IV.

ENVIRONMENTAL IMPACTS AND MITIGATION

A. INTRODUCTION

CEQA requires environmental documents to identify significant environmental effects that may result from a proposed project (CEQA Guidelines §15126(a) and §15126.2). Direct and indirect significant effects of a project on the environment should be identified and described, with consideration given to both short- and long-term impacts. The discussion of environmental impacts may include, but is not limited to, the resources involved; physical changes; alterations of ecological systems; health and safety problems caused by physical changes; and other aspects of the resource base, including water, scenic quality, and public services. If significant adverse environmental impacts are identified, the CEQA Guidelines require a discussion of measures that could either avoid or substantially reduce any adverse environmental impacts to the greatest extent feasible (CEQA Guidelines §15126.4).

The CEQA Guidelines state that the degree of specificity required in a CEQA document depends on the type of project being proposed (CEQA Guidelines §15146). The detail of the environmental analysis for certain types of projects cannot be as great as for others. For example, the environmental document for projects such as the adoption or amendment of a comprehensive zoning ordinance or a local general plan should focus on the secondary effects that can be expected to follow from the adoption or amendment, but the analysis need not be as detailed as the analysis of the specific construction projects that might follow. Therefore, this Draft Program EIR analyzes impacts on a statewide level, and also analyzes impacts at the district level to the maximum extent feasible. When adopting their architectural coatings rules, each district will need to decide if the ARB's analysis in this Program EIR is sufficient, or whether it is necessary to perform additional analysis for any district-specific impacts.

The categories of environmental impacts recommended for evaluation in a CEQA document are established by CEQA (Public Resources Code, §21000 *et seq*.) and the CEQA Guidelines, as promulgated by the State of California Secretary of Resources. Under the CEQA Guidelines, there are 16 environmental categories in which potential adverse impacts from a project are evaluated. Projects are evaluated against the environmental categories in an environmental checklist and those environmental categories that may be adversely affected by the project are further analyzed in the appropriate CEQA document.

Pursuant to CEQA, a NOP/IS including an environmental checklist were prepared for this project (see Appendix B). Of the 16 potential environmental impact categories on the checklist, it was determined that a Draft Program EIR should be prepared to address potential adverse effects on the following environmental categories: air quality, water, public services, transportation/circulation, solid waste/hazardous waste, and hazards. The following sections analyze the potential adverse environmental impacts associated with implementing the SCM.

B. THRESHOLDS OF SIGNIFICANCE

Neither CEQA nor the CEQA Guidelines describe specific thresholds of significance or how they may be used. Instead of dictating a one-size-fits-all approach, CEQA authorizes public agencies to adopt by "ordinance, resolution, rule or regulation" their own "objectives, criteria, and procedures for the evaluation of projects" (see Public Resources Code §21082).

Simply stated, the threshold of significance for a given environmental effect is that level at which the Lead Agency finds the effects of the project to be significant[1]. According to the Office of Planning and Research (OPR), a threshold of significance can be defined as: "A quantitative or qualitative standard, or set of criteria, pursuant to which the significance of a given environmental effect may be determined."

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A threshold provides a rational basis for significance determinations. This complies with the CEQA Guidelines' requirement that a Lead Agency's determination of significance be "based to the extent possible on scientific and factual data" (see CEQA Guidelines §15064(b)).

Ideally, a threshold of significance provides a clear differentiation of whether or not the project may result in a significant environmental effect. More practically, a threshold will assist the Lead Agency in making this determination. In either case, thresholds do not substitute for the agency's use of careful judgment in determining significance (see CEQA Guidelines §15064).

Thresholds may be either qualitative or quantitative. Some effects, such as traffic or noise, lend themselves to numerical standards. Others, such as aesthetics or wildlife habitat, are difficult to quantify and must rely upon qualitative descriptions. In either case, thresholds should be based on legal standards, studies, surveys, reports, or other data that can identify that point at which a given environmental effect becomes significant. Thresholds are intended to be analytical tools to assist in significance determinations, not rigid standards.

In devising thresholds of significance, OPR recommends that they be based on the following standards:

- A health-based standard such as air pollutant emission standards, water pollutant discharge standards, or noise levels.
- Service capacity standards such as traffic level of service, water supply capacity, or waste treatment plant capacity.
- Ecological tolerance standards such as physical carrying capacity, impacts on declared threatened or endangered species, loss of prime farmland, or wetland encroachment.

[1] Additionally, a significant effect on the environment means a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project including land, air, water, minerals, flora, fauna, ambient noise, and objects of historic or aesthetic significance. CEQA Guidelines § 15382. An economic or social change by itself shall not be considered a significant effect on the environment. Id. A social or economic change related to a physical change may be considered in determining whether the physical change is significant. Id.

- Cultural resource standards such as impacts on historic structures or archaeological resources.
- Other standards relating to environmental quality issues, such as those listed in Appendix G – Initial Study Checklist of the CEQA Guidelines.

Most public agencies in California have not formally adopted a comprehensive set of significance thresholds as part of their local CEQA guidelines. To date, ARB has not formally adopted thresholds of significance. Where a Lead Agency has not adopted its own thresholds of significance, OPR recommends that the Lead Agency contact other agencies to discuss incorporation of their thresholds into its own analysis. The rationale for contacting other agencies is to reduce duplicative environmental reviews and take advantage of regulatory agency expertise.

For purposes of this Program EIR, the ARB will rely on the thresholds of significance (significance criteria) adopted by the SCAQMD and used in its analysis of the environmental impacts associated with implementation of Rule 1113 – Architectural Coatings. The basic reason for ARB's use of the SCAQMD's significance criteria is as follows: the SCAQMD generally has the worst air quality in California. As a result of their air quality problems, the SCAQMD's significance criteria tend to be the most conservative in California. Thus, using the SCAQMD's significance criteria will provide for a worst-case analysis for many identified environmental impact areas discussed below. In addition, using SCAQMD's significance criteria will provide consistency and harmonization between the ARB's analysis and the SCAQMD's environmental analysis for Rule 1113.

It should be noted that the use of the SCAQMD's significance criteria is not intended to supplant individual districts' CEQA significance criteria. As mentioned earlier, the proposed project is essentially a model rule that is designed to be considered by the districts when adopting architectural coatings rules. Therefore, if a district has different significance criteria for a particular environmental impact area, the district will need to decide whether to use those criteria in lieu of the criteria discussed in this Draft Program EIR. The reader is referred to each environmental impact area section for the specific criteria used by the ARB for evaluating the environmental impacts associated with the implementation of the SCM.

C. ANALYSIS OF POTENTIAL ENVIRONMENTAL IMPACTS

The following subsections contain the environmental impact analysis for the six topics identified in the NOP/IS as having potential impacts.

1. Air Quality

The primary objective of the proposed SCM is to set VOC limits and other requirements that are feasible (based on existing and currently developing coatings technology) and that will achieve significant reductions in VOC emissions from architectural coatings. The SCM is also intended to serve as a model rule (*i.e.*, a suggested control measure) that will provide a basis for uniformity among architectural coatings rules in California.

The proposed SCM sets allowable VOC content limits for a number of architectural coatings categories, including categories such as flat coatings, nonflat coatings, and specialty coatings. The proposed VOC limits would become effective on January 1, 2003, for all categories except industrial maintenance (IM) coatings, which have an effective date of January 1, 2004. Other components of the proposed SCM include a three-year "sell-through" provision (for coatings manufactured before the applicable effective dates), definitions, test methods, standards for painting practices and thinning of coatings, container labeling requirements, an optional averaging provision (to be developed), and reporting requirements for perchloroethylene and methylene chloride. The complete text of the proposed SCM can be found in Appendix A.

Based on current estimates, implementation of the proposed SCM would result in approximately 11 tons per day of VOC emission reductions statewide, excluding the SCAQMD[2], by the year 2004.

Significance Criteria

The project will be considered to have significant adverse air quality impacts if any one of the thresholds in Table IV-1 are equaled or exceeded.

The objective of the SCM is to reduce VOC emissions from affected coatings categories. Analysis of the SCM indicates that the proposed project is expected to generate direct air quality benefits. The direct effect of implementing the SCM is a reduction of VOC emissions from affected coatings categories statewide.

a. Analysis of Industry Issues

Some industry representatives have alleged that the use of low-VOC coatings may create significant adverse air quality impacts. These issues were raised in the past during the development of the 1989 SCM and the adoption of various local district rules, and more recently, in comments submitted on the NOP/IS. To briefly summarize these issues, industry representatives contend that new solvent-borne or water-borne formulations to meet the proposed VOC content limits will result in more coatings use or the use of noncompliant coatings, and an overall increase in VOC emissions over time. Industry also contends that low-VOC reformulations will contain more reactive solvents, therefore contributing to a greater rate of ozone formation than conventional solvents.

To evaluate industry's claims of low-VOC coatings' poor performance, ARB staff reviewed the results of the NTS study, as described in Appendix D of this Draft Program EIR. Staff also reviewed the 1998 Architectural Coatings Survey data regarding market share of compliant coatings (see Table II-2). Lastly, staff reviewed product data sheets for over 500 conventional and low-VOC coatings to compare solids content by volume and area of coverage, drying time, pot life (defined as the time interval after mixing of a multi-component coating

[2] SCAQMD has already adopted the same or more stringent limits for most of the categories in the SCM in its Rule 1113; the SCM would result in an additional 0.15 ton per day emission reduction in the SCAQMD (from the interim limits).

TABLE IV-1
SCAQMD AIR QUALITY SIGNIFICANCE THRESHOLDS

Mass Daily Thresholds		
Pollutant	**Construction**	**Operation**
NOx	100 lbs/day	55 lbs/day
VOC	75 lbs/day	55 lbs/day
PM10	150 lbs/day	150 lbs/day
SOx	150 lbs/day	150 lbs/day
CO	550 lbs/day	550 lbs/day
Lead	3 lbs/day	3 lbs/day
TAC, AHM, and Odor Thresholds		
Toxic Air Contaminants (TACs) Accidental Release of Acutely Hazardous Materials (AHMs)	MICR $\geq$ 10 in 1 million* HI $\geq$ 1.0 (project increment) HI $\geq$ 5.0 (facility-wide) CAA §112(r) threshold quantities	
Odor	Project creates or is subjected to an objectionable odor > 10 D/T	
NO_2 1-hour average annual average	 20 ug/m^3 (= 1.0 pphm) 1 ug/m^3 (= 0.05 pphm)	
PM10 24-hour annual geometric mean	 2.5 ug/m^3 1.0 ug/m^3	
Sulfate 24-hour average	 1 ug/m^3	
CO 1-hour average 8-hour average	 1.1 mg/m^3 (= 1.0 ppm) 0.50 mg/m^3 (= 0.45 ppm)	

* Note: for purposes of the human health impacts analysis in this Program EIR, we used a MICR $\geq$ 1 in 1 million. Some districts use this threshold in their health risk analysis programs.

MICR = maximum individual cancer risk; HI = Hazard Index; D/T = dilution to threshold factor; ug/m^3 = microgram per cubic meter; pphm = parts per hundred million; mg/m^3 = milligram per cubic meter; ppm = parts per million; TAC = toxic air contaminant; AHM = acutely hazardous material

during which the coating is usable with no difficulty), shelf life, and durability. Table IV-2 is a summary of these coatings characteristics grouped by coatings category as defined in the SCM (see Appendix E for details).

i. More Thickness

PROJECT SPECIFIC IMPACT: Some industry representatives contend that low-VOC water-borne and solvent-borne coatings are formulated with a high solids content and are therefore difficult to handle during application, tending to produce a thick film when applied directly from the can. A thicker film supposedly indicates that a smaller surface area is covered with a given amount of material, thereby increasing VOC emissions per unit of area covered as compared to conventional coatings.

TABLE IV-2
SUMMARY OF COATINGS CHARACTERISTICS

Coating Category	# of samples	Range of VOC Content (gm/l)	Average VOC Content (gm/l)	Average % Solids by Volume	Average Coverage (sq ft/gal)	Average Drying Time (hrs) Between Coats	Average Pot Life* @70 deg. (hrs)	Average Shelf Life (yrs)
Lacquers (>680 g/l)	13	687-755	717	16.8	286	0.5	n/a	1
Lacquers (550-680 g/l)	63	550-680	651	23.5	324	1.3	n/a	1
Lacquers (<550 g/l)	56	64-550	260	32.3	435	5.5	n/a	1
Flats (250-100 g/l)	95	102-250	153.3	32.6	360	3.9	n/a	1.1
Flats (<100 g/l)	40	0-<100	51.6	34.9	337	4.2	n/a	1.3
Floor Coatings (>100 g/l)	13	111-463	282	49.4	341	n/a	7	2
Floor Coatings (100-50 g/l)	4	79-102	91	69.3	278	n/a	2.3	2
Floor Coatings (< 50 g/l)	13	0 - 30	2.5	79.5	370	n/a	1.9	1.3
Industrial Maintenance Coatings (420-250 g/l)	40	257-420	353	56	337	n/a	6.4	1.0
Industrial Maintenance Coatings (250-100 g/l)	24	114-258	187	55	277	n/a	5.2	1.2
Industrial Maintenance Coatings (<100 g/l)	39	0-108	44	72	305	n/a	2.5	1.1
Nonflats (250-150 g/l)	10	215-<380	223	35.5	403	8.4	n/a	1
Nonflats (150-50 g/l)	11	70-135	88.9	39	340	8	n/a	1
Nonflats (<50 g/l)	15	0-50	11.8	38.8	408	6.5	n/a	1
Quick Dry Enamels (400-250 g/l)	3	400	400	50.5	421	14.3	n/a	-
Quick Dry Enamels (<250 g/l)	9	75-249	190.3	36.3	374	5	n/a	1

** For two-component coatings only*

TABLE IV-2 (CONTINUED)
SUMMARY OF COATINGS CHARACTERISTICS

Coating Category	# of samples	Range of VOC Content (gm/l)	Average VOC Content (gm/l)	Average % Solids by Volume	Average Coverage (sq ft/gal) @ ~3 mil	Average Drying Time (hrs) Between Coats	Average Pot Life* @70 deg. (hrs)	Average Shelf Life (yrs)
Primer, Sealer, Undercoater (350-200 g/l)	16	250-350	325	54.3	390	15	7**	1.4
Primer, Sealer, Undercoater (200-100 g/l)	6	124-206	171.3	43.7	341	3.4	6**	2.3
Primer, Sealer, Undercoater (<100 g/l)	13	0-109	62.7	36.2	398	6.7	2.4**	2.5
Quick Dry Primer, Sealer, Undercoater (exempt – 200 g/l)	2	560	560	27.0	600	2.5	n/a	3
Quick Dry Primer, Sealer, Undercoater (200-100 g/l)	2	118-130	124	43	385	1.5	n/a	1
Quick Dry Primer, Sealer, Undercoater (<100 g/l)	8	0-108	71.5	39.3	381	2.2	n/a	1.0
Water Proofing Sealer (400-250 g/l)	4	400	400	15.8	144	n/a	n/a	1.0
Water Proofing Sealer (<250 g/l)	9	0-234	99.8	36.2	204	n/a	4.6**	1.6
Stains (350-250 g/l)	2	350	350	55.6	450	24	n/a	3
Stains (<250 g/l)	10	0-250	131.9	25.4	288	7.9	n/a	4.5

* *For two-component coatings only*
** *Represents only a few products in the category*

ANALYSIS: ARB staff analyzed the solids content and coverage area for a number of major coating categories using product data sheets from over 500 coatings (see Table IV-2) and information obtained from the 1998 ARB Architectural Coatings Survey (see Table IV-3). We did not detect a consistent relationship between VOC content and solids content. While some lower-VOC coatings appear to have higher solids than higher-VOC coatings (*e.g.*, lacquers, floor coatings, IM coatings), others appear to have similar or lower solids than higher-VOC coatings (*e.g.*, flats; nonflats; primers, sealers and undercoaters; quick dry primers, sealers and undercoaters, waterproofing sealers, and stains).

Further, we did not detect a consistent relationship between solids content and coverage area (see Appendix E). We first looked at coatings where a lower VOC content appeared to

correspond with a higher solids content. For IM coatings, coverage appears to decrease with increased solids content. For floor coatings, coverage appears to be unchanged with increased solids content. For lacquers, coverage appears to increase with increased solids content. We also looked at coatings where a lower VOC content appeared to correspond with a lower solids content. For stains, although the sample size is small, coverage appears to decrease with decreased solids content. For primers, sealers and undercoaters, coverage appears to be unaffected by decreased solids content.

The "more thickness" issue aside, if industry's allegations regarding increased coatings use due to less coverage were true, we would expect to see a corresponding increase in per capita sales. ARB survey data show that estimated per capita use of architectural coatings has remained remarkably constant since 1988 (ARB, 1991, 1999c). Per capita estimated sales in 1988 are estimated to be 2.7 gallons, and in 1996, estimated per capita sales are 2.7 gallons. Over the same period of time, emissions from the use of architectural coatings have decreased from
3.4 pounds per capita in 1988 to 2.6 pounds per capita in 1996. If usage were increasing because of less coverage, the surveys would reflect this.

CONCLUSION: ARB staff concludes that the data do not support industry's assertion that compliant low-VOC coatings are necessarily formulated with a higher solids content than conventional coatings. Further, the data do not support industry's assertion that there is an inverse correlation between solids content and coverage area. Finally, coatings use does not appear to be increasing due to less coverage. Consequently, claims of significant adverse air quality impacts resulting from more thickness are unfounded.

ii. Illegal Thinning

PROJECT SPECIFIC IMPACT: Some manufacturers have asserted that thinning occurs in the field in excess of what is allowed by the SCM. It is asserted that because low-VOC water-borne and solvent-borne coatings are more viscous due to a high solids content, painters have to adjust the properties of the coatings to make them easier to handle and apply. In particular for solvent-borne coatings, this adjustment consists of thinning the coating as supplied by the manufacturer by adding solvent to reduce its viscosity. The added solvent allegedly increases VOC emissions back to or sometimes above the level of older formulations.

Industry representatives have also asserted that manufacturers will reformulate coatings to meet the SCM VOC content limits by merely increasing the solids content, which would produce a thicker film. Industry claims that a thicker film means less coverage and thinning will occur to obtain the same coverage area as conventional coatings, resulting in more VOC emissions per area covered.

ANALYSIS: As shown in Table IV-2 (see also the "More Thickness" discussion), the area of coverage of low-VOC coatings is generally comparable to that of conventional coatings. It is therefore unlikely that a coatings applicator, whether a contractor or do-it-yourselfer, will have to thin low-VOC, solvent-borne coatings to obtain the same coverage.

TABLE IV-3
VOC CONTENT VS. SOLIDS BY VOLUME

Coating Types	ARB SURVEY RESULTS	
	Sales Weighted Average VOC Content (gm/l)	Sales Weighted Average Solids by Volume (%)
Lacquers (>550 g/l)	658	21
Lacquers (<550 g/l)	360	30
Flats (>100 g/l)	132	35
Flats (<100 g/l)	61	35
Floor Coatings (>100 g/l)	225	42
Floor Coatings (<100 g/l)	31	79
IM Coatings (>250 g/l)	373	54
IM Coatings (<250 g/l)	111	76
Nonflats (>150 g/l)	218	37
Nonflats (<150 g/l)	114	37
Quick Dry Enamels (>250 g/l)	403	50
Quick Dry Enamels (<250 g/l)	n/a	n/a
PSU (>200 g/l)	355	51
PSU (<200 g/l)	103	32
Quick Dry PSU (>200 g/l)	407	44
Quick Dry PSU (<200 g/l)	104	43
Water Proofing Sealer (>250 g/l)	362	39
Water Proofing Sealer (<250 g/l)	151	26
Stains(>250 g/l)	419	40
Stains(<250 g/l)	135	34

In addition, the majority of reformulated compliant coatings are water-borne or will use exempt solvents. Since exempt solvents are not considered reactive VOCs, thinning with these solvents would not increase VOC emissions. Water-based coatings are thinned with water and therefore thinning would not result in increased VOC emissions.

The ARB staff is not aware of information that demonstrates trends in the use of paint thinners. However, a number of studies have addressed the thinning issue. The results are detailed below:

- In mid-1991, the ARB conducted a field study of thinning in regions of California that have established VOC limits for architectural coatings (ARB, 1991). A total of 85 sites where painting was in progress were investigated. A total of 121 coatings were in use at these sites, of which 52 were specialty coatings. The overall result of this study was that only six percent of the coatings were thinned in excess of the required VOC limit, indicating a 94 percent compliance rate.

- The SCAQMD contracted with an environmental consulting firm to study thinning practices in the SCAQMD (SCAQMD, 1993a). In Phase I of the study, consumers who had just purchased paints were interviewed as they left stores located in different areas of the district. Of 70 solvent-borne paint users interviewed, only three indicated that they planned to thin their coatings before use. In Phase II of the study, paint samples were

collected from painting contractors. None of the four solvent-borne samples collected were thinned.

- During the 1996 Rule 1113 amendments, SCAQMD staff conducted over 60 unannounced site visits to industrial parks and new residential construction sites to survey contractors regarding their thinning practices, coatings application techniques, and clean-up practices (SCAQMD, 1999). Samples of coatings, as supplied and as applied, were also collected during these site visits for laboratory analysis and subsequent study of thinning practices. Out of the 91 samples taken, only nine were thinned with solvents. Out of the nine thinned samples, only two were thinned to the extent that the VOC content exceeded the applicable rule limit. In addition, during pre-arranged visits, excessive thinning was observed at only one site at a 1:2 ratio. At this level, the coating was thinned to the point where, according to the professional contractor using it, it did not provide adequate hiding and he had to apply several coats. The practice of over-thinning is expected to inhibit hiding power, application properties, and drying time of a coating, which would likely discourage the practice. Simply put, a painter who overthins a can of paint would quickly discover that the overthinning works so poorly that he or she would likely never do it again.

- Subsequent to the amendments to Rule 1113 in November 1996, SCAQMD staff took coatings samples from 47 sites with ongoing painting operations (SCAQMD, 1999). Three of 20 solvent-borne samples (all IM coatings) were thinned with solvent prior to use, with none exceeding the compliance limit.

In an effort to verify industry's claims of increased thinning due to implementation of Rule 1113, the SCAQMD, in addition to conducting the studies described above, has specifically asked for empirical data from the paint industry on a number of occasions over the last nine years. To date, neither the SCAQMD nor the ARB has received any countervailing empirical data from the coatings industry, or from any other source, to indicate that thinning is occurring to a greater extent than the above data would indicate.

