APPENDIX B:

2000 SUGGESTED CONTROL MEASURE FOR ARCHITECTURAL COATINGS

California Air Resources Board (ARB)
Suggested Control Measure for Architectural Coatings

1. APPLICABILITY

1.1 Except as provided in subsection 1.2, this rule is applicable to any person who supplies, sells, offers for sale, or manufactures any architectural coating for use within the District, as well as any person who applies or solicits the application of any architectural coating within the District.

1.2 This rule does not apply to:

1.2.1 Any architectural coating that is sold or manufactured for use outside of the District or for shipment to other manufacturers for reformulation or repackaging.
1.2.2 Any aerosol coating product.
1.2.3 Any architectural coating that is sold in a container with a volume of one liter (1.057 quart) or less.

2. DEFINITIONS

2.0 Adhesive: Any chemical substance that is applied for the purpose of bonding two surfaces together other than by mechanical means.

2.1 Aerosol Coating Product: A pressurized coating product containing pigments or resins that dispenses product ingredients by means of a propellant, and is packaged in a disposable can for hand-held application, or for use in specialized equipment for ground traffic/marking applications.

2.2 Antenna Coating: A coating labeled and formulated exclusively for application to equipment and associated structural appurtenances that are used to receive or transmit electromagnetic signals.

2.3 Antifouling Coating: A coating labeled and formulated for application to submerged stationary structures and their appurtenances to prevent or reduce the attachment of marine or freshwater biological organisms. To qualify as an antifouling coating, the coating must be registered with both the U.S. EPA under the Federal Insecticide, Fungicide, and Rodenticide Act (7 U.S.C. Section 136, *et seq*.) and with the California Department of Pesticide Regulation.

2.4 Appurtenance: Any accessory to a stationary structure coated at the site of installation, whether installed or detached, including but not limited to: bathroom and kitchen fixtures; cabinets; concrete forms; doors; elevators; fences; hand railings; heating equipment, air conditioning equipment, and other fixed mechanical equipment or stationary tools; lampposts; partitions; pipes and piping systems; rain gutters and downspouts; stairways, fixed ladders, catwalks, and fire escapes; and window screens.

2.5 Architectural Coating: A coating to be applied to stationary structures or their appurtenances at the site of installation, to portable buildings at the site of installation, to pavements, or to curbs. Coatings applied in shop applications or to non-stationary structures such as airplanes, ships, boats, railcars, and automobiles, and adhesives are not considered architectural coatings for the purposes of this rule.

2.6 Bitumens: Black or brown materials including, but not limited to, asphalt, tar, pitch, and asphaltite that are soluble in carbon disulfide, consist mainly of hydrocarbons, and are obtained from natural deposits or as residues from the distillation of crude petroleum or coal.

2.7 Bituminous Roof Coating: A coating which incorporates bitumens that is labeled and formulated exclusively for roofing.

2.8 Bituminous Roof Primer: A primer which incorporates bitumens that is labeled and formulated exclusively for roofing.

2.9 Bond Breaker: A coating labeled and formulated for application between layers of concrete to prevent a freshly poured top layer of concrete from bonding to the layer over which it is poured.

2.10 Clear Brushing Lacquers: Clear wood finishes, excluding clear lacquer sanding sealers, formulated with nitrocellulose or synthetic resins to dry by solvent evaporation without chemical reaction and to provide a solid, protective film, which are intended exclusively for application by brush, and which are labeled as specified in subsection 4.1.5.

2.11 Clear Wood Coatings: Clear and semi-transparent coatings, including lacquers and varnishes, applied to wood substrates to provide a transparent or translucent solid film.

2.12 Coating: A material applied onto or impregnated into a substrate for protective, decorative, or functional purposes. Such materials include, but are not limited to, paints, varnishes, sealers, and stains.

2.13 Colorant: A concentrated pigment dispersion in water, solvent, and/or binder that is added to an architectural coating after packaging in sale units to produce the desired color.

2.14 Concrete Curing Compound: A coating labeled and formulated for application to freshly poured concrete to retard the evaporation of water.

2.15 Dry Fog Coating: A coating labeled and formulated only for spray application such that overspray droplets dry before subsequent contact with incidental surfaces in the vicinity of the surface coating activity.

2.16 Exempt Compound: A compound identified as exempt under the definition of Volatile Organic Compound (VOC), subsection 2.60. Exempt compounds

content of a coating shall be determined by U.S. EPA Method 24 or South Coast Air Quality Management
District (SCAQMD) Method 303-91 (Revised February 1993), incorporated by reference in subsection 6.5.10.

2.17 Faux Finishing Coating: A coating labeled and formulated as a stain or glaze to create artistic effects including, but not limited to, dirt, old age, smoke damage, and simulated marble and wood grain.

2.18 Fire-Resistive Coating: An opaque coating labeled and formulated to protect the structural integrity by increasing the fire endurance of interior or exterior steel and other structural materials, that has been fire tested and rated by a testing agency approved by building code officials for use in bringing assemblies of structural materials into compliance with federal, state, and local building code requirements. The fire-resistive coating and the testing agency must be approved by building code officials. The fire-resistant coating shall be tested in accordance with ASTM Designation E 119-98, incorporated by reference in subsection 6.5.2.

2.19 Fire-Retardant Coating: A coating labeled and formulated to retard ignition and flame spread, that has been fire tested and rated by a testing agency approved by building code officials for use in bringing building and construction materials into compliance with federal, state and local building code requirements. The fire-retardant coating and the testing agency must be approved by building code officials. The fire-retardant coating shall be tested in accordance with ASTM Designation E 84-99, incorporated by reference in subsection 6.5.1.

2.20 Flat Coating: A coating that is not defined under any other definition in this rule and that registers gloss less than 15 on an 85-degree meter or less than 5 on a 60-degree meter according to ASTM Designation D 523-89 (1999), incorporated by reference in subsection 6.5.3.

2.21 Floor Coating: An opaque coating that is labeled and formulated for application to flooring, including, but not limited to, decks, porches, steps, and other horizontal surfaces which may be subject to foot traffic.

2.22 Flow Coating: A coating labeled and formulated exclusively for use by electric power companies or their subcontractors to maintain the protective coating systems present on utility transformer units.

2.23 Form-Release Compound: A coating labeled and formulated for application to a concrete form to prevent the freshly poured concrete from bonding to the form. The form may consist of wood, metal, or some material other than concrete.

2.24 Graphic Arts Coating or Sign Paint: A coating labeled and formulated for hand-application by artists using brush or roller techniques to indoor and outdoor signs (excluding structural components) and murals including lettering enamels, poster colors, copy blockers, and bulletin enamels.

2.25 High-Temperature Coating: A high performance coating labeled and formulated for application to substrates exposed continuously or intermittently to temperatures above 204°C (400°F).

2.26 Industrial Maintenance Coating: A high performance architectural coating, including primers, sealers, undercoaters, intermediate coats, and topcoats, formulated for application to substrates exposed to one or more of the following extreme environmental conditions listed in subsections 2.26.1 through 2.26.5, and labeled as specified in subsection 4.1.4:

2.26.1 Immersion in water, wastewater, or chemical solutions (aqueous and non-aqueous solutions), or chronic exposure of interior surfaces to moisture condensation;
2.26.2 Acute or chronic exposure to corrosive, caustic or acidic agents, or to chemicals, chemical fumes, or chemical mixtures or solutions;
2.26.3 Repeated exposure to temperatures above 121°C (250°F);
2.26.4 Repeated (frequent) heavy abrasion, including mechanical wear and repeated (frequent) scrubbing with industrial solvents, cleansers, or scouring agents; or
2.26.5 Exterior exposure of metal structures and structural components.

2.27 Lacquer: A clear or opaque wood coating, including clear lacquer sanding sealers, formulated with cellulosic or synthetic resins to dry by evaporation without chemical reaction and to provide a solid, protective film.

2.28 Low Solids Coating: A coating containing 0.12 kilogram or less of solids per liter (1 pound or less of solids per gallon) of coating material.

2.29 Magnesite Cement Coating: A coating labeled and formulated for application to magnesite cement decking to protect the magnesite cement substrate from erosion by water.

2.30 Mastic Texture Coating: A coating labeled and formulated to cover holes and minor cracks and to conceal surface irregularities, and is applied in a single coat of at least
10 mils (0.010 inch) dry film thickness.

2.31 Metallic Pigmented Coating: A coating containing at least 48 grams of elemental metallic pigment per liter of coating as applied (0.4 pounds per gallon), when tested in accordance with SCAQMD Method 318-95, incorporated by reference in subsection 6.5.4.

2.32 Multi-Color Coating: A coating that is packaged in a single container and that exhibits more than one color when applied in a single coat.

2.33 Nonflat Coating: A coating that is not defined under any other definition in this rule and that registers a gloss of 15 or greater on an 85-degree meter and 5 or greater on a 60-degree meter according to ASTM Designation D 523-89 (1999), incorporated by reference in subsection 6.5.3.

2.34 Nonflat - High Gloss Coating: A nonflat coating that registers a gloss of 70 or above on a 60-degree meter according to ASTM Designation D 523-89 (1999), incorporated by reference in subsection 6.5.3.

2.35 Nonindustrial Use: Nonindustrial use means any use of architectural coatings except in the construction or maintenance of any of the following: facilities used in the manufacturing of goods and commodities; transportation infrastructure, including highways, bridges, airports and railroads; facilities used in mining activities, including petroleum extraction; and utilities infrastructure, including power generation and distribution, and water treatment and distribution systems.

2.36 Post-Consumer Coating: A finished coating that would have been disposed of in a landfill, having completed its usefulness to a consumer, and does not include manufacturing wastes.

2.37 Pre-Treatment Wash Primer: A primer that contains a minimum of 0.5 percent acid, by weight, when tested in accordance with ASTM Designation D 1613-96, incorporated by reference in subsection 6.5.5, that is labeled and formulated for application directly to bare metal surfaces to provide corrosion resistance and to promote adhesion of subsequent topcoats.

2.38 Primer: A coating labeled and formulated for application to a substrate to provide a firm bond between the substrate and subsequent coats.

2.39 Quick-Dry Enamel: A nonflat coating that is labeled as specified in subsection 4.1.8 and that is formulated to have the following characteristics:

2.39.1 Is capable of being applied directly from the container under normal conditions with ambient temperatures between 16 and 27°C (60 and 80°F);

2.39.2 When tested in accordance with ASTM Designation D 1640-95, incorporated by reference in subsection 6.5.6, sets to touch in 2 hours or less, is tack free in
4 hours or less, and dries hard in 8 hours or less by the mechanical test method; and

2.39.3 Has a dried film gloss of 70 or above on a 60 degree meter.

2.40 Quick-Dry Primer, Sealer, and Undercoater: A primer, sealer, or undercoater that is dry to the touch in 30 minutes and can be recoated in 2 hours when tested in accordance with ASTM Designation D 1640- 95, incorporated by reference in subsection 6.5.6.

2.41 Recycled Coating: An architectural coating formulated such that not less than 50 percent of the total weight consists of secondary and post-consumer coating, with not less than
10 percent of the total weight consisting of post-consumer coating.

2.42 Residence: Areas where people reside or lodge, including, but not limited to, single and multiple family dwellings, condominiums, mobile homes, apartment complexes, motels, and hotels.

2.43 Roof Coating: A non-bituminous coating labeled and formulated exclusively for application to roofs for the primary purpose of preventing penetration of the substrate by water or reflecting heat and ultraviolet radiation. Metallic pigmented roof coatings which qualify as metallic pigmented coatings shall not be considered to be in this category, but shall be considered to be in the metallic pigmented coatings category.

2.44 Rust Preventative Coating: A coating formulated exclusively for nonindustrial use to prevent the corrosion of metal surfaces and labeled as specified in subsection 4.1.6.

2.45 Sanding Sealer: A clear or semi-transparent wood coating labeled and formulated for application to bare wood to seal the wood and to provide a coat that can be abraded to create a smooth surface for subsequent applications of coatings. A sanding sealer that also meets the definition of a lacquer is not included in this category, but is included in the lacquer category.

2.46 Sealer: A coating labeled and formulated for application to a substrate for one or more of the following purposes: to prevent subsequent coatings from being absorbed by the substrate, or to prevent harm to subsequent coatings by materials in the substrate.

2.47 Secondary Coating (Rework): A fragment of a finished coating or a finished coating from a manufacturing process that has converted resources into a commodity of real economic value, but does not include excess virgin resources of the manufacturing process.

2.48 Shellac: A clear or opaque coating formulated solely with the resinous secretions of the lac beetle (*Laciffer lacca*), thinned with alcohol, and formulated to dry by evaporation without a chemical reaction.

2.49 Shop Application: Application of a coating to a product or a component of a product in or on the premises of a factory or a shop as part of a manufacturing, production, or repairing process (e.g., original equipment manufacturing coatings).

2.50 Solicit: To require for use or to specify, by written or oral contract.

2.51 Specialty Primer, Sealer, and Undercoater: A coating labeled as specified in subsection 4.1.7 and that is formulated for application to a substrate to seal fire, smoke or water damage; to condition excessively chalky surfaces, or to block stains. An excessively chalky surface is one that is defined as having a chalk rating of four or less as determined by ASTM Designation D 4214-98, incorporated by reference in subsection 6.5.7.

2.52 Stain: A clear, semitransparent, or opaque coating labeled and formulated to change the color of a surface but not conceal the grain pattern or texture.

2.53 Swimming Pool Coating: A coating labeled and formulated to coat the interior of swimming pools and to resist swimming pool chemicals.

2.54 Swimming Pool Repair and Maintenance Coating: A rubber based coating labeled and formulated to be used over existing rubber based coatings for the repair and maintenance of swimming pools.

2.55 Temperature-Indicator Safety Coating: A coating labeled and formulated as a color-changing indicator coating for the purpose of monitoring the temperature and safety of the substrate, underlying piping, or underlying equipment, and for application to substrates exposed continuously or intermittently to temperatures above 204°C (400°F).

2.56 Tint Base: An architectural coating to which colorant is added after packaging in sale units to produce a desired color.

2.57 Traffic Marking Coating: A coating labeled and formulated for marking and striping streets, highways, or other traffic surfaces including, but not limited to, curbs, berms, driveways, parking lots, sidewalks, and airport runways.

2.58 Undercoater: A coating labeled and formulated to provide a smooth surface for subsequent coatings.

2.59 Varnish: A clear or semi-transparent wood coating, excluding lacquers and shellacs, formulated to dry by chemical reaction on exposure to air. Varnishes may contain small amounts of pigment to color a surface, or to control the final sheen or gloss of the finish.

2.60 Volatile Organic Compound (VOC): Any volatile compound containing at least one atom of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate, and excluding the following:

2.60.1 methane;
methylene chloride (dichloromethane);
1,1,1-trichloroethane (methyl chloroform);
trichlorofluoromethane (CFC-11);
dichlorodifluoromethane (CFC-12);
1,1,2-trichloro-1,2,2-trifluoroethane (CFC-113);
1,2-dichloro-1,1,2,2-tetrafluoroethane (CFC-114);
chloropentafluoroethane (CFC-115);
chlorodifluoromethane (HCFC-22);
1,1,1-trifluoro-2,2-dichloroethane (HCFC-123);
2-chloro-1,1,1,2-tetrafluoroethane (HCFC-124);
1,1-dichloro-1-fluoroethane (HCFC-141b);
1-chloro-1,1-difluoroethane (HCFC-142b);

trifluoromethane (HFC-23);
pentafluoroethane (HFC-125);
1,1,2,2-tetrafluoroethane (HFC-134);
1,1,1,2-tetrafluoroethane (HFC-134a);
1,1,1-trifluoroethane (HFC-143a);
1,1-difluoroethane (HFC-152a);
cyclic, branched, or linear completely methylated siloxanes;
the following classes of perfluorocarbons:
(A) cyclic, branched, or linear, completely fluorinated alkanes;
(B) cyclic, branched, or linear, completely fluorinated ethers with no unsaturations;
(C) cyclic, branched, or linear, completely fluorinated tertiary amines with no unsaturations; and
(D) sulfur-containing perfluorocarbons with no unsaturations and with the sulfur bonds only to carbon and fluorine; and

2.60.2 the following low-reactive organic compounds which have been exempted by the U.S. EPA:
acetone;
ethane;
parachlorobenzotrifluoride (1-chloro-4-trifluoromethyl benzene);
perchloroethylene; and
methyl acetate.

2.61 VOC Content: The weight of VOC per volume of coating, calculated according to the procedures specified in subsection 6.1.

2.62 Waterproofing Sealer: A coating labeled and formulated for application to a porous substrate for the primary purpose of preventing the penetration of water.

2.63 Waterproofing Concrete/Masonry Sealer: A clear or pigmented film-forming coating that is labeled and formulated for sealing concrete and masonry to provide resistance against water, alkalis, acids, ultraviolet light, and staining.

2.64 Wood Preservative: A coating labeled and formulated to protect exposed wood from decay or insect attack, that is registered with both the U.S. EPA under the Federal Insecticide, Fungicide, and Rodenticide Act (7 United States Code (U.S.C.) Section 136, *et seq.*) and with the California Department of Pesticide Regulation.

3. STANDARDS

3.1 **VOC Content Limits:** Except as provided in subsections 3.2, 3.3, 3.8, 3.9, and 3.10, no person shall: (i) manufacture, blend, or repackage for sale within the district;
(ii) supply, sell, or offer for sale within the district; or (iii) solicit for application or apply within the district, any architectural coating with a VOC content in excess of the corresponding limit specified in Table 1, after the specified effective date in Table 1.

3.2 **Most Restrictive VOC Limit:** If anywhere on the container of any architectural coating, or any label or sticker affixed to the container, or in any sales, advertising, or technical literature supplied by a manufacturer or anyone acting on their behalf, any representation is made that indicates that the coating meets the definition of or is recommended for use for more than one of the coating categories listed in Table 1, then the most restrictive VOC content limit shall apply. This provision does not apply to the coating categories specified in subsections 3.2.1 through 3.2.15.

3.2.1 Lacquer coatings (including lacquer sanding sealers).
3.2.2 Metallic pigmented coatings.
3.2.3 Shellacs.
3.2.4 Fire-retardant coatings.
3.2.5 Pretreatment wash primers.
3.2.6 Industrial maintenance coatings.
3.2.7 Low-solids coatings.
3.2.8 Wood preservatives.
3.2.9 High temperature coatings.
3.2.10 Temperature-indicator safety coatings.
3.2.11 Antenna coatings.
3.2.12 Antifouling coatings.
3.2.13 Flow coatings.
3.2.14 Bituminous roof primers.
3.2.15 Specialty primers, sealers, and undercoaters.

3.3 **Sell-Through of Coatings:** A coating manufactured prior to the effective date specified for that coating in Table 1 may be sold, supplied, or offered for sale for up to three years after the specified effective date. In addition, a coating manufactured before the effective date specified for that coating in Table 1 may be applied at any time, both before and after the specified effective date, so long as the coating complied with the standards in effect at the time the coating was manufactured. This subsection 3.3 does not apply to any coating that does not display the date or date-code required by subsection 4.1.1.

SCM Clarification - New subsection "3.3.1"
(See June 7, 2001 letter to all districts by Mike Kenny, ARB Executive Officer)

3.3.1 A coating included in an approved Averaging Program that does not comply with the specified limit in Table 1 may be sold, supplied, or offered for sale for up to three years after the end of the compliance period specified in the approved Averaging Program. In addition, such a coating may be applied at any time, both during and after the compliance period. This subsection 3.3.1 does not apply to any coating that does not display on the container either the statement: "This product is subject to architectural coatings averaging provisions in California," or a substitute symbol specified by the Executive Officer of the ARB. This subsection 3.3.1 shall remain in effect until January 1, 2008.

3.4 **Painting Practices:** All architectural coating containers used to apply the contents therein to a surface directly from the container by pouring, siphoning, brushing, rolling, padding, ragging or other means, shall be closed when not in

use. These architectural coating containers include, but are not limited to, drums, buckets, cans, pails, trays or other application containers. Containers of any VOC-containing materials used for thinning and cleanup shall also be closed when not in use.

3.5 **Thinning:** No person who applies or solicits the application of any architectural coating shall apply a coating that is thinned to exceed the applicable VOC limit specified in
Table 1.

3.6 **Rust Preventative Coatings:** Effective January 1, 2004, no person shall apply or solicit the application of any rust preventative coating for industrial use, unless such a rust preventative coating complies with the industrial maintenance coating VOC limit specified in Table 1.

3.7 **Coatings Not Listed in Table 1:** For any coating that does not meet any of the definitions for the specialty coatings categories listed in Table 1, the VOC content limit shall be determined by classifying the coating as a flat coating or a nonflat coating, based on its gloss, as defined in subsections 2.20, 2.33, and 2.34 and the corresponding flat or nonflat VOC limit shall apply.

3.8 **Industrial Maintenance Coatings:**

3.8.1 After January 1, 2004, a manufacturer, seller, or user may petition the APCO to apply an industrial maintenance coating with a VOC content up to 340 g/l if all of the following conditions are met:

3.8.1.1 The industrial maintenance coating is to be applied in a district located within the North Central Coast, San Francisco Bay Area, or North Coast Air Basins.

3.8.1.2 The petition submitted to the APCO contains the following information, as applicable: job requirements and description, volume of coating, maximum VOC content, and a certification that a complying coating meeting the job performance requirements is not available.

3.8.1.3 If the APCO grants written approval, such approval shall contain volume and VOC limit conditions. Until written approval is granted by the APCO and received by the petitioner, all provisions of this rule shall apply.

3.8.2 The APCO shall not approve any petition under subsection 3.8.1 if the approvals previously granted by the APCO during the calendar year, when combined with the petition under consideration, would result in excess VOC emissions for that calendar year which would be greater than 5 percent of the annual emission reduction achieved within the district from implementing the January 1, 2004, VOC limit for industrial maintenance coatings.

3.8.3 Coatings subject to this provision shall be sold only if an approved petition (or a copy of it) is provided prior to the sale. Coatings subject to this provision shall not be available to the general public.

3.9 **Lacquers:** Notwithstanding the provisions of subsection 3.1, a person or facility may add up to 10 percent by volume of VOC to a lacquer to avoid blushing of the finish during days with relative humidity greater than 70 percent and temperature below 65°F, at the time of application, provided that the coating contains acetone and no more than
550 grams of VOC per liter of coating, less water and exempt compounds, prior to the addition of VOC.

