United States
Environmental Protection
Agency

Air and Radiation

EPA420-S-05-005
June 2005

California Oxygen Waiver Decision

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Transportation and Regional Programs Division
Office of Transportation and Air Quality
U.S. Environmental Protection Agency

Executive Summary

The Clean Air Act requires that all reformulated gasoline (RFG) must meet an oxygen content requirement. In March, 1999, California Governor Gray Davis issued an order banning use of MTBE in gasoline starting January 1, 2003 (later changed to January 1, 2004) and in April, 1999, he requested that EPA waive the RFG oxygen content requirement for federal RFG in California. EPA may grant a waiver of the oxygen content requirement under Section 211(k)(2)(B) of the Act, if EPA determines that compliance with the oxygen content requirement would "prevent or interfere with the attainment by the area of a national primary ambient air quality standard."

California's claim was that a waiver would provide California gasoline manufacturers flexibility to produce either oxygenated or non-oxygenated RFG, and this would result in less emissions related to ozone and particulate matter than if all the gasoline were oxygenated.

EPA performed a complex analysis, prior to its June 12, 2001 decision, to evaluate the emissions impact of a waiver under several refining scenarios. The analysis included 1) refinery modeling to predict the properties of California gasoline with and without a waiver, and 2) generation and use of models to predict changes in vehicle and nonroad emissions in the California fleet, based upon changes in fuel properties induced by a waiver.

EPA's initial evaluation of the emissions impacts of a waiver showed an expected reduction in oxides of nitrogen (NOx), increase in carbon monoxide (CO), and significant uncertainty about the overall impact on volatile organic compounds (VOC). There was no clear evidence that the emissions changes from a waiver would tend to reduce ozone, and, in fact, it was possible that it could increase ozone.

EPA's position was that a minimum threshold criterion for granting of a waiver was a clear demonstration of the impacts of a waiver on any applicable NAAQS, and a showing that it would aid in attaining at least one National Ambient Air Quality Standard (NAAQS) and would not hinder attaining any other NAAQS. On June 12, 2001, EPA denied the waiver request because the impact of a waiver on ozone was uncertain - it was not clear whether a waiver of the oxygen content requirement would cause ozone levels to decrease or increase. In light of this, EPA did not evaluate the effect a waiver would have on particulate matter (PM).

The State of California petitioned for judicial review of EPA's decision to deny the waiver. See Davis v. EPA, 348 F.3d 772 (9th Cir. 2003). The Court largely upheld EPA's interpretation of the Act and its application to California's request for a waiver. However, the Court found that EPA had abused its discretion by refusing to evaluate the effect that an oxygen content waiver would have on California's efforts to comply with the PM NAAQS. Accordingly, the court vacated EPA's decision and remanded it to the

agency with instructions to review the waiver request with full consideration of the effects of a waiver on both the ozone and PM NAAQS.

On February 2, 2004, California submitted new information in a letter to EPA. The submission contained new analyses and information regarding commingling and permeation emissions associated with the use of ethanol, as well as analyses pertaining to the relationship of NOx emissions to PM formation.

The February 2, 2004 submission from California EPA contained an analysis which examined the contribution of ammonium nitrate to PM10 and PM-2.5 in California, and in turn, the contribution of NOx emissions to ammonium nitrate and ultimately to PM concentrations. The analysis relied upon monitored PM10 and PM2.5 concentrations at stations in the San Joaquin Valley (SJV) and the South Coast (SC), and also used chemical mass balance (CMB) modeling performed in conjunction with the SJV and SC State Implementation Plans (SIPs) for PM10. California's analysis indicates that the higher NOx emissions associated with compliance with the RFG oxygen content requirement in California are likely to contribute to higher PM10 and PM2.5 concentrations in SJV and SC such that a waiver of the oxygen content requirement would be expected to lead directionally to reduced PM concentrations.

After careful consideration of CARB's analysis, we believe that the evidence before EPA establishes a clear directional relationship between a waiver of the RFG oxygen content requirement in California and PM formation in SJV and SC.

With regard to ozone, EPA's June, 2001 decision to deny California's request for an oxygen content waiver was based on the conclusion that the directional effect of a waiver on VOC emissions was uncertain. In its February 2, 2004 submission, California provided additional information and analysis relating to commingling and permeation VOC emissions due to using ethanol for meeting the oxygen content requirement in RFG. This information addresses:

- The degree to which a waiver will result in increased emissions of VOC due to commingling of gasoline with ethanol and gasoline without ethanol

- VOC permeation increases from nonroad equipment and gasoline cans that result from an increased use of ethanol in gasoline

The February 2, 2004 submission included several documents relevant to California's revised commingling and permeation analyses. To support the revised commingling estimates, California included a California Air Resources Board (CARB) Commingling Study that provided recent data on California consumer fueling habits and direct measurements of Reid Vapor Pressure (RVP) increases in consumers' vehicle fuel tanks. The report also contained estimates using a simulation model. California

provided two technical reports relevant to permeation emissions.[1] Both of these reports contained results from test programs where ethanol and non-ethanol gasolines were used.

California's more recent commingling analysis uses assumptions that are reasonable interpretations from the only real-world studies available for California consumer habits associated with re-fueling. Consequently, it is reasonable to reassess the impact of an oxygen content waiver on VOC emissions in light of the new data submitted. California's analysis leads us to revise our previously estimated ranges of commingling RVP increases in such a fashion that we believe the best estimate is now similar to the estimate made by California in their most recent submission.

California, as previously noted, also submitted estimates of the additional VOC emission reductions that could occur with a waiver, based on a reduction of permeation related emissions. California's revised estimate from off-road engines appears to be technically reasonable. The study appears to present an experimental design that can be expected to reasonably estimate at least overall permeation emission changes due to the use of ethanol in off-road engines.

Similarly, the study of permeation emissions from containers appears to be adequately designed to reasonably estimate increased permeation emissions from containers with ethanol gasoline, recognizing there is little or no additional information available on the subject.

When this new information regarding ethanol-blended gasoline was incorporated into their previous analysis, California estimated that total VOC emissions in the South Coast Air Basin (SCAB) would decrease with an oxygen content waiver.

EPA independently calculated revised estimates of expected VOC emissions changes from a waiver for the scenarios where ethanol was blended at 2.0 weight percent oxygen, the blending level currently used in California and expected to be used in the future. In addition to evaluating the commingling effect representing California's estimate of the likely waiver impact, EPA also evaluated net changes assuming a higher, more conservative commingling effect. EPA also used the permeation VOC impacts which California reported. This revised analysis estimates net VOC reductions for each of these scenarios at both levels of commingling impact. The analysis shows that, in all scenarios, net VOC emissions would be expected to decrease with an oxygen content waiver.

With these revised estimates, total VOC and NOx emissions are likely to decrease with a waiver while CO emissions are likely to increase. The decreases in

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[1] The commingling and permeation reports are cited and discussed in the body of this document.

NOx and VOCs would be expected to directionally reduce ozone. The increase in CO may have an adverse impact on ozone. However, CO is far less reactive in contributing to ozone production than either VOC or NOx. The effect on ozone of the increase in CO emissions and the effect on ozone of the decrease in VOC emissions are expected to approximately offset each other. When the beneficial effect of a reduction in NOx emissions is also taken into account, it is readily apparent that the effect of decreases in these more important ozone-forming emissions more than offsets the effect of CO increases. In light of this revised analysis, EPA concludes that the overall impact on emissions is slight. We found that total VOC and NOx emissions are likely to decrease with a waiver while CO emissions are likely to increase. The net change in emissions would likely have an overall benefit in terms of ozone, for all scenarios considered.

In the previous decision to deny California's waiver request, EPA included considerable discussion of the waiver authority under Section 211(k)(2)(B). EPA explained that it had significant discretion in interpreting this provision, and described a three step decision-making process. First, it was important that there be a clear demonstration of the impact of a waiver on each applicable NAAQS. This was because EPA believed it should not grant a waiver unless, at a minimum, there was a clear demonstration that granting a waiver would aid attainment of at least one NAAQS and would not hinder attainment for any other NAAQS. Once this initial threshold had been met, EPA would then determine whether the impact that had been demonstrated amounted to prevention or interference with attainment. Finally, EPA stated that even if prevention or interference with attainment was found, EPA retained discretion to consider additional factors other than the impact on attainment of the NAAQS in determining whether to grant or deny a waiver

In this case, EPA has determined that California has satisfied the initial threshold of the waiver analysis. Therefore, EPA has interpreted and applied the statutory requirement that compliance with the oxygen content requirement must prevent or interfere with attainment before a waiver may be granted. In interpreting this provision, EPA evaluated the text of section 211(k)(2)(B), other similar provisions, and the legislative history. EPA concludes that the phrase "prevent or interfere with attainment" as used in section 211(k)(2)(B) should be interpreted as follows. Preventing attainment means compliance with the oxygen content requirement has an impact that clearly stands as an absolute or practical barrier to achieving attainment. Interfering with attainment means compliance with the oxygen content requirement has an impact that clearly leads to achieving attainment at a later date than with a waiver.

This interpretation is supported by the text of the Act and EPA's interpretation of similar provisions. It also provides an appropriate balance of the factors important to Congress in adopting the RFG oxygen content requirement. The legislative history makes it clear that Congress enacted the oxygen content requirement in the RFG program to further several important Congressional goals, and expected that the benefits from the oxygen content requirement should not be readily foregone. EPA's interpretation recognizes the air quality and non-air quality factors that Congress

identified. EPA's interpretation preserves these benefits unless EPA determines that waiving the oxygen content requirement would change the date when an area would attain a primary NAAQS. EPA believes that the appropriate balance of the factors important to Congress calls for an interpretation of prevention or interference with attainment that is keyed to whether or not there is a clear demonstration that a waiver would in fact accelerate attainment of a NAAQS or would clearly avoid a delay of attainment.

California has not made such a demonstration in this case. With respect to PM10, EPA has approved attainment demonstrations that show attainment by the specified attainment date, without reliance on the reductions from a waiver. California has not clearly demonstrated that approval of a waiver would in fact lead to an earlier attainment date, and there has been no commitment by the state to such a result. With respect to PM2.5, no demonstration has been made by California as to when or how any of the federal RFG areas will achieve attainment of the PM 2.5 NAAQS. As such California has not demonstrated that approval of a waiver would either accelerate the date attainment is achieved or would avoid a delay in achieving attainment. Similar analyses apply for ozone. Therefore, California has not clearly demonstrated that compliance with the oxygen content requirement prevents or interferes with attainment of the ozone or PM NAAQS in California.

Even where it is shown that the oxygen content requirement prevents or interferes with attainment of NAAQS, the statute provides that EPA "may" grant a waiver. EPA believes that it has the discretion to deny a waiver even where EPA determines that compliance with the oxygen content requirement prevents or interferes with attainment. In exercising this discretion, EPA could consider, among other possible factors, any potentially negative effects of a waiver on public health or welfare not limited to air quality impacts, as well as considering the non-air quality benefits that Congress sought to promote through the RFG program. In this case, even if EPA accepted California's definition of prevention or interference with attainment and determined that the circumstances in California are consistent with such definition, EPA would deny the waiver.

In the federal RFG areas of California, ethanol is currently the oxygenate used to supply the oxygen content required under section 211(k)(2)(B). Basically, all federal RFG in California is blended with ethanol to meet this requirement. EPA's analysis indicates that if a waiver were granted, there would be a significant reduction in the percentage of RFG that would use ethanol. This reduction in the use of ethanol would undermine the potential benefits vis a vis energy security and support for rural and agricultural economy that Congress expected from the oxygen content requirement.