CONCLUSION: Current practice indicates that coatings applicators do not engage in widespread thinning, and even when thinning occurs, the coating's VOC content limits are rarely exceeded. Furthermore, excessive thinning is not expected to be a problem because a majority of the coatings that would comply with the SCM's limits will be water-borne formulations. Other compliant coatings are available that may be applied without thinning. Lastly, even if some thinning occurs, thinning would likely be done with water or exempt solvents. As a result, claims of thinning resulting in significant adverse air quality impacts are unfounded.

iii. More Priming

PROJECT SPECIFIC IMPACT: Some coatings manufacturers and contractors have asserted that low-VOC water-borne and solvent-borne topcoats do not adhere to unprimed substrates as well as higher-VOC solvent-borne topcoats. Therefore, the substrates must be primed with solvent-borne primers to enhance adherence. Industry representatives have also stated that the use of water-borne compliant topcoats could require more priming to promote adhesion.

ANALYSIS: Results of the NTS study show that when compared to conventional, currently compliant coatings, low-VOC coatings have similar performance and application characteristics (see Appendix D). In addition, manufacturers' testing shows that a majority of the low-VOC (<250 g/l) IM coatings passed adhesion tests, such as ASTM test methods D4541, D3359-78, D2197, or D412 (see Appendix E). Furthermore, according to ARB survey data, the amount of solvent-borne primers, sealers, and undercoaters relative to the total amount of architectural coatings sold has remained constant, at about seven percent, since 1984 (ARB, 1986, 1991, 1999c). In addition, as mentioned above, the ARB's surveys do not show a significant increase in per capita coatings use. If a trend had developed where more primers were being used prior to the application of topcoats, the survey data would be expected to reflect this trend as an increase in the overall use of architectural coatings.

Surface preparation is also related to the issue of priming. Manufacturers' recommendations for surface preparation are the same for conventional and low-VOC coatings (*i.e.*, apply to clean, dry surfaces). It is not expected that these recommendations would change if additional coatings were to be reformulated as a result of the SCM.

At any rate, the issue of more priming is only relevant for a few uses for which a specialty primer category is available. (The SCM allows higher VOC contents for these specialty primers.) The majority of coatings are flats and nonflats where special priming concerns are not an issue. Even if more primers were used for some flats and nonflats, they would be water-borne primers that would not significantly increase VOC emissions.

CONCLUSION: ARB staff concludes more primers are not needed because low-VOC coatings have similar adhesion qualities as conventional coatings. The amount of solvent-borne primers, sealers, and undercoaters relative to the total amount of coatings sold has remained constant since 1984. Low-VOC coatings also do not require different surface preparation than conventional coatings. Finally, the SCM allows the use of specialty primers for those situations that require them. Consequently, claims of significant adverse air quality impacts resulting from more priming are unfounded.

iv. More Topcoats

PROJECT-SPECIFIC IMPACTS: Some coatings manufacturers and contractors assert that low-VOC water-borne and solvent-borne topcoats may not cover, build (the wet or dry thickness of a coating film), or flow-and-level (the flow out of a paint so that when the film is dry, it shows no brush marks or ripples) as well as higher-VOC solvent-borne formulations. Therefore, more coats are necessary to achieve equivalent cover and coating build-up.

ANALYSIS: Results of the NTS study show that low-VOC and conventional topcoats (nonflats and IM coatings) have comparable cover, build, and flow-and-level characteristics (see Appendix D for details). Furthermore, most flats and nonflats are already well below the proposed limits in the SCM. As shown in the ARB survey data, per capita sales of nonflats and IM coatings have not increased historically, and a per capita sales increase would be expected to occur if more coats of paint were actually needed (ARB, 1986, 1991, 1999c).

Technology breakthroughs over the past several years have resulted in the marketing of acrylic-based, water-borne flat coatings that exhibit performance characteristics that are equivalent or superior to traditional solvent-borne coatings (SCAQMD, 1999). Several coatings manufacturers now formulate low-VOC nonflat coatings (<150 g/l) with high build, and some manufacturers also formulate even lower VOC (<50 g/l) coatings that also demonstrate excellent hide. Technology breakthroughs in additives include the following:

- Flow and leveling agents that have mitigated flow problems, even on substrates like plastics, glass, concrete, and resinous wood. These additives even assist in overcoming flow and leveling problems when coating oily or contaminated substrates.
- Pigment-wetting agents that have assisted in better dispersion of organic pigments in an aqueous media by altering their hydrophobic nature. This results in better flow characteristics.
- Defoamers and microfoam agents that have mitigated bubble retention problems, thereby eliminating the loss of drying capacity and thus improving the film.
- Biocides that are not susceptible to degradation by hydrolysis and that have provided good stability and eliminated settling problems.

From 1991 to 1992, the Ventura County Air Pollution Control District (VCAPCD) conducted performance tests on 49 different coatings representing clear wood finishes, quick dry enamels, quick dry primers, and industrial maintenance coatings (SCAQMD, 1999). Both brush and spray applications were tested. The performance tests evaluated ease of application, appearance, adhesion, hardness of topcoat, ability to cover extreme surface conditions (rusty metal, charred wood), and appearance after six months. A painter with Ventura County's Department of Facilities and Grounds did the painting and judged the application and appearance. Several observers from paint manufacturers and paint contractors oversaw the testing process. They found that these coatings performed well and that additional topcoats were not required.

CONCLUSION: ARB staff concludes that low-VOC and conventional coatings are comparable in terms of cover, build, and flow-and-level. Therefore, low-VOC coatings should not require additional topcoats. Consequently, claims of significant adverse air quality impacts resulting from more topcoats are unfounded.

v. More Touch-Ups and Repair Work

PROJECT-SPECIFIC IMPACTS: Some coatings manufacturers and contractors assert that water-borne and low-VOC solvent-borne formulations dry slowly and are susceptible to damage such as sagging, wrinkling, alligatoring (breaks in the paint film surface having the appearance of alligator skin), or becoming scraped and scratched. Some industry representatives contend that low-VOC, acetone-borne lacquers, water-borne topcoats, and substitutes will require more touch-ups and repair work because longer drying times allow for the contamination of the coated surface with airborne dust and construction debris. Once the topcoat becomes contaminated and is no longer smooth or aesthetically pleasing, touch-ups and repairs may be required. Industry also claims that high-solids, solvent-borne alkyd enamels tend to yellow in dark areas, and that

water-borne coatings tend to blister or peel and result in severe blocking problems. All of these problems are claimed to result in the need to apply additional coatings for repair and touch-up.

ANALYSIS: According to the product data sheets reviewed by ARB staff, the average drying time between coats for low-VOC coatings was similar to or less than the average drying time for conventional coatings in all categories except lacquers (see Table IV-2 and the tables in Appendix E). Results of the NTS study also show that when compared to conventional, currently compliant coatings, low-VOC coatings have similar performance and application characteristics (see Appendix D). Staff's review of product data sheets revealed that water-borne coatings are resistant to chemicals, corrosion, chalk, impact, and abrasion. Similar to their conventional counterparts, water-borne coatings retain gloss and color, and adhere well to a variety of substrates. Further, both low-VOC coatings and conventional coatings pass abrasion and impact resistance tests, and are considered to have proven durability qualities. Some low-VOC epoxy and urethane systems perform significantly better than their alkyd-based counterparts. Examples of these coatings can be found in Appendix E.

Finally, if more touch-up and repairs were required for low-VOC coatings, one would expect to see a corresponding increase in coatings sales. As discussed previously, per capita coatings sales have remained remarkably constant since 1988 (ARB, 1991, 1999c).

CONCLUSION: Based on results of the NTS study and information contained in the coatings product data sheets, ARB staff does not anticipate that low-VOC coatings will require more touch-up and repair work. Consequently, industry's claims of resulting adverse air quality impacts from more touch-up and repair work are unfounded.

vi. More Frequent Recoating

PROJECT-SPECIFIC IMPACT: Some coatings manufacturers and contractors assert that the durability of compliant water-borne and low-VOC, solvent-borne coatings is inferior to that of traditional solvent-borne coatings. Durability problems include cracking, peeling, excessive chalking, and color fading, all of which typically result in more frequent recoating. As a result, manufacturers and contractors claim that more frequent recoating would be necessary, resulting in greater total emissions than is the case for conventional coatings.

ANALYSIS: The durability of a coating is dependent on many factors, including surface preparation, application technique, exposure conditions (*e.g.*, mechanical stresses, chemicals, and weathering), type of binder in the formulation, and substrate coated. Results of the NTS study show that when compared to conventional, currently compliant coatings, low-VOC coatings have similar performance and application characteristics (see Appendix D).

Regarding surface preparation, manufacturers' recommendations are the same for conventional and low-VOC coatings (*i.e.*, apply to clean, dry surfaces). It is not expected that these recommendations would change if additional coatings were to be reformulated as a result of the SCM.

Application techniques do not differ significantly between compliant low-VOC coatings and conventional coatings. Therefore, it is expected that if low-VOC coatings are applied according to manufacturers' recommendations, they should be as durable as conventional coatings. Other key durability characteristics considered by the staff include resistance to scrub or abrasion,

corrosion, chemicals, impact, stains, and ultraviolet (UV) light. This evaluation revealed that compliant low-VOC coatings have durability characteristics similar to conventional coatings.

As mentioned previously, the durability of a coating is also governed by the nature of the binder used in its formulation (binders are also known as film formers or resins). The major impact on the coating film is oxidation by exposure to light, causing the film to first lose color and gloss, and gradually become brittle and incoherent. This condition, mainly caused by photochemical degradation, is especially a problem for coatings used for exterior painting. The coatings industry has developed a variety of additives acting as UV absorbers or free radical scavengers that ultimately slow down the photooxidative process, thereby increasing coating life. Antioxidants and sterically hindered amines are two classes of free radical scavengers, also known as hindered amine light stabilizers. These can be used with solvent-free or water-borne coatings. Other additives that enhance durability include adhesion promoters, corrosion inhibitors, curing agents, reactive diluents, optical brighteners, and algicides/mildewcides.

The most commonly used binders in architectural coatings are acrylics and alkyds. Table IV-4 below, extracted from material provided as part of the Durability and Performance of Coatings seminar held by Eastern Michigan University, describes some typical characteristics and highlights strengths and weaknesses of each resin type (SCAQMD, 1999). The table clearly emphasizes the superior durability of acrylic coatings. Using available additives that improve application and durability characteristics, properly formulated water-borne acrylic systems generally outperform solvent-borne coatings.

Water-borne coatings for IM applications are resistant to chemicals, corrosion, chalk, and abrasion (SCAQMD, 1999). Both water-borne and solvent-borne low-VOC IM coating formulations have passed abrasion and impact resistance tests, such as ASTM test methods D4060 and G14, respectively. Similar to their conventional counterparts, water-borne IM coatings also tend to retain gloss and color.

CONCLUSION: ARB staff concludes that low-VOC coatings for both architectural and IM applications are durable and long lasting. Any durability problems experienced by low-VOC coatings are no different than those seen with conventional coatings. Recent coatings technology has improved the durability of new coatings. Because low-VOC coatings are as durable as conventional coatings, more frequent recoating is not necessary. Consequently, claims of significant adverse air quality impacts resulting from more frequent recoating are unfounded.

TABLE IV-4
PERFORMANCE COMPARISON OF ACRYLIC AND ALKYD RESIN SYSTEMS

Acrylic Coatings	Alkyd Coatings
Excellent exterior durability because of high degree of resistance to thermal, photooxidation, and hydrolysis – Pendant groups are ester bonds, but body is C-C bonds, which are much harder to break.	Limited exterior durability because prone to hydrolysis.
Very good color and gloss retention, and resistance to embrittlement	Embrittlement and discoloration issues with age
Require good surface preparation. Since the surface tension is high, the substrate surface needs to be cleaner before application	Minimal surface preparation requirements due to low surface tension. Relatively foolproof applications
Acrylic coatings are generally higher in cost	Lower costs
Polyurethane modified acrylics perform even better, especially in flexibility	Rapid drying, good adhesion, and mar resistance. Silicone modified alkyds have higher performance
Low-VOC and solvent-free formulations available	Higher VOC formulations

vii. Substitution

PROJECT-SPECIFIC IMPACT: Some coatings manufacturers and contractors assert that because water-borne and low-VOC solvent-borne coatings are inferior in durability and more difficult to apply, consumers and contractors will substitute allegedly better performing, higher VOC coatings from other categories for use in categories with low VOC compliance limits. An example of this substitution would be the use of a rust preventative coating, which has a higher VOC content limit requirement, in place of an IM coating or a nonflat coating.

ANALYSIS: There are several reasons why ARB staff believes that widespread substitution will not occur as a result of implementing the SCM. First, based on results of the NTS study (Appendix D) and ARB staff's research of resin manufacturers' and coatings formulators' product data sheets, a substantial number of low-VOC coatings are currently available with performance characteristics comparable to conventional coatings (see the tables in Appendix E and Table IV-2). Second, the SCM prohibits the application of certain coatings in specific settings. For example, rust preventative coatings cannot be used in industrial settings. (The SCM has a reporting requirement to track the use of rust preventative coatings and specialty primers.) Also, the type of performance (*i.e.*, durability) desired in some settings would strongly discourage the use of certain coatings. For example, in an IM setting, a coating with a life of 10 years or more is typically desired due to the harshness of the environment. Therefore, it is unlikely that an alkyd-based rust preventative coating with a typical life of five years would be used in place of an IM coating. Lastly, the SCM requires that when a manufacturer makes any representation that a coating can be used in more than one coating category, the lower limit of the two categories is applicable.

CONCLUSION: ARB staff does not expect that low-VOC coatings will be substituted with higher-VOC coatings. Currently, there are a substantial number of low-VOC coatings with

performance characteristics comparable to conventional coatings. Consequently, claims of significant adverse air quality impacts resulting from substitution are unfounded.

viii. More Reactivity

PROJECT-SPECIFIC IMPACT: Different types of solvents have different degrees of "reactivity," which refers to a compound's ability to accelerate the formation of ground-level ozone. Some industry representatives claim that requiring manufacturers to reformulate to water-borne technology will lead to increases in ozone formation because the VOCs used in water-borne coatings are more reactive than those used in solvent-borne coatings. They have also suggested that the VOCs used in architectural coatings, such as mineral spirits, are low reactive, and thus, do not contribute to ozone formation. It has also been contended by industry that NO_x control alone may be most appropriate for reducing ground level ozone. Furthermore, some industry representatives claim that mass-based controls may not be effective and that reducing VOCs under certain conditions may actually lead to ozone nonattainment (Kessler, 1999; EL RAP, 1996; 1998).

ANALYSIS:

a. The Reactivity of Water-borne and Solvent-borne Products

As mentioned above, some industry representatives have asserted that many of the VOCs used in water-borne architectural coatings are more reactive than the VOCs used in solvent-borne coatings (EL RAP, 1996). It is further claimed that prescribing lower mass-based VOC limits, which may force reformulation to water-borne technology, will lead to overall increases in ozone formation from the category.

The existing data (ARB, 1999c) do not support the claim that water-borne coatings are more reactive than solvent-borne. Using the Maximum Incremental Reactivity (MIR) scale as the basis for comparing reactivities of VOCs, it is true that, on a per gram basis, some VOCs used in water-borne coatings are more reactive than some VOCs used in solvent-borne coatings (Carter, 1999a). For example, using the MIR scale as the basis, a typical VOC used in water-borne coatings, such as propylene glycol, is two to three times more reactive than a typical mineral spirit used in a solvent-borne coating. However, the reactivity of propylene glycol is approximately three times less reactive (again on a per gram basis) than that of other VOCs used extensively in solvent-borne coatings such as xylenes and toluene. It should also be noted that the reactivity of 2,2,3-trimethyl-1,3-pentanediol isobutyrate (Texanol), a VOC used extensively in water-borne coatings, has a similar reactivity estimate as a typical mineral spirit used in solvent-borne coatings (Carter, 1999c).

However, rather than comparing the reactivities of individual VOCs, the more appropriate method to compare reactivities of water-borne versus solvent-borne coatings is to look at the total, or weighted, reactivity of a product or product category. To do this, weighted species profiles were developed for water-borne and solvent-borne coatings using ARB survey data (actual data not provided due to confidentiality) (ARB, 1999c). This comparison of species profiles provides strong evidence that reformulating from solvent-borne to water-borne coatings to reduce total VOC content is an effective strategy to reduce the ozone formation potential from the architectural coatings category as a whole. In fact, the comparison found that, on a weighted basis, solvent-borne coatings are over two times more reactive than water-borne coatings. The analysis is described in greater detail below.

First, we analyzed the reported ARB survey data and found that 82 percent of coatings used in California are water-borne, yet water-borne coatings account for only 33 percent of the total emissions (ARB, 1999c). Conversely, while only 18 percent of total sales are solvent-borne coatings, they account for 67 percent of the emissions (ARB, 1999c). We then conducted a more detailed assessment of the reactivity of the emissions from water-borne and solvent-borne categories to determine if the water-borne coatings emissions were more reactive than those of solvent-borne coatings.

Five categories of architectural coatings were selected for the analysis because the products in these categories may be challenged to reformulate from solvent-borne to water-borne technology. The coatings categories used in our evaluation are: 1) Primers, Sealers, and Undercoaters; 2) Semitransparent Stains; 3) Quick Dry Enamels; 4) Quick Dry Primers, Sealers, and Undercoaters; and 5) Industrial Maintenance Coatings. To protect data confidentiality, the five categories were aggregated to create a single water-borne species profile and a single solvent-borne species profile. In aggregate, the survey data show that for these five categories, the product sales are 91,361,273 pounds per year, of which 30 percent (27,552,785 pounds per year) are water-borne and 70 percent (63,808,488 pounds per year) are solvent-borne. When the ozone formation potential of these categories is considered (using the MIR scale), water-borne products contribute 17 percent of the ozone formation potential (15,765,198 pounds of ozone), while solvent-borne products contribute 83 percent (78,272,991 pounds of ozone). Dividing the pounds of ozone potentially produced by the pounds of product sales shows that, solvent-borne products produce more ozone per pound of product than water-borne products. In fact, when the weighted, aggregated speciation profile is considered, water-borne products produce 0.57 pound of ozone per pound of product, while solvent-borne products produce 1.23 pounds of ozone per pound of product. Therefore, we conclude that solvent-borne coatings have the potential to form more than *twice* as much ozone as water-borne products. (Ozone formation potentials for the ingredients categorized under aggregated VOCs < 1.0%; proprietary VOCs; and other VOCs are calculated using the sales weighted average of the speciated VOCs that altogether comprise more than 95% of the water-borne or solvent-borne VOC inventory, respectively.)

Based on this analysis, there is no basis to conclude that reformulation to water-borne coatings would cause an increase in ozone formation. Rather, reformulation to water-borne coatings should lead to a decrease in ozone formation from architectural coatings.

b. The Effectiveness of Mass–based Controls for Reducing Ozone

It has been claimed that establishing mass-based limits may actually lead to increases in ground level ozone formation (EL RAP, 1998). However, no comprehensive studies were available that substantiate this claim. To the contrary, data support a conclusion that mass-based VOC control strategies have been and continue to be an effective means to reduce formation of ground level ozone. As shown in Table IV-5 below, between 1980 to1998, the number of days that the South Coast Air Basin has exceeded the federal ozone standard has decreased from 167 days in 1980 to 60 days in 1998. During this same period, the maximum one-hour ozone concentrations have decreased from 0.49 parts-per-million (ppm) in 1980 to 0.24 ppm in 1998. Virtually all of the emission reductions were due to mass-based control of VOCs and NO_x. In

one study, Fiore *et al*. suggested that decreasing trends in ground-level ozone from 1980 through 1995 are attributed to emission controls (Fiore *et al.*, 1998).

TABLE IV-5
OZONE DATA SUMMARIES (1980-1998)
SOUTH COAST AIR BASIN

Year	Number of Days Standard Exceeded			Ozone Concentrations in ppm				
				1 Hour			8 Hour	
	State 1 Hour	Federal 1 Hour	Federal 8 Hour	Max 1 Hour	3 Year 4th High*	EPDC*	Max 8 Hour	3 Year Avg. 4th High*
1998	107	60	92	0.24	0.22	0.224	0.206	0.154
1997	144	64	118	0.21	0.22	0.229	0.148	0.148
1996	141	85	115	0.24	0.23		0.173	0.161
1995	153	98	120	0.26	0.25	0.249	0.203	0.165
1994	165	118	148	0.30	0.28	0.279	0.208	0.171
1993	185	124	161	0.28	0.30	0.297	0.195	0.177
1992	190	142	173	0.30	0.30	0.286	0.218	0.180
1991	184	130	160	0.32	0.31	0.304	0.203	0.182
1990	185	131	161	0.33	0.33	0.310	0.193	0.186
1989	211	157	181	0.34	0.33	0.320	0.252	0.192
1988	216	178	194	0.35	0.34	0.319	0.258	0.205
1987	196	160	178	0.33	0.35	0.344	0.210	0.217
1986	217	167	191	0.35	0.35	0.360	0.251	0.222
1985	207	158	181	0.39	0.36	0.375	0.288	0.266
1984	209	175	190	0.34	0.36	0.354	0.248	0.225
1983	192	153	169	0.39	0.36	0.365	0.258	0.229
1982	198	151	166	0.40	0.39		0.265	0.233
1981	233	187	199	0.39	0.42	0.401	0.282	0.251
1980	210	167	179	0.49	0.43	0.451	0.336	0.273

* The 3 year 4th high, 3 year average 4th high, and Expected Peak Day Concentration (EPDC) are calculated based on data for 3 successive years, listed by the last year of the three year period. The EPDC represents the ozone concentration expected to occur once per year.

Source: http://www.arb.ca.gov/aqd/ozone/a1bsc.htm

c. Reactivity of "Mineral Spirits"

Industry representatives have asserted that the organic compounds contained in solvent-borne coatings (primarily mineral spirits), are not sufficiently reactive to contribute to the maintenance of ozone levels in excess of the standard (Smiland and Khachigian, 1999).

The ARB staff does not agree. "Mineral spirits" is a term that generally refers to various hydrocarbon solvents that are commonly used in solvent-borne paints and other products. Even though not all commercially available hydrocarbon solvents, or mineral spirits, have been studied in terms of their ozone formation potential, existing data indicate that hydrocarbon solvents are reactive and are likely to form ozone once emitted. For example, in his latest compilation of MIR values, Dr. Carter estimates the reactivities of four types of mineral spirits to range in reactivity from 0.97-1.49 grams ozone per gram VOC (Carter, 1999a). This means that for the types of mineral spirits tested, every gram emitted will have the potential to lead to formation of at least one gram of ozone. It should be further noted that U.S. EPA currently uses the reactivity of ethane as a "bright line" to determine whether a VOC is negligibly reactive in the atmosphere (Dimitriades, 1999). Using the MIR scale as a basis, the reactivity of ethane is 0.35 grams ozone per gram of VOC emitted (Carter, 1999a). Hence, mineral spirits are at least three to four times more reactive than ethane. It is also well known that some mineral spirits contain aromatic compounds. As such, a hydrocarbon solvent with a 30 percent aromatic content could be as much as eight to nine times more reactive than ethane. This indicates that mineral spirits are sufficiently reactive to participate in ozone formation, and hence, contribute to the excess ozone levels in the ambient air.

d. Negative Reactivity

Industry has suggested that under certain conditions, reducing VOC emissions may actually lead to ozone nonattainment because of the concept of "negative reactivity" (Kessler, 1999). Industry has also suggested that a "NO_x" only control strategy should be implemented for ozone control.

