



APPENDIX G

Comments

on the Draft Program
Environmental Impact Report
Part 2 of 3

CERTIFIED APRIL 2016 | STATE CLEARINGHOUSE # 2015031035



FOR THE **2016-2040** REGIONAL TRANSPORTATION PLAN/
SUSTAINABLE COMMUNITIES STRATEGY

Southern California Association of Governments

**APPENDIX G:
COMMENTS ON THE DRAFT PROGRAM ENVIRONMENTAL IMPACT REPORT
PART 2 OF 3**

Letter Number	Comment letter
SCAG Member Jurisdictions and Local Agencies (Cont.)	
20	City of La Canada Flintridge
21	City of Lake Forest
22	City of Mission Viejo
23	City of Rancho Cucamonga
24	City of San Clemente
25	City of South El Monte
26	City of South Pasadena
27	City of Tustin
28	County of Los Angeles Department of Public Health
29	County of Ventura
30	Orange County Public Works
31	Riverside County Planning Department
SCAG Subregional Governments	
32	Orange County Council of Governments
33	West Riverside Council of Governments
County Transportation Commissions	
34	Orange County Transportation Authority
35	San Bernardino Associated Governments



City Council
David A. Spence, Mayor
Jonathan C. Curtis, Mayor Pro Tem
Michael T. Davitt
Leonard Pieroni
Terry Walker

February 1, 2016

Ms. Courtney Aguirre and Ms. Lijun Sun
Southern California Association of Governments
818 W. 7th Street, 12th Floor
Los Angeles, CA 90017
Via Email: 2016PEIR@scag.ca.gov

Re: 2016 Draft Regional Transportation Plan/Sustainable Communities Strategy and Draft Program Environmental Impact Report

Dear Ms. Aguirre and Ms. Sun:

The City of La Cañada Flintridge is represented by the firm of Shute, Mihaly & Weinberger as a part of the 5-City Alliance (including the cities of Glendale, La Cañada Flintridge, Pasadena, Sierra Madre and South Pasadena) in the matter of the review of the 2016 Draft Regional Transportation Plan/Sustainable Communities Strategy and Draft Program Environmental Impact Report. Their letter, dated January 29, 2016, has been submitted to you separately. The City joins in, and incorporates herein by reference, those comments of the 5- City Alliance.

To serve as reinforcement of this letter, the City asserts its concurrence with the following points made within the letter:

- I. The Proposed Freeway Tunnel Alternative Is Flawed and Unnecessary. | 1
- II. The Freeway Tunnel Alternative Would Not Implement the 2016 RTP/SCS's Goals. | 2
- III. There Are Viable Ways to Maximize the Productivity of the Region's Transportation System While Minimizing Environmental Harm. | 3
- IV. The RTP/SCS PEIR Violates CEQA. | 4
 - A. The PEIR's Justifications For Failing to Provide a More Detailed Analysis of the RTP/SCS's Environmental Impacts Are Unavailing. | 5
 - B. The PEIR's Description of the Project Violates CEQA. | 6
 - C. The PEIR's Analysis of and Mitigation for the Project's Air Quality Impacts Are Inadequate. | 7
 - 1. The PEIR Fails to Adequately Evaluate the Plan's Potential to Violate Air Quality Standards and to Contribute Substantially to an Existing or Projected Violation. | 8
 - 2. The PEIR Substantially Understates the Plan's Air Quality Impacts. | 9
 - 3. The PEIR Fails to Analyze the Plan's Cumulative Air Quality Impacts. | 10
 - 4. The PEIR Fails to Adequately Analyze or Mitigate the Plan's Construction-related Impacts. | 11
 - 5. The PEIR Fails to Adequately Evaluate the Plan's Potential to Expose Sensitive Receptors to Substantial Pollutant Concentrations and Harm Public Health. | 12

- (a) The PEIR's Health Risk Assessment Relies on an Incorrect Baseline for Determining the Significance of the Plan's Health Risks. 13
- (b) The PEIR Substantially Understates the Plan's Health Impacts Because It Studies Only a Fraction of the Plan's Highway Projects. 14
- (c) The PEIR Does Not Analyze the Health Risk Near the SR- 710 North Project. 15
- (d) The Health Risk Analysis Underestimates the Number of Potentially Affected People. 16
- (e) The Health Risk Analysis Focuses Solely on Emissions from Trucks, Ignoring Hazardous Compounds Emitted from Cars. 17
- (f) The PEIR Masks the Actual Health Effects of the Plan Because It Does Not Disclose Where the Impacts Would Occur. 18
- (g) The PEIR's Mitigation Measures Are Vague, Optional, and Otherwise Unenforceable. 19
- D. The PEIR Fails to Properly Analyze the Plan's Contribution to Climate Change. 20
 - 1. The PEIR Fails to Analyze the Plan's Inconsistency with State Climate Policy. 21
- E. The PEIR Fails to Analyze the Plan's Inconsistency with State Climate Policy. 22
- F. There Is No Evidence that the SR-710 North Project Was Included in the Greenhouse Gas Inventory for the Plan. 23

As can be seen by the points made by the 5-City Alliance, the City is gravely concerned with the project's impacts on air quality and health. The impacts of not addressing these air quality and health risk assessments adequately would result in very deleterious impacts on the residents of our City. In addition to incorporating the Shute, Mihaly & Weinberger letter that has been submitted regarding this matter, the City attaches its own comment letter dated August 4, 2015 and submitted to Caltrans in response to the SR-710 North Extension Project DEIR/S. This comment letter addresses primarily air quality, cancer and other health risks, in part, as follows:

I. Air Quality impacts have not been adequately disclosed and analyzed.

In fact, the EPA comment letter dated August 27, 2015 which was submitted to Caltrans stated: *"refined analysis and disclosure to the public of impacts in anticipated hotspot locations, as well as the potential need for Freeway Tunnel Alternative design changes to eliminate identified impacts. For these reasons, and because the project area's existing air quality is so poor, we have rated the Freeway Tunnel Alternative as "3"-Inadequate Information..."*

Additionally, the letter to Caltrans regarding the DEIR/S from the SCAQMD dated August 5, 2015 states: *"... the Health Risk Assessment (HRA) for the project shows that the tunnel alternatives will present a significant health risk to local residents when compared to a No Build scenario, however the Draft EIR/EIS concludes that this impact is less than significant, and no mitigation is required. Second, localized air quality impacts are not adequately analyzed, and decision-makers would not be able to use the EIR/EIS as written to determine if the project will adversely affect air quality in the local area. For example, there is no quantitative analysis of localized impacts for the freeway tunnel alternatives to determine if ambient air quality standards are exceeded for NO2 or CO. For these reasons, the analysis should be revised..."*

II. The DEIR/S Denigrates Its Own Analysis of Cancer Risks, Making the Document Self-Contradictory and Confusing, and Fatally Compromising its Function as a Full Disclosure Document. 25

III.	The DEIR/S' Analysis of Conventional Air Pollutants is Inadequate.	26
IV.	The DEIR/S Fails to Address California's Ambient Air Quality Standards.	27
V.	The Analysis of Conformity With Federal Clean Air Act Requirements Does Not Excuse a Failure to Address the California Ambient Air Quality Standards.	28
VI.	The DEIR/S' analysis of Construction Emissions is Inadequate.	29
VII.	The DEIR/S Performs No Analysis of Secondary Particulate Matter Emissions.	30
VIII.	The DEIR/S Fails to Calculate Total Local Expected Cancer Cases.	31
IX.	The DEIR/S' Treatment of Greenhouse Gas (GHG) Emissions Due to the Project is Inadequate.	32
X.	Traffic Impacts have not been adequately disclosed and analyzed.	33
	A. The DEIR/S's Traffic Analysis is Not Supported by Substantial Evidence and Fails Both to Provide Adequate Information and to Identify or Propose all Feasible Mitigation Measures for Adoption.	34
	1. The DEIR/S Uses a Transportation Model That Has Not Been Shown by Substantial Evidence to be Valid, Potentially Invalidating the Traffic Analysis, and the Air Quality Analysis.	35
XI.	Seismic Impacts have not been adequately disclosed and analyzed.	36
XII.	The Environmental Justice Analysis Fails to Address the Serious Health Issue of Disparate Impact of Exposure to Toxic Air contaminants.	37
XIII.	Recirculation is required.	38

The City concurs with the conclusion of the Shute Mihaly letter, which states that **we respectfully request that SCAG eliminate the SR-710 North Project from the 2016 RTP/SCS.** First, the Freeway Tunnel Alternative is flawed and unnecessary, failing to provide a real solution to the region's transportation needs. Second, the Freeway Tunnel would be inconsistent with the RTP/SCS's goal that transportation projects be sustainable and environmentally protective. Third, there are viable alternatives to the Freeway Tunnel that improve mobility and expand transportation options while limiting dependence on personal vehicles. Finally, the PEIR's evaluation of environmental impacts from the RTP/SCS's transportation projects generally, and from the SR-710 North Project specifically, fails to comply with CEQA. Further, in the event that SCAG does not eliminate the SR-710 North Project from the RTP/SCS, it will need to prepare and recirculate a revised PEIR correcting the problems identified in the letter submitted by the 5-City Alliance in this matter.