The ethanol used in California can be expected to provide a reduction in fossil fuel use compared to the gasoline that it replaces. This fossil fuel savings reduces reliance on importation of crude oil and other sources of fossil fuel energy. The California Energy Commission in a presentation it made before the National Association

of State Energy Officials on February 9, 2004 projected that by 2010, ethanol use in federal RFG alone would be approximately 1 billion gallons in California.[2] A significant percentage of this displacement would not occur if a waiver were granted.

Granting California's request for a waiver would reduce fossil fuel savings gained from the use of ethanol, and would generate less support for our agricultural and rural economies. At the same time, California has not clearly demonstrated that a waiver would in fact accelerate attainment of a NAAQS or would clearly avoid a delay of attainment. These factors support a denial of California's request, even if EPA accepted California's views and determined, for purposes of section 211(k)(2)(B), that the circumstances found here would constitute prevention or interference with attainment of the ozone or PM NAAQS in California.

[2] "Ethanol Use in California's Gasoline: Policy Drivers and Challenges", presented by Pat Perez, Manager, Transportation Fuels Office, California Energy Commission; available at http://www.energy.ca.gov/ethanol/documents/2004-02-09_PEREZ_EHANOLGAS.PDF

I. BACKGROUND

A. California's request for a waiver from the oxygen requirement

The Clean Air Act requires that all reformulated gasoline must meet an oxygen content requirement. In March, 1999, Governor Gray Davis of California issued an order banning the use of MTBE in gasoline starting January 1, 2003 (later changed to January 1, 2004) and in April, 1999, he requested that EPA waive the RFG oxygen content requirement for California. EPA may grant a waiver of the oxygen content requirement under Section 211(k)(2)(B) of the Act, if EPA determines that compliance with the oxygen content requirement would "prevent or interfere with the attainment by the area of a national primary ambient air quality standard."

From that time through February, 2000, California submitted several analyses in support of the request and EPA staff spent the remainder of 2000 evaluating the waiver request. California's argument was that a waiver would provide California gasoline manufacturers the flexibility to produce either oxygenated or non-oxygenated RFG, and this could result in less emissions than if all the gasoline were oxygenated.

EPA performed a complex analysis to evaluate the emissions impact of a waiver under several refining scenarios. The analysis included 1) refinery modeling to predict the properties of California gasoline with and without a waiver, and 2) generation and use of models to predict changes in vehicle and nonroad emissions in the California fleet, based upon changes in fuel properties induced by a waiver.

EPA's initial evaluation prior to June, 2001, of the emissions impacts of a waiver showed 1) a likely decrease in NOx under various gasoline scenarios, 2) an increase in CO under these scenarios, and 3) significant uncertainty about the change in VOC emissions. The VOC emissions impact ranged from a decrease in VOC to an increase, largely depending on the amount of VOC increases from commingling of ethanol gasoline with non-oxygenated gasoline in vehicle fuel tanks. Given an expected reduction in NOx, increase in CO, and significant uncertainty about the overall VOC impact, there was no clear evidence that the emissions changes from a waiver would tend to reduce ozone, and, in fact, it appeared possible that it could increase ozone.

EPA's position was that a minimum threshold for granting of a waiver was a clear demonstration of the impacts of a waiver on any applicable NAAQS, and a showing that it would aid in attaining at least one National Ambient Air Qaulity Standard (NAAQS) and would not hinder attaining any other NAAQS. On June 12, 2001, EPA denied the waiver request because the impact of a waiver on ozone was uncertain - it was not clear whether a waiver of the oxygen content requirement would cause ozone levels to

decrease or increase. In light of this, EPA did not evaluate the effect a waiver would have on particulate matter (PM).

B. Judicial Review of EPA's Denial

The State of California petitioned for judicial review of EPA's decision to deny the waiver. See Davis v. EPA, 348 F.3d 772 (9th Cir. 2003). The Court held that the statute affords broad discretion to EPA in responding to state requests for waivers of the RFG oxygen content requirement. The Court upheld EPA's interpretation of the statute as requiring that a state must "clearly demonstrate" the impact of a waiver with respect to applicable NAAQS. The Court reviewed EPA's technical analysis of the potential impact of an oxygen content wavier on California ozone levels, and upheld EPA's conclusion that California had failed to clearly demonstrate whether the waiver would actually help to reduce ozone levels. Id. at 780-83. However, the Court concluded that EPA abused its discretion by refusing to evaluate the effect that an oxygen content waiver would have on California's efforts to comply with the PM NAAQS. Accordingly, the court vacated EPA's decision and remanded it to the agency with instructions to review the waiver request with full consideration of the effects of a waiver on both the ozone and PM NAAQS. Id. at 787.

C. California's Supplemental Application

On February 2, 2004, California submitted new information in a letter to EPA. The submission contained new analyses and information regarding commingling and permeation[3], as well as analyses pertaining to the relationship of NOx emissions to PM formation. California also presented its views on why the emissions impact amounted to prevention or interference with attainment of the ozone and PM NAAQS.

[3] Commingling refers to the RVP increase (with resultant emission increase) that occurs when non-ethanol and ethanol-oxygenated gasoline blends are mixed in vehicle gas tanks. Since the presence of ethanol causes an increase in the volatility of the gasoline (as measured by the Reid Vapor Pressure or RVP), such commingling would contribute to an increase in evaporative VOC emissions. Permeation refers to the escape of gasoline constituents through the walls of non-metallic fuel lines and gasoline tanks. These soft components of automotive fuel systems tend to be more permeable to ethanol than to other hydrocarbons in gasoline. Thus, ethanol-RFG blends tend to result in an increase in evaporative emissions due to permeation through these components.

II. EMISSIONS ANALYSIS

A. Particulate Matter

1. Establishment of directional relationship between NOx and VOC emissions and PM concentrations

The February 2, 2004 submission from California EPA contained an analysis prepared by the Planning and Technical Support Division of the California Air Resources Board which examined the contribution of ammonium nitrate to PM10 and PM-2.5 in California, and in turn, the contribution of NOx emissions to ammonium nitrate and ultimately to PM concentrations. The analysis relied upon monitored PM10 and PM2.5 concentrations at stations in the San Joaquin Valley (SJV) and the South Coast (SC), and also used chemical mass balance (CMB) modeling performed in conjunction with the SJV and SC PM10 attainment plans.

Analysis of the chemical composition data collected at monitors in SJV and SC indicate that ammonium nitrate – a secondary particle formed from directly emitted NOx and ammonia compounds from pollution sources – makes up a large fraction of PM10 and a larger fraction of PM2.5 mass. As discussed in Attachment 1 of California EPA's February 2, 2004 submittal, approximately 20 to 30 percent of the annual average PM10 mass and 30 to 40 percent of the annual average PM2.5 mass is ammonium nitrate. (Document V.C.6A filed in EPA docket A-2000-10). The ammonium nitrate fraction has been shown to be most responsive to changes in NOx emissions, and – to a much lesser extent – to changes in VOC emissions. Thus, California relied on this in defining the directional relationship between NOx emissions and formation of secondary PM10 and PM2.5; i.e., PM concentrations vary directly with NOx and VOC emissions. As such, decreases in NOx and VOC emissions result in decreases in PM concentrations.

2. Quantification of effect of NOx and VOC emission changes on PM concentrations

Having established the directional relationship between NOx and VOC emissions to PM concentrations, the SJV and SC in preparing their attainment plans for PM10 then established a mathematical relationship between NOx emissions and secondary particulate (i.e., ammonium nitrate) formation in the respective air basins. They did this through CMB modeling which incorporated grid-based photochemical aerosol modeling (UAM-Aero). The UAM-Aero model was run for a gridded emission inventory of the SJV and SC modeling domains. The modeling results were compared with monitored values of PM10 and there was overall agreement between the measured and simulated concentration. The districts examined the modeled effect of emissions at those monitor locations in each respective basin that recorded the highest PM10 values. Based on the percentage amount by which PM-10 concentrations exceed both the 24-hour and annual standards in the San Joaquin Valley and South Coast, the 24-hour PM-10

standard is the most difficult to attain in the San Joaquin Valley; and in the South Coast it is the annual standard.

The CMB modeling provided both the directional relationship between NOx emissions and PM10 and PM2.5, and an apportionment of the nitrate fraction of particulate matter. CARB, in preparing the analysis submitted to U.S. EPA in the February 2, 2004 package, then used the UAM-Aero results to calculate a conversion factor for NOx emissions and VOC emissions to nitrate fraction for each of the monitor locations at which the peak PM10 values were recorded in SJV and SC. The proportionality ratio thus calculated was 1.5 NOx to one nitrate. CARB then calculated the effect of changes in NOx and VOC emissions on the 24-hour particulate concentration at the peak PM10 monitoring locations (Bakersfield-Golden in SJV and Riverside-Rubidoux in SC) by applying the proportionality ratio combined with a specific change in NOx and VOC emissions to modeled PM10 concentrations at those locations. In this manner, the incremental effect of changes in NOx and VOC emissions on PM-10 was obtained by calculating the change in PM10 associated with a change in NOx and VOC emissions by tons per day using the proportionality ratio.

Based on this technique, CARB showed that a change of 10 tons/day of NOx would change the peak 24-hour PM-10 concentration by 1.5 $\mu g/m^3$ at the Bakersfield-Golden monitor station in SJV, and 0.12 $\mu g/m^3$ at the Riverside-Rubidoux station in SC. Changing VOC emissions by the same amount showed a much smaller effect on PM-10 concentration of 0.14 $\mu g/m^3$ in at the Bakersfield-Golden monitor station in SJV, and 0.011 $\mu g/m^3$ at the Riverside-Rubidoux station in SC. For the annual average, CARB used a simple linear rollback approach for estimating the effect of NOx and VOC changes on PM10, rather than the proportional rollback established on a receptor-specific basis. That is, they applied a uniform proportion based on application of the UAM-LT model which provided annual average PM10 total mass and composition. The change in annual PM10 concentration for a 10 ton/day change in NOx emissions was still an order of magnitude larger than from the same 10 ton/day change in VOC emissions.

Finally, CARB assumed that emission reductions that lower PM10 concentrations will also lower PM2.5 concentrations stating “[b]ecause almost all of the ammonium nitrate and secondary organic carbon can be found in the PM2.5 size fraction, the results presented for PM10 also are applicable for PM2.5.”

3. Effect of oxygen requirement in RFG on PM formation in SJV and SC

Using the mathematical relationships established above, CARB then assessed the effect of compliance with the RFG oxygen content requirement on formation of PM. They did this by using the NOx and VOC emission estimates presented for Scenario 1 in Table 31 on page 122 of U.S. EPA's Technical Support Document for the denial of California's request for a waiver.[4] This scenario provides the highest VOC emission increase (9.23 tons/day) of the scenarios that we examined associated with a waiver of the oxygen requirement in RFG in California, and a NOx decrease of 6.6 tons/day. Using these emission changes in combination with the proportionality ratio discussed above, CARB calculated that these emissions changes would result in an overall reduction in PM concentrations, since the reductions in PM are driven by the NOx reductions. The increase in VOC emissions under the worst-case scenario defined above would increase the PM concentrations slightly, but the net effect would be an overall reduction in PM concentrations. Specifically, the 6.6 tons/day reduction in NOx emissions from a waiver would result in a reduction in peak 24-hr PM10 concentrations of 0.9 $\mu g/m^3$ while the VOC emissions increase of 9.23 tons/day would increase the 24-hr PM10 concentrations by 0.13 $\mu g/m^3$. Similarly, the above NOx emission change would result in a decrease in annual PM10 by 0.07 $\mu g/m^3$, while the increase in VOC emissions would increase annual PM10 by 0.01 $\mu g/m^3$.