3.10 **Averaging Compliance Option:** On or after January 1, 2003, in lieu of compliance with the specified limits in Table 1 for floor coatings; industrial maintenance coatings; primers, sealers, and undercoaters; quick-dry primers, sealers, and undercoaters; quick-dry enamels; roof coatings; rust preventative coatings; stains; waterproofing sealers, as well as flats and non-flats (excluding recycled coatings), manufacturers may average designated coatings such that their actual cumulative emissions from the averaged coatings are less than or equal to the cumulative emissions that would have been allowed under those limits over a compliance period not to exceed one year. Such manufacturers must also comply with the averaging provisions contained in Appendix A, as well as maintain and make available for inspection records for at least three years after the end of the compliance period. This subsection 3.10 and Appendix A shall cease to be effective on January 1, 2005, after which averaging will no longer be allowed.

4. CONTAINER LABELING REQUIREMENTS

4.1 Each manufacturer of any architectural coating subject to this rule shall display the information listed in subsections 4.1.1 through 4.1.8 on the coating container (or label) in which the coating is sold or distributed.

4.1.1 **Date Code:** The date the coating was manufactured, or a date code representing the date, shall be indicated on the label, lid, or bottom of the container. If the manufacturer uses a date code for any coating, the manufacturer shall file an explanation of each code with the Executive Officer of the ARB.

4.1.2 **Thinning Recommendations:** A statement of the manufacturer's recommendation regarding thinning of the coating shall be indicated on the label or lid of the container. This requirement does not apply to the thinning of architectural coatings with water. If thinning of the coating prior to use is not necessary, the recommendation must specify that the coating is to be applied without thinning.

4.1.3 **VOC Content:** Each container of any coating subject to this rule shall display either the maximum or the actual VOC content of the coating, as supplied, including the maximum thinning as recommended by the

manufacturer. VOC content shall be displayed in grams of VOC per liter of coating. VOC content displayed shall be calculated using product formulation data, or shall be determined using the test methods in subsection 6.2. The equations in subsection 6.1 shall be used to calculate VOC content.

4.1.4 **Industrial Maintenance Coatings:** In addition to the information specified in subsection 4.1.1, 4.1.2, and 4.1.3, each manufacturer of any industrial maintenance coating subject to this rule shall display on the label or lid of the container in which the coating is sold or distributed one or more of the descriptions listed in subsections 4.1.4.1 through 4.1.4.3.

4.1.4.1 "For industrial use only."
4.1.4.2 "For professional use only."
4.1.4.3 "Not for residential use or Not intended for residential use."

4.1.5 **Clear Brushing Lacquers:** Effective January 1, 2003, the labels of all clear brushing lacquers shall prominently display the statements "For brush application only," and "This product must not be thinned or sprayed."

4.1.6 **Rust Preventative Coatings:** Effective January 1, 2003, the labels of all rust preventative coatings shall prominently display the statement "For Metal Substrates Only."

4.1.7 **Specialty Primers, Sealers, and Undercoaters:** Effective January 1, 2003, the labels of all specialty primers, sealers, and undercoaters shall prominently display one or more of the descriptions listed in subsection 4.1.7.1 through 4.1.7.5.

4.1.7.1 For blocking stains.
4.1.7.2 For fire-damaged substrates.
4.1.7.3 For smoke-damaged substrates.
4.1.7.4 For water-damaged substrates.
4.1.7.5 For excessively chalky substrates.

4.1.8 **Quick Dry Enamels:** Effective January 1, 2003, the labels of all quick dry enamels shall prominently display the words "Quick Dry" the dry hard time.

4.1.9 **Nonflat - High Gloss Coatings:** Effective January 1, 2003, the labels of all nonflat - high gloss coatings shall prominently display the words "High Gloss."

5. REPORTING REQUIREMENTS

5.1 **Clear Brushing Lacquers:** Each manufacturer of clear brushing lacquers shall, on or before April 1 of each calendar year beginning in the year 2004, submit an annual report to the Executive Officer of the ARB. The report shall specify the

number of gallons of clear brushing lacquers sold in the State during the preceding calendar year, and shall describe the method used by the manufacturer to calculate State sales.

5.2 **Rust Preventative Coatings:** Each manufacturer of rust preventative coatings shall, on or before April 1 of each calendar year beginning in the year 2004, submit an annual report to the Executive Officer of the ARB. The report shall specify the number of gallons of rust preventative coatings sold in the State during the preceding calendar year, and shall describe the method used by the manufacturer to calculate State sales.

5.3 **Specialty Primers, Sealers, and Undercoaters:** Each manufacturer of specialty primers, sealers, and undercoaters shall, on or before April 1 of each calendar year beginning in the year 2004, submit an annual report to the Executive Officer of the ARB. The report shall specify the number of gallons of specialty primers, sealers, and undercoaters sold in the State during the preceding calendar year, and shall describe the method used by the manufacturer to calculate State sales.

5.4 **Toxic Exempt Compounds:** For each architectural coating that contains perchloroethylene or methylene chloride, the manufacturer shall, on or before April 1 of each calendar year beginning with the year 2004, report to the Executive Officer of the ARB the following information for products sold in the State during the preceding year:

5.4.1 the product brand name and a copy of the product label with legible usage instructions;
5.4.2 the product category listed in Table 1 to which the coating belongs;
5.4.3 the total sales in California during the calendar year to the nearest gallon;
5.4.4 the volume percent, to the nearest 0.10 percent, of perchloroethylene and methylene chloride in the coating.

5.5 **Recycled Coatings:** Manufacturers of recycled coatings must submit a letter to the Executive Officer of the ARB certifying their status as a Recycled Paint Manufacturer. The manufacturer shall, on or before April 1 of each calendar year beginning with the year 2004, submit an annual report to the Executive Officer of the ARB. The report shall include, for all recycled coatings, the total number of gallons distributed in the State during the preceding year, and shall describe the method used by the manufacturer to calculate State distribution.

5.6 **Bituminous Coatings:** Each manufacturer of bituminous roof coatings or bituminous roof primers shall, on or before April 1 of each calendar year beginning with the
year 2004, submit an annual report to the Executive Officer of ARB. The report shall specify the number of gallons of bituminous roof coatings or bituminous roof primers sold in the State during the preceding calendar year, and shall describe the method used by the manufacturer to calculate State sales.

6. COMPLIANCE PROVISIONS AND TEST METHODS

6.1 **Calculation of VOC Content:** For the purpose of determining compliance with the VOC content limits in Table 1, the VOC content of a coating shall be determined by using the procedures described in subsection 6.1.1 or 6.1.2, as appropriate. The VOC content of a tint base shall be determined without colorant that is added after the tint base is manufactured.

6.1.1 With the exception of low solids coatings, determine the VOC content in grams of VOC per liter of coating thinned to the manufacturer's maximum recommendation, excluding the volume of any water and exempt compounds. Determine the VOC content using equation 1 as follows:

$$\text{VOC Content} = \frac{(W_s - W_w - W_{ec})}{(V_m - V_w - V_{ec})} \qquad (1)$$

Where:
VOC Content = grams of VOC per liter of coating
W_s = weight of volatiles, in grams
W_w = weight of water, in grams
W_{ec} = weight of exempt compounds, in grams
V_m = volume of coating, in liters
V_w = volume of water, in liters
V_{ec} = volume of exempt compounds, in liters

6.1.2 For low solids coatings, determine the VOC content in units of grams of VOC per liter of coating thinned to the manufacturer's maximum recommendation, including the volume of any water and exempt compounds. Determine the VOC content using equation 2 as follows:

$$\text{VOC Content}_{ls} = \frac{(W_s - W_w - W_{ec})}{(V_m)} \qquad (2)$$

Where:
VOC Content$_{ls}$ = the VOC content of a low solids coating in grams of VOC per liter of coating
W_s = weight of volatiles, in grams
W_w = weight of water, in grams
W_{ec} = weight of exempt compounds, in grams
V_m = volume of coating, in liters

6.2 **VOC Content of Coatings:** To determine the physical properties of a coating in order to perform the calculations in subsection 6.1, the reference method for VOC content is
U.S. EPA Method 24, incorporated by reference in subsection 6.5.11, except as provided in subsections 6.3 and 6.4. An alternative method to determine the VOC content of coatings is SCAQMD Method 304-91 (Revised February 1996),

incorporated by reference in subsection 6.5.12. The exempt compounds content shall be determined by SCAQMD Method 303-91 (Revised August 1996), incorporated by reference in subsection 6.5.10. To determine the VOC content of a coating, the manufacturer may use U.S. EPA Method 24, or an alternative method as provided in subsection 6.3, formulation data, or any other reasonable means for predicting that the coating has been formulated as intended (e.g., quality assurance checks, record keeping). However, if there are any inconsistencies between the results of a Method 24 test and any other means for determining VOC content, the Method 24 test results will govern, except when an alternative method is approved as specified in subsection 6.3. The District Air Pollution Control Officer (APCO) may require the manufacturer to conduct a Method 24 analysis.

6.3 **Alternative Test Methods:** Other test methods demonstrated to provide results that are acceptable for purposes of determining compliance with subsection 6.2, after review and approved in writing by the staffs of the District, the ARB, and the U.S. EPA, may also be used.

6.4 **Methacrylate Traffic Marking Coatings:** Analysis of methacrylate multicomponent coatings used as traffic marking coatings shall be conducted according to a modification of U.S. EPA Method 24 (40 CFR 59, subpart D, Appendix A), incorporated by reference in subsection 6.5.13. This method has not been approved for methacrylate multicomponent coatings used for other purposes than as traffic marking coatings or for other classes of multicomponent coatings.

6.5 **Test Methods:** The following test methods are incorporated by reference herein, and shall be used to test coatings subject to the provisions of this rule:

6.5.1 **Flame Spread Index:** The flame spread index of a fire-retardant coating shall be determined by ASTM Designation E 84-99, “Standard Test Method for Surface Burning Characteristics of Building Materials” (see section 2, Fire-Retardant Coating).

6.5.2 **Fire Resistance Rating:** The fire resistance rating of a fire-resistive coating shall be determined by ASTM Designation E 119-98, “Standard Test Methods for Fire Tests of Building Construction Materials” (see section 2, Fire-Resistive Coating).

6.5.3 **Gloss Determination:** The gloss of a coating shall be determined by ASTM Designation D 523-89 (1999), “Standard Test Method for Specular Gloss” (see section 2, Flat Coating, Nonflat Coating, Nonflat - High Gloss Coating, and Quick-Dry Enamel).

6.5.4 **Metal Content of Coatings:** The metallic content of a coating shall be determined by SCAQMD Method 318-95, “Determination of Weight Percent Elemental Metal in Coatings by X-Ray Diffraction,” *SCAQMD Laboratory Methods of Analysis for Enforcement Samples* (see section 2, Metallic Pigmented Coating).

6.5.5 **Acid Content of Coatings:** The acid content of a coating shall be determined by ASTM Designation D 1613-96, "Standard Test Method for Acidity in Volatile Solvents and Chemical Intermediates Used in Paint, Varnish, Lacquer, and Related Products" (see section 2, Pre-treatment Wash Primer).

6.5.6 **Drying Times:** The set-to-touch, dry-hard, dry-to-touch, and dry-to-recoat times of a coating shall be determined by ASTM Designation D 1640-95, "Standard Test Methods for Drying, Curing, or Film Formation of Organic Coatings at Room Temperature" (see section 2, Quick-Dry Enamel and Quick-Dry Primer, Sealer, and Undercoater). The tack-free time of a quick-dry enamel coating shall be determined by the Mechanical Test Method of ASTM Designation D 1640-95.

6.5.7 **Surface Chalkiness:** The chalkiness of a surface shall be determined using ASTM Designation D 4214-98, "Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films" (see section 2, Specialty Primer, Sealer, and Undercoater).

6.5.8 **Exempt Compounds--Siloxanes:** Exempt compounds that are cyclic, branched, or linear completely methylated siloxanes, shall be analyzed as exempt compounds for compliance with section 6 by BAAQMD Method 43, "Determination of Volatile Methylsiloxanes in Solvent-Based Coatings, Inks, and Related Materials," *BAAQMD Manual of Procedures*, Volume III, adopted 11/6/96 (see section 2, Volatile Organic Compound, and subsection 6.2).

6.5.9 **Exempt Compounds--Parachlorobenzotrifluoride (PCBTF)**: The exempt compound parachlorobenzotrifluoride, shall be analyzed as an exempt compound for compliance with section 6 by BAAQMD Method 41, "Determination of Volatile Organic Compounds in Solvent Based Coatings and Related Materials Containing Parachlorobenzotrifluoride," *BAAQMD Manual of Procedures*, Volume III, adopted 12/20/95 (see section 2, Volatile Organic Compound, and subsection 6.2).

6.5.10 **Exempt Compounds:** The content of compounds exempt under U.S. EPA Method 24 shall be analyzed by SCAQMD Method 303-91 (Revised 1993), "Determination of Exempt Compounds," *SCAQMD Laboratory Methods of Analysis for Enforcement Samples* (see section 2, Volatile Organic Compound, and subsection 6.2).

6.5.11 **VOC Content of Coatings:** The VOC content of a coating shall be determined by U.S. EPA Method 24 as it exists in appendix A of 40 *Code of Federal Regulations* (CFR) part 60, "Determination of Volatile Matter Content, Water Content, Density, Volume Solids, and Weight Solids of Surface Coatings" (see subsection 6.2).

6.5.12 **Alternative VOC Content of Coatings:** The VOC content of coatings may be analyzed either by U.S. EPA Method 24 or SCAQMD Method 304-91 (Revised 1996), "Determination of Volatile Organic Compounds (VOC) in Various Materials," *SCAQMD Laboratory Methods of Analysis for Enforcement Samples* (see subsection 6.2).

6.5.13 **Methacrylate Traffic Marking Coatings:** The VOC content of methacrylate multicomponent coatings used as traffic marking coatings shall be analyzed by the procedures in 40 CFR part 59, subpart D, appendix A, "Determination of Volatile Matter Content of Methacrylate Multicomponent Coatings Used as Traffic Marking Coatings" (September 11, 1998) (see subsection 6.4).

Table 1
VOC CONTENT LIMITS FOR ARCHITECTURAL COATINGS

Limits are expressed in grams of VOC per liter[a] of coating thinned to the manufacturer's maximum recommendation, excluding the volume of any water, exempt compounds, or colorant added to tint bases. "Manufacturer's maximum recommendation" means the maximum recommendation for thinning that is indicated on the label or lid of the coating container.

Coating Category	Effective 1/1/2003	Effective 1/1/2004
Flat Coatings	100	
Nonflat Coatings	150	
Nonflat - High Gloss Coatings	250	
Specialty Coatings		
Antenna Coatings	530	
Antifouling Coatings	400	
Bituminous Roof Coatings	300	
Bituminous Roof Primers	350	
Bond Breakers	350	
Clear Wood Coatings • Clear Brushing Lacquers • Lacquers (including lacquer sanding sealers) • Sanding Sealers (other than lacquer sanding sealers) • Varnishes	 680 550 350 350	
Concrete Curing Compounds	350	
Dry Fog Coatings	400	
Faux Finishing Coatings	350	
Fire Resistive Coatings	350	
Fire-Retardant Coatings: • Clear • Opaque	 650 350	
Floor Coatings	250	
Flow Coatings	420	
Form-Release Compounds	250	
Graphic Arts Coatings (Sign Paints)	500	

Table 1 Continued

Coating Category	Effective 1/1/2003	Effective 1/1/2004
High Temperature Coatings	420	
Industrial Maintenance Coatings		250
Low Solids Coatings[b]	120	
Magnesite Cement Coatings	450	
Mastic Texture Coatings	300	
Metallic Pigmented Coatings	500	
Multi-Color Coatings	250	
Pre-Treatment Wash Primers	420	
Primers, Sealers, and Undercoaters	200	
Quick-Dry Enamels	250	
Quick-Dry Primers, Sealers, and Undercoaters	200	
Recycled Coatings	250	
Roof Coatings	250	
Rust Preventative Coatings	400	
Shellacs: • Clear • Opaque	 730 550	
Specialty Primers, Sealers, and Undercoaters	350	
Stains	250	
Swimming Pool Coatings	340	
Swimming Pool Repair and Maintenance Coatings	340	
Temperature-Indicator Safety Coatings	550	
Traffic Marking Coatings	150	
Waterproofing Sealers	250	
Waterproofing Concrete/Masonry Sealers	400	
Wood Preservatives	350	

a Conversion factor: one pound VOC per gallon (U.S.) = 119.95 grams VOC per liter.
b Units are grams of VOC per liter (pounds of VOC per gallon) of coating, including water and exempt compounds.

APPENDIX A:
AVERAGING PROVISION

A. AVERAGING PROVISION

A.1 The manufacturer shall demonstrate that actual emissions from the coatings being averaged are less than or equal to the allowable emissions, for the specified compliance period using the following equation:

$$\sum_{i=1}^{n} GiMi \leq \sum_{i=1}^{n} GiViLi$$

Where:

$$\sum_{i=1}^{n} GiMi = \text{Actual Emissions}$$

$$\sum_{i=1}^{n} GiViLi = \text{Allowable Emissions}$$

Gi = Total Gallons of Product (i) subject to Averaging;

Mi = Material VOC Content of Product (i), in pounds per gallon;

$$Mi = \frac{Ws - Ww - Wec}{Vm}$$

Vi = Percent by Volume Solids and VOC in Product (i);

$$Vi = \frac{Vm - Vw - Vec}{Vm}$$

Where: Ws, Ww, Wec, Vm, Vw, and Vec are defined in subsection 6.1, except that in this Appendix weights are in pounds and volumes are in gallons.

For Non - Zero VOC Coatings:

$$Vi = \frac{\text{Material VOC (also known as VOC Actual)}}{\text{Coating VOC (also known as VOC Regulatory)}}$$

Where: $\text{Coating VOC} = \frac{Ws - Ww - Wec}{Vm - Vw - Vec}$

For Zero VOC Coatings:

Vi = Percent Solids by Volume

Li = Regulatory VOC Content Limit for Product (i), in pounds per gallon (as listed in Table 1)

The averaging is limited to coatings that are designated by the manufacturer. Any coating not designated in the averaging Program shall comply with the VOC limit in Table 1. The manufacturer shall not include any quantity of coatings that it knows or should have known will not be used in the State, if statewide coatings data are used. If district-specific coatings data are used, the manufacturer shall not include any quantity of coatings that it knows or should have known will not be used in the district.

SCM Clarification - New Section "A.1.1"
(See June 7, 2001 letter to all districts by Mike Kenny, ARB Executive Officer)

A.1.1 In addition to the requirements specified in subsection A.1, manufacturers shall not include in an Averaging Program any coating with a VOC content in excess of the following maximum VOC contents, for the applicable categories.

Averaging Category	VOC Limit (Li)[1] grams/liter	Maximum VOC Content grams/liter
Flat	100	250
Nonflat (Excludes High Gloss)	150	250
Floor	250	400
Industrial Maintenance	250	420
Primer, Sealer, Undercoater	200	350
Quick Dry Primer, Sealer, Undercoater	200	450
Quick Dry Enamel	250	400
Roof	250	300
Bituminous Roof	300	300
Rust Preventative	400	400
Stains	250	350
Waterproofing sealers	250	400

1. As listed in Table 1. Used when determining allowable emissions in subsection A.1.

A.2 AVERAGING PROGRAM (PROGRAM)

At least six months prior to the start of the compliance period, manufacturers shall submit an Averaging Program to the Executive Officer of the Air Resources Board. As used in this Appendix A, "Executive Officer" means the Executive Officer of the Air Resources Board. Averaging may not be implemented until the Program is approved in writing by the Executive Officer.

Within 45 days of submittal of a complete Program, the Executive Officer shall either approve or disapprove the Program. The Program applicant and the Executive Officer may agree to an extension of time for the Executive Officer to take action on the Program.

A.3 GENERAL REQUIREMENTS

The Program shall include all necessary information for the Executive Officer to make a determination as to whether the manufacturer may comply with the averaging requirements over the specified compliance period in an enforceable manner. Such information shall include, but is not limited to, the following:

A.3.1 An identification of the contact persons, telephone numbers, and name of the manufacturer who is submitting the Program.

A.3.2 An identification of each coating that has been selected by the manufacturer for inclusion in this program that exceeds the applicable VOC limit in
Table 1, its VOC content specified in units of both VOC actual and VOC regulatory, and the designation of the coating category.

A.3.3 A detailed demonstration showing that the projected actual emissions will not exceed the allowable emissions for a single compliance period that the Program will be in effect. In addition, the demonstration shall include VOC content information for each coating that is below the compliance limit in Table 1. The demonstration shall use the equation specified in subsection A.1 of this Appendix for projecting the actual emissions and allowable emissions during each compliance period. The demonstration shall also include all VOC content levels and projected volume within the State for each coating listed in the Program during each compliance period. The requested data can be summarized in a matrix form.

A.3.4 A specification of the compliance period(s) and applicable reporting dates. The length of the compliance period shall not be more than one year or less than six months.

A.3.5 An identification and description of all records to be made available to the Executive Officer upon request, if different than those identified under subsection A.3.6.

A.3.6 An identification and description of specific records to be used in calculating emissions for the Program and subsequent reporting, and a detailed explanation as to how those records will be used by the manufacturer to verify compliance with the averaging requirements.

A.3.7 A statement, signed by a responsible party for the manufacturer, that all information submitted is true and correct, and that records will be made available to the Executive Officer upon request.

A.4 REPORTING REQUIREMENTS

A.4.1 For every single compliance period, the manufacturer shall submit a mid-term report listing all coatings subject to averaging during the first

half of the compliance period, detailed analysis of the actual and allowable emissions at the end of the mid-term, and an explanation as to how the manufacturer intends to achieve compliance by the end of the compliance period. The report shall be signed by the responsible party for the manufacturer, attesting that all information submitted is true and correct. The mid-term report shall be submitted within 45 days after the midway date of the compliance period. A manufacturer may request, in writing, an extension of up to 15 days for submittal of the mid-term report.