Before addressing these issues, a short discussion of ozone chemistry and the role of NO_x and VOC in its formation is necessary.

i. Chemistry of Ozone Formation and Reactivity

In situ tropospheric chemical generation of ozone involves complex interactions among hydrocarbons and oxides of nitrogen (NO_x) (Carter, 1994; Silman *et al.*, 1995; Bergin *et al.*, 1998b; NRC, 1991; 1999). In the ambient air, the primary process leading to ozone formation is the photolysis of nitrogen dioxide (NO_2).

$$NO_2 + h\nu \rightarrow NO + O(^3P)$$

$$O(^3P) + O_2 + M \rightarrow O_3 + M$$

where M = third body such as N_2
where $O(^3P)$ = ground state oxygen atom
At photo-equilibrium, the steady state ozone concentration is then given by

$$[O_3]_{steady} = \frac{k_{photo}[NO_2]}{k_1[NO]} \qquad (I)$$

where k_{photo} and k_1 are the photolysis rate of NO_2 and the rate constant for the reaction of NO with O_3, respectively. It is apparent from the equation (I) that additional processes converting NO to NO_2 can lead to enhanced ozone levels. VOCs are chemicals known to play an important role in such processes (NRC, 1991). The ability of a VOC to induce ozone formation is known as "reactivity." Under the ambient atmospheric conditions, the major loss process of volatile organic compounds (VOCs) can be summarized as follows:

$$VOC + OH \rightarrow RO_2 + \text{products}$$

$$RO_2 + \alpha NO \rightarrow \beta NO_2 + \text{radicals}$$

$$\text{Radicals} \rightarrow \delta OH + \text{products (}e.g.\text{, HCHO)}$$

The reaction is initiated by hydroxyl (OH) radicals reacting to form peroxy radicals (RO_2). In the presence of sufficient amounts of NO_x (*i.e.*, NO and NO_2), reactions of peroxy radicals with NO compete effectively with their reactions with other peroxy radicals. This, in turn, leads to NO-to-NO_2 conversions and ultimately results in regeneration of the OH radicals. Therefore, a VOC can enhance the rate of ozone formation via an increase in the amount of NO_2 (β) converted from NO. In addition, the reaction with OH radicals is the major (or in most cases the only) loss process of most VOCs. Therefore, any enhanced production of OH radicals ($\delta > 1$) [either by the parent VOC or its products, for example, formaldehyde; (HCHO)] would increase not only its own rate of ozone formation but also increase the rate of ozone formation of other VOCs present.

However, if a radical termination process is present in the VOC's reactions, it will lead to lesser amounts of other VOCs reacting. This affects the total amount of O_3 formed (Carter, 1994; Bergin *et al.*, 1998b). Furthermore, processes like organic nitrate formation (for example, peroxyacetyl nitrate (PAN) from acetaldehyde) can affect the ability of a VOC to form ozone by reducing the amount of NO available (α) to form NO_2 (see, for example, Atkinson, 1994). Hence, the impact of a VOC on ozone formation is a function of: 1) its reaction rates (*i.e.*, kinetics); 2) direct mechanistic effects such as the amount of NO-to-NO_2 conversion; 3) indirect mechanistic effects on other VOCs via processes such as radical initiation; and, 4) the presence of other species in an urban airshed with which the VOCs potentially react. Consequently, there is a wide variation in the ability of VOCs to induce ozone formation (see, for example, Carter, 1994), and the relative importance of these processes determine whether a VOC has an enhancing (*i.e.*, positive reactivity) or a suppressing effect (*i.e.*, negative reactivity) on ozone formation.

ii. Control of NO_x Alone in Ozone Control Strategies

As described previously, the rate of ozone production is dependent on the specific VOCs present and the NO_x and VOC concentrations (Russell *et al.*, 1995). Nevertheless, NO_x and VOC emission reduction requirements needed to achieve the ambient air quality standard for ozone can be represented by an Empirical Kinetics Modeling Approach (EKMA) diagram (see, for example, Milford *et al.*, 1989). In an EKMA diagram, sensitivity of ozone formation is divided into a VOC-limited, a NO_x-limited, and transitional regimes. These regimes correspond to conditions under which ozone formation is most effectively reduced by decreasing emissions of VOCs, NO_x, or both respectively.

The chemistry which results in VOC-limited and NO_x-limited regions has been described in the literature (Bergin *et al.*, 1998b; NRC, 1999). Briefly, hydroperoxy (HO_2), peroxy (RO_2), and hydroxyl (OH) radicals play an important role in sustaining the ozone-generating cycle fueled by VOCs and NO_x. When the ambient VOC-to-NO_x ratio increases from low to high, there is a change in the relative importance of the termination steps for these radicals [*i.e.*, reaction (1) - (3)]. It is the fate of the OH, HO_2, and RO_2 radicals which determine whether an urban airshed is VOC- or NO_x-limited.

$$HO_2 + HO_2 + M \rightarrow H_2O_2 + O_2 + M \qquad (1)$$

$$RO_2 + HO_2 \rightarrow ROOH + O_2 \qquad (2)$$

$$OH + NO_2 + M \rightarrow HNO_3 + M \qquad (3)$$

Because of the ozone-NO_x-VOC sensitivity and the dynamic chemical characteristics of an air parcel (see, for example, Lu and Turco, 1996), both VOC- and NO_x-limited regions exist in an airshed. Hence, VOC- or NO_x-alone control strategies may not be as effective as a combined VOC-NO_x reduction strategy for reducing the formation of ozone. In fact, a combined strategy has been implemented by both federal and state agencies. For example, in California's Cleaner Burning Gasoline and Low Emission Vehicle (LEV) programs, both VOC and NO_x emission reductions are required. In 1995, total NO_x and VOC emissions had been reduced by 10 percent and 40 percent, respectively, compared to 1980 (Fiore *et al.*, 1998).

However, in the largest metropolitan areas, such as Los Angeles and New York City, studies on ground level ozone trend data, obtained from the period of 1980-1995 have shown that VOC emission control is more important than NO_x control in reducing ozone formation (Trainer *et al.*, 1987; Milford *et al.*, 1989; McKeen *et al.*, 1991; Roselle *et al.*, 1991; Jacob *et al.*, 1993; Fiore *et al.*, 1998). This conclusion is consistent with the observed low VOC-to-NO_x ratios (*i.e.*, VOC-limited region) (Wolff and Korsog, 1992) in Los Angeles based on the 1996-1997 VOC and NO_x data obtained from the Photochemical Assessment Monitoring Stations (PAMS) of the ARB (Woodhouse, 1999). Despite the stringent regulations implemented in the South Coast Air Basin, the low VOC-to-NO_x ratios observed (ranging from 1.6 to 9.5) suggest that summertime ozone production in the Los Angeles area is still VOC-limited. In addition, the 1996-1997 PAMS data indicated that low VOC/NO_x ratios were also observed throughout California (San Diego, Fresno, and Sacramento) (Woodhouse, 1999). There is no indication that ozone reduction would be more effective via the implementation of a NO_x-alone control strategy

in these areas. Hence, VOC control is, and will continue to be, an important tool in improving California's air quality, especially in the large metropolitan areas such as Los Angeles.

iii. VOC Reduction Will Not Lead to Ozone Non-Attainment due to Negative Reactivity

As described above, a combined strategy of VOC and NO_x control has been, and continues to be California's plan to attain the NAAQS for ozone. However, some industry representatives have asserted that, under certain conditions, controlling VOCs may actually lead to ozone nonattainment due to the concept of "negative reactivity."

"Negative reactivity" is a phenomenon that occurs when, under certain conditions, VOCs have a suppressing effect on ozone formation. Such a phenomenon is observed for a subset of VOCs in a system characterized by low NO_x concentrations. Although this can be observed in laboratory settings, the low NO_x conditions conducive to the suppressing effect of these VOCs are not commonly experienced in ozone non-attainment urban areas. This is because most non-attainment episodes, such as in the South Coast Air Basin, are characterized by high concentrations of NO_x and low VOC/NO_x ratios.

As mentioned earlier, a subset of VOCs is capable of exhibiting "negative reactivity." These include VOCs that affect ozone formation via direct or indirect processes to reduce the availability of NO_x, or inhibit radical initiation, respectively. Examples include n-octane and toluene, which react predominately to form organic nitrates. This process reduces the availability of NO for NO-to-NO_2 conversions; thus, suppressing ozone formation. However, the conditions under which such phenomena occur are characterized by low NO_x concentrations and high VOC/NO_x ratios. Industry reasons that a net ozone-producing effect results when these VOCs are removed. However, traditional mass-based VOC controls do not selectively remove VOCs exhibiting ozone-suppressing effects. Thus, the industry claim that control of VOCs leads to more ozone due to negative reactivity is not substantiated in the real world. In fact, studies have been conducted which suggest that mass-based control of VOCs and NO_x result in long-term downward trends in ground level ozone in urban areas (Fiore *et al.*, 1998).

Furthermore, in high VOC/NO_x areas, the Empirical Kinetic Modeling Approach (EKMA) model predicts that reduction of VOCs has no effective impact on the ambient ozone level. This is consistent with the observation that ozone-suppressing capability of a VOC changes with the environmental conditions, and different VOCs exhibit different trends in negative reactivity. For example, both n-pentadecane and toluene are capable of suppressing ozone formation in the high VOC/NO_x environment (Dunn-Edwards, 1998). With decreasing NO_x concentrations (at a given VOC/NO_x ratio), toluene shows a decrease in its ozone-suppressing capability; however, the reverse is true for n-pentadecane, where it shows an increase in its ozone-suppressing capability (Dunn-Edwards, 1998). Hence, removal of negatively reacting VOCs from the ambient mixture may have no net impact on the ozone level, and the relatively stable reactivity trend of the base reactive organic gas (ROG) mixture at low NO_x conditions is very likely the result of such conteracting effects.

To reiterate, industry's statement that VOC control causes more ozone has not been substantiated under real world atmospheric conditions. Moreover, the atmospheric conditions (characterized by very high VOC-to-NO_x ratios) that must exist in order for VOC control to exhibit an enhancing effect on ozone formation are not likely to occur in urban centers. A study by Fiore *et al.* has suggested that decreasing levels of ozone concentrations in urban areas are due largely in part to mass-based controls of VOC and NO_x emissions (Fiore *et al.*, 1998). Therefore, a prudent ozone control strategy, such as ARB's dual control program of VOCs and NO_x, will continue to be necessary. Moreover, modeling simulations show that reducing VOCs will result in reductions in predicted ozone concentrations (Milford *et al.*, 1989).

CONCLUSION: Our analysis of the available data indicates that there is no validity to the claim that water-borne coatings are more reactive than solvent-borne coatings. To the contrary, the ARB staff's analysis indicates that solvent-borne coatings are over two times more reactive than water-borne coatings. Thus, reformulation to water-borne coatings is likely to lead to a decrease in the ozone formed from emissions of architectural coatings. Given that one of the major constituents used in solvent-borne coatings is "mineral spirits," this same analysis supports the ARB's conclusion that "mineral spirits" are sufficiently reactive to lead to the formation of ozone once emitted.

ARB staff also concludes that, contrary to industry claims, mass-based VOC regulations have been effective at reducing ground level ozone concentrations. To support this conclusion, data collected from the South Coast Air Basin show that the number of days that the federal one-hour ozone standard was exceeded has been reduced by almost 65 percent between the years 1980 and 1998. These reductions in ozone exceedances can only be attributed to effective mass-based VOC controls.

Finally, we agree with industry that, under certain atmospheric conditions produced in a laboratory setting (high VOC/NOx ratios), some selected VOCs may exhibit "negative reactivity." However, there are no data to support that these conditions are typically found in "real world" urban atmospheres (characterized by lower VOC/NOx ratios), or that VOC control has led to increases in ozone formation. As outlined above, ample data support the conclusion that reducing VOCs results in reductions in predicted ozone concentrations.

ix. Synergistic Effects of the Eight Issues

Industry representatives have stated that the synergistic effect of all of the eight issues discussed above should be analyzed. ARB staff analysis of NTS data and review of product data sheets concludes that, because low-VOC coatings perform comparably to higher-VOC coatings, none of the eight issues is expected to result in adverse air quality impacts. Therefore, since individually each issue does not result in a significant adverse air quality impact, the synergistic effect of all eight issues will not result in significant adverse air quality impacts.

b. Low Vapor Pressure

PROJECT-SPECIFIC IMPACT: Some coatings manufacturers have asserted that certain coatings solvents should not be regulated as VOCs. Industry representatives make this assertion on the premise that replacement solvents are less volatile than conventional solvents. In particular, industry representatives argue that some solvents currently used in consumer products and architectural coatings are considered low volatility compounds, meaning that they have a vapor pressure of less than 0.1 mm of Hg at 20° Celsius.

ANALYSIS: In alleging that the ARB should exempt low vapor pressure VOCs (LVP-VOCs), industry is not claiming that adverse environmental impacts would occur (*i.e.*, that air quality would worsen) if we did not include such an exemption in the SCM. Industry is instead claiming that it does not make sense for the ARB to regulate LVP-VOCs, because supposedly LVP-VOCs do not evaporate. The analysis of this issue is discussed at length in Chapter V of this Draft Program EIR.

CONCLUSION: ARB staff believes that LVP-VOCs should not be exempted as VOCs for the reasons discussed in Chapter V. However, assuming industry is correct in its assertion that LVP-VOCs do not evaporate and therefore do not contribute to ozone formation, then regulating them as VOCs would either have neutral impacts, or would help reduce ozone. This is because the SCM may encourage a shift to water-borne coatings, which generally use more LVP-VOC solvents than solvent-borne coatings. Replacement of solvent-borne coatings with water-borne coatings would result in fewer emissions. ARB staff therefore concludes that this issue does not need to be analyzed as a potential adverse environmental impact.

c. Odor

PROJECT-SPECIFIC IMPACT: It is likely that reformulated low-VOC coatings will contain exempt solvents, as well as less hazardous and less toxic coalescing solvents. Although some of these replacement solvents have strong odors, their conventional solvent counterparts also have strong odors.

ANALYSIS: Individuals can differ quite markedly from the population average in their sensitivity to odor, due to a variety of innate, chronic, or acute physiological conditions. This includes olfactory adaptation or smell fatigue, in which continuing exposure to an odor results in a gradual diminution or even disappearance of the smell sensation. Table IV-6 lists the odor thresholds for some conventional coating solvents as well as their potential replacement solvents. This information was obtained from the MSDS for each coating solvent. Table IV-6 illustrates the fact that odor thresholds of many replacement solvents are the same or higher than those of conventional solvents. It is expected that replacement solvents will be used to meet the recommended SCM VOC content limits.

Currently available low-VOC flat and nonflat coatings have few or no odors. They are preferred for use in settings such as hospitals, day care centers, and convalescent homes. Further, because the volume of coalescing solvents in water-based products is typically less than five percent, odor impacts are not expected from their use. Other affected coatings categories reformulated

TABLE IV-6
COMPARISON OF ODOR THRESHOLDS FOR CONVENTIONAL AND REPLACEMENT COATING SOLVENTS

Solvent	Threshold (PPM[1])
Conventional Solvents	
Toluene	2.9
Xylenes	0.081-40
MEK	5.4
Stoddard Solvent	1-30
Ethyl Alcohol	84
Methyl Alcohol	100
EGBE	0.1
EGEE	2.7
EGME	2.3
Replacement Solvents	
Acetone	63
Texanol	None Provided by Mfr.
Propylene Glycol	Odorless[2]
Ethylene Glycol	Odorless[2]
Oxsol 100 (PCBTF)	0.1[3]
Diisocyanates TDI HDI MDI	 0.17 Odorless[2] Odorless[2]

Sources: [1] New Jersey Department of Health, http://www.state.nj.us/health/eoh/rtkweb/rtkhsfs.htm#T
[2] MallincKrodt Baker, Inc., http://www.jtbaker.com/msds/
[3] OxyChem Specialty Business Group
[4] OSHA, http://www.osha-slc.gov/ChemSamp_data/

with replacement solvents are not expected to create odor impacts because, as shown in Table IV-6, the odor thresholds for many of these solvents are the same or higher than those of most conventional solvents.

CONCLUSION: Odor impacts from implementation of the SCM are not expected to differ from those due to conventional solvents used in currently available coatings.

OVERALL CONCLUSION: Based on the preceding analysis of potential air quality impacts from implementing the SCM, it is concluded that the SCM will result in statewide VOC emission reductions of approximately 14 tons per day (excluding the SCAQMD) by the year 2004.

PROJECT SPECIFIC MITIGATION MEASURES: None required.

REMAINING IMPACTS: Because the SCM will result in an overall, long-term air quality benefit (VOC reductions), no adverse impacts remain.

CUMULATIVE IMPACTS: As shown above, analysis of project-specific air quality impacts indicates that implementation of the SCM is not expected to generate any significant adverse project-specific air quality impacts. Since the SCM is a regulatory project that affects districts as well as coatings formulators, painting contractors, and do-it-yourselfers statewide, the project-specific air quality impacts associated with the SCM are the same as its cumulative air quality impacts. Therefore, because the SCM will not result in any adverse project-specific air quality impacts, the SCM will not have any cumulative adverse air quality impacts[3].

In fact, ARB staff has determined that implementing the SCM for architectural coatings will produce substantial net air quality benefits throughout California. Implementation of the SCM will reduce VOC emissions, which in turn will tend to further reduce ambient ozone concentrations on a statewide basis.

CUMULATIVE IMPACT MITIGATION: No cumulative impact mitigation measures are required.

2. Water

In the NOP/IS, staff identified potential water demand and water quality impacts that could occur as a result of implementing the SCM. Specifically, staff determined that implementing the SCM may result in additional water demand from the manufacturing and clean-up of compliant water-borne coatings as well as additional generation of wastewater that could be disposed of into storm drains and sanitary sewers.

Significance Criteria

The project will be considered to have significant adverse water demand impacts if any one of the following criteria is met by the project in any district:

- The project increases demand for water by more than 5,000,000 gallons per day.
- The project requires construction of new water conveyance infrastructure.

The project will be considered to have significant adverse water quality impacts if any one of the following criteria is met by the project in any district:

- The project creates a substantial increase in mass inflow of effluents to public wastewater treatment facilities.
- The project results in a substantial degradation of surface water or groundwater quality.
- The project results in substantial increases in the area of impervious surfaces, such that interference with groundwater recharge efforts occurs.
- The project results in alterations to the course or flow of floodwaters.

[3] The significance criteria for cumulative impacts are the same as the significance criteria for project-specific impacts.

a. Water Demand

PROJECT SPECIFIC IMPACTS: If compliant coatings are reformulated with water, there could be increased demands for water use in the manufacturing and cleanup of water-borne coatings. Comments received on the NOP/IS and at public meetings indicated that the potential depletion of groundwater supplies and lowering of the water table from both the manufacture and the need for more surface preparation (power washing) should be analyzed.

ANALYSIS: To analyze these impacts, ARB staff projected the potential increased water demand as a result of using water to manufacture and clean up water-borne coatings. As a worst-case scenario, ARB staff assumed that all solvent-borne coatings affected by the SCM would be reformulated with water, and did not account for any use of exempt solvents such as acetone. ARB staff also assumed for this worst-case analysis that all coatings sold for use in California were manufactured in California and apportioned the manufacturing water demand according to population. (This greatly overestimates the manufacturing water demand for the majority of California, and underestimates demand for the SCAQMD, since many California coatings manufacturers are located in the South Coast Air Basin. However, the SCAQMD conducted a separate analysis for their area of jurisdiction and found negligible water demand impacts (SCQAMD, 1999)). ARB staff also used drought-year projections of water demand, which are lower than average-year demand projections in most regions of California, making the increase due to the SCM a larger percentage of the total water demand. The Department of Water Resources projections of total water demand also assumed that no new projects would be undertaken to increase or more efficiently use existing water supply. As shown in Table IV-7, water demand impacts associated with the manufacture and cleanup of reformulated water-borne coatings are anticipated to create a negligible incremental water demand and do not exceed the significance threshold of 5,000,000 gallons per day in any hydrologic region of California (hydrologic regions are much larger than districts, roughly corresponding to air basins in size, and it is therefore expected that increased water demand in any district would be considerably lower).

Regarding the need for additional surface preparation (power washing), as mentioned above in the Air Quality section, manufacturers' recommendations are the same for conventional and low-VOC coatings (*i.e.*, apply to clean, dry surfaces). It is not expected that these recommendations would change if additional coatings were to be reformulated as a result of the SCM.

CONCLUSION: As shown in Table IV-7, implementation of the SCM is expected, even as a worst-case scenario, to create a negligible increased demand for water of approximately 100,000 gallons per day statewide. While there are projected drought-year shortages in some regions of California, these shortages would occur regardless of the SCM. Therefore, no significant water demand impacts, including the lowering of water tables or the depletion of groundwater, are expected as a result of implementing the SCM.