On behalf of the City of La Cañada Flintridge, I submit this comment letter to the 2016 Draft Regional Transportation Plan/Sustainable Communities Strategy and Draft Program Environmental Impact Report.

Sincerely,

Mark R. Alexander
City Manager

c: City Council, City of La Cañada Flintridge



CITY COUNCIL

David A. Spence, Mayor
Jonathan C. Curtis, Mayor Pro Tem
Michael T. Davitt
Leonard Pieroni
Terry Walker

August 4, 2015

Mr. Garrett Damrath, Chief Environmental Planner
Division of Environmental Planning
Department of Transportation, District 7
100 S. Main Street, MS-16A
Los Angeles, CA 90012

Re: Comments by La Cañada Flintridge on the SR-710 North Extension Project DEIR/S

Dear Mr. Damrath:

I. INTRODUCTION.

The City of La Cañada Flintridge (City) submits the following comments on the Draft Environmental Impact Report/Statement for the extension of State Route 710 (DEIR/S) on its own behalf, and on behalf of the persons and families that live, work, and recreate in the City. The City also joins in, and incorporates herein by reference, the comments of the Five City Alliance, of which it is a part. The Alliance's comments are being filed separately.

The DEIR/S, while totaling approximately 26,000 pages (including appendices), nevertheless fails to fulfill the two basic duties imposed on government agencies by the California Environmental Quality Act (CEQA), Public Resources Code (PRC) §§ 21000, et seq., namely the duty to fully explore, analyze, and disclose all significant environmental effects of the proposed project (PRC § 21002.1), and to avoid or mitigate those significant effects, whether by choosing a less environmentally damaging alternative project or by identifying and recommending for adoption all feasible mitigation measures.

To begin with, the DEIR/S is confusing and cannot easily be navigated by a layperson with a realistic amount of time to devote to the task. (See CEQA Guidelines § 15140, which emphasizes that EIRs should be readily understandable by the lay public.) Although the main document refers to supporting documentation – for example, the Air Quality section of the DEIR/S relies on information in the separate Air Quality Assessment and Health Risk Assessment, each of which, in turn, has its own appendices

in addition to the appendices to the main document – the main DEIR/S does not tell the reader where to find the supporting information in those additional documents, or in the appendices that themselves support those supporting documents. Similarly, the Geology/Soils/Seismic/Topography section of the DEIR/S relies on information in two additional supporting documents, but the reader is not told what portions of the main DEIR/S rely on information in the supporting documents, and where in those documents to find that information. This multi-tiered construct lacking explanatory sign posts to the reader not only promotes confusion, but actively frustrates meaningful public participation.

Further, the main document often is wholly conclusory in its discussion of the crucial topic of seismic safety related to alternatives that would be built and operate below ground directly over an active fault and two other potentially active faults, yet the reader cannot know without reading additional hundreds of pages of supporting documents where to find whatever evidence CalTrans/Metro has to support these conclusory statements. A non-expert – in other words, an ordinary member of the public – cannot know where in this overwhelming mass of data to find the information he or she seeks on a particular topic.

Compounding these problems, the segregation of information and analysis performed by CalTrans/Metro to attempt to satisfy the more stringent requirements of CEQA into a separate section of the DEIR/S means that a reader cannot read any section of the main document and trust that he or she has been told everything that the agencies know about a particular aspect of the project's environmental impacts without looking up that particular aspect in the separate CEQA section of the DEIR/S. The convoluted structure of the DEIR/S severely impairs its mandated function to be an informational document.

As will also be discussed below, the DEIR/S fails to correctly define the study area covered by the environmental analysis. The DEIR/S artificially circumscribes it by freeway routes rather than by the full reach of the proposed project's environmental effects. This results in a failure to identify all of the project's significant environmental effects.

The DEIR/S also fails to openly identify a preferred project, skewing the overall focus of the analysis and resulting in the illegal postponement of a crucial analysis until after the main public comment period, making it impossible for impacted parties to comment on the choice of alternative.

The document fails to set and disclose thresholds of significance for the effects it does identify, leading again to a failure to identify all significant effects or to identify them as significant. It minimizes the significance of the effects of toxic air pollutant emissions from the project and denigrates the very methods of analysis it employs to examine those effects.

CEQA's requirements are treated as an unwelcome burden, confined to a separate section of the DEIR/S that implies that the environmental effects examined under CEQA are of lesser significance, or less worthy of attention, than those analyzed under the National Environmental Policy Act (NEPA), 42 U.S.C. §§ 4321 *et seq.*

Finally, the document fails to identify and recommend for adoption all feasible mitigation measures. It focuses almost solely on mitigation for construction impacts, for which it proposes inadequate mitigation, and almost totally ignores mitigation for operational impacts.

As discussed below, the DEIR/S is so seriously flawed that it must be revised and recirculated.

II. THE SCOPE OF THE DEIR/S' "STUDY AREA" IS ILLEGALLY LIMITED.

CEQA requires an EIR to address "the area which will be affected by a proposed project. . . ." (CEQA Guidelines § 15125(c).) NEPA also requires that "the area to be affected or created" by the project being analyzed, and its alternatives, must be examined. (NEPA Guidelines, § 1502.15.) Neither set of Guidelines allows for the artificial limitation of the analysis area to existing freeway routes or a study area limited solely to that area that the agency wishes to study. Instead, the full reach of significant environmental effects must define the study area. (CEQA Guidelines § 15126.2(a); 61719191617161718181718171817181718171817181718171817182020171817 (2004) 124 Cal.App.4th 1184, 1216.)

Notwithstanding the above, the DEIR/S uses an artificially truncated and inadequate geographic area of analysis, omitting areas where environmental impacts from the Project may or will be felt. The prime example of this is the limitation of the geographic area of analysis to the "Study Area" identified in the DEIR/S, which is artificially defined by freeways and state routes closest to the proposed Project. (See, e.g., Fig. ES-1.)

The DEIR/S limits the traffic analysis to a roughly rectangular area defined by several existing east-west and north-south freeways (see, e.g., Fig. ES-1.) It excludes analysis of freeways and intersections that its own data indicate would be affected by the Project, despite the fact that the DEIR/S states as two of its three main purposes to “[i]mprove efficiency of the existing *regional* freeway and transit network,” and to “[m]inimize environmental impacts related to mobile sources.” (p. 1-8, emphasis added.)

Among other things, the DEIR/S clearly shows that traffic impacts from the Project will extend beyond the boundaries of the Study Area, as for example, in up to 400 additional vehicles per hour at intersections on the I-210 westward of the Study Area. (pp. 3.5-48, 3.5-49, 3.5-53.) In many cases, the effects of the Project impact an intersection on the I-210 westbound that is already at Level of Service (LOS) F, the worst, most congested condition, and in some cases, the Project’s effects push an intersection from LOS E to LOS F (e.g., for the Dual-Bore No Toll alternative, the I-210 eastbound between the Hubbard Street off-ramp and the on-ramp, the I-210 westbound between the Maclay Avenue off-ramp and the on-ramp, and the I-210 westbound between the Hubbard Street on-ramp and the Polk Street off-ramp [p. 3.5-51]; for the Dual-Bore No Toll and No Trucks alternative, the I-210 eastbound between the Hubbard Street off-ramp and the on-ramp [p. 3.5-53]).

Plainly, the Project will worsen traffic and cause many more vehicles to be on the I-210 eastbound, particularly in peak morning and evening commute hours. The Study Area should be expanded to include all areas where Project impacts will be experienced, and the DEIR/S should be revised to examine all Project impacts, including traffic congestion, air pollution, and noise impacts on these areas.

The Project will also add vehicles to the I-5 northbound, e.g., the I-5 northbound between the SR 2 southbound and northbound off- and on-ramps (pp. 3.5-51 [Dual-Bore No Tolls], 3.5-55 [Dual-Bore with Tolls]), a freeway that is already one of the most heavily congested in the region. Yet despite knowing that the Project will add vehicles on both the I-210 and the I-5, the DEIR/S does not analyze the impacts on the intersection of the I-210 and the I-5, a logical bottleneck that can also impact the I-5/I-14 junction. The DEIR/S cannot show that it “improve[s] the efficiency of the regional freeway . . . network” and “[minimize[s] environmental impacts related to mobile sources”, two of the three purposes of the Project, without expanding the Study Area to include these intersections and examining the Project’s impacts on them.¹

¹ See the discussion of artificial limitation of the study area in the Willdan Report, filed with these comments.