A.4.2 Within 60 days after the end of the compliance period or upon termination of the Program, whichever is sooner, the manufacturer shall submit to the Executive Officer a report listing all coatings subject to averaging during the compliance period, providing a detailed demonstration of the balance between the actual and allowable emissions for the compliance period, any identification and description of specific records used by the manufacturer to verify compliance with the averaging requirement, and any other information requested by the Executive Officer to determine whether the manufacturer complied with the averaging requirements over the specified compliance period. The report shall be signed by the responsible party for the manufacturer, attesting that all information submitted is true and correct, and that records will be made available to the Executive Officer upon request. A manufacturer may request, in writing, an extension of up to 30 days for submittal of the final report.

A.5 RENEWAL OF A PROGRAM

A Program automatically expires at the end of the compliance period. The manufacturer may request a renewal of the Program by submitting a renewal request that shall include an updated Program, meeting all applicable Program requirements. The renewal request will be considered conditionally approved until the Executive Officer makes a final decision to deny or approve the renewal request based on a determination of whether the manufacturer is likely to comply with the averaging requirements. The Executive Officer shall base such determination on all available information, including but not limited to, the mid-term and the final reports of the preceding compliance period. The Executive Officer shall make a decision to deny or approve a renewal request no later than 45 days from the date of the final report submittal, unless the manufacturer and the Executive Officer agree to an extension of time for the Executive Officer to take action on the renewal request.

A.6 MODIFICATION OF A PROGRAM

A manufacturer may request a modification of the Program at any time prior to the end of the compliance period. The Executive Officer shall take action to approve or disapprove the modification request no longer than 45 days from the date of its submittal. No modification of the compliance period shall be allowed.

A Program need not be modified to specify additional coatings to be averaged that are below the applicable VOC limits.

A.7 TERMINATION OF A PROGRAM

A.7.1 A manufacturer may terminate its Program at any time by filing a written notification to the Executive Officer. The filing date shall be considered the effective date of the termination, and all other provisions of this rule including the VOC limits shall immediately thereafter apply. The manufacturer shall also submit a final report 60 days after the termination date. Any exceedance of the actual emissions over the allowable emissions over the period that the Program was in effect shall constitute a separate violation for each day of the entire compliance period.

A.7.2 The Executive Officer may terminate a Program if any of the following circumstances occur:

A.7.2.1 The manufacturer violates the requirements of the approved Program, and at the end of the compliance period, the actual emissions exceed the allowable emissions.

A.7.2.2 The manufacturer demonstrates a recurring pattern of violations and has consistently failed to take the necessary steps to correct those violations.

A.8 CHANGE IN VOC LIMITS

If the VOC limits of a coating listed in the Program are amended such that its effective date is less than one year from the date of adoption, the affected manufacturer may base its averaging on the prior limits of that coating until the end of the compliance period immediately following the date of adoption.

A.9 LABELING

Each container of any coating that is included in averaging program, and that exceeds the applicable VOC limit in Table 1 shall display the following statement: "This product is subject to architectural coatings averaging provisions in California." A symbol specified by the Executive Officer may be used as a substitute.

A.10 VIOLATIONS

The exceedance of the allowable emissions for any compliance period shall constitute a separate violation for each day of the compliance period. However, any violation of the requirements of the Averaging Provision of this rule, which the violator can demonstrate, to the Executive Officer, did not cause or allow the emission of an air contaminant and was not the result of negligent or knowing activity may be considered a minor violation.

A.11 SUNSET OF AVERAGING PROVISION

The averaging provision set forth in Appendix A shall cease to be effective on January 1, 2005, after which averaging will no longer be allowed.

APPENDIX C:

AIR QUALITY STANDARDS AND NONATTAINMENT AREAS

AIR QUALITY STANDARDS

C.1. Current Ozone and Particulate Matter Standards

To protect California's population from the harmful effects of ozone and PM, federal and State air quality standards for these contaminants have been established. These standards are shown in Table C-1.

The ARB adopted new PM standards in June of 2002, responding to requirements of the Children's Environmental Health Protection Act (Senate Bill 25, Escutia 1999). This Act requires the evaluation of all health-based ambient air quality standards to determine if the standards adequately protect human health, particularly that of infants and children. The subsequent review of the PM standards resulted in the recommendation of more health-protective ambient air quality standards for PM_{10} and a new standard for $PM_{2.5}$. The new PM standards became effective in 2003.

For ozone, the ARB approved a new eight-hour standard of 0.070 ppm and retained the one-hour ozone standard of 0.09 ppm in April 2005. These updated standards resulted from an extensive review of the scientific literature, which indicated that significant harmful health effects could occur among both adults and children if exposed to levels above these standards.

Table C-1
Ambient Air Quality Standards for Ozone, PM_{10}, and $PM_{2.5}$

Pollutant	Averaging Time	State Standard	National Standard
Ozone	1 Hour	0.09 ppm (180 $\mu g/m^3$)	----
	8 Hour	0.070 ppm (137 $\mu g/m^3$)	0.08 ppm (157 $\mu g/m^3$)
PM_{10}	24 Hour	50 $\mu g/m^3$	150 $\mu g/m^3$
	Annual Arithmetic Mean	20 $\mu g/m^3$	----
$PM_{2.5}$	24 Hour	----	35 $\mu g/m^3$
	Annual Arithmetic Mean	12 $\mu g/m^3$	15 $\mu g/m^3$

C.2. California Clean Air Act

The California Clean Air Act (CCAA) was enacted in 1988 and has the fundamental goal that all areas of California are to attain the State ambient air quality standard for ozone by the earliest practicable date. The State eight-hour ozone standard is set by the ARB, and is more stringent than the federal eight-hour ozone standard. As specified in the CCAA, the ARB has designated areas of California to be in "attainment" or "nonattainment" for the State ozone standard. Local districts that are nonattainment for the State ozone standard are required by the CCAA to prepare plans, which must be designed to achieve and maintain the standard by the earliest practicable date. In developing their plans

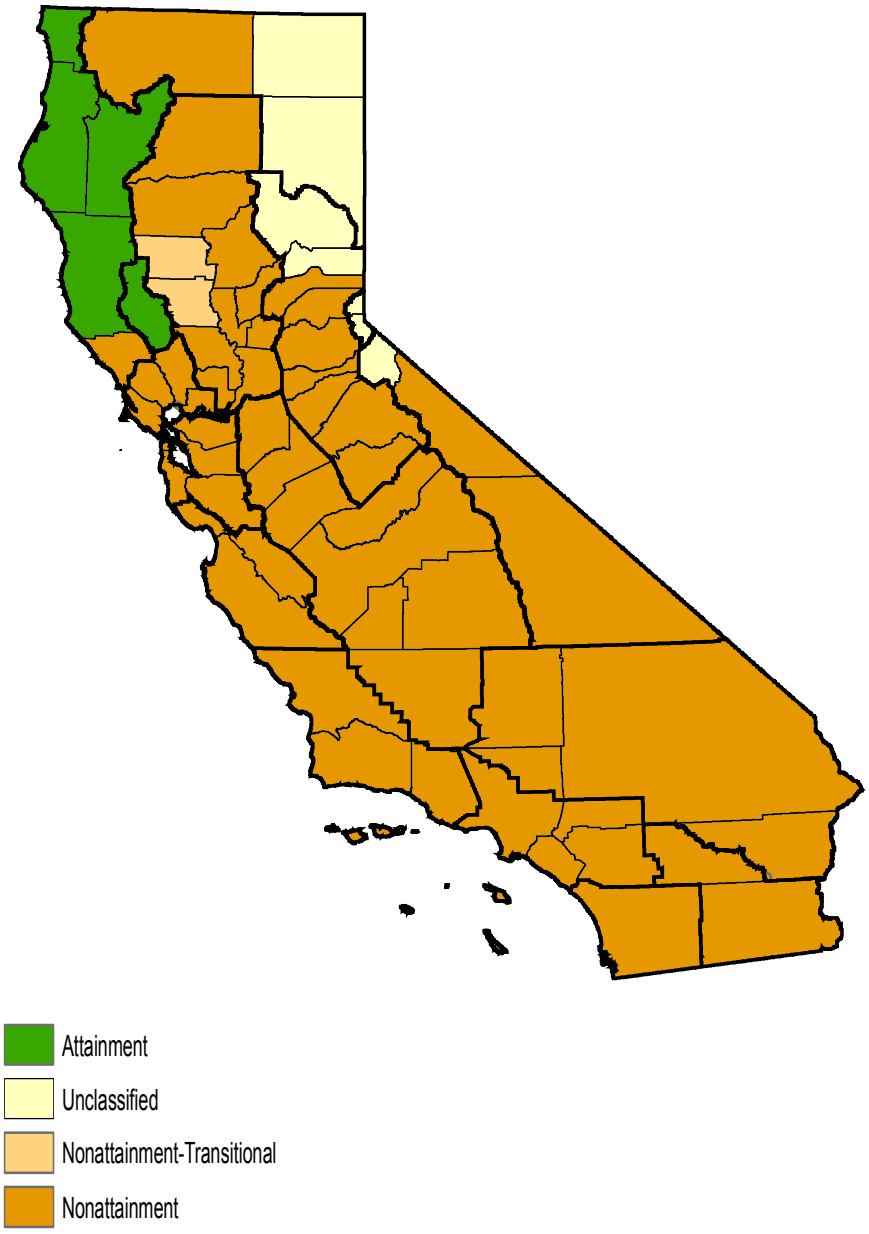
each district determines which measures are necessary to include, as well as the specific details of each included measure.

C.3. Status of Air Quality – State Standards

State law indicates that the California Legislature intends progress toward clean air to be made as quickly as possible. The CCAA specifically declares that it is the intent of the Legislature that the state air quality standards be achieved "...by the earliest practicable date..." (Health and Safety Code, sections 40910 and 40913(a)). Unhealthy levels of ozone and PM are not limited to urban areas, but can be found in nearly every county in California as seen in Figures C-1, C-2, and C-3. These figures highlight areas that exceed the State ambient air quality standards (i.e. "nonattainment areas").

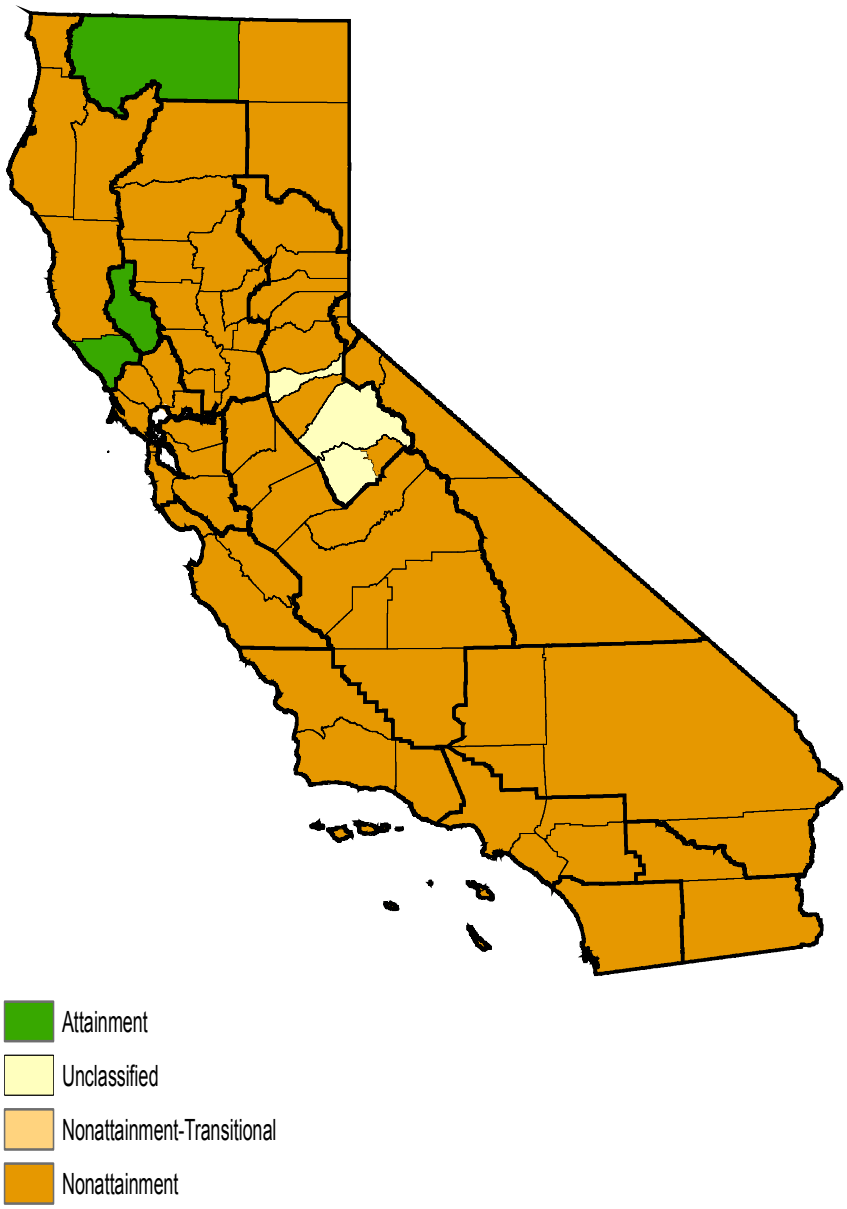
The 35 districts in California have air quality planning responsibilities. Of the 35 districts, 30 are nonattainment for the State 1-hour/8-hour ozone standard, 31 are nonattainment for the State 24-hour/annual PM_{10} standard, and 11 are nonattainment for the State annual $PM_{2.5}$ standard. For the State ozone and PM_{10} standards, a district is designated "nonattainment" for ozone if it does not meet either the 1-hour or 8-hour standard and "nonattainment" for PM_{10} if it does not meet either the 24-hour or annual standard. Table C-2 lists the districts that have been designated "nonattainment" because they exceed State standards for ozone or PM. Of the 30 ozone nonattainment districts, all but eight already have an architectural coatings rule. These eight districts are the Great Basin Unified, Amador County, Calaveras County, Mariposa County, Tuolumne County, Northern Sierra, Siskiyou County, and Glenn County Districts. Some of these districts are impacted by upwind districts and will have no requirements to adopt an architectural coating rule based on the proposed SCM. Of the 31 PM_{10} nonattainment districts, all but ten have an architectural rule. These ten districts include the above eight ozone nonattainment districts with the exception of Amador County and Siskiyou County and the addition of the North Coast Unified, Mendocino County, Modoc County, and Lassen County Districts. The only $PM_{2.5}$ nonattainment district without an architectural rule is the Northern Sierra AQMD.

Figure C-1
2006 Area Designations for State Ambient Air Quality Standard for Ozone



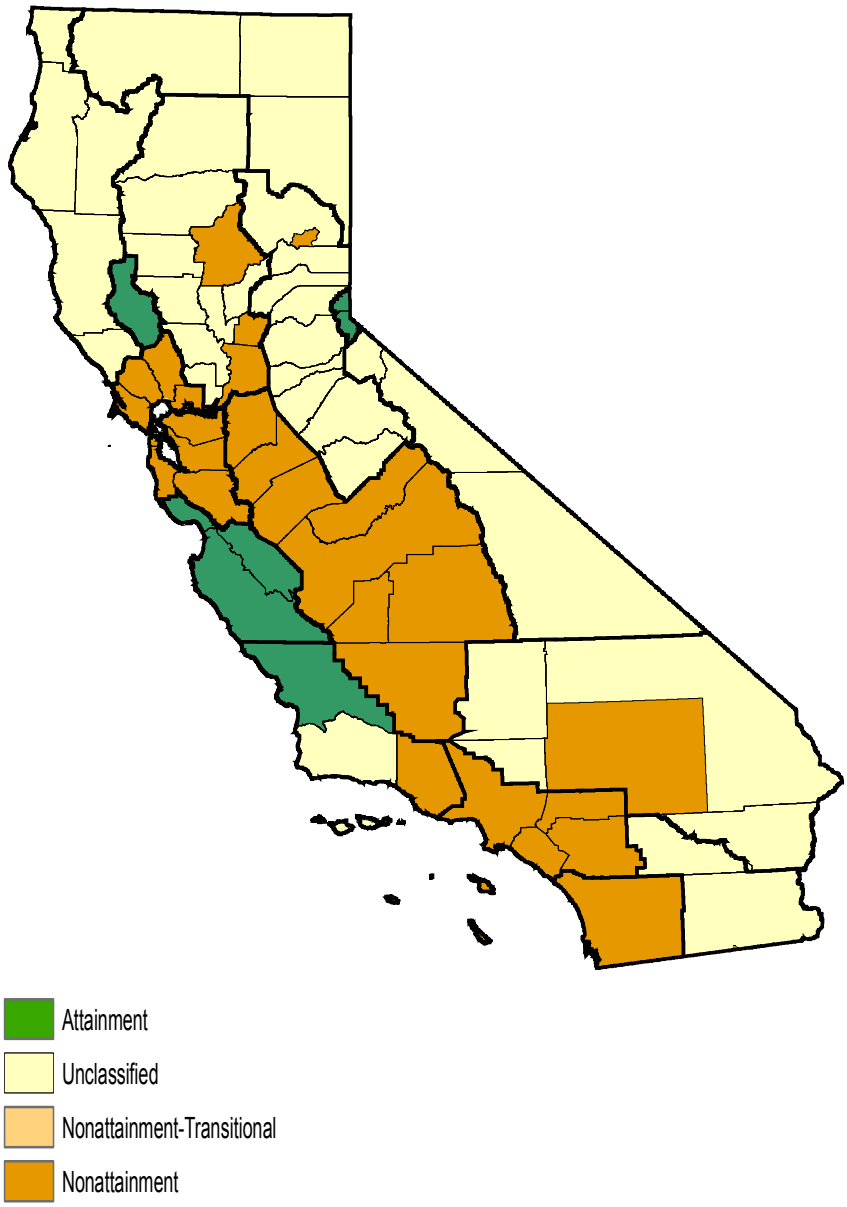
(ARB, 2006b)

Figure C-2
2006 Area Designations for State Ambient Air Quality Standard for PM_{10}



(ARB, 2006b)

Figure C-3
2006 Area Designations for State Ambient Air Quality Standard for $PM_{2.5}$



(ARB, 2006b)

Table C-2
2006 State Nonattainment Areas for Ozone, PM_{10}, and $PM_{2.5}$

	State Nonattainment Air Basin	Air District	County	Ozone	PM_{10}	$PM_{2.5}$
1	Great Basin Valley	Great Basin Unified APCD	Alpine		X	
			Inyo	X	X	
			Mono	X	X	
2	Lake Tahoe	Placer County APCD	Placer (eastern portion)		X	
		El Dorado County AQMD	El Dorado (eastern portion)		X	
3	Mojave Desert	Mojave Desert AQMD	San Bernardino (central portion)	X	X	X
		Kern County APCD	Kern (eastern portion)	X	X	
		South Coast AQMD	Riverside (eastern portion)	X	X	
		Antelope Valley AQMD	Los Angeles (northeast portion)	X	X	
4	Mountain Counties	Amador County APCD	Amador	X		
		Calaveras County APCD	Calaveras	X	X	
		Mariposa County APCD	Mariposa	X	X[2]	
		Tuolumne County APCD	Tuolumne	X		
		El Dorado County AQMD	El Dorado (western portion)	X	X	
		Placer County APCD	Placer (central portion)	X	X	
		Northern Sierra AQMD	Nevada	X	X	
			Plumas		X	X[4]
			Sierra		X	
5	North Central Coast	Monterey Bay Unified APCD	Santa Cruz	X	X	
			Monterey	X	X	
			San Benito	X	X	
6	North Coast	Northern Sonoma County APCD	Sonoma (northern portion)	X		
		North Coast Unified AQMD	Del Norte		X	
			Humboldt		X	
			Trinity		X	
		Mendocino AQMD	Mendocino		X	
7	Northeast Plateau	Siskiyou County APCD	Siskiyou	X		
		Modoc APCD	Modoc		X	
		Lassen APCD	Lassen		X	

Table C-2
2006 State Nonattainment Areas for Ozone, PM_{10}, and $PM_{2.5}$

	State Nonattainment Air Basin	Air District	County	Ozone	PM_{10}	$PM_{2.5}$
8	Sacramento Valley	Butte County AQMD	Butte	X	X	X
		Colusa County APCD	Colusa	X[1]	X	
		Glenn County APCD	Glenn	X[1]	X	
		Shasta County AQMD	Shasta	X	X	
		Feather River AQMD	Sutter	X	X	
			Yuba	X	X	
		Tehama County APCD	Tehama	X	X	
		Sacramento Metro AQMD	Sacramento	X	X	X
		Placer County APCD	Placer (western portion)	X	X	X
		Yolo-Solano AQMD	Solano (eastern portion)	X	X	
			Yolo	X	X	
9	Salton Sea	South Coast AQMD	Riverside (central portion)	X	X	
		Imperial County APCD	Imperial	X	X	X[3]
10	San Diego	San Diego County APCD	San Diego	X	X	X
11	San Francisco Bay Area	Bay Area AQMD	Alameda	X	X	X
			Contra Costa	X	X	X
			Marin	X	X	X
			Napa	X	X	X
			San Francisco	X	X	X
			San Mateo	X	X	X
			Santa Clara	X	X	X
			Solano (western portion)	X	X	X
			Sonoma (southern portion)	X	X	X
12	San Joaquin Valley [5]	San Joaquin Valley APCD	Fresno	X	X	X
			Kern (western portion)	X	X	X
			Kings	X	X	X
			Madera	X	X	X
			Merced	X	X	X
			San Joaquin	X	X	X
			Stanislaus	X	X	X
			Tulare	X	X	X

Table C-2
2006 State Nonattainment Areas for Ozone, PM_{10}, and $PM_{2.5}$

	State Nonattainment Air Basin	Air District	County	Ozone	PM_{10}	$PM_{2.5}$
13	South Central Coast	San Luis Obispo County APCD	San Luis Obispo	X	X	
		Santa Barbara County APCD	Santa Barbara	X	X	
		Ventura County APCD	Ventura (continental portion)	X	X	X
14	South Coast	South Coast AQMD	Los Angeles (western portion)	X	X	X
			Orange	X	X	X
			Riverside (western portion)	X	X	X
			San Bernardino (southwestern portion)	X	X	X

(ARB, 2006a; 2006b)

1. Nonattainment-Transitional
2. Yosemite National Park Only
3. City of Calexico Only
4. Portola Valley Only
5. In April 2007, the Governing Board of the San Joaquin Valley Air District voted to ask the U.S. EPA to designate the air basin as "Extreme" nonattainment for ozone. This designation would create a deadline of 2024 for the basin to meet the federal 8-hour ozone standard.