4. Validity of California's argument for particulate matter

The approach that CARB used in its analysis of the effect of oxygen content in RFG on PM10 and PM2.5 in SJV and SC indicates the same NOx/PM-10 directional relationship relied upon in the attainment demonstrations for these air basins. The analysis indicates that the higher NOx emissions associated with compliance with the RFG oxygen content requirement in California are likely to contribute to higher PM10 and PM2.5 concentrations in SJV and SC than with a waiver.[5]

After careful consideration of CARB's analysis, we believe that the evidence before EPA establishes the relationship between oxygen in RFG in California and increased PM formation in SJV and SC.

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[4] "Technical Support Document: Analysis of California's Request for Waiver of the Reformulated Gasoline Oxygen Content Requirement for California Covered Areas" (EPA-420-R-01-016; June, 2001. Available at http://www.epa.gov/otaq/regs/fuels/rfg/r01016.pdf)

[5] On May 24, 2004, EPA received a submission from the Renewable Fuels Association (RFA) which comments on various aspects of California's request for a waiver from the oxygen content requirement including analyses regarding changes In PM and ozone associated with a waiver. The substance of these comments are either discussed within the body of this document or are addressed in an EPA memorandum to the Docket entitled "Response to comments submitted by the Renewable Fuels Association. (Docket A-2000-10, document V-D-1)

B. VOC and ozone analysis

1. Analysis leading to EPA's June, 2001 Decision to Deny

The analysis which supported EPA's June, 2001 decision to deny California's request for an oxygen content waiver, concluded that the directional effect of a waiver on VOC emissions was uncertain. EPA separately estimated several types of VOC emissions changes that could occur with a waiver and summed them to estimate the net VOC change for the twelve scenarios evaluated.[6] Specifically, EPA considered:

- Exhaust emission changes resulting from predicted "no waiver" to "waiver" changes in emission-related fuel parameters, including but not limited to oxygen content.

- Evaporative VOC emission changes resulting from predicted differences in as-blended RVP.

- Changes in permeation VOC emissions resulting from differences in ethanol content.

- Changes in VOC emissions related to RVP changes caused by commingling of ethanol-oxygenated and non-oxygenated gasoline in vehicle fuel tanks.

Our analysis predicted that the impact of a waiver on VOC emissions would be mixed, that is, the effect of a waiver on the VOC sources listed above would not be directionally the same in each case. First, exhaust VOC emissions would *increase* with a waiver, as indicated when EPA's VOC emissions model is used to predict exhaust VOC emissions from the fuels that our refinery analysis indicates are likely to be produced with and without a waiver. Second, the refinery modeling indicates that the RVP of both oxygenated and non-oxygenated fuels produced under a waiver would be lower than without a waiver, with a consequent *reduction* in "as-blended" evaporative emissions. Third, the smaller proportion of gasoline containing ethanol in the waiver case would also tend to *reduce* VOC emissions from permeation. In the absence of any commingling considerations (discussed below), the net result of these opposite exhaust and non-exhaust effects would be a reduction in VOC emissions with a waiver, though the magnitude of the reduction varies across scenarios. Finally, regarding commingling, EPA concluded that commingling of ethanol and non-oxygenated gasoline in vehicles

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[6] EPA evaluated twelve "no waiver" to "waiver" scenarios. Each scenario consisted of sets of "no waiver" and "waiver" fuel properties predicted by refinery modeling with a specific set of assumptions. Ethanol-oxygenated and non-oxygenated gasoline were predicted to share the market if a waiver were granted, and market shares as well as properties were significant in EPA's analysis.

would be more prevalent with an oxygen content waiver than without, since refinery modeling predicted that a substantial amount of ethanol would be used even if a waiver were granted resulting in a mixed ethanol and non-ethanol gasoline market. Consequently, the commingling component of VOC emissions would be *higher* with a waiver, potentially offsetting the net reduction from the other VOC changes.

CARB estimated that commingling would have the effect of raising the RVP of gasoline by about 0.1 psi. EPA considered CARB's analysis, but concluded that a 0.2 psi commingling effect (or even higher) was at least as likely. In addition to ethanol market share, the commingling effect is very sensitive to such variables as brand loyalty, initial amount of gasoline in the tank when it is refueled, and how much gasoline is added. A limited amount of data to quantify these factors had been collected, and used in models to estimate commingling effects. Since commingling is very sensitive to factors which had been only crudely estimated, EPA concluded that a plausible case can be made for commingling effects ranging from 0.1 psi to 0.3 psi.

EPA concluded that, depending on the scenario, the net VOC change with a waiver might be directionally positive or negative depending upon the estimated commingling component associated with VOC emissions. With a 0.1 psi commingling RVP increase, EPA predicted net VOC emission increases in two of the twelve scenarios evaluated. With a 0.2 psi commingling RVP increase, net emission increases were predicted for seven of the twelve scenarios.[7]

EPA's analysis considered the effect of the waiver on VOC emissions of both on-road and off-road sources. EPA explicitly included exhaust, as-blended evaporative and commingling VOC emission changes from non-road sources in its estimate of the VOC emissions impact of a waiver. CARB estimated, in its February 7, 2000 submission, that the difference in VOC emissions due to permeation losses when comparing non-oxygenated gasoline to gasoline/ethanol blends with 2.0 weight percent oxygen is about 13 tons/day for all federal RFG areas, assuming 100 percent penetration of non-oxygenated fuels. EPA quantified permeation effects by adjusting proportionally for various non-oxygenated penetrations and oxygen contents different than 2.0 weight percent, assuming that 60 percent of these permeation losses would represent the

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[7] When California established its Phase 3 RFG standards, it adopted a 0.1 psi reduction in allowable RVP (from Phase2) to compensate for the expected increase in VOC associated with commingling if a waiver were granted. If this 0.1 psi reduction in allowable RVP were credited against the additional 0.2 psi equivalent increase in VOC emissions from commingling, the net increase in VOC emissions expected from a commingling effect would be 0.1 psi. The 0.1 and 0.2 psi equivalent increases cited here take CARB's adjustment into account. As noted in its June, 2001 decision document, EPA did not need to decide whether it was appropriate to offset the expected increase in emissions from commingling with the 0.1 psi RVP reduction adopted by CARB. Based on EPA's estimates of the likely range of commingling effects and VOC emissions, even if the 0.1 psi offset had been applied, net VOC changes, hence the effect of the waiver on ozone, was uncertain.

South Coast Air Quality Management District (SCAQMD).[8] EPA understood that this 13 tons/day CARB permeation estimate, which formed the basis for EPA's permeation estimates, represented on-road vehicles. Although we assumed that there would be a permeation VOC emission change associated with non-road sources, we did not include an estimate of this change in our analysis.[9]

2. Revised VOC Analysis

a. New VOC Information Submitted by California

In its February 2, 2004 submission, California provided additional information and analysis relating to commingling and permeation VOC emissions. California claims that, in light of this new evidence, EPA's finding that a waiver of the oxygen mandate might adversely affect VOC emissions and therefore increase ozone levels can no longer be justified. Importantly, on May 11, 2004, California submitted a revised "demonstration document"[10] correcting some information in the original document. This information addresses:

- The degree to which a waiver will result in increased emissions of VOC due to commingling
- VOC permeation increases from nonroad equipment and gasoline cans that result from an increased use of ethanol in gasoline

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8 Although Sacramento and San Diego were also federal RFG areas, EPA's initial waiver analysis estimated tons per day emission changes for the SCAQMD (Los Angeles area) only. EPA focused on the SCAQMD because 1) CARB claimed that the SCAQMD and Sacramento Metropolitan Air Quality Management District needed additional NOx reductions for these areas to attain the National Ambient Air Quality Standards (NAAQS) for ozone and particulate matter and 2) SCAQMD is by far the largest of these areas in gasoline sales.

9 EPA noted in the June, 2001 decision document that there is much uncertainty about the estimation of permeation and other emissions on off-road vehicles/engines as discussed in detail in the Technical Support Document. CARB did not provide an estimate of non-road permeation emissions changes in its February 7, 2000 waiver submission. Since there would have been a high degree of uncertainty associated with any estimate of non-road permeation emissions changes and little information with which to derive such an estimate, EPA did not attempt to quantify non-road permeation in its initial waiver analysis.

10 "Demonstration that the U.S. Environmental Protection Agency Must Grant California A Waiver From The Federal Reformulated Gasoline Oxygen Mandate on Remand From The U.S. Court of Appeals for the Ninth Circuit", December, 2003 and revised, May 11, 2004.

California claims that the likely commingling effect from a waiver is an RVP increase of approximately 0.06 psi. California included estimates of the net VOC change that would result with a commingling increase of 0.06 psi, if all other components of the VOC emission change were as EPA previously estimated. These revised VOC emission estimates, for the twelve scenarios which EPA previously considered, all showed a net VOC emission decrease with an oxygen content waiver. These decreases ranged from 0.08 to12.70 tons/day.

California also estimated the nonroad permeation VOC emission decreases that would occur with a waiver, and added these negative changes to the net results of including the changes in commingling discussed above. When these changes were incorporated, California estimated that total VOC emissions in the South Coast Air Basin (SCAB) would decrease from 3.06 to18.38 tons per day with an oxygen content waiver.

The February 2, 2004 submission included several documents relevant to California's revised commingling and permeation analyses. To support the revised commingling estimates California included a CARB Commingling Study that provided recent data on California consumer fueling habits from observations of almost 400 fuelings, and direct measurements of RVP increases in consumers' vehicle fuel tanks.[11] The report also contained estimates of commingling RVP increases using a simulation model. California provided two technical reports relevant to permeation emissions; one addressing evaporative emissions from small engines ("the off-road study"),[12] and one addressing permeation from containers ("the container study").[13] Both of these reports contained results from test programs where ethanol and non-ethanol gasolines were used.

b. EPA's consideration of the new information and analysis

(1) Commingling

As noted, CARB had previously estimated the likely commingling effect to be about 0.1 psi with an oxygen waiver in effect. EPA did not reject this estimate, but concluded that 0.1 psi represented the low end of the likely range of commingling

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[11] "Draft Assessment of the Real-World Impacts of Commingling California Phase 3 Reformulated Gasoline", August 2003

[12] California Air Resources Board, "Evaporative Emissions from Off-road Equipment", June 22, 2001

[13] "Test Protocol and Results for the Determination of Permeation Rates from High Density Polyethylene Containers & Barrier Surface Treatment Feasability Study", May 17, 1999

effects. Both CARB's estimate and EPA's range of estimates were based on certain assumptions about owner refueling behavior.

While EPA used a model to help predict the possible magnitude of the commingling effect, the model was not explicitly designed to predict the commingling effect in California.[14] This model allowed the user to specify several input parameters, including oxygenated fuel market share, and to select from a limited number of curves representing owner loyalty and refueling behavior. While these "loyalty" and "fill" curves in the EPA model were based, to an extent, on actual data, these data were not necessarily representative of consumer behavior in either the entire state of California or in the SCAQMD.

CARB relied primarily on a "simplified" analysis, rather than a computer simulation, to estimate the potential commingling RVP increase.[15] CARB did employ a computer-based commingling simulation model (UCD model), to estimate an adjustment factor to adjust "simplified" calculations based on a 10 volume percent ethanol content in oxygenated gasoline to a situation with gasoline having a lower oxygen content.[16] (CARB estimated that the commingling RVP increase with 5.7 volume percent ethanol content is about 80% of that at 10 volume percent, all else being equal.) The UCD model, which CARB used only to a limited extent to support its initial 0.1 psi commingling estimate, is capable of estimating RVP increases under a variety of consumer refueling behaviors. Different behaviors are modeled by changing the values of certain inputs to the model. These inputs are parameters of probability distributions which the model uses to simulate various aspects of refueling behavior. Although this model may provide an estimate of the commingling RVP increase consistent with a particular set of inputs, appropriate values of these inputs must be chosen to estimate a "real world" commingling RVP increase applicable to a specific geographic area, such as the South Coast Air Basin (SCAB). It is difficult or impossible to do this with any confidence without data to provide a means to estimate appropriate input parameters. Consequently, even had CARB used this model more extensively in its initial commingling analysis, it would have provided little additional validation of its commingling estimate.