Table IV-7
Projected Water Demand for Reformulated Coatings

Region	1996 Population[a] (thousands)	2010 Population[a] (thousands)	1996 Water Demand[b] (bgy)	2010 Water Demand[b] (bgy)	1996 Coating Sales[c] (mgy)	2010 Coating Sales[c] (mgy)	2010 Mfg. Demand[d] (mgy)	2010 Clean-up Demand[e] (mgy)	2010 Total Demand[f] (mgy)	% Increase in Water Demand[g]	Total Impacts[h] (gal/day)
North Coast	615	743	3,478	3,488	0.31	0.36	0.36	0.36	0.71	2.05E-05	1,957
San Francisco Bay	5,830	6,527	1,878	1,880	2.81	3.14	3.14	3.14	6.28	3.34E-04	17,196
Central Coast	1,371	1,706	525	527	0.66	0.82	0.82	0.82	1.64	3.11E-04	4,494
South Coast	17,580	21,516	1,733	1,880	8.46	10.34	10.34	10.34	20.69	1.10E-03	56,684
Sacramento River	2,376	2,430	4,601	4,633	1.15	1.19	1.19	1.19	2.37	5.12E-05	6,493
San Joaquin River	1,649	2,452	3,171	3,148	0.79	1.18	1.18	1.18	2.36	7.49E-05	6,460
Tulare Lake	1,800	2,673	3,756	3,738	0.86	1.29	1.29	1.29	2.57	6.88E-05	7,042
North Lahontan	86	109	287	291	0.04	0.05	0.05	0.05	0.10	3.60E-05	287
South Lahontan	765	1,497	215	261	0.36	0.72	0.72	0.72	1.44	5.51E-04	3,944
Colorado River	556	871	1,486	1,408	0.26	0.42	0.42	0.42	0.84	5.95E-05	2,295
California Total	32,628	40,524	21,130	21,255	15.69	19.48	19.48	19.48	38.96	1.83E-04	106,751

[a] Population projections obtained from California Department of Finance, as cited by Department of Water Resources.
[b] Water demand projections obtained from Department of Water Resources.
[c] Solvent-borne sales only. The 1998 ARB Survey sales data is used as the baseline for 1996. Total sales are apportioned by population data obtained from the Department of Finance for each region. It is assumed that coating sales will increase directly with population
[d] Assumes that one gallon of water will be used to manufacture one gallon of coating applied. Also assumes as a "worst-case" scenario, that all coatings used in California were manufactured in California, and that manufacture of coatings is distributed throughout California according to population.
[e] Assumes that one gallon of water will be used to clean up equipment for every gallon of coating applied.
[f] Total manufacture and clean-up water demand.
[g] The percentage increase in water demand as a result of the incremental increase due to manufacture and clean-up of water-borne coatings.
[h] The incremental increase in daily water usage associated with implementation of the SCM

Acronyms: bgy = billion gallons per year; mgy = millions of gallons per year

It should be noted, however, that water providers throughout California are currently exploring various strategies for increasing water supplies and maximizing the use of existing supplies. Options include storage of water from existing sources, use or storage of water unused by other states or agricultural agencies, and advance delivery of water to irrigation districts. These continuing and future water management programs will help to assure that California's full-service water demands will be met at all times.

PROJECT-SPECIFIC MITIGATION: None required.

REMAINING IMPACTS: None.

CUMULATIVE IMPACTS: Cumulative water demand impacts from implementing the SCM are not considered to be cumulatively considerable as defined by CEQA Guidelines §15065(c) for the following reason. Although implementing the SCM is expected to incrementally increase water demand to formulate compliant coatings, this increased demand does not generate a significant adverse water demand impact, because it does not exceed any water resources threshold of significance.

Based upon the above consideration, there may be incremental, but not significant, water demand impacts. These incremental effects are not considered to be cumulatively considerable. This conclusion is consistent with CEQA Guidelines §15130(a), which states in part, "Where a lead agency is examining a project with an incremental effect that is not 'cumulatively considerable,' a lead agency need not consider that effect significant, but shall briefly describe its basis for concluding that the incremental effect is not cumulatively considerable."

CUMULATIVE IMPACT MITIGATION: None required.

b. Water Quality

i. Groundwater and Surface Water Impacts

PROJECT-SPECIFIC IMPACT: Some industry members have contended that increased use of water-borne technologies to meet the VOC content limits will result in an increase in improper disposal of the waste generated from these coatings onto the ground or into storm drains. Comments received on the NOP/IS indicated that there could be water quality impacts if low-VOC coatings are required for the water and sewage system infrastructures, and that water quality impacts could also result from the release of hazardous materials due to the failure of tank lining and pipe coatings.

ANALYSIS: Regarding improper disposal, during its 1996 Rule 1113 amendments, SCAQMD staff conducted over 60 unannounced site visits at industrial parks and new housing construction sites in an effort to evaluate coating and clean-up practices. During these site visits, SCAQMD staff surveyed contractors regarding their clean-up practices. Out of 32 responses received from the contractors, seven (22 percent) indicated that they dumped their waste material onto the ground, 18 (56 percent) indicated that they used a disposal company to handle waste material, and seven (22 percent) indicated that they recycled their waste material as thinner. This survey demonstrates that a majority of the contractors either dispose of the waste material properly as required by the coatings manufacturer's MSDSs or recycle the waste material, regardless of the type of coating. Based upon these results, there is no reason to expect that painting contractors,

especially those that dispose of wastes properly, will change their disposal practices as a result of implementing the SCM.

Furthermore, the National Paint and Coatings Association's "Protocol for Management of Post Consumer Paint" and the SCAQMD's "Painter's Guide to Clean Air," as well as other publications, provide the public and painting contractors with information as to environmentally sound coatings disposal practices. These public outreach programs are expected to reduce the amount of coatings waste material entering the sewer and storm drain systems and being dumped on the ground, thereby further reducing any water quality impacts associated with the improper disposal of compliant coatings.

Even if it is assumed that those who currently recycle their waste coatings will instead dump them illegally, significant adverse surface and/or groundwater impacts are not anticipated from implementing the SCM. Based upon staff research of currently available compliant coatings, it is likely that resin manufacturers and coatings formulators, in complying with the SCM VOC content limits, will replace conventional coatings formulations, which may contain toluene, xylenes, mineral spirits, and methyl ethyl ketone (MEK), with either exempt solvents (*e.g.*, acetone, Oxsol 100, and t-butyl acetate—if formally delisted as a VOC) or water-borne formulations.

In addition to the above-mentioned solvents, coalescing solvents such as Texanol and propylene glycol may be used more widely in low-VOC, water-borne formulations as alternatives to more toxic coalescing solvents such as ethylene glycol monobutyl ether (EGBE), ethylene glycol monoethyl ether (EGEE), ethylene glycol monomethyl ether (EGME), and their acetates.

Additionally, a report prepared for ARB indicates that a majority of current water-borne formulations (flats and nonflats) contain nonhazardous solvents (Censullo, 1996). The Censullo report, which is intended to upgrade the species profiles for a number of sources within the general categories of industrial and architectural coatings operations, reported that the four most common solvents in the 52 randomly chosen water-borne coatings (flats and nonflats) were: Texanol (found in 37/52); propylene glycol (31/52); diethylene glycol butyl ether (23/52); and ethylene glycol (14/52). It thus appears that the use of solvents such as Texanol and propylene glycol in water-borne coatings formulations is prevalent today and should continue into the future, with the eventual replacement of more toxic and hazardous coalescing solvents such as EGBEs with less toxic or nontoxic coalescing solvents.

ARB and SCAQMD staff research also reveals that low-VOC, two-component IM coating systems containing diisocyanate compounds such as toluene diisocyanate (TDI), hexamethylene diisocyanate (HDI), and methylene bisphenyl diisocyanate (MDI) may be used to meet the SCM's VOC content limits. Water-borne two-component systems may replace solvent-borne, one-component and two-component IM systems. However, users of these coating systems would be painting contractors that are more sophisticated and experienced than the average consumer in the proper disposal methods and applicable disposal requirements. Furthermore, after these coatings are mixed and exceed their pot life, they become a solid mass and are disposable as solid waste rather than wastewater. Thus, it is unlikely that these painting contractors will improperly dispose of these compliant coating systems and cause water quality

impacts. See the Solid Waste/Hazardous Waste section below for a discussion of California law regarding the disposal of wastewater containing latex materials.

As shown in Table IV-8, replacement solvents have ecological effects that are comparable to conventional solvents. Therefore, the use of replacement solvents in compliant low-VOC reformulations will not create incrementally significant adverse groundwater or surface water impacts over and above the existing effects associated with the use of conventional solvents.

Regarding the concern about water quality impacts from the failure of tank and pipe coatings, results of the NTS study and the staff's review of product data sheets reveal that there are currently available IM coatings that comply with the proposed VOC content limits and which have coating and durability characteristics comparable to existing high-VOC coatings. Thus, water quality impacts from the alleged failure of pipe and tank lining coatings is not expected to occur.

CONCLUSION: Disposal practices are not expected to change as a result of implementing the SCM. Even if some users improperly disposed of their leftover paint, significant groundwater and surface water quality impacts are not expected from the use of Texanol, propylene glycol, and ethylene glycol as replacement solvents in compliant water-borne coatings. Furthermore, the potential for significant impacts to groundwater and surface water from the use of compliant IM coatings containing diisocyanates is unlikely, since these coatings would be disposed of as solid waste materials. It is expected that users will properly dispose of any waste generated from application of these coatings. Lastly, water quality impacts are not expected to occur as a result of tank lining and pipe coating failures because durability characteristics are similar for low-VOC and conventional coatings.

ii. Impacts to Publicly Owned Treatment Works (POTWs)

PROJECT-SPECIFIC IMPACT: As already noted, it is anticipated that some future compliant coatings will be formulated with water-borne technologies. As a result, more water will be used for clean-up, and the resultant wastewater material would be disposed of into public sewer systems. Thus, the increased usage of water-borne compliant coatings could adversely affect the ability of local POTWs to handle the projected incremental increase in waste material. Comments were received on the NOP/IS stating that the environmental effects of increased wastewater generation and the need for new or expanded wastewater treatment facilities should be evaluated.

ANALYSIS: In evaluating the projected generation of wastewater, staff assumed that the current practice of using water to clean coating equipment (spray guns, rollers, and brushes) will continue into the future. Table IV-9 illustrates the potential increase of waste material likely to be received by POTWs in California as a result of implementing the SCM.

TABLE IV-8
ECOLOGICAL INFORMATION FOR COATINGS SOLVENTS

Characteristic	CONVENTIONAL SOLVENTS								
	Toluene	Xylenes	MEK	Stoddard solvent	Ethyl alcohol	Methyl alcohol	EGBE	EGEE	EGME
Solubility in Water (@ 20 ^{o}C)	500 ppm	130 ppm	27%	Insoluble	100%	100%	Miscible	Miscible	Miscible
Vapor Pressure (@ 20 ^{o}C)	22 mmHg	6 mmHg	85 mmHg	1.1 mmHg	44 mmHg	96 mmHg	0.6 mmHg	3.8 mmHg	6.2 mmHg
Environmental Fate (Released into the Water)				Not Available	Not Available				
Evaporation	Moderately	Moderately	Moderately			Significantly	Slightly	Slightly	Moderately
Biodegradable			Moderately			Moderately	Moderately	Moderately	Slightly
Bioaccumulation			Moderately				Slightly	Slightly	
Environmental Fate (Released into the Soil)				Not Available	Not Available				
Evaporation	Moderately	Moderately				Significantly	Significantly	Moderately	Moderately
Biodegradable	Moderately	Moderately				Significantly	Moderately	Moderately	
Groundwater Leaching	Expected	Expected	Expected			Expected	Expected	Expected	Expected
Environmental Toxicity	Toxic to Aquatic Life	Toxic to Aquatic Life	Not Toxic to Aquatic Life	Not Available	Not Available	Slightly Toxic to Aquatic Life	Not Toxic to Aquatic Life	Not Toxic to Aquatic Life	Not Toxic to Aquatic Life
LC50/96 Hour Value for Fish	10 –100 mg/l	10 –100 mg/l	>100 mg/l	Not Available	Not Available	Not Available	>100 mg/l	>100 mg/l	>100 mg/l
Bioconcentration Factor (eels)	13.2	1.3	Not Available	Not Available	Not Available	Not Available	<100	Not Available	Not Available

TABLE IV-8 (CONTINUED)
ECOLOGICAL INFORMATION FOR COATINGS SOLVENTS

Characteristic	REPLACEMENT SOLVENTS					
	Acetone	Texanol	Propylene glycol	Ethylene glycol	Oxsol 100	TDI
Solubility in Water (@ 20 ^{o}C)	100%	0.1%	100%	100%	29 ppm	Decomposes
Vapor Pressure (@ 20 ^{o}C)	180 mmHg	0.01 mmHg	0.07 mmHg	0.06 mmHg	5.3 mmHg	0.04 mmHg
Environmental Fate (Released into the Water)					Not Available	
Evaporation	Significantly					
Biodegradable	Significantly	Expected*	Significantly	Significantly		Slightly
Bioaccumulation	Slightly			Slightly		
Environmental Fate (Released into the Soil)		Not Available			Not Available	Not Available
Evaporation	Significantly			Slightly		
Biodegradable	Significantly		Significantly	Significantly		
Ground Water Leaching	Expected		Expected	Expected		
Environmental Toxicity	Not Toxic to Aquatic Life	Moderately Toxic to Aquatic Life*	No Information Found	Not Toxic to Aquatic Life	Not Available	Not Available
LC50/96 Hour Value for Fish	>100 mg/l	33 mg/l	Not Available	>100 mg/l	Not Available	Not Available
Bioconcentration Factor (eels)	Not Available	Not Available	Not Available	Not Available	2.3	Not Available

Source: Mallinckrodt Baker, Inc., http://www.jtbaker.com/msds/; * Eastman Chemical Co., http://www.enm.com

TABLE IV-9
PROJECTED POTW IMPACT FROM REFORMULATED COATINGS

County	1999 Average Daily Wastewater Flow (gal)	2010 Coatings Disposal (gal)[a]	2010Coatings Disposal (gal/day)[b]	Total Impacts (% increase in Wastewater Flow)
ALAMEDA	155,399,800	805,395	2,207	0.0014
ALPINE	38,000	705	2	0.0051
AMADOR	764,000	18,602	51	0.0067
BUTTE	7,051,000	125,900	345	0.0049
CALAVERAS	1,016,000	26,282	72	0.0071
COLUSA	1,410,000	15,144	41	0.0029
CONTRA COSTA	66,268,000	499,382	1,368	0.0021
DEL NORTE	1,326,000	18,137	50	0.0037
EL DORADO	4,728,000	104,736	287	0.0061
FRESNO	14,332,100	464,138	1,272	0.0089
GLENN	1,779,000	19,012	52	0.0029
HUMBOLDT	8,603,200	66,010	181	0.0021
IMPERIAL	12,207,000	107,866	296	0.0024
INYO	1,817,000	9,467	26	0.0014
KERN	41,783,000	418,555	1,147	0.0027
KINGS	6,935,000	75,267	206	0.0030
LAKE	2,831,100	37,851	104	0.0037
LASSEN	1,460,000	21,071	58	0.0040
LOS ANGELES	701,837,800	5,162,195	14,143	0.0020
MADERA	5,710,000	85,253	234	0.0041
MARIN	18,981,200	125,870	345	0.0018
MARIPOSA	126,000	10,063	28	0.0219
MENDOCINO	4,222,200	51,223	140	0.0033
MERCED	16,509,000	128,718	353	0.0021
MODOC	492,000	5,601	15	0.0031
MONO	2,266,000	6,115	17	0.0007
MONTEREY	8,149,100	233,485	640	0.0078
NAPA	1,697,000	69,876	191	0.0113
NEVADA	8,540,000	58,592	161	0.0019
ORANGE	311,314,200	1,540,110	4,219	0.0014
PLACER	8,137,000	158,524	434	0.0053
PLUMAS	1,751,000	10,837	30	0.0017
RIVERSIDE	84,049,100	1,034,701	2,835	0.0034
SACRAMENTO	272,683,000	699,177	1,916	0.0007
SAN BENITO	2,392,000	33,122	91	0.0038
SAN BERNARDINO	112,106,600	1,065,014	2,918	0.0026
SAN DIEGO	279,594,200	1,675,274	4,590	0.0016
SAN FRANCISCO	86,700,000	380,902	1,044	0.0012
SAN JOAQUIN	50,464,100	353,349	968	0.0019
SAN LUIS OBISPO	7,679,600	158,082	433	0.0056
SAN MATEO	56,000,000	396,997	1,088	0.0019

TABLE IV-9 (CONTINUED)
PROJECTED POTW IMPACT FROM REFORMULATED COATINGS

SANTA BARBARA	27,596,100	228,043	625	0.0023
SANTA CLARA	170,060,000	984,016	2,696	0.0016
SANTA CRUZ	24,630,600	150,520	412	0.0017
SHASTA	10,700,000	103,662	284	0.0027
SIERRA	275,000	1,733	5	0.0017
SISKIYOU	2,825,300	24,115	66	0.0023
SOLANO	34,938,100	233,241	639	0.0018
SONOMA	25,408,400	265,066	726	0.0029
STANISLAUS	36,491,000	285,028	781	0.0021
SUTTER	3,802,000	48,892	134	0.0035
TEHAMA	2,420,000	34,352	94	0.0039
TRINITY	266,000	7,140	20	0.0074
TULARE	30,633,600	228,555	626	0.0020
TUOLUMNE	1,970,000	33,299	91	0.0046
VENTURA	57,153,900	416,005	1,140	0.0020
YOLO	8,798,000	94,914	260	0.0030
YUBA	3,637,000	35,991	99	0.0027
CALIFORNIA TOTAL	2,812,754,300	19,409,743	53,177	0.0019

[a] Based on estimated 2010 coatings sales of current solvent-borne formulations. Assumes that one gallon of water will be used to clean up equipment for every gallon of coating applied. Also assumes that all solvent-borne coatings categories will be converted to water-borne formulations.

The staff's analysis considerably overestimates potential wastewater impacts from implementing the SCM. In the absence of projected average daily flows to the various POTWs in California, staff evaluated the impact of coatings wastewater disposal using estimated 2010 coatings sales and 1999 average daily wastewater flows. It was also assumed that one gallon of water would be used to clean up each gallon of paint. Finally, staff assumed that water-borne technology would replace all solvent-borne coatings currently sold in California, including those solvent-borne coatings that already comply with the proposed VOC content limits. Even under this worst-case scenario, coatings wastewater disposal is estimated to account for approximately 50,000 gallons per day, or only a 0.0019 percent increase in the statewide daily flow of wastewater to POTWs.

CONCLUSION: The potential increase in coatings wastewater disposal is considered to contribute a negligible amount to the average daily flow of wastewater to POTWs in California. Implementation of the SCM will therefore not result in the need for new or expanded wastewater treatment facilities. Hence, wastewater impacts associated with the disposal of water-borne clean-up waste material generated from the coatings categories affected by the SCM are not considered significant.

OVERALL CONCLUSION: Based upon the preceding analyses, implementation of the SCM is not expected to create significant adverse groundwater and surface water quality impacts for the following reasons. First, coatings manufacturers are using less hazardous or nonhazardous materials in their formulations. This trend may be the result of increasingly stringent state and

federal regulations relative to hazardous materials, as well as the potential for increased liability associated with using hazardous materials. Second, experienced users are expected to properly dispose of waste generated from the use of compliant coatings. Third, public outreach programs are anticipated to further inform the public and painting contractors as to the proper disposal methods for compliant coatings. Fourth, even if waste materials were disposed of improperly, the use of replacement solvents would not incrementally increase water quality impacts above the impacts associated with the use of current conventional solvents.

Based upon projections of coatings sales and wastewater disposal, California's POTWs are expected to be able to handle any incremental increase in wastewater associated with the use of compliant water-borne coatings. As a result, no significant impacts to POTWs are expected as a result of implementing the SCM.

PROJECT-SPECIFIC MITIGATION MEASURES: None required.

REMAINING IMPACTS: Because water quality impacts are not significant, no adverse impacts remain.

CUMULATIVE IMPACTS: The ARB has evaluated the SCM to determine potential significant cumulative water resources impacts. No significant additional project-specific water resources impacts are expected to result from implementing the SCM, and no significant cumulative adverse water resources impacts are anticipated.

CUMULATIVE IMPACT MITIGATION: None required.

3. Public Services

In the NOP/IS, staff identified potential significant public services impacts that could occur as a result of implementing the SCM, specifically, whether reformulated compliant coatings could lead to more demand for fire department services. Comments received on the NOP/IS also indicated that implementing the SCM could result in increased maintenance at public facilities because low-VOC coatings allegedly do not perform or hold up as well as traditional solvent-borne coatings.

Significance Criteria

The project will be considered to have significant adverse public services impacts if the following criteria are met in any district:

- The project results in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, or need for new or physically altered government facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives.

a. Additional Maintenance of Public Facilities

PROJECT-SPECIFIC IMPACTS: In response to the NOP/IS, some commenters have asserted that because reformulated compliant coatings will not perform as well as current coatings, the infrastructure needs at public facilities may be impacted due to more frequent maintenance activities. Water-borne coatings would have to applied during the warmer and drier months, and consequently public facilities—especially parks—may be severely impacted and unavailable for periods of time when they otherwise would be available.

ANALYSIS: Results of the NTS study show that when compared to conventional, currently compliant coatings, low-VOC coatings have similar performance and application characteristics (see Appendix D). As discussed in the Air Quality section of this chapter, low-VOC coatings for both architectural and IM applications are durable and long lasting. Any durability problems experienced by low-VOC coatings are no different than those seen with conventional coatings. Because low-VOC coatings are as durable as conventional coatings, more frequent recoating is not necessary.

Regarding the comment that water-borne coatings must be applied during the warmer and drier months, staff's evaluation of drying times in the Air Quality section indicates that for all categories except lacquers, drying times of low-VOC coatings are similar or shorter than those of conventional coatings. Thus, there should be no reason why application of water-borne coatings should be limited to the warmer and drier months.

CONCLUSION: Based upon NTS data and the dry time and qualitative durability descriptions in the coatings product data sheets, staff concluded that low-VOC coatings have durability and dry time characteristics comparable to conventional coatings, and that therefore the SCM will not adversely impact the maintenance of public facilities.

PROJECT-SPECIFIC MITIGATION MEASURES: No mitigation measures are required.

REMAINING IMPACTS: Because public service impacts are not significant, no adverse impacts remain.

CUMULATIVE IMPACTS: The ARB has evaluated the SCM to determine potential significant cumulative public services impacts. No significant additional project-specific public services impacts at public facilities are expected to result from implementing the SCM, and no significant cumulative adverse public services impacts are anticipated.

CUMULATIVE IMPACT MITIGATION: None required.

b. Fire Protection

PROJECT-SPECIFIC IMPACTS: Potential adverse impacts to fire departments could occur in two ways: 1) if there is an increase in accidental releases of hazardous materials used in compliant coatings, or an increase in fires caused by flammable solvents, fire departments would have to respond more frequently to accidental release incidences or fires, and 2) if there is an

increase in the amount of hazardous materials stored at affected facilities, fire departments would have to conduct additional inspections. If either of these situations were to occur as a result of implementation of the SCM on a statewide basis, more firefighting personnel and facilities may be required.

Comments received on the NOP/IS and at public meetings indicated that the flammability of acetone, which may be increasingly used as an exempt solvent in certain formulations, is a concern.

ANALYSIS: Table IV-10 highlights the flammability characteristics of currently used solvents compared to replacement solvents that may be used to reformulate various affected coatings categories to meet the SCM's proposed VOC content limits.

As a worst-case scenario, ARB staff assumed that most affected SCM coatings categories would be reformulated with acetone to meet the proposed VOC content limits. Considering the only coatings categories that may be reformulated with acetone are lacquers, floor coatings, and some waterproofing sealers, this assumption greatly overestimates the potential impacts to fire departments associated with the SCM.

As illustrated in Table IV-10, the flammability classifications by the National Fire Protection Association (NFPA) are the same for acetone, toluene, xylenes, MEK, ethyl alcohol, and methyl alcohol. Although acetone has the lowest flashpoint of these compounds, it still has one of the highest Lower Explosive Limits (2.6 percent by volume), which means that acetone vapors will not cause an explosion unless the vapor concentration exceeds 26,000 parts per million (ppm).