In many of the nonattainment districts, substantial additional emission reductions will be necessary in order to achieve and maintain the State ozone standard. The SCM will be available for adoption by the above districts in order to reduce VOC emissions and attain or maintain the State ozone and PM standards.

C.3. Status of Air Quality – Federal Standards

Federal law also indicates that the U.S. Congress intends progress toward clean air to be made as quickly as possible. The federal Clean Air Act declares that the federal air quality standards are to be achieved "...as expeditiously as practicable..." (Federal Clean Air Act, sections 172(a)(2), 181(a), and 188(c)).

Thirty-five counties or portions of counties are designated as nonattainment for the federal 8-Hour Ozone standard with attainment dates ranging from 2007 to 2021. Table C-3 lists the districts that have been designated "nonattainment" because they exceed federal standards for ozone. The San Joaquin Valley and South Coast air basins are expected to have until 2023 to attain the federal standard, by invoking the "bump-up" provision in the federal Clean Air Act.

For particulate matter, the South Coast Air Basin and the San Joaquin Valley Air Basin are the only two areas in the State that exceed the annual federal PM 2.5 standard. These areas are required by federal law to develop SIPs describing how they will attain the standards by 2015. The U.S. EPA further requires that all necessary emission reductions be achieved one calendar year sooner – by 2014

– in recognition of the annual average form of the standard. The Owens Valley is the only federal PM10 nonattainment area. It did not meet its December 31, 2006 attainment date and must submit plan revisions by December 31, 2007 detailing how it will reach attainment.

Table C-3
8-Hour Federal Ozone Nonattainment Areas

	Federal Nonattainment Area	Air District	County	Federal 8-Hr Ozone Designation (Attainment Year)
1	Amador and Calaveras Counties (Central Mountain)	Amador County APCD	Amador	Subpart 1 (2009)
		Calaveras County APCD	Calaveras	
2	Chico	Butte County AQMD	Butte	Subpart 1 (2009)
3	Imperial County	Imperial County APCD	Imperial	Marginal (2007)
4	Kern County (Eastern Kern)	Kern County APCD	Kern (eastern portion)	Subpart 1 (2009)
5	Los Angeles South Coast Air Basin	South Coast AQMD	Los Angeles (western portion)	Severe-17 (2021)
			Orange	
			Riverside (western portion)	
			San Bernardino (southwestern portion)	
6	Los Angeles – San Bernardino Counties (Western Mojave)	Antelope Valley AQMD	Los Angeles (northeastern portion)	Moderate (2010)
		Mojave Desert AQMD	San Bernardino (central portion)	
7	Mariposa and Tuolumne Counties (Southern Mountain)	Mariposa County APCD	Mariposa	Subpart 1 (2009)
		Tuolumne County APCD	Tuolumne	
8	Nevada County (Western Part)	Northern Sierra AQMD	Nevada (western portion)	Subpart 1 (2009)
9	Riverside County (Coachella Valley)	South Coast AQMD	Riverside (central portion)	Serious (2013)
10	Sacramento Metro	El Dorado County AQMD	El Dorado (western portion)	Serious (2013)
		Placer County APCD	Placer (western portion)	
		Sacramento Metro AQMD	Sacramento	
		Yolo-Solano AQMD	Solano (eastern portion)	
			Yolo	
11	San Diego	San Diego County APCD	San Diego	Subpart 1 (2009)

Table C-3
8-Hour Federal Ozone Nonattainment Areas

	Federal Nonattainment Area	Air District	County	Federal 8-Hr Ozone Designation (Attainment Year)
12	San Francisco Bay Area	Bay Area AQMD	Alameda	Marginal (2007)
			Contra Costa	
			Marin	
			Napa	
			San Francisco	
			San Mateo	
			Santa Clara	
			Solano (western portion)	
			Sonoma (southern portion)	
13	San Joaquin Valley	San Joaquin Valley APCD	Fresno	Serious (2013)
			Kern (western portion)	
			Kings	
			Madera	
			Merced	
			San Joaquin	
			Stanislaus	
			Tulare	
14	Sutter County (Sutter Buttes)	Feather River AQMD	Sutter (Sutter Buttes portion)	Subpart 1 (2009)
15	Ventura County	Ventura County APCD	Ventura (continental portion)	Moderate (2010)
	15 Federal Nonattainment Areas	**20 Air Districts**	**35 Counties**	

(U.S. EPA, 2007)

C.5. Improving Air Quality

Over the past 40 years, air pollution control agencies in California have been working diligently to improve air quality. Much of the effort was directed towards the more traditional sources of air pollution such as mobile sources (e.g., cars, trucks, etc.) and stationary sources (e.g., factories, power plants, etc.)
While there have been dramatic gains in reducing emissions from these traditional sources, there is a need for further reductions from other sources of emissions, including architectural coatings, to continue to make progress toward meeting the State and Federal ambient air quality standards and protecting the public health of California citizens. Emissions from all other sources, including architectural coatings, have become more significant as emissions from the traditional sources are further reduced. Therefore, the emissions from these sources must be evaluated for further reductions.

Architectural coatings comprise an important source of emissions in California because they are widely distributed, emit VOCs when used, and contribute to the air pollution problem in California. Although each container of paint may seem to be a small source of emissions, when the total number of users in California is aggregated, the total VOC emissions become significant. Implementation of the proposed SCM will continue the progress toward meeting California's air quality goals.

C.6. State Implementation Plan Commitments

For areas with unhealthy levels of air pollutants, clean air laws require districts to develop plans to describe how they will attain ambient air quality standards. The CCAA requires districts that have been designated nonattainment for the State ambient air quality standards to prepare and submit plans for attaining and maintaining the standards (see Health and Safety Code §40910 *et seq*.). In addition, the federal Clean Air Act requires that districts designated nonattainment for the federal ambient air quality standards prepare State Implementation Plans (SIPs) to demonstrate attainment with the federal standards. SIPs are a compilation of several documents, including new and previously submitted plans, programs (e.g., monitoring, modeling, permitting, etc.), district rules, State regulations and federal controls. State law makes ARB the lead agency for submittal of California's SIPs. Local air districts and other agencies (e.g., Bureau of Automotive Repair) prepare SIP elements and submit them to ARB for review and approval. ARB forwards the compiled SIP revisions to U.S. EPA for approval.

There are 15 non-attainment areas for the federal ozone standard and 2 non-attainment areas for the PM2.5 standard. For these areas, Ozone SIPs and PM2.5 SIPs must be adopted and sent to the U.S. EPA by June 2007 and April 2008, respectively. The SIPs must show how each area will attain the federal standards. To do this, the SIPs will identify the amount of emissions that must be reduced in each area to meet the standard and the emission controls needed to reduce the necessary emissions. Emission reductions from district rules, including architectural coatings rules, are an essential part of California's effort to attain air quality standards for ozone.

Six local air districts in two federal ozone nonattainment areas included control measures for architectural coatings in their draft or final 2007 Ozone SIPs. These districts are:

- El Dorado AQMD[1]
- Feather River AQMD[1]
- Placer County APCD[1]
- Sacramento Metropolitan AQMD[1]
- San Joaquin Valley Unified APCD[2]
- Yolo-Solano AQMD[1]

1. The Sacramento Federal Ozone Nonattainment Area includes all of Sacramento and Yolo Counties, portions of Placer and El Dorado Counties, eastern Solano County and southern Sutter County.
2. San Joaquin Valley Unified APCD adopted its ozone SIP in April 2007

Table C-4 lists the emission reduction commitments for architectural coatings in the draft or final 2007 Ozone SIPs for each district.

Table C-4
2007 Ozone SIP Commitments For VOC Emission Reductions From Architectural Coating Measures

District	Implementation Year	2012 ROG Planning Inventory[2] (tpd)	Emission Reductions in 2012 (tpd)	% Reductions
El Dorado County AQMD[1]	2012	0.38	0.06	16%
Feather River AQMD	Pre-2012	0.02	0.003	15%
Placer County APCD[3]	2013	0.89	0.13	15%
Sacramento Metropolitan AQMD	2012	4.12	0.62	15%
San Joaquin Valley Unified APCD	2012	9.7	2.0	21%
Yolo-Solano County AQMD	2011	0.96	0.14	15%
TOTAL:		**16.1**	**2.95**	**18%**

1. El Dorado County had not yet adopted the 2000 SCM limits at the time that the draft 2007 SIP was developed. Therefore, their SIP Commitment value is actually larger, but for the purpose of this table we are only including the 2007 SCM commitment.
2. The 2012 ROG Planning Inventory is based on ARB's 2001 Architectural Coating Survey and does not reflect the data from ARB's 2005 Architectural Coating Survey that was used to develop the proposed SCM.
3. For Placer County, values represent the 2018 ROG Planning Inventory and the 2018 Emission Reductions.

ARB staff believes that the proposed SCM will achieve reductions that are in line with emission reductions claimed by districts in their draft 2007 Ozone SIPs (see Table C-5). The proposed SCM is expected to achieve about a 28 percent emission reduction. The values in Table C-5 assume that the emissions from architectural coatings are approximately 95 tpd statewide, on an annual average basis, not including emissions from thinning and clean-up (ARB, 2006c). Statewide emissions are apportioned to districts, based on population. Districts outside of the South Coast AQMD represent 56% of the State's population which corresponds to 53 tpd of VOC emissions from architectural coating usage. The South Coast AQMD is not expected to adopt the proposed SCM because its architectural coatings Rule 1113 includes VOC limits that are, in most cases, at least as stringent as the proposed SCM. Since the non-South Coast districts are the primary target for adoption of the SCM, we are only estimating emission reductions for those districts. The emission reductions from the SCM are estimated to be about 4.3 tpd for the six districts with SIP commitments and about 10.7 tpd from the remaining non-South Coast districts for a total estimated emission reduction of 15 tpd, in the non-South Coast AQMD portion of the State.

Table C-5
Comparison of Estimated Emission Reductions From the Proposed SCM and the 2007 Ozone SIP Commitments

	[A]	[B] =[A]*[95 tpd]	[C]	[D] = [B]*[C]	[E] = [A]/[56%]	[F] =[E]*[15 tpd]
Districts with SIP Commitments	**% of CA Population[2]**	**Emission Inventory (TPD in 2004)[3]**	**SIP Commitment (%)**	**SIP Commitment (TPD in 2004)**	**% of Total SCM Reductions**	**Reductions From SCM (TPD in 2004)**
El Dorado (part)[1]	0.50%	0.48	16%	0.08	0.89%	0.13
Feather River	0.40%	0.38	15%	0.06	0.71%	0.11
Placer County	0.80%	0.76	15%	0.11	1.43%	0.21
Sacramento Metro	3.70%	3.52	15%	0.53	6.61%	0.99
San Joaquin	9.80%	9.31	21%	1.96	17.50%	2.63
Yolo-Solano	0.90%	0.86	15%	0.13	1.61%	0.24
TOTAL:	**16.1%**	**15.3**		**2.9**		**4.3**

1. El Dorado County had not yet adopted the 2000 SCM limits at the time that the draft 2007 SIP was developed. Therefore, their SIP Commitment value includes reductions from the 2000 SCM and the proposed 2007 SCM.
2. The "% of CA Population" may not represent the entire district population. For some districts in the Sacramento Nonattainment Area, only a portion of the district population is included for SIP planning purposes.
3. Emission Inventory data are based on data from ARB's 2005 Architectural Coating Survey. These data are for coatings only and do not include emissions from thinning solvents, cleanup solvents, or additives.

REFERENCES

Air Resources Board. The California Almanac of Emissions and Air Quality, 2006 Edition. Online, Internet at http://www.arb.ca.gov/aqd/almanac/almanac.htm. 2006. (ARB, 2006a)

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Air Resources Board. "2005 Architectural Coatings Survey, Draft Report." September, 2006. (ARB, 2006c)

United States Environmental Protection Agency. "Classifications of 8-Hour Ozone Nonattainment Areas". Online internet at http://www.epa.gov/air/oaqps/greenbk/gnc.html. August 16, 2007. (U.S. EPA, 2007)

APPENDIX D:

SUMMARY OF CURRENT VOC LIMITS

NOTE: This summary is provided for comparison purposes ONLY. Please refer to the official rule language for compliance purposes.

Table D-1: Summary of Architectural Coating Rules and VOC Limits[1] in California

Agency	U.S. EPA	CARB	Antelope	Bay Area	Butte	Colusa	El Dorado	Fea-ther River	Imperial	Kern	Mojave	Monterey	Northern Sonoma	Pla-cer	Sacra-mento	San Diego	San Joaquin	San Luis Obispo	Santa Barbara	Sha-sta	South Coast	The-hama	Ventura	Yolo-Solano
Rule Reference	63 FR 176: 48848	SCM	1113	8-3	230	2.26	215	3.15	424	410.1	1113	426	485	218	442	67	4601	433	323	3:31	1113	4:39	74.2	2.14
Adopted	Sep 98	Jun 77	Jul 97	Mar 78	July 79	1979	Sep 94	June 91	Nov 82	Apr 72	Feb 79	May 79	Apr-02	Jun 79	Dec 78	Nov 77	Apr 91	Mar-02	Oct 71	May-02	Sep 77	Aug-02	Jun 79	Nov-01
Last Amended	Feb 00	Jun 00	Mar-03	Nov 01	Aug-02	Jul-02	Sep 94	Nov-02	Feb-05	Sep-06	Feb-03	Apr-02		Dec-01	May-01	Dec-01	Oct-01		Nov-01		Jun-06		Nov-01	
Antenna	530	530	530	530	530	530		530	530	530	530	530	530	530	530	530	530	530	530	530		530	530	530
Anti-Fouling	450	400	400	400	400	400		400	400	400	400	400	400	400	400	400	400	400	400	400		400	400	400
Anti-Graffiti	600						340																	
Bituminous Coatings and Mastics	500																							
Bituminous Roof Coatings		300	300	300	300	300		300	300	300	300	300	300	300	300	300	300	300	300	300		300	300	300
Bituminous Roof Primers		350	350	350	350	350		350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350
Bond Breakers	600	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350
Calcimine Recoaters	475																							
Chalkboard Resurfacers	450																							
Concrete Curing Compounds	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	100	350	350	350
Concrete Curing Compounds for Roadways and Bridges																					350			
Concrete Curing and Sealing Compounds	700																							
Concrete Protective	400																							
Concrete Surface Retarders	780																							
Conversion Varnishes	725																							
Dry Fog	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	150	400	400	400
Extreme High Durability	800																							
Faux Finishing/ Glazing (Japans)	700	350	350	350	350	350		350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350

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Rule Reference	63 FR 176: 48848	SCM	1113	8-3	230	2.26	215	3.15	424	410.1	1113	426	485	218	442	67	4601	433	323	3:31	1113	4:39	74.2	2.14
Fire Proofing, Exterior																					350			
Fire Resistive		350	350	350	350	350		350	350	350	350	350	350	350	350	350	350	350	350	350		350	350	350
Fire Retardant, Clear		650	650	650	650	650	650	650	650	650	650	650	650	650	650	650	650	650	650	650	650	650	650	650
Fire Retardant, Opaque (Pigmented)		350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350
Fire Retardant/ Resistive, Clear	850																							
Fire Retardant/ Resistive, Opaque	450																							
Flats	250	100	100	100	100	100	(250)[2]	100	100	100	100	100	100	100	100	100	100	100	100	100	50 [3]	100	100	100
Flats, Specialty							400																	
Floor	400	250	250	250	250	250		250	250	250	250	250	250	250	250	250	250	250	250	250	50	250	250	250
Flow	650	420	420	420	420	420		420	420	420	420	420	420	420	420	420	420	420	420	420		420	420	420
Form Release Compounds	450	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250		250	250	250
Graphic Arts (Sign Paints)	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500
Heat Reactive	420																							
High Temperature Industrial Maintenance							420														420			
High Temperature	650	420	420	420	420	420		420	420	420	420	420	420	420	420	420	420	420	420	420		420	420	420
Impacted Immersion	780																							
Industrial Maintenance	450	250	250	250	250	250	420	250	250	250	250	250	250	250	250	250	250	250	250	250	100 [3]	250	250	250
Lacquers, Clear Brushing		680	680	680	680	680		680	680	680	680	680	680	680	680	680	680	680	680	680	275	680	680	680
Lacquers, Clear or Opaque/ Pigmented (including clear lacquer sanding sealers)	680	550	550	550	550	550	680	550	550	550	550	550	550	550	550	550	550	550	550	550	275	550	550	550
Low Solids Coatings[1]		120	120	120	120	120		120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120
Low Solids Stains[1]	120						120																	
Low Solids	120						120																	

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Wood Preservatives[1]																								
Magnesite Cement	600	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450
Mastic Texture	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300
Metallic Pigmented	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500
Multi-Color	580	250	250	250	250	250	420	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250
Nonferrous Ornamental Metal Lacquers and Surface Protectants	870																							
Nonflat Coatings	380	150	150	150	150	150	(250)[2]	150	150	150	150	150	150	150	150	150	150	150	150	150	50	150	150	150
Nonflat High Gloss Coatings		250	250	250	250	250	(250)[2]	250	250	250	250	250	250	250	250	250	250	250	250	250	50	250	250	250
Nuclear	450																							
Pre-Treatment Wash Primers	780	420	420	420	420	420	675	420	420	420	420	420	420	420	420	420	420	420	420	420	420	420	420	420
Primers and Undercoaters	350																							
Primers, Sealers, and Undercoaters		200	200	200	200	200	350	200	200	200	200	200	200	200	200	200	200	200	200	200	100	200	200	200
Quick Dry Enamels	450	250	250	250	250	250	400	250	250	250	250	250	250	250	250	250	250	250	250	250	50	250	250	250
Quick Dry Primers, Sealers, and Undercoaters	450	200	200	200	200	200		200	200	200	200	200	200	200	200	200	200	200	200	200	100	200	200	200
Recycled Coatings		250	250	250	250	250		250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250
Repair and Maintenance Thermoplastic	650																							
Roof	250	250	250	250	250	250	300	250	250	250	250	250	250	250	250	250	250	250	250	250	50	250	250	250
Roof, Aluminum																					100			
Rust Preventative	400	400	400	400	400	400		400	400	400	400	400	400	400	400	400	400	400	400	400	100	400	400	400
Sanding Sealers																					275			
Sanding Sealers (Non-Lacquer)	550	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350		350	350	350
Sealers	400																							

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(including interior clear wood sealers)																								
Shellacs, Clear	730	730	730	730	730	730	730	730	730	730	730	750	730	730	730	730	730	730	730	730	730	730	730	730
Shellacs, Opaque/ Pigmented	550	550	550	550	550	550	550	550	550	550	550	550	550	550	550	550	550	550	550	550	550	550	550	550
Specialty Primers																					100			
Specialty Primers, Sealers, and Undercoaters		350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350		350	350	350
Stains		250	250	250	250	250		250	250	250	250	250	250	250	250	250	250	250	250	250		250	250	250
Stains, Clear	550																							
Stains, Exterior																					100			
Stains, Interior																					250			
Stains, Semi-transparent	550						350																	
Stains, Opaque	350						350																	
Stain Controllers	720																							
Swimming Pool	600	340	340	340	340	340	340	340	340	340	340	340	340	340	340	340	340	340	340	340	340	340	340	340
Swimming Pool Repair & Maintenance		340	340	340	340	340	650	340	340	340	340	340	340	340	340	340	340	340	340	340	340	340	340	340
Temperature-Indicator Safety		550	550	550	550	550		550	550	550	550	550	550	550	550	550	550	550	550	550		550	550	550
Thermoplastic Rubber and Mastics	550																							
Traffic	150	150	150	150	150	150	250	150	150	150	150	150	150	150	150	150	150	150	150	150	100	150	150	150
Varnishes	450	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	275	350	350	350
Waterproofing Sealers		250	250	250	250	250	400	250	250	250	250	250	250	250	250	250	250	250	250	250	100	250	250	250
Waterproofing Concrete/ Masonry Sealers		400	400	400	400	400		400	400	400	400	400	400	400	400	400	400	400	400	400	100	400	400	400
Water Proofing Sealers and Treatments	600																							

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Water Proofing Sealers and Treatments, Opaque	600																							
Wood Preservatives		350	350	350	350	350		350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350
Wood Preservatives, Below Ground	550						350														350			
Wood Preservatives, Clear and Semi-transparent	550						350																	
Wood Preservatives, Opaque	350						350																	
Zinc Rich Industrial Maintenance Primers																					100			
Zone Marking	450																							

Notes:

1. Volatile Organic Compound (VOC) limits are expressed as “VOC Regulatory” or “Coating VOC” (grams of VOC per liter of coating, less water and exempt compounds) for all categories except Low Solids. The VOC limit for Low Solids is expressed as VOC Actual or Material VOC (grams VOC per liter of coating, including water and exempt compounds)
2. Parentheses indicate 250 g/l VOC limits that are based on El Dorado’s default provision, but the limits are not specifically stated in the rule.
3. The South Coast AQMD Rule 1113 VOC limit for Flat coatings becomes effective on 7/1/08. Rule 1113 allows for the use of tertiary Butyl Acetate as an exempt solvent to meet the 100 g/l VOC limit for the Industrial Maintenance category only.
4. The EPA rule states that if a coating is not included in their table of VOC limits, it is classified as either a Flat (250 g/l) or Nonflat (380 g/l) based on the gloss level.
   The ARB 2000 SCM and many district rules state that, if a coating is not included in their table of VOC limits, it is classified as either a Flat (100 g/l) or Nonflat (150 g/l) based on the gloss level.
5. California districts not mentioned in this table are subject to the VOC limits in the U.S. EPA National Architectural Coating Rule

APPENDIX E:

EMISSION REDUCTION CALCULATION METHODOLOGY

Emission Reduction Calculations

ARB staff estimated emission reductions based on 2004 sales data, as reported in the 2005 Survey. For each category with a proposed reduction in VOC limit, ARB staff calculated the expected emission reductions for each product that was reported in that category. For each reported product in the survey,

[Emission Reductions] = [Pre-Limit Emissions] – [Post-Limit Emissions]

where
"Pre-Limit Emissions" are calculated directly from survey data for each product, as reported
"Post-Limit Emissions" are estimates based on the potential impact of the lower VOC limit

ARB staff used the following assumptions and protocols to perform emission reduction calculations:

- When estimating "Post-Limit Emissions", we assumed that the volume percent of solids remained constant for each product after it was reformulated to meet the proposed VOC limit.
- When estimating "Post-Limit Emissions", we assumed that the sales volume remained constant for each product after it was reformulated to meet the proposed VOC limit.
- When estimating "Post-Limit Emissions", we assumed a portion of the VOC in each product was replaced by either water or exempt compounds after the product was reformulated to meet the proposed VOC limit.
- If a product was included in an averaging program and had a high VOC content that exceeded the limit in the 2000 SCM, we did not calculate emission reductions from the product's high VOC content. For high-VOC products in averaging programs, we only calculated emission reductions from the VOC limit in the 2000 SCM down to the proposed VOC limit.
- If a product was noncompliant and had a high VOC content that exceeded the limit in the 2000 SCM, we did not calculate emission reductions from the product's high VOC content. For high-VOC noncompliant products, we only calculated emission reductions from the VOC limit in the 2000 SCM down to the proposed VOC limit.
- If a product was "overcompliant" and had a low VOC content that was below the limit in the 2000 SCM, but above the proposed limit, we only calculated emission reductions from the product's actual VOC content down to the proposed VOC limit.
- If a product was "overcompliant" and had a low VOC content that was already below the proposed limit, no emission reductions were calculated.