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[14] This model is described in SAE paper 940765, "In-Use Volatility Impact of Commingling Ethanol and Non-Ethanol Fuels" Peter J. Caffrey and Paul A. Machiele, US EPA

[15] Using a "simplified" analysis CARB calculated the RVP boost for each possible outcome under two scenarios (three refills with initial tank volume at the quarter tank level and 4 refills at the half tank level) and averaged the results for each scenario. CARB's and EPA's commingling analyses are discussed in detail in both the June, 2001 decision document and the June, 2001 Technical Support Document.

[16] The simulation model was developed by Dr. David M. Rocke, University of California, Davis.

In summary, in EPA's previous evaluation of California's waiver request, neither CARB nor EPA estimates of the commingling effect utilized California-specific information on consumer refueling habits. Both estimates relied on consideration of certain hypothetical situations. While EPA's analysis may have been more rigorous in the sense that it relied more heavily on a computer simulation model, there was no compelling argument to demonstrate that EPA's estimates of the commingling effect were more likely to be correct than CARB's. EPA acknowledged the uncertainty of its estimates, and accordingly considered a range of possible commingling RVP increases applicable to all the scenarios.

As previously noted, California's new submission included a draft report documenting its commingling field study in which actual data were collected and analyzed. Data were collected in three areas: Lake Tahoe, the Bay Area and Los Angeles. This field study included actual measurements of RVP and oxygenate content of gasoline in vehicles before and after refueling, as well as in the dispensed fuel. While this study did measure RVP increases that occur when ethanol and non-ethanol gasolines are commingled during refueling, it does not directly estimate the commingling RVP increase that would occur with an oxygen content waiver, or with the substitution of ethanol for MTBE in California gasoline. Rather, these measurements can be used with certain other data and assumptions to derive an estimate of these commingling impacts. Using this approach, the study estimated a statewide commingling impact of 0.07 psi.

Since the study also collected data relating to consumer brand loyalty, and other fueling habits, results from the study could also be used to estimate certain of the input parameters for the UCD commingling simulation model. Using this approach, California estimated average statewide commingling impacts of 0.055-0.069 psi RVP for 6 volume percent ethanol blends and 0.062-0.077 psi RVP for 7.7 volume percent ethanol blends.[17] CARB also concluded that the likely commingling effect from a waiver is an average RVP increase of approximately 0.06 psi.

CARB's estimates of commingling using the above model-based approach still required certain assumptions, as would any analysis of potential commingling given the available data. For example, CARB assumed that commingling would occur only in vehicles operated by "non-loyal" consumers, and the estimates of overall commingling

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[17] The commingling RVP estimates cited in the previous paragraph were for the"base" case. A range of estimates is given because CARB estimated the RVP increase at nine different ethanol market shares reflecting the range of market shares that EPA's refinery modeling predicted. While California cited the base case results in its updated waiver request, CARB's commingling report also provides estimates for "more conservative" (greater RVP increase) and "less conservative " (smaller RVP increase) cases. The range of estimates for the "more conservative" case was 0.072 -0.087 psi for 6 volume percent ethanol, and 0.081- 0.097 psi for 7.7 volume percent ethanol blends.

were weighted accordingly.[18] In fact, it may very well be that loyal and non-loyal consumers can only seldom be completely categorized as such. Still, just as loyal consumers may, from time to time, purchase "other-brand" gasoline, non-loyal consumers may often purchase gasoline from the same station over several successive purchases. Also, the UCD model requires the user to specify, among other inputs, the parameters of a probability distribution describing consumers propensity to purchase ethanol gasoline. This information was not explicitly measured by the field study survey, and CARB's analysis involved assuming varying values for the parameters of this distribution (i.e., the "base", "more conservative" and "less conservative" cases cited earlier). This bounding approach appears to us to be reasonable without more definitive data.

In short, EPA believes that California's more recent commingling analysis has merit since CARB's resulting assumptions are reasonable interpretations from the only real-world studies available for California consumer habits associated with commingling. Consequently, it is reasonable to reassess the impact of an oxygen content waiver on VOC emissions in light of the new data submitted. Such an analysis revises our previously estimated ranges of commingling RVP increases in such a fashion that we believe the best estimate lies somewhere within the range of estimates utilized by California in their most recent submission. EPA has reached this conclusion because:

- Unlike California's and EPA's previous analyses, the analysis is based on data that are recent, California-specific, and, in part, specific to the Los Angeles area.

- Model input parameters are derived from these real-world data.

- Although alternative analyses with different assumptions are possible, EPA cannot reject California's assumptions. In fact, utilizing CARB's assumptions on brand loyalty and other inputs resulting from their more recent study, EPA's own modeling approach, as utilized in our original decisions, would produce similarly lower commingling effects.

- It is widely known that California refiners have, in fact, generally used ethanol at 2.0 weight percent oxygen (6 volume percent ethanol) rather than 2.7 weight percent (7.7 volume percent ethanol). Such usage would also directionally reduce the commingling effect.[19]

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[18] The field study measured consumer brand loyalty by asking owners if a different brand of gasoline was used in the last fueling of the vehicle.

[19] EPA initially considered scenarios where ethanol would be used at 2.7 weight percent oxygen (7.7 volume percent ethanol), as well as scenarios where ethanol would be used at 2.0 weight percent oxygen (6 volume percent ethanol). In our initial analysis we assumed the same range of commingling increases for all of the scenarios. However, for a given market share, we would expect the commingling impact to be less with 2.0 weight percent ethanol-oxygenated gasoline than with 2.7 weight percent, as reflected in the

In summary, EPA considers California's range of estimates of 0.055 psi to 0.087 psi RVP increase to be a reasonable range of estimates of the likely impact of a waiver. Thus, it is reasonable to evaluate the impact of the waiver on VOC emissions with some limited number of values approximating this range. California utilized what it believed to be the most reasonable point estimate of 0.06 psi for the commingling effect. California's demonstration document estimated that, if this estimate of commingling is utilized, net VOC emissions changes in EPA's original VOC analysis would show decreases for the waiver case. Furthermore, these decreases would range from 0.08 tons/day to 12.70 tons/day for the twelve scenarios previously evaluated.[20] Our own review indicates that these estimates are correct.[21] Since we now know that refiners have chosen to blend ethanol at 2.0 weight percent oxygen, it is also reasonable to restrict this analysis to the four previously modeled scenarios where ethanol is blended at 2.0 weight percent with or without a waiver. Additionally, these four scenarios were the "worst case" VOC scenarios in EPA's initial analysis. California's estimate, verified by EPA, of the emission decreases for these scenarios ranged from 0.08 tons/day to 5.23 tons/day. Thus, if the commingling effect is 0.06 psi, we would estimate that VOC emissions would decrease with a waiver, assuming that there was no reason to revise other aspects of our initial estimate of waiver-related VOC changes. (As is discussed below in the section on permeation, further revisions of these net VOC changes are warranted.)

As explained in footnote [19], CARB evaluated several commingling cases based upon EPA's twelve originally outlined scenarios and using better or worse case assumptions about other factors affecting commingling not measured by the study. The *upper end* estimate of the range of what CARB believes to be the most likely commingling case for 6 volume percent ethanol blends was 0.069 psi. CARB also estimated an even more conservative commingling case upper end estimate of 0.087 psi. If no revisions are made to other aspects of our previous VOC estimates, we estimate that VOC emissions will increase with a waiver for two of the four remaining scenarios when the commingling impact increases slightly above 0.06 psi. At 0.07 psi, net VOC increases for these two scenarios are approximately 0.5 tons/day, and at 0.09 psi, net increases are approximately 1.8 tons/day. Although California's commingling study does shed substantial light on the input parameters (e.g., brand loyalty, etc.) that are needed to estimate commingling effects, this study is not definitive. For example,

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CARB estimates.

[20] See the table on page 23 of California's demonstration document.

[21] EPA verified the VOC change estimates at 0.06 psi, and the results shown are in good agreement with EPA's calculations. Any small differences are apparently due to round-off and to California's linear extrapolation of these estimates from results of EPA's earlier analysis, rather than calculating them directly using the methodology described in EPA's June, 2001 Technical Support Document.

as is discussed above, CARB's commingling study did not fully consider the variation that may occur in brand loyalty beyond the scope of its study. Consequently EPA believes it is reasonable to also consider the higher more conservative estimates of commingling effects presented by CARB. Therefore, in Table 1 below, we have fully considered the highest estimate (0.09 psi) along with the estimate deemed by CARB to be the most reasonable (0.06 psi).

(2) Permeation

California's demonstration document includes estimates of permeation VOC emission increases from non-marine small engines using ethanol gasoline. California based this estimate on its off-road study test results of five lawn mowers using commercial California gasoline containing 6 percent ethanol.[22] In its original demonstration document, California claimed that evaporative emissions increased by up to 49 percent, and applied this factor to the approximately 20 tons per day evaporative emissions from non-marine off-road engines statewide, resulting in a 10 ton per day evaporative emissions increase, or about 4 tons per day in the SCAB. Subsequent submissions by CARB[23] recognized that the RVP of the two fuels used in the study differed. CARB utilized a linear interpolation method to account for the difference in evaporative emissions between the engines tested with ethanol and those tested with MTBE gasoline due to this difference in RVP.[24] When these RVP differences were

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22 "Evaporative Emissions from Off-road Equipment" June 22, 2001. Average hot soak and diurnal test evaporative emission increases of 48% and 49% were reported for the commercial pump fuel containing ethanol relative to a commercial pump fuel containing MTBE. These procedures measure evaporative emissions related to fuel volatility (RVP), but also measure any permeation emissions that occur during the testing. Factors other than volatility influence permeation emissions. If both gasolines had the same volatility characteristics, it would be reasonable to assume that the difference in emissions measured during this testing is entirely due to permeation. However, these two gasolines had different volatility characteristics. Consequently, only a portion of the emissions difference is attributable to permeation.

23 See "ARB Responses to U.S. EPA Questions on Ethanol Permeation (May 24, 2004) " submitted as an attachment to a May 24, 2004 e-mail from Win Satiawan to Dave Kortum (Docket A-2000-10, document V.C.24b).

24 CARB stated: "In the 2001 ARB study, " Evaporative Emissions from Off-road Equipment," off-road engines using 5.7 percent ethanol gasoline (average RVP 7.28 psi) increased total evaporative emissions by about 49 percent compared to the same engines using MTBE fuel (average RVP 6.87 psi). Adjusting for 'as-blended' RVP discrepancy between the two fuels results in ethanol permeation rate of about 43 percent, an approximately six percent reduction to account for higher evaporative emissions of ethanol fuel. This adjustment is a function of RVP only, and was computed as percent difference in RVP relative to the MTBE fuel (i.e., 0.41 * 100% / 6.87). For all practical purposes, this linear interpolation method is acceptable over a small range of RVP, which,

taken into account, CARB concluded that the ethanol permeation increased overall evaporative emissions by 43 percent. This results in an 8.6 ton per day statewide increase, with (allocating 40 percent of these emissions to the SCAB as in their demonstration document) about 3.4 tons per day in the SCAB.

