executive Officer in accordance with Section 10.

13. Service Accumulation; Emission Measurements.

(a) (1) The manufacturer shall determine the engine operating schedule to be used for dynamometer service accumulation on emission-data engines selected under Section 11(b). This determination shall be consistent with good engineering practice. A single engine operating schedule shall be used for all engines in an engine family group-control system combination. Operating schedules may be different for different combinations.

(2) The manufacturer shall determine, for each engine family or group of engine families, the number of hours at which the engine-system combination is stabilized (no more than 50 hours for catalyst equipped) for emission-data testing.

(3) The manufacturer shall maintain, and provide to the Executive Officer if requested, a record of the rationale used in making this determination. The manufacturer may elect to accumulate 50 hours on each test engine within an engine family group without making a determination. However, the Executive Officer may determine under Section 11(c) that no testing is required.

(b) (1) (i) The results of all emission testing shall be supplied to the Executive Officer. The manufacturer shall furnish to the Executive Officer an explanation for voiding any test. The Executive Officer will determine if voiding the test was appropriate based upon the explanation given by the manufacturer for the voided test. Tests between test points may be conducted as required by the Executive Officer. Data from all tests (including voided tests) may be submitted weekly to the Executive Officer, but shall be air posted or delivered to the Executive Officer within 7 days after completion of the test. In addition, all test data shall be compiled and provided to the Executive Officer in accordance with Section 10.

(ii) The results of all emission tests shall be recorded and reported to the Executive Officer. These results shall be rounded, in accordance with ASTM E 29-90 to the number of decimal places contained in the applicable emission standard expressed to one additional significant figure.

(2) Whenever a manufacturer intends to operate and test an engine that may be used for emission data, the manufacturer shall retain in its records all information concerning all emissions tests and maintenance, including engine alterations to represent other engine selections. This information shall be submitted, including the engine description and specification information required by the Executive Officer, to the Executive Officer following the emission-data test.

(3) Emission testing of any type with respect to any certification engine other than that specified in these procedures is not allowed except as such testing may be specifically

authorized by the Executive Officer.

14. Test Procedures, General Requirements.

(a) Manufacturers shall use the procedures in Part II of these Test Procedures and all of this Part I.

(b) The Executive Officer may, on the basis of written application by a manufacturer, prescribe test procedures, other than those set forth in this part, for any off-road large spark-ignition engine that the Executive Officer determines cannot be satisfactorily tested by the procedures set forth in this part.

(c) If the manufacturer does not submit a written application for use of special test procedures but the Executive Officer determines that an off-road large spark-ignition engine cannot be satisfactorily tested by the procedures set forth in this part, the Executive Officer shall notify the manufacturer in writing that the application for certification has been rejected, and set forth the reasons for such rejection in accordance with the provisions of Section 9(c).

(d) The Executive Officer may amend these procedures when the amendment is supported by data showing the necessity for the correction.

15. Confirmatory Testing by the Executive Officer.

(a) The Executive Officer may require that a manufacturer provide to the ARB one or more of the test engines for confirmatory testing at the manufacturer's expense. Such testing shall take place at such place or places as the Executive Officer may designate. The Executive Officer may specify that he will conduct such testing at the manufacturer's facility, in which case instrumentation and equipment specified by the Executive Officer shall be made available by the manufacturer for test operations. Any testing conducted at a manufacturer's facility pursuant to this paragraph shall be scheduled by the manufacturer as promptly as possible.

(b) (1) Whenever the Executive Officer conducts a test on a test engine the results of that test, unless subsequently invalidated by the Executive Officer, shall comprise the official data for the engine at that prescribed test point and the manufacturer's data for that prescribed test point shall not be used in determining compliance with emission standards.

(2) Whenever the Executive Officer does not conduct a test on a test engine at a test point, the manufacturer's test data will be accepted as the official data for that point; **provided** that if the Executive Officer makes a determination that there is a lack of correlation between the manufacturer's test equipment and the test equipment used by the Executive Officer, no manufacturer's test data will be accepted for the purposes of certification until the reasons for the lack of correlation are determined and the validity of the data is established by the manufacturer; **and further provided** that if the Executive Officer has reasonable basis to believe that any test data submitted by the manufacturer is not accurate or has been obtained in violation of any provision of this part, the Executive Officer may refuse to accept that data as the official data pending retesting or submission or further information.

(3) (i) (A) The Executive Officer may adjust or cause to be adjusted any adjustable parameter of an emission-data engine that the Executive Officer has determined to be

subject to adjustment for certification testing in accordance with Section 9(d)(1), to any setting within the physically adjustable range of that parameter, as determined by the Executive Officer in accordance with Section 9(d)(3)(i), prior to the performance of any tests to determine whether such engine conforms to applicable emission standards, including tests performed by the manufacturer under Section 10(c). The Executive Officer, in making or specifying such adjustments, may consider the effect of the deviation from the manufacturer's recommended setting on emissions performance characteristics as well as the likelihood that similar settings will occur on in-use engines. In determining likelihood, the Executive Officer may consider factors such as, but not limited to, the effect of the adjustment on engine performance characteristics and surveillance information from similar in-use engines.

(B) For those engine parameters that the Executive Officer has not determined to be subject to adjustment during certification testing in accordance with Section 9(d)(1), the emission-data engine presented to the Executive Officer for testing shall be calibrated within the production tolerances applicable to the manufacturer's specifications to be shown on the engine label (see the Section 2434, Title 13, California Code of Regulations) as specified in the application for certification. If the Executive Officer determines that an engine is not within such tolerances, the engine shall be adjusted at the facility designated by the Executive Officer prior to the test and an engineering report shall be submitted to the Executive Officer describing the corrective action taken. Based on the engineering report, the Executive Officer will determine if the engine shall be used as an emission-data engine.

(ii) If the Executive Officer determines that the test data developed under paragraph (b)(3)(i) of this section would cause the emission-data engine to fail due to excessive 50-hour emission values, then the following procedure shall be observed:

(A) The manufacturer may request a retest. Before the retest, those engine parameters that the Executive Officer has not determined to be subject to adjustment for certification testing in accordance with Section 9(d)(1) may be readjusted to manufacturer's specification, if these adjustments were made incorrectly prior to the first test. The Executive Officer may adjust or cause to be adjusted any parameter that the Executive Officer has determined to be subject to adjustment in accordance with Section 9(d)(3)(i). However, if the idle speed parameter is one that the Executive Officer has determined to be subject to adjustment, the Executive Officer shall not adjust it to a setting that causes a higher engine idle speed than would have been possible within the physically adjustable range of the idle speed parameter on the engine before it accumulated any dynamometer service, all other parameters being identically adjusted for the purpose of the comparison. Other maintenance or repairs may be performed in accordance with Section 12. All work on the engine shall be done at such location and under such conditions as the Executive Officer may prescribe.

(B) The engine will be retested by the Executive Officer and the results of this test shall comprise the official data for the emission-data engine.

16. Certification.

(a) (1) If, after a review of the test reports and data submitted by the manufacturer, data derived from any inspection carried out under Section 6(c), and any other pertinent data or

information, the Executive Officer determines that a test engine(s) meet(s) the requirements of these procedures, he will issue an Executive Order with respect to such test engine(s) except in cases covered by paragraph (c) of this section.

(2) Such certificate will be issued for such period not to exceed one model year as the Executive Officer may determine and upon such terms as he may deem necessary or appropriate to assure that any new off- road large spark-ignition engine covered by the Executive Order will meet the requirements of this part.

(3) One such Executive Order will be issued for each engine family.

(b) (1) The Executive Officer will determine whether an engine covered by the application complies with applicable standards by observing the following relationships:

(i) An emission-data test engine selected under Section 11(b)(3) shall represent all engines in the same engine-system combination.

(ii) An emission-data test engine selected under Section 11(b)(3) shall represent all engines containing that emission control system and having similar peak horsepower.

(2) The Executive Officer will proceed as in paragraph (a) of this section with respect to the engines belonging to an engine family group, all of which comply with all applicable standards.

(3) If, after a review of the test reports and data submitted by the manufacturer, data derived from any additional testing conducted pursuant to Section 15, data or information derived from any inspection carried out under Section 6(c) or any other pertinent data or information, the Executive Officer determines that one or more test engines of the certification test fleet do not meet applicable standards, the Executive Officer will notify the manufacturer in writing, setting forth the basis for his determination. Within 30 days following receipt of the notification, the manufacturer may request a hearing on the Executive Officer's determination under Title 17, California Code of Regulations, Division 3, Chapter 1, Subchapter 1.25.

(4) The manufacturer may, at his option, proceed with any of the following alternatives with respect to any engine family group represented by a test engine(s) determined not in compliance with applicable standards:

(i) Request a hearing under Section 5; or

(ii) Delete from the application for certification the engines represented by the failing test engine. (Engines so deleted may be included in a later request for certification under Section 17.) The Executive Officer may then select in place of each failing engine an alternate engine chosen in accordance with the selection criteria employed in selecting the engine that failed; or

(iii) Modify the test engine and demonstrate by testing that it meets applicable standards. Another engine that is in all material respect the same as the first engine, as modified, may then be operated and tested in accordance with applicable test procedures.

(5) If the manufacturer does not request a hearing or present the required data for certification under paragraphs (b)(4) of this section (as applicable), the Executive Officer will deny certification.

(c) (1) Notwithstanding the fact that any certification engine(s) may comply with other provisions of these procedures, the Executive Officer may withhold or deny the issuance of

an Executive Order (or suspend or revoke any such Executive Order that has been issued) with respect to any such engine(s) if:

(i) The manufacturer submits false or incomplete information in his application for certification thereof;

(ii) The manufacturer renders inaccurate any test data that he submits pertaining thereto or otherwise circumvents the intent of the Act, or of this part with respect to such engine:

(iii) Any ARB Enforcement Officer is denied access on the terms specified in Section 6(c) to any facility or portion thereof that contains any of the following:

(A) The engine;

(B) Any components used or considered for use in its modification or buildup into a certification engine;

(C) Any production engine that is or will be claimed by the manufacturer to be covered by the Executive Order;

(D) Any step in the construction of an engine described in paragraph (c)(iii)(C) of this section;

(E) Any records, documents, reports, or histories required by this part to be kept concerning any of the above;

(iv) Any ARB Enforcement Officer is denied "reasonable assistance" (as defined in Section 6(c)) in examining any of the items listed in paragraph (c)(1)(iii) of this section.

(2) The sanctions of withholding, denying, revoking, or suspending of a certificate may be imposed for the reasons in paragraphs (c)(1)(i), (ii), (iii), or (iv) of this section only when the infraction is substantial.

(3) In any case in which a manufacturer knowingly submits false or inaccurate information or knowingly renders inaccurate or invalid any test data or commits any other fraudulent acts and such acts contribute substantially to the Executive Officer's decision to issue an Executive Order, the Executive Officer may deem such certificate void **ab initio**.

(4) In any case in which certification of an engine is proposed to be withheld, denied, revoked, or suspended under paragraph (c)(1)(iii) or (iv) of this section, and in which the Executive Officer has presented to the manufacturer involved reasonable evidence that a violation of Section 6(c) in fact occurred, the manufacturer shall have the burden of establishing any contention to the satisfaction of the Executive Officer that even though the violation occurred, the engine in question was not involved in the violation to a degree that would warrant withholding, denial, revocation, or suspension of certification under either paragraph (c)(1)(iii) or (iv) of this section.

(5) Any revocation or suspension of certification under paragraph (c)(1) of this section shall:

(i) Be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with Section 5 hereof.

(ii) Extend no further than to forbid the introduction into commerce of engines previously covered by the certification that are still in the hands of the manufacturer, except in cases of such fraud or other misconduct as makes the certification invalid **ab initio**.

17. Addition of an Engine After Certification.

(a) If a manufacturer proposes to add to his product line an engine of the same engine-system combination as engines previously certified but that was not described in the application for certification when the test engine(s) representing other engines of that combination was certified, he shall notify the Executive Officer. Such notification shall be in advance of the addition unless the manufacturer elects to follow the procedure described in Section 19. This notification shall include a full description of the engine to be added.

(b) The Executive Officer may require the manufacturer to perform such tests on the test engine(s) representing the engine to be added that would have been required if the engine had been included in the original application for certification.

(c) If, after a review of the test reports and data submitted by the manufacturer, and data derived from any testing conducted under Section 15, the Executive Officer determines that the test engine(s) meets all applicable standards, the appropriate Executive Order will be amended accordingly. If the Executive Officer determines that the test engine(s) does not meet applicable standards, he will proceed under Section 16(b).

18. Changes to an Engine Covered by Certification.

(a) The manufacturer shall notify the Executive Officer of any change in production engines in respect to any of the parameters listed in Section 11(a)(1) thru 11(a)(4), as applicable, giving a full description of the change. Such notification shall be in advance of the changes unless the manufacturer elects to follow the procedure described in Section 19.

(b) Based upon the description of the change, and data derived from such testing as the Executive Officer may require or conduct, the Executive Officer shall determine whether the engine, as modified, would still be covered by the Executive Order then in effect.

(c) If the Executive Officer determines that the outstanding Executive Order would cover the modified engines he will notify the manufacturer in writing. Except as provided in Section 19 the change may not be put into effect prior to the manufacturer's receiving this notification. If the Executive Officer determines that the modified engines would not be covered by the Executive Order then in effect, the modified engines shall be treated as additions to the product line subject to Section 17.

19. Alternative Procedures for Notification of Additions and Changes.

(a) A manufacturer may, in lieu of notifying the Executive Officer in advance of an addition of an engine under Section 17 or a change in an engine under Section 18, notify the Executive Officer concurrently with making an addition of an engine or a change in an engine, if the manufacturer determines that following the change all engines affected by the addition or change will still meet the applicable emission standards. Such notification shall include a full description of the addition or change and any supporting documentation the manufacturer may desire to include to support the manufacturer's determination. The manufacturer's determination that the addition or change does not cause noncompliance shall be based on an engineering

evaluation of the addition or change and/or testing.

(b) The Executive Officer may require that additional emission testing be performed to support the manufacturer's original determination submitted in paragraph (a) of this section. If additional testing is required the Executive Officer shall proceed as in Section 17(b) and (c) or Section 18(b) and (c) as appropriate. Additional test data, if requested, must be provided within 30 days of the request or the manufacturer must rescind the addition or change immediately. The Executive Officer may grant additional time to complete testing. If based on this additional testing or any other information, the Executive Officer determines that the engines affected by the addition or change do not meet the applicable standards the Executive Officer will notify the manufacturer to rescind the addition or change immediately upon receipt of the notification.

(c) Election to produce engines under this section will be deemed to be a consent to recall all engines that the Executive Officer determines under Section 17(c) do not meet applicable standards, and cause such nonconformity to be remedied at no expense to the owner.

20. Submission of Engine Identification Numbers.

(a) Upon request of the Executive Officer, the manufacturer of any off-road large spark-ignition engine covered by an Executive Order shall, within 30 days, identify by engine identification number or alternative tracking method, the engine(s) covered by the Executive Order.

(b) The manufacturer of any off-road large spark-ignition engine covered by an Executive Order shall provide to the Executive Officer, within 60 days of the issuance of an Executive Order, an explanation of the elements in any engine identification coding system in sufficient detail to enable the Executive Officer to identify those engines that are covered by an Executive Order.

21. Production Engines.

Any off-road large spark-ignition engine manufacturer obtaining certification under this part shall notify the Executive Officer, on a yearly basis, of the number of engines of such engine family-engine displacement-exhaust emission control system-fuel system combination produced for sale in California during the preceding year.