In addition, the DEIR/S has artificially limited the geographic scope of impacts from mobile source air pollutant emissions, and in particular, emission of mobile source air toxics (MSATS) such as diesel particulate (DPM) emissions, that will result from the proposed Project. Diesel particulate emissions have been found by the California Air Resources Board to be a Toxic Air Contaminant because of its serious effects on human health. (Cal. Code of Regs., tit. 17, § 93000.) It has also been declared by the State's qualified scientific experts to be a substance known to the State of California to cause cancer (Cal. Code of Regs, tit. 27, § 27001) pursuant to the Safe Drinking Water and Toxic Enforcement Act of 1986, commonly referred to as Proposition 65, Cal. Health and Safety Code §§ 25249.6, et seq.²

Because of their potential to seriously harm human health, it is crucial to predict and disclose increases in emissions of MSATs, especially diesel particulates. Here, the public cannot be sure that the full reach of the increases in MSAT emissions, and resultant cancer risks, have been predicted and disclosed, because of the limits placed by the DEIR/S on the Study Area.

In the Health Risk Assessment, maps are presented that purport to show the increase in cancer risk, over a no-build scenario, as a result of the Project's different alternatives. (Health Risk Assessment, Figures 11-19.) These maps show increased cancer risks by highlighting various geographic areas within the Study Area in different colors, each corresponding to a range of increased cancer risk. However, the colored areas bleed over the Study Area boundaries in ways that do not make clear whether the full extent of each cancer risk zone has been documented and displayed. In the clearest example, Figures 11, 12, 14, 15, and 18 all show the darker green area of cancer risk increases of between one and ten cancer cases per million people exposed at that level of carcinogen emissions in the area in and around La Cañada Flintridge. The color overlays all end in a straight line, and seem to be cut off (at least in part) by the top of the image's frame (roughly corresponding to the border of the Study Area), rather than by the end of the risk zone's boundaries.

2 While governmental entities are not subject to Proposition 65 (Health and Safety Code § 25249.11(b)), and are not compelled to provide the exposure warning that a private business might have to provide, the listing of diesel particulate matter as a known carcinogen is relevant to analyzing the impacts on the human environment of a project that will increase the amount and distribution of its emission.

Similarly, the cancer risk shaded area at the northern edge of Figures 12, 14, 15, 17, and 18 all appear to cut off sharply at a line that roughly corresponds to Sierra Madre Boulevard. The Figures' appearance strongly suggests that modeling of cancer risks was cut off at this point by design, rather than by the actual modeling outputs as to the relevant risk levels.

Finally, the cancer risk shaded areas around the I-605 in Figures 11, 12, 16, 17, 18, and 19 is shown ending in a series of stair-stepped angles, again suggested that the full extent of the risk area was not shown, but, rather, that modeling was cut off to correspond with the boundaries of the Study Area, rather than with the cancer risk levels.

Overall, the Figures suggest that the air quality modeling for MSATs was designed to address only the risks in the pre-determined Study Area, not the full impacts of the Project on MSAT cancer risk in the region. This violates both NEPA and CEQA.

III. AIR QUALITY IMPACTS HAVE NOT BEEN ADEQUATELY DISCLOSED AND ANALYZED.

1. Failure to Identify a Preferred Project Slants the DEIR/S' Analysis.

The DEIR/S does not identify a preferred project. The Executive Summary states that the preferred alternative – the actual Project – will not be selected until after the DEIR/S is circulated and all comments from agencies and the public have been considered; in other words, not until after general public review is over. (pp. ES-15, 3.13-2.) Such a procedure makes the DEIR/S less focused and less likely to stimulate public discussion and comments. Here, it is also inconsistent with the DEIR/S's reliance on the adoption into regional transportation funding plans of a tunnel project to justify a finding of Conformity with federal Clean Air Act requirements. CalTrans/Metro cannot legitimately rely on the Southern California Association of Governments (SGAG) Regional Transportation Plan's (RTP) inclusion of a tunnel alternative to satisfy the Clean Air Act's requirements, and at the same time also claim that a tunnel alternative has not actually been chosen as the preferred project.

The failure to openly select a preferred project seriously compromises the informational function of the document, including because the Air Quality section states that no localized analysis of particulate matter emissions for federal Clean Air Act purposes will be conducted until and unless one of the Tunnel alternatives is chosen as the preferred project. This procedure, which improperly allows deferred study and

deferred mitigation, results in an environmental document that does not put front and center an analysis of one of the most serious health threats that a new transportation facility may pose: increased localized exposure of the public to fine particulate matter, especially to diesel particulate matter emissions. The omission of the analysis of particulate matter emissions and their extremely serious health effects robs the decision makers and the public of information on health risks that should be critical to the decision as to whether to build the Project, or whether to choose an alternative to a tunnel alternative. Figures 11 through 19, buried at the back of the Health Risk Assessment, show increased cancer risks to substantial areas in several different parts of the Study Area due to exposure to diesel particulate emissions. That analysis should have been placed in the body of the DEIR/S and in the context of an acknowledged choice of a preferred project.

2. The DEIR/S Denigrates Its Own Analysis of Cancer Risks, Making the Document Self-Contradictory and Confusing, and Fatally Compromising its Function as a Full Disclosure Document.

Probably because CalTrans/Metro understand that CEQA requires an analysis of such a significant potential impact of the Project as increased exposure to carcinogenic vehicle emissions, the DEIR/S does an analysis, but does it in a way that minimizes its accessibility to the general public and openly denigrates its value. The analysis appears in a separate, 100+ page, technical Health Risk Assessment, and is summarized in a bare, five-page section of the main body of the DEIR/S that is identified as an evaluation done solely for CEQA purposes. (CEQA Evaluation of air quality impacts at pp. 4-5 through 4-9.)

In yet another document, the Air Quality Assessment contradicts the entire premise of the Health Risk Assessment and the CEQA analysis of increased exposure to carcinogenic vehicle emissions (primarily diesel particulate emissions) by forcefully arguing for FHWA's position that such an analysis is "not . . . useful to decision-makers", in part because the FHWA believes that there is no "national consensus on an acceptable level of risk", and that there are not generally accepted methodologies for performing an analysis of risks to health from exposure to toxic air pollutants. (Air Quality Assessment Report at 5-26.)

CalTrans/Metro have given the public two documents that appear mutually contradictory. The Air Quality Assessment states that there are no accepted methods for calculating the risks to human health posed by exposure to toxic air pollutants (*Id.*), while the Health Risk Analysis uses the methods that California has adopted for performing

such analyses, and concludes that the Project will cause increased cancer risks to significant numbers of residents near the different Project alternatives. How is the public to evaluate a document that performs an essential analysis, but at the same time states that the analysis is meaningless? The internal inconsistency of the DEIR/S, and its failure to make clear and to take seriously the full extent of the health risk from the SR-710 extension, as discussed below, make it flawed and inadequate as an informational document under both NEPA and CEQA.

3. The DEIR/S' Analysis of Conventional Air Pollutants is Inadequate.³

One of the most serious failings of the DEIR/S is its conspicuous failure to present adequately the extreme nature of the existing air pollution problem in this region. The document persistently downplays, buries or ignores altogether the severe existing health threat from air pollution in this area, and the degree to which various Project alternatives will make that health threat worse.⁴

The Project is proposed for an area that the American Lung Association, in its State of the Air 2014 report, ranked as the worst in the U.S. as to the total number of people whose health is at risk from ozone pollution, the fourth most-polluted area in the U.S. for short-term particulate pollution, and the third most-polluted in the U.S. for year-round particulate pollution.⁵ The DEIR/S concedes that the region fails to meet the health-based National Ambient Air Quality Standards (NAAQS) for ozone (DEIR/S p. 3.13-7), and that it is designated as an "extreme" nonattainment area, one of only two

3 La Canada Flintridge notes that underestimation of traffic counts and impacts by CalTrans/Metro, discussed further on in this letter, may have fatally compromised the air quality analysis. See Traffic Impacts discussion, below, and the Willdan Report filed with these comments.

4 The discussion of PM2.5 in this section addresses only PM2.5 insofar as it is a criteria pollutant, and not as a Mobile Source Air Toxic (MSAT).

5 All American Lung Association rankings found at www.stateoftheair.org/2015/city-rankings/most-polluted-cities.html. All documents incorporated by reference and/or provided via embedded links herein are requested to be part of the administrative record for this matter. In addition, excerpts from State of the Air are attached hereto as Exhibit 1.

areas in the nation designated “extreme” ozone polluted areas by the U.S. EPA⁶. The region also fails to meet the NAAQS for fine particulate matter that measures less than 2.5 microns in diameter, and is therefore referred to as “PM2.5”. (DEIR/S at pp. 3.13-7, 3.13-7.) The DEIR/S also admits that the region fails to meet the more stringent California Ambient Air Quality Standards (CAAQS) for ozone, fine particulate matter, and larger breathable particulate matter (less than 10 microns in diameter, and therefore referred to as “PM10”). (DEIR/S at 3.13-7.)