CARB's approach to attributing a portion of the measured evaporative emissions difference to permeation is a simplified approach but there is little data available to evaluate offroad permeation emissions or, indeed, even to evaluate evaporative emissions generally for offroad equipment. In our original decision, EPA utilized a model developed for onroad vehicles to estimate offroad evaporative emissions increases for both the waiver and no waiver case, and we recognized that such data and conclusions should be viewed with some caution given the much smaller amount of data available for offroad engines.[25] Nevertheless, this model could be used, as an alternative to CARB's linear interpolation approach, to estimate the portion of the measured evaporative emissions difference that is attributable to volatility differences (i.e., RVP), rather than permeation. Use of the model would provide at least one check of the validity of CARB's approach. Using the method that we used to calculate non-road (as-well as on-road) VOC changes due to RVP in the initial waiver analysis, which was based on CA's EMFAC7G on-road emissions model, we would estimate a 16.38 percent VOC increase due to RVP increasing from 6.87 to 7.28 psi, the RVP differences in the CARB permeation study. Consequently, we assume that the remainder of the total VOC increase from CARB's offroad permeation study (32.28%) is due to permeation. If our offroad permeation estimate of about 32 percent is used instead of CARB's 43 percent estimate, there is little change in the net effect and no change in direction of VOC emissions for all waiver versus no waiver scenarios.[26] Since both approaches yield similar results and the same conclusions, and since there are no good data to support one approach over the other, we utilized CARB's 43 percent estimate for purposes of calculating offroad emissions effects.

Additionally, the CARB off-road study compared permeation emissions of off-road equipment utilizing *an MTBE fuel* to equipment using an ethanol fuel. The more appropriate comparison would be between an ethanol fuel and an all-hydrocarbon fuel since MTBE fuels would not be utilized in a waiver situation due to California's banning of such fuels. EPA has seen no evidence to support the conclusion that MTBE fuels

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in this case, is close to laboratory instrument reproducibility (ASTM D323-58, 0.21 psi RVP)."

[25] "Technical Support Document: Analysis of California's Request for Waiver of the Reformulated Gasoline Oxygen Content Requirement for California Covered Areas.", p119, June, 2001.

[26] Referring to Table 1 at the end of this section, net VOC changes would be as follows if EPA's approach were utilized: at 0.06 psi boost the total VOC changes would be -2.96, -2.38, -8.51 and -6.56 tpd and at 0.09 boost the total VOC changes would be -0.98, -0.40, -6.60 and -4.64 tpd.

result in permeation effects substantially different than from non-oxygenated gasoline, and, in its May 13, 2004 submission cited previously, California cited testimony from an expert that "permeation rate difference between MTBE and non-oxy fuel is very small and negligible." [27] EPA, therefore, believes that the use of the fuels in the study provides information also applicable for comparing permeation rates of ethanol fuels to all-hydrocarbon fuels.

California used results from the container study, cited earlier, to estimate potential permeation emission increases from storing ethanol gasoline in portable fuel containers. It states that the test results indicated that the presence of about 5.25 volume percent ethanol in gasoline increases permeation emissions from untreated containers by about 45 percent, or about 4.5 tons per day statewide or about 1.8 tons per day for the SCAB.[28]

The demonstration document concludes that the two studies showed that adding 5-6 percent ethanol to all gasoline would increase SCAB permeation emissions by about 5.8 tons per day. With the small correction to the off-road engine permeation estimate discussed above, this number should be revised to about 5.2 tons per day. Table 1 of California's revised demonstration document includes estimates of additional tons per day permeation losses applicable to each of the scenarios which EPA modeled for the SCAB. This table does not reflect the correction to the permeation estimates.[29]

This revised estimate of 3.4 tons per day from off-road engines in the SCAB appears to be sound in that it is consistent with the measured 49 percent increase in emissions found in California's off-road permeation study, corrected to 43 percent to account for volatility differences between the test fuels. This is further supported by

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[27] CARB stated "[a]ccording to Harold Haskew, an expert in fuel permeation issues, permeation rate difference between MTBE and non-oxy fuel is very small and negligible. As a result, ethanol gasoline permeation rate relative to non-oxy base fuel is assumed the same relative to MTBE (i.e., 43 percent)." The final report on a Coordinating Research Council test program to evaluate permeation emissions from automotive systems found that the permeation differences between MTBE and non-oxygenated gasoline were not statistically significant. ("Fuel Permeation from Automotive Systems", Final Report, CRC Project No. E-65, September 2004). We are unaware of any comparable study specific to off-road vehicles and equipment.

[28] California's cites a total inventory of VOC emissions from gasoline containers statewide as 10 tpd. Off-road evaporative emission estimates were adopted from the ARB staff's report, "Proposed California Phase 3 Reformulated Gasoline Regulations: Initial Statement of Reasons," October 22, 1999, Appendix M, Table K3, page M-6 (http://www.arb.ca.gov/regact/carfg3/appm.pdf). This shows statewide gasoline container evaporative emissions of about 14 tons per day, excluding pleasure craft.

[29] For the four scenarios where oxygen is used at 2% with or without a waiver, the off-road + container permeation totals in Table 1 would change from -3.77, -2.90,-4.29 and -2.90 tons/day to -3.41,-2.62,-3.88 and -2.62 tons/day.

EPA's alternative method of evaluating the data contained in that study. Thus, the study appears to present a sound experimental design to at least grossly estimate overall permeation emission changes due to the use of ethanol in off-road engines. There does not appear to be information that would dispute these findings. [30]

Similarly, the study of permeation emissions from containers appears to be adequately designed to make an estimate of increased permeation emissions from containers with ethanol gasoline, especially in light of the fact that little or no additional information is available on the subject.

Consequently, while there is still uncertainty associated with permeation VOC estimates, EPA concludes:

- There is sufficient technical basis to include an estimate of off-road permeation VOC emission changes in an evaluation of the effects of an oxygen content waiver on emissions, and

- Based on the technical information submitted, the off-road permeation reductions with a waiver claimed in California's demonstration document appear reasonable.

(3) Revised Estimates of Waiver Impacts on VOC and Potential Impact on Ozone

EPA has prepared revised estimates of no waiver to waiver VOC emissions changes for the scenarios where ethanol was blended at 2.0 weight percent oxygen. In addition to the changes based on a commingling effect of 0.06 psi, representing California's estimate of the likely waiver impact, we have evaluated net changes

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[30] California stated in its demonstration document that the Coordinating Research Council (CRC) was in the process of conducting a permeation test program using fuel system components extracted from 10 California vehicles selected based on their contribution to the California on-road fleet. The CRC study results were published before EPA issued its decision, so EPA considered the study in order to determine if the results suggested that there were substantial inaccuracies in the analysis or conclusions contained in California's submission and in this decision document. This is described in a memorandum "Consideration of the CRC Permeation Study in Evaluation of California's Revised RFG Oxygen Content Waiver Request" [*see docket OAR-2004-0038*]. The memorandum concludes that the CRC results suggest that previous analyses have not over-estimated ethanol-related on-road permeation impacts and may have underestimated them. However, EPA has not revised the on-road permeation emission estimates in this decision document since substitution of earlier on-road permeation estimates with revised estimates based on the CRC study would not impact EPA's qualitative conclusions regarding the net effect of the waiver on VOC emissions. Additionally, considerable review is needed to determine how to best use the CRC data to estimate permeation emission impacts.

assuming a commingling effect of 0.09 psi. This represents the upper limit of California's estimate for the "more conservative" case for 6 volume percent ethanol (2 weight percent oxygen) blends. EPA has also used the off-road and container permeation VOC impacts which California reported. This revised analysis estimates net VOC reductions for each of these scenarios at both levels of commingling impact. Results are shown in Table 1, along with the oxides of nitrogen (NOx) and carbon monoxide (CO) emission change estimates from EPA's initial 2001 analysis.

With these revised estimates, total VOC and NOx emissions are likely to decrease with a waiver while CO emissions are likely to increase. Consequently, EPA can no longer reasonably conclude that the effect of a waiver on ozone is uncertain because of the uncertainty in the direction of the VOC change. The increase in CO may have an adverse impact on ozone. However, as was discussed in EPA's previous decision,[31] CO is far less reactive in contributing to ozone than either VOC or NOx. The effect on ozone of the increase in CO emissions and the effect on ozone of the decrease in VOC emissions are expected to approximately offset each other.[32] When the beneficial effect of a reduction in NOx emissions is also taken into account, it is readily apparent that the effect of decreases in these more important ozone-forming emissions more than offsets the effect of the CO increases. In light of this revised analysis, with a waiver it is most likely that VOC and NOx would decrease, CO would increase, and the net change would have an overall benefit in terms of ozone for all likely scenarios.

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31 "Technical Support Document: Analysis of California's Request for Waiver of the Reformulated Gasoline Oxygen Content Requirement for California Covered Areas.", p126, 127, June, 2001.

32 In its original submissions (CARB February 7, 2000 submission, EPA Docket A-2000-10, Number II-D-20 and 21), California argued that increases in CO resulting from a waiver are offset by decreases in VOC emissions and presented relative reactivity factors for CO and VOC. If EPA were to apply California's reactivity factors, or similar factors, to our current emissions estimates presented below, we generally agree that the CO increases are approximately offset by decreases in emissions of VOC. This issue is also addressed in our "Response to Comments submitted by Renewable Fuels Association" (docket A-2000-10, document V.D.1).

Table 1: Waiver Impacts at Various Commingling-Related RVP Boosts (Revised)

				Waiver Case Oxygen Market Shares and Oxy Levels			Emission Inventory Changes (tons/day)					
No Waiver Oxy Level	Waiver Oxy Level	Nationwide MTBE Use	Unocal Patent	% Oxyfuel	% Non-Oxyfuel	Year-round Oxygen Avg	NOx	VOC baseline[33]	VOC with all permeation, 0 psi boost[34]	VOC with all permeation, 0.06 psi boost[35]	VOC with all permeation, 0.09 psi boost[36]	CO
2.0	2.0	Reduced	Patent not avoided	35	65	1.0	-6.60	-4.02	-7.43	-3.51	–1.53	173.13
2.0	2.0	Continues	Patent not avoided	50	50	1.3	-5.08	-4.10	-6.72	-2.80	-0.82	133.18
2.0	2.0	Reduced	Patent avoided	26	74	0.9	-7.20	-9.05	-12.93	-9.13	-7.22	197.11
2.0	2.0	Continues	Patent avoided	50	50	1.3	-4.84	-8.17	-10.79	-6.98	-5.06	133.18

[33] Results from the column are labeled “VOC no boost” in Table 1 of EPA’s June, 2001 decision document. Column includes on- and off-road exhaust emissions effects, on- and off-road as blended RVP effects, and onroad permeation effects. As is explained earlier in this section, California claimed that any commingling resulting from a waiver would be offset by California’s adoption of a more stringent (by 0.1 psi) RVP standard in its CARFG3 regulations. This column and the adjoining “0 psi boost” column assume that such an offset should be taken into account. In fact, EPA does not need to decide whether such an accounting is appropriate since all scenarios result in the same directional conclusions regarding VOC.

[34] Estimated total VOC change if California’s estimate of off-road and container permeation is included and there is no commingling; i.e. RVP increase due to commingling (boost) is 0 psi.

[35] Estimated total VOC change if off-road and container permeation is included and the commingling boost is 0.06 psi, California’s “most likely” estimate. This column is equivalent to the column labeled “Total VOC” in Table 31 of California’s May 11, 2004 demonstration document. These are EPA’s calculations, which differ trivially from California’s.

[36] Estimated total VOC change if off-road and container permeation is included and the commingling boost is 0.09 psi, the upper limit of California’s “more conservative” case.