22. Maintenance Instructions.

(a) The manufacturer shall furnish or cause to be furnished to the purchaser of each new off-road large spark-ignition engine subject to the standards prescribed in Section 7 written instructions for the proper maintenance and use of the engine by the purchaser consistent with the provisions of Section 12, which establishes what scheduled maintenance the Executive Officer approves as being reasonable and necessary.

(1) The maintenance instructions required by this section shall be in clear, and to the extent practicable, nontechnical language.

(2) The maintenance instructions required by this section shall contain a general description of the documentation that the manufacturer will require from the ultimate purchaser

or any subsequent purchaser as evidence of compliance with the instructions.

(b) Instructions provided to purchasers under paragraph (a) of this section may specify the performance of any scheduled maintenance allowed under Section 12.

(c) Scheduled emission-related maintenance in addition to that performed under Section 12(b) may only be recommended to offset the effects of abnormal in-use operating conditions, except as provided in paragraph (d) of this section. The manufacturer shall be required to demonstrate, subject to the approval of the Executive Officer that such maintenance is reasonable and technologically necessary to assure the proper functioning of the emission control system. Such additional recommended maintenance shall be clearly differentiated, in a form approved by the Executive Officer, from that approved under Section 12(b).

(d) Inspections of emission-related parts or systems with instructions to replace, repair, clean, or adjust the parts or systems if necessary, are not considered to be items of scheduled maintenance that insure the proper functioning of the emission control system. Such inspections, and any recommended maintenance beyond that approved by the Executive Officer as reasonable and necessary under paragraphs (a), (b), and (c) of this section, may be included in the written instructions furnished to engine or equipment owners under paragraph (a) of this section; **provided** that such instructions clearly state, in a form approved by the Executive Officer that the owner need not perform such inspections or recommended maintenance in order to maintain the emission warranty.

23. Submission of Maintenance Instructions.

(a) The manufacturer shall provide to the Executive Officer, no later than the time of the submission required by Section 10, a copy of the maintenance instructions that the manufacturer proposes to supply to the ultimate purchaser in accordance with Section 22(a). The Executive Officer will review such instructions to determine whether they are reasonable and necessary and sufficient to assure the proper functioning of the engine's (or equipment's) emission control systems. The Executive Officer will notify the manufacturer of his determination whether such instructions are reasonable and necessary and sufficient to assure the proper functioning of the emission control systems.

(b) Any revision to the maintenance instructions that will affect emissions shall be supplied to the Executive Officer at least 30 days before being supplied to the ultimate purchaser unless the Executive Officer consents to a lesser period of time.

24. Alternative Certification Procedures.

(a) (1) The Executive Officer shall determine that of the following certification procedures (paragraph (a)(3) or (a)(4) of this section), if any, may be used to demonstrate compliance for each off-road large spark-ignition engine family group for which certification is sought. In making this determination, the Executive Officer will consider whether the following criteria have been met.

(i) In prior certifications:

(A) The applications have been properly completed and demonstrate understanding of the certification protocol.

(B) The test engine selection has been acceptable to the Executive Officer.

(C) All applicable emission control label requirements have been complied with.

(D) The applications have not included requests for deviations from the test procedures.

(ii) For the engine family group in question:

(A) The test engine includes technology similar to previously certified engines.

(B) Such other criteria as the Executive Officer determines on a case-by-case basis.

(2) The engine family groups selected for the procedure described in paragraph (a)(3) of this section shall be subject to this procedure at the option of the manufacturer.

(3) The following provisions apply to those off-road large spark-ignition engine family groups that the Executive Officer has specified may be subject to the abbreviated certification review procedure.

(i) The manufacturer shall satisfy all applicable requirements of these provisions necessary to demonstrate compliance with the applicable standards.

(ii) As specifically allowed by the Executive Officer, the manufacturer shall assume the responsibility for part or all of the decisions applicable to the family group for which certification is sought and that are within the jurisdiction of the Executive Officer, with the exception that the Executive Officer shall determine whether a test engine has met the applicable emission standards.

(iii) The manufacturer shall maintain, update, and correct all records and information required.

(iv) The Executive Officer may review a manufacturer's records at any time. At the Executive Officer's discretion, this review may take place either at the manufacturer's facility or at another facility designated by the Executive Officer.

(v) At the Executive Officer's request, the manufacturer shall notify the Executive Officer of the status of the certification program, including projected schedules of those significant accomplishments specified by the Executive Officer.

(vi) The manufacturer shall permit the Executive Officer to inspect any facilities, records, and vehicles from which data are obtained under the abbreviated certification review procedure.

(vii) Upon completing all applicable requirements of these provisions, the manufacturer shall submit an application for certification. Such application shall be made in writing to the Executive Officer by the manufacturer.

(A) The Executive Officer may approve or disapprove, whole or in part, an application for certification according to the procedures specified in Section 9(b).

(B) If, after a review of the application for certification, test reports and data submitted by the manufacturer, data obtained during an inspection, and any other

pertinent data or information, the Executive Officer determines that a test engine(s) has not met the applicable provisions, the Executive Officer shall notify the manufacturer in writing and set forth the reason(s) for the determination as specified in Section 9.

(4) Those engine family groups that are to be subjected (to the complete ARB review procedure) shall follow the procedures specified in these provisions, with the exception of paragraph (a)(3) of this section.

(b) The manufacturer may request that an engine family group be subject (to the abbreviated certification review procedure) shall make such request during annual certification preview program or at least 6 months before the start of the model year for abbreviated certification review procedure.

(c) The Executive Officer may require that an engine family group previously allowed to be subject (to the abbreviated certification review procedure) be transferred to the complete review procedure.

25. Test Fuel.

(a) (1) If the engine is a gasoline-fueled large spark-ignition engine, then the test fuel used shall be consistent with the fuel specifications as outlined in the "California Exhaust Emission Standards and Test Procedures for 1988 and Subsequent Model Passenger Cars, Light-Duty Trucks, and Medium- Duty Vehicles," as adopted May 20, 1987, and last amended June 24, 1996, and incorporated by reference herein. The California fuel specifications are contained in the California Code of Regulations, Title 13, Chapter 5, Article 1, Sections 2260-2272. If the engine is tested using the U.S. EPA test fuel, consistent with the fuel specifications as outlined in Title 40 Code of Federal Register, Part 86, the manufacturer shall demonstrate that the emission test results complies with these Test Procedures.

(2) If the engine is not a gasoline-fueled large spark-ignition engine, then the test fuel used shall be consistent with the fuel specifications as outlined in the "California Exhaust Emission Standards and Test Procedures for 1988 and Subsequent Model Passenger Cars, Light-Duty Trucks, and Medium- Duty Vehicles," as adopted May 20, 1987, and last amended June 24, 1996, and incorporated by reference herein. The California fuel specifications are contained in the California Code of Regulations, Title 13, Chapter 5, Article 3, Sections 2290-2293.5. If the engine is tested using the U.S. EPA test fuel, consistent with the fuel specifications as outlined in Title 40 Code of Federal Register, Part 86, the manufacturer shall demonstrate that the emission test results complies with these Test Procedures.

(b) During all engine tests, the engine shall employ a lubricating oil consistent with the engine manufacturer's specifications for that particular engine. These specifications shall be recorded and declared in the certification application.

State of California
AIR RESOURCES BOARD

CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR NEW 2001 ~~AND LATER~~ THROUGH 2006 OFF-ROAD LARGE SPARK-IGNITION ENGINES

PART II

Adopted: September 1, 1999

NOTE: This document incorporates by reference the International Standards Organization (ISO) 8178 test procedure, Part 1, August 15, 1996, Part 4, August 15, 1996, and Part 5, May 15, 1998, with modifications. Sections which have been included in their entirety are set forth with the section number and title. California provisions which modify specific ISO provisions are denoted by the words "DELETE" for the ISO language and "REPLACE WITH" for the new California language. The symbols "*****" and "..." mean that the remainder of the ISO text for a specific section is not shown in these procedures but has been included by reference, unchanged. ISO sections which are not listed are not part of the procedures.

~~This document is all newly adopted text.~~
The sole amendments are to the title and years of applicability of the regulations.

CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR NEW 2001 ~~AND LATER~~ THROUGH 2006 OFF-ROAD LARGE SPARK-IGNITION ENGINES

PART II

To the extent the following provisions of ISO 8178, Part 1, August 15, 1996, Part 4, August 15, 1996, and Part 5, May 15, 1998, pertain to the testing and compliance of exhaust emissions from off-road large spark-ignition engines, they are adopted and incorporated herein by this reference as Part II of the California Exhaust Emission Standards and Test Procedures for New 2001 ~~and Later~~ through 2006 Off-Road Large Spark-Ignition Engines (Test Procedures), except as altered or replaced by the provisions set forth below.

Since the scope of this regulation is limited to off-road spark-ignition engines, the ISO provisions contained in the procedure identified above which pertain to Diesel cycle engines or to engines used for applications other than off-road purposes shall not be applicable to Part II of these Test Procedures.

International Standards Organization (ISO) 8178, RIC Engines - Exhaust emission measurement - Part 1: Test bed measurement of gaseous and particulate exhaust emissions from RIC engines.

1. Scope

2. Normative References

3. Definitions

ADD:

Note: In addition to the definitions listed here, those definitions listed in section 2 of Part I of these Test Procedures apply.

* * * * *

4. Symbols and Abbreviations

ADD:

Note: In addition to the symbols and abbreviations listed here, those symbols and abbreviations listed in section 3 of Part I of these Test Procedures shall apply.

* * * * *

5. Test Conditions

6. DELETE and

REPLACE WITH:

6. Test fuels

Test fuels shall meet the requirements specified in section 25 of Part I of these Test Procedures.

7. Measurement Equipment and data to be measured

DELETE all references to subsection 7.5 (Determination of the Particulates).

8. Calibration of the analytical instruments

9. DELETE

10. Running conditions (Test cycles)

11. Test run

DELETE all references to the particulates and particulate sampling method.

12. Data evaluation for gaseous and particulate emission

DELETE all references to the particulate emission.

13. Calculation of gaseous emissions

14. DELETE

15. Determination of the gaseous emissions

ADD:

NOTE: Manufacturers may use the raw exhaust gas sampling methods for certification testing through 2004 model year with prior Executive Officer approval.

* * * *

16. DELETE

Figures and Explanations

Annex A consumption	Calculation of the exhaust gas mass flow and/or of the combustion air
Annex B	Equipment and auxiliaries to be installed for the test to determine engine power
Annex C	Efficiency calculation and corrections for the non-methane hydrocarbon cutter measuring method
Annex D	Formulae for the calculation of the coefficients u, v, w in 13.4
Annex E	Heat calculation (transfer tube)
Annex F	Bibliography

ISO 8178, RIC Engines - Exhaust emission measurement - Part 4: Test cycles for different engine applications.

1. Scope

2. Normative References

3. Definitions

ADD:

Note: In addition to the definitions listed here, those definitions listed in section 2 of Part I of these Test Procedures shall apply.

* * * * *

4. Symbols and Abbreviations

ADD:

Note: In addition to the symbols and abbreviations listed here, those symbols and abbreviations listed in section 3 of Part I of these Test Procedures shall apply.

* * * * *

5. Torque

6. Intermediate speed

7. Information regarding of the test

8. Modes and weighting factors for test cycles

8.2 DELETE

8.3 Test cycle types C "Off-road vehicles and industrial equipment"

8.3.1 DELETE

8.4 Test cycle type D "Constant"

DELETE all references to D-1 test cycle

8.5 DELETE

8.6 DELETE

8.7 Test cycles type G "Utility, lawn and garden", typically < 25 hp.

DELETE all reference to G-2 and G-3 test cycles.

ADD:

Note: Manufacturers may use the G-1 test cycle for engines equal to or less than 1.0 liter. Manufacturer must show that the engines tested with the G-1 test cycle have engine characteristics and operating characteristics similar to small off-road equipment engines (less than 25 hp).

* * * *

Annex A DELETE

Annex B Combined table of the weighting factors

Annex C Bibliography

ISO 8178, RIC Engines - Exhaust emission measurement - Part 5: Test fuels.

1. DELETE and

REPLACE WITH:

1. Scope

This part specifies the calculation of the fuel specific factors and exhaust gas flow, which are necessary to determine the emission test results in accordance with ISO 8178, Part 1.

2. Normative References

3. Definitions

ADD:

Note: In addition to the definitions listed here, those definitions listed in section 2 of Part I of these Test Procedures apply.

* * * * *

4. Symbols and Abbreviations

ADD:

Note: In addition to the symbols and abbreviations listed here, those symbols and abbreviations listed in section 3 of Part I of these Test Procedures apply.

* * * * *

5. DELETE and REPLACE WITH:

5. Choice of Fuels

Test fuels shall meet the requirements specified in section 25 of Part I of these Test Procedures.

6. DELETE

7. Calculation of the Exhaust Gas Flow Using Fuel Specific Factors

8. Calculation of the Fuel Specific Factors

Tables

PROPOSED REGULATION ORDER, PART 3

Amend the title and dates of applicability of incorporated "California Exhaust Emission Standards and Test Procedures for New 2001 and Later Off-Road Large Spark-Ignition Engines" and adopt incorporated "California Exhaust Emission Standards and Test Procedures for New 2007 and Later Off-Road Large Spark-Ignition Engines."

Test Procedures

PROPOSED CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR NEW 2007 AND LATER OFF-ROAD LARGE SPARK-IGNITION ENGINES
PART I

PROPOSED CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR NEW 2007 AND LATER OFF-ROAD LARGE SPARK-IGNITION ENGINES
PART II

State of California
AIR RESOURCES BOARD

PROPOSED CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR NEW 2007 AND LATER OFF-ROAD LARGE SPARK-IGNITION ENGINES

PART I

Adopted: [insert date of adoption]

NOTE: This document incorporates by reference Title 40, Code of Federal Regulations (CFR), Part 1065 - Test Procedures and Equipment, Subparts A, B, C, D, E, F, G, H, I, J, and K as noticed on November 8, 2002 (Federal Register, Volume 67, Friday, November 8, 2002, pages 68409 through 68427). Sections that have been included in their entirety are set forth with the section number and title. California provisions that replace specific federal provisions are denoted by the words "DELETE" for the federal language and "REPLACE WITH" or "ADD" for the California regulations. The symbols "* * * * *" and "..." mean that the remainder of the CFR text for a specific section, which is not shown in these regulations, has been included by reference, with only the printed text changed. Federal regulations that are not listed are not part of the California regulations.

This document is all newly adopted text.

PART 1065 – TEST PROCEDURES AND EQUIPMENT

Subpart A – Applicability and General Provisions

Subpart B – Equipment and Analyzers

* * * * *

(a) (6) DELETE, REPLACE WITH:
The general CVS sample system consists of a dilution air filter (optional) and mixing assembly, cyclone particulate separator (optional), a sample line for the bag sample or other sample lines a dilution tunnel, and associated valves and sensors for pressure and temperature. The temperature of heated sampling line should be maintained within the following ranges:

(A) For non-methanol-fueled engines: If the temperature of the exhaust gas at the sampling probe is equal to or below 463 K (190 °C), maintain a wall temperature of 463 K ± 10 K (190 °C ± 10 °C) as measured at every separately controlled heated section. If the temperature of the exhaust gas at the sampling probe is above 463 K (190 °C), maintain a wall temperature greater than 453 K (180 °C).

(B) For methanol-fueled engines: If the temperature of the exhaust gas at the sampling probe is equal to or below 385 K (112 °C), maintain a wall temperature of 385 K ± 10 K (112 °C ± 10 °C) as measured at every separately controlled heated section. If the temperature of the exhaust gas at the sampling probe is above 385 K (112 °C), maintain a wall temperature greater than 375 K (102 °C).