The main body of the DEIR/S presents only one page with very small print that gives a short description of the adverse health effects of these pollutants (DEIR/S at 3.13-7), and the Air Quality Assessment Report displays a three-page table with only short summaries of health effects of the various pollutants (DEIR/S at 2-6-8). This lack of full information about the severity of the area’s air pollution problem is a critical and inexcusable failure to provide the full environmental disclosure that NEPA and CEQA require. Exposure to ozone at levels present in the greater Los Angeles area have been shown to interfere with the lung development in children, leading to significant lung damage as they reach adulthood.⁷ Children exercising during high-ozone days have been found to be at risk of developing asthma. The DEIR/S presents data from air pollution monitors in Pasadena and downtown Los Angeles that make it appear that ozone is no longer a serious problem (p. 3.13-5-6), but the California Air Resources Board reports that Los Angeles County exceeded the health-based state standard for ozone on 66 days in 2014, 59 days in 2013, and 79 days in 2012, showing that air pollution is still a critical public health problem. (<http://www.arb.ca.gov/adam/topfour/topfour2.php>.) Since ozone is a regional pollutant, emissions from the Project will contribute to that problem.

Particulate matter pollution is also a serious threat to health. The DEIR/S admits that exposure to fine particulate matter, PM2.5, can cause cancer, and presents maps showing areas where various alternative Projects are projected to cause various rates of increased cancers.⁸ (Health Risk Assessment, Figures 11-19.) However, the DEIR/S does not discuss, outside of the brief paragraph-long descriptions cited above, the non-

6 California’s San Joaquin Valley is the other “extreme” ozone area.

7 Gauderman, et al., “The Effect of Air Pollution on Lung Development from 10 to 18 Years of Age,” *New England Journal of Medicine*, vol. 351, no. 11, pp. 1057-1067 (Sept. 2004), attached hereto as Exhibit 2.

8 Discussed further, infra.

cancer health damage caused by exposure to particulate matter in the air. For example, the American Heart Association, in a 2010 Scientific Statement, presented its expert conclusion that exposure to PM2.5 for even a few days to weeks can trigger both fatal and non-fatal heart attacks; exposure for longer periods can shorten life expectancy in the exposed population.⁹¹⁰ The Health Risk Assessment calculates the levels of “non-cancer chronic and acute risks” from exposure to Project-caused MSAT emissions (see, e.g., HRA at p. 3-5), but it never spells out for the public the full nature of these risks, and certainly does not make clear that cardiovascular disease and heart attacks are among them.

CEQA requires that an agency “find out and disclose all it reasonably can” about the environmental consequences of a project. (CEQA Guidelines § 15144; see also, Santiago County Water Dist. v. County of Orange (1981) 118 Cal.App.3d 818, 829 (decision to approve or disapprove an a project “is a nullity if based upon an EIR that does not provide the decision makers, and the public, with the information about the project that is required by CEQA”); NEPA Guidelines at § 1502.16(a), (b), and (d); Kern v. U.S. Bureau of Land Management (2002) 284 F.3d 1062, 1072.)

CEQA and NEPA both require the disclosure and consideration of relevant public health information and of a project’s effects on human health. (CEQA Guidelines § 15126.2(a); Bakersfield Citizens for Local Control v. City of Bakersfield (2004) 124 Cal.App.4th 1184, 1219; Metropolitan Edison Company v. People Against Nuclear Energy, et al. (1983) 460 U.S. 766, 771 (“NEPA requires agencies to consider effects on health”; City of Las Vegas, Nev. v. F.A.A. (9th Cir. 2009) 570 F.3d 1109, 1115 (“Although NEPA is primarily concerned about the environment, the regulations state that, in determining whether a federal action would ‘significantly’ affect the environment, the agency should consider ‘[t]he degree to which the proposed action affects public health and safety’ [citing the NEPA Guidelines at 40 C.F.R. § 1508.27]).”

The DEIR/S fails in this duty as to the non-cancer risks from exposure to

9 Brook, et al., “Particulate Matter Air Pollution and Cardiovascular Disease – An Update to the Scientific Statement from the American Heart Association” (2010), attached hereto as Exhibit 3, and available at <http://circ.ahajournals.org>.

10 See also, “What is a safe distance to live or work near high auto emission roads?” San Diego UrbDeZine, May 18, 2015, attached hereto as Exhibit 4, and available at <http://sandiego.urbdezine.com>.

particulate matter pollution. The Health Risk Assessment does present calculations of the “non-cancer chronic and acute risks” (HRA at p. 2-1), but does not define these risks beyond the facts that they are non-cancer, and are either chronic or acute.¹¹ The decision makers and the public cannot know whether the numbers in the Health Risk Assessment do or do not include asthma, decreased lung function, heart disease, heart attacks, or other known health effects of the various components of automobile and truck emission other than carcinogens. The DEIR/S and its various appendices grossly fail to provide adequate information as to the human health impacts of the Project.

The document also fails to perform a carbon monoxide “hot spot” analysis for the La Cañada Flintridge areas where traffic and congestion will both increase, thereby also increasing the emissions of carbon monoxide and the chances that a hot spot will occur. La Cañada Flintridge requests such an analysis.

4. The DEIR/S Fails to Address California’s Ambient Air Quality Standards.

Another grave failure of the DEIR/S to provide full environmental disclosure is its failure to address the California Ambient Air Quality Standards (CAAQS), even though they are as fully legally applicable to the Study Area and the region as the National Ambient Air Quality Standards (NAAQS)¹² (DEIR/S, p. 3.13-1; Air Quality Assessment, p. 3-1.) Not only are the CAAQS more stringent than the NAAQS, but some address different lengths of time over which pollutants are averaged (e.g., the year-long average standard for PM10) than the NAAQS, and different, perhaps more stringent, control measures may be required in order to meet them. Nor does the federal Clean Air Act Conformity analysis, discussed below, demonstrate compliance with the CAAQS, or show the effect of the Project on meeting the CAAQS.

11 The HRA is confined to the risks posed by MSATs, but diesel particulate emissions are included in the definition of MSATs. (DEIR/S at p. 3.13-31.) As discussed above, cardiovascular risks posed by exposure to diesel particulates have been demonstrated. Therefore, at least the cardiovascular risks posed by the diesel particulate component of the MSAT total could and should have been calculated, given their severity (including possible death). If a quantitative analysis is not feasible, the DEIR/S should have demonstrated that infeasibility and made whatever qualitative analysis is feasible.

12 The federal Clean Air Act (“CAA”), found at 42 U.S.C §§ 7400, *et seq.*, explicitly permits states to adopt and enforce their own air quality standards, so long as those standards are more stringent than their federal counterparts. 42 U.S.C. § 7616. No federal preemption applies.

The CAAQS are found at California Code of Regulations, title 17, § 70200, Table of Standards. They are adopted by the California Air Resources Board under authority granted by the California Health and Safety Code, § 39601, are generally more stringent than the NAAQS, and cover more pollutants than the NAAQS. The DEIR/S admits that the region fails to meet the CAAQS for ozone, PM10, PM2.5, and nitrogen oxides (DEIR/S at p. 3.13-7), but does not present any analysis of the Project's impact from failing to meet the CAAQS, despite the provision in the CEQA Checklist that requires an examination of and answer to the question:

III. Air Quality. Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determination. Would the project:

- (c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in non-attainment under an applicable federal *or state* ambient air quality standard (Including releasing emissions which exceed quantitative thresholds for ozone precursors)?

(CEQA Guidelines Appendix G, Environmental Checklist, Evaluation of Environmental Impacts, Section III(c), found at DEIR/S vol. II, p. 3, emphasis added.)

The DEIR/S does not appear to have any evaluation of impacts of the Project on attainment of the CAAQS at all, despite the fact that the basin is in non-attainment of the CAAQS for ozone (both one-hour concentrations and eight-hour concentrations), for PM10, for PM2.5, and for nitrogen dioxide. (DEIR/S, Table 3.13.3, p. 3.13-7). The DEIR/S simply ignores Project impacts on the CAAQS for ozone, nitrogen dioxide, and for both PM10 and PM2.5 (insofar as PM10 and PM2.5 are criteria, i.e., conventional, pollutants covered by ambient air quality standards), performing no analysis of the impacts of Project-caused emissions on those CAAQS.