III. DETERMINATION OF WHETHER COMPLIANCE WITH THE OXYGEN CONTENT REQUIREMENT PREVENTS OR INTERFERES WITH ATTAINMENT OF THE PM OR OZONE NAAQS

A. Legal framework for waiver decisions

EPA's previous decision to deny California's waiver request included considerable discussion of EPA's authority under Section 211(k)(2)(B). (See Appendix A of the Technical Support Document[37]). EPA explained that it had significant discretion in interpreting section 211(k)(2)(B), and described a three step decision making process. First, it was important that there be a clear demonstration of the impact of a waiver on each applicable NAAQS. This was because EPA believed it should not grant a waiver unless, at a minimum, there was a clear demonstration that granting a waiving would aid attainment of at least one NAAQS and would not hinder attainment for any other NAAQS. Once this initial threshold had been met, EPA would then determine whether the impact that had been demonstrated amounted to prevention or interference with attainment. Finally, EPA believed that even if prevention or interference was found, EPA retained discretion to consider additional factors other than impact on attainment of the NAAQS in determining whether to grant or deny a waiver.

EPA's prior denial was based on California's failure to satisfy the initial threshold of the decision making process. EPA found that there was no clear demonstration of whether a waiver would help or hinder attainment of the ozone NAAQS. EPA denied the waiver on this basis without considering the impacts of a waiver on the PM NAAQS. Thus, EPA did not make any final decision or interpretation regarding the second or third steps of the decision making process.

In the Davis case, the United States Court of Appeals for the Ninth Circuit upheld EPA's interpretation that California must "clearly demonstrate" the impact of a waiver for each applicable NAAQS. However, the Court rejected EPA's denial of the waiver because EPA had not considered the impact of a waiver on PM as well as on ozone. EPA had denied California's request because it failed to clearly demonstrate that a waiver would not hinder attainment of the ozone NAAQS. EPA had not considered the impact on PM, based on EPA's view of the minimum initial threshold of the decision making process. The Davis court held that EPA abused its discretion by not evaluating the effect that an oxygen content waiver would have on California's efforts to comply with the PM NAAQS.

As described in section II of this document, California has addressed the factual concerns relating to VOC emissions that EPA noted in its previous denial of the State's waiver request. EPA finds that the net change in emissions that would result from a

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[37] "Technical Support Document: Analysis of California's Request for Waiver of the Reformulated Gasoline Oxygen Content Requirement for California Covered Areas"; EPA420-R-01-016; June 2001. Available at http://www.epa.gov/otaq/regs/fuels/rfg/r01016.pdf

waiver would be expected to directionally contribute to reduced ambient levels of ozone and PM. Thus, California has satisfied the first step of EPA's decision making process. EPA therefore proceeds to interpret and apply the key phrase "prevent or interfere with attainment," which is at the heart of the second step of the analysis.[38]

California argues that "the substantial net increases in PM resulting from the federal oxygen requirement, coupled with the current PM nonattainment status of most federal RFG areas in the state, produce a situation where the federal RFG oxygen requirement prevents or interferes with the attainment of the NAAQS for PM10 and PM2.5."[39] California notes that the substantial NOx increases from the federal RFG oxygen mandate "contribute to PM10 or PM2.5 concentrations in the federal RFG areas in California. It necessarily follows that these NOx increases prevent or interfere with attainment of the PM10 or PM2.5 NAAQS in those areas where the ambient standards are not presently attained."[40] Thus, California's basic view is that prevention or interference is shown whenever compliance with the oxygen content requirement would increase emissions that contribute to ambient air concentrations of a criteria pollutant, in an area that is in nonattainment for that criteria pollutant.

California argues that the approval of an attainment demonstration for PM10 for two areas, San Joaquin Valley and the South Coast, does not change this conclusion. First, a waiver would bring immediate reductions that would bring the area closer to attaining the NAAQS for PM10 in the interim. Second, although the attainment demonstration is based on emissions inventories without a waiver, denial of a waiver prevents the areas from relying on the additional emissions reductions that a waiver would provide. Finally, with respect to PM2.5, California states that significant additional unidentified control measures are need for PM2.5 attainment, and the oxygen mandate therefore clearly prevents or interferes with attainment of the PM2.5 NAAQS.[41]

California also argues that "a waiver of the federal oxygenate requirement would provide an additional margin of safety in assuring attainment of the federal PM10 standards in [the San Joaquin Valley and the South Coast area] as well as facilitate more expeditious attainment."[42] With respect to PM2.5, California states that "significant further emissions reductions beyond those specified for PM10 will be needed," and therefore "additional reductions in NOx emissions will be essential in achieving the federal PM2.5 standards in these areas."[43]

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38 It's important to note that EPA did not reach this second step in the initial denial, and EPA's interpretation of this statutory criteria was not before the Davis court.

39 Letter from California EPA Secretary Terry Tamminen to U.S. EPA Administrator Michael O. Leavitt. February 2 letter, page 2.

40 Supra at note 10, p.9.

41 Supra at note 10, p.9,10.

42 Supra at note 10, p.8.

43 Id.

With respect to ozone, California states that the analysis of the "federal RFG oxygen mandate shows substantial increases in the combined emissions of NOx and VOC, the two principal precursors of ozone."[44] California claims that "based on the data and analysis now available, California has adequately demonstrated that a waiver will assist the State's efforts to attain and maintain the NAAQS for ozone." As a result, California concludes that the oxygen mandate "likely interferes with attainment of the ozone NAAQS, and the Clean Air Act provides no basis for US EPA to deny a waiver based on the unlikely possibility that a waiver might hinder ozone attainment."[45] In it's original application, California stated without further analysis that "the loss of additional benefits from the California program will interfere with attainment" of the ozone NAAQS, and would "delay attainment of the ozone standard" in all three federal RFG areas.[46] In a subsequent submission, California stated that a waiver would result in "significant additional NOx reduction" and, therefore "denial of the waiver will prevent or interfere with attainment and maintenance of the national ambient air quality standard." California noted that it's 1994 demonstration of attainment in its 1-hour ozone SIP relies on NOx reductions. The additional reductions from a waiver would therefore "help expedite the attainment of the ozone standard." Any reduction in ozone precursors can be considered crucial to expeditious attainment of the standards."[47]

The core element of California's argument is that the existence of reductions in emissions from a waiver would lead to a reduction in ambient concentrations of a criteria pollutant, and the reduction in emissions is by itself enough to show that compliance with the oxygen content requirement prevents or interferes with attainment in a non-attainment area. California argues that additional reductions from a waiver would in all cases provide aid, of greater or lesser degree, in ensuring attainment of the ozone or PM NAAQS, and additional reductions would in all cases reduce the degree of nonattainment in the interim. California concludes that a waiver will therefore "facilitate" earlier attainment than that specified in the PM10 attainment demonstrations, or would "expedite" attainment, or avoid "delaying" attainment, but does not demonstrate how this result would flow from the emissions reductions expected from the grant of a waiver. California makes no demonstration that a waiver would in fact lead to attainment any earlier with a waiver than without a waiver.

Under California's suggested approach, EPA would logically approve a waiver in any situation where a waiver would produce emissions reductions that would reduce a criteria pollutant in a non-attainment area. The mere existence of the additional reductions, by themselves, would appear to always meet the criteria suggested by California, irrespective of any impact on the actual date attainment is achieved.

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44 Supra at note 10, p1.

45 Id.

46 Attachment to letter from California Air Resources Board Executive Officer, Michael P. Kenney to U.S. EPA Assistant Administrator Robert Perciasepe, July 9, 1999, p. 1.

47 Attachment to letter from California Air Resources Board Executive Officer, Michael P. Kenney to U.S. EPA Assistant Administrator Robert Perciasepe, December 24, 1999 pp. 12,13.

EPA does not accept this interpretation of "prevent or interfere with attainment." For the reasons discussed below, EPA concludes that the phrase "prevent or interfere with attainment" as used in section 211(k)(2)(B) should be interpreted as follows. Preventing attainment means compliance with the oxygen content requirement has an impact that clearly stands as an absolute or practical barrier to achieving attainment. Interfering with attainment means compliance with the oxygen content requirement has an impact that clearly leads to achieving attainment at a later date than with a waiver

The text of section 211(k)(2)(B) supports this interpretation. Congress provided that EPA may waive the oxygen content requirement upon a determination that compliance with the requirement "would prevent or interfere with the attainment" of a primary NAAQS. Congress did not define the phrase "prevent or interfere with attainment," but the text implies that actual achievement of attainment is the primary focus of the provision. For example, Congress did not refer to progress towards attainment, as it did in section 110(l), or to minimizing the degree of nonattainment, but instead referred to prevention or interference with the status of attainment.

The legislative history of this provision supports the view that oxygen content waivers should not be granted lightly. As noted in Davis, 348 F.3d 772, 780, the legislative history indicates that Congress wanted EPA to closely scrutinize waiver requests. During consideration of the 1990 Clean Air Act Amendments, Senator Simpson urged EPA to "avoid a proliferation of too many different oxygen levels when it grants partial oxygen content waivers, to solve NOx cap or NAAQS problems under other provisions of § 211(k)." *Id; see* 136 Cong. Rec. 3504, 3522 (1990), *reprinted in* Committee on Environment and Public Works, 103rd Cong., 4A Legislative History of the Clean Air Act Amendments of 1990 at 1170. The Conference Report indicated that "waiver of the oxygen requirements by petition must be the exception rather than the rule." *Id. at 1024 .* The Conference Report also stated that waiver applicants should be required to "demonstrate that they are trying to comply with [the oxygen content] provision within their capabilities." *Id.*

The legislative history makes it clear that Congress enacted the oxygen content requirement to further important Congressional goals, and expected that the benefits from the oxygen content requirement should not be readily foregone. The legislative history shows that Congress required the use of oxygenates to provide a form of clean gasoline octane that produced potential benefits for the U.S. agricultural economy and promoted energy security through the use of renewable fuels such as ethanol. The air quality impact of the oxygen content requirement focused on the ability of oxygenates to reduce air toxics, while the waiver provision was adopted to address concerns about potential adverse air quality impacts on attaining a NAAQS.[48] EPA's interpretation recognizes these additional air quality and non-air quality impacts that Congress

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[48] For example, see the following from the floor debate on the Conference Committee bill: 1 Leg. Hist. at 851-856 (Sen. Durenberger); 1 Leg. Hist. at 1154-71 (Sen. Simpson); 1 Leg. Hist. at 969 (Sen. Baucus); 1 Leg. Hist. at 1073 (Sen. Dole); 1 Leg. Hist. at 1187 (Rep. Dingell); 1 Leg. Hist. at 11.95 (Rep. Waxman); 1 Leg. Hist. at 1209 (Rep. Sharp); 1 Leg. Hist. at 1263-67 (Rep. Madigan); 1 Leg. Hist. at 1315 (Rep. Hall); 1 Leg. Hist. at 1435 (Rep. Richardson). Similar statements were made during consideration of the respective House and Senate bills.

identified, and reflects Congress' desire that these additional benefits not be readily foregone. EPA's interpretation preserves these benefits unless EPA determines that removing the oxygen content requirement would change the date when an area would attain a primary NAAQS.

EPA has also taken into consideration its interpretation of a similar provision in section 110(l). Section 110(l) addresses revisions to State SIPs and provides that EPA "shall not approve a revision of a plan if the revision would interfere with any applicable requirement concerning attainment and reasonable further progress . . . or any other applicable requirement of this chapter." EPA has interpreted this section as allowing EPA to approve a State amendment to a SIP so long as the amendment will not cause a delay in attainment, prevent a State from demonstrating reasonable further progress on the dates required, or otherwise fail to meet a requirement of the Act. Thus, EPA can approve SIP revisions that allow an increase in emissions, as long as such increase does not delay the date when attainment is achieved, or have the other effects noted above. *See generally* Navistar International Trans. Co. v. EPA, 941 F.2d 1339 (6th Cir. 1991).