A general schematic of the SI sampling system is shown in Figure 1065.110-1.

* * * * *

§1065.125 Analyzers (overview/general response characteristics).

§1065.130 Hydrocarbon analyzers.

§1065.135 NO_x analyzers.

§1065.140 CO and CO_2 analyzers.

§1065.150 Flow meters.

§1065.155 Temperature and pressure sensors.

Subpart C – Test Fuels and Analytical Gases

§1065.201 General requirements for test fuels.

* * * * *

(e) DELETE, REPLACE WITH:
If the engine is tested using the EPA test fuel, consistent with the fuel specifications as outlined in Title 40 CFR, Part 86, the manufacturer shall demonstrate that the emission test results complies with these Test Procedures.

§1065.210 Test fuel specifications for gasoline.

§1065.215 Test fuel specifications for natural gas.

§1065.220 Test fuel specifications for liquefied petroleum gas.

§1065.240 Lubricating oils.

§1065.250 Analytical gases.

Subpart D – Analyzer and Equipment Calibrations

§1065.301 Overview.

§1065.305 International calibration standards.

§1065.315 Torque calibration.

Subpart E – Engine Selection, Preparation, and Service Accumulation

§1065.401 Selecting a test engine.

* * * * *

ADD:

(d) Emission-data engines.

(1) Engines will be chosen to be run for emission data based upon engine family groups. Within each engine family group, the requirements of this paragraph must be met.

(2) Engines of each engine family group will be divided into groups based upon their exhaust emission control systems. One engine of each system combination shall be run for gaseous emission data. The complete gaseous emission test must be conducted. Within each combination, the engine that features the highest horsepower, primarily at or near the rated speed, will usually be selected. The engine manufacturer may elect to test the worst-case emissions engine within each combination with prior approval from the Executive Officer. The engine with the highest horsepower will usually be selected. For engine families that contain multiple fuel systems, the engine manufacturer shall conduct separate individual gaseous emission test based on the

worst-case emissions configuration for each different fuel system within the engine family's engine configuration.

(3) The Executive Officer may select a maximum of one additional engine within each engine-system combination based upon features indicating that it may have the highest emission levels of the engines of that combination. In selecting this engine, the Executive Officer will consider such features as the injection system, fuel system, engine control system, rated speed, rated horsepower, peak torque speed, and peak torque.

(4) Within an engine family control system combination, the manufacturer may alter any emission-data engine (or other engine including current or previous model year emission-data engines and development engines provided they meet the emission-data engines' protocol) to represent more than one selection under paragraph (d)(2) and (3) of this section.

(e) In lieu of testing an emission-data engine selected under paragraph (d) of this section, and submitting data therefore, a manufacturer may, with the prior written approval of the Executive Officer, submit exhaust emission data as applicable on a similar engine, for which certification has previously been obtained or for which all applicable data required under Section 10 has previously been submitted.

(f) Durability-data Engine

(1) The engine manufacturer shall select the engine configuration that best represents the entire engine family or groups of engine families to demonstrate engine and emission durability. The duration of the engine durability demonstration for the purpose of generating deterioration factors for the emission calculation shall be equivalent to the emissions durability period as defined in these Test Procedures.

(2) (i) The engine manufacturer shall use good engineering practice to determine engine and emission durability.

(ii) The engine manufacturer shall provide the Executive Officer with a written plan of the method used to determine engine and emission durability. The Executive Officer shall approve the plan if it demonstrates, according to good engineering judgement, the development of reasonable deterioration factors. The engine manufacturer shall not proceed with testing until the Executive Officer has approved the plan.

(iii) In the absence of a manufacturer's specific service accumulation cycle, engine durability demonstration shall be conducted using multiple runs of the ISO 8178, Part IV, test cycle C-2, or for constant speed engines using multiple runs of the ISO 8178, Part IV, D-2 test cycle. The engine manufacturer may

request, with the advanced approval of the Executive Officer, to reduce the total amount of service accumulation hours for any durability / service accumulation engine. The engine manufacturer may make such request only after an engine has accumulated at a minimum one half of the engine's defined useful life period. The Executive Officer shall base such approval on engine's durableness, maintenance events, emission test results, and the stability of engine out emissions.

(3) Regardless of which service accumulation cycle is used for generating the deterioration factors for emissions certification, the Executive Officer shall accept the manufacturer□s deterioration factors for certification the first year; but, may deny the use of the manufacturer's deterioration factors for subsequent certification based on incorrect or inaccurate representativeness of actual in-use emissions test results.

§1065.405 Preparing and servicing a test engine

§1065.410 Service limits for stabilized test engines.

§1065.415 Durability demonstration.

Subpart F – Running an Emission Test

§1065.501 Overview of the engine dynamometer test procedures.

§1065.510 Engine mapping procedures.

§1065.515 Test cycle generation.

§1065.520 Engine starting, restarting, and shutdown.

§1065.525 Engine dynamometer test run.

§1065.530 Test cycle validation criteria.

Subpart G – Data Analysis and Calculations

Subpart H – Particulate Measurements [Reserved]

Subpart I – Testing with Oxygenated Fuels

Subpart J – Field Testing

Subpart K – Definitions and Other Reference Information

State of California
AIR RESOURCES BOARD

PROPOSED CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR NEW 2007 AND LATER OFF-ROAD LARGE SPARK-IGNITION ENGINES

PART II

Adopted: [insert date of adoption]

NOTE: This document incorporates by reference Title 40, Code of Federal Regulations (CFR), Part 1068 - Test Procedures and Equipment, Subparts A, B, C, D, E, F, and G as noticed on November 8, 2002 (Federal Register, Volume 67, Friday, November 8, 2002, pages 68427 through 68447). Sections that have been included in their entirety are set forth with the section number and title. California provisions that replace specific federal provisions are denoted by the words "DELETE" for the federal language and "REPLACE WITH" or "ADD" for the California regulations. The symbols "* * * * *" and "..." mean that the remainder of the CFR text for a specific section, which is not shown in these regulations, has been included by reference, with only the printed text changed. Federal regulations that are not listed are not part of the California regulations.

This document is all newly adopted text.

PART 1068 – GENERAL COMPLIANCE PROVISIONS FOR NONROAD PROGRAMS

Subpart A – Applicability and Miscellaneous Provisions

§1068.1 Does this part apply to me?

§1068.5 How must manufacturers apply good engineering judgment?

§1068.10 How do I request EPA to keep my information confidential

§1068.15 Who is authorized to represent the Agency?

§1068.20 May EPA enter my facilities for inspections?

§1068.25 What information must I give to EPA?

* * * * *

ADD:

(c) (1) Upon request of the Executive Officer, the manufacturer of any off-road large spark-ignition engine covered by an Executive Order shall, within 30 days, identify by engine identification number or alternative tracking method, the engine(s) covered by the Executive Order.

(2) The manufacturer of any off-road large spark-ignition engine covered by an Executive Order shall provide to the Executive Officer, within 60 days of the issuance of an Executive Order, an explanation of the elements in any engine identification coding system in sufficient detail to enable the Executive Officer to identify those engines that are covered by an Executive Order.

(d) Any off-road LSI engine manufacturer obtaining certification under this part shall notify the E.O., on a yearly basis, of the number of engines of such engine family-engine displacement-exhaust emission control system-fuel system combination produced for sale in California during the preceding year.

§1068.30 What definitions apply to this part?

Subpart B – Prohibited Actions and Related Requirements

Subpart C – Exemptions and Exclusions

§1068.225 What are the provisions for exempting engines for national security?

DELETE [Reserve]

§1068.230 What are the provisions for exempting engines for export?

DELETE [Reserve]

§1068.235 What are the provisions for exempting engines used solely for competition?

DELETE [Reserve]

§1068.240 What are the provisions for exempting new replacement engines?

DELETE, REPLACE WITH:

(a) Beginning in 2004, a new off-road large spark-ignition engine intended solely to replace an engine in a piece of off-road equipment that was originally produced with an engine manufactured prior to the applicable implementation date as described in section 1048.101, shall not be subject to the emissions requirements of section 1048.101 provided that:

(i) The engine manufacturer has ascertained that no engine produced by itself or the manufacturer of the engine that is being replaced, if different, and certified to the requirements of this article, is available with the appropriate physical or performance characteristics to repower the equipment; and

(ii) Unless an alternative control mechanism is approved in advance by the Executive Officer, the engine manufacturer or its agent takes ownership and possession of the engine being replaced; and

(iii) The replacement engine is clearly labeled with the following language, or similar alternate language approved in advance by the Executive Officer:

THIS ENGINE DOES NOT COMPLY WITH CALIFORNIA OFF-ROAD OR ON-HIGHWAY EMISSION REQUIREMENTS. SALE OR INSTALLATION OF THIS ENGINE FOR ANY PURPOSE OTHER THAN AS A REPLACEMENT ENGINE IN AN OFF-ROAD VEHICLE OR PIECE OF OFF-ROAD EQUIPMENT WHOSE ORIGINAL ENGINE WAS NOT CERTIFIED IS A VIOLATION OF CALIFORNIA LAW SUBJECT TO CIVIL PENALTY.

(b) At the beginning of each model year, the manufacturer of replacement engines must provide, by engine model, an estimate

of the number of replacement engines it expects to produce for California for that model year.

(c) At the conclusion of the model year, the manufacturer must provide, by engine model, the actual number of replacement engines produced for California during the model year, and a description of the physical or performance characteristics of those models that indicate that certified replacement engine(s) were not available as per paragraph (a).

§1068.245 What temporary provisions address hardship due to unusual circumstances?

DELETE [Reserve]

§1068.250 What are the provisions for extending compliance deadlines for small-volume manufacturers under hardship?

DELETE [Reserve]

§1068.255 What are the provisions for exempting engines for hardship for equipment manufacturers and secondary engine manufacturers?

DELETE [Reserve]

Subpart D – Imports

§1068.301 Does this subpart apply to me?

DELETE [Reserve]

§1068.305 How do I get an exemption or exclusion for imported engines?

DELETE [Reserve]

§1068.310 What are the exclusions for imported engines?

DELETE [Reserve]

§1068.315 What are the permanent exemptions for imported engines?

DELETE [Reserve]

§1068.320 How must I label an imported engine with a permanent exemption?

DELETE [Reserve]

§1068.325 What are the temporary exemptions for imported engines?

DELETE [Reserve]

§1068.330 How do I import engines to modify for other applications?

DELETE [Reserve]

§1068.335 What are the penalties for violations?

DELETE [Reserve]

Subpart E – Selective Enforcement Auditing

§1068.401 What is a selective enforcement audit?

DELETE [Reserve]

§1068.405 What is in a test order?

DELETE [Reserve]

§1068.410 How must I select and prepare my engines?

DELETE [Reserve]

§1068.415 How do I test my engines?

DELETE [Reserve]

§1068.420 How do I know when my engine family fails an SEA?

DELETE [Reserve]

§1068.425 What happens if one of my production-line engines exceeds the emission standards?

DELETE [Reserve]

§1068.430 What happens if an engine family fails an SEA?

DELETE [Reserve]

§1068.435 May I sell engines from an engine family with a suspended certificate of conformity?

DELETE [Reserve]

§1068.440 How do I ask EPA to reinstate my suspended certificate?

DELETE [Reserve]

§1068.445 When may EPA revoke my certificate under this subpart and how may I sell these engines again?

DELETE [Reserve]

§1068.450 What records must I send to EPA?

DELETE [Reserve]

§1068.455 What records must I keep?

DELETE [Reserve]

Subpart F – Reporting Defects and Recalling Engines

§1068.501 How do I report engine defects?

§1068.505 How does the recall program work?

(a) DELETE, REPLACE WITH:
A manufacturer shall be notified whenever the Executive Officer has determined, based on production-line test results or in-use test results, enforcement testing results, or any other information, that a substantial number of a class or category of equipment or engines produced by that manufacturer, although properly maintained and used, contain a failure in an emission-related component which, if uncorrected, may result in the equipment's or engines' failure to meet applicable standards over their useful lives; or whenever a class or category of equipment or engines within their useful lives, on average, do not conform to the emission standards prescribed pursuant to Part 5 (commencing with Section 43000) of Division 26 of the HSC or any regulation adopted by the state board pursuant thereto, other than an emissions standard applied to new engines to determine "certification" as specified in Chapter 9, as applicable to the model year of such equipment or engines.

* * * * *

ADD:

(f) It shall be presumed for purposes of this section that an emission-related failure will result in the exceedance of emission standards unless the manufacturer presents evidence in accordance with the procedures set forth in subsections (1), (2), and (3) which demonstrates to the satisfaction of the Executive Officer that the failure will not result in exceedance of emission standards within the useful life of the equipment or engine..

(1) In order to overcome the presumption of noncompliance set forth in paragraph (f) above, the average emissions of the equipment and engines with the failed emission-related component must comply with applicable emission standards. A manufacturer may demonstrate compliance with the emission standards by following the procedures set forth in either paragraphs (f)(2) or (f)(3) of this section.

(2) A manufacturer may test properly maintained in-use equipment with the failed emission-related component pursuant to the applicable certification emission tests specified in Section 2433, Title 13 of the California Code of Regulations. The emissions shall be projected to the end of the equipment's or engine's useful life using in-use deterioration factors. The in-use deterioration factors shall be chosen by the manufacturer from among the following:

(A) "Assigned" in-use deterioration factors provided by the ARB on a manufacturer's conditions; request and based on ARB in-use testing; or,

(B) deterioration factors generated during certification, provided adjustments are made to account for equipment aging, customer hour usage-accumulation practices, type of failed component, component failure mode, effect of the failure on other emission-control components, commercial fuel and lubricant quality, and any other factor which may affect the equipment's or engine's operating or,

(C) subject to approval by the Executive Officer, a manufacturer-generated deterioration factor. Such deterioration factor must based on in-use data generated from certification emission tests performed on properly maintained and used equipment in accordance with the procedures set forth in Section 2433 of Title 13 of the California Code of Regulations, and the equipment from which it was derived must be representative of the in-use fleet with regard to emissions performance and equipped with similar emission control technology as equipment with the failed component.

(3) In lieu of the equipment or engine emission testing described in subsection (2) above and subject to approval by the Executive Officer, a manufacturer may perform an engineering analysis, laboratory testing or bench testing, when appropriate, to demonstrate the effect of the failure.

(g) Penalties. Failure by a manufacturer to carry out all recall actions ordered by the Executive Officer pursuant to Sections 1068.510 of these procedures is a violation of Health and Safety Code Section 43013 and 43105 and shall subject the manufacturer, on a per engine basis, to any and all remedies available under Part 5, Division 26 of the Health and Safety Code, sections 43000 et seq.

§1068.510 How do I prepare and apply my remedial plan?

* * * * *

ADD:
(a) (14) The capture rate required for each class or category of equipment or engine to be recalled. Under recalls based o exceedance of emission standards, the capture rate shall be at a minimum 80 percent of the equipment or engine within the subject engine family.

* * * * *

(c) DELETE, REPLACE WITH:
A description of the impact of the proposed changes on the average emissions of the equipment or engines to be recalled based on noncompliance described in this section above. The description shall contain the following:

(1) Average noncompliance emission levels.

(2) Average emission reduction or increase per pollutant resulting from the recall repair. These averages shall be verified by the manufacturer by applying the proposed recall repairs to two or more in-use equipment or engines representing the average noncompliance emission levels. Only those equipment or engines with baseline emission levels within 25 percent of the average emission levels of noncomplying pollutant(s) established under the in-use enforcement test program may be used by manufacturers to verify proposed recall repairs. The Executive Officer may allow the use of equipment or engines exceeding these upper averaging noncompliance limits if none which meet the limits can be reasonably procured.