- Emission reductions were only calculated for products sold in large containers (greater than one liter), because small containers (one liter or less) are exempt from the SCM VOC limits.

The next section of this appendix contains a document with a detailed explanation of the methodology that was used to calculate emissions and emission reductions.

NOTE: The following document was submitted to the United States Environmental Protection Agency in December, 2005, in response to a request for comments regarding emission reduction calculations methods. This document describes ARB's recommended methodology for calculation of emission reductions.

California Air Resources Board (ARB) Comments

Reference: Federal Register, Vol. 70, No. 168, August 31, 2005, U.S. Environmental Protection Agency (U.S. EPA), "Advance Notice to Solicit Comments, Data and Information for Determining the Emissions Reductions Achieved In Ozone Nonattainment and Maintenance Areas From the Implementation of Rules Limiting the VOC Content of AIM Coatings" (i.e., ANPR)

Background: U.S. EPA is soliciting comments, data and information for determining how to calculate the reductions in volatile organic compound (VOC) emissions achieved in ozone nonattainment and maintenance areas from the implementation of rules which limit the VOC content of architectural coatings (commonly referred to as architectural and industrial maintenance, or AIM, coatings). In response to the ANPR, ARB is submitting a recommended methodology that is detailed below.

ARB's Recommended Methodology for Calculating Emission Reductions

ARB has completed seven surveys of AIM coatings sold in California, and we are currently working on our eighth AIM survey. A summary of the surveys is provided below:

Surveyed Calendar Year	Sales Volume (gallons)	VOC Emissions (pounds) [1]	VOC Emissions per Gallon Sold (lb VOC/gal)
1975	48,206,000	82,417,000	1.71
1980	57,247,000	91,949,000	1.61
1984	58,481,000	97,718,000	1.67
1988	77,876,000	84,124,000	1.08
1990	77,056,000	77,236,000	1.00
1996	87,496,000	72,594,000	0.83
2000	98,455,172	80,104,000	0.81
2004	In progress	-	-

1. Emissions do not include emissions from thinning and cleanup solvents.

The most recent three surveys have collected particularly detailed data, including: VOC ingredient weight percentages; VOC_{ACTUAL} (a.k.a., Material VOC); $VOC_{REGULATORY}$ (a.k.a., Coating VOC); and Volume Percent Solids. ARB and the local air districts have used this survey data to characterize specific

coating categories and conduct detailed analyses of the impacts that may result from lower VOC limits.

Based on our experience, we believe that the methodology for calculating emission reductions is dependent upon the type of data that are available to support the calculation. If detailed survey data are available that include specific product information, a detailed analysis of potential reductions can be conducted for each product. If no detailed data are available, it will be necessary to use a more general approach that relies on emission factors and estimated product parameters, as illustrated in the following table.

	AVAILABLE DATA	EMISSION REDUCTION CALCULATION METHOD
Option 1:	Detailed Product Information is Available, Including: • VOC_{ACTUAL} • $VOC_{REGULATORY}$ • Volume % Solids • Sales Volume	Calculate potential emission reductions for each reported product in each coating category.
Option 2:	Only General Data are Available: • e.g., Nationwide Sales and Population	Calculate overall emission reductions for entire coating category.

Each of these approaches is discussed below.

<u>Option 1: Detailed Emission Inventory</u>

Step 1: Identify the available data.
Conducting a survey of coating manufacturers is one of the best ways to collect detailed data on the AIM coatings being sold in the area of concern. It is important that survey data be representative of the geographic area and the appropriate VOC limits. For example, the most recent survey data from California may not be representative of coatings that are being sold elsewhere in the United States, because California's longstanding VOC limits have been generally lower than those in other states. In addition, coatings that have high sales volumes in California may have lower sales volumes in other parts of the country.

Available data should include a detailed survey with the following information for each reported AIM product:

- VOC_{ACTUAL} (Material VOC)
- $VOC_{REGULATORY}$ (Coating VOC)
- Volume % Solids
- Sales Volume (gallons)

Step 2: Calculate emission reductions for each product. (see Appendix for details)

Emission reductions represent the difference between the VOC emissions before a limit is adopted and the emissions after a limit is adopted.

For each reported product in the survey,
[Emission Reductions] = [Pre-Limit Emissions] – [Post-Limit Emissions]

"Pre-Limit Emissions" can be calculated directly from survey data for each product:

[Pre-Limit Emissions, lbs VOC] = [VOC_{ACTUAL}, lb VOC/gal coating]*[Sales Volume, gals coating]

"Post-Limit Emissions" are estimates based on the potential impact of the lower $VOC_{REGULATORY}$ limit. When the $VOC_{REGULATORY}$ limit is lowered, some coatings will need to be reformulated and, consequently, they will have a new VOC_{ACTUAL} value. It's possible to predict a new VOC_{ACTUAL} value using the following equation:

$$[\text{NEW } VOC_{ACTUAL}] = \frac{[\text{Avg. VOC Density, g/l}]*[VOC_{REGULATORY}\text{ Limit, g/l}]*[\text{Vol. \% Solids}]}{([\text{Avg. VOC Density, g/l}]-[VOC_{REGULATORY}\text{ Limit, g/l}])}$$

where
Average VOC Density = 880 grams/liter
$VOC_{REGULATORY}$ Limit = New $VOC_{REGULATORY}$ Limit, grams/liter
Vol. % Solids = Volume Percent Solids, as reported for each product

[Post-Limit Emissions, lbs VOC] = [NEW VOC_{ACTUAL}, lb VOC/gal coating]*[Sales Volume, gals coating]

Calculation of the predicted new VOC_{ACTUAL} is based on the following assumptions:

- **Maintain constant Volume % Solids.**
  It is assumed that the volume percentage of solids in the reformulated coating will be the same as the volume percentage of solids for the coating reported in the survey. When analyzing our survey data, we have not found a linear correlation between VOC_{ACTUAL} values and volume percentage of solids. This is illustrated in Figure 1, a scatter diagram that shows volume percentage of solids vs. VOC_{ACTUAL} content for Flat and Nonflat architectural coatings. Therefore, we see no need to adjust solids contents when analyzing the effects of lower VOC limits.

Because we are assuming the volume percentage of solids remains constant in the coatings, we use the reported volume of coatings when estimating the "Post-Limit Emissions". There is no need to adjust the reported volume up or down to account for the same amount of overall solids being applied to surfaces.

- **Maintain constant sales volume.**
  As just mentioned, it is assumed that the volume of reformulated coating will be the same as the volume of existing coatings reported in the survey. However, some have argued that this approach underestimates future sales volume, because they believe it takes more low-VOC waterborne coating (e.g., 90%-100% more) to provide the same amount of hiding power as a high-VOC solventborne coating. A gallon of waterborne coating generally contains a lower volume percentage of solids than a gallon of solventborne coating, and it is assumed that less solids means less hiding power. ARB recently sponsored a research project that disproves this claim. The project tested the hiding properties of ten solventborne coatings and twenty waterborne coatings by determining the quantity of coating that was required to provide equivalent hiding. On average, it took approximately 1.3 gallons of waterborne coating and 1.1 gallons of solventborne coating, a difference of only 18%, to provide equivalent hiding when painting a typical room. (Incidentally, the waterborne coating only emitted an average of 0.3 lbs of VOCs, while the solventborne coating emitted 2.9 lbs of VOCs.) Therefore, we believe this study also supports our assumption to keep the coating volume constant. Some results from this research project are provided in Figure 2, which contains graphs that illustrate the gallons of coating required to provide hiding vs. VOC content.

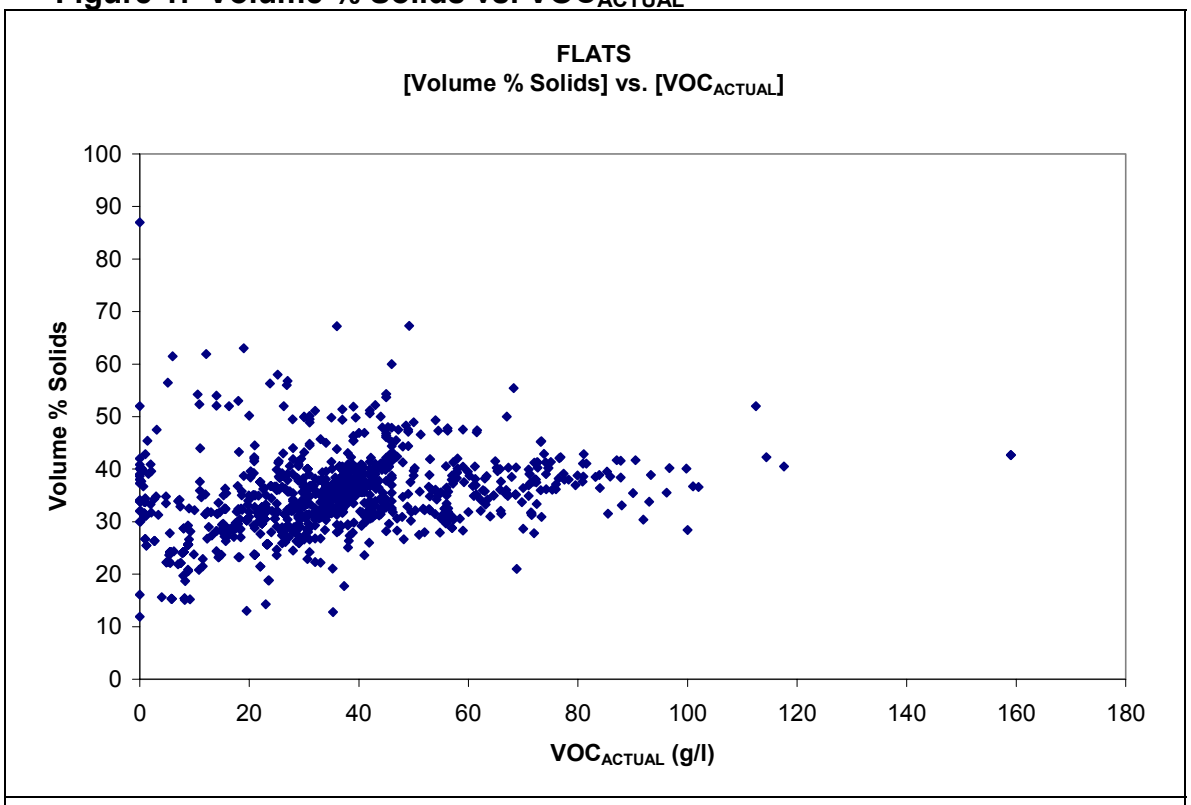
- **Assume a portion of the VOC in the product is replaced by either water or exempt compounds to meet the new $VOC_{REGULATORY}$ limit.**

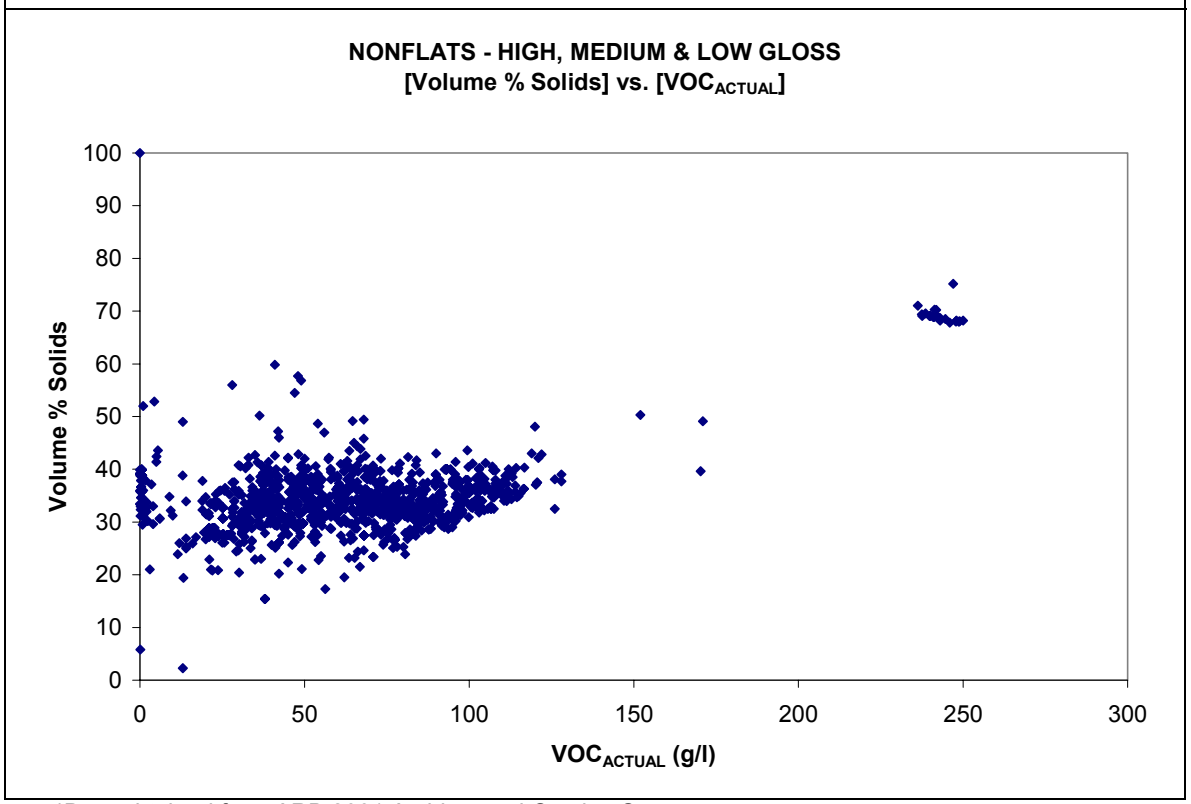
Step 3: Determine Overall Emission Reduction Percentage.

After emission reductions are calculated for each product, add up the individual reductions to determine the overall emission reduction percentage:

$$[\%\ \text{Reduction}] = \frac{([\text{Total Pre-Limit Emissions}] - [\text{Total Post-Limit Emissions}])}{[\text{Total Pre-Limit Emissions}]}$$

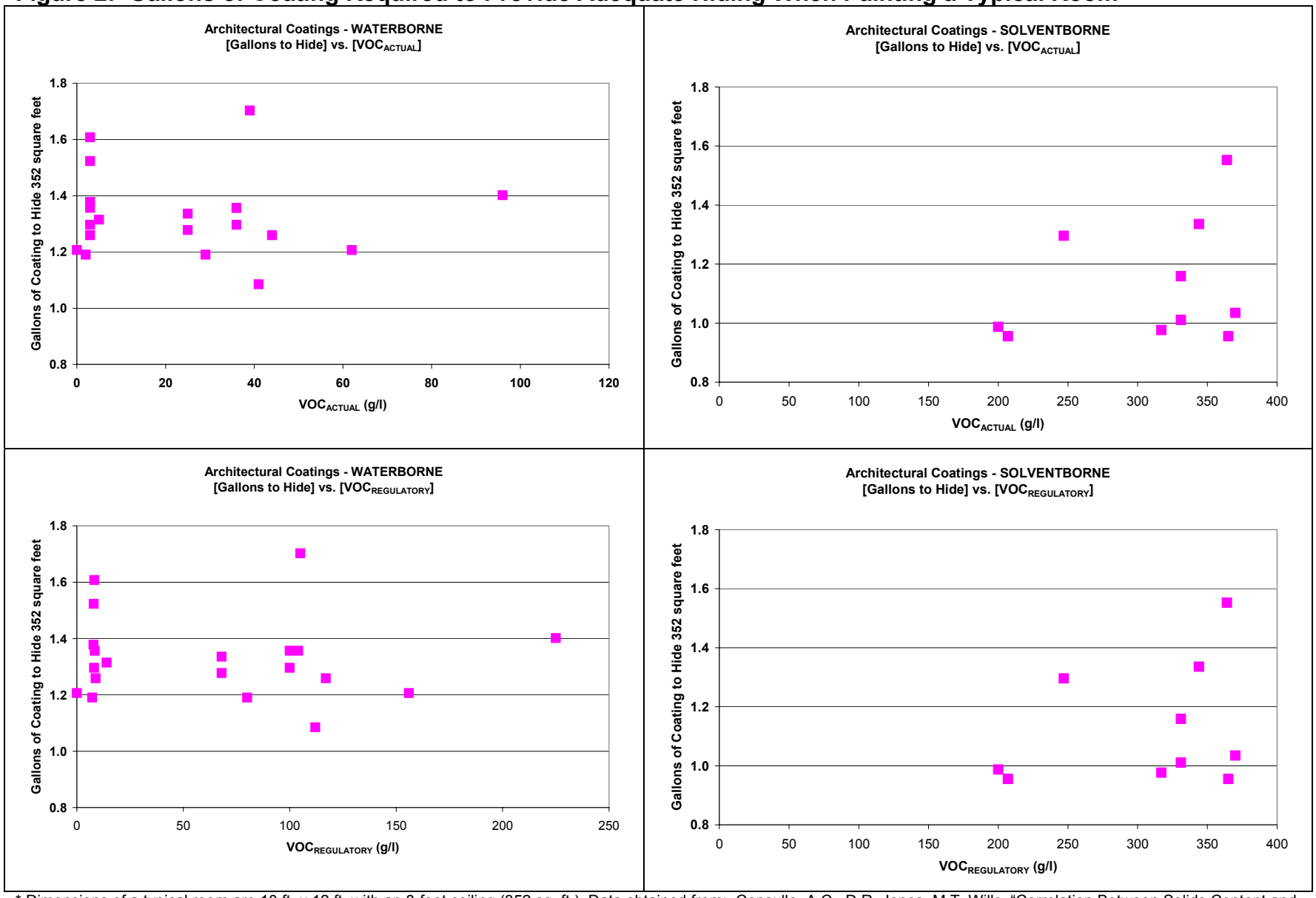
Figure 1: Volume % Solids vs. VOC_{ACTUAL}*





*Data obtained from ARB 2001 Architectural Coating Survey.
Note: Charts do not include coatings with $VOC_{REGULATORY}$ greater than 250 g/l.

Figure 2: Gallons of Coating Required to Provide Adequate Hiding When Painting a Typical Room*



* Dimensions of a typical room are 10 ft. x 12 ft. with an 8-foot ceiling (352 sq. ft.) Data obtained from: Censullo, A.C., D.R. Jones, M.T. Wills, "Correlation Between Solids Content and Hiding as it Relates to Calculation of VOC Content in Architectural Coatings", Table 14, dated December 2004.

Option 2: General Emission Inventory

Step 1: Identify the available data.
If detailed local survey data are not available, emission reductions can be estimated using general publicly-available information. At a minimum, the available data should include the following, both of which can be obtained from the U.S. Census website:

- Nationwide Sales Volume
- Population or Housing Unit Data (state and national)

Nationwide coating sales volume can be obtained from the following report that is available on the U.S. Census website:

- Current Industrial Report, MA325F – Paint and Allied Products
  http://www.census.gov/industry/1/ma325f04.pdf

  (Note: When using this report, AIM coatings include those titled "Architectural Coatings", "Industrial New Construction and Maintenance Paints", and "Traffic Marking Paints".)

After using the Current Industrial Report to identify total AIM sales nationwide, it's possible to assign a portion of the nationwide sales to an individual state, by using the state's percentage of national population or housing units. Population data and housing unit data can be found on the following U.S. Census website:

- http://www.census.gov/popest/states/tables/NST-EST2003-01.pdf
  http://factfinder.census.gov/home/saff/main.html

Step 2: Determine appropriate emission factors.
Use an emission factor based on pounds VOC emitted per gallon of coating (i.e., VOC_{ACTUAL}.) ARB Architectural Coating Surveys can be used to identify sales-weighted average values for VOC_{ACTUAL} in various categories. Survey reports are readily available online which include data summaries for coating sales that occurred during calendar years 1990, 1996, and 2000. For some categories, the types of coatings that were reported in older ARB surveys may be similar to the types of coatings being sold currently in other states where VOC limits are higher. However, it is important to note that coatings sold in California have historically been subject to more stringent VOC limits than coatings sold elsewhere in the United States. For example, in 1990, Nonflat architectural coatings in California were being regulated with a 250 g/l VOC limit. This limit is significantly lower than the 380 g/l VOC limit that was adopted under the U.S. EPA's 1998 National Volatile Organic Compound Emission Standards for Architectural Coatings, which is currently in place in much of the U.S. Due to these differences, emission factors based on California survey data may be lower than the appropriate factors for other areas of the United States. Alternatively, the summary

table on page 1 of this document can be used to estimate an overall emission factor for architectural coatings.