The DEIR/S does not offer any evidence that the CAAQS will be met by the opening year of any Project alternative. If they are not met, then added pollutant emissions from the Project may interfere with meeting them. If they are met, then added pollutant emissions from the Project might push the region back into nonattainment. Either way, analysis of added emissions from the Project should be given to the public and the decision makers. For example, opening year nitrogen oxide emissions from all Dual-Bore alternatives exceed the emissions from the No-Build alternative, and emissions of PM10 and PM2.5 from all Single-Bore and Dual-Bore alternatives exceed these emissions from the No-Build alternative. (Air Quality Assessment at p. 5-21.)

These emissions may affect either meeting or maintaining the CAAQS for nitrogen dioxide, ozone¹³, and particulate matter.

The DEIR/S' failure to analyze and disclose the impacts of the Project on the CAAQS is a per se violation of CEQA, and the document must be revised and recirculated to provide the decisionmakers and the public with this analysis.

5. The Analysis of Conformity With Federal Clean Air Act Requirements Does Not Excuse a Failure to Address the California Ambient Air Quality Standards.

The DEIR/S and its appendices only examine the consistency of the Project with federal Clean Air Act requirements, namely a so-called "conformity" analysis. (See, e.g., DEIR/S at pp. 3.13-1-2, 3.13-14-31.) This conformity analysis addresses only the conventional pollutants (also called "criteria" pollutants), meaning pollutants for which definite, numerical, federal standards have been set by the U.S. EPA. (DEIR/S, p. 3.13-1.) Each state must have a State Implementation Plan (SIP) by which it will attain the National Ambient Air Quality Standards (NAAQS). (42 U.S.C. § 7410.) The conformity process was put into the Clean Air Act to prevent federal agencies from "engag[ing] in, support[ing] in any way or provid[ing] financial assistance for, licens[ing] or permit[tin]g, or approv[ing], any activity which does not conform to [a state] implementation plan." (42 U.S.C. § 7506(c)(1).) In other words, Conformity is intended to prevent the federal government from carrying out, funding, or approving actions that add pollutants to a state's air while the state is carrying out a federally mandated plan to reduce those pollutants. The Clean Air Act does this by requiring that federal actions make findings that their actions "conform" to the provisions of the SIP. "These safeguards prevent the Federal Government from interfering with the States' abilities to comply with the C[lean] A[ir] A[ct's] requirements." Department of Transp. v. Public Citizen (2004) 541 U.S. 752, 758.

Conformity is a tool used by the federal government to ensure that it is not investing taxpayer dollars in projects that worsen air quality, and to ensure that the air quality impacts of federally funded projects are being planned for by the states and localities that receive the funding. By its nature, it addresses only the NAAQS, not the California standards. At page 5-7, the Air Quality Assessment states that the Conformity analysis covers only the federal PM10 and PM2.5 standards, leaving the CAAQS

13 Nitrogen oxides are precursor emissions that combine with reactive organic gas (ROG) emissions in sunlight to form ozone. (Air Quality Assessment at p. 4-1.)

unaddressed. Nor does the Clean Air Act's Conformity section (42 U.S.C. § 7506) preempt the CAAQS. Nor could they, since, as noted above, the Clean Air Act does not preempt the setting and enforcement of state air quality standards (42 U.S.C. § 7416), but explicitly allows states to set and enforce separate, more stringent standards, as the CAAQS are.

Beyond being irrelevant to the Project's impact on the CAAQS, the Conformity determination discussed in the DEIR/S also fails to be the accessible, clear discussion of air quality that NEPA and CEQA require. (CEQA Guidelines § 15140, requiring CEQA documents to "be written in plain language"; NEPA Guidelines § 1502.8, requiring environmental impact statements to "be written in plain language.") The DEIR/S' discussion of how certain computerized modeling of air quality and pollutant concentrations was done cannot possibly be described as plain language – it is, instead, often pure "geek speak", and prevents the public from understanding and evaluating the quality of the background work that purports to support the Conformity analysis. (See DEIR/S at 3.13, p. 20-21.) This is a failure to perform the DEIR/S' central function as an informational tool.

Finally, because it fails to analyze the impacts on the CAAQS of the Project, the DEIR/S does not propose adoption of mitigation for those impacts. The only mitigation measures proposed relate to construction, not operation, and, as discussed below, even those are woefully inadequate.

6. The DEIR/S' analysis of Construction Emissions is Inadequate.

The DEIR/S is careful to point out that construction emissions, because they would not last longer than five years at any one general location, are exempt from a federal conformity analysis for compliance with plans to meet the NAAQS. (DEIR/S, p. 3.13-10.) This, however, does exempt them from either NEPA or CEQA analysis, or an analysis of their impacts on meeting the CAAQS. A full analysis of construction emissions must be done under those statutes.

The DEIR/S does provide information on the maximum pollutant emissions *per day* from construction of the various alternatives (DEIR/S, p. 3.13-11), but this should be only the start of the analysis. Construction of the Project may extend for up to five years (DEIR/S, p. 3.13-10); the estimated per year and total construction emissions of all criteria and MSAT pollutants should be calculated and presented. The current table, listing only per-day emissions, minimizes the amount of aerial pollution that will be dumped into the Study Area air over the construction of the Project.

Nor is the significance of the emissions made clear. While the DEIR/S does not adopt significance criteria for construction emissions, the South Coast Air Quality Management District (SCAQMD) has adopted such thresholds for use in evaluating projects under CEQA within the SCAQMD's jurisdiction, as this Project is.¹⁴ The DEIR/S could and should have presented and applied these thresholds, which are applicable in the Study Area. Below, we have created a table comparing the data in the DEIR/S' Table 3.13-4, Maximum Construction Emissions by Alternative (lbs. /day), found at page 3.13-11, with the SCAQMD thresholds. All numbers refer to pounds per day of pollutant emissions.

Comparison of Project Construction Emissions with SCAQMD Significance Thresholds (lbs./day)

Alternative	Reactive Organic gases (ozone precursor)¹⁵	Carbon Monoxide	Nitrogen Oxides (ozone precursor)	PM10	PM2.5
TSM/TDM	49	548	935	513	130
Bus Rapid Transit	12	123	206	327	74
Light Rail Transit	119	1,335	2,242	720	207
Freeway Tunnel Single-Bore	214	2,167	4,337	1,116	330
Freeway Tunnel Dual-Bore	237	2,284	4,926	1,460	411
SCAQMD Significance Thresholds (lbs./day)	75	550	100	150	55

14 Found at www.aqmd.gov/docs/default-source/ceqa/handbook/scaqmd-air-quality-significance-thresholds.pdf?sfvrsn=2, and attached hereto as Exhibit 5.

15 Ozone is not directly emitted, but forms in the air when reactive organic gases (ROG), also sometimes referred to as volatile organic compounds (VOC), mix with nitrogen oxides in the air in the presence of sunlight. (DEIR/S, Table 3.13-3, found at p. 3.13-7, in the box describing "Typical Source" for ozone.)

As the table above shows, the pollutant emissions projected for construction of the Project exceed SCAQMD significance thresholds for every Build alternative, in some case by forty times or more (e.g., nitrogen oxide emissions for the tunnel alternatives). Only the TSM/TDM alternative fails to exceed the thresholds, and then only for reactive organic gases and carbon monoxide. Construction of any alternative, and especially the tunnel alternatives, will have significant effects on air quality in the areas in which construction will occur.

Impacts of such high significance demand correspondingly serious mitigation, especially since this Project will be built in a heavily populated urban area. The DEIR/S does not provide it. Only five mitigation measures to mitigate all of the criteria pollutant, MSAT pollutant, and GHG pollutant emissions of all construction are set out in the DEIR/S. (DEIRS/S at p. 3.13-40-42.) Of those avoidance, minimization, and/or mitigation measures, several measures simply require compliance with applicable laws and regulations (e.g., AQ-1 requires dust control by compliance with SCAQMD's Rule 403, and AQ-3 requires the construction contractor to use the diesel fuel required by U.S. EPA), some are the most basic common sense (e.g., AQ-3 requires that construction equipment be located away from sensitive receptors and away from buildings' fresh air intakes), and others contain loopholes (e.g., AQ-2 requires the use of cleaner [U.S. EPA Tier 2] diesel engines only if "available, which term is not defined), AQ-3 says to use alternative fuels like natural gas and electric power "where appropriate", which term is also not defined). Strangely, Metro's Green Construction Policy is only applied to the TSM/TDM, Bus Rapid Transit, and Light Rail Transit alternatives, and CalTrans' Standard Specifications for Construction are only applied to the tunnel alternatives. No reason is given for this segregation of mitigation by alternative. Given the gravity of the potential health impacts, the more stringent of these regulatory regimes should be applied to all aspects of Project construction.