In contrast, for example, toluene vapors can cause an explosion at 13,000 ppm, which poses a much greater risk of explosion. The concentration of xylene vapors that could cause an explosion is even lower at 10,000 ppm. Under operating guidelines of working with flammable coatings under well-ventilated areas, as prescribed by the fire department codes, it would be difficult to achieve concentrations of such vapors.

Chemistry classes from grade school to universities, as well as industrial laboratories, use acetone for wiping down counter tops and cleaning glassware. Acetone is also used as a solvent for paint, varnish, lacquers, inks, adhesives, floor coatings, and cosmetic products including nail polish and nail polish remover.

Labels and MSDSs accompanying acetone-borne products caution the user regarding acetone's flammability and advise the user to keep the container away from heat, sparks, flames, and all other sources of ignition. The labels also normally warn the user that the vapors may cause flash fire or ignite explosively and to use only with adequate ventilation. These warnings on acetone-borne products are similar to the warnings found on a vast majority of coatings products.

As part of the SCAQMD's Environmental Assessment for the 1996 amendments to Rule 1113 (SCAQMD, 1996) and to address concerns raised by industry, the SCAQMD contacted four local fire departments to gain an understanding of potential impacts to fire

departments associated with the use of reformulated coatings containing acetone. During these interviews, the four local fire departments indicated that they would treat all solvents that have a vapor pressure less than 65° Fahrenheit the same. As shown in Table IV-10, several conventional coatings have flashpoints below 65° Fahrenheit.

In particular, Captain Michael R. Lee, of the Petroleum-Chemical Unit for the County of Los Angeles Fire Department, submitted a letter to the SCAQMD stating that the Uniform Fire Code (UFC) treats solvents such as acetone, butyl acetate, MEK, and xylenes as Class I Flammable Liquids (SCAQMD, 1996). Further, the UFC considers all of these solvents to present the same relative degree of fire hazard. The UFC also sets the same requirements for the storage, use, and handling of all four solvents. Captain Lee also indicated that in his opinion, acetone presents the highest degree of fire hazard of the four solvents considered, but is not significantly more hazardous than the others. He recommended that all four solvents be used with extreme caution and with proper safeguards in place.

Additionally, the County of Los Angeles, Fire Department, Fire Prevention Guide #9 regulates spray application of flammable or combustible liquids (SCAQMD, 1999). The guide requires no open flame, spark-producing equipment, or exposed surfaces exceeding the ignition temperature of the material being sprayed within the area. For open spraying, as would be the case for the field application of acetone-based coatings, no spark-producing equipment or open flame shall be within 20 feet horizontally and 10 feet vertically of the spray area. Anyone not complying with the above guidelines would be in violation of current fire codes. The fire department limits residential storage of flammable liquids to five gallons and recommends storage in a cool place. If the flammable coating container will be exposed to direct sunlight or heat, storage in cool water is recommended. Lastly, all metal containers involving the transfer of five gallons or more should be grounded and bonded.

CONCLUSION: Based upon the above considerations, it is not expected that the SCM will generate significant adverse impacts to local fire departments that would require new or additional firefighting resources. Similarly, as noted below in the Hazards section, the use of replacement solvents in future compliant coatings is not expected to result in an increase in accidental releases of coatings materials. Additionally, as demonstrated in the Hazards section, future compliant coatings materials are not expected to cause significant adverse human health impacts, so accidental release scenarios would be expected to pose a lower risk to responding firefighters. Furthermore, if manufacturers continue to use solvents such as Texanol, propylene glycol, ethylene glycol, and Oxsol 100 in their compliant water-borne coatings, fire departments would not be expected to experience adverse impacts because in general these replacement solvents are less flammable solvents as rated by the NFPA.

PROJECT-SPECIFIC MITIGATION MEASURES: None required.

TABLE IV-10
CHEMICAL CHARACTERISTICS FOR COMMON COATING SOLVENTS

Conventional Solvents								
Chemical Compounds	**M.W.**	**Boiling Point (@760 mmHg, ^{o}F)**	**Evaporation Rate (@25 ^{o}C)**	**Flashpoint (^{o}F)**	**LEL/UEL (% by Vol.)**	**Autoignition Temperature (^{o}C)**	**Vapor Pressure (mmHg @ 20 ^{o}C)**	**Flammability Classification (NFPA)**
Toluene	92	111	2.0	41	1.2/7	538	22	3
Xylenes	106	139	0.8	81	1.0/6.6	499	6	3
MEK	72	80	4.0	25	1.8/11.5	474	8.7	3
Stoddard solvent	144	154-188	0.1	109-113	1/7	232	1.1	2
Ethyl alcohol	46	78	2.3	56	3.3/19	435	44	3
Methyl alcohol	32	64.5	4.6	54	6/36	470	96	3
Isopropyl alcohol	60	180	1.4	53	2.0/12.0	399	33	3
EGBE	118	340	0.07	144	1.1/12.7	460	0.8	2
EGEE	90	275	0.3	109	1.7/15.7	235	3.8	2
EGME	76	255	1.0	102	1.8/14	547	6.2	2

TABLE IV-10 (CONTINUED)
CHEMICAL CHARACTERISTICS FOR COMMON COATING SOLVENTS

Replacement Solvents								
Chemical Compounds	**M.W.**	**Boiling Point (@760 mmHg, °F)**	**Evaporation Rate (@25 °C)**	**Flashpoint (°F)**	**LEL/UEL (% by Vol.)**	**Autoignition Temperature (°C)**	**Vapor Pressure (mmHg @ 20 °C)**	**Flammability Classification (NFPA)**
Acetone	58	56	6.1	-4	2.6/12.8	538	180	3
Texanol	216	471	0.002	248	0.6/4.2	393	0.01	1
Propylene Glycol	76	187	0.01	225	2.6/12.5	415	0.07	1
Ethylene Glycol	62	197	0.01	244	3.2/15.3	412	0.06	1
Oxsol 100	181	282	0.9	109	0.9/10.5	97	5.3	1
TDI	174	482	No Info	261	0.9/9.5	620	10	1
HDI	168	491	No Info	284	0.9/9.5	454	0.05	1
MDI	250	342	No Info	396	0.9/9.5	454	0.05	1

Source: OxyChem Specialty Business Group

REMAINING IMPACTS: Because public service impacts to fire departments are not significant, no adverse impacts remain.

CUMULATIVE IMPACTS: The ARB staff has evaluated the SCM to determine potential significant cumulative fire protection impacts. No significant additional project-specific fire protection impacts are expected to result from implementing the SCM, and no significant cumulative adverse fire protection impacts are anticipated.

CUMULATIVE IMPACT MITIGATION: None required.

4. Transportation/Circulation

In the NOP/IS prepared for the SCM, potential transportation/circulation impacts were identified, specifically, that implementing the SCM may cause increased trips to landfills for disposal of additional waste materials (coatings and containers) due to problematic performance characteristics (shelf life, pot life, and freeze-thaw) of certain low-VOC coatings formulations.

Significance Criteria

The project will be considered to have significant transportation/circulation impacts if any one of the following criteria is met in any district:

- The project results in the need for 350 or more employees.
- The project will increase heavy-duty transport truck traffic to and/or from any one facility by more than 350 truck trips per day.
- The project will increase customer traffic by more than 700 trips per day.

PROJECT-SPECIFIC IMPACTS: In response to the NOP/IS, some commenters have asserted that transportation/circulation impacts will occur as a result of implementing the SCM because of the reduced freeze-thaw stability of low-VOC coatings. It is asserted that out-of-state manufacturers would have to ship these coatings during the three nonwinter seasons to avoid potential freezing en route, resulting in an increase in traffic during the high ozone periods.

In addition, some manufacturers have also asserted that low-VOC coatings require more surface preparation and have longer drying times than conventional coatings. As a result, jobs will take more than one day to complete. Other transportation/circulation issues include the assertion that low-VOC coatings contain a higher solids content, with a lower average coverage area. As a result, more transport trips would be necessary to supply the additional volumes of coatings for a given job. It is also claimed that low-VOC coatings require more touch-up and repair, which means more trips to each job site.

Some industry members have also claimed that the SCM will generate solid waste/hazardous waste impacts which in turn, will lead to increased traffic impacts due to compliant coatings having allegedly shorter pot lives, shorter shelf lives, or lesser freeze-thaw capabilities compared to existing coatings.

ANALYSIS: Regarding freeze-thaw characteristics, manufacturers have indicated that the addition of surfactants will improve the freeze-thaw capabilities of water-borne coatings. In addition, the NTS study shows that there are compliant water-borne coatings that have passed freeze-thaw stability tests (see Appendix D). Regarding drying time, as discussed in the Air

Quality section of this chapter, both the NTS study and ARB staff's evaluation of coatings product data sheets indicate that low-VOC primers, sealers, and undercoaters have comparable or shorter drying times, on average, than conventional coatings. (It is assumed that the largest concern regarding drying time would be for primers, sealers, and undercoaters, which by definition require additional topcoats.) Consequently, the assertion that low-VOC coatings have longer drying times that will require more trips over more days is not supported by the NTS study or coatings product information sheets.

Also, as discussed in the Air Quality impacts section of this chapter, manufacturers' recommendations are the same for conventional and low-VOC coatings (*i.e.*, apply to clean, dry surfaces). It is not expected that these recommendations would change to require further surface preparation if additional coatings were to be reformulated as a result of the SCM.

As further discussed in the Air Quality section, results of the NTS study, historical sales data, and staff's evaluation of product data sheets indicate that coverage area for low-VOC coatings is generally comparable to that of conventional coatings. Therefore, it is not likely that additional trips due to apply additional volumes of coatings will be necessary.

Extra touch-up and repair and more frequent coating applications are related to durability qualities of coatings. As discussed in the Air Quality section of this chapter, both the NTS study and ARB staff's evaluation of coatings product data sheets indicates that low-VOC coatings have durability characteristics comparable to conventional coatings.

Staff's worst-case evaluation of the solid waste/hazardous waste impacts associated with the use of low-VOC coatings (see below) does not indicate that there will be significant increases in the amount of material landfilled due to freeze-thaw, shelf-life, or pot-life problems. The small incremental increase (if any) would not generate the need for additional employees, or generate additional customer or heavy-duty truck traffic that would exceed the significance criteria described above.

CONCLUSION: Based upon the above considerations, no significant adverse transportation/ circulation impacts are anticipated from implementing the SCM.

PROJECT-SPECIFIC MITIGATION MEASURES: No mitigation measures are required.

CUMULATIVE IMPACTS: The ARB staff has evaluated the SCM to determine potential significant cumulative transportation/circulation impacts. No significant additional project-specific transportation/circulation impacts are expected to result from implementing the SCM, and no significant cumulative adverse transportation/circulation impacts are anticipated.

CUMULATIVE IMPACT MITIGATION: None required.

5. Solid Waste/Hazardous Waste

In the NOP/IS prepared for the SCM, ARB staff identified potential significant adverse solid waste/hazardous waste impacts associated with the implementation of the SCM, specifically, whether implementation of the SCM on a statewide basis could cause solid waste/hazardous waste impacts as described below.

Significance Criteria

The project will be considered to have significant adverse solid waste/hazardous waste impacts if the following criteria are met by the project in any district:

- The generation and disposal of nonhazardous or hazardous wastes that exceed the capacity of designated landfills.
- The project does not comply with federal, state, and local statutes and regulations related to solid waste and hazardous waste.

PROJECT-SPECIFIC IMPACTS: Comments received on the NOP/IS have alleged that implementing the SCM will generate solid waste/hazardous waste impacts for the following reasons:

- Compliant lower-VOC coatings targeted by the SCM will not have the same freeze-thaw capabilities as existing coatings, and therefore may "go bad" during transport from mild climates to extreme climates, resulting in that load being discarded into a landfill.
- Compliant lower-VOC coatings targeted by the SCM will have shorter shelf lives, and therefore a percentage of the manufacturer's inventory will have to be landfilled because the coatings have "gone bad" in the can over time.
- As a result of the lower-VOC content limits for IM and floor coatings, manufacturers will formulate more two-component systems that may have, on average, a shorter pot life compared to conventional coatings. As a result, low-VOC coatings could solidify in the can during the application process, resulting in an unusable portion of coating that would need to be discarded into a landfill.
- Because the proposed SCM will require the use of water-borne technologies, more surface preparation in the form of sandblasting will be required. This in turn will increase the amount of wastes deposited in landfills.

ANALYSIS: ARB staff evaluation of coatings product data sheets (see the tables in Appendix E and Table IV-2) shows that all categories of low-VOC coatings except quick dry primers, sealers, and undercoaters have comparable or even longer shelf lives than conventional coatings. However, low-VOC IM and floor coatings had average pot lives that were shorter (on the order of one-half) than those of conventional coatings. As discussed above, the NTS study shows that there are compliant water-borne coatings that pass freeze-thaw stability tests. Furthermore, manufacturers have indicated that the addition of surfactants will help to overcome freeze-thaw problems.

To estimate solid waste impacts associated with implementing the SCM, staff assumed that, beginning in 2003 and 2004 (for IM coatings), five percent of all affected coatings (those that currently do not comply with the proposed VOC limits; see Table II-2) would be landfilled

due to freeze-thaw problems, one percent of all affected coatings would be landfilled due to a shorter shelf life, and 10 percent of all IM and floor coatings would be landfilled as a result of having a shorter pot life (SCAQMD, 1999). According to California law, coatings that have solidified are not considered a hazardous waste and may disposed of in municipal landfills (although it is illegal for the homeowner or contractor to intentionally allow a paint to solidify for purposes of such disposal). Liquid coatings must be sent to a hazardous waste treatment facility (see below). Therefore, the ARB staff assumed that the only coatings that would solidify due to the SCM and be considered nonhazardous waste would be IM and floor coatings. However, the empty containers of failed (but still liquid) coatings due to freeze-thaw and shelf-life problems were included in the solid waste analysis.

Table IV-11 shows the estimated nonhazardous material that may be landfilled if industry's assertions are correct. Table IV-11 also shows that the landfilling of nonhazardous material associated with implementation of the SCM is insignificant, accounting for less than one percent of the permitted 1999 throughput in any county.

According to the Department of Toxic Substances Control (DTSC), latex (water-borne) paint in its virgin (pure) form is not considered a hazardous material. However, DTSC indicates that when coatings formulators add pigments, binders, biocides, etc., to virgin latex paint it becomes a hazardous material. In this form, latex paint cannot be disposed of into sewers or storm drains unless it is a constituent of wastewater generated from equipment cleaning activities. Furthermore, DTSC recommends cleaning equipment (brushes, rollers, and spray guns) used to apply latex paint with water in sinks or other facilities that flow directly to a wastewater treatment facility.

Increased sandblasting wastes are not expected as a result of implementing the SCM. As discussed in the Air Quality section of this chapter, manufacturers' recommendations do not currently specify additional surface preparation, including abrasive blasting, for water-borne coatings. As with all coatings, the surface needs to be properly prepared prior to application of a coating for optimal performance.

To estimate the amount of liquid hazardous waste that would be generated due to implementation of the SCM, it was assumed that five percent and one percent per year of all coatings affected by the SCM would be disposed due to freeze-thaw and shelf-life problems, respectively. As a worst-case scenario, it was assumed that construction of additional permitted capacity within California would not occur. It was also assumed that all coatings, including existing solvent-borne formulations, would be reformulated as waterborne coatings. As shown in Table IV-12, the increased amount of coatings that would be disposed of in hazardous waste landfills from 2003 through 2010 is not expected to significantly impact the capacity of these landfills.

It should be noted that the above analysis overestimates the actual solid waste and hazardous waste impacts associated with implementation of the SCM for several reasons. First, it is not likely that coatings manufacturers will simply dispose of all coatings damaged due to the alleged freeze-thaw and shelf-life problems. It may be possible that some of these coatings can be reused for various other purposes, such as painting over graffiti, etc. Second, discussions with manufacturers of low-VOC resin technology have indicated that the inclusion of surfactants will help eliminate freeze-thaw and shelf-life problems. Lastly, when painting contractors become familiar with appropriate application techniques required for applying low-VOC, two-component IM systems, pot-life problems will decrease significantly or be eliminated altogether since the contractors will be able to more accurately estimate the correct amount of coating to be

mixed to minimize waste. It is expected that by the time the SCM VOC limits become effective, painting contractors will have learned the proper application techniques for the low-VOC, two-component IM systems. Therefore, the amount of pot-life disposal shown in Table IV-11 above should drop even further after the VOC limits become effective.

CONCLUSION: As shown in Tables IV-11 and IV-12, even if some compliant coatings are landfilled due to freeze-thaw, shelf-life, or pot-life problems, the total amount of solid waste and hazardous waste material deposited in California's landfills will not create a significant solid waste or hazardous waste impact.

PROJECT-SPECIFIC MITIGATION MEASURES: No mitigation measures are required.

CUMULATIVE IMPACTS: The ARB has evaluated the SCM to determine potential significant cumulative solid waste/hazardous waste impacts. No significant additional project-specific solid waste/hazardous waste impacts are expected to result from implementing the SCM, and no significant cumulative adverse solid waste/hazardous waste impacts are anticipated for the reasons identified above.

CUMULATIVE IMPACT MITIGATION: None required.

6. Hazards

The NOP/IS prepared for the SCM identified potential significant adverse hazards impacts associated with the proposed project, specifically, whether implementation of the SCM on a statewide basis could generate hazards impacts as described below. Hazards impacts are divided into hazards impacts and human health impacts and are analyzed separately.

a. Hazardous Materials

Significance Criteria

The project will be considered to have significant adverse hazards impacts if any one of the following criteria is met by the project in any district:

- The project results in a substantial number of people being exposed to a substance causing irritation.
- The project results in one or more people being exposed to a substance causing serious injury or death.
- The project creates substantial human exposure to a hazardous chemical.

TABLE IV-11
ANTICIPATED SOLID WASTE IMPACTS ASSOCIATED WITH IMPLEMENTING THE SCM[a]

County	Permitted Throughput tons/day (1999)	Freeze-Thaw Disposal[b] tons/day (2010)	Shelf-Life Disposal[c] tons/day (2010)	Pot life Disposal[d] tons/day (2010)	Total Disposal tons/day (2010)	Total Impact (% of Permitted Throughput)
Alameda	16014	0.196[e]	0.033[e]	0.384[e]	0.613[e]	0.004
Alpine	0	0.000	0.000	0.000	0.000	N/A
Amador	3	0.003	0.001	0.006	0.010	0.323
Butte	170	0.021	0.004	0.041	0.065	0.039
Calaveras	500	0.004	0.001	0.009	0.014	0.003
Colusa	1	0.002	0.000	0.005	0.008	0.790
Contra Costa	6750	0.082	0.014	0.162	0.258	0.004
Del Norte	30	0.003	0.001	0.006	0.009	0.032
El Dorado	300	0.017	0.003	0.034	0.054	0.018
Fresno	1984	0.077	0.013	0.150	0.240	0.012
Glenn	100	0.003	0.001	0.006	0.010	0.010
Humboldt	500	0.011	0.002	0.021	0.034	0.007
Imperial	1153	0.018	0.003	0.035	0.056	0.005
Inyo	109	0.002	0.000	0.003	0.005	0.005
Kern	6586	0.069	0.012	0.135	0.216	0.003
Kings	300	0.012	0.002	0.024	0.039	0.013
Lake	200	0.006	0.001	0.012	0.020	0.010
Lassen	135	0.003	0.001	0.007	0.011	0.008
Los Angeles	69382	0.852	0.144	1.671	2.666	0.004
Madera	395	0.014	0.002	0.028	0.044	0.011
Marin	2300	0.021	0.004	0.041	0.065	0.003
Mariposa	60	0.002	0.000	0.003	0.005	0.009
Mendocino	203	0.008	0.001	0.017	0.026	0.013
Merced	1300	0.021	0.004	0.042	0.066	0.005
Modoc	10	0.001	0.000	0.002	0.003	0.029
Mono	26	0.001	0.000	0.002	0.003	0.012
Monterey	2117	0.039	0.006	0.076	0.121	0.006
Napa	1650	0.012	0.002	0.023	0.036	0.002
Nevada[f]	0	0.010	0.002	0.019	0.030	N/A
Orange	21700	0.254	0.043	0.499	0.795	0.004
Placer	1200	0.026	0.004	0.051	0.082	0.007
Plumas	1249	0.002	0.000	0.004	0.006	0.000
Riverside	10498	0.171	0.029	0.335	0.534	0.005
Sacramento	6628	0.115	0.019	0.226	0.361	0.006
San Benito	250	0.005	0.001	0.011	0.017	0.007
San Bernardino	10266	0.176	0.030	0.345	0.550	0.005
San Diego	12665	0.276	0.047	0.542	0.865	0.007
San Francisco	0	0.063	0.011	0.123	0.197	N/A
San Joaquin	8035	0.058	0.010	0.114	0.183	0.002
S. Luis Obispo	1563	0.026	0.004	0.051	0.082	0.005
San Mateo	3998	0.065	0.011	0.129	0.205	0.005
Santa Barbara	3352	0.038	0.006	0.074	0.118	0.004
Santa Clara	12750	0.162	0.027	0.319	0.508	0.004
Santa Cruz	1295	0.025	0.004	0.049	0.078	0.006
Shasta	1803	0.017	0.003	0.034	0.054	0.003

TABLE IV-11 (CONTINUED)
ANTICIPATED SOLID WASTE IMPACTS ASSOCIATED WITH IMPLEMENTING THE SCM[a]

Sierra	5	0.000	0.000	0.001	0.001	0.018
Siskiyou	73	0.004	0.001	0.008	0.012	0.017
Solono	6730	0.038	0.006	0.076	0.120	0.002
Sonoma	2500	0.044	0.007	0.086	0.137	0.006
Stanislaus	1700	0.047	0.008	0.092	0.147	0.009
Sutter	0	0.008	0.001	0.016	0.025	N/A
Tehama	100	0.006	0.001	0.011	0.018	0.018
Trinity	20	0.001	0.000	0.002	0.004	0.019
Tulare	599	0.038	0.006	0.074	0.118	0.020
Tuolumne	15	0.005	0.001	0.011	0.017	0.116
Ventura	3000	0.069	0.012	0.135	0.215	0.007
Yolo	2300	0.016	0.003	0.031	0.049	0.002
Yuba[g]	1000	0.014[g]	0.002[g]	0.028[g]	0.044[g]	0.004
California Total	227572	3.202	0.640	6.283	10.127	0.004

[a] The 1998 ARB Architectural Coatings Survey sales data is used as the baseline for 1996. Coatings sales for 2010 were grown according to California population projections from the Dept. of Finance and apportioned to individual counties.
[b] Assumed that five percent of all containers from coatings affected by the SCM would be landfilled (liquid product is a hazardous waste). Also assumed that all coatings are sold in gallon containers, and that each container weighs one pound.
[c] Assumed that one percent of all containers from coatings affected by the SCM would be landfilled (liquid product is a hazardous waste). Also assumed that all coatings are sold in gallon containers, and that each container weighs one pound.
[d] Assumed that 10 percent of IM and floor coatings (both solidified product and containers) affected by the SCM would be landfilled. Also assumed that all coatings are sold in gallon containers, and that each container weighs one pound. To convert gallons to tons, it is assumed that the coatings had an average density of 10.5 pounds per gallon.
[e] Includes waste from the city and county of San Francisco.
[f] Waste is shipped to Lovelock, Nevada for disposal.
[g] Includes waste from Sutter Co.