* * * * *

(g) DELETE

(h) DELETE, REPLACE WITH:

(1) If the Executive Officer finds that the recall plan is designed effectively to correct the nonconformity and complies with the provisions of this Section, he or she will so notify the manufacturer in writing. Upon receipt of the approval notice from the Executive Officer, the manufacturer shall commence implementation of the approved plan. Notification of equipment or engine owners and the implementation of recall repairs shall commence within 45 days of the receipt of notice unless the manufacturer can show good cause for the Executive Officer to extend the deadline.

(2) If the Executive Officer does not approve the recall plan or the mitigation measures provided in this Section as submitted, the Executive Officer shall order modification of the plan or mitigation measures with such changes and additions as he or she determines to be necessary. The Executive Officer shall notify the manufacturer in writing of the disapproval and the reasons for the disapproval.

(3) The manufacturer may content the Executive Officer's disapproval by requesting a public hearing pursuant to the procedures set forth in Subchapter 1.25, Division 3, Chapter 1, Title 17, California Code of Regulations. As a result of the hearing, the Board may affirm, overturn or modify the Executive Officer's action. In its decision, affirming or modifying, the Board shall specify the date by which the manufacturer shall commence notifying equipment or engine owners and implementing the required recall repairs.

(4) If no public hearing is requested in accordance with (3) above, the manufacturer shall incorporate the changes and additions required by the Executive Officer and shall commence notifying equipment or engine owners and implementing the required recall repairs within 60 days of the manufacturer's receipt of the Executive Officer's disapproval.

ADD:

(i) The manufacturer shall comply with the capture rate specified in the recall plan as determined pursuant to this Section, above, by the end of the fifth quarter, as defined in Section 2112(j), Chapter 2, Title 13 of the California Code of Regulations, following the quarter in which the notification of equipment or engine owners was initiated. If, after good faith efforts, the manufacturer cannot correct the percentage of equipment specified in the plan by the applicable

deadlines and cannot take other measures to bring the engine family into compliance with the standards, the manufacturer shall propose mitigation measures to offset the emissions of the unrepaired equipment within 45 days from the last report filed pursuant to Section 1068.525, below. The Executive Officer shall approve such measures provided that:

(1) The emission reductions from the recalled and repaired equipment or engines and the mitigation measures are equivalent to achieving the capture rate; and

(2) The emission reductions from the mitigation measures are real and verifiable; and

(3) The mitigation measures are implemented in a timely manner.

(j) Extension of Time. The Executive Officer may extend any deadline in the plan if he or she finds in writing that a manufacturer has shown good cause for such extension.

(k) The Executive Officer may waive any or all of the requirements of these procedures if he or she determines that the requirement constitutes an unwarranted burden on the manufacturer without a corresponding emission reduction.

§1068.515 How do I mark or label repaired engines?

* * * * *

ADD:

(e) Proof of Correction Certificate. The manufacturer shall require those who perform the recall repair to provide the owner of each equipment or engine repaired with a certificate, through a protocol and in a format prescribed by the Executive Officer, which indicates that the noncomplying equipment or engine has been corrected under the recall program. This requirement shall become effective and applicable upon the effective date of the recall enforcement program referred to in this section, above.

§1068.520 How do I notify affected owners?

* * * * *

(a) (3) DELETE, REPLACE WITH:

A statement that eligibility may not be denied solely on the basis that the equipment or engine owner used parts not manufactured by the original equipment manufacturer, or had repairs performed

by outlets other than the equipment or engine manufacturer's franchised dealers.

* * * * *

§1068.525 What records must I send to EPA?

§1068.530 What records must I keep?

§1068.535 How can I do a voluntary recall for emission-related problems?

DELETE, REPLACE WITH:

(a) When any manufacturer initiates a voluntary emission recall, the manufacturer shall notify the Executive Officer of the recall at least 30 days before owner notification is to begin. The manufacturer shall also submit to the Executive Officer a voluntary recall plan for approval, as prescribed in the following:

(1) (A) a description of each class or category of engines to recall, including the number of engines to be recalled, the engine family or a sub-group thereof, the model year, and such other information as may be required to identify the engines:

(B) a description of the specific modifications, alterations, repairs, corrections, adjustments, or other changes to be made to correct the engines affected by the nonconformity;

(C) a description of the method by which the manufacturer will notify engine owners including copies of any letters of notification to be sent to engine owners;

(D) a description of the proper maintenance or use, if any, upon which the manufacturer conditions eligibility for repair under the recall plan, and a description of the proof to be required of an engine owner to demonstrate compliance with any such conditions;

(E) a description of the procedure to be followed by engine owners to obtain correction of the nonconformity. This shall include designation of the date on or after which the owner can have the nonconformity remedied, the time reasonably necessary to perform the labor to remedy the nonconformity, and the designation of facilities at which the nonconformity can be remedied;

(F) a description of the class of persons other than dealers and authorized warranty agents of the manufacturer who will remedy the nonconformity;

(G) a description of the system by which the manufacturer will assure that an adequate supply of parts is available to perform the repair under the plan; or

(2) (A) a description of each class or category of engines subject to recall, including the number of engines subject to being recalled, the engine family or a sub-group thereof, the model year, and such other information as may be required to identify the engines;

(B) a description of the method by which the manufacturer will use the in-use emissions credit, averaging, banking, and trading program, as described in Section 2438(e), to remedy the nonconformity.

(b) Voluntary Recall Progress Report. A manufacturer who initiates a voluntary emission recall campaign pursuant to paragraph (a)(1) of this section must submit at least one report on the progress of the recall campaign. This report shall be submitted to the Executive Officer by the end of the fifth quarter, as defined in Section 2112(j), Chapter 2, Title 13 of the California Code of Regulations, following the quarter in which the notification of equipment or engine owners was initiated, and include the following information:

(1) Engine family involved and recall campaign number as designated by the manufacturer.

(2) Date owner notification was begun, and date completed.

(3) Number of equipment or engines involved in the recall campaign.

(4) Number of equipment or engines known or estimated to be affected by the nonconformity.

(5) Number of equipment or engines inspected pursuant to the recall plan and found to be affected by the nonconformity.

(6) Number of inspected equipment or engines.

(7) Number of equipment or engines receiving repair under the recall plan.

(8) Number of equipment or engines determined to be unavailable for inspection or repair under the recall plan due to exportation, theft, scrapping, or for other reasons (specify).

(9) Number of equipment or engines determined to be ineligible for recall action due to removed or altered components.

(10) A listing of the identification numbers of equipment or engines subject to recall but for whose repair the manufacturer has not been invoiced. This listing shall be supplied in a standardized computer data storage device to be specified by the Executive Officer.

(11) Any service bulletins transmitted to dealers which relate to the nonconformity and which have not previously been submitted.

(12) All communications transmitted to equipment or engine owners which relate to the nonconformity and which have not previously been submitted.

(c) The information gathered by the manufacturer to compile the reports must be retained for not less than seven years from the date of the manufacture of the engines and must be made available to the Executive Officer or designee of the Executive Officer upon request.

(d) A voluntary recall plan shall be deemed approved unless disapproved by the Executive Officer within 20 business days after receipt of the recall plan.

(e) Under a voluntary recall program, initiated and conducted by a manufacturer or its agent or representative as a result of in-use enforcement testing or other evidence of noncompliance provided or required by the Board to remedy any nonconformity, the capture rate shall be at a minimum 55 percent of the equipment or engine within the subject engine family or a sub-group thereof. The manufacturer shall comply with the capture rate by the end of the fifth quarter, as defined in Section 2112(j), Chapter 2, Title 13 of the California Code of Regulations, following the quarter in which the notification of equipment or engine owners was initiated. If the manufacturer cannot correct the percentage of equipment specified in the plan by the applicable deadlines, the manufacturer must use good faith efforts through other measures, subject to approval by the Executive Officer, to bring the engine family into compliance with the standards. If the Executive Officer does not approve the manufacturer's efforts, the manufacturer shall propose mitigation measures to offset the emissions of the unrepaired equipment within 45 days from the last report filed pursuant to paragraph (b), above. The Executive Officer shall approve such measures provided that:

(1) The emission reductions from the recalled and repaired equipment or engines and the mitigation measures are equivalent to achieving the capture rate; and

(2) The emission reductions from the mitigation measures are real and verifiable; and

(3) The mitigation measures are implemented in a timely manner.

§1068.540 What terms do I need to know for this subpart?

Subpart G – Hearings

§1068.601 What are the procedures for hearings?

DELETE, REPLACE WITH:
Parties affected by an Executive Officer's determination may file a request for an adjudicatory hearing under Title 17, Division 3, Chapter 1, California Code of Regulations Subchapter 1.25. If, after reviewing the request and supporting data, the Executive Officer finds that the request raises a substantial issue of fact, a hearing in accordance with Subchapter 1.25 shall be granted.

Appendix B

Verification Procedure

Proposed Regulation Order, Part 4

Verification Process Flowchart

Verification Testing Flowchart

PROPOSED REGULATION ORDER, PART 4

NOTE: The entire text is new language proposed to be added to the California Code of Regulations.

Adopt Article 3, Verification Procedure, Warranty, and In-Use Compliance Requirements for Retrofits to Control Emissions from Off-Road Large Spark-Ignition Engines, Chapter 15, Division 3, Title 13, California Code of Regulations, and new sections 2780 through 2789, to read as follows:

Article 3. Verification Procedure, Warranty, and In-Use Compliance Requirements for Retrofits to Control Emissions from Off-Road Large Spark-Ignition Engines.

§ 2780. Applicability and Purpose.

These procedures apply to LSI retrofit emission control systems, which, through the use of sound principles of science and engineering, control emissions of hydrocarbons (HC) and oxides of nitrogen (NOx) from off-road large spark-ignition (LSI) engines. These systems may include but are not limited to, closed-loop fuel control systems, fuel injection systems, and three-way catalysts. These procedures are not applicable to retrofit strategies that employ or make use of fuel additives.

The use of LSI retrofit emission control systems verified in accordance with this article may be a means of complying with other state board regulations applicable to the use of LSI engines, to the extent provided for in those regulations.

NOTE: Authority cited: Sections 39002, 39003, 39500, 39600, 39601, 39650-39675, 40000, 43000, 43000.5, 43011, 43013, 43018 and 43105, 43600, 43700, Health and Safety Code. Reference: Sections 39650-39675, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107, and 43204-43205.5 Health and Safety Code; Title 17 California Code of Regulations Section 93000.

§ 2781. Definitions.

(a) The definitions in Section 1900(b), Chapter 1, Title 13 of the California Code of Regulations are incorporated by reference herein. The following definitions shall govern the provisions of this chapter:

(1) "Applicant" means the entity that has applied for or has been granted verification under this Procedure
(2) "Average" means the arithmetic mean.
(3) "Baseline" means: (i) for uncontrolled engines, the emission levels from the engine as tested without the LSI retrofit emission control system implemented using the test cycle specified in this verification procedure; and (ii) for certified engines, the emission standards to which the engine was certified.

(4) "Certified engine" means an engine manufactured in compliance with ARB or EPA emission standards.

(5) "Durability" means the ability of the applicant's LSI retrofit emission control system to maintain a level of emissions at or below its verification emission level and maintain its physical integrity over the durability periods specified in these regulations. The minimum durability demonstration periods contained herein are not necessarily meant to represent the entire useful life of the LSI retrofit emission control system in actual service.

(6) "Emergency Engine Repair" means repair conducted outside of normal scheduled maintenance that is required for the safe operation of the equipment.

(7) "Emission Control Group" means a set of LSI engines and applications determined by parameters that affect the performance of a particular LSI retrofit emission control system. The exact parameters depend on the nature of the LSI retrofit emission control system and may include, but are not limited to, baseline or certification levels of engine emissions, combustion cycle, displacement, aspiration, horsepower rating, duty cycle, exhaust temperature profile, and fuel composition. An applicant could specify an emission control group to be comprised of engines from several different engine families, applications and equipment manufacturers. Verification of an LSI retrofit emission control system and the extension of existing verifications is done on the basis of emission control groups.

(8) "Executive Officer" means the Executive Officer of the Air Resources Board or the Executive Officer's designee.

(9) "Executive Order" means the document signed by the Executive Officer that specifies the verification level or percentage reduction of an LSI retrofit emission control system for an emission control group and includes any enforceable conditions and requirements necessary to support the designated verification.

(10) "Hot Start" means the start of an engine within four hours after the engine is last turned off.

(11) "LSI retrofit emission control system" means any device or system employed with an in-use off-road LSI-engine vehicle or piece of equipment that is intended to reduce emissions. Examples of LSI retrofit emission control systems include, but are not limited to, closed-loop fuel control system, fuel injection system, three-way catalysts, and combinations of the above.

(12) "LSI Retrofit Emission Control Group Name." See Section 2786(c)(2).

(13) "Off-Road Large Spark-Ignition Engine" or "LSI Engine" means any spark ignition engine that produces a gross power of greater than 19 kilowatts (25 horsepower) or is designed (e.g., through fueling, engine calibrations, valve timing, engine speed modifications, etc.) to produce greater than 19 kW (>25 hp), and is used in an off-road vehicle or equipment that is not excluded below. If an engine family has models at or below 19 kW (25 hp) and models above 19 kW (25 hp), only the models above 19 kW (25 hp) would be considered LSI engines. A spark ignition engine's operating

characteristics are significantly similar to the theoretical Otto combustion cycle with the engine's primary means of controlling power output being to limit the amount of air and fuel that is throttled into the combustion chamber of the engine. LSI engines are designed for powering equipment applications including, but not limited to, forklift trucks, sweepers, generators, and industrial equipment and other miscellaneous applications. Specifically excluded from this category are: i) engines operated on or in any device used exclusively upon stationary rails or tracks; ii) engines used to propel marine vessels; iii) internal combustion engines attached to a foundation at a location for at least 12 months; iv) off-road recreational vehicles and snowmobiles; and v) stationary or transportable gas turbines for power generation.

(14) "Off-Road Vehicle" or "Off-Road Equipment" means any non-stationary device, powered by an internal combustion engine or motor, used primarily off the highways to propel, move, or draw persons or property including any device propelled, moved, or drawn exclusively by human power. Examples include, but are not limited to, marine vessels, construction/farm equipment, industrial equipment, locomotives, small off-road engines, off-road motorcycles, and off-highway recreational vehicles.

(15) "Otto Cycle Engine" means a type of engine with operating characteristics significantly similar to the theoretical Otto combustion cycle. The primary means of controlling power output in an Otto cycle engine is by limiting the amount of air and fuel that can enter the combustion chambers of the engine. As an example, gasoline-fueled and LPG engines are Otto cycle engines.

(16) "Revoke" means to cancel the verification status of an LSI retrofit emission control system. If an LSI retrofit emission control system's verification status is revoked by the Executive Officer, the applicant must immediately cease and desist selling the LSI retrofit emission control system to end-users.

(17) "Verification" means that after the data submitted has been thoroughly evaluated and an engineering judgment has determined that an LSI Retrofit Emission Control System for installation on in-use equipment will meet the requirements of this procedure, an Executive Order is issued. This ensures the emissions reductions achieved by the control strategy are real and durable and production units in the field achieve reductions consistent with the verification procedure.

NOTE: Authority cited: Sections 39002, 39003, 39500, 39600, 39601, 39650-39675, 40000, 43000, 43000.5, 43011, 43013, 43018 and 43105, 43600, 43700, Health and Safety Code. Reference: Sections 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107, 43204, 43205, and 43205.5; Health and Safety Code.

§ 2782. Application Process.