For example, in general a State can demonstrate that amending or dropping an approved control program does not interfere with attainment where the State can demonstrate that without the control program the area will still attain as expeditiously as practicable but not later than the applicable attainment deadline. Alternatively, in general a State could show that the SIP revision preserves the status quo with respect to air quality impact, either by getting substitute reductions from other programs or showing there is no increased ambient air impact with the SIP revision. The evidence required of a State to show noninterference may vary depending on the type of SIP revision at issue. For example, if a SIP revision would cause an increase in emissions, the revision generally would not be approved unless the State provides equivalent emissions reductions or takes the further step of affirmatively demonstrating that the revision would not delay attainment or otherwise interfere with any other applicable requirement of the Act.

EPA believes it is also appropriate to focus the evaluation of a waiver under section 211(k)(2)(B) on whether attainment would be delayed by compliance with the oxygen content requirement. Under EPA's interpretation of interference with attainment under section 211(k)(2)(B), interference is based on the effect that a change in emissions would have on achieving attainment. Interference would occur where compliance with the oxygen content requirement has been clearly shown to delay attainment.

For purposes of section 211(k)(2)(B), EPA believes it is appropriate in all cases to require a clear evidentiary demonstration that compliance with the oxygen content requirement leads to a delay in attainment. As noted above, Congress adopted the RFG requirement for a variety of air quality and non-air quality reasons, and expected

that the benefits from this requirement should not be easily or readily foregone.[49] Requiring the State to demonstrate that removing the oxygen content requirement would change the date when an area would attain a primary NAAQS is an appropriate way to preserve these benefits. Based on this, EPA believes it is appropriate to take a somewhat different approach implementing section 211(k)(2)(B) compared to section 110(l). EPA is placing the burden on the State in all cases where an RFG oxygen content waiver is sought to clearly demonstrate that compliance with the oxygen content requirement interferes with attainment. Showing that the oxygen content requirement causes an increase in emissions does not satisfy this burden; the State must also clearly show that such emissions increase leads to a delay in attainment. Requiring this showing by the State implements the core principle embodied in the concept of interference, common to both section 211(k)(2)(B) and section 110(l), and adopts an evidentiary burden to demonstrate interference for purposes of section 211(k)(2)(B) that sets an appropriate threshold for the exercise of this discretionary waiver authority.[50]

Under California's interpretation, almost any level of NOx emissions reductions from a waiver would reduce PM concentrations, and would increase the "margin of safety" built into a SIP's approved attainment demonstration. In addition almost any level of additional reductions has the potential in the abstract to arguably "facilitate" to some degree earlier attainment than specified in an approved SIP, and in the abstract could directionally help a State to attain in situations where an attainment SIP had not yet been submitted or approved. However EPA believes that this would set the criteria for a waiver too low and does not properly reflect Congress' desire that a waiver should be the exception rather than the rule. It would basically rely on speculation about the potential effect of a waiver on a future attainment date, instead of requiring a clear demonstration that such an effect will occur. It would too lightly forego the variety of benefits Congress expected from the oxygen content requirement. EPA believes that a more appropriate balance of the factors important to Congress calls for an interpretation of prevention or interference with attainment that is keyed to whether there is a clear demonstration that a waiver would in fact lead to earlier attainment of a NAAQS by either advancing attainment or avoiding a delay of attainment.

As discussed below, California has not made such a demonstration in this case. With respect to PM10, EPA has approved attainment demonstrations in California that do not rely on the reductions from a waiver. California has not clearly demonstrated that approval of a waiver would in fact lead to an earlier PM10 attainment date, and there has been no commitment by the State to such a result. With respect to PM2.5, no

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[49] This Congressional expectation is also reflected in the fact that a waiver may be granted only if there is interference with attainment **-** interference with any other applicable requirement of the Act is not sufficient to meet the threshold for a waiver. This limitation on the discretionary waiver authority under section 211(k)(2)(B) is in contrast to the much broader scope of section 110(l), where Congress expressly provided for disapproval of a SIP revision if it interferes with any applicable requirement of the Act, not just attainment.

[50] In a similar situation, under section 211(c)(4)(C), the burden is on the State to make the appropriate evidentiary demonstration to show that the state fuel program is "necessary to achieve attainment." EPA is applying the same approach here - the burden is on the State to submit information sufficient to show that compliance with the oxygen content requirement will cause a delay in NAAQS attainment.

demonstration has been made by California as to when or how any of the federal RFG areas will achieve attainment of the PM 2.5 NAAQS. As such California has not demonstrated that approval of a waiver would either accelerate the date attainment is achieved or would avoid a delay in achieving attainment. Similar analyses apply for ozone.[51]

Even where it is shown that the oxygen content requirement prevents or interferes with attainment of NAAQS, the statute provides that EPA "may" grant a waiver. EPA believes that it therefore has the discretion to deny a waiver even where there has been a determination of prevention or interference with attainment. In exercising this discretion, EPA could consider, among other possible factors, any potentially negative effects of a waiver on public health or welfare not limited to air quality impacts, as well as considering the non-air quality benefits that Congress sought to promote through the RFG program. As discussed later, even if EPA accepted California's views on what constitutes prevention or interference with attainment, EPA would deny the waiver under this third step.[52]

B. Consideration of attainment of the PM and ozone NAAQS in RFG areas in California

In this section we examine the current status of California's SIPs for attainment of the PM and ozone NAAQS in the federal RFG areas.

1. Attainment of the PM10 NAAQS in the SJV

As noted above, the SJV is in non-attainment of the PM10 NAAQS and is classified as a serious PM-10 nonattainment area. Under the Clean Air Act, the initial

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[51] Should California submit a demonstration that approval of a waiver would lead to earlier NAAQS attainment, EPA would review that submission and may find that interference exists, applying the legal framework discussed above.

[52] Because California assumed use of oxygenated RFG in its approved SIPs, it is clear that EPA's denial of California's waiver request conforms to the SIPs for purposes of section 176(c) of the CAA. Furthermore, under EPA's general conformity regulations, only those emissions which are "caused by" a federal action, need to be addressed through a conformity analysis. In other words, conformity applies only if the "emissions would not otherwise occur in the absence of the Federal action." See 40 CFR §§ 93.152 (definitions of *"caused by," "direct emissions"* and *"indirect emissions")*, 93.153(b). The requirement to use oxygenated RFG in California is not, however, "caused by" EPA's denial of California's waiver request. Instead, it occurs by operation of the Clean Air Act. Thus, if California had never submitted a request for an oxygen waiver, no EPA action would be required for the oxygenated RFG requirements to apply there. EPA's waiver denial itself does not increase emissions compared to what would occur if EPA took no action. . Because any emissions related to the oxygen content of RFG in California will not be "caused by" EPA's action on California's waiver request, there are no "direct emissions" or "indirect emissions" resulting from the EPA action, and the denial of California's waiver request does not trigger the requirement under section 176(c) and EPA's implementing regulations for EPA to make a conformity determination. See 40 CFR 93.152, 93.153(b).

attainment deadline for such areas was December 31, 2001. Because that date has passed, California was therefore required to develop a plan that provides for expeditious attainment of the PM-10 NAAQS, and for an annual reduction in PM-10 or PM-10 precursors emissions of at least five percent until attainment. California submitted the PM10 plan for SJV on August 19, 2003. On February 4, 2004, EPA published a proposal to approve California's San Joaquin Valley plan to attain the federal standards for PM10. 69 FR 5412. On April 28, 2004, EPA issued a final rule approving the plan. As explained in the rulemaking, EPA approved an attainment date of 2010.

California's PM-10 attainment plan relies on reductions from sources of NOx as well as from sources of directly emitted PM-10 to achieve attainment. California has demonstrated that attainment will be achieved as expeditiously as practicable, that the CAA section 189(d) five percent requirement is met, and that reasonable further progress (RFP) and quantitative milestones will be achieved. We also approved various vehicle, engine, and fuel programs for mobile source categories that are not federally preempted as meeting the requirement of Best Available Control Measures (BACM). The measures include: California heavy-duty diesel vehicle standards; low-emission Vehicle (LEV) 2 and CAP 2000 California exhaust and evaporative emissions standards; heavy-duty diesel engine standards for 2007 and later; gasoline–Phase III California RFG regulations; diesel fuel regulations for motor vehicles; the Carl Moyer Program, providing funding to pay for the incremental costs of cleaner on-road, off-road, marine, locomotive and other non-road sources; and the school bus idling regulations. We approved the programs as meeting BACM for the mobile source and fuels categories, "since the State's measures (supplemented by Federal controls for certain mobile source categories) reflect the most stringent emission control programs currently available, taking into account economic and technological feasibility." 69 FR 5419.

California's plan for attainment relies on reductions from control measures that have already been adopted, as well as reductions from a variety of control measures that are under development or consideration but have not yet been adopted, covering both mobile sources and other sources. Based on California's expeditious action in adopting and preparing to adopt control measures, EPA determined that an attainment date of 2010 is as expeditious as practicable under the circumstances. EPA also explained that it expected California to continue to investigate opportunities to "accelerate progress" as new control opportunities arise, and to expeditiously implement feasible control measures. 69 FR 5426. This reflects the need to accelerate the attainment date if practicable, as well as the need to comply with the deadlines for reductions under the 5% and reasonable further progress plan.

With respect to the various mobile source control measures still under development and consideration, California identified a number of specific measures. Based on California's's submission, EPA approved an enforceable commitment by the State to adopt mobile source measures between 2002 and 2008 "that will achieve an additional 10 tons/day of NOx, and 0.5 tons/day of PM-10 by 2010." 69 FR 5426. These measures, while necessary for the attainment demonstration, have not yet been

adopted and implemented. Thus, the enforceable commitment is an enforceable SIP obligation to achieve the additional reductions by 2010.[53]

EPA determined that the circumstances presented by SJV warranted consideration of approval of the enforceable commitment. Among other things, EPA concluded that the nature and content of the commitment and the expected regulatory actions underlying them would not "interfere" with meeting the requirements for reasonable further progress, the annual schedule of 5% reductions. In effect, EPA was confident that the enforceable commitment would not lead to a delay in the deadlines that had to be met under the reasonable further progress requirements. EPA then considered the commitment, and approved it because it addresses a limited portion of the PM10 plan, the State and District are capable of fulfilling their commitment, and the commitment is for a reasonable and appropriate period of time. Finally, EPA approved an enforceable commitment for a mid-course review, that will include a complete reassessment of all Plan elements including the attainment demonstration and control measures, with a SIP revision based on the review to be submitted by March 31, 2006. 69 FR 5427-29.

In summary, the PM10 SIP approved for SJV demonstrates attainment by 2010, which is as expeditiously as practicable, based on measures already adopted or measures already under consideration or development and that will be adopted. A mid-course review will be conducted to re-evaluate the elements of the Plan. The measures are expected to both satisfy all requirements for interim reductions, such as reasonable further progress, as well as achieve attainment by 2010. The additional NOx reductions from a waiver are not relied on to support any of the determinations underlying the SIP approval.

EPA concludes based on the current circumstances and the SJV PM10 SIP that denial of a waiver would not change the orderly implementation of the Plan and would not change the underlying basis in the SIP approval for expecting that SJV would in fact attain by 2010. California has not demonstrated that compliance with the oxygen content requirement either stands as an absolute or practical barrier to attainment of the PM-10 NAAQS in the SJV, or that approval of a waiver would lead to an earlier attainment date than would be obtained without a waiver. Therefore, California has not shown that the oxygen content requirement prevents or interferes with attainment of the PM-10 NAAQS in the SJV.