PROJECT-SPECIFIC IMPACTS: Hazards impacts concerns are related to the risk of fire, explosions, or the release of hazardous substances in the event of an accident or upset conditions. It is expected that the VOC content limits in the proposed SCM may be achieved, in part, through the use of replacement solvents and predominantly water-borne technologies. For example, acetone, which is a flammable substance, may be used as a replacement solvent in lacquer, floor coating, and some waterproofing sealer formulations. Overall, exempt solvents such as acetone, Oxsol 100, and t-butyl acetate (if formally delisted as a VOC by the U.S.EPA), are considered to be viable alternatives to other, more toxic solvents currently found in various coatings.

TABLE IV-12
ANTICIPATED HAZARDOUS WASTE IMPACTS ASSOCIATED WITH IMPLEMENTING THE SCM[a]

Facility	Permitted Capacity cubic yards (1999)	Remaining Capacity cubic yards (1999)	Estimated Remaining Years (as of 1999)	Freeze-Thaw Disposal[b] cubic yards	Shelf-Life Disposal[c] cubic yards	Total Disposal cubic yards	Total Impact (% of Remaining Capacity)
Chem Waste Management, Kettleman Hills	10 million	8 million	20	76,843	15,454	92,296 (2003-2010)	1.15
Safety Kleen, Lokern	10.7 million (not yet constructed)	0.3 million	7	1,227	170	1,448 (2003-2006)	0.43
Safety Kleen, Imperial	2.6 million (not yet constructed)	0.2 million	5	252	50	302 (2003-2004)	0.15

[a] Based on cumulative disposal from 2003-2010 (Chem. Waste Management), 2003-2006 (Safety Kleen, Lokern), and 2003-2004 (Safety Kleen, Imperial.). The 1998 ARB Architectural Coatings Survey sales data is used as the baseline for 1996. Coatings sales for 2003-2010 were grown according to California population projections from the Dept. of Finance. It was assumed that each facility received disposed coatings proportionately to its fraction of the statewide remaining capacity.
[b] Assumed that five percent of all coatings affected by the SCM would be landfilled.
[c] Assumed that one percent of all coatings affected by the SCM would be landfilled .
[d] One cubic yard = 201.96 gallons.

Additionally, solvents such as Texanol and propylene glycol may be used more widely in low-VOC, water-borne formulations as alternatives to more toxic coalescing solvents such as EGBE, EGEE, EGME, and their acetates. Furthermore, diisocyanates (hexamethylene diisocyanate (HDI), methylene bisphenyl diisocyanate (MDI), and toluene diisocyanate (TDI)) may be used more widely in low-VOC, two-component IM systems as activators.

To the extent that future compliant coatings would be formulated with exempt solvents or other potentially hazardous materials, and to the extent that these materials could be accidentally released into the environment, it is conceivable that implementing the VOC limits in the SCM could create significant adverse hazards impacts.

ANALYSIS: As a result of being delisted as a VOC by the U.S. EPA, the ARB, and many districts, acetone usage has been steadily increasing. Although acetone is expected to be used to reformulate some compliant coatings, current information from coatings product information sheets (see the tables in Appendix E) indicates that acetone is only expected to be used in a limited number of coatings categories (lacquers, floor coatings, and waterproofing sealers). Therefore, it is unlikely that implementation of the SCM will substantially increase the future use of acetone throughout California.

While any anticipated increase in acetone usage may increase the number of trucks or rail cars that transport acetone within California, the safety characteristics of individual trucks or rail cars that transport acetone will not be affected by the SCM. The consequences (exposure

effects) of an accidental release of acetone are directly proportional to the size of the individual transport trucks or rail cars and the release rate. Although the probability of an accidental release of acetone could increase, the severity of an incident involving acetone transport will not change as a result of implementing the SCM. Similarly, the severity of an accident involving the storage of acetone is not expected to change from existing conditions. This holds true for other replacement solvents but on a much smaller scale. As shown in Table IV-10, many conventional solvents are as flammable as acetone, so there would be no net change or possibly a reduction in the hazards consequences from replacing some conventional solvents with acetone.

With regard to other possible replacement solvents, based on discussions with resin manufacturers and coatings formulators, the trend in coatings technology is to replace EGBEs with less toxic/less hazardous coalescing solvents such as Texanol and propylene glycol. Staff has verified this trend by reviewing product data sheets and MSDSs for currently available, compliant low-VOC coatings. Additionally, a report prepared for the ARB (Censullo, 1996), indicates that a majority of current water-based formulations (flats and nonflats) do not contain solvents that are hazardous air pollutants (HAPs). Further, it appears that the use of solvents such as Texanol and propylene glycol in water-borne coatings formulations is prevalent today and should continue into the future, with the eventual replacement of more toxic and hazardous coalescing solvents such as EGBEs with less or nontoxic coalescing solvents.

As noted in the Water Quality section of this chapter, some reformulated two-component IM coating systems may contain diisocyanate compounds. While the use of diisocyanate compounds does not reflect the trend of using less hazardous compounds, there should be no significant increase in the risk of upset due to increased use of these compounds. Like Texanol, Oxsol 100, propylene glycol, and ethylene glycol, diisocyanates are significantly less flammable than currently used, highly flammable conventional solvents. Therefore, the increased use of compliant coatings containing diisocyanates would be offset by the decreased use of more flammable solvents.

CONCLUSION: Potential hazards impacts resulting from implementing the SCM are not expected to be significant for the following reasons. The increased use of acetone will generally be balanced by reduced usage of other equally or more hazardous materials such as MEK, toluene, xylenes, etc. Further, emergency contingency plans that are already in place are expected to minimize potential hazards impacts posed by any increased use of acetone in future compliant coatings. In addition, businesses are required to report increases in the storage of flammable and otherwise hazardous materials to local fire departments to ensure that adequate conditions are in place to protect against hazards impacts.

It is also anticipated that resin manufacturers and coatings formulators will continue the trend of using less toxic or hazardous solvents such as Texanol, Oxsol 100, and propylene glycol in their compliant water-borne coatings. Thus, future compliant coatings will likely contain less hazardous or nonhazardous materials as compared to conventional coatings, a net benefit.

While diisocyanates are more toxic than some conventional solvents, they are significantly less flammable than currently used solvents. Thus, the overall risk of upset is not significantly increased as a result of using compliant coatings containing diisocyanates.

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PROJECT SPECIFIC MITIGATION MEASURES: None required.

REMAINING IMPACTS: Because hazards impacts are not significant, no adverse impacts remain.

CUMULATIVE IMPACTS: The ARB staff has evaluated the SCM to determine potential significant cumulative hazards impacts. No significant additional project-specific hazards impacts are expected to result from implementing the SCM, and no significant cumulative adverse hazards impacts are anticipated.

CUMULATIVE IMPACT MITIGATION: None required.

b. Human Health

The NOP/IS prepared for the SCM identified potential significant adverse human health impacts associated with the proposed project, specifically, whether the use of reformulated coatings could generate human health impacts as described below.

Significance Criteria

The project will be considered to have a significant adverse human health impact if any of the following occur in any district:

- The project equals or exceeds a maximum individual cancer risk (MICR) threshold for toxic air contaminants (TACs) of one in one million (1×10^{-6}) for both project-specific and cumulative impacts.
- The project creates an excess cancer case of 0.5 or greater in a population subject to a cancer risk of greater than one in one million (1×10^{-6}).
- The project results in HAP emissions that result in a hazard index greater than or equal to 1.0.

Some industry representatives have asserted that low-VOC compliant coatings will contain compounds that are more toxic than current formulations. For example, diisocyanates (HDI, MDI, and TDI) may be used more widely in low-VOC, two-component IM systems. Manufacturers have also suggested that for some IM applications, two-component, low-VOC systems containing diisocyanates will replace existing higher-VOC, two-component and one-component systems.

Based on discussions with manufacturers, exempt solvents are considered to be viable alternatives to aid coatings manufacturers in reformulating existing coatings to meet the VOC content limits proposed in the SCM. For example, acetone may be used as a replacement solvent in lacquers, floor coatings, and waterproofing sealers. Acetone has been used in lacquers and waterproofing sealers, but manufacturers may increase the acetone content in these coatings to comply with the SCM limits.

Coalescing solvents such as Texanol and propylene glycol may be used more widely in low-VOC water-borne formulations as alternatives to their more toxic counterparts such as EGBE, EGEE, EGME and their acetates. In certain coatings formulations such as nonflats, coalescing solvents act as plasticizers to allow the otherwise solid resin to flow together to form a film.

Using available toxicological information to evaluate potential human health impacts associated with implementing the SCM, ARB staff compared the toxicity of the most common currently used coatings solvents to solvents expected to be used in reformulated, compliant coatings. As a measure of toxicity, ARB staff compared the Threshold Limit Values (TLVs) established by the American Conference of Governmental Industrial Hygiene (ACGIH), OSHA's Permissible Exposure Limits (PELs) and Short Term Exposure Limits (STELs), the Immediately Dangerous to Life and Health (IDLH) levels recommended by the National Institute for Occupational Safety and Health (NIOSH), and health hazards developed by the National Safety Council.

As illustrated in Table IV-13, some replacement solvents have higher or less severe TLVs, PELs, STELs, and IDLHs than conventional solvents. For example, acetone is considered less toxic than most of the listed conventional solvents. However, some replacement solvents, in particular the diisocyanate group of solvents, appear to have more severe toxicological effects than conventional solvents.

To analyze the toxic effects associated with the use of compliant low-VOC coatings, the SCAQMD conducted a health risk assessment for the compounds listed in Table IV-13 consistent with the procedures in the SCAQMD's Risk Assessment Procedures for Rules 1401 and 212 and the ARB's Health Risk Assessment (HRA) Computer Program (version 2.0e).[4] A HRA is used to estimate the likelihood of an individual contracting cancer or experiencing other adverse health effects as a result of exposure to toxic air contaminants (TACs). Risk assessment is a methodology for estimating the probability or likelihood of the occurrence of an adverse health effect.

Risks from carcinogens are expressed as an added lifetime risk of contracting cancer as a result of a given exposure. For example, if the emissions from a facility are estimated to produce a risk of one in one million (1×10^{-6}) to the most exposed individual, this means that the individual's chance of contracting cancer has been increased by one chance in one million over and above his or her chance of contracting cancer from all other factors (diet, smoking, heredity, etc.). This added risk to a maximally exposed individual is referred to as a "maximum individual cancer risk" or MICR.

[4] ARB and OEHHA staff evaluated both the methodology and conclusions reached by SCAQMD in their HRA. ARB and OEHHA staff agree with both, and the ARB staff therefore concluded that no significant adverse human health impacts will occur due to implementation of the SCM.

TABLE IV-13
TOXICITY OF COATING SOLVENTS

Conventional Solvents				
Solvents	**TLV (ACGIH) (ppm)**	**PEL (OSHA) (ppm)**	**STEL (ACGIH) (ppm)**	**IDLH (NIOSH) (ppm)**
Toluene	50	200	300	500
Xylenes	100	100	150	900
MEK	200	200	300	3,000
Stoddard solvent	100	500	Not Established	3,400
Ethyl alcohol	1000	1000	Not Established	3,300 @ 10% LEL
Methyl alcohol	200	200	250	6,00
EGBE	25	50	Not Established	700
EGEE	5	200	Not Established	500
EGME	5	25	Not Established	200
Replacement Solvents				
Solvents	**TLV (ACGIH) (ppm)**	**PEL (OSHA) (ppm)**	**STEL (ppm)**	**IDLH (ppm)**
Acetone	500	1000	750	2,500 @ 10% LEL
Texanol	Not Established	Not Established	Not Established	Not Established
Di-propylene glycol	Not Established	Not Established	Not Established	Not Established
Propylene glycol	50[1]	Not Established	Not Established	Not Established
Ethylene glycol	50	50	Not Established	Not Established
Oxsol 100	25[2]	Not Established	Not Established	Not Established
Methylene chloride	50	25	Not Established	2,300[3]
TDI	0.005	0.02	0.02	2.5
HDI	0.005	Not Established	Not Established	Not Established
MDI	0.005	0.02	0.02	7

Sources: [1] AIHA workplace environmental exposure level
[2] Manufacturer's recommendation
[3] California recommendation

To evaluate noncancer health effects from a TAC, exposure levels are estimated (just as with carcinogens) so that they can be compared to a corresponding Reference Exposure Level (REL). As for carcinogens, exposure is evaluated for the most exposed individual. Chronic exposures are evaluated using the same exposure assumptions described for carcinogens—continuously for a 70-year residential lifetime or eight to nine hours per day and 50 weeks per year for a 46-year working (commercial or industrial) lifetime. For acute exposures, the maximum hourly airborne concentration of a TAC is estimated. The health risk from exposure to a noncarcinogenic TAC is evaluated by comparing the estimated level of a sensitive receptor's exposure to the TAC to the TAC's REL. The ratio is expressed as a hazard index (HI), which is the ratio of the estimated exposure level to the REL:

$$\text{Hazard Index (HI)} = \frac{\text{Estimated Exposure Level}}{\text{Reference Exposure Level}}$$

A HI of one or less indicates that the estimated exposure level does not exceed the REL, and that no adverse health effects are expected. For CEQA purposes, the SCAQMD's significance threshold for noncarcinogenic impacts is a hazard index greater than or equal to one.

The ratio of the estimated acute level of sensitive receptor's exposure to a TAC to the acute REL is called an acute HI. The ratio of the estimated chronic level of exposure to a TAC to its chronic REL is called a chronic hazard index. Based on the foregoing HRA methodologies, the SCAQMD estimated the long-term carcinogenic, long-term chronic, and short-term acute health risks associated with the use of the above-listed compounds where toxicity data were available. Tables IV-14 through IV-16 highlight the results of this risk analysis. These tables present the amount of each compound that can be emitted and coating usage before the SCAQMD significance thresholds are exceeded. For a more detailed discussion of how the table values were derived, and the unit risk factors, chronic RELs, and acute RELs used to conduct the HRA, the reader is referred to Appendix E of this Draft Program EIR.

i. Carcinogenic Effects

PROJECT-SPECIFIC IMPACT: Discussions with resin manufacturers and coatings formulators and review of coatings product sheets indicate that TDI may be used in some low- or zero-VOC, water-borne, two-component IM coating systems. TDI is the only compound listed in Table IV-13 that has a carcinogenic unit risk factor (OEHHA, 1999a). TDI belongs to a group of compounds known as diisocyanates, which are low-molecular-weight aromatic and aliphatic compounds. HDI and MDI also belong to this group, but are not considered to be carcinogenic. These water-borne compliant formulations are intended as direct replacements for their higher-VOC, solvent-borne, two-component counterparts currently being applied. Some industry representatives have suggested that water-borne two-component systems may also replace higher-VOC, solvent-borne, one-component IM systems. Thus, there could be an incremental increase in the use of coatings containing TDI, HDI, and MDI.

Comments received on the NOP/IS indicated that the possible use of coatings containing diisocyanates used in the neighborhood of a school, as well as on school structures themselves, could cause adverse health effects.

Additional comments received on the NOP/IS indicated that implementation of the SCM will eliminate solvent-borne primers and result in increased use of sandblasting to prepare surfaces for coating with water-borne systems, thus exposing people to crystalline silica, a Proposition 65 carcinogen.

ANALYSIS: In the HRA conducted by the SCAQMD (see footnote 4), the potential cancer risks to downwind receptors and applicators of compliant coatings containing TDI were analyzed. As a worst-case scenario, SCAQMD staff assumed that approximately one percent (by weight) of the TDI in a two-component system would be emitted, although in theory these low- to zero-VOC systems should not result in volatilization of any VOCs, including TDI. The results of the HRA for the use of coatings containing TDI are shown in Table IV-14.

As shown in Table IV-14, approximately 1.5 gallons per day of coatings containing TDI can be used before the significance threshold of a MICR $>1 \times 10^{-6}$ is exceeded at a downwind receptor distance of 100 meters. At closer source receptor distances, the amount of daily

coatings that can be used before the 1 x 10^{-6} threshold is exceeded are 0.13 gallons at 25 meters and 0.04 gallons at 50 meters.

TABLE IV-14
MAXIMUM INDIVIDUAL CANCER RISK FROM POTENTIAL EXPOSURES TO TDI COATINGS
(Gallons Per Day That Would Exceed a MICR of 1 x 10^{-6})

	Downwind Receptor Distances (in meters)					
	25		**50**		**100**	
Compound	**Emissions** lbs/day	**Usage** gals/day	**Emissions** lbs/day	**Usage** gals/day	**Emissions** lbs/day	**Usage** gals/day
TDI	0.01	0.13	0.04	0.39	0.16	1.48

Regarding the comment about exposure to crystalline silica as a result of sandblasting, as discussed in the Air Quality section of this chapter, manufacturers' recommendations are the same for conventional and low-VOC coatings (*i.e.*, apply to clean, dry surfaces). It is not expected that these recommendations would change if additional coatings were to be reformulated as a result of the SCM. However, any potential increase in sandblasting would not be expected to result in increased exposure to crystalline silica for the following reasons. State law restricts outdoor abrasive blasting (including sandblasting) throughout California. Under title 17, CCR, abrasive blasting may not be performed outdoors unless specified techniques and/or materials are used. Those techniques and materials minimize the emission of fine particulate matter from blasting operations, and thus minimize public exposure to inhalable particles. Specifically, the regulation requires that outdoor blasting be conducted using either wet, hydroblasting, or vacuum blasting techniques, or must use iron shot/grit or ARB-certified abrasives. Abrasives must meet specific performance standards before they can be certified by ARB. The performance standards require that, before blasting, the abrasives shall not contain more than one percent by weight material passing a #70 U.S. standard sieve and that, after blasting, the abrasives shall not contain more than 1.8 percent by weight material five microns or smaller. As an alternative to the before-blasting requirements, the abrasive shall not produce visible emissions more than 20 percent opacity when blasted in accordance with a specified test method. A variety of abrasive types have been certified by ARB. Certified abrasives include such materials as garnet, corn cob, dry ice, sand, glass, natural mineral olivine, and nickel, copper, and coal slag.

CONCLUSION: Although the daily usage levels in Table IV-14 are quite low, significant adverse carcinogenic human health impacts are not expected for downwind residential or sensitive receptors for the following reasons. As explained above, the resultant MICR from the HRA estimates the probability of a potential maximally exposed individual contracting cancer as a result of continuous exposure to toxic air contaminants over a period of 70 years for residential and 46 years for worker receptor locations. Most, if not all, applications of low- or zero-VOC, two-component IM systems containing TDI will occur primarily in industrial settings where residential or sensitive receptors are not proximately located. Furthermore, the application of these coating systems will be for maintenance (touch-up and repair) or repaint purposes, lasting only several days to several weeks, and occurring on an intermittent basis (once every 2-3 years to every 10 years, or more). Furthermore, as shown below in the Acute Effects subsection, the amount of TDI, HDI, or MDI emitted during spraying applications is below acceptable human exposure levels. Therefore, downwind residential or sensitive receptors will not be exposed on a long-term basis to TDI concentrations that would result in significant carcinogenic human health impacts.

Significant carcinogenic impacts are also not expected for workers (coatings applicators). Discussions with resin manufacturers and coatings formulators reveal that significant cancer

risks are eliminated by following the coatings manufacturers', OSHA's, and ACGIH's required and recommended safety practices for handling materials containing TDI. (See the "Acute Effects" subsection for a description of the recommended safety practices for handling materials containing TDI, as well as HDI and MDI.) According to resin manufacturers and coatings formulators, the safety practices and application techniques associated with higher-VOC, solvent-borne, two-component systems will be the same for the compliant water-borne, two-component systems, in part because some existing two-component systems also contain diisocyanates. Thus, applicators will not require additional training beyond what is currently required regarding the proper handling or proper application of these compliant coatings.

Furthermore, it appears that HDI and MDI are replacing TDI in compliant water-borne, two-component systems. Since HDI and MDI are noncarcinogenic, the replacement of TDI with HDI and MDI would eliminate the cancer risk associated with the use of these coatings.

Finally, staff concludes that increased exposure to crystalline silica will not occur because: 1) implementation of the SCM is not expected to cause an increase in sandblasting as a method of surface preparation, and 2) California law regulates the practice of abrasive blasting to minimize the emission of fine particulate matter from abrasive blasting operations, and thus minimize public exposure to inhalable particles.

ii. Chronic Effects

PROJECT-SPECIFIC IMPACT: Some industry representatives have stated that several replacement solvents that could be used to formulate compliant low-VOC coatings (TDI and HDI) could cause significant adverse chronic human health impacts. Comments received on the NOP/IS stated that the most prevalent solvent currently used in solvent-borne coatings is mineral spirits, which is neither carcinogenic nor teratogenic, and which will likely be replaced with ethylene glycol ethers and ethylene glycol ether acetates if the SCM is implemented.

ANALYSIS: To analyze the existing chronic health risks associated with solvents used in conventional coatings to downwind receptors and applicators of these coatings, the SCAQMD prepared a HRA (see footnote 4) for solvents used in conventional coatings (Table IV-15). Table IV-15 shows the number of gallons it would take on a daily basis to equal or exceed a chronic hazard index of 1.0. Since no more than 25-30 gallons can be applied per day for most coatings applications (SCAQMD, 1999), solvents that take less than approximately 25 gallons per day to contribute to a chronic hazard index of 1.0 or more could create significant human health impacts. As shown in Table IV-15, the lists of both conventional solvents and replacement solvents contain compounds where typical rates of usage could contribute to a chronic hazard index greater than or equal to 1.0.

As with risks associated with carcinogens, risks associated with compounds that pose chronic risks are based on long-term continuous exposure. Architectural coatings are applied on an infrequent and intermittent basis. For first-time painting or repainting situations, application of coatings occurs all at one time over the course of several hours or weeks, depending on the specific nature of the job. For touch-up and maintenance applications, actual application of coatings takes several hours to several weeks to complete, depending on the specific nature of the job, and occurs periodically throughout the year or over the course of several years. Therefore, because of the intermittent and infrequent application of architectural coatings,

long-term exposure of downwind residential or sensitive receptors to chronic health effects is not anticipated from implementation of the SCM.