At the very least, use of the non-diesel construction equipment, or the cleanest diesel equipment now manufactured, and, where the cleanest diesels are not available, mandatory installation of California Air Resources Board certified particulate traps as retrofits on dirtier equipment, should be adopted. Metro's Green Construction Policy should be applied across the board, and, climate-change mitigation such as cool roofs and pavements should be considered for all construction, as should GHG emissions offsets.¹⁶

The DEIR/S concludes that these few and inadequate mitigation measures "would

16 GHG emissions will linger in the atmosphere, sometimes for decades, making offsets an effective mitigation.

reduce construction-related air quality impacts and fugitive dust emissions and construction equipment emissions of the Build Alternatives to less than significant levels.” (DEIR/S, p. 4-7.) The document offers no substantial evidence, indeed, no evidence at all, to substantiate this claim. There are no calculations presented in the body of the document that show construction emission levels being reduced below the SCAQMD thresholds of significance, and if they appear in Appendix A to the Air Quality Assessment Report, these technical details are not summarized in that document, as required by CEQA Guidelines § 15147. Substantial evidence is not identified that supports the claim of mitigation of construction emissions to levels of insignificance.

The construction emissions analysis in the DEIR/S is deficient, and should be redone and recirculated, both as to analysis and disclosure of impacts and as to mitigation.

7. The DEIR/S Performs No Analysis of Secondary Particulate Matter Emissions.

All particulates are not directly emitted from stationary sources or from vehicles. As the DEIR/S explains, there are both directly and indirectly emitted particulates. Directly emitted particulates include particulates emitted directly from vehicle tailpipes, particulates emitted as vehicle brakes wear down, particulates emitted as vehicle tires wear down, and road dust that is swept into the air by vehicles traveling over the roads. (DEIR/S at p. 3.13-19.) The DEIR/S explicitly states that it analyzes only these types of directly emitted particulates. (Id.) However, some particulates form in the air through the interaction of chemicals and other materials over time. (Id.) The DEIR/S explicitly states that it does not analyze the environmental or health effects of secondary particulates, that this analysis is subsumed into the determination as to whether the Project is in conformity with the region wide SIP. (Id.)

Yet the only discussion of conformity of the Project with the NAAQS for particulate matter states that “[s]econdary emissions of PM2.5 and PM10 are considered part of the regional emissions analysis prepared for the conforming [Regional Transportation Plan] and [Federal Transportation Improvements Plan]. (DEIR/S at 3.13-20.) No analysis of the impacts of the Project on the CAAQS for these pollutants is done in this document, nor are citations provided to any such analysis of conformity with the NAAQS for the Regional Transportation Plan or the Federal Transportation Improvements Plan, to allow a reader to determine the adequacy of those analyses. No analysis of the health effects of such particulates is performed, and no mitigation is identified or proposed for adoption. This is a clear violation of both NEPA and CEQA.

8. The DEIR/S Fails to Calculate Total Local Expected Cancer Cases.

As discussed above, both NEPA and CEQA require that the impacts of a project on human health must be analyzed and disclosed. The DEIR/S and its appendices profoundly fail to adequately identify and disclose the human health effects of the Project, in that they fail to perform a calculation of the total number of cancer cases that can be expected to result from the Project. The DEIR/S affirmatively states:

“Because the no build and build alternatives of the project would have net health benefits in the region, evaluation of the population cancer burden is not necessary.”

CalTrans/Metro do not define “the region.” Is it limited to the Study Area? Does it include all of Los Angeles County, or the entire South Coast Air Basin? The reader does not know. The reader does know from the Health Risk Assessment (HRA) that certain portions of the Study Area will be subjected to increased risk of cancer from the Project; maps are provided that show the areas and the level of increased risk. (HRA at Figures 11-19.)¹⁷ It would be reasonable and practical to overlay these maps on standard census tract maps to estimate the total number of persons within each exposure area.¹⁸

Applying the risk factor given in the Health Risk Assessment (e.g., ten cancer cases per million persons exposed in a given area) to the population total for a given area would yield the estimated total number of expected cancer cases in that area, sometimes called a “population cancer burden.” These projected cancer cases could be summed, and the totals presented and compared with the DEIR/S’ claims of net “regional” benefits.

17 The Health Risk Assessment also contains maps showing the cancer risk for various areas *as compared with conditions in 2012* (HRA at Figures 1-10), apparently asserting that the overall decrease in the cancer risk from vehicle emissions that will be brought about by U.S. EPA, California Air Resources Board, and South Coast Air Quality Management District regulations and enforcement actions are somehow part of the SR-710 North Extension project. While local cancer risks in some areas would be reduced over current conditions by the shift in vehicle traffic that the Project would cause, the overwhelming bulk of the reductions are not due to the Project, but to the regulatory agencies’ actions over many years. It is misleading for the Project to appear to take credit for them.

18 CalTrans/Metro clearly has access to such maps, since they are used in the Environmental Justice section of the DEIR/S (e.g., at 3.3-57-58), and in Appendix L.

Mr. Garrett Damrath
August 4, 2015
Page 19

Such analyses have been done for Proposition 65 environmental exposures, and should have been done in the Health Risk Assessment for the areas in Figures 11 through 19 that show increased cancer risk due to various Project alternatives. (See “Technical Support Document for Exposure Assessment and Stochastic Analysis, FINAL,” August, 2012, Tier 4 Analysis, available at the Office of Environmental Health Hazard Assessment website at www.oehha.ca.gov/air/hot_spots/pdf/2012tsd/TSDportfolio2012.pdf.)

The decision makers and the public would benefit from estimated numbers of persons in specific areas who are expected to develop cancer as a result of the various Project alternatives, although CalTrans/Metro should perform both a local and a regional cancer burden analysis. Such information, as the California Supreme Court stated in Laurel Heights Improvement Committee v. Regents of the University of California (1988) 47 Cal.3d 376, 392, would enable the public to “know the basis on which its responsible officials either approve or reject environmentally significant action, and the public, being duly informed, can respond accordingly to action with which it disagrees.” Portions of La Cañada Flintridge lie within a zone of increased cancer risk for several alternatives, including the TSM/TDM alternative (HRA, Figure 11), the BRT alternative (HRA, Figure 12), the LRT alternative (HRA, Figure 13), and all tunnel alternatives that do not ban trucks (HRA, Figures 14, 15, 17 and 18).

As far as can be discerned from the small maps in the Health Risk Assessment, some of these risk zones appear to encompass multiple sites where children will be present, including multiple schools and at least one day care center. A color map showing the location of schools in La Cañada Flintridge, and showing their proximity to the I-210, is attached to this letter as Exhibit 7. All of these zones include some residential areas. La Cañada Flintridge wants to know, and is entitled to know, how many of its residents – particularly its children – would be exposed to what level of cancer risks as a result of the Project. This is part of CalTrans/Metro’s duty under NEPA Guidelines § 1502.15 to describe the environment of the area to be affected by the proposed project, and CEQA Guidelines § 15125 (same). We believe that every city within the increased cancer risk zones wants, and is entitled to, the same knowledge. In addition, the decision makers should be able to evaluate this information, and balance it against the information as to the number of persons who will be able to make two and one-half minute shorter trips – a main Project benefit cited in the DEIR/S – if the Project is carried out. (DEIR/S, p. 3.5-37.)

Since the maps in the Health Risk Assessment clearly show that Project construction will redistribute the existing cancer risk around the Study Area and beyond, depending on which Project alternative is chosen (HRA, Figures 11-19), the calculation

should be made for all areas that would be exposed to increased cancer risks from the Project. The same calculation should be performed for non-cancer risks, including risk of heart disease and heart attacks. This information would allow the decision makers and the public to know the full health consequences of choosing one alternative over another, including the consequences of choosing a Build over the No-Build alternative.

In addition, the DEIR/S shows that it is possible to identify the location of sensitive receptors, using the same system of identification used for the Atmospheric Modeling system (AERMOD) analysis for the tunnel alternatives (HRA, p. 2-13). The sensitive receptors in each area of increased exposure to particulate pollution from the Project's various alternatives should be plotted and provided to the decision makers and the public.

This analysis would also allow the identification of potential mitigation measures for the increased exposure to MSATs, something that is barely discussed in the DEIR/S, and generally only in the context of Project construction, not operation. If sensitive receptors are identified in areas of increased exposure, such measures as retrofitting schools and day care centers with HEPA filters on air conditioners to filter out particulates, at least while children are indoors, could be carried out. It is CalTrans/Metro's affirmative duty under CEQA to identify and adopt all feasible mitigation, including for Project operation. (Pub. Res. Code §§ 21002, 21081(a).)