2. Attainment of the PM-10 NAAQS in the South Coast

On December 17, 2002, EPA published a proposal to approve California's SIP for the South Coast to provide for attainment of the PM-10 NAAQS. 67 FR 77212. EPA

[53] A separate enforceable commitment was approved with respect to control of emissions of PM10, from sources such as agricultural sources.

published its final approval on April 18, 2003. 68 FR 19316. EPA proposed to extend the attainment date of December 31, 2001 to December 31, 2006.

We have determined that, like the PM-10 SIP for SJV, the South Coast SIP contains a series of control measures as well as enforceable commitments and that EPA's approval was based on reductions of PM-10, NOx, SOx, and VOCs without relying for such attainment on EPA granting a waiver of the RFG oxygen content requirement.

As in the case of the PM-10 SIP for SJV discussed above, the plan provides for timely reduction of PM-10 and precursor emissions and a demonstration that the NAAQS will be achieved by 2006, independent of a waiver being granted. California has not demonstrated that compliance with the oxygen content requirement either stands as an absolute or practical barrier to attainment of the PM-10 NAAQS, or that approval of a waiver would lead to an earlier attainment date than would be obtained without a waiver. Therefore, California has not shown that the oxygen content requirement prevents or interferes with attainment of the PM-10 NAAQS in the South Coast.

3. Attainment of the 1 hr. ozone NAAQS in the South Coast

On February 8, 2000, EPA published a proposal to approve California's SIP for South Coast to provide for attainment of the ozone NAAQS. 65 FR 6091. EPA published its final approval on April 10, 2004. 69 FR 18903. EPA approved an attainment date of 2010.

We have reviewed these plans and have determined that, like the PM-10 SIP for SJV, the South Coast SIP for 1-hour ozone contains a series of control measures as well as enforceable commitments and that EPA's approval was based on reductions of NOx and VOCs without relying for such attainment on EPA granting a waiver of the RFG oxygen content requirement.

The plan provides for timely reduction of NOx and VOC emissions and a demonstration that the NAAQS will be achieved by 2010, independent of a waiver being granted. California has not demonstrated that compliance with the oxygen content requirement either stands as an absolute or practical barrier to attainment of the 1-hour ozone NAAQS in the South Coast, or that approval of a waiver would lead to an earlier attainment date than would be obtained without a waiver. Therefore, California has not shown that the oxygen content requirement prevents or interferes with attainment of the 1-hour ozone NAAQS in the South Coast.

4. Attainment of the 1 hr. ozone NAAQS in the SJV

Upon enactment of the 1990 Clean Air Act Amendments, the San Joaquin Valley Air Basin ("SJVAB") was classified as a Serious ozone nonattainment area for the 1-

hour ozone standard with an attainment date of no later than November 15, 1999. In a rule published on November 8, 2001, EPA found that the SJVAB failed to attain the 1-hour ozone standard by the required serious area attainment date (1999) and reclassified the SJVAB (excluding Eastern Kern) to Severe ozone nonattainment (effective December 10, 2001) with an attainment date of no later than November 15, 2005. RFG was required as of December 10, 2002.

Unable to demonstrate attainment by the Severe area attainment date of 2005, the State of California, on behalf of the San Joaquin Valley Unified Air Pollution Control District ("District"), voluntarily requested, pursuant to CAA §181(b)(3), to be reclassified Extreme ozone nonattainment. EPA granted the State's request, effective May 17, 2004, in a rulemaking dated April 16, 2004 (69 FR 20550). Our final rule required the State to submit by November 15, 2004, an extreme ozone plan for the San Joaquin Valley that provided for the attainment of the one-hour ozone standard as expeditiously as practicable, but no later than November 15, 2010. The State submitted its extreme area ozone plan for the San Joaquin Valley on November 15, 2004 ("2004 Ozone Plan") which includes a modeled attainment demonstration and a Rate of Progress ("ROP") plan for milestone years 2008 and 2010.[54]

The 2004 Ozone Plan demonstrates the 2008 and 2010 ROP milestones will be met, and attainment of the 1-hour ozone standard will be achieved by 2010. Starting with a predicted 2010 baseline inventory of 367.6 tpd VOC emissions, and 401.7 tpd NOx emissions, the 2004 Ozone Plan relies on the following NOx and VOC emission reductions to achieve the required ROP and attainment goals–

- State and District commitments already approved into the SJV PM-10 plan (total = 11.9 tpd VOC, 41.2 tpd VOC).

- New State and District commitments in the Extreme Ozone plan (total = 36 tpd VOC, 11.9 tpd NOx).

- Reductions from long-term measures (i.e., §182(e)(5)) (total = 5 tpd VOC, 5 tpd NOx).

California has not demonstrated that compliance with the oxygen content requirement either stands as an absolute or practical barrier to attainment of the 1-hour ozone NAAQS in the SJV, or that approval of a waiver would lead to an earlier attainment date than would be obtained without a waiver. Therefore, California has not shown that the oxygen content requirement prevents or interferes with attainment of the 1-hour ozone NAAQS in the SJV.

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[54] The previous ROP plan for SJV, entitled "Amended 2002 and 2005 Rate of Progress Plan for San Joaquin Valley Ozone," was adopted by the San Joaquin Valley Air Pollution Control District on December 31, 2002 and submitted to EPA by the State on April 10, 2003.

5. Attainment of the PM10 and 1 hr. Ozone NAAQS for Sacramento and San Diego

On March 20, 2003, EPA published a proposal to approve California's plan to provide for attainment of the 1 hr. ozone NAAQS for San Diego. 68 FR 13653. EPA published its final approval on June 26, 2003. 68 FR 37976. EPA published a proposal to approve California's plan to provide for attainment of the 1 hr. ozone NAAQS for Sacramento on March 18, 1996. 61 FR 10920. EPA published its final approval on January 8, 1997. 62 FR 1150.

EPA has reviewed these plans for the RFG covered areas of Sacramento and San Diego and has verified that in each plan the State has projected attainment with the 1 hr. ozone NAAQS by the applicable attainment date without relying on EPA granting a waiver of the RFG oxygen content requirement.

California has not demonstrated that compliance with the oxygen content requirement either stands as an absolute or practical barrier to attainment of the PM-10 or 1-hour ozone NAAQS in Sacramento or San Diego, or that approval of a waiver would lead to an earlier attainment date in either of these areas than would be obtained without a waiver. Therefore, California has not shown that the oxygen content requirement prevents or interferes with attainment of the PM-10 or 1-hour ozone NAAQS in Sacramento or San Diego.

San Diego is in attainment of the PM-10 NAAQS. EPA has determined that the Sacramento area has attained the NAAQS for PM-10, as noticed in the February 15, 2002 Federal Register. 67 FR 7082. California has not demonstrated that approval of a waiver would avoid or delay a return to nonattainment.

6. Attainment of the PM2.5 and 8 hr Ozone NAAQS in the Federal RFG Areas in California

At this time, no demonstration has been made by California as to when or how any of the federal RFG areas will achieve attainment of the PM 2.5 or the 8 hr ozone NAAQS. As such California has not demonstrated that compliance with the oxygen content requirement either stands as an absolute or practical barrier to attainment of the NAAQS, or that approval of a waiver would lead to an earlier attainment date than would be obtained without a waiver. Therefore, California has not shown that the oxygen content requirement prevents or interferes with attainment of the PM 2.5 or 8-hour ozone NAAQS in the Federal RFG areas in California.

C. Determination Regarding Prevention or Interference with Attainment

EPA finds that California has not clearly demonstrated that compliance with the oxygen content requirement prevents or interferes with attainment of either the PM or

ozone NAAQS for any federal RFG area in California, for purposes of section 211(k)(2)(B), because California has not demonstrated that compliance with the oxygen content requirement stands as an absolute or practical barrier to achieving attainment, or that compliance clearly leads to achieving attainment at a later date than with a waiver.

D. Consideration of Additional Factors

While California has not met the criteria of preventing or interfering with attainment, EPA has also considered what action it would take if EPA adopted California's view of prevention or interference with attainment, and, using that approach, found that this requirement was met for California. In such a case, as discussed in section III.A., EPA would still have the discretion to consider factors other than attainment of the NAAQS in deciding whether to grant California's request for a waiver.

In the federal RFG areas of California, ethanol is currently the oxygenate used to supply the oxygen content required under section 211(k)(2)(B). Basically all federal RFG in California is blended with ethanol to meet this requirement. EPA's analysis indicates that if a waiver were granted there would be a significant reduction in the percentage of RFG that would use ethanol. This reduction in the use of ethanol would undermine the potential benefits vis a vis energy security and support for rural and agricultural economy that Congress expected from the oxygen content requirement.

The ethanol used in California can be expected to provide a clear reduction in fossil fuel use compared to the gasoline that it replaces. This fossil fuel savings reduces reliance on importation of crude oil and other sources of fossil fuel energy. The California Energy Commission in a presentation it made before the National Association of State Energy Officials on February 9, 2004 projected that by 2010, ethanol use in federal RFG alone would displace approximately 1 billion gallons of gasoline in California.[55] A significant percentage of this displacement would not occur if a waiver were granted.

Studies have evaluated the effects on fossil fuel energy use of using ethanol blended with gasoline compared with the effects of using gasoline in a mid-size passenger car. Such studies have considered the petroleum and energy use associated with chemicals manufacturing, farming of corn and biomass, ethanol production and ethanol combustion. For gasoline energy use, such studies considered petroleum and energy use associated with petroleum recovery and refining, and gasoline combustion. The results of such analyses show that by displacing gasoline

[55] "Ethanol Use in California's Gasoline: Policy Drivers and Challenges", presented by Pat Perez, Manager, Transportation Fuels Office, California Energy Commission; available at http://www.energy.ca.gov/ethanol/documents/2004-02-09_PEREZ_EHANOLGAS.PDF

consumed in the U.S., ethanol use reduces the amount of fossil fuels used to make motor vehicle fuel.[56, 57]

Granting California's request for a waiver would reduce the level of fossil fuel savings gained from the use of ethanol, and would generate less support for our agricultural and rural economies. At the same time, California has not clearly demonstrated that a waiver would lead to an earlier attainment date for a NAAQS than would be obtained without a waiver. These factors support a denial of California's request pursuant to EPA's discretionary authority, even if EPA accepted California's view and determined, for purposes of section 211(k)(2)(B), that under the present circumstances compliance with the RFG oxygen content requirement prevents or interferes with attainment of the ozone and PM NAAQS in California.

IV. Conclusion

EPA denies California's request for a waiver as there has been no clear demonstration that compliance with the oxygen content requirement prevents or interferes with attainment of either the PM or ozone NAAQS. Even if EPA adopted California's view and determined that the evidence before the agency demonstrates that compliance with the oxygen content requirement prevents or interferes with attainment, EPA would exercise it's discretion and deny the waiver for the reasons described above.

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[56] For example, see: "Effects of Fuel Ethanol Use on Fuel-Cycle Energy and Greenhouse Gas Emissions"; M. Wang, C. Saricks, and D. Santini; January 1999 (ANL/ESD-38)

[57] The Agency is aware of studies that suggest the production of ethanol consumes more fossil fuel than it displaces (e.g. see "Ethanol Fuels: Energy Balance, Economics, and Environmental Impacts are Negative," by David Pimentel, Natural Resources Research (Vol., 12, No. 2); however, the Agency has reviewed these studies and supports the findings, cited in footnote fifty-six above, from the Department of Energy's Argonne National Laboratory that indicate a net positive fuel balance achieved with ethanol.