TABLE IV-15
CHRONIC EXPOSURE RISK ASSESSMENT
(Gallons Per Day That Would Exceed a Chronic Hazard Index of 1.0)

	Downwind Receptor Distances					
	25m		**50m**		**100m**	
Conventional Solvents	**Emissions** lbs/day	**Usage** gals/day	**Emissions** lbs/day	**Usage** gals/day	**Emissions** lbs/day	**Usage** gals/day
Toluene	30.06	28.63	91.14	86.80	341.12	324.88
Xylenes	45.09	42.94	136.71	130.20	511.68	487.32
MEK	150.30	143.14	455.71	434.01	1705.61	1624.39
Isopropyl Alcohol	300.60	286.28	911.41	868.01	3411.22	3248.78
Glycol Ethers/Acetates	3.01	2.86	9.11	8.68	34.11	32.49
EGBE	3.01	2.86	9.11	8.68	34.11	32.49
EGEE	30.060	28.628	91.141	86.801	341.122	324.878
EGME	3.01	2.86	9.11	8.68	34.11	32.49
Replacement Solvents						
Propylene Glycol	450.90	429.43	1367.12	1302.02	5116.83	4873.18
Ethylene Glycol	60.12	57.26	182.28	173.60	682.25	649.76
Methylene Chloride	450.90	429.43	1367.12	1302.02	5116.83	4873.18
Isocyanate	0.01	0.14	0.043	0.41	0.16	1.54
TDI	0.01	0.10	0.03	0.30	0.12	1.14
HDI	0.00	0.01	0.01	0.04	0.02	0.16

EGBE is a coalescing solvent currently used in some water-borne formulations. Based on discussions with resin manufacturers and coatings formulators, the current trend in coatings technology is to replace EGBEs, or glycol ethers, with less toxic or less hazardous coalescing solvents such as Texanol and propylene glycol. Staff has verified this trend by reviewing product data sheets and material safety data sheets (MSDSs) for currently available compliant low-VOC coatings. Additionally, a report prepared for ARB (Censullo, 1996) indicates that a majority of current water-based formulations (flats and nonflats) contain non-HAP solvents. The report, which is intended to upgrade the species profiles for a number of sources within the general categories of industrial and architectural coatings operations, identified the four most common solvents in the 52 randomly chosen water-borne coatings (flats and nonflats) as: Texanol (found in 37 of 52); propylene glycol (31 of 52); diethylene glycol butyl ether (23 of 52); and ethylene glycol (14 of 52). It appears from this information that the use of non-HAP solvents such as Texanol and propylene glycol in water-borne coatings formulations is already becoming more prevalent. This trend should continue in the future with the eventual replacement of more toxic and hazardous coalescing solvents such as EGBEs with less toxic or hazardous materials.

An article by the Chemical Manufacturers Association, “A Review of the Uses and Health Effects of Ethylene Glycol Monobutyl Ether” (cited in SCAQMD, 1999), indicates that

based on recent studies, there is little possibility of significant adverse human health effects at exposure levels encountered in the typical workplace. Further, the article points out that exposures to EGBE in consumer use would be considerably lower than the ACGIH exposure limit of 25 ppm. The article provided information that workers exposed to EGBE levels twice the ACGIH exposure limit did not experience adverse health effects. To the extent that implementation of the SCM would accelerate the current trend away from EGBEs, human health benefits would be expected.

CONCLUSION: Chronic exposure of coatings applicators to coatings containing replacement solvents, in particular the diisocyanate compounds, is not expected to produce significant chronic risks since applicators will be following the manufacturers' and ACGIH's recommended safety practices, and OSHA's required safety practices, for handling these materials. These recommended safety practices are discussed below in the "Acute Effects" subsection. Because the safety practices and application techniques associated with higher-VOC solvent-borne coatings are the same as those for compliant water-borne coatings, applicators will not need additional training regarding the proper handling or application of compliant coatings containing TDI.

In some compliant water-borne IM coatings, it appears that TDI and HDI are being replaced with MDI. Unlike TDI and HDI, MDI is not currently listed as a chronic TAC in the Air Toxics Hot Spots Program Risk Assessment Guidelines (OEHHA, 1999c). Furthermore, manufacturers are moving away from using EGBE in their water-borne formulations, replacing them with less toxic or less hazardous coalescing solvents such as Texanol and propylene glycol.

Lastly, because of the intermittent and infrequent application of architectural coatings, long-term exposure of downwind residential or sensitive receptors to chronic health effects is not anticipated from implementation of the SCM.

iii. Acute Effects

PROJECT-SPECIFIC IMPACT: Some industry representatives have suggested that several replacement solvents that could be used to formulate compliant low-VOC coatings could cause significant adverse acute human health impacts.

Acute Worker Health Analysis. Several of the solvents used in conventional coatings that were analyzed for chronic health effects have also been analyzed for short-term or acute effects. Table IV-16 presents the results of the SCAQMD's acute HRA for the solvents used in conventional coatings (see footnote 4). (There are no acute RELs for any of the replacement solvents, so they could not be analyzed in the HRA. However, see the discussion of diisocyanates, below.)

As shown in Table IV-16, even low usage of conventional coatings formulated with EGBE, EGEE, or EGME could trigger acute human health impacts. However, as noted earlier, resin manufacturers and coatings formulators are tending towards replacing EGBE, EGEE, and EGME with less toxic coalescing solvents such as Texanol and propylene glycol in conventional, higher-VOC coatings. These less toxic coalescing solvents will likely be used to formulate compliant low-VOC coatings. To a certain extent, the SCM may have the beneficial effect of encouraging or accelerating the trend of formulating coatings with less toxic or nontoxic solvents. Therefore, implementation of the SCM may ultimately provide human health benefits.

TABLE IV-16
SHORT-TERM ACUTE EXPOSURE RISK ASSESSMENT
FOR CONVENTIONAL SOLVENTS
(Gallons Per Day That Would Exceed an Acute Hazard Index of 1.0)

	Downwind Receptor Distances					
	25m		50m		100m	
Compound	**Emissions** lbs/hr	**Usage** gals/day	**Emissions** lbs/hr	**Usage** gals/day	**Emissions** lbs/hr	**Usage** gals/day
Toluene	20.00	152.38	39.98	304.58	107.10	815.96
Xylenes	11.00	83.81	21.99	167.52	58.90	448.78
MEK	6.50	49.52	12.99	98.99	34.81	265.19
Isopropyl Alcohol	1.60	12.19	3.20	24.37	8.57	65.28
Methyl Alcohol	14.00	106.67	27.98	213.21	74.97	571.17
Glycol Ethers/Acetates	0.75	5.71	1.50	11.42	4.02	30.60
EGBE	7.00	53.33	13.99	106.60	37.48	285.59
EGEE	0.19	1.41	0.37	2.82	0.99	7.55
EGME	0.05	0.35	0.09	0.71	0.25	1.90
Methyl Chloroform	34.00	259.05	67.96	517.78	182.06	1387.14
Methylene Chloride	1.75	13.33	3.50	26.65	9.37	71.40

Discussions with coatings manufactures and review of coatings product data sheets indicate that diisocyanates (TDI, HDI, and MDI) may be used to formulate some low-VOC, water-borne two-component IM coatings (SCAQMD, 1999). These compliant water-borne formulations are intended as direct replacements for their higher-VOC, solvent-borne, two-component counterparts, which also contain diisocyanates. However, some industry representatives have asserted that these water-borne two-component systems may also replace solvent-borne, one-component IM systems, which for the most part do not contain diisocyanates. Thus, there could be an incremental increase in the use of coatings containing TDI, HDI, and MDI.

Diisocyanates, including TDI, HDI, and MDI, are low-molecular-weight aromatic and aliphatic compounds. These compounds are widely used in the manufacture of flexible and rigid foams, fibers, coatings, and elastomers, and are increasingly being used in the manufacture of automobiles and building insulation materials as well as autobody repair. The major route of occupational exposure to diisocyanates is inhalation of the vapor or aerosol; exposure may also occur through skin contact during the handling of liquid diisocyanates. Occupational exposure could potentially occur during the mixing and application of two-component IM coatings containing diisocyanates.

Diisocyanates are powerful irritants to the mucous membranes of the eyes and gastrointestinal and respiratory tracts. Direct skin contact with diisocyanates can also cause marked inflammation. Respiratory irritation may progress to a chemical bronchitis with severe bronchospasm.

After one or more exposures, diisocyanates can also sensitize workers, making them subject to severe asthma attacks if they are exposed again—even at concentrations below the NIOSH REL. Death from severe asthma in sensitized subjects has been reported. Additionally, sporadic cases of hypersensitivity pneumonitis (HP) have also been reported in workers exposed

to diisocyanates. Individuals with acute HP typically develop symptoms four to six hours after exposure.

The main concern is when the coating is sprayed onto the substrate. During the application process, it may be possible that the diisocyanates could volatilize and come into contact with the worker. SCAQMD staff contacted resin manufacturers and coatings formulators to obtain additional information about TDI, HDI, and MDI (SCAQMD, 1999). Resin manufacturers indicated that there is currently a trend to replace TDI, which is also a carcinogen, with the less hazardous diisocyanate compounds, HDI and MDI. Furthermore, a resin manufacturer indicated that use of a plural spraying system would minimize the amount of diisocyanate exposure because the diisocyanate compounds bind to the coating constituents during this type of spraying application.

Although adverse human health effects from acute exposures to TDI, HDI, and MDI may occur, OEHHA has not finalized acute RELs for TDI, HDI, and MDI. As a result, there is currently no approved method for analyzing acute health impacts from these compounds. Further, even conservatively using the short-term exposure limit (STEL) of 0.02 for TDI as a surrogate REL for TDI, HDI, and MDI, coatings applicators would have to apply complicated two-component IM systems at a rate of four gallons or more per hour (assuming a sensitive receptor is located at a distance of 100 meters) to exceed an acute HI of 1.0. Investigation reveals that it is not likely that painters could apply two-component systems at this rate (SCAQMD, 1999). Further, the formulation of compliant IM coating systems not containing diisocyanates and the development of spray technology that minimizes diisocyanate emissions should be available when the SCM's VOC content limits go into effect. Lastly, as demonstrated below in the discussion concerning public exposure to diisocyanates, workers' exposures to diisocyanates are for the most part below the acceptable levels. Consequently, the SCM is not expected to result in significant adverse impacts to coatings applicators.

In addition, significant adverse acute health impacts are not expected to occur as a result of implementing the SCM if workers applying two-component coating systems containing diisocyanates follow OSHA's required, and the coatings manufacturers' and ACGIH's recommended, safety practices for handling materials containing diisocyanates. The following paragraphs summarize some of the safety measure required or recommended by NIOSH and OSHA to reduce acute human health impacts associated with the use of compliant coatings containing diisocyanates.

As noted previously, there is already a trend in the coatings industry to move away from reformulating coatings with hazardous materials to less or nonhazardous materials. Therefore, when feasible, coatings applicators should use coatings that contain less hazardous materials. In place of two-component IM systems that contain diisocyanates, coatings applicators can use one-component low-VOC IM systems. Other safety measures to protect individuals against exposure to diisocyanates are described in the following paragraphs.

Worker Isolation – Areas containing diisocyanates should be restricted to essential workers. If feasible, these workers should avoid direct contact with diisocyanates by using automated equipment operated from a control booth or room with separate ventilation.

Protective Clothing and Equipment – When there is potential for diisocyanate exposure, workers should be provided with and required to use appropriate personal protective clothing and equipment such as coveralls, footwear, chemical-resistant gloves and goggles, full face shields, and suitable respiratory equipment.

Respiratory Protection – Only the most protective respirators should be used for situations involving exposures to diisocyanates because they have poor warning properties, are potent sensitizers, or may be carcinogenic. These respirators include:

- Any self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode, and
- Any supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.

Any respiratory protection program must, at a minimum, meet the requirements of the OSHA respiratory protection standard [29 CFR 1910.134]. Respirators must be certified by NIOSH and MSHA according to 30 CFR or by NIOSH (effective July 19, 1995) according to 42 CFR 84. A complete respiratory protection program should include: (1) regular training and medical evaluation of personnel, (2) fit testing, (3) periodic environmental monitoring, (4) periodic maintenance, inspection, and cleaning of equipment, (5) proper storage of equipment, and (6) written standard operating procedures governing the selection and use of respirators. The program should be evaluated regularly. The following publications contain additional information about selection, fit testing, use, storage, and cleaning of respiratory equipment: NIOSH Guide to Industrial Respiratory Protection (NIOSH, 1987a) and NIOSH Respiratory Design Logic (NIOSH 1987b).

Worker and Employer Education – Worker education is vital to a good occupational safety and health program. OSHA requires that workers be informed about:

- Materials that may contain or be contaminated with diisocyanates;
- The nature of the potential hazard [29 CFR 1910.1200]. Employers must transmit this information through container labeling, MSDSs, and worker training;
- The serious health effects that may result from diisocyanate exposures; and
- Any materials that may contain or be contaminated with diisocyanates.

Additionally, workers should take the following steps to protect themselves from diisocyanate exposure:

- Be aware that the highest diisocyanate concentrations may occur inside containment structures.
- Use appropriate respiratory protection when working with diisocyanates.
- Wash hands and face before eating, drinking, or smoking outside the work area.
- Shower and change into clean clothes before leaving the worksite.
- Participate in medical monitoring and examination programs, air monitoring programs, or training programs, offered by your employer.

According to resin manufacturers and coatings formulators, the above safety practices and application techniques recommended for future compliant low-VOC coatings are currently used for conventional, solvent-borne, two-component systems. Thus, applicators will not require additional training regarding the proper handling or application of compliant coatings containing diisocyanates. This will further reduce the applicator's exposure to diisocyanates.

Acute Sensitive Receptor Health Analysis. Most, if not all, applications of two-component IM systems containing diisocyanates will occur in industrial settings where residential or sensitive receptors are not located within 100 meters. However, some industry representatives have asserted that there are certain applications of these coatings where the public could be exposed, such as coating of bridges.

Various health studies indicate that the public's primary exposure to diisocyanates would be through the spraying of two-component IM systems. Controlled laboratory monitoring by Mobay[5] showed nondetectable air concentrations of HDI during mixing of a two-component system containing HDI. Field monitoring conducted by Caltrans showed nondetectable HDI air concentrations during hand brushing and rolling of a one-component system containing HDI. Additionally, as shown in Table IV-17 below, field monitoring studies conducted by Mobay revealed that HDI and MDI concentrations were well below thresholds recommended by ACGIH and OSHA during brushing and rolling of one-component IM topcoats (one system containing HDI and the other containing MDI), as well as during spraying of a two-component IM system containing HDI. Therefore, it is not expected that the general public would suffer significant adverse acute health impacts from exposure to diisocyanates resulting from the mixing and application of compliant one- or two-component IM systems.

It should again be noted that other water-borne technologies are in development that could be viable replacements for some applications of low-VOC, two-component IM systems containing diisocyanates. For example, some resin manufacturers and coatings formulators are offering low-VOC, water-borne, acrylic, acrylic/epoxy, or acrylic urethane dispersed one-component IM systems, instead of two-component polyurethane systems containing diisocyanates. Consequently, implementing the SCM is not expected to result in significant adverse impacts to sensitive receptors.

CONCLUSION: Based upon the above considerations, significant adverse acute human health impacts are not expected as a result of implementing the SCM.

OVERALL CONCLUSION: Based upon the preceding analyses, implementation of the SCM is not expected to create significant adverse carcinogenic, chronic, or acute human health impacts. Although TDI, which is classified as a carcinogen, could be used in low-VOC, two-component IM coatings, adverse impacts are not expected because application of IM coatings occurs primarily in industrial settings where sufficient safety equipment and procedures are in place to prevent significant exposures. Also, the application of these coating systems will be for maintenance (touch-up and repair) or repaint purposes, lasting only a few days to weeks, and occurring on an intermittent basis (once every two years to every 10 years or more). Based on these intermittent exposures, increased cancer risks are negligible. Furthermore, the coatings

[5] Mobay is now Bayer.

industry is moving away from using TDI to using noncarcinogens, such as HDI or MDI, to formulate low-VOC, two-component coatings.

ARB staff does not antipate increased exposures to the carcinogen, crystalline silica, from sandblasting activities because implementation of the SCM is not expected to cause an increase in sandblasting as a method of surface preparation. Furthermore, California law regulates the practice of abrasive blasting to minimize the emission of fine particulate matter from abrasive blasting operations, and thus minimize public exposure to inhalable particles.

No significant chronic human health impacts are expected from implementing the SCM. In the context of worker exposure, the use of personal protective equipment should provide adequate protection to applicators during coatings application. Also, as mentioned above in the discussion of carcinogens, only intermittent exposures are anticipated, particularly for IM coatings. Furthermore, the current trend in coatings technology is to replace EGBEs, or glycol ethers, with less toxic or less hazardous coalescing solvents such as Texanol, ethylene glycol, and propylene glycol.

Finally, no significant acute human health effects are expected from implementing the SCM. Less toxic coalescing solvents will likely be used to formulate some future compliant coatings. Also, the development of spray technology will further reduce diisocyanate emissions. Further, to exceed an acute hazard index of 1.0, painters would have to apply complicated, two-component coatings at a rate of four gallons or more per hour. Investigation reveals that it is not likely that painters could apply two-component systems at this rate. Lastly, based on actual field monitoring data, the brushing, rolling, or spraying of one- or two-component, low-VOC, IM systems containing diisocyanate compounds should not expose the public at large to significant adverse human health impacts. The concentrations of diisocyanate compounds emitted during the application of these IM systems are below established health protective thresholds. In the context of worker exposure, the use of personal protective equipment should provide adequate protection to applicators during coatings application.

PROJECT SPECIFIC MITIGATION MEASURES: None required.

REMAINING IMPACTS: Because human health impacts are not significant, no adverse impacts remain.

CUMULATIVE IMPACTS: The ARB has evaluated the SCM to determine potential significant cumulative human health impacts. No significant, additional, project-specific human health impacts are expected to result from implementing the SCM, and no significant, cumulative, adverse human health impacts are anticipated.

D. ENVIRONMENTAL IMPACTS FOUND NOT TO BE SIGNIFICANT

The NOP/IS concluded that the environmental impact areas identified in the following subsections would not be significantly adversely affected by implementation of the SCM. Therefore, these environmental areas were not further analyzed in this Draft Program EIR. A brief discussion of why the SCM will not significantly adversely affect each of these environmental areas is provided below.

1. Land Use and Planning

Implementation of the SCM will not cause significant adverse impacts to land uses or land use planning in California. Any increased activities are expected to occur at existing facilities, and no new facilities are likely to be constructed which would result in any land use impacts.

No new development or alterations to existing land use designations will occur as a result of implementing the SCM. It is not anticipated that existing land uses located throughout California would require additional land or require rezoning to continue current operations. Therefore, no significant adverse impacts affecting existing or future land uses are expected.

Present or planned land uses in California will not be affected as a result of implementing the SCM. Land use and other planning considerations are determined by local governments and no land use or planning requirements will be altered by the proposed SCM.

2. Population and Housing

Implementation of the proposed SCM will primarily affect the formulation of architectural coatings and is not anticipated to generate any significant effects, either direct or indirect, on California's population as no additional workers are anticipated to be required. Further, implementation of the SCM is not expected to cause a relocation of population within California. As a result, housing in California is not expected to be affected by the SCM. New housing construction is not expected to be affected by the use of compliant, lower-VOC coatings.

Additionally, implementation of the SCM is not expected to contribute to any significant housing cost increases because reformulated coatings are currently being sold at prices comparable to conventional coatings. Direct economic impacts are not required to be analyzed pursuant to CEQA unless they also have a significant, direct effect on physical environmental parameters. Economic impacts associated with the SCM will be discussed in the ARB Staff Report for the SCM.

Table IV-17
Short-term Acute Exposure From the Spraying of a Two-Component IM system containing HDI poly-isocynate

Fleming Park Bridge, Neville Island, Pennsylvania		
Spraying Two-Component Polyurethane Intermediate Coat		
Sample Site	**Monomeric HDI (ppb)**	**HDI Poly-Isocyanate (mg/m^3)**
Painter #1	2.4	2.5
Painter #2	1.9	2.2
Painter #3	4.1	5.2
Downwind 50 ft*	0.5	<0.02
Deck	0.6	0.09
Under the Bridge	<0.4	0.02
TLV/STEL	**20.0****	**1.0*****
Spraying Two-Component Polyurethane Top Coat		
Sample Site	**Monomeric HDI (ppb)**	**HDI Poly-Isocyanate (mg/m^3)**
Painter #1	4.6	1.65
Painter #2	4.0	1.81
Mixer/Supervisor	0.7	0.03
Deck	<0.06	<0.03
In Truck	<0.06	<0.03
Under the Bridge 25 ft*	<0.07	<0.03
Under the Bridge 25 ft*	<0.07	<0.07
Under the Bridge 15 ft*	1.6	0.8
Downwind 50 ft*	1.3	0.8
Mixing Area	0.8	0.04
TLV/STEL	**20.0****	**1.0*****
Mobay New Martinsville, WV Plant		
Spraying Two-Component Polyurethane Top Coat on Chemical Storage Tank		
Sample Site	**Monomeric HDI (ppb)**	**HDI Poly-Isocyanate (mg/m^3)**
Painter	0.9	0.14
Painter Helper	<0.2	<.0.02
Downwind 25 ft* (North)	<0.2	<.0.02
Above Painters	<0.2	<.0.02
East 25 ft*	<0.2	<.0.02
Downwind 50 ft*	<0.2	<.0.02
West 15 ft*	<0.2	<.0.02
Upwind 15 ft*	<0.3	<.0.03
TLV/STEL	**20.0****	**1.0*****
Spraying Two-Component Polyurethane Top Coat on Waste Treatment Tank		
Sample Site	**Monomeric HDI (ppb)**	**HDI Poly-Isocyanate (mg/m^3)**
Painter	0.9	0.16
Upwind 15 ft*	0.9	<0.04
Downwind 15 ft*	1.4	0.24
Downwind 35 ft*	<0.4	<0.04
STEL	**20.0****	**1.0*****

* Distances are average number of feet from spray gun.

** ACGIH has established a Threshold Level Value as an eight hour Time-Weighted Average (TLV-TWA) for HDI of 5 parts per billion (ppb). Although Permissible Exposure Limits (PELs) have been established for several diisocyanate compounds, federal OSHA has not established on for HDI. Mobay (now Bayer) endorses the ACGIH's Short Term Exposure Limit (STEL) of 20 ppb for HDI. This concentration should not be exceeded even for brief periods.

*** ACGIH and federal OSHA have not TLV-TWA or a PEL for HDI poly-isocyanates. However, Mobay (now Bayer) recommends a TLV-TWA of 0.5 mg/m^3 for HDI poly-isocyanates. Mobay (now Bayer) also recommends a short STEL (averaged over 15 minutes) of 1 mg/m^3 for HDI poly-isocyanates.