(a) *Overview.* Before submitting a formal application for the verification of an LSI retrofit emission control system for use with an emission control group, the applicant must submit a letter of intent with a proposed verification plan to ARB (pursuant to Section 2782(b)). To obtain verification, the applicant must conduct emissions reduction testing (pursuant to Section 2783), a durability demonstration with testing (pursuant to Section 2784), and a field demonstration (pursuant to Section 2785), and must submit the results along with comments and other information (pursuant to Sections 2786 and 2787) in an application to the Executive Officer, in the format shown in Section 2782(d). If the Executive Officer grants an interim verification of an LSI retrofit emission control system, he or she will issue an Interim Verification Letter to the applicant specifying the verified emissions reduction and any conditions that must be met for the LSI retrofit emission control system to function properly. After the Executive Officer grants interim verification of an LSI retrofit emission control system, the applicant must provide a warranty, conduct in-use compliance testing of the system after having sold or leased a specified number of units, and report the results to the Executive Officer (pursuant to Section 2789). An LSI retrofit emission control system that employs two or more individual sub-systems or components must be tested and submitted for evaluation as one system.

(b) *Proposed Verification Plan.* Before formally submitting an application for the verification of an LSI retrofit emission control system, the applicant must submit a proposed verification plan to ARB. The proposed verification plan should outline the applicant's plans for meeting the testing and other requirements. The Executive Officer shall use the information in the proposed plan to help determine the need for additional analyses and the appropriateness of allowing alternatives to the prescribed requirements and in determining whether the control strategy relies on sound principles of science and engineering. The proposed plan should include the following information:

(1) Identification of the contact persons, phone numbers, names and addresses of the responsible party proposing to submit an application.

(2) Description of the LSI retrofit emission control system and principles of operation. A schematic depicting operation should be included as appropriate. It is the responsibility of the applicant to demonstrate that the product relies on sound principles of science and engineering to achieve emission reductions. The description of the LSI retrofit emission control system must include, at a minimum, the information described in section 2782(d), items 2 and 3.

(A) If, after reviewing the description of the LSI retrofit emission control system, the Executive Officer determines that the applicant has not made a satisfactory demonstration that its product relies on sound principles of science and engineering to achieve emissions

reductions, the Executive Officer shall notify the applicant of the determination in writing. The applicant may choose to withdraw from the verification process or submit additional materials and clarifications. The additional submittal must be received by the Executive Officer no later than 60 days from the date of the notification letter or the Executive Officer may suspend reviewing the proposed verification plan.

(B) If, after reviewing the additional submittal, the Executive Officer determines that the applicant has not yet made a satisfactory demonstration that its product relies on sound principles of science and engineering to achieve emission reductions, the review shall be suspended. If the Executive Officer has suspended reviewing the proposed verification plan, it may only be reactivated at the discretion of the Executive Officer.

(C) If at any time, the Executive Officer has reason to doubt the scientific or engineering soundness of a product, the Executive Officer may require the applicant to submit additional supporting materials and clarifications no later than 60 days from the date of the notification letter. If the additional submittal is not received by the Executive Officer by the deadline established in the notification letter, the review of the proposed verification plan may be suspended. In deciding whether to suspend reviewing the proposed verification plan the Executive Officer will review submittals as provided in subsection (B) above.

(3) Preliminary parameters for defining emission control groups that are appropriate for the LSI retrofit emission control system. The Executive Officer will work with the applicant to determine appropriate emission control group parameters.

(4) The applicant's plan for meeting the requirements of Sections 2783-2786. Existing test data may be submitted for the Executive Officer's consideration. The proposed verification plan must focus on verification of the LSI retrofit emission control system for use with a single emission control group.

(5) A brief statement that the applicant agrees to provide a warranty pursuant to the requirements of Section 2787.

(c) *Executive Officer Review Timeframe.* After an applicant submits a proposed verification plan, the Executive Officer shall, within 30 days of its receipt, determine whether the applicant has identified an appropriate testing procedure to support an application for verification and notify the applicant in writing that it may submit an application for verification. The Executive Officer may suggest modifications to the proposed verification plan to facilitate verification of the LSI retrofit emission control system. All applications, correspondence, and reports must be submitted to:

Air Resources Board
9528 Telstar Avenue
El Monte, CA 91731

(d) *Application Format.* The application for verification of an LSI retrofit emission control system must follow the format shown below. If a section asks for information that is not applicable to the LSI retrofit emission control system, the applicant must indicate "not applicable." If the Executive Officer concurs with the applicant's judgment that a section is not applicable, the Executive Officer may waive the requirement to provide the information requested in that section.

1. Identification
   - 1.1 Identification of applicant, manufacturer, and product
   - 1.2 Identification of contact names for engineering or technical information of product or system
   - 1.3 Identification and description of the emission control group (see 2781 (a) (7) and 2783 (a)
   - 1.4 Identification of level of verification being sought
     - 1.4.1 Emissions reduction claim

2. LSI Retrofit Emission Control System Information
   - 2.1 General description of the LSI retrofit emission control system
     - 2.1.1 Discussion of principles of operation and system design
     - 2.1.2 Schematics depicting operation (as appropriate)
   - 2.2 Favorable operating conditions
   - 2.3 Unfavorable operating conditions (e.g., inappropriate duty cycle or application, geographical limitations, etc.) and associated reductions in performance
   - 2.4 Fuel and lubrication oil requirements (e.g., fuel specifications) and misfueling considerations (see 2783(d)(2), 2784(c2), 2786 (a) and (e).
   - 2.5 Identification of failure modes and associated consequences
   - 2.6 Discussion of potential safety issues *(e.g., lack of proper maintenance, unfavorable operating conditions, etc.)*
   - 2.7 Installation requirements
   - 2.8 Maintenance requirements

3. LSI Retrofit Emission Control System and Emission Control Group Compatibility
   - 3.1 Compatibility with the engine
     - 3.1.1 Discussion on calibrations and design features that may vary from engine to engine
     - 3.1.2 Effect on overall engine performance
     - 3.1.3 Effect on fuel consumption
     - 3.1.4 Engine oil consumption considerations
   - 3.2 Compatibility with the equipment/application
     - 3.2.1 Dependence of calibration and other design features on application characteristics

3.2.2 Comparison of field data with operating conditions of equipment applications suitable for the LSI retrofit emission control group.

4. Testing Information
   - 4.1 Emission testing requirements
     - 4.1.1 Test facility identification
     - 4.1.2 Description of engine and equipment *(make, model year, engine family name, etc.)*
     - 4.1.3 Test procedure description *(-pre-conditioning period, test cycle, etc.)*
     - 4.1.4 Test fuel and lubrication oil (see 2783 (d)
     - 4.1.5 Test results and comments electronically submitted in comma-delimited columns in spreadsheet or text files
   - 4.2 Durability Demonstration requirements
     - 4.2.1 Test facility identification
     - 4.2.2 Description of field application (where applicable)
     - 4.2.3 Description of engine and equipment *(make, model year, engine family name, etc.)*
     - 4.2.4 Test procedure description *(field or bench, test cycle, etc.)*
     - 4.2.5 Test fuel and lubrication oil (see 2784 (c)
     - 4.2.6 Test results and comments electronically submitted in comma-delimited columns in spreadsheet or text files
     - 4.2.7 Summary of evaluative comments from third-party for in-field durability demonstration *(e.g., driver or fleet operator)*
   - 4.3 Field Demonstration requirements (where applicable)
     - 4.3.1 Field application identification
     - 4.3.2 Description of engine and equipment *(make, model year, engine family name, etc.)*
     - 4.3.3 Summary of evaluative comments on retrofit compatibility of the LSI retrofit emission control system with the equipment from third-party *(e.g., driver or fleet operator)*
   - 4.4 Alternative In-Use Compliance Test Procedure (where applicable)
     - 4.4.1 Description of the proposed alternative in-use test procedure
     - 4.4.2 Description of test equipment, including measurement accuracy and precision
     - 4.4.3 Description of advantages and limitations of the proposed alternative in-use test procedure
     - 4.4.4 Description of the emission correlation of the proposed alternative in-use test procedure with emission results from engine dynamometer test conducted for verification of the LSI retrofit emission control system
     - 4.4.5 Test results and comments

5. References

6. Appendices

6.1 Laboratory test report information *(for all tests)*
  6.1.1 Actual laboratory test data
  6.1.2 Quality assurance and quality control information
6.2 Third-party letters or questionnaires describing in-field performance
6.3 LSI retrofit emission control system label
6.4 Owner's manual (as described in Section 2786 (e))
6.5 Other supporting documentation

(e) Within 30 days of receipt of the application, the Executive Officer shall notify the applicant whether the application is complete.

(f) Within 60 days after an application has been deemed complete, the Executive Officer shall determine whether the LSI retrofit emission control system merits verification and shall classify it as shown in Table 1. The applicant and the Executive Officer may mutually agree to a longer time period for reaching a decision, and the applicant may submit additional supporting documentation before a decision has been reached. The Executive Officer shall notify the applicant of the decision in writing and specify the verification level or percentage reduction for the LSI retrofit emission control system and identify any terms and conditions that are necessary to support the verification.

Table 1. LSI Engine Retrofit System Verification Levels

Classification	*Percentage Reduction (HC+NOx)*	*Absolute Emissions (HC+NOx)*
LSI Level 1 [(1)]	≥ 25% [(2)]	Not Applicable
LSI Level 2 [(1)]	≥ 75% [(3)]	3.0 g/bhp-hr [(3)]
LSI Level 3a [(1)]	≥ 85% [(4)]	0.5, 1.0, 1.5, 2.0, 2.5 g/bhp-hr
LSI Level 3b [(5)]	Not Applicable	0.5, 1.0, 1.5, 2.0 g/bhp-hr

Notes:
(1) Applicable to uncontrolled engines only
(2) The allowed verified emissions reduction is capped at 25% regardless of actual emission test values
(3) The allowed verified reduction for LSI Level 2 is capped at 75% or 3.0 g/bhp-hr regardless of actual emission test values

(4) Verified in 5% increments, applicable to LSI Level 3a classifications only
(5) Applicable to emission-controlled engines only

(g) Extensions of an Existing Verification. If the applicant has verified an LSI retrofit emission control system with one emission control group and wishes to extend the verification to include additional engines or equipment into the existing emission control group, or it wishes to include additional emission control groups, it may apply to do so using the original test data, additional test data, engineering justification and analysis, and any other information deemed necessary by the Executive Officer to address the differences between the emission control group already verified and the additional emission control group(s). Processing time periods follow sections (e) and (f) above.

(h) *Design Modifications.* If an applicant modifies the design of an LSI retrofit emission control system that has already been verified or is under consideration for verification by the Executive Officer, the modified version must be evaluated under this Procedure. The applicant must provide a detailed description of the design modification along with an explanation of how the modification will change the operation and performance of the LSI retrofit emission control system. To support its claims, the applicant must submit additional test data, engineering justification and analysis, and any other information deemed necessary by the Executive Officer to address the differences between the modified and original designs. An applicant must have written approval from the Executive Officer prior to making any design modifications to an LSI retrofit emission control system that has already been verified or is under consideration for verification by the Executive Officer. Processing time periods follow sections (e) and (f) above.

(i) *Treatment of Confidential Information.* Information submitted to the Executive Officer by an applicant may be claimed as confidential, and such information shall be handled in accordance with the procedures specified in Title 17, California Code of Regulations, Sections 91000-91022. The Executive Officer may consider such confidential information in reaching a decision on a verification application.

(j) The Executive Officer may lower the verification level or revoke the verification status of a verified LSI retrofit emission control system later if there are serious errors, omissions or inaccurate information in the application for verification or supporting information which, if known at the time of verification, would have justified lowering the verification level or denying the application.

NOTE: Authority cited: Sections 39002, 39003, 39500, 39600, 39601, 39650-39675, 40000, 43000, 43000.5, 43011, 43013, 43018 and 43105, 43600, 43700, Health and Safety Code. Reference: Sections 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107, 43204, 43205, and 43205.5; Health and Safety Code.

§ 2783. Emissions Reduction Testing Requirements.

(a) *Emission Control Group.* The applicant must identify the emission control group and test the LSI retrofit emission control system on representative engines from that emission control group. The applicant must identify the test engines, and equipment if applicable, by providing the engine family name, make, model, and model year. The applicant must also describe equipment applications on which the LSI retrofit emission control system is intended to be used, by giving examples of in-use equipment, characterizing typical duty cycles, indicating any fuel requirements, and/or providing other application-related information.

(b) *Engine Pre-conditioning.* All testing should be performed with the test engine in a proper state of maintenance. The applicant may tune-up or rebuild the test engine prior to, but not after, baseline testing, unless rebuilding the engine is a part of the requirements for installation of the LSI retrofit emission control system.

(c) *LSI Retrofit System Pre-conditioning.* The engine or equipment installed with an LSI retrofit emission control system must be operated for a break-in period of between 25 and 100 hours before emission testing.

(d) *Test Fuel.*

(1) The test fuel used shall be consistent with the fuel specifications as outlined in the "California Exhaust Emission Standards and Test Procedures for 2001 and Subsequent Model Passenger Cars, Light-Duty Trucks, and Medium- Duty Vehicles," as incorporated by reference in section 1961(d) If the engine is tested using the U.S. EPA test fuel, as outlined in 40 CFR Part 1065, the manufacturer shall demonstrate that the emission results are consistent with these Test Procedures.

(2) During all engine tests, the engine shall employ lubricating oil consistent with the engine manufacturer's specifications for that particular engine. These specifications shall be recorded and declared in the verification application.

(e) *Test Cycle.*

(1) *Systems verified prior to 2007.* Any LSI retrofit emission control system verified before January 1, 2007,must be tested using the steady-state test procedure (C2) set forth in the, "California Exhaust Emission Standards and Test Procedures for New 2001 and Later Off-Road Large Spark-Ignition Engines" as incorporated by reference in section 2433(d), or the U.S. EPA transient test procedure as set forth in 40 CFR Part 1048, Subpart F, as adopted November 8, 2002. For off-road engines used in constant-speed operation, the applicant must use the steady-state test procedure (D2) set forth in the "California Exhaust Emission Standards and Test Procedures for New 2001 and Later Off-Road Large

Spark-Ignition Engines" as incorporated by reference in section 2433(d), or the U.S. EPA transient test cycle as outlined in 40 CFR Part 1048, Subpart F, as adopted November 8, 2002. The required test cycles are summarized in Table 2, below.

Table 2. Test Cycles for Emissions Reduction Testing

Test Type	***LSI Retrofit System Verification Date***	***Off-Road (including portable engines)***	***Off-Road (constant-speed operation)***
Engine	Pre-2007	Steady-state test cycle (C2) from ARB off-road regulations or U.S. EPA transient test cycle	Steady-state test cycle (D2) from ARB off-road Regulations or U.S. EPA transient test cycle
Engine	2007 and later	U.S. EPA transient test cycle	U.S. EPA transient test cycle

(2) *Systems verified in 2007 or later.* Any LSI retrofit emission control system verified on or after January 1, 2007, must be tested using the U.S. EPA transient test procedure as set forth in 40 CFR Part 1048, Subpart F, as adopted November 8, 2002.

(f) *Alternative Test Cycles and Methods.* The applicant may request the Executive Officer to approve an alternative test cycle or method in place of a required test cycle or method. In reviewing this request, the Executive Officer may consider all relevant information including, but not limited to, the following:

(1) Similarity of characteristics to the specified test cycle or method and in-use duty cycle.

(2) Body of existing test data generated using the alternative test cycle or method.

(3) Technological necessity.

(4) Technical ability to conduct the required test.