ARB staff do not recommend using ARB's on-line emission inventory data to determine emission factors on a per capita basis. This data incorporates highly localized information that may not be appropriate for other areas. For example, the growth percentages that are used to develop emission forecasts are specific to different California county government organizations. In addition, California has 35 air districts and these districts can have different architectural coating regulations, which result in different control factors within the emissions inventory. Air districts in California can have one of the following three types of architectural coating rules: (1) A rule that is based on ARB's 2000 Suggested Control Measure; (2) U.S. EPA's 1998 National Volatile Organic Compound Emission Standards for Architectural Coatings; or (3) the South Coast Air Quality Management District's Rule 1113. For these reasons and others, we believe that statewide survey data from actual survey reports are the best source of information when trying to develop general emission factors.

Step 3: Determine appropriate control factors.
The supporting documentation for architectural coating regulations will usually contain the expected percent reduction in VOC emissions that will result when the regulation is implemented (i.e., the control factor.) Sources of control factors include the following:

- ARB Staff Report for the Proposed Suggested Control Measure for Architectural Coatings, Executive Summary; June 6, 2000; http://www.arb.ca.gov/coatings/arch/sreport/vol1-2.pdf
- South Coast Air Quality Management District Rule 1113, amendments adopted on: Nov. 8, 1996; May 14, 1999; and Dec. 5, 2003. SCAQMD staff reports are available at http://www.aqmd.gov

It is also possible to estimate control factors, using a variation of the method discussed previously in Option #1 and the following equations:

$$[\text{Control Factor, \%}] = \frac{[\text{Pre-Limit VOC}_{\text{ACTUAL}}\text{, g/l}]-[\text{NEW VOC}_{\text{ACTUAL}}\text{, g/l}]}{[\text{Pre-Limit VOC}_{\text{ACTUAL}}\text{, g/l}]}$$

where

Pre-Limit VOC_{ACTUAL}, g/l = The VOC_{ACTUAL} value for a typical coating, prior to adoption of a new limit. In some cases, sales-weighted average VOC_{ACTUAL} values can be obtained from ARB survey reports. However, it is important to note that the ARB values may be lower than those found in other parts of the United States.

$$[\text{NEW VOC}_{\text{ACTUAL}}] = \frac{[\text{Avg. VOC Density, g/l}]*[\text{VOC}_{\text{REGULATORY}}\text{ Limit, g/l}]*[\text{Vol. \% Solids}]}{([\text{Avg. VOC Density, g/l}]-[\text{VOC}_{\text{REGULATORY}}\text{ Limit, g/l}])}$$

Average VOC Density = 880 grams/liter
$VOC_{REGULATORY}$ Limit = New $VOC_{REGULATORY}$ Limit, grams/liter
Vol. % Solids = Volume Percent Solids, % for a typical coating. In some cases, sales-weighted average Volume % Solids values can be obtained from ARB survey reports. However, it is important to note that the ARB values may be different than those found in other parts of the United States.

Step 4: Calculate overall emission reductions.

Determine potential emission reductions (see Appendix for details.)
For the entire inventory,
[Emission Reductions, lbs] = [Coating Sales, gals]*[Emission Factor, lb/gal]*[Control Factor, %]

Conclusion: ARB staff believes that the methodology that is used for calculation of emission reductions for AIM coatings should be flexible enough to accommodate the type of data that are available to support the analysis. It is unlikely that there is one method that will be suitable for all regions of the country, because the types of coatings and the available data vary widely depending on location. Therefore, we encourage U.S. EPA to develop guidance on this topic that gives states and regions the flexibility to account for these differences, rather than adopting a rule that would result in a prescriptive approach.

This Appendix contains detailed emission reduction calculations, based on the two approaches discussed in the main document.

Option 1: Detailed Emission Inventory

Step 1: Identify the available data.

Product	VOC_{ACTUAL} (g/l)	$VOC_{REGULATORY}$ (g/l)	Volume % Solids	Sales Volume (gals)
#1	78	190	33%	10,000
#2	110	220	39%	7,500
#3	350	350	55%	5,000
#4	55	140	34%	2,500

Step 2: Calculate emission reductions for each product.

Eqn. 1: [Pre-Limit Emissions, lbs VOC] = [VOC_{ACTUAL}, lb VOC/gal coating]*[Sales Volume, gals coating]

Eqn. 2: $$[\text{NEW } VOC_{ACTUAL}, \text{ g/l}] = \frac{[\text{Dvoc, g/l}]*[VOC_{REGULATORY} \text{ Limit, g/l}]*[\text{Vs}]}{([\text{Dvoc, g/l}]-[VOC_{REGULATORY} \text{ Limit, g/l}])}$$

where

Dvoc = Average VOC Density, which is assumed to be approximately 880 grams/liter

$VOC_{REGULATORY}$ Limit = New $VOC_{REGULATORY}$ Limit, grams/liter

Vs = Volume Percent Solids, %

To convert from units of (grams/liter) to (lbs/gal):

$$[VOC_{ACTUAL}, \frac{\textit{lbs VOC}}{\textit{gal coating}}] = [VOC_{ACTUAL}, \frac{\textit{grams VOC}}{\textit{liter coating}}] * \frac{[1 \text{ lb VOC}]}{[454 \textit{ grams VOC}]} * \frac{[3.785 \text{ liters coating}]}{[1 \text{ gal coating}]}$$

Eqn. 3: [Post-Limit Emissions, lbs VOC] = [NEW VOC_{ACTUAL}, lb VOC/gal]*[Sales Volume, gals coating]

Eqn.4: [Emission Reductions] = [Pre-Limit Emissions] – [Post-Limit Emissions]

Example Calculation for Product #1:

[Pre-Limit Emissions] = [78 grams/liter]*[1 lb/454 grams]*[3.785 liters/gal]*[10,000 gals] = 6,503 lbs VOC

Assume the New $VOC_{REGULATORY}$ Limit is 150 g/l.

$$[\text{NEW } VOC_{ACTUAL}] = \frac{[880 \text{ g/l}]*[150 \text{ g/l}]*[33\%]}{([880 \text{ g/l}]-[150 \text{ g/l}])} = 60 \text{ g/l}$$

[Post-Limit Emissions] = [60 g/l]*[1 lb/454 grams]*[3.785 liters/gallon]*[10,000 gals] = 5,002 lbs VOC

[Emission Reductions] = [6,503] – [5,002] = 1,501 lbs VOC

A summary of the emission reduction calculations for Products #1- #4 is provided below. All products are in the same coating category with a new $VOC_{REGULATORY}$ Limit of 150 g/l.

Product	Pre-Limit Emissions (lbs VOC)	NEW VOC_{ACTUAL} (g/l)	Post-Limit Emissions (lbs VOC)	Emission Reduction (lbs VOC)
#1	6,503	60	5,002	1,501
#2	6,878	71	4,440	2,438
#3	14,590	100	4,169	10,421
#4	1,146	No reductions were calculated for Product #4, because it already complied with the new $VOC_{REGULATORY}$ limit.		0
TOTAL:	29,117			14,360

Step 3: Determine Overall Emission Reduction Percentage.

For these four products, the overall emission reduction percentage:

$$[\%\ \text{Reduction}] = \frac{([29{,}117] - [14{,}360])}{[29{,}117]} = 51\%$$

<u>Option 2: General Emission Inventory</u>

Step 1: Identify the available data.

For example, the following table illustrates how to estimate coating usage data for Arizona:

	United States	Arizona
Population in 2004	285,691,501	5,633,997 (2% of United States)
Housing Units	122,671,734	2,458,231 (2% of United States)
Sales Volume:		
Architectural Coatings	822,186,000 gals	16,443,720 gals
Industrial New Construction and Maintenance Paints - Interior	22,492,000 gals	449,840 gals
Industrial New Construction and Maintenance Paints - Exterior	35,167,000 gals	703,340 gals
Traffic Marking Paints	35,907,000 gals	718,140 gals

Step 2: Determine appropriate emission factors.

Category	Emission Factors*, based on 1990 sales (lb VOC/gal)	Emission Factors*, based on 1996 sales (lb VOC/gal)
Architectural Coatings	0.93	0.74
Industrial New Construction and Maintenance Paints – Interior & Exterior	2.86	2.43
Traffic Marking Paints	0.90	0.93

*Emission factors are based on data reported in ARB Architectural Coating surveys and they do not include emissions from the use of thinning and cleanup solvents.

Example emission calculations are provided below, using emission factors based on ARB 1996 data:

Category	Example Emissions Calculations
Architectural Coatings	[16,443,720 gals]*[0.74 lb/gal] = 12,168,353 lbs
Industrial New Construction and Maintenance Paints – Interior & Exterior	[449,840+703,340 gals]*[2.43 lb/gal] = 2,802,227 lbs
Traffic Marking Paints	[718,140 gals]*[0.93 lb/gal] = 667,870 lbs

Total Pre-Limit Emissions = 12,168,353 + 2,802,227 + 667,870 lbs = 15,638,450 lbs emitted

Step 3: Determine appropriate control factors.

Listed below are the AIM VOC limit reductions from ARB's 2000 Suggested Control Measure. For California, these reductions resulted in a control factor of approximately 20% from a 1996 baseline. However, control factors can vary, depending on the particular emission inventory for an area and the combination of old limits and new limits.

Category	Control Factor = 20%, based on ARB SCM	
	Old Limit	***New Limit***
Flat	250	100
Industrial Maintenance	420	250
Lacquers	680	550
Multi-Color	420	250

Category	**Control Factor = 20%, based on ARB SCM**	
	Old Limit	***New Limit***
Nonflat: High Gloss	250	250
Nonflat: Low Gloss	250	150
Nonflat: Medium Gloss	250	150
Primer, Sealer, Undercoater	350	200
Quick Dry Enamel	400	250
Quick Dry Primer, Sealer, Undercoater	450	200
Roof	300	250
Rust Preventative	420	400
Stains: Clear/Semitransparent & Opaque	350	250
Swimming Pool Repair & Maintenance	650	340
Traffic Marking Paints	250	150
Waterproofing Sealers	400	250

Alternatively, control factors for individual categories can be estimated using the following equations:

$$[\text{Control Factor, \%}] = \frac{[\text{Pre-Limit VOC}_{\text{ACTUAL}}\text{, g/l}]-[\text{NEW VOC}_{\text{ACTUAL}}\text{, g/l}]}{[\text{Pre-Limit VOC}_{\text{ACTUAL}}\text{, g/l}]}$$

where

Pre-Limit VOC_{ACTUAL}, g/l = The VOC_{ACTUAL} value for a typical coating, prior to adoption of a new limit. In some cases, sales-weighted average VOC_{ACTUAL} values can be obtained from ARB survey reports. However, it is important to note that the ARB values may be lower than those found in other parts of the United States.

$$[\text{NEW VOC}_{\text{ACTUAL}}] = \frac{[\text{Avg. VOC Density, g/l}]*[\text{VOC}_{\text{REGULATORY}}\text{ Limit, g/l}]*[\text{Vol. \% Solids}]}{([\text{Avg. VOC Density, g/l}]-[\text{VOC}_{\text{REGULATORY}}\text{ Limit, g/l}])}$$

Average VOC Density = 880 grams/liter
$VOC_{REGULATORY}$ Limit = New $VOC_{REGULATORY}$ Limit, grams/liter
Vol. % Solids = Volume Percent Solids, % for a typical coating. In some cases, sales-weighted average Volume % Solids values can be obtained from ARB survey reports. However, it is important to note that the ARB values may be different than those found in other parts of the United States.

This alternative method has the advantage of being able to provide estimated emission reductions for individual categories, rather than using an overall control factor for all categories. To use this method, it is necessary to identify typical coatings that provide representative values for the Pre-Limit VOC_{ACTUAL} and Volume % Solids. This information can be obtained by working with manufacturers and reviewing product data sheets.

Provided below is an example of estimated control factors for several categories. These factors were estimated using ARB architectural coating survey data, but the same approach can be used by inputting data obtained from manufacturers and different values for the old and new VOC limits.

	ARB SURVEY DATA - 1996 SALES						
Coating Category	**SWA VOC_{REG} (g/l)**	**SWA VOC_{ACTUAL} (g/l)**	**SWA Vol. % Solids**	**Old VOC_{REG} Limit (g/l)**	**New VOC_{REG} Limit (g/l)**	**NEW VOC_{ACTUAL} (g/l)**	**Estd. Control Factor**
Flats	98	40	35%	250	100	39	1%
Industrial Maintenance	300	291	60%	420	250	210	28%
Lacquer – Clear	649	626	20%	680	550	293	53%
Lacquer – Opaque	545	527	27%	680	550	396	25%
Multi-Color	263	163	33%	420	250	115	29%
Nonflat - High Gloss	248	160	40%	250	250	N/A	N/A
Nonflat – Low Gloss	134	61	36%	250	150	65	0%*
Nonflat - Medium Gloss	155	69	37%	250	150	67	3%
Primer, Sealer, Undercoater	170	118	37%	350	200	96	19%
Quick Dry Enamels	403	393	50%	400	250	175	56%
Quick Dry PSUs	303	272	44%	450	200	114	58%
Roof	23	16	45%	300	250	157	0%*
Rust Preventative	371	367	48%	420	400	352	4%
Stains – Clear	285	240	34%	350	250	119	51%
Stains – Semitransparent	401	357	38%	350	250	133	63%
Stains – Opaque	157	82	36%	350	250	126	0%*
Swimming Pool Repair & Maintenance	569	569	29%	650	340	161	72%
Traffic Marking	154	111	58%	250	150	105	6%
Waterproofing Sealers – Clear	347	234	36%	400	250	126	46%
Waterproofing Sealers – Opaque	219	191	47%	400	250	164	14%

* No estimated control factor could be calculated because the predicted "NEW VOC Actual" value was higher than the existing "SWA VOC Actual" value. Calculation of a control factor by this method requires that the "NEW VOC Actual" be lower than the existing "SWA VOC Actual".
"N/A" = Not Applicable because the VOC limit was not changed. Nonflat – High Gloss is included for informational purposes only.

Step 4: Calculate overall emission reductions.

[Emission Reductions, lbs] = [Coating Sales, gals]*[Emission Factor, lb/gal]* [Control Factor, %]

Category	Example Emission Reduction Calculations
Architectural Coatings	[16,443,720 gals]*[0.74 lb/gal]*[20%] = 2,433,671 lbs
Industrial New Construction and Maintenance Paints – Interior & Exterior	[449,840+703,340 gals]*[2.43 lb/gal]*[20%] = 560,446 lbs
Traffic Marking Paints	[718,140 gals]*[0.93 lb/gal]*[20%] = 133,574 lbs

Total Reductions = 2,433,671 + 560,446 + 133,574 lbs = 3,127,691 lbs reduced

Assumptions:
(1) Arizona's current product mix is similar to California's 1996 product mix.
(2) Arizona's current VOC limits are similar to California's pre-2000 SCM limits.
(3) The overall control factor is 20%.

APPENDIX F:

SCM WORKSHOP NOTICES

Air Resources Board

Linda S. Adams
Secretary for Environmental Protection

Robert F. Sawyer, Ph.D., Chair
1001 I Street • P.O. Box 2815
Sacramento, California 95812 • www.arb.ca.gov

Arnold Schwarzenegger
Governor

November 7, 2006

Dear Sir or Madam:

You are invited to participate in a public workshop to discuss proposed changes to the Air Resources Board's (ARB or Board) Suggested Control Measure for Architectural Coatings (SCM). The SCM is a model rule which has been used by California air pollution control districts to develop architectural coating rules. Currently, twenty air districts have rules based on the SCM that was approved by the Board in 2000.

At the workshop ARB staff will discuss the following:

- Project timeline and development activities;
- ARB's architectural coating survey analysis;
- Districts' State Implementation Plan commitments;
- Coating category definitions and other SCM areas of concern; and
- Concept of reactivity-based standards.

The date, time, and location of the workshop are:

Date:	Tuesday, December 12, 2006
Time:	10:00 a.m. to 12:00 p.m.
Location:	Training 2 West and East, 2nd Floor
Address:	Cal/EPA Headquarters 1001 I Street Sacramento, California 95812

If you wish to participate by phone, please contact Lynna Negri at (916) 324-8018 or at lnegri@arb.ca.gov to ensure that adequate phone lines are available. The dial-in number for phone participants is (866) 755-6191, passcode 2181331.

At least one week prior to the workshop, we will post an agenda and handouts on our website at http://www.arb.ca.gov/coatings/arch/arch.htm. To be notified of when these materials are posted, please sign up for the Architectural Coatings ListServe at http://www.arb.ca.gov/listserv/arch-ctgs.htm.

We look forward to your participation in this workshop. If you have special accommodations or language needs, please contact Lynna Negri at (916) 324-8018 or at lnegri@arb.ca.gov. TTY/TTD/Speech-to-Speech users may dial 7-1-1 for the California Relay Service. For public transportation information, please contact Regional Transit at (916) 321-BUSS or view the transportation information on the California Environmental Protection Agency's web site at http://calepa.ca.gov/epabldg/location.htm.

If you have any questions about the workshop, please contact Mr. Jim Nyarady, Manager, Strategy Evaluation Section, at (916) 322-8273 or jnyarady@arb.ca.gov.

Sincerely,

Barbara Fry, Chief
Measures Assessment Branch

cc: Mr. Jim Nyarady, Manager
Strategy Evaluation Section

Air Resources Board

Linda S. Adams
Secretary for Environmental Protection

Robert F. Sawyer, Ph.D., Chair
1001 I Street • P.O. Box 2815
Sacramento, California 95812 • www.arb.ca.gov

Arnold Schwarzenegger
Governor

February 8, 2007

Dear Sir or Madam:

You are invited to participate in a public workshop to discuss proposed changes to the Air Resources Board's (ARB or Board) Suggested Control Measure for Architectural Coatings (SCM). The SCM is a model rule which has been used by California air pollution control districts to develop architectural coating rules. Currently, twenty air districts have rules based on the SCM that was approved by the Board in 2000.

At the workshop ARB staff will discuss the following:

- Project timeline and development activities;
- Preliminary proposed VOC limits; and
- Preliminary proposed revisions to coating category definitions.

The date, time, and location of the workshop are:

Date:	Tuesday, March 13, 2007
Time:	1:30 p.m. to 3:30 p.m.
Location:	Training 1 East and West, 1st Floor
Address:	Cal/EPA Headquarters 1001 I Street Sacramento, California 95812

If you wish to participate by phone, please contact Sarah Penfield at (916) 324-8181 or at spenfiel@arb.ca.gov to ensure that adequate phone lines are available. The dial-in number for phone participants is (866) 755-6191, passcode 2181331.

Prior to the workshop, we will post an agenda and handouts on our website at http://www.arb.ca.gov/coatings/arch/arch.htm. To be notified of when these materials are posted, please sign up for the Architectural Coatings ListServe at http://www.arb.ca.gov/listserv/arch-ctgs.htm.

We look forward to your participation in this workshop. If you have special accommodation needs, please contact ARB's Disability Coordinator at (916) 323-4916. If you are a person with limited English and would like to request interpreter services, please contact ARB's Bilingual Manager at (916) 323-7053. TTY/TTD/Speech-to-Speech users may dial 7-1-1 for the California Relay Service. For public transportation information, please contact Regional Transit at (916) 321-BUSS or view the transportation information on the California Environmental Protection Agency's web site at http://calepa.ca.gov/epabldg/location.htm.

If you have any questions about the workshop, please contact Mr. Jim Nyarady, Manager, Strategy Evaluation Section, at (916) 322-8273 or jnyarady@arb.ca.gov.

Sincerely,

Barbara Fry, Chief
Measures Assessment Branch

cc: Mr. Jim Nyarady, Manager
Strategy Evaluation Section

Air Resources Board

Linda S. Adams
Secretary for Environmental Protection

Robert F. Sawyer, Ph.D., Chair
1001 I Street • P.O. Box 2815
Sacramento, California 95812 • www.arb.ca.gov

Arnold Schwarzenegger
Governor

May 1, 2007

Dear Sir or Madam:

You are invited to participate in a public workshop to discuss proposed changes to the Air Resources Board's (ARB or Board) Suggested Control Measure for Architectural Coatings (SCM). The SCM is a model rule which has been used by California air pollution control districts to develop architectural coating rules. Currently, twenty air districts have rules based on the SCM that was approved by the Board in 2000.

At the workshop ARB staff will discuss the following:

- Project timeline and development activities;
- Draft proposed revisions to the SCM rule language;
- Draft proposed VOC limits; and
- Draft proposed revisions to coating category definitions.

The date, time, and location of the workshop are:

Date:	Wednesday, June 6, 2007
Time:	9:00 a.m. to 12:00 p.m.
Location:	Training 1 East and West, 1st Floor
Address:	Cal/EPA Headquarters 1001 I Street Sacramento, California 95812

If you wish to participate by phone, please contact Sarah Penfield at (916) 324-8181 or at spenfiel@arb.ca.gov to ensure that adequate phone lines are available. The dial-in number for phone participants is (866) 755-6191, passcode 2181331.

Prior to the workshop, we will post an agenda and handouts on our website at http://www.arb.ca.gov/coatings/arch/arch.htm. To be notified of when these materials are posted, please sign up for the Architectural Coatings ListServe at http://www.arb.ca.gov/listserv/arch-ctgs.htm.

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

California Environmental Protection Agency

Printed on Recycled Paper

We look forward to your participation in this workshop. If you have special accommodation needs, please contact ARB's Disability Coordinator at (916) 323-4916. If you are a person with limited English and would like to request interpreter services, please contact ARB's Bilingual Manager at (916) 323-7053. TTY/TTD/Speech-to-Speech users may dial 7-1-1 for the California Relay Service. For public transportation information, please contact Regional Transit at (916) 321-BUSS or view the transportation information on the California Environmental Protection Agency's web site at http://calepa.ca.gov/epabldg/location.htm.

If you have any questions about the workshop, please contact Mr. Jim Nyarady, Manager, Strategy Evaluation Section, at (916) 322-8273 or jnyarady@arb.ca.gov.

Sincerely,

Barbara Fry, Chief
Measures Assessment Branch

cc: Mr. Jim Nyarady, Manager
Strategy Evaluation Section

APPENDIX G:

ECONOMIC ANALYSIS DETAILS

Summary of Economic Analysis Methodology

Summary

The total cost of the proposed SCM to affected businesses is estimated to be $4 million per year in annualized nonrecurring costs and $8.3 million per year in recurring costs. This equates to $12.3 million dollars annually over the project horizon. This represents the cost of raw materials, research and development, equipment, testing, and training to architectural coatings manufacturers.