We note also that emissions of diesel particulates may be underestimated by the DEIR/S. The filters through which vehicle emissions in the tunnels would pass are assumed to have an efficiency of between 80% and 99+% removal of particulates, with the 80% figure used to be conservative. (HRA, p. 2-7.) However, details about the filters are extremely sketchy, and do not, without more, appear to constitute substantial evidence for these removal numbers. The Health Risk Assessment rightly states that control efficiency of the filters depends on the distribution of particle size (*id.*); presumably, the smaller the particles, the less the filter efficiency. However, there is evidence that ultrafine particulates as small as 0.1 micron in diameter, capable of being deeply inhaled, can have health effects as serious as those of PM2.5, including exacerbating or even causing heart and respiratory diseases.¹⁹

19 See, e.g., Ostro, et al., "Associations of Mortality with Long-Term Exposures to Fine and Ultrafine Particles, Species and Sources: Results from the California Teachers Study Cohort," *Environmental Health Perspectives*, vol. 123, no. 6, pp. 549-556 (June 2015), attached hereto as Exhibit 6.

The DEIR/S provides no data on the particle size proven to be controlled by the filters, or the filters' continued efficiency (or deterioration) over time. Although a citation (presumably, to a vendor) is given, no description of the contents of the referenced work is provided. Without backup data, the decision makers and the public cannot know whether ultrafine particles will be controlled and at what efficiency, or the overall durability and reliability of the filters and filtration system as to all sizes of particles, and over what time frame.

This is too important an impact to be taken solely on trust. If the particulate emissions from the tunnels are understated, then the health risks may be significantly greater than the DEIR/S estimates. CalTrans/Metro must provide more than a single citation, without more, in order to claim that substantial evidence supports the DEIR/S' conclusions as to particulate emissions from the tunnel alternatives.

9. The DEIR/S' Treatment of Greenhouse Gas (GHG) Emissions Due to the Project is Inadequate.

The DEIR/S' treatment of climate change and greenhouse gas (GHG) emissions begins with a disclaimer that "it is too speculative to make a significance determination regarding the project's direct and indirect impact with respect to climate change." (DEIR/S, p. 4-60.) The "analysis" that follows appears colored by this position. Although CalTrans acknowledges the existence of Executive Orders EO-3-05 and EO-01-07, which mandate reductions in California's GHG emissions on general timetables (*Id.*), the analysis never compares the GHG emissions from the Project to the requirements of either Executive Order. Such a comparison should have been made, since 40% of California's GHG emissions come from the transportation sector, and the requirements of EO-3-05 and EO-01-07 cannot be met without significant reductions in transportation-caused GHG emissions.

CalTrans is a state agency, and is bound by the terms of these Executive Orders. At least a comparison of Project emissions with the mandated emissions reductions of the Executive Orders should be provided. The document shows that both total vehicle miles traveled (VMT) (Air Quality Assessment, p. 5-29) and per capita VMT rise in the Study Area by the horizon year of 2035, contradicting the goals of the Executive Orders, AB 32, and SB 375 (the Sustainable Communities and Climate Protection Act of 2008, Health and Safety Code §§ 65080, *et seq.*).

The DEIR/S claims that the GHG emissions from Project operations would be slightly lower than the No-Build, as shown in Tables 4.9-4.11 (p. 4-100). These Tables

present the per-day GHG emissions, rather than the standard convention of per-year totals, presumably to make the Project's GHG emissions appear as small as possible. The DEIR/S also separately reports the GHG emissions from Project construction from the operational emissions (Table 4-12, p. 4-101), despite the fact that both sets of GHG emissions are attributable to the same Project, again making the totals appear smaller. Adding in the daily emissions due to electricity needed to power the Light Rail alternative and the ventilation, lighting, etc., needed to operate the tunnels would reduce even the modest GHG emissions reductions shown in the DEIR/S. Even without this addition, the GHG emissions from the LRT and BRT alternatives exceed the No-Build alternative's emissions in 2035. Because the DEIR/S cuts off analysis at 2035, the public cannot know whether the GHG emissions of the Project's other alternatives would continue to rise as well, reducing or eliminating the supposed GHG benefits of the Project.

Finally, mitigation measures for GHG emissions are almost completely limited to construction emissions, except for using LED lighting in the tunnel alternatives. No real operational mitigation is proposed, despite the fact that the Tables show a slowing in the difference between Project per-day GHG emissions and No-Build per-day GHG emissions between 2025 and 2035, and total Project area vehicle miles traveled (VMT) are projected to increase by 11.3% (Air Quality Assessment, p. 5-29), implying that GHG emissions will also rise. Yet no mitigation beyond LED lighting is discussed or adopted. Offsetting of Project GHG emissions (e.g., by buying and crushing old, inefficient vehicles, which would also reduce conventional and MSAT pollutant emissions in the area)²⁰ is not even discussed. In violation of CEQA, the DEIR/S fails to identify and recommend for adoption all feasible mitigation.

IV. TRAFFIC IMPACTS HAVE NOT BEEN ADEQUATELY DISCLOSED AND ANALYZED.

1. The DEIR/S's Traffic Analysis is Not Supported by Substantial Evidence and Fails Both to Provide Adequate Information and to Identify or Propose all Feasible Mitigation Measures for Adoption.

La Cañada Flintridge has had an analysis of the traffic impacts of the SR-710 extension project performed by a well-respected transportation engineering firm; its report is attached as Exhibit 8 to these comments. The report shows that the DEIR/S'

²⁰ Should a toll alternative be chosen, use of toll revenue might be considered for this purpose, as part of the environmental mitigation for Project impacts.

traffic analysis fails to comply with CEQA both as an environmental full disclosure document, and as a substantive document of mitigation and environmental protection. In addition, these failures also corrupt the basis of the air quality analysis, likely leading to an underestimation of the amount of new criteria and toxic pollutants the Project will cause to be dumped into the air La Cañada Flintridge residents must breathe.

2. The DEIR/S Uses a Transportation Model That Has Not Been Shown by Substantial Evidence to be Valid, Potentially Invalidating the Traffic Analysis, and the Air Quality Analysis.

The importance of the transportation modeling in the DEIR/S cannot be overstated. One of the main objectives of the Project is to “[i]mprove efficiency of the existing regional freeway and transit network.” (p. 1-8.) Reliable predictions as to whether, and how well, the various Project alternatives can or cannot meet this objective depend on accurate and adequate transportation modeling. In addition, the air quality analysis and noise analysis both depend heavily on the volumes of traffic expected, for example, to use the Project’s Freeway Tunnel alternatives. Without accurate predictions of traffic volume, timing, and location, air pollutant emissions levels cannot be accurately modeled. Projections of traffic volumes form the basis for the air quality analysis, as, for example, in the use of traffic counts for various intersections and freeway segments in the Air Quality Assessment (see, e.g., pp. 5-9), and modeled average daily traffic data that were used as input to air quality models in order to project the expected pollutant emissions and concentration along various surface streets and freeway segments. (See, e.g., Air Quality Assessment Report at 5-14 to 5-15.)

The traffic volumes projected by CalTrans/Metro’s traffic models also form the basis for the calculation of expected MSAT emissions and the inputs to the toxics concentration modeling whose results are reported in the Health Risk Assessment. (E.g., at 2-1 to 2-2, 2-5 to 2-6.) In addition, modeling results form the basis for the federal Clean Air Act Conformity determination, crucial to Project funding. (DEIR/S at 3.13-16-17, and 3.13-21-22.) If the model used by CalTrans/Metro is not valid, if it does not predict future traffic volumes at specified locations and time periods (such as AM and PM commute times) with acceptable accuracy, then not only the DEIR/S’ conclusions as to Project’s traffic impacts, but its conclusions as to air quality impacts, lack substantial supporting evidence. In that case, the DEIR/S is inadequate under both NEPA and CEQA as an informational document. (Inland Empire Public Lands Council v. U.S. Forest Service (9th Cir. 1996) 88 F.3d 754, 758; Save Our Peninsula Committee v. Monterey County Bd. of Supervisors (2001) 87 Cal.App.4th 99, 128.)

That is exactly what the traffic report done for La Cañada Flintridge by the Willdan Group (hereafter "Willdan Report") shows. Evaluating the modeling results on several crucial points, the Willdan Report shows that the SR-710 North travel model used by CalTrans/Metro does not appear to be valid, and likely underestimates the traffic volumes predicted in the DEIR/S. If a traffic model is valid, its predictions should match reality within a reasonable range, and not predict unacceptably high or low results. The DEIR/S itself in its Transportation Technical Report, Table 3-2, compares the volumes of traffic predicted by its model with actual volumes ("counts") in the real world, calculating the percentage by which the model outputs either exceed (a positive number) or are less than (a negative number) actual traffic volume counts. These percentage variances between the modeled traffic volumes and actual counted traffic volumes are compared with the range of model-to-count variations that CalTrans' guidelines and Federal Highway Administration guidelines specify as acceptable. (Table 3-2, reproduced at page 3 of Willdan Report.) This comparison shows whether the percentage variations from real counts for the DEIR/S' model are within an acceptable range, or whether the model's predictions vary from reality too much for it be used and relied on as an acceptable, validated model.