(g) Tests to *Verify HC, NOx, and CO Emissions Reductions.* A minimum of three hot-start tests for the test cycle selected from Table 2, or an Executive Officer-approved alternative test cycle, must be run for baseline and control configurations.

(h) *Results.* For all valid emission tests used to support emissions reduction claims, the applicant must report emissions of total hydrocarbons, oxides of nitrogen, and carbon monoxide in grams/brake horsepower-hour (g/bhp-hr).

(i) *Incomplete and Aborted Tests.* The applicant must identify all incomplete and aborted tests and explain why those tests were incomplete or aborted.

(j) *Additional Analyses.* The Executive Officer may require the applicant to perform additional analyses if there is reason to believe that the use of an LSI retrofit emission control system may result in the increase of toxic air contaminants, or other harmful compounds.
(1) In its determination, the Executive Officer may consider all relevant data, including but not limited to the following:
(A) The addition of any substance to the fuel, intake air, or exhaust stream.
(B) Whether a catalytic reaction is known or reasonably suspected to increase toxic air contaminants or ozone precursors.
(C) Results from scientific literature.
(D) Field experience.
(E) Any additional data.
(2) The Executive Officer will determine appropriate test methods for additional analyses in consultation with the applicant.

(k) *Quality Control of Test Data.* The applicant must provide information on the test facility, test procedure, and equipment used in the emission testing, including evidence establishing that the test equipment used meets the specifications and calibrations given in 40 CFR Part 86, subpart N.

(l) *Testing or inspection.* The Executive Officer may, with respect to any verified LSI retrofit emission control system sold, leased, offered for sale, or manufactured for sale in California, order the applicant to make available for testing and/or inspection a reasonable number of LSI retrofit emission control systems, and may direct that they be delivered at the applicant's expense to the state board at the Haagen-Smit Laboratory, 9528 Telstar Avenue, El Monte, California or where specified by the Executive Officer. The Executive Officer may also, with respect to any verified LSI retrofit emission control system being sold, leased, offered for sale, or manufactured for sale in California, have an applicant test and/or inspect a reasonable number of units at the applicant or manufacturer's facility or at any test laboratory under the supervision of the Executive Officer.

NOTE: Authority cited: Sections 39002, 39003, 39500, 39600, 39601, 39650-39675, 40000, 43000, 43000.5, 43011, 43013, 43018 and 43105, 43600, 43700, Health and Safety Code. Reference: Sections 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107, 43204, 43205, and 43205.5; Health and Safety Code.

§ 2784. Durability Demonstration Requirements.

(a) The applicant must demonstrate, to the satisfaction of the Executive Officer, the durability of the applicant's LSI retrofit emission control system through an

actual field or laboratory-based demonstration test. If the applicant chooses a laboratory-based durability demonstration, an additional field demonstration will be required to demonstrate in-field compatibility (pursuant to Section 2785). If the applicant has demonstrated the durability of the identical system in a prior verification or OEM certification, or has demonstrated durability through field experience, the applicant may request that the Executive Officer accept the previous demonstration in fulfillment of this requirement. In evaluating such a request, the Executive Officer may consider all relevant information including, but not limited to, the similarity of baseline emissions and application duty cycles, the relationship between the emission control group or engine family(ies) used in previous testing and the current emission control group, the number of engines tested, evidence of successful operation and user acceptance, and published reports.

(b) *Engine Selection.* Subject to the approval of the Executive Officer, the applicant may choose the engine to be used in the durability demonstration. The engine must be representative of the engines in the emission control group for which verification is sought. The selected engine need not be the same as the engine used for the emission testing (pursuant to Section 2783), but if the applicant does use the same engine, the emission testing results may also be used for the zero-hour durability tests.

(c) *Test Fuel.*

(1) The test fuel used shall be consistent with the fuel specifications as outlined in the "California Exhaust Emission Standards and Test Procedures for 2001 and Subsequent Model Passenger Cars, Light-Duty Trucks, and Medium- Duty Vehicles," as incorporated by reference in section 1961(d). If the engine is tested using the U.S. EPA test fuel, as outlined in 40 CFR Part 1065, the manufacturer shall demonstrate that the emission results are consistent with ARB Test Procedures. Manufacturers can use "commercially available fuels" to accumulate service hours but emission testing must be conducted using test fuel as specified in this section.

(2) During all engine tests, the engine shall employ lubricating oil consistent with the engine manufacturer's specifications for that particular engine. These specifications shall be recorded and declared in the verification application.

(d) *Service Accumulation.* The durability demonstration consists of an extended service accumulation period in which the LSI retrofit emission control system is used in the field or in a laboratory, with emissions reduction testing before and after the service accumulation. Service accumulation begins after the first emission test and concludes before the final emission test. The pre-conditioning period required in Section 2783 (c) cannot be used to meet the service accumulation requirements.

(1) Minimum Durability Demonstration Periods. The minimum durability demonstration period is 1,000 hours if it can be correlated or demonstrated to be equivalent to 2,500 hours in-use. The applicant must provide to the Executive Officer sufficient written documentation to justify the request for the minimum durability demonstration period. The applicant may propose a sampling scheme that could be used to support an accelerated durability schedule for approval by the Executive Officer. The sampling scheme may include, but is not limited to, logging only significant changes in a parameter, averages, or changes above some threshold value. Data must be submitted electronically in columns as a text file or another format approved by the Executive Officer.

(2) Fuel for Durability Demonstrations. The fuel used during durability demonstrations should be equivalent to the test fuel, or a fuel with properties less favorable to the durability of the retrofit emission control system. Durability demonstrations may, at the applicant's option and with the Executive Officer's approval, include intentional use of out-of-specification fuels so that data on the effects of using out-of-specification fuels may be obtained.

(e) *Test Cycle.* Testing requirements are summarized in Table 3. Note that the same cycle(s) must be used for both the initial (zero hour) and final (2,500 hour) tests as defined in Section 2783 (e).

Table 3. Emission Tests Required for Durability Demonstrations

Application	***LSI Retrofit System Verification Date***	***Test Type***	***Zero-Hour Test (prior durability demonstration) 2,500-Hour Test (after completion of 100% of the durability demonstration or the minimum durability demonstration)***
Off-Road and portable engines	Pre-2007	Engine	Steady-state test cycle from ARB off-road regulations or U.S. EPA transient test cycle or an alternative cycle
Off-Road and portable engines	2007 and later	Engine	U.S. EPA transient test cycle or an alternative cycle

(f) *Test Run.* The number of tests to be conducted in accordance with the required test cycle shown in Table 3 is described below.

(1) The LSI retrofit emission control system must undergo one set of emission tests: (3 hot starts each for baseline and with the retrofit emission control system) at the beginning (zero hour) and one set of emission tests (3 hot starts for baseline and with the emission control system) after completion

of the durability demonstration (2,500 hours) or the minimum durability demonstration period (1,000 hours). If there are substantial test data from previous field studies or field demonstrations, applicants may request that the Executive Officer consider these in place of the initial emission tests.

(2) As an alternative to testing a single unit before and after the service accumulation period, the applicant may request that the Executive Officer consider the testing of two identical units, one that has been pre-conditioned and another that has completed the service accumulation period. In reviewing the request, the Executive Officer may consider all relevant information, including, but not limited to, the following:

(A) The effect of the LSI retrofit emission control system on engine operation over time. Strategies that cause changes in engine operation are likely not to qualify for this testing option.

(B) The quality of the evidence the applicant can provide to support that the two units are identical.

(C) Previous experience with similar or related technologies.

(g) *Maintenance During Durability Demonstration.* Except for emergency engine repair, only scheduled maintenance on the engine and LSI retrofit emission control system may be performed during the durability demonstration. If normal maintenance includes replacement of any component of the engine emission control system, the time (years or hours) between component change must be reported with the results of the demonstration. If emergency repair was conducted on an engine equipped with the LSI retrofit emission control system within the durability demonstration period, the applicant must, within 30 days of the repair, report to the Executive Officer on what repair was performed and what components were involved, and provide an explanation on the possible cause(s) for the engine's and/or LSI retrofit emission control system's malfunction. Based on the information provided by the applicant, the Executive Officer will decide whether to allow that engine to continue to be used in the durability demonstration program, or to start anew the durability demonstration period.

(h) *Performance Requirements.* The LSI retrofit emission control system must meet the following requirements throughout the durability demonstration period:

(1) If the applicant claims a percent emissions reduction, the percent emissions reduction must meet or exceed the minimum percent emissions reduction associated with the LSI Level for which the applicant is seeking verification.

(2) If the applicant claims a reduced emission level, the reduced emission level must not exceed the emission level associated with the LSI Level for which the applicant is seeking verification.

(3) The LSI retrofit emission control system must maintain its physical integrity. Its physical structure and all of its components not specified for

regular replacement during the durability demonstration period must remain intact and fully functional.

(4) The LSI retrofit emission control system must not cause any damage to the engine, vehicle, or equipment.

(5) Except for emergency engine repair, no maintenance of the LSI retrofit emission control system beyond that specified in its owner's manual will be allowed without prior Executive Officer approval.

(i) *Failure During the Durability Demonstration Period.* If the LSI retrofit emission control system fails to maintain its initial verified percent emissions reduction or absolute emissions for any reason, the Executive Officer may downgrade the system to the verification level that corresponds to the lowest degraded performance observed in the durability demonstration period. If the LSI retrofit emission control system fails to maintain the emissions reduction performance pursuant to Sections 2784(h)(1) and 2784(h)(2), as demonstrated during the emission test pursuant to Section 2783, during the durability period, the LSI retrofit emission control system will not be verified. If the LSI retrofit emission control system fails in the course of the durability demonstration period, the applicant must submit a report explaining the circumstances of the failure within 90 days of the failure. The Executive Officer may then, as appropriate, determine whether to deny verification or allow the applicant to correct the failed LSI retrofit emission control system and either continue the durability demonstration or begin a new durability demonstration.

NOTE: Authority cited: Sections 39002, 39003, 39500, 39600, 39601, 39650-39675, 40000, 43000, 43000.5, 43011, 43013, 43018 and 43105, 43600, 43700, Health and Safety Code. Reference: Sections 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107, 43204, 43205, and 43205.5; Health and Safety Code.

§ 2785. Field Demonstration Requirements.

(a) *Compatibility.* The applicant must demonstrate compatibility of its LSI retrofit emission control system in the field with at least one piece of equipment belonging to the emission control group for which it seeks verification. Note that if the durability demonstration selected by the applicant is in-field, it may be used to satisfy the field demonstration requirement for that emission control group. However, an applicant that elected to demonstrate durability in-field must still comply with the reporting requirements as specified in 2785(c).

(1) Compatibility is determined by the Executive Officer based on the third-party statement (see section 2785 (c)) and any other data submitted. An LSI retrofit emission control system is compatible with the chosen application if it:

(A) Does not cause damage to the engine or engine malfunction;

(B) Does not hinder or detract from the vehicle or equipment's ability to perform its normal functions; and

(C) Is physically intact and well mounted with no signs of leakage or other visibly detectable problems.

(2) To determine whether separate field demonstrations are required when applying to extend additional engine or equipment in an existing emission control group or when applying to verify additional emission control groups, the Executive Officer may consider all relevant information, including, but not limited to existing field experience and engineering justification and analysis.

(b) *Test Period.* A piece of equipment must be operated with the LSI retrofit emission control system installed for a minimum period of 200 hours.

(c) *Reporting Requirements.* The applicant must provide a written statement from a third party approved by the Executive Officer, such as the owner or operator of the equipment used in the field demonstration. The written statement must be provided at the end of the test period and must describe the following aspects of the field demonstration: overall performance of the test application and the LSI retrofit emission control system, maintenance performed, problems encountered, and any other relevant information. The results of a visual inspection conducted by the third party at the end of the demonstration period must also be described. The description should comment on whether the LSI retrofit emission control system is physically intact, securely mounted, or leaking any fluids, and should include any other evaluative observations.

(d) *Failure During the Field Demonstration.* The LSI retrofit emission control system will be deemed to fail the field demonstration requirements if it could not comply with the criteria specified in Section 2785 (a)(1) during the test period. If the LSI retrofit emission control system fails in the course of the field demonstration, the applicant must notify ARB within 15 days of the failure, and submit a report explaining the circumstances of the failure within 90 days of the failure. The Executive Officer may then determine whether to deny verification or allow the applicant to correct the failed LSI retrofit emission control system and either continue the field demonstration or begin a new field demonstration.

NOTE: Authority cited: Sections 39002, 39003, 39500, 39600, 39601, 39650-39675, 40000, 43000, 43000.5, 43011, 43013, 43018 and 43105, 43600, 43700, Health and Safety Code. Reference: Sections 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107, 43204, 43205, and 43205.5; Health and Safety Code.

§ 2786. Other Requirements.

(a) *Fuel and Oil Requirements.* The applicant must specify the fuel and lubricating oil requirements necessary for proper functioning of the LSI retrofit emission control system. The applicant must also specify any consequences

that will result from failure to comply with these requirements, as well as methods for reversing any negative consequences.

(b) *Maintenance Requirements.* The applicant must identify all normal maintenance requirements for the LSI retrofit emission control system. The applicant must specify the recommended intervals for cleaning and/or replacing components. Any components to be replaced within the defects warranty period must be included with the original LSI retrofit emission control system package or provided free of charge to the customer at the appropriate maintenance intervals. Any normal maintenance items that the applicant does not intend to provide free of charge must be approved by the Executive Officer (the applicant is not required to submit cost information for these items). In addition, if applicable, the applicant must specify procedures for proper handling of spent components and/or materials cleaned from the LSI retrofit emission control system. If any such materials are hazardous, the applicant must identify them as such in the owner's manual.

(c) *System Labeling.*

(1) The applicant must either affix legible and durable labels, or provide such labels to the installer along with instructions on how to affix them, on both the LSI retrofit emission control system and the engine on which the LSI retrofit emission control system is installed, except as noted in (3) below. The required labels must identify the name, address, and phone number of the manufacturer, the LSI retrofit emission control group name (defined in (2) below), a unique serial number for the LSI retrofit emission control system and the month and year of manufacture. The month and year of manufacture are not required on the label if this information can be readily obtained from the applicant by reference to the serial number. A scale drawing of a sample label must be submitted with the verification application. Unless an alternative is approved by the Executive Officer, the label information must be in the following format:

Name, Address, and Phone Number of Manufacturer
LSI Retrofit Emission Control Group Name
Product Serial Number
ZZ-ZZ (Month and Year of manufacture, e.g., 11-05)

(2) LSI Retrofit Emission Control Group Name. Each LSI retrofit emission control system shall be assigned a name defined as below:

CA/IV/MMM/MY/LL##/NHP## or NHL##/APP/XXXXX
Where:

CA:	Designates an LSI retrofit emission control system verified in California
IV:	Year of interim verification
MMM:	Manufacturer code (assigned by the Executive Officer)
MY:	Date of manufacture (month, year)
LL##:	Verified LSI Level (e.g., LL2 means the retrofit system was verified to the "LSI Level 2", LL3a means the retrofit system was verified to "LSI Level 3a).
NHP##:	Verified HC + NOx reduction percent (e.g., NH75 means HC + NOx reduction of 75 percent).
NHL##:	Verified HC + NOx absolute emissions in units of g/bhp-hr, (e.g., NH3.0 means verified HC + NOx emission level of 3.0 g/bhp-hr).
APP:	Verified application which may include a combination of Off-road (OF),or Stationary (ST)
XXXXX:	Five alphanumeric character code issued by the Executive Officer

(3) The applicant may request that the Executive Officer approve an alternative label. In reviewing this request, the Executive Officer may consider all relevant information including, but not limited to, the informational content of an alternative label as proposed by the applicant.