3. Geophysical

Architectural coatings are applied to buildings, stationary structures, roads, etc. The proposed amendments affect coatings formulators and have no effects on geophysical formations in California. Additionally, because add-on control equipment will not be used to reduce VOC emissions from architectural coatings, implementation of the SCM is not expected to result in additional exposure of people or property to geological hazards such as earthquakes, landslides, mudslides, ground failure, or other natural hazards. Therefore, implementation of the SCM is not expected to create potential adverse geophysical impacts.

4. Biological Resources

Implementation of the SCM will not cause impacts to sensitive habitats of plants or animals because all activities will typically occur at construction, industrial, or commercial sites already in operation. No new development that could potentially adversely affect plant and animal life is anticipated. Potential impacts to aquatic life from releases of any paint and associated wastewater disposed of in sewers and storm drains are discussed in the Water Quality section of this chapter. The analysis of water quality impacts to both groundwater and surface water concluded that implementing the SCM would not generate significant adverse water quality impacts.

5. Energy and Mineral Resources

a. Electricity

Because add-on control equipment will not likely be used to comply with the provisions of the SCM, no additional energy use is expected from such equipment. Additionally, implementation of the SCM will not substantially increase the number of businesses or amount of equipment in California. Furthermore, energy use associated with specialized spray equipment (plural systems) used to apply reformulated two-component coatings is expected to be negligible. Therefore, no increases in electricity consumption are expected from implementation of the SCM. Consequently, elctricity use impacts are not considered to be significant.

Some industry representatives have asserted that implementing the SCM would increase the demand for electrical power to manufacture more coatings than are currently manufactured. This comment is based on the assumption that for a variety of reasons, low-VOC coatings are inferior to high-VOC coatings, and that the SCM will result in an overall increase in coatings use. All of the issues that supposedly would result in more coatings use have been analyzed in the Air Quality section of this chapter. In general, staff evaluation of coatings product data sheets for a substantial number of conventional and low-VOC coatings (see the tables in Appendix E and Table IV-2) concluded that increased manufacturing of low-VOC coatings will not occur, and therefore increases in electricity demand are not expected.

b. Natural Gas

The consumption of natural gas in California is not expected to increase as a result of implementation of the SCM. Electricity will be the primary source of energy used to power spray equipment operated at various sites throughout California. Consequently, natural gas energy impacts from implementing the SCM are not considered to be significant.

c. Fossil Fuels

Implementation of the SCM is not expected to substantially increase the consumption of nonrenewable fossil fuel resources (diesel and gasoline) within California. It is not anticipated that there will be additional trips associated with more frequent application of compliant coatings, and any additional trips due to increased disposal of compliant coatings will be insignificant. Thus, even if there were an incremental increase in fuel usage, it is expected to be negligible. Therefore, fossil fuel energy impacts from implementing the SCM are not considered to be significant.

d. Mineral Resources

Some industry representatives have asserted that implementation of the SCM would require the production of more coatings in the future than are currently manufactured. Allegedly, this would result in the disposal of more paint cans, resulting in a wasteful use of a mineral resource (metal). As discussed in the "Electricity" subsection above, available information on low-VOC coatings contradicts the assertion that more low-VOC coatings would need to be manufactured than would otherwise be necessary with conventional coatings. Consequently, the SCM is not expected to result in a wasteful use of mineral resources.

A comment received on the NOP/IS stated there could be non-renewable resources impacts resulting from the use of non-paint alternatives such as vinyl or aluminum siding or interior wall coverings, in lieu of unsatisfactory paints. Based on the ARB's staff's analysis of currently compliant coatings, implementation of the proposed SCM is not expected to result in substitution of low-VOC coatings with non-paint alternatives. It is highly speculative that users will abandon paints altogether for non-paint substitutes when compliant performing coatings are available. It should be noted that non-paint substrates such as stucco, siding, and concrete are used throughout California. However, their use for the most part has nothing to do with the availability of compliant performing coatings, but more with user preferences.

6. Noise

No significant noise impacts are associated with the use of architectural coatings. California coatings formulators potentially affected by the SCM are predominantly located in existing industrial or commercial areas. It is assumed that these facilities are subject to and in compliance with existing local noise standards. In addition to noise generated by current operations, noise sources in each area include nearby freeways, truck traffic to adjacent businesses, and operational noise from adjacent businesses.

In general, the primary noise source at existing facilities is from vehicular traffic, such as trucks transporting raw materials to and hauling finished products, wastes, or other materials away from the facility, and miscellaneous noise such as spray equipment (compressors, spray nozzles) and heavy equipment use (forklifts, trucks, etc.). Noise is generated during operating hours, which generally range from 6 a.m. to 5 p.m. Monday through Friday. Implementation of the SCM is not expected to alter noise from existing noise generating sources. It is also likely that affected companies are operating in compliance with any local noise regulations that may exist in their respective communities. Therefore, no significant noise impacts are expected from the proposed project.

Additionally, implementation of the SCM is not expected to result in significant noise impacts in residential areas. As with industrial or commercial areas, it is assumed that these areas are subject to local community noise standards. Contractors or do-it-yourselfers applying compliant coatings in residential areas are expected to comply with local community noise standards. In any event, there should be no increase in noise from coatings application as a result of implementing the SCM.

One comment received on the NOP/IS indicated that because water-borne coatings require more thorough surface preparation compared to solvent-borne coatings, and because solvent-borne primers would no longer be available if the SCM were implemented, more power washing and abrasive blasting will occur, generating noise in residential as well as industrial areas. As discussed in the Air Quality section of this chapter, low-VOC coatings do not require substantially different surface preparation, including power washing or abrasive blasting, than conventional coatings. Moreover, any additional power washing or abrasive blasting would be subject to the same local community noise standards as are current practices. Thus, no additional noise is expected from increased power washing or sandblasting as a result of implementing the SCM.

Some industry representatives have asserted that noise impacts would increase because low-VOC coatings have a lower coverage area than conventional coatings, so spray equipment would be used for longer periods of time. As already discussed, low-VOC coatings generally have a coverage area comparable to conventional coatings (see the “More Thickness” discussion in the Air Quality section of this chapter). Further, coatings application systems that rely on pressure and a power source are available that have very low noise levels associated with them. Consequently, no significant adverse noise impacts are anticipated.

7. Aesthetics

The proposed SCM does not require any changes in the physical environment that would obstruct any scenic vistas or views of interest to the public. In addition, no major changes to existing facilities or stockpiling of additional materials or products outside of existing facilities are expected because any physical changes would occur at existing industrial or commercial sites. Therefore, no significant impacts adversely affecting existing visual resources such as scenic views or vistas are anticipated to occur.

A comment received on the NOP/IS indicated that the Draft Program EIR must analyze aesthetics impacts resulting from the ban of over 90 percent of all architectural coatings. First, implementation of the SCM will not result in the ban of over 90 percent of all architectural coatings, as low-VOC coatings that meet the proposed limits in the SCM are already available and being used for many applications (see Table II-2). Based upon information gathered by ARB staff on these currently available compliant products, which have performance characteristics comparable to conventional coatings, significant aesthetic impacts are not expected.

Another comment received on the NOP/IS stated that the Draft Program EIR must analyze aesthetics impacts from the elimination of the anti-graffiti coatings category. However, based on the availability of anti-graffiti systems that comply with the proposed SCM VOC content limits, ARB staff anticipates that the anti-graffiti coatings category will not be eliminated and that implementation of the SCM will not result in significant aesthetic impacts.

8. Cultural Resources

There are existing laws that protect and mitigate potential impacts to cultural resources. Should archaeological resources be found during the application of architectural coatings to newly constructed or existing structures, the application of such coatings would cease until a thorough archaeological assessment was conducted. Furthermore, the application of architectural coatings would almost always occur after construction, where archaeological resources would have already been disturbed. Implementation of the SCM is therefore not anticipated to result in any activities or promote any programs that could have a significant adverse impact on cultural resources in California.

One comment received on the NOP/IS stated that implementation of the SCM may jeopardize the maintenance of historic buildings because the unavailability of traditional coatings will make maintenance of these buildings more difficult. The commenter stated that it may not be possible to find acceptable substitute products to maintain both the historical and physical integrity of these structures, which is considered especially problematic with the elimination of solvent-borne primers. Staff does not agree that there would be any such impacts. Based upon information on currently available compliant products, performance characteristics of low-VOC products should be sufficient to meet the weathering impacts on outdoor structures. As discussed in the Air Quality section of this chapter, staff's review of the NTS study and product data sheets revealed that water-borne coatings had durability characteristics similar to conventional, solvent-borne coatings and thus do not require more touch-up and repair work. Water-borne primers also have performance characteristics similar to solvent-borne primers.

Consequently, significant adverse impacts to cultural resources are not anticipated as a result of implementing the SCM.

9. Recreation

Implementation of the SCM will not generate additional demand for or otherwise affect land used for recreational purposes. Further, as already explained in the Land Use and Planning, Aesthetics, and Cultural Resources sections above, the proposed amendments are not expected to have adverse affects on land uses in general. No significant adverse effects on recreational facilities were identified.

Some industry representatives have indicated that demand for parks would increase due to increased job losses and unemployed workers. Implementation of the SCM is not expected to result in significant job losses and, therefore, this is not a realistic adverse impact. Even if industry were correct in their assumptions that low-VOC coatings are inferior and more coatings would have to be manufactured and used, such a scenario would result in *more* demand for coatings, and presumably *more* demand for workers to manufacture and apply the coatings. The final version of the Staff Report for the SCM will include the ARB staff's economic assessment that addresses cost and related employment impacts associated with adoption and implementation of the SCM.

10. Economic Impacts

Under CEQA, detailed analyses of economic effects are necessary only when such effects have significant impacts on physical environmental parameters. The SCM would establish VOC content limits for various categories of architectural coatings, and this would have no impact on physical or environmental parameters.

E. OTHER CEQA TOPICS

The following sections address various topics and issues required by CEQA such as growth inducement, short-term versus long-term effects, and irreversible changes.

1. Irreversible Environmental Changes

CEQA Guidelines §15126(c) requires an environmental analysis to consider "any significant irreversible environmental changes which would be involved if the proposed action should be implemented." In particular, CEQA Guidelines §15126.2(c) indicates that "[u]ses of nonrenewable resources during the initial and continued phases of the project may be irreversible since a large commitment of such resources makes removal or nonuse thereafter unlikely. Primary impacts and, particularly, secondary impacts (such as highway improvement which provides access to a previously inaccessible area) generally commit future generations to similar uses. Also, irreversible damage can result from environmental accidents associated with the project. Irretrievable commitments of resources should be evaluated to assure that such current consumption is justified."

The Initial Study identified air quality, water, public services, transportation/circulation, solid waste/hazardous waste, and hazards as potential impact areas to be evaluated. The analysis presented in the Draft Program EIR concluded that no significant adverse project-specific or cumulative impacts would occur to any of these environmental areas.

For example, the air quality impacts analysis included an evaluation of eight issues identified by industry that might produce significant adverse air quality impacts. The results of this analysis indicated that there was no evidence supporting significant adverse air quality impacts as a result of any of the eight

issues. The analysis of water impacts indicated that an incremental increase in the amount of wastewater from cleaning coating equipment could occur, but this increase would not be significant. The analysis of public services and transportation/ circulation concluded that the SCM would not create any significant adverse impacts to these areas. The solid waste/hazardous waste analysis included an evaluation of the potential for an incremental increase in solid waste impacts resulting from some types of coatings that may have a shorter pot life or shorter shelf life, or may be less able to withstand freeze-thaw conditions than conventional coatings. A worst-case analysis was performed and it was determined that even if there were an incremental increase in solid waste impacts, this increase would not be significant. The analysis of hazards impacts indicated that future compliant low-VOC coatings could be formulated with hazardous materials. However, solvents used in low-VOC coatings are typically less hazardous than solvents used in conventional coatings. Therefore, hazards impacts are considered to be insignificant. Further, because IM coatings are typically applied in industrial settings where safety equipment, training, and procedures are in place, workplace exposures to potentially hazardous coatings would be minimal. In addition, because architectural coatings are applied on an as-needed basis, continuous exposures would not occur. As a result, no significant cancer or noncancer human health impacts are anticipated.

As can be seen by the information presented in this Draft Program EIR, the proposed project would not result in irreversible environmental changes or the irretrievable commitment of resources.

2. Potential Growth-Inducing Impacts

CEQA Guidelines §15126(d) requires an environmental analysis to consider the "growth-inducing impact of the proposed action." CEQA Guidelines §15126.2(d) states that the Draft Program EIR shall "[d]iscuss the ways in which the proposed project could foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment."

As already explained in the Land Use and Planning, Aesthetics, and Cultural Resources sections above, implementing the SCM primarily affects existing coatings formulation companies and will not, by itself, have any direct or indirect growth-inducing impacts on California businesses because it is not expected to foster economic or population growth or the construction of additional housing.

F. CONSISTENCY

CEQA Guidelines §15125(d) states that "[t]he EIR shall discuss any inconsistencies between the proposed project and applicable general plans and regional plans. Such regional plans include, but are not limited to, the applicable air quality attainment or maintenance plan or State Implementation Plan, area-wide waste treatment and water quality control plans, regional transportation plans, regional housing allocation plans, habitat conservation plans, natural community conservation plans and regional land use plans for the protection of the Coastal Zone, Lake Tahoe Basin, San Francisco Bay, and Santa Monica Mountains." The following is a brief discussion of how the SCM is consistent with these plans.

1. Consistency with State Implementation Plan

The federal Clean Air Act (Act) requires states to prepare State Implementation Plans (SIPs) describing how they will meet the National Ambient Air Quality Standards. Under the 1990 Amendments to the Act, new SIPs for all serious, severe and extreme federal ozone nonattainment areas were due by November 15, 1994. In order to comply with the Act, in November 1994 the ARB adopted California's 1994 SIP for ozone. The SIP is California's blueprint for meeting the one-hour national ambient air quality standard for ozone. It includes rules adopted by individual local air districts in nonattainment areas, as well the districts' commitments to achieve additional emission reductions by adopting new control measures. The SIP also contains the ARB's mobile source, fuels, and consumer products control programs, California's vehicle inspection and maintenance program, and federal measures. California's 1994 ozone SIP has been approved by the U.S. EPA (see the January 8, 1997, Federal Register notice: 62 FR 1150).

The SCM is consistent with the SIP, because the SCM will be available for adoption by nonattainment districts to help meet their SIP commitments under the Act. Following is a more detailed description of the district architectural coatings SIP commitments that are contained in the 1994 ozone SIP.

In the 1994 ozone SIP, five local air districts in four federal ozone nonattainment areas included control measure commitments to achieve additional VOC emission reductions from architectural coatings. These districts are SCAQMD, Ventura County Air Pollution Control District (VCAPCD), Yolo-Solano Air Quality Management District (YSAQMD), Placer County Air Pollution Control District (PCAPCD), and San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD). YSAQMD and PCAPCD are part of the same federal ozone nonattainment area, which is referred to as the Sacramento Metropolitan Nonattainment Area. Table IV-18 lists the emission reduction commitments for architectural coatings in the 1994 ozone SIP by district and by attainment year. Appendix G identifies the detailed emission reduction commitments by interim milestone years.

TABLE IV-18
1994 OZONE SIP COMMITMENTS FOR VOC EMISSION REDUCTIONS FROM ARCHITECTURAL COATINGS MEASURES

District	Attainment Year	Committed Emission Reductions in Attainment Year		Status of Rulemaking
		TPD	Percentage	
San Joaquin Valley*	1999	1.5	7	In progress
Placer County	2005	1.6	9	Adopted 1997
Yolo-Solano				In progress
Ventura County	2005	0.9	15	In progress
South Coast*	2010	62.3	75	Adopted Phases I & II

* The U.S EPA is in the process of reclassifying San Joaquin Valley as severe nonattainment with an attainment date of 2005.

Table IV-19 below shows that staff believes that the proposed SCM will achieve sufficient reductions when compared to the percentage emission reductions claimed by the San Joaquin Valley Unified, Ventura County, and Yolo-Solano districts in their 1994 ozone SIPs. The mass emission reductions in some cases are less than those claimed in the 1994 ozone SIP (see Table IV-18), primarily because the architectural coatings emissions inventory used in the 1994 ozone SIP is larger than the 1998 survey data used to calculate emission reductions from this proposed SCM. The official ARB emission inventory for architectural coatings is in the process of being updated to reflect these new data. The values in Table IV-19 assume that the emissions from architectural coatings are approximately 100 TPD, on an annual average, statewide, not including emissions from thinning and clean-up (ARB, 1999). The emission reductions from the SCM are estimated to be 11 TPD, in the non-SCAQMD portion of the State.

TABLE IV-19
COMPARISON OF ESTIMATED EMISSION REDUCTIONS FROM THE PROPOSED SCM AND THE 1994 OZONE SIP COMMITMENTS

District	District's percent of California's population (A)	District's architectural coatings inventory (100 TPD * A) = (B)	1994 SIP commitment reduction (C)	1994 SIP commitment reduction (B*C) = (D)	District's percent of SCM reductions (A/55%)(100) (E)	District's reduction from SCM (E*11.3 TPD)
San Joaquin Valley	9.3%	9.3 TPD	7%	0.7 TPD	16.9%	1.9 TPD
Ventura	2.2%	2.2 TPD	15%	0.3 TPD	4.0%	0.5 TPD
Yolo-Solano	0.8%	0.8 TPD	9%	0.1 TPD	1.5%	0.2 TPD

2. Consistency with District Plans under the California Clean Air Act

In addition to the federal planning requirements described above in subsection 1, the California Clean Air Act (CCAA) imposes a separate set of planning requirements on local air pollution control and air quality management districts (districts). The CCAA was enacted in 1988, and has the fundamental goal that all areas of California are to attain the State ambient air

quality standards (State standards) by the earliest practicable date. The State standards are set by the ARB, and the State one-hour ozone standard is more stringent than the federal one-hour ozone standard. As specified in the CCAA, the ARB has designated areas of California to be in "attainment" or "nonattainment" for the State standards. Local districts that are nonattainment for the State standards are required by the CCAA to prepare plans, which must be designed to achieve and maintain the State standards 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.

Of the 35 districts in California, 22 are nonattainment for the State one-hour ozone standard and have air quality planning responsibilities. Of the 22 nonattainment districts, all but four already have an architectural coatings rule. These four districts are the Glenn, San Luis Obispo, Shasta, and Tehama County districts.

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 is consistent with the district plans because, if needed, the SCM will be available for adoption by the above four districts in order to reduce VOC emissions and attain or maintain the State ozone standard. The remaining 18 districts (except for the SCAQMD, which has already adopted a rule that will achieve greater emission reductions than the SCM will achieve) could also revise their existing rules to be consistent with the SCM, in order to achieve greater emission reductions from the SCM's more stringent VOC limits.

3. Consistency with Area-Wide Waste Treatment and Water Quality Control Plans

The SCM is consistent with area-wide waste treatment and water quality control plans because implementation of the SCM on a statewide basis will not significantly affect the ability of POTWs to treat and handle wastewater.

4. Consistency with Regional Transportation Plans (RTPs)

The SCM is consistent with RTPs since no significant adverse impact to transportation/ circulation will result from the additional regulation of architectural coatings within each affected district. While industry has asserted that some traffic and congestion may be generated from the disposal of small quantities of architectural coatings due to shelf-life, pot-life, and freeze-thaw problems, any such effects would be negligible and would not create significant adverse impacts to transportation/circulation. Furthermore, since compliant low-VOC coatings have performance characteristics that are comparable to their higher-VOC counterparts, additional trips are not expected to result over and above current trips associated with conventional coatings.

5. Consistency with Regional Housing Allocation Plans

As explained earlier, implementation of the SCM will not create or cause the need for additional housing throughout California. Furthermore, the SCM will not affect how housing is planned or allocated

in the various districts that could potentially adopt the SCM. Therefore, the SCM is considered to be consistent with regional allocation plans throughout California.

6. Consistency with Habitat Conservation Plans

Implementation of the SCM will not create or cause impacts to sensitive habitats of plants or animals because all activities will typically occur at construction, industrial, or commercial sites already in operation. No new development that could potentially adversely affect plant and animal life is anticipated. Therefore, the SCM is considered to be consistent with habitat conservation plans throughout California.

7. Consistency with Natural Community Conservation Plans

As explained earlier, implementation of the SCM will not create impacts to cultural resources throughout California. There are existing laws in place that are designed to protect and mitigate potential impacts to cultural resources. Should archaeological resources be found during the application of architectural coatings to newly constructed structures or existing structures, the application of such coatings would cease until a thorough archaeological assessment was conducted. Furthermore, in most cases, the application of architectural coatings would occur after construction where archaeological resources would already have been disturbed. Therefore, the SCM is considered to be consistent with natural community conservation plans throughout California.

8. Consistency with Regional Land Use Plans for the Protection of the Coastal Zone, Lake Tahoe Basin, San Francisco Bay, and Santa Monica Mountains

Implementation of the SCM is not anticipated to conflict with regional land use plans for the protection of the Coastal Zone, Lake Tahoe Basin, San Francisco Bay, or the Santa Monica Mountains for the following reasons. As mentioned above, all activities associated with the SCM will typically occur at construction, industrial, or commercial sites already in operation.

Coastal Zone. Implementation of the SCM is not anticipated to result in any new development on tidelands, submerged lands, or public trust lands. Implementation of the SCM is not expected to result in the discharge or disposal of any dredged material or any gaseous, liquid, solid, or thermal waste; the grading, removing, dredging, mining, or extraction of any materials; changes in the density or intensity of use of the land; changes in the intensity of use of water or access thereto; the construction, reconstruction, demolition, or removal of any structures; or the removal or harvesting of major vegetation.

Lake Tahoe Basin. Implementation of the SCM is not anticipated to exceed any established environmental threshold carrying capacity necessary to maintain significant scenic, recreational, educational, scientific, or natural value of the Region or to maintain public health and safety within the Region, including but not limited to standards for air quality, water quality, soil conservation, vegetation preservation, wildlife, fisheries, noise, recreation, and scenic resources.

San Francisco Bay. Implementation of the SCM is not anticipated to result in development or fill of open water and slough areas in the San Francisco Bay that would impact fish and wildlife; vegetation; water surface area and volume; marshes and mudflats; weather and

air quality (from decreasing size of open water through filling and the smog-producing consequences of urban development); shell deposits; and fresh water inflow.

Santa Monica Mountains. Implementation of the SCM is not anticipated to result in any new development that would result in the irreplaceable loss of open space and recreational resources; or the physical and biological deterioration of air, land, and water systems; or that would adversely impact regional life-support systems including fish and wildlife, thereby being harmful to the needs of the present and future population of the region.

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