This appendix covers the methodology used in the Economic Analysis presented in Chapter 7. The methodology is similar to what was used in previous ARB regulations (ARB, 1990; ARB, 1991; ARB, 1997; ARB, 1999; ARB, 2000; ARB, 2003; ARB, 2004; ARB, 2005) and follows guidelines recommended by Cal/EPA for economic analysis (Cal/EPA, 1996).

Methodology

For this analysis, we considered the impact to architectural coatings manufacturers. Although other entities such as distributors, retailers, end users and raw material suppliers may be impacted, coating manufacturers will be the primary entities affected.

First, we analyzed data from the 2005 Architectural Coatings Survey to determine complying and noncomplying volume for the 16 categories that have a proposed change to the VOC limit, and a projected emission reduction of more than .01 tons per day (tpd) outside of the South Coast Air Quality Management District (SCAQMD). We assumed that costs would not be incurred for coatings in a category that did not have a proposed limit. We also determined the number of noncomplying products and the expected emission reductions for each of these categories based on the survey data. These data are summarized in Table G-1.

Table G-1
Survey Data Inputs for Cost Calculations Outside of SCAQMD for Categories with Greater Than .01 TPD Emission Reduction

Coating Category	Proposed Limit (g/l)	Emission Reductions (Tons/Day)	Estimated # of Non-Compliant Products	Estimated # of Non-Compliant Gallons per Year
Aluminum Roof	400	0.19	48	193,566
Bituminous Roof	50	0.17	42	79,722
Concrete Masonry Sealer	100	0.54	243	647,318
Dry Fog	150	0.31	39	120,535
Flat	50	3.12	2,079	19,213,031
Floor	100	0.07	167	100,834

Table G-1
Survey Data Inputs for Cost Calculations Outside of SCAQMD for Categories with Greater Than .01 TPD Emission Reduction

Coating Category	Proposed Limit (g/l)	Emission Reductions (Tons/Day)	Estimated # of Non-Compliant Products	Estimated # of Non-Compliant Gallons per Year
Mastic Texture	100	0.10	22	79,316
Non Flat	100	2.79	2,121	12,649,813
Non Flat High Gloss	150	0.91	362	1,074,079
PSU	100	1.12	323	3,747,874
Roof	50	0.07	87	135,698
Rust Preventative	250	1.57	303	832,567
Specialty PSU	100	2.62	70	859,266
Traffic Marking	100	0.09	87	320,397
Waterproofing Membrane	250	0.09	13	98,848
Wood Coatings	275	1.41	940	736,786
Total		**15.2**	**6,946**	**40,889,649**

We collected data from manufacturers with the 2007 Economic Impacts Survey. This survey was sent to all manufacturers who responded to the 2005 Architectural Coatings Survey who manufactured products in one of the affected categories. This survey collected information on the number of products that would need to be reformulated due to the proposed limits of the SCM and the cost to reformulate those products.

Based on responses to the ARB Economic Survey and discussions with manufacturers, more than half of the non-complying products that will be reformulated will be in response to the proposed limits of the SCAQMD. This is confirmed by comparing the portion of non-complying products in the ARB 2005 survey and the responses to the Economic Survey. For the purposes of this analysis, we assumed that half of the non-complying products would be reformulated due to the proposed limits of the SCM.

From these responses, we sorted the recurring and non-recurring costs by category where applicable, and applied the average of all responses in categories that did receive a specific response. This data is summarized in Table G-2.

Table G-2 Non-Recurring and Recurring Cost from 2007 ARB Economic Impacts Survey		
Coating Category	**ARB Economic Survey Reported Nonrecurring Cost to Reformulate (Dollars per Product)**	**ARB Economic Survey Reported Non-Raw Material Recurring Costs (Dollars per Year per Product)**
Aluminum Roof	11,625	$86,328
Bituminous Roof	17,171	$75,537
Concrete Masonry Sealer	6,068	$437,036
Dry Fog	7,332	$70,142
Flat	3,642	$3,739,082
Floor	14,893	$300,350
Mastic Texture	7,332	$39,567
Nonflat	4,014	$3,814,619
Nonflat High Gloss	4,719	$651,057
PSU	5,681	$580,916
Roof	17,281	$156,470
Rust Preventative	7,332	$544,946
Specialty PSU	4,263	$125,895
Traffic Marking	8,533	$156,470
Waterproofing Membrane	7,332	$23,381
Wood Coatings	5,391	$1,690,590

Based on the ARB survey, product data sheets and discussions with manufacturers, staff determined the ingredients of typical complying and non-complying formulations for the 20 categories. These formulations were sent out to industry for comments.

Data on the raw materials were obtained from chemical manufacturers, distributors of raw materials, Chemical Market Reporter (CMR) Magazine, and discussions with manufacturers. Resin costs are the primary influence on raw materials cost for most coatings and, because there are a variety of resins with differing costs, resins have the most variable impact on raw materials cost. Resin costs were taken from the CMR chemical prices in 2000, and were inflated by the producer price index between 2000 and 2007 for plastic material and resin manufacturers (BLS, 2007).

In cases where there were no data available for an ingredient, a default price of $1.50 per pound was used.

Comparing the difference in raw material costs between typical complying and non-complying formulations gave us the amount of cost or cost savings in raw materials a manufacturer would incur if changing from a typical non-compliant

coating to a typical complying coating. These costs are summarized in Table G-3.

Table G-3
Raw Material Cost Differential Between Complying and Non-Complying Products

Coating Category	Raw Material Cost of a Typical Complying Formulation	Raw Material Cost of a Typical Non-Complying Formulation	Difference of Raw Material Cost of Complying and Non-Complying per Gallon
Aluminum Roof	$3.17	$3.66	-$0.49
Bituminous Roof	$2.57	$2.96	-$0.39
Concrete Masonry Sealer	$2.35	$3.52	-$1.17
Dry Fog	$6.87	$8.71	-$1.85
Flat	$4.13	$4.45	-$0.32
Floor	$5.24	$4.24	$1.00
Mastic Texture	$5.85	$4.43	$1.42
Nonflat	$5.58	$4.86	$0.72
Nonflat High Gloss	$4.35	$5.99	-$1.64
PSU	$4.64	$4.23	$0.42
Roof	$5.54	$7.48	-$1.94
Rust Preventative	$5.98	$7.57	-$1.59
Specialty PSU	$4.53	$6.30	-$1.77
Traffic Marking	$3.79	$3.55	$0.24
Waterproofing Membrane	$12.27	$8.35	$3.90
Wood Coatings	$5.00	$9.67	-$4.67

These costs were multiplied by the non-complying volume to determine the recurring raw material related cost of the proposed limits.

The recurring costs from Table G-2 were multiplied by the number of products that would need to be reformulated for each category. The total annual cost is the sum of the raw material related costs, the recurring non-raw material costs and annualized non-recurring costs. These calculations are summarized in Table G-4.

Table G-4 Calculated Annual Cost				
Coating Category	**Annual Recurring Costs (Raw Material) Dollars per Year**	**Annual Recurring Costs (Non-raw Material) Dollars per Year**	**Annualized Nonrecurring Cost Dollars per Year**	**Total Annual Cost per Year**
Aluminum Roof	-$94,785	$86,328	$64,441.97	$55,985
Bituminous Roof	-$30,718	$75,537	$83,287.43	$128,106
Concrete Masonry Sealer	-$749,150	$437,036	$170,288.94	-$141,826
Dry Fog	-$222,428	$70,142	$33,023	-$119,264
Flat	-$6,189,405	$3,739,082	$874,438	-$1,575,886
Floor	$100,339	$300,350	$287,232	$687,922
Mastic Texture	$112,598	$39,567	$18,629	$170,794
Nonflat	$9,120,928	$3,814,619	$983,224	$13,918,771
Nonflat High Gloss	-$1,758,417	$651,057	$197,285	-$910,076
PSU	$1,563,126	$580,916	$211,915.10	$2,355,957
Roof	-$263,878	$156,470	$173,629	$66,220
Rust Preventative	-$1,324,934	$544,946	$256,566	-$523,423
Specialty PSU	-$1,517,941	$125,895.00	$34,463	-$1,357,584
Traffic Marking	$78,066	$156,470	$85,735	$320,271
Waterproofing Membrane	$385,012	$23,381	$11,008	$419,401
Wood Coatings	-$3,443,964	$1,690,590	$585,185	-$1,168,189
Total	**-$4,235,550**	**$12,492,381**	**$4,070,350**	**$12,327,181**

The cost effectiveness is determined by taking the total annual cost of a category and dividing by the annual emission reduction. Assuming all costs are passed on to consumers, we calculate the cost increase per gallon. The cost increase per gallon to end users is determined by taking the total cost of the category, dividing by the number of non-compliant gallons, and multiplying by a factor of 4X. This represents the assumption that the cost of a product is doubled from the manufacturer to the distributor, and is doubled again from the distributor to the end user. Taking the raw material costs for complying and non-complying products, and using the same 4X multiplier gives cost increase per gallon. This data is summarized in Table G-5.

Table G-5 Calculated Cost-Effectiveness and Cost Increase Per Gallon				
Coating Category	**Individual Cost Effectiveness for Each Limit (Dollars per Pound VOC Reduced)**	**Cost Increase to Consumers per Gallon (4X)**	**Typical Non-Complying Cost per Gallon**	**Typical Complying Cost per Gallon**
Aluminum Roof	$0.41	$1.16	$14.63	$12.67
Bituminous Roof	$1.02	$6.43	$11.84	$10.30
Concrete Masonry Sealer	-$0.36	-$0.88	$14.09	$9.40
Dry Fog	-$0.52	-$3.96	$34.86	$27.47
Flat	-$0.69	-$0.33	$17.81	$16.52
Floor	$13.90	$27.30	$16.96	$20.94
Mastic Texture	$2.37	$8.61	$17.72	$23.40
Non Flat	$7.03	$4.40	$19.44	$22.32
Non Flat High Gloss	-$1.37	-$3.39	$23.96	$17.41
PSU	$2.73	$2.51	$16.90	$18.57
Roof	$1.38	$1.95	$29.94	$22.16
Rust Preventative	-$0.46	-$2.51	$30.30	$23.93
Specialty PSU	-$0.71	-$6.32	$25.19	$18.12
Traffic Marking	$4.76	$4.00	$14.18	$15.16
Waterproofing Membrane	$6.56	$16.97	$33.38	$48.96
Wood Coatings	-$1.13	-$6.34	$38.70	$20.00
Weighted Average	**$1.12**	**$1.21**		

A sensitivity analysis was conducted to determine the impacts on the annual costs from assumed changes to resin costs, the primary variable influence on raw material costs. We conducted this analysis with four different runs, one baseline and three assumed increases in resin prices. As Table G-6 shows, even with an extreme assumption of 50% increase in compliant resin price, the overall cost-effectiveness of the proposed limits are still consistent with the cost effectiveness values for past ARB regulations shown earlier in Table 7-3.

We assumed the resin costs for complying coatings would increase by a certain level. Resin costs are the primary influence on raw materials cost for most coatings and, because there are a variety of resins with differing costs, resins have the most variable impact on raw materials cost. The resin portion of a coating typically represents about 20% to 50% or more of the total raw materials cost of a gallon of coating. With current ingredient prices as the baseline scenario, we conducted complete cost-effectiveness calculations at 10%, 20%, and 50% assumed increases in compliant resin costs. The 10% and 20%

assumed resin price increases are consistent with the socioeconomic impacts analysis conducted by the SCAQMD and confidential comments provided by some manufacturers. To be conservative, we use the 20% resin price increase assumption wherever we refer to the "average" cost-effectiveness of each limit and the overall cost-effectiveness. The 50% assumed resin price increase is intended as an extreme upper boundary for purposes of the sensitivity analysis and is not suggested by any information available to staff as reflective of projected actual resin prices when the proposed limits become effective.

Table G-6
Cost-Effectiveness of Proposed Limits Under Sensitivity Analysis

	Baseline	10% Increase	20% Increase	50% Increase
Coating Category	**RCM = 1.0**	**RCM = 1.1**	**RCM = 1.2**	**RCM = 1.5**
Aluminum Roof	$0.41	$0.41	$0.41	$0.41
Bituminous Roof	$1.02	$1.02	$1.02	$1.02
Concrete Masonry Sealer	-$0.60	-$0.48	-$0.36	-$0.01
Dry Fog	-$0.86	-$0.69	-$0.52	-$0.01
Flat	-$1.76	-$1.23	-$0.69	$0.92
Floor	$13.06	$13.50	$13.94	$15.26
Mastic Texture	$1.80	$2.09	$2.37	$3.24
Non Flat	$4.65	$5.84	$7.03	$10.61
Non Flat High Gloss	-$1.92	-$1.65	-$1.37	-$0.55
PSU	$1.40	$2.06	$2.73	$4.71
Roof	$0.12	$0.75	$1.38	$3.26
Rust Preventative	-$0.80	-$0.63	-$0.46	$0.06
Specialty PSU	-$0.83	-$0.77	-$0.71	-$0.53
Traffic Marking	$3.47	$4.11	$4.76	$6.70
Waterproofing Membrane	$4.70	$5.63	$6.56	$9.34
Wood Coatings	-$1.48	-$1.31	-$1.13	-$0.62
Overall Cost-Effectiveness	**$0.20**	**$0.65**	**$1.11**	**$2.49**

On the following pages, we present typical formulations for complying and non-complying products. As noted earlier, these formulations were developed based on survey data, product datasheets, and input from manufacturers. In cases where an ingredient comprised less than 5% of the total weight of a formulation, the ingredient was changed to "All Other VOCs" or "All Other Solids." The formulations shown have an assumed 20% increase in resin prices for the future complying product.

References

Air Resources Board. Technical Support Document. "Proposed Regulation to Reduce Volatile Organic Compound Emissions from Consumer Products." (a.k.a. "Phase I Consumer Products Regulation). August 1990. (ARB, 1990)

Air Resources Board. Technical Support Document. "Proposed Amendments to the Statewide Regulation to Reduce Volatile Organic Compound Emissions from Consumer Products – Phase II." (a.k.a. "Phase II Consumer Products Regulation). October 1991. (ARB, 1991)

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Air Resources Board. Staff Report for the 2000 Suggested Control Measure for Architectural Coatings. June, 2000. (ARB, 2000)

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U. S. Department of Labor, Bureau of Labor Statistics. Producer Price Index Industry Data – Plastics Material and Resin Manufacturing. July 11, 2007. (BLS, 2007)

California Environmental Protection Agency. Memorandum from Peter M. Rooney, Undersecretary, to Cal/EPA Executive Officers and Directors. Economic Analysis Requirements for the Adoption of Administrative Regulations. Appendix C (Cal/EPA Guidelines for Evaluation Alternatives to Proposed Major Regulations). December 6, 1996. (Cal/EPA, 1996)

Category	**Aluminum Roof**	Assumed Resin Cost Multiplier (RCM)	1.2

Physical Properties	**Typical Non-Compliant**	**Typical Compliant**
Weight % VOC:	43%	30%
VOC Limit (g/l):	500	400
VOC Reg. for Sample Formulation (g/l):	433	302
Density (lbs/gallon):	8.4	8.4

Formulation and Cost Comparison

Component (A)	Unit Cost ($/lb) (B)	RCM (C)	**Typical Non-Compliant** Wt% (D)	Cost (B) X (D)	**Typical Compliant** Wt% (E)	Cost (B) X (C) X (E)
Asphalt	$0.17		32%	$0.05	30%	$0.05
Calcium Carbonate	$0.17		7%	$0.01	25%	$0.04
Aluminum	$0.90		17%	$0.15	15%	$0.14
All Other Solids	$0.65		3%	$0.02		
Mineral Spirits	$0.50		22%	$0.11	30%	$0.15
Aromatic 100	$0.50		13%	$0.06		
Medium Aliphatic Solvent Naphtha	$0.42		9%	$0.04		
	Sum		100%		100%	

Total Cost, $/Pound	$0.44	$0.38
% Cost Differential Relative to Current Product		-13.4%
Total Cost, $/Gallon	$3.66	$3.17
Total Cost Differential per Gallon Relative to Current Product		-$0.49

Assumptions:

(1) Cost of "Additives" remains at $1.50 per pound
(2) Average unit size = 1 gallons
(3) RCM: Assumed Compliant Resin Cost Multiplier.
RCM = 1.0 unless otherwise specified.

Category	**Bituminous Roof**	Assumed Resin Cost Multiplier (RCM)	1.2

Physical Properties	**Typical Non-Compliant**	**Typical Compliant**
Weight % VOC:	28%	0%
VOC Limit (g/l):	300	50
VOC Reg. for Sample Formulation (g/l):	292	0
Density (lbs/gallon):	8.7	8.7

Formulation and Cost Comparison

Component (A)	Unit Cost ($/lb) (B)	RCM (C)	**Typical Non-Compliant** Wt% (D)	Cost (B) X (D)	**Typical Compliant** Wt% (E)	Cost (B) X (C) X (E)
Asphalt	$0.17		65%	$0.11	40%	$0.07
Cellulose Fiber	$1.50		5%	$0.08		
Clay Bentonite	$2.00				11%	$0.22
All Other Solids	$0.90		2%	$0.02	1%	$0.01
Water	$0.00				48%	$0.00
Stoddard Solvent	$0.50		28%	$0.14		
	Sum		100%		100%	

Total Cost, $/Pound	$0.34	$0.30
% Cost Differential Relative to Current Product		-13.0%
Total Cost, $/Gallon	$2.96	$2.57
Total Cost Differential per Gallon Relative to Current Product		-$0.39

Assumptions:

(1) Cost of "Additives" remains at $1.50 per pound
(2) Average unit size = 1 gallons
(3) RCM: Assumed Compliant Resin Cost Multiplier.
RCM = 1.0 unless otherwise specified.

Category **Concrete Masonry Sealer (Water Repellent/Weather Resistance)**

Assumed Resin Cost Multiplier (RCM): 1.2

Physical Properties	**Typical Non-Compliant**	**Typical Compliant**
Weight % VOC:	25%	3%
VOC Limit (g/l):	400	100
VOC Reg. for Sample Formulation (g/l):	389	84
Density (lbs/gallon):	13.0	11.0

Formulation and Cost Comparison

Component (A)	Unit Cost ($/lb) (B)	RCM (C)	**Typical Non-Compliant** Wt% (D)	**Typical Non-Compliant** Cost (B) X (D)	**Typical Compliant** Wt% (E)	**Typical Compliant** Cost (B) X (C) X (E)
Titanium Dioxide	$1.18		5%	$0.06	5%	$0.06
Cement	$0.06		25%	$0.02		
Silica	$0.65		20%	$0.13		
Calcium Carbonate	$0.17		20%	$0.03	27%	$0.05
Acrylic Resin	$0.85	1.2	5%	$0.04	25%	$0.25
Water	$0.00				40%	$0.00
Hydrocarbon Solvent (Naphtha)	$0.46		18%	$0.08		
Aromatic Solvent	$0.50		7%	$0.04		
All Other VOCs	$0.60				2%	$0.01
Additives (VOC)	$1.50				1%	$0.02
	Sum		100%		100%	

Total Cost, $/Pound	$0.40	$0.39
% Cost Differential Relative to Current Product		-2.6%
Total Cost, $/Gallon	$5.16	$4.26
Total Cost Differential per Gallon Relative to Current Product		-$0.91

Assumptions:

(1) Cost of "Additives" remains at $1.50 per pound

(2) Average unit size = 1 gallons

(3) RCM: Assumed Compliant Resin Cost Multiplier.
RCM = 1.0 unless otherwise specified.

Category **Concrete Masonry Sealer (Decorative/Stain Resistance)**

Assumed Resin Cost Multiplier (RCM): 1.2

Physical Properties

	Typical Non-Compliant	Typical Compliant
Weight % VOC:	7%	0%
VOC Limit (g/l):	400	100
VOC Reg. for Sample Formulation (g/l):	372	0
Density (lbs/gallon):	8.6	8.4

Formulation and Cost Comparison

Component (A)	Unit Cost ($/lb) (B)	RCM (C)	Typical Non-Compliant Wt% (D)	Typical Non-Compliant Cost (B) X (D)	Typical Compliant Wt% (E)	Typical Compliant Cost (B) X (C) X (E)
Acrylic Resin	$0.85		15%	$0.13		
Siloxane Resin	$1.50	1.2			3%	$0.05
Water	$0.00		78%	$0.00	97%	$0.00
Diethylene Glycol Monomethyl Ether	$1.28		5%	$0.06		
All Other VOCs	$1.35		1%	$0.01		
Additives (VOC)	$1.50		1%	$0.02		
Sum			100%		100%	

	Typical Non-Compliant	Typical Compliant
Total Cost, $/Pound	$0.22	$0.06
% Cost Differential Relative to Current Product		-74.7%
Total Cost, $/Gallon	$1.90	$0.47
Total Cost Differential per Gallon Relative to Current Product		-$1.43

Assumptions:

(1) Cost of "Additives" remains at $1.50 per pound

(2) Average unit size = 1 gallons

(3) RCM: Assumed Compliant Resin Cost Multiplier.
RCM = 1.0 unless otherwise specified.

Category **Dry Fog** Assumed Resin Cost Multiplier (RCM) 1.2

Physical Properties	**Typical Non-Compliant**	**Typical Compliant**
Weight % VOC:	29%	3%
VOC Limit (g/l):	400	150
VOC Reg. for Sample Formulation (g/l):	400	85
Density (lbs/gallon):	11.5	11.5

Formulation and Cost Comparison

Component (A)	Unit Cost ($/lb) (B)	RCM (C)	**Typical Non-Compliant** Wt% (D)	Cost (B) X (D)	**Typical Compliant** Wt% (E)	Cost (B) X (C) X (E)
Titanium Dioxide	$1.18		26%	$0.31	20%	$0.24
Alkyd Resin	$0.71		45%	$0.32		
Vinyl Acrylic Copolymer Resin	$0.71	1.2		$0.00	40%	$0.34
Water	$0.00			$0.00	37%	$0.00
VM&P Naptha	$0.46		28%	$0.13		
All Other VOCs			1%	$0.01	3%	$0.02
	Sum		100%		100%	

Total Cost, $/Pound	$0.76	$0.60
% Cost Differential Relative to Current Product		-21.2%
Total Cost, $/Gallon	$8.71	$6.87
Total Cost Differential per Gallon Relative to Current Product		-$1.85

Assumptions:

(1) Cost of "Additives" remains at $1.50 per pound
(2) Average unit size = 1 gallons
(3) RCM: Assumed Compliant Resin Cost Multiplier.
RCM = 1.0 unless otherwise specified.