(d) *Additional Information*. The Executive Officer may require the applicant to provide additional information about the LSI retrofit emission control system or its implementation when such information is needed to assess environmental impacts associated with its use.

(e) *Owner's Manual*. The applicant must provide a copy of the LSI retrofit emission control system owner's manual, which must clearly specify at least the following information:

(1) Warranty statement including the warranty period over which the applicant is liable for any defects.
(2) Installation procedure and maintenance requirements for the LSI retrofit emission control system.
(3) Fuel consumption improvement or penalty, if any.
(4) Fuel requirements, if any.
(5) Requirements for lubrication oil quality and maximum lubrication oil consumption rate
(6) Contact information for replacement components and cleaning agents.

(f) *Noise Level Control.* Applicants must ensure that the LSI retrofit emission control system complies with all applicable local government requirements for noise control.

(g) *Limit on CO.* In order for an LSI retrofit emission control system to be verified, it must comply with one of the following two limits on CO:
(1) For an LSI retrofit emission control system designed to be installed in a certified engine, the system must not increase the emissions of CO greater than the CO emission standards for new, emission-certified, off-road LSI engines adopted by the Air Resources Board and in effect for the model year in which the engine certification was issued;
(2) For an LSI retrofit system designed to be installed in an engine that is not emission-certified, the system must not cause the CO emission level to exceed the greater of 37 g/bhp-hr or ten percent above the engine's baseline CO emission level as determined in accordance with sections 2783 and 2784.

(h) *Emission Sampling Ports.* To facilitate in-field and normal maintenance diagnostic emission measurements, the applicant may choose to design the LSI retrofit emission control system to have a minimum of two sampling ports where emissions measurements could be made. Guideline suggestions for the sampling port criteria are presented here:
(1) The sampling ports are to be designed to allow for measurements of uncontrolled, engine-out emissions and controlled, tailpipe emissions;
(2) The sampling ports are to be ¼ inch NPT half couplings, either welded to the exhaust system, or manufactured into the retrofit emission control device where possible;
(3) The sampling port to be used for measuring uncontrolled, engine-out emissions is to be located in a straight section of the exhaust pipe upstream from the retrofit emission control device, after the turbocharger, if so equipped, with a minimum of one to two pipe diameters from any elbows upstream of the sampling port. It is acceptable to locate the sampling port adjacent to the oxygen sensor threaded port, if so equipped;
(4) The sampling port to be used for measuring controlled, tailpipe emissions is to be placed on the muffler body, after the catalyst, if so equipped, or if in the exhaust pipe, should be located a minimum distance of 10 inches from the tailpipe opening, if feasible, otherwise, it should be located as far as possible from the tailpipe opening;
(5) The locations of the sampling ports are to be designed to be accessible to test personnel without removing major engine or equipment components, such as the forklift counterweight, for example;
(6) The sampling ports are to be equipped with threaded plugs.
(7) If the sampling ports are designed to be installed by the retrofit system installer, the applicant must provide all necessary parts and complete instructions for proper installation;

NOTE: Authority cited: Sections 39002, 39003, 39500, 39600, 39601, 39650-39675, 40000, 43000, 43000.5, 43011, 43013, 43018 and 43105, 43600, 43700, Health and Safety Code. Reference: Sections 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107, 43204, 43205, and 43205.5; Health and Safety Code.

§ 2787. Warranty Requirements.

(a) (1) *Product Warranty.*

(A) The applicant must provide a warranty to all owners, for ownership within the warranty period, and lessees, for lease contract within the warranty period, that its verified LSI retrofit emission control system is free from defects in design, materials, workmanship, or operation of the LSI retrofit emission control system which cause the LSI retrofit emission control system to fail to conform to at least 90 percent of the its verified level for the minimum warranty period of 3 years or 2,500 hours, provided the operation of and conditions of use for the equipment, engine, and LSI retrofit emission control system conform with the operation and conditions specified in the ARB's Executive Order and that the engine or equipment belongs to the emission control group as specified in the ARB's Executive Order for that LSI retrofit emission control system.

(B) In the absence of a device to measure hours of use, the LSI retrofit emission control system must be warranted for a period of three years. If a device to measure hours is used, the engine must be warranted for 3 years or 2,500 hours, whichever occurs first. The warranty must cover the full repair or replacement cost of the LSI retrofit emission control system, including parts and labor.

(C) The warranty must also cover the full repair or replacement cost of returning the engine components to the condition they were in prior to the failure, including parts and labor, for damage to the engine proximately caused by the verified LSI retrofit emission control system. Repair or replacement of any warranted part, including the engine, must be performed at no charge to the equipment or engine owner. This includes only those relevant diagnostic expenses in the case in which a warranty claim is valid. The applicant may, at its option, instead pay the fair market value of the engine prior to the time the failure occurs.

(D) The repair or replacement of any warranted part, otherwise eligible for warranty coverage, may be excluded from such warranty if the LSI retrofit emission control system or engine has been abused, neglected, or improperly maintained, and such abuse, neglect, or improper maintenance was the direct cause of the need for the repair or replacement of the part.

(E) Failure of the equipment or engine owner to ensure scheduled maintenance or to keep maintenance records for the equipment,

engine, or LSI retrofit emission control system may, but shall not per se, be grounds for disallowing a warranty claim.

(2) *Installation Warranty*

(A) A person or company that installs a verified LSI retrofit emission control system must warrant that the installation is free from defects in workmanship or materials which cause the LSI retrofit emission control system to fail to conform to at least 90 percent of its verified level for the minimum warranty period of 3 years or 2,500 hours, whichever occurs first, except as noted in 2787(a)(1)(B), or the other requirements as specified in sections 2786(c) and (e).

(B) The extent of the warranty coverage provided by installers must be the same as the warranty provided by the applicant as established in subsection (a)(1) and the same exclusions must apply.

(b) (1) *Product Warranty Statement.* The applicant must furnish a copy of the following statement in the owner's manual. The applicant may include descriptions of circumstances that may result in a denial of warranty coverage, but these descriptions shall not otherwise limit warranty coverage in any way.

YOUR WARRANTY RIGHTS AND OBLIGATIONS

(Applicant's name) must warrant the LSI retrofit emission control system in the application for which it is sold or leased to be free from defects in design, materials, workmanship, or operation of the LSI retrofit emission control system which cause the LSI retrofit emission control system to fail to conform to the emission control performance level it was verified to, or to the requirements in the California Code of Regulations, Title 13, Chapter 9, Article 8, Sections 2780 to 2786, and 2789, for 3 years or 2,500 hours, pursuant to Section 2787(a)(1), provided there has been no abuse, neglect, or improper maintenance of your LSI retrofit emission control system, engine or equipment, as specified in the owner's manuals. Where a warrantable condition exists, this warranty also covers the engine from damage caused by the LSI retrofit emission control system, subject to the same exclusions for abuse, neglect or improper maintenance. Please review your owner's manual for other warranty information. Your LSI retrofit emission control system may include a core part (e.g., three-way catalyst, carburetor, mixer or regulator) as well as hoses, connectors, and other emission-related assemblies. Where a warrantable condition exists, (applicant's name) will repair or replace your LSI retrofit emission control system at no cost to you including diagnosis, parts, and labor.

WARRANTY COVERAGE:

For a (engine size) engine used in a(n) (type of application) application, the warranty period will be 3 years or 2,500 hours of operation, whichever occurs first. If any emission-related part of your LSI retrofit emission control system is defective in design, materials, workmanship, or operation of the LSI retrofit emission control system thus causing the LSI retrofit emission control system to fail to conform to the emission control performance level it was verified to, or to the requirements in the California Code of Regulations, Title 13, Chapter 9, Article 8, Sections 2780 to 2786, and 2789, within the warranty period, as defined above. (Applicant's name) will repair or replace the LSI retrofit emission control system, including parts and labor.

In addition, (applicant's name) will replace or repair the engine components to the condition they were in prior to the failure, including parts and labor, for damage to the engine proximately caused by the verified LSI retrofit emission control system. This also includes those relevant diagnostic expenses in the case in which a warranty claim is valid. (Applicant 's name) may, at its option, instead pay the fair market value of the engine prior to the time the failure occurs.

OWNER'S WARRANTY RESPONSIBILITY

As the (engine, equipment) owner, you are responsible for performing the required maintenance described in your owner's manual. (Applicant's name) recommends that you retain all maintenance records and receipts for maintenance expenses for your engine or equipment, and LSI retrofit emission control system. If you do not keep your receipts or fail to perform all scheduled maintenance, (applicant's name) may have grounds to deny warranty coverage. You are responsible for presenting your equipment or engine, and LSI retrofit emission control system to (applicant's name) or a (applicant's name) dealer as soon as a problem is detected. The warranty repair or replacement should be completed in a reasonable amount of time, not to exceed 30 days. If a replacement is needed, this may be extended to 90 days should a replacement not be available, but must be performed as soon as a replacement becomes available.

If you have questions regarding your warranty rights and responsibilities, you should contact (Insert chosen applicant's contact) at 1-800-xxx-xxxx or the California Air Resources Board at 9528 Telstar Avenue, El Monte, CA 91731, or (800) 363-7664, or electronic mail: helpline@arb.ca.gov.

(b)(2) *Installation Warranty Statement.* The installer must furnish the owner with a copy of the following statement.

YOUR WARRANTY RIGHTS AND OBLIGATIONS

(Installer's name) must warrant that the installation of an LSI retrofit emission control system is free from defects in workmanship or materials which cause

the LSI retrofit emission control system to fail to conform to the emission control performance level it was verified to, or to the requirements in the California Code of Regulations, Title 13, Sections 2781 to 2786 and 2789. The warranty period and the extent of the warranty coverage provided by (installer's name) must be the same as the warranty provided by the product manufacturer, and the same exclusions must apply.

OWNER'S WARRANTY RESPONSIBILITY

As the engine or equipment owner, you are responsible for presenting your engine or equipment and LSI retrofit emission control system to (installer's name) as soon as a problem with the installation is detected.

If you have questions regarding your warranty rights and responsibilities, you should contact (Insert chosen installer's contact) at 1-800-xxx-xxxx or the California Air Resources Board at 9528 Telstar Avenue, El Monte, CA 91731, or (800) 363-7664, or electronic mail: helpline@arb.ca.gov.

(c) (1) *Annual Warranty Report.* The applicant must submit a warranty report to the Executive Officer by February 1 of each calendar year. The warranty report must include the following information:

(A) Annual and cumulative sales, and annual and cumulative leases of equipment installed with LSI retrofit emission control systems—(California only).

(B) Annual and cumulative production of LSI retrofit emission control systems (California only).

(C) Annual summary of warranty claims (California only). The summary must include:

i. A description of the nature of the claims and of the warranty replacements or repairs. The applicant must categorize warranty claims for each LSI retrofit emission control system group by the component(s) part number(s) replaced or repaired.

ii. The number and percentage of LSI retrofit emission control systems of each model for which a warranty replacement or repair was identified.

iii. A short description of the LSI retrofit emission control system component that was replaced or repaired under warranty and the most likely reason for its failure.

(E) (D) Date the warranty claims were filed and the engine family and application the LSI retrofit emission control systems were used with. The reason(s) for any instances in which warranty service is not provided to end-users that file warranty claims. The applicant may also want to report instances where the applicant chose to honor warranty claims even though the applicant has determined that those warranty claims were invalid or that they were not required per Section 2787 of this regulation.

(c) (2) *Periodic Warranty Reports.*

(A) The applicant must submit a warranty report within 30 calendar days if there are three or more warranty claims for the same component or same part number repaired or replaced; or, if there are four or more total warranty claims, or four percent of the cumulative number of LSI retrofit systems subject to these warranty provisions, whichever is greater. The warranty report must include the following information:

i. A description of the nature of the claims and of the warranty replacements or repairs. The applicant must categorize warranty claims for each LSI retrofit emission control group by the component(s) part number(s) replaced or repaired.

ii. The number and percentage of LSI retrofit emission control systems of each model for which a warranty replacement or repair was identified.

iii. A short description of the LSI retrofit emission control system component that was replaced or repaired under warranty and the most likely reason for its failure.

iv. Date the warranty claims were filed and the engine family and application the LSI retrofit emission control systems were used with.

v. The reason(s) for any instances in which warranty service is not provided to end-users that file warranty claims. The applicant may also want to report instances where the applicant chose to honor warranty claims even though the applicant has determined that those warranty claims were invalid or that they were not required per Section 2787 of this regulation.

(B) The applicant must comply with the requirements specified pursuant to Section 2787(c)(2)(A), above, for warranty claims submitted to the applicant after the reporting dates of the periodic warranty report.

NOTE: Authority cited: Sections 39002, 39003, 39500, 39600, 39601, 39650-39675, 40000, 43000, 43000.5, 43011, 43013, 43018 and 43105, 43600, 43700, Health and Safety Code. Reference: Sections 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107, 43204, 43205, and 43205.5; Health and Safety Code.

§ 2788. Determination of Emissions Reduction.

(a) *Calculation of Emissions Reduction.* The emissions reduction verified for an LSI retrofit emission control system is based on the average of all valid test results, as specified in Sections 2783(g) and 2784(f), before (baseline) and after (control) implementation of the LSI retrofit emission control system. Test results from both the emission testing and durability testing are to be included. If the applicant chooses to perform either the zero hour or the 2500-hour durability baseline test, but not both, it must use those results to calculate the reductions obtained in both the zero hour and 2500-hour control tests.

(1) Percentage Reduction. The percentage reduction for a given pair of baseline and control test sets (where a "set" consists of all test cycle repetitions) is the difference between the average baseline and average

control emissions divided by the average baseline emissions, multiplied by 100 percent. The average of all such reductions, as shown in the equation below, is used in the verification of an LSI retrofit emission control system.

$$\text{Percentage Reduction} = 100 \times \frac{\Sigma\,[(\text{baseline}_{AVG} - \text{control}_{AVG})/\text{baseline}_{AVG}]}{\text{Number of control test sets}}$$

Where:

Σ = sum over all control test sets

baseline_{AVG} or control_{AVG} = average of emissions from all baseline or control test repetitions within a given set

(2) Absolute Emission Level. The absolute emission level is the average control emission level, as defined in the following equation:

$$\text{Absolute Emission Level} = \frac{\Sigma\,(\text{control}_{AVG})}{\text{Number of control test sets}}$$

(b) *Categorization of the LSI Retrofit Emission Control System.* The Executive Officer shall categorize an LSI retrofit emission control system to reduce HC and NOx emissions based on its verified emissions reductions. An LSI retrofit emission control system that reduces HC and NOx will be assigned its verified percentage reduction or verified emissions reduction level, pursuant to section 2782(f).

The Executive Officer may lower the verification level or revoke the verification status of a verified LSI retrofit emission control group if the applicant fails to observe the requirements of Sections 2786 or 2787. The Executive Officer must allow the applicant an opportunity to address the possible lowering or revocation of the verification level in a corrective report to the Executive Officer and the Executive Officer may make this determination based on all relevant information.

NOTE: Authority cited: Sections 39002, 39003, 39500, 39600, 39601, 39650-39675, 40000, 43000, 43000.5, 43011, 43013, 43018 and 43105, 43600, 43700, Health and Safety Code. Reference: Sections 39650-39675, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107, and 43204-43205.5 Health and Safety Code; Title 17 California Code of Regulations Section 93000.

§ 2789. In-Use Compliance Requirements.

(a) *Applicability.* These in-use compliance requirements apply to all LSI retrofit emission control systems for off-road applications. It is the responsibility of the applicant to perform in-use compliance testing for each verified LSI retrofit emission control group. Testing is required when 50 units within a given LSI retrofit emission group have been sold or leased in the California market.