Table 3-2 shows that, as compared with CalTrans' and FHWA's own guidelines, the model's predictions fall outside a range considered acceptable for a valid model as to more than half of the predictions being evaluated. (See Willdan Report at p. 2.) The DEIR/S claims that its model is well validated, but does not explain why a model that fails to conform to CalTrans' own guidelines (and FHWA's) for model validation to this degree can be considered valid. Without a well-supported explanation of why the model is valid, despite its significant deviance from the requirements of CalTrans' and FHWA's guidelines, the DEIR/S lacks substantial evidence supporting the traffic analysis, the air quality analysis, and probably the noise analysis.

Similarly, Figure 6-5, in Appendix A to the DEIR/S' Transportation Technical Report, called the Model Validation Report, compares the modeled volume of traffic for various kinds of streets, for on- and off-ramps, and for freeways, with actual counts for these streets, ramps, and freeways. The straight lines going from the lower left corner to the upper right corner of the graph show what complete agreement between the model's predictions and actual counts for PM volumes would look like, while the data points show where the model's predictions varied from the count. The Willdan Report concludes that the preponderance of points below the model-to-count agreement line shows that the model predicts PM traffic volumes that "could be very low compared to what they should be. The resulting analysis would indicate much better LOS [i.e., less congestion] than there actually would be." (Willdan Report at p. 3, emphasis in original.)

The DEIR/S currently lacks substantial evidence supporting the accuracy and acceptability of its transportation model. Lacking traffic projects produced by a valid transportation model, the air quality analysis, including the Conformity analysis, are also not supported by substantial evidence. The DEIR/S fails as an environmental full disclosure document under both NEPA and CEQA. (NEPA Guidelines § 1502.16; CEQA Guidelines § 15003(c).)

3. The Thresholds of Significance in the Traffic Analysis Impermissibly Minimize the SR-710 Extension Project's Impacts on Signalized Intersections.

A lead agency has some discretion to set significance levels under CEQA for the evaluation of project impacts. (Guidelines § 15064.7.) However, once agencies have set such thresholds, the public has the right to expect that the agency will apply the applicable thresholds consistently. Here, LA Metro, in its Congestion Management Plan (CMP), and the Los Angeles City's Department of Transportation (LADOT) have adopted significance thresholds that inform the decision makers and the public when a project's effects on traffic become significant. Such a finding of significant impact, of course, triggers a CEQA duty to impose all feasible mitigation for such significant impacts. (PRC §§ 21002, 21081(a); Guidelines § 15126.4(a).)

Here, CalTrans/Metro has ignored thresholds of significance established by LA Metro for intersections governed by the CMP, and have adopted significance thresholds for the Project that are more lenient (require a higher impact to be considered significant) than the CMP thresholds, and more lenient than Los Angeles County's Department of Public Works and LA DOT's thresholds. (See Table "Comparison of Significant Impact Thresholds" in Willdan Report at p. 6.)

In some cases, the specially set thresholds of significance for the Project are over twice as lenient as other agencies' thresholds, and may deem over a hundred signalized intersections as not significantly affected, when they would be deemed significantly affected under the CMP or LA DOT standards. (See *id.*) By creating these looser thresholds of significance, CalTrans/Metro may have violated one of the most central principles of CEQA, namely that all feasible mitigation must be adopted for significant impacts from a project. (*City of Marina v. Bd. of Trustees of the California State University* (2006) 39 Cal.4th 341, 350.) CalTrans/Metro must provide an adequate justification for the thresholds it uses, in order to have an EIR/S that complies with CEQA.

4. The Thresholds of Significance in the Traffic Analysis Impermissibly Minimize the SR-710 Extension Project's Impacts on Freeway Segments.

The Willdan Report also compares the benchmarks used in the DEIR/S to identify freeway segments that would be significantly affected by the Project to CalTrans' own criteria. (See Willdan Report at pp.7-8.) It concludes that CalTrans/Metro has ignored CalTrans' own Measures of Effectiveness (MOE), in which the target MOE for freeway segments is between Level of Service (LOS) C and LOS D, and mitigation must be applied if the MOE is exceeded. Here, by contrast, CalTrans/Metro appears to have abandoned this MOE, and will classify a freeway as significantly affected by the Project only if it is expected to operate at LOS F under a Build Alternative, and if traffic demand increases by 2 percent or more. In other words, only outright gridlock is unacceptable and requires mitigation; anything less than gridlock apparently will not be mitigated.

Without more justification, use of benchmarks that are such a departure from CalTrans' normal benchmarks of significant impacts would require a far greater showing of justification than the DEIR/S currently supplies in order for the DEIR/S to provide substantial evidence supporting the DEIR/S's conclusions about lack of significant impacts and lack of need for mitigation as to freeways. This is especially true for a Project, one of whose chief purposes is to improve freeway system efficiency and, presumably, decrease congestion. Willdan has identified multiple freeway segments and ramps on I-210 that would require mitigation under CalTrans' normal MOE standards, and each one should be analyzed and examined for significant impacts and need for mitigation. (*Id.* at p. 7.)

5. The DEIR/S Does Not Comply with CEQA's Mandate That All Significant Impacts Be Mitigated or That Mitigation be Shown to be Infeasible.

The Legislature was clear in passing CEQA that "the long-term protection of the environment, consistent with the provision of a decent home and suitable living environment, for every Californian, shall be the guiding criterion in public decisions." (PRC §21001, subd. (d).) CEQA mandates that "[e]ach public agency shall mitigate or avoid the significant effects on the environment of projects that it carries out or approves whenever it is feasible to do so." (PRC § 21002.1(b).) If it is infeasible to mitigate any significant environmental impact from a project, the public agency must make findings that mitigation is infeasible for specified reasons, or that the mitigation is the responsibility of another agency. (PRC § 21081(a).) The DEIR/S fails this mandate as to

traffic impacts.

As the Willdan Report sets out in detail (see pp. 8-9), CalTrans/Metro identify multiple intersections and freeway segments that would suffer significant impacts from various Project alternatives in Tables 3.5.12 and Table 3.5.13 in the DEIR/S. Some "potential improvement" is listed for each such impact, presumably as potential mitigation. Most of the "potential improvements" are not recommended for adoption. However, instead of making a showing of infeasibility, the DEIR/S gives what might be called a shorthand reason, such as that the "potential improvement" would cost too much, or would require acquisition of additional land. While some, or all, of these reasons may be true, the DEIR/S does not make the actual showing of infeasibility, supported by substantial evidence, that CEQA requires. Further, as Willdan points out (p. 8 of Report), the DEIR/S does not even demonstrate that each "potential improvement" would, if applied, actually mitigate the significant impact. This portion of the DEIR/S is patently inadequate under both NEPA and CEQA. This lack of mitigation will impact La Cañada Flintridge seriously, causing greater congestion, slower traffic, and probably increased air pollutant emissions. (See Willdan Report at p. 9.)

In sum, the DEIR/S profoundly fails to comply with NEPA and CEQA as to traffic impacts. The document must be rewritten to comply with these statutes, and recirculated, so that the public can be adequately informed as to the impacts of the Project on traffic and the roads and freeways.

V. SEISMIC IMPACTS HAVE NOT BEEN ADEQUATELY DISCLOSED AND ANALYZED.

The Geology/Soils/Seismic/Topography section does a good job of describing the existing environment and enumerating the hazards posed by the known and presumed active faults, but is extremely vague as to the likelihood of any of the hazards occurring. It is almost silent as to what types and degrees of damage to the human environment could occur if any of the hazards it identifies should actually occur. Finally, it is terse and conclusory as to methods by which the dangers would be prevented, and silent as to how any damage would or could be remedied.

The DEIR discloses that all Project alternatives would cross the Raymond Fault, an active fault with the capability to produce a 6.7 magnitude earthquake, and two potentially active faults, the Eagle Rock and the San Rafael. (DEIR/S, p. 3.10-4.) It also discloses that the Light Rail Transit and the tunnel alternatives, which involve excavation and tunnel construction below ground surface (Light Rail tunnel crown about 60 feet

below ground surface, and Freeway tunnels about 120-250 feet below ground surface) would cross the Raymond and San Rafael faults at tunnel level. The Freeway tunnels would also cross the potentially active Eagle Rock fault. (Geologic Hazard Evaluation to Support Environmental Studies Document SR 710 North Study, Los Angeles, hereafter "Geologic Hazard Evaluation", at p. ES-1, ES-5.)

Building such structures directly across active faulting zones poses substantial dangers. The DEIR/S lists such dangers, but gives grossly inadequate information as to the environmental effects that could occur, or the mitigation measures that CalTrans/Metro would use to avoid or minimize the dangers. In most cases, the answer is a combination of stating that CalTrans/Metro would follow existing regulations and design standards, and stating that mitigation would be based