Category	**Flat**	Assumed Resin Cost Multiplier (RCM)	1.2

Physical Properties

	Typical Non-Compliant	Typical Compliant
Weight % VOC:	4%	2%
VOC Limit (g/l):	100	50
VOC Reg. for Sample Formulation (g/l):	90	47
Density (lbs/gallon):	10.0	10.0

Formulation and Cost Comparison

Component (A)	Unit Cost ($/lb) (B)	RCM (C)	Typical Non-Compliant Wt% (D)	Typical Non-Compliant Cost (B) X (D)	Typical Compliant Wt% (E)	Typical Compliant Cost (B) X (C) X (E)
Titanium Dioxide	$1.18		19%	$0.22	17%	$0.20
Calcium Carbonate	$0.17		16%	$0.03		$0.00
Silicates	$0.65		9%	$0.06	15%	$0.10
Talc	$0.15				16%	$0.02
Vinyl Acrylic Resin	$0.71	1.2	13%	$0.09	9%	$0.08
Water	$0.00		39%	$0.00	41%	$0.00
All Other VOCs			4%	$0.05	2%	$0.02
	Sum		100%		100%	

Total Cost, $/Pound	$0.45	$0.41
% Cost Differential Relative to Current Product		-7.2%
Total Cost, $/Gallon	$4.45	$4.13
Total Cost Differential per Gallon Relative to Current Product		-$0.32

Assumptions:

(1) Cost of "Additives" remains at $1.50 per pound
(2) Average unit size = 1 gallons
(3) RCM: Assumed Compliant Resin Cost Multiplier.
RCM = 1.0 unless otherwise specified.

Category	**Floor**	Assumed Resin Cost Multiplier (RCM)	1.2

Physical Properties	**Typical Non-Compliant**	**Typical Compliant**
Weight % VOC:	6%	3%
VOC Limit (g/l):	250	100
VOC Reg. for Sample Formulation (g/l):	180	95
Density (lbs/gallon):	10.0	11.0

Formulation and Cost Comparison

Component (A)	Unit Cost ($/lb) (B)	RCM (C)	**Typical Non-Compliant** Wt% (D)	Cost (B) X (D)	**Typical Compliant** Wt% (E)	Cost (B) X (C) X (E)
Titanium Dioxide	$1.18		14%	$0.17	16%	$0.19
Calcium Carbonate	$0.17		10%	$0.02	14%	$0.02
Acrylic Resin	$0.85	1.2	20%	$0.17	23%	$0.23
Water	$0.00		50%	$0.00	44%	$0.00
All Other VOCs			6%	$0.07	3%	$0.03
	Sum		100%		100%	

Total Cost, $/Pound	$0.42	$0.48
% Cost Differential Relative to Current Product		12.2%
Total Cost, $/Gallon	$4.24	$5.24
Total Cost Differential per Gallon Relative to Current Product		$1.00

Assumptions:

(1) Cost of "Additives" remains at $1.50 per pound
(2) Average unit size = 1 gallons
(3) RCM: Assumed Compliant Resin Cost Multiplier.
RCM = 1.0 unless otherwise specified.

Category **Mastic Texture** Assumed Resin Cost Multiplier (RCM) 1.2

Physical Properties	**Typical Non-Compliant**	**Typical Compliant**
Weight % VOC:	15%	3%
VOC Limit (g/l):	300	100
VOC Reg. for Sample Formulation (g/l):	239	74
Density (lbs/gallon):	9.5	11.0

Formulation and Cost Comparison

Component (A)	Unit Cost ($/lb) (B)	RCM (C)	**Typical Non-Compliant** Wt% (D)	Cost (B) X (D)	**Typical Compliant** Wt% (E)	Cost (B) X (C) X (E)
Titanium Dioxide	$1.18		8%	$0.09	8%	$0.09
Mica	$0.45		20%	$0.09	26%	$0.12
Perlite	$0.45		5%	$0.02		
Acrylic Resin	$0.85	1.2			28%	$0.28
Alkyd Resin	$0.71	1.2	27%	$0.19		
Water	$0.00		25%	$0.00	35%	$0.00
Hydrocarbon Solvent (Naphtha)	$0.46		15%	$0.07		
All Other VOCs					3%	$0.03
	Sum		100%		100%	

Total Cost, $/Pound	$0.47	$0.53
% Cost Differential Relative to Current Product		14.0%
Total Cost, $/Gallon	$4.43	$5.85
Total Cost Differential per Gallon Relative to Current Product		$1.42

Assumptions:

(1) Cost of "Additives" remains at $1.50 per pound
(2) Average unit size = 1 gallons
(3) RCM: Assumed Compliant Resin Cost Multiplier.
RCM = 1.0 unless otherwise specified.

Category	**Non Flat**	Assumed Resin Cost Multiplier (RCM)	1.2

Physical Properties	**Typical Non-Compliant**	**Typical Compliant**
Weight % VOC:	6%	4%
VOC Limit (g/l):	150	100
VOC Reg. for Sample Formulation (g/l):	153	104
Density (lbs/gallon):	10.0	10.0

Formulation and Cost Comparison

Component (A)	Unit Cost ($/lb) (B)	RCM (C)	**Typical Non-Compliant** Wt% (D)	Cost (B) X (D)	**Typical Compliant** Wt% (E)	Cost (B) X (C) X (E)
Titanium Dioxide	$1.18		17%	$0.20	21%	$0.25
Silicates	$0.65				8%	$0.05
All Other Solids			3%	$0.02		
Calcium Carbonate	$0.17		7%	$0.01		
Acrylic Resin	$0.85	1.2	23%	$0.19	22%	$0.22
Water	$0.00		44%	$0.00	45%	$0.00
All Other VOCs			6%	$0.05	4%	$0.03
	Sum		100%		100%	

Total Cost, $/Pound	$0.48	$0.56
% Cost Differential Relative to Current Product		15.6%
Total Cost, $/Gallon	$4.83	$5.58
Total Cost Differential per Gallon Relative to Current Product		$0.75

Assumptions:

(1) Cost of "Additives" remains at $1.50 per pound
(2) Average unit size = 1 gallons
(3) RCM: Assumed Compliant Resin Cost Multiplier.
RCM = 1.0 unless otherwise specified.

Category **Non Flat High Gloss** Assumed Resin Cost Multiplier (RCM) 1.2

Physical Properties	**Typical Non-Compliant**	**Typical Compliant**
Weight % VOC:	6%	3%
VOC Limit (g/l):	250	150
VOC Reg. for Sample Formulation (g/l):	154	106
Density (lbs/gallon):	10.0	10.0

Formulation and Cost Comparison

Component (A)	Unit Cost ($/lb) (B)	RCM (C)	Typical Non-Compliant Wt% (D)	Typical Non-Compliant Cost (B) X (D)	Typical Compliant Wt% (E)	Typical Compliant Cost (B) X (C) X (E)
Titanium Dioxide	$1.18		18%	$0.21	11%	$0.13
Acrylic Resin	$0.85	1.2	27%	$0.23	20%	$0.20
Silica	$0.65		5%	$0.03	11%	$0.07
Water	$0.00		44%	$0.00	55%	$0.00
All Other VOCs			6%	$0.12	3%	$0.03
	Sum		100%		100%	

Total Cost, $/Pound	$0.60	$0.44
% Cost Differential Relative to Current Product		-27.3%
Total Cost, $/Gallon	$5.99	$4.35
Total Cost Differential per Gallon Relative to Current Product		-$1.64

Assumptions:

(1) Cost of "Additives" remains at $1.50 per pound
(2) Average unit size = 1 gallons
(3) RCM: Assumed Compliant Resin Cost Multiplier.
RCM = 1.0 unless otherwise specified.

Category **PSU** Assumed Resin Cost Multiplier (RCM) 1.2

Physical Properties	**Typical Non-Compliant**	**Typical Compliant**
Weight % VOC:	4%	2%
VOC Limit (g/l):	200	100
VOC Reg. for Sample Formulation (g/l):	120	60
Density (lbs/gallon):	10.0	10.0

Formulation and Cost Comparison

Component (A)	Unit Cost ($/lb) (B)	RCM (C)	**Typical Non-Compliant** Wt% (D)	Cost (B) X (D)	**Typical Compliant** Wt% (E)	Cost (B) X (C) X (E)
Titanium Dioxide	$1.18		13%	$0.15	15%	$0.18
All Other Solids			6%	$0.07	5%	$0.06
Acrylic Resin	$0.85	1.2	15%	$0.13	18%	$0.18
Talc	$0.15		12%	$0.02	10%	$0.02
Water	$0.00		50%	$0.00	50%	$0.00
All Other VOCs			4%	$0.05	2%	$0.03
	Sum		100%		100%	

Total Cost, $/Pound	$0.42	$0.46
% Cost Differential Relative to Current Product		10.6%
Total Cost, $/Gallon	$4.20	$4.64
Total Cost Differential per Gallon Relative to Current Product		$0.44

Assumptions:

(1) Cost of "Additives" remains at $1.50 per pound
(2) Average unit size = 1 gallons
(3) RCM: Assumed Compliant Resin Cost Multiplier.
RCM = 1.0 unless otherwise specified.

Category	**Roof**	Assumed Resin Cost Multiplier (RCM)	1.2

Physical Properties	**Typical Non-Compliant**	**Typical Compliant**
Weight % VOC:	20%	2%
VOC Limit (g/l):	250	50
VOC Reg. for Sample Formulation (g/l):	252	51
Density (lbs/gallon):	10.5	10.5

Formulation and Cost Comparison

Component (A)	Unit Cost ($/lb) (B)	RCM (C)	**Typical Non-Compliant** Wt% (D)	Cost (B) X (D)	**Typical Compliant** Wt% (E)	Cost (B) X (C) X (E)
Titanium Dioxide	$1.18		10%	$0.12	10%	$0.12
Zinc Oxide	$2.20		5%	$0.11	5%	$0.11
Acrylic Resin	$0.85	1.2	30%	$0.25	25%	$0.25
Calcium Carbonate	$0.17		35%	$0.06	18%	$0.03
Water	$0.00				40%	$0.00
All Other VOCs			2%	$0.03	2%	$0.02
Aliphatic Hydrocarbons	$0.50		12%	$0.06		
Propylene Glycol	$1.35		6%	$0.08		
	Sum		100%		100%	

Total Cost, $/Pound	$0.71	$0.53
% Cost Differential Relative to Current Product		-26.0%
Total Cost, $/Gallon	$7.48	$5.54
Total Cost Differential per Gallon Relative to Current Product		-$1.94

Assumptions:

(1) Cost of "Additives" remains at $1.50 per pound
(2) Average unit size = 1 gallons
(3) RCM: Assumed Compliant Resin Cost Multiplier.
RCM = 1.0 unless otherwise specified.

Category **Rust Preventative** Assumed Resin Cost Multiplier (RCM) 1.2

Physical Properties	**Typical Non-Compliant**	**Typical Compliant**
Weight % VOC:	33%	5%
VOC Limit (g/l):	400	250
VOC Reg. for Sample Formulation (g/l):	391	127
Density (lbs/gallon):	9.9	10.0

Formulation and Cost Comparison

Component (A)	Unit Cost ($/lb) (B)	RCM (C)	**Typical Non-Compliant** Wt% (D)	Cost (B) X (D)	**Typical Compliant** Wt% (E)	Cost (B) X (C) X (E)
Titanium Dioxide	$1.18		25%	$0.30	23%	$0.27
All Other Solids	$0.65		4%	$0.03		
Alkyd Resin	$0.71		38%	$0.27		
Acrylic resin	$0.85	1.2			28%	$0.28
Water	$0.00				44%	$0.00
Stoddard Solvent	$0.50		31%	$0.16		
All Other VOCs			2%	$0.02	5%	$0.04
	Sum		100%		100%	

Total Cost, $/Pound	$0.77	$0.60
% Cost Differential Relative to Current Product		-21.8%
Total Cost, $/Gallon	$7.57	$5.98
Total Cost Differential per Gallon Relative to Current Product		-$1.59

Assumptions:

(1) Cost of "Additives" remains at $1.50 per pound
(2) Average unit size = 1 gallons
(3) RCM: Assumed Compliant Resin Cost Multiplier.
RCM = 1.0 unless otherwise specified.

Category	**Specialty PSU**	Assumed Resin Cost Multiplier (RCM)	1.2

Physical Properties	**Typical Non-Compliant**	**Typical Compliant**
Weight % VOC:	26%	2%
VOC Limit (g/l):	350	100
VOC Reg. for Sample Formulation (g/l):	312	61
Density (lbs/gallon):	10.0	11.0

Formulation and Cost Comparison

Component (A)	Unit Cost ($/lb) (B)	RCM (C)	**Typical Non-Compliant** Wt% (D)	Cost (B) X (D)	**Typical Compliant** Wt% (E)	Cost (B) X (C) X (E)
Titanium Dioxide	$1.18		8%	$0.09	15%	$0.18
Talc	$0.15		37%	$0.06	23%	$0.03
All Other Solids			4%	$0.06	3%	$0.05
Acrylic Resin	$0.85	1.2			14%	$0.14
Alkyd Resin	$0.71		25%	$0.18		
Water	$0.00				43%	$0.00
All Other VOCs			1%	$0.01	2%	$0.01
Mineral Spirits	$0.95		25%	$0.24		
	Sum		100%		100%	

Total Cost, $/Pound	$0.63	$0.41
% Cost Differential Relative to Current Product		-34.6%
Total Cost, $/Gallon	$6.30	$4.53
Total Cost Differential per Gallon Relative to Current Product		-$1.77

Assumptions:

(1) Cost of "Additives" remains at $1.50 per pound
(2) Average unit size = 1 gallons
(3) RCM: Assumed Compliant Resin Cost Multiplier.
RCM = 1.0 unless otherwise specified.

Category	**Traffic Marking**	Assumed Resin Cost Multiplier (RCM)	1.2

Physical Properties	**Typical Non-Compliant**	**Typical Compliant**
Weight % VOC:	7%	5%
VOC Limit (g/l):	150	100
VOC Reg. for Sample Formulation (g/l):	110	78
Density (lbs/gallon):	10.0	10.0

Formulation and Cost Comparison

Component (A)	Unit Cost ($/lb) (B)	RCM (C)	**Typical Non-Compliant** Wt% (D)	Cost (B) X (D)	**Typical Compliant** Wt% (E)	Cost (B) X (C) X (E)
Titanium Dioxide	$1.18		7%	$0.08	7%	$0.08
Calcium Carbonate	$0.17		52%	$0.09	53%	$0.09
Acrylic Resin	$0.85	1.2	14%	$0.12	16%	$0.16
Water	$0.00		20%	$0.00	19%	$0.00
All Other VOCs			7%	$0.06	5%	$0.04
	Sum		100%		100%	

Total Cost, $/Pound	$0.35	$0.38
% Cost Differential Relative to Current Product		6.9%
Total Cost, $/Gallon	$3.55	$3.79
Total Cost Differential per Gallon Relative to Current Product		$0.24

Assumptions:

(1) Cost of "Additives" remains at $1.50 per pound
(2) Average unit size = 1 gallons
(3) RCM: Assumed Compliant Resin Cost Multiplier.
RCM = 1.0 unless otherwise specified.

Category **Waterproofing Membrane** Assumed Resin Cost Multiplier (RCM) 1.2

Physical Properties	**Typical Non-Compliant**	**Typical Compliant**
Weight % VOC:	32%	20%
VOC Limit (g/l):	400	250
VOC Reg. for Sample Formulation (g/l):	383	240
Density (lbs/gallon):	10.0	10.0

Formulation and Cost Comparison

Component (A)	Unit Cost ($/lb) (B)	RCM (C)	**Typical Non-Compliant** Wt% (D)	Cost (B) X (D)	**Typical Compliant** Wt% (E)	Cost (B) X (C) X (E)
Butyl Benzyl Phthalate	$1.50				10%	$0.15
Asphalt	$0.17		10%	$0.02		
Carbon Black	$2.29				10%	$0.23
Calcium Carbonate	$0.17		18%	$0.03	20%	$0.03
Polyurethane Resin	$1.50	1.2	40%	$0.60	40%	$0.72
Water	$0.00					
Hydrocarbon Solvent (Naphtha)	$0.46		28%	$0.13	20%	$0.09
All Other VOCs	$1.50		4%	$0.06		
	Sum		100%		100%	

Total Cost, $/Pound	$0.83	$1.22
% Cost Differential Relative to Current Product		46.7%
Total Cost, $/Gallon	$8.35	$12.24
Total Cost Differential per Gallon Relative to Current Product		$3.90

Assumptions:

(1) Cost of "Additives" remains at $1.50 per pound
(2) Average unit size = 1 gallons
(3) RCM: Assumed Compliant Resin Cost Multiplier.
RCM = 1.0 unless otherwise specified.

Category	**Lacquer**	Assumed Resin Cost Multiplier (RCM)	1.2

Physical Properties	**Typical Non-Compliant**	**Typical Compliant**
Weight % VOC:	33%	10%
VOC Limit (g/l):	550	275
VOC Reg. for Sample Formulation (g/l):	545	265
Density (lbs/gallon):	8.3	8.7

Formulation and Cost Comparison

Component (A)	Unit Cost ($/lb) (B)	RCM (C)	**Typical Non-Compliant** Wt% (D)	Cost (B) X (D)	**Typical Compliant** Wt% (E)	Cost (B) X (C) X (E)
Nitrocellulose	$1.50		20%	$0.30		
Acrylic Resins	$0.85	1.2			20%	$0.20
Polyurethane Resins	$1.50	1.2			8%	$0.14
Additives	$1.50		5%	$0.08	4%	$0.06
Water	$0.00			$0.00	58%	$0.00
Acetone	$0.70		42%	$0.29		
Methyl-n-Amyl Ketone	$1.50		10%	$0.15		
Butyl Acetate	$1.50		10%	$0.15		$0.00
All Other VOCs			13%	$0.05	10%	$0.13
Sum			100%		100%	
Total Cost, $/Pound				$1.11		$0.54
% Cost Differential Relative to Current Product						-51.4%
Total Cost, $/Gallon				$9.36		$4.71
Total Cost Differential per Gallon Relative to Current Product						-$4.65

Assumptions:

(1) Cost of "Additives" remains at $1.50 per pound
(2) Average unit size = 1 gallons
(3) RCM: Assumed Compliant Resin Cost Multiplier.
RCM = 1.0 unless otherwise specified.

Category	**Varnish**	Assumed Resin Cost Multiplier (RCM)	1.2

Physical Properties	**Typical Non-Compliant**	**Typical Compliant**
Weight % VOC:	36%	10%
VOC Limit (g/l):	350	275
VOC Reg. for Sample Formulation (g/l):	349	271
Density (lbs/gallon):	8.1	8.6

Formulation and Cost Comparison

Component (A)	Unit Cost ($/lb) (B)	RCM (C)	**Typical Non-Compliant** Wt% (D)	Cost (B) X (D)	**Typical Compliant** Wt% (E)	Cost (B) X (C) X (E)
Polyurethane Resins	$1.50	1.2	56%	$0.82	24%	$0.42
Additives	$1.50		8%	$0.12	6%	$0.09
Water	$0.00			$0.00	60%	$0.00
Distillate (Petroleum), Hydrotreated Light	$0.95		14%	$0.13		
Stoddard Solvent	$1.50		10%	$0.15		
Medium Aliphatic Solvent Naphtha	$0.42		10%	$0.04		
All Other VOCs			2%	$0.02	10%	$0.15
	Sum		100%		100%	

Total Cost, $/Pound	$1.28	$0.66
% Cost Differential Relative to Current Product		-48.8%
Total Cost, $/Gallon	$10.39	$5.65
Total Cost Differential per Gallon Relative to Current Product		-$4.74

Assumptions:

(1) Cost of "Additives" remains at $1.50 per pound
(2) Average unit size = 1 gallons
(3) RCM: Assumed Compliant Resin Cost Multiplier.
RCM = 1.0 unless otherwise specified.

Category **Opaque Lacquer** Assumed Resin Cost Multiplier (RCM) 1.2

Physical Properties	**Typical Non-Compliant**	**Typical Compliant**
Weight % VOC:	19%	6%
VOC Limit (g/l):	550	275
VOC Reg. for Sample Formulation (g/l):	438	107
Density (lbs/gallon):	8.5	8.5

Formulation and Cost Comparison

Component (A)	Unit Cost ($/lb) (B)	RCM (C)	**Typical Non-Compliant** Wt% (D)	Cost (B) X (D)	**Typical Compliant** Wt% (E)	Cost (B) X (C) X (E)
Nitrocellulose	$1.50		24%	$0.36		
Titanium Dioxide	$1.18		10%	$0.12	10%	$0.12
Additives	$1.50		2%	$0.03	3%	$0.05
Silicates	$0.65		6%	$0.04	6%	$0.04
Acrylic Resin	$0.85	1.2			26%	$0.26
Calcium Carbonate	$0.17		6%	$0.01	7%	$0.01
Water	$0.00				42%	$0.00
Acetone	$0.70		16%	$0.11		
All Other VOCs			12%	$0.12	6%	$0.08
Isobutyl Isobutyrate	$1.50		5%	$0.08		
Butyl Acetate 1-	$1.50		8%	$0.12		
Isobutyl Acetate	$1.50		6%	$0.09		
VM&P Naphtha	$0.46		5%	$0.02		
Sum			100%		100%	

Total Cost, $/Pound	$1.10	$0.56
% Cost Differential Relative to Current Product		-49.4%
Total Cost, $/Gallon	$9.33	$4.72
Total Cost Differential per Gallon Relative to Current Product		-$4.61

Assumptions:

(1) Cost of "All Others" or "Additives" remains at $1.50 per pound
(2) Average unit size = 1 gallons
(3) RCM: Assumed Compliant Resin Cost Multiplier.
RCM = 1.0 unless otherwise specified.