(b) *Test Period.* Applicants must obtain access to and test LSI retrofit emission control systems, as described below in (c), (d), and (e), once they have been operated between 1,500 and 2,000 hours or between 22 and 29 months, whichever comes first.

(c) *Selection of LSI Retrofit Emission Control Systems for Testing.* For each LSI retrofit emission control group, the Executive Officer will identify a representative sample of engines or equipment equipped with LSI retrofit emission control systems for in-use compliance testing. The engines or equipment with the selected LSI retrofit emission control systems installed must have good maintenance records and may receive a tune-up or normal maintenance prior to testing. The applicant must obtain information from the end users regarding the accumulated hours of usage, maintenance records (to the extent practicable), operating conditions and a description of any unscheduled maintenance that may affect the emission results. If the specified information is not available for the engine or equipment selected, the Executive Officer may select a different engine or equipment for testing. Upon notification that an engine or equipment has been selected, an applicant would have 6 months to provide an in-use compliance testing proposal for approval by the Executive Officer. Testing would begin when the engines had accumulated sufficient hours of service; testing must be completed within one year of notification.

(d) *Number of LSI Retrofit Emission Control Systems to be Tested.* The number of LSI retrofit emission control systems an applicant must test will be determined as follows:

(1) A minimum of four LSI retrofit emission control systems in each LSI retrofit emission control group must be tested. For every system tested that does not reduce emissions by at least 90 percent of the lower bound of its initial verification level, two more LSI retrofit emission control systems from the same group must be obtained and tested. The total number of systems tested shall not exceed ten per LSI retrofit emission control group.

(2) At the discretion of the Executive Officer, applicants may begin by testing more than the minimum of four LSI retrofit emission control systems. Applicants may concede failure of an emission control system before testing a total of ten LSI retrofit emission control systems.

(e) *In-use Compliance Emission Testing.* Applicant must measure emissions using one of the following test procedures for in-use compliance emission testing:

(1) *Laboratory Testing.* Remove the selected engines or the retrofit emission control systems for testing in a laboratory. Applicants must follow the testing procedure used for initial emissions reduction verification as described in Section 2783. For engines originally verified to a percentage reduction, both baseline and control tests are required; for engines originally verified to an absolute emission, only control tests are required.

In addition, applicants must use the same test cycle(s) that they used to verify the LSI retrofit emission control system originally.

(2) *Testing Installed Engines.* Test the selected engines while they remain installed in the equipment. Applicants must follow the U.S. EPA field-testing procedures as specified in 40 CFR part 1065, subpart J, as adopted November 8, 2002. The accuracy and precision of the measurement system used for in-use testing must be at least +/-5 percent or better. For engines originally verified to a percentage reduction, both baseline and control tests are required; for engines originally verified to an emission level, only control tests are required.

(3) *Alternative In-Use Testing.* The Executive Officer may approve an alternative to the in-use testing described above, on a case-by-case basis. The proposed alternative must use scientifically sound methodology and be designed to accurately determine whether the LSI retrofit emission control system is in compliance with the requirements that are specified in the verification Executive Order. If the applicant wants to use an alternative in-use test procedure, the applicant should submit the proposed alternative in-use test procedure at the same time the applicant submits the proposed verification testing procedure (pursuant to Section 2782(b) for LSI retrofit control system verification. If the applicant proposes an alternative test to determine in- use emissions of the LSI retrofit system, the applicant must provide data to show that the emission test results from the proposed alternative test are consistent with the emission test results derived from engine dynamometer test for the test cycle(s) that was used in the initial verification of the LSI retrofit system.

(f) If an LSI retrofit emission control system fails catastrophically during the in-use compliance testing, the applicant must provide an investigative report detailing the causes of the failure to the Executive Officer within 90 days of the failure.

(g) The Executive Officer may, with respect to any LSI retrofit emission control system sold, leased, offered for sale, or manufactured for sale in California, order the applicant to make available for compliance testing and/or inspection a reasonable number of LSI retrofit emission control systems, and may direct that the retrofit emission control systems be delivered at the applicant's expense to the state board at the Haagen-Smit Laboratory, 9528 Telstar Avenue, El Monte, California or where specified by the Executive Officer. The Executive Officer may also, with respect to any LSI retrofit emission control system being sold, leased, offered for sale, or manufactured for sale in California, have an applicant compliance test and/or inspect a reasonable number of units at the applicant or manufacturer's facility or at any test laboratory under the supervision of the ARB Executive Officer.

(h) *In-Use Compliance Report.* The applicant must submit an in-use compliance report to the Executive Officer within three months of completing testing. The

following information must be reported for each of the minimum of four LSI retrofit emission control systems tested:
(1) Parties involved in conducting the in-use compliance tests.
(2) Quality control and quality assurance information for the test equipment.
(3) LSI retrofit emission control group name and manufacture date.
(4) Equipment and type of engine (engine family name, make, model year, model, displacement, etc.) the LSI retrofit emission control system was applied to.
(5) Estimated hours the LSI retrofit emission control system was in use.
(6) Results of all emission testing.
(7) Summary of all maintenance, adjustments, modifications, and repairs performed on the LSI retrofit emission control system.

(i) The Executive Officer may request the applicant to perform additional in-use testing if the warranty claims exceed the thresholds specified in section 2787(c)(2)(A) or based on other relevant information. As noted in section 2787(c)(2)(A), if warranty claims exceed the specified thresholds, the applicant must notify the Executive Officer and submit a warranty report within 30 calendar days of that time.

(j) Conditions *for Passing In-Use Compliance Testing*. For an LSI retrofit emission control system to pass in-use compliance testing, emission test results must indicate that the retrofit system reduced emissions by at least 90 percent of the lower bound of the emissions reduction level to which the Executive Officer originally verified it to. If the first four LSI retrofit emission control systems tested within an LSI retrofit emission control group meet this standard, the LSI retrofit emission control group passes in-use compliance testing. If any of the first four LSI retrofit emission control systems tested within an LSI retrofit emission control group fail to reduce emissions by at least 90 percent of the lower bound of the emissions reduction level to which the Executive Officer originally verified it to, and if more than four units are tested, at least 70 percent of all units tested must pass the 90 percent standard for the LSI retrofit emission control group to pass in-use compliance testing. For each failed test, for which the cause of failure can be attributed to the product and not to maintenance or other engine-related problems, two additional units must be tested, up to a total of ten units per LSI retrofit emission control group.

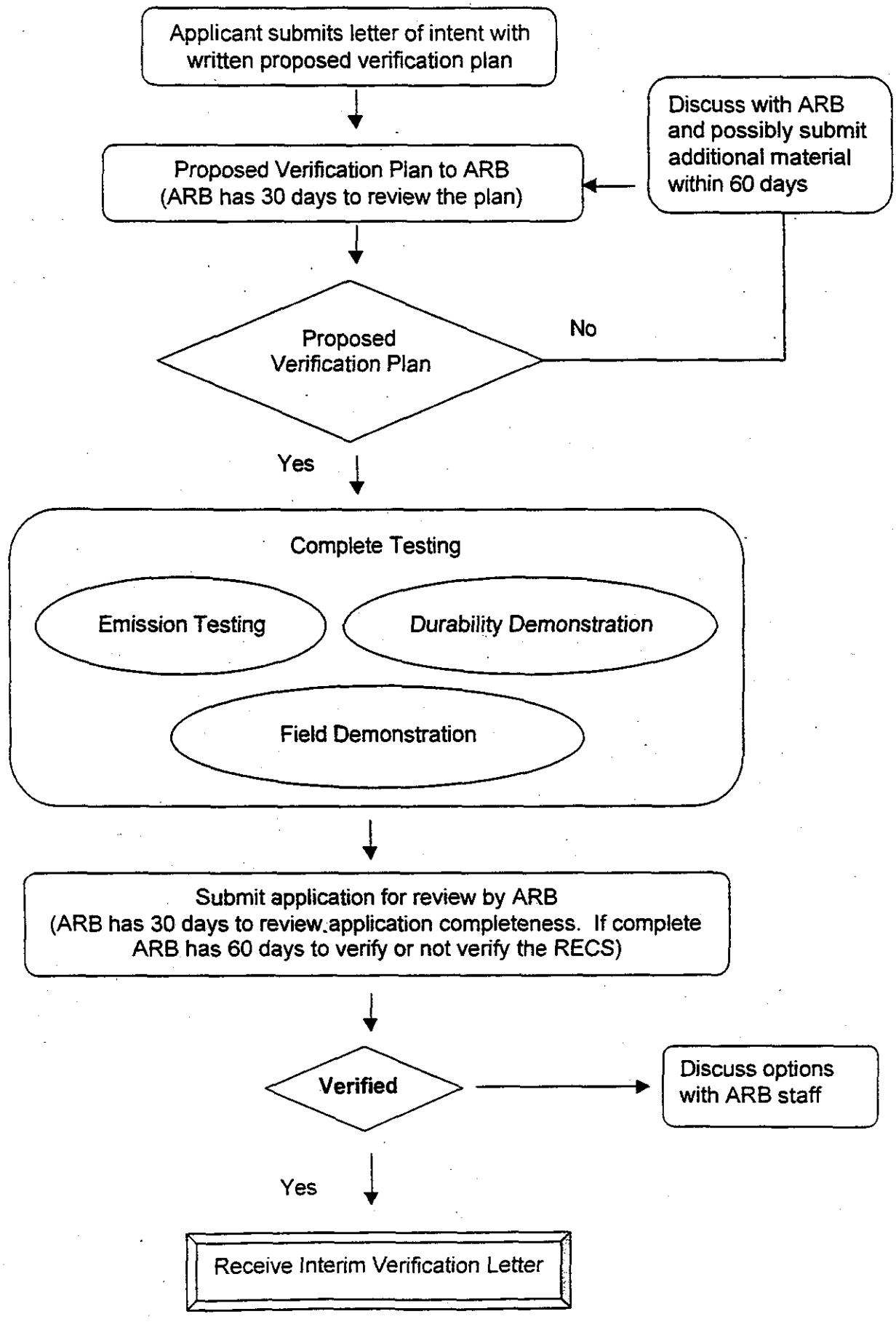
(k) *Failure of In-use Compliance Testing – Remedial Action*. If the LSI retrofit system from an emission control group does not meet the minimum requirements for in-use compliance testing, the applicant must submit a remedial report within 90 days after the in-use compliance report is submitted. The remedial report must include:
(1) Summary of the in-use compliance report.
(2) Detailed analysis of the failed LSI retrofit emission control systems and possible reasons for failure.

(3) Remedial measures to correct or replace failed LSI retrofit emission control systems as well as the rest of the in-use LSI retrofit emission control systems.

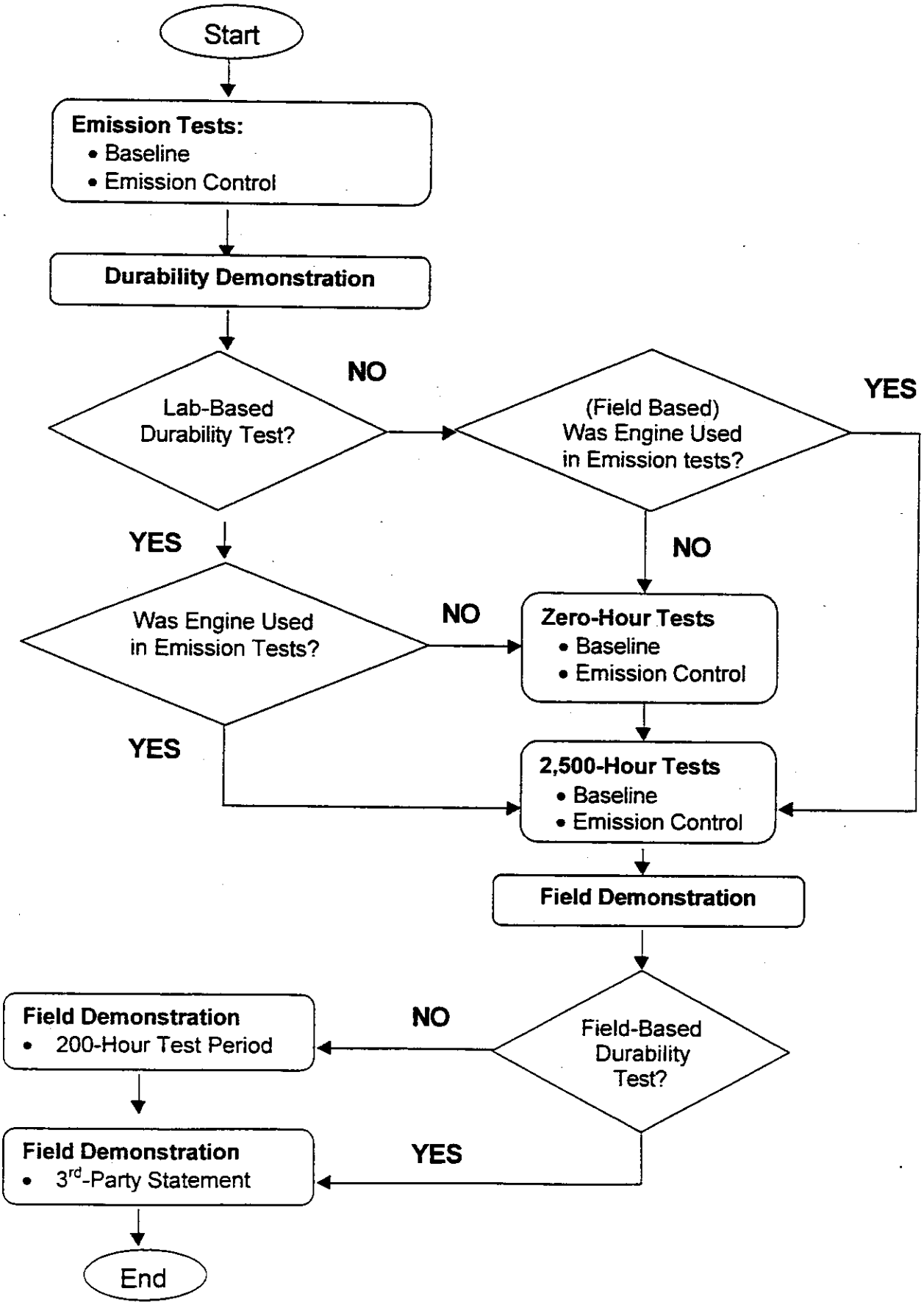
(l)The Executive Officer may evaluate the remedial report, annual warranty report, and all other relevant information to determine if the LSI retrofit emission control group passes in-use compliance testing. The Executive Officer may request more information from the applicant. Based on this review, the Executive Officer may lower the verification level or revoke the verification status of a verified LSI retrofit emission control group. The Executive Officer may also lower the verification level or revoke the verification status of a verified LSI retrofit emission control group, if the applicant does not conduct in-use compliance testing in accordance with this section, or if the Executive Officer conducts in-use compliance testing in accordance with this section (including alternative testing) and the LSI retrofit emission control group does not pass the standards in this section. The Executive Officer must allow the applicant an opportunity to address the possible lowering or revocation of the verification level in a remedial report to the Executive Officer prior to taking action lowering or revoking the verification level, and shall consider all relevant information.

NOTE: Authority cited: Sections 39002, 39003, 39500, 39600, 39601, 39650-39675, 40000, 43000, 43000.5, 43011, 43013, 43018 and 43105, 43600, 43700, Health and Safety Code. Reference: Sections 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107, 43204, 43205, and 43205.5; Health and Safety Code.

Attachment 2: Interim Verification Process Flowchart



Attachment 3: Interim Verification Testing Flowchart



No written material available at time of electronic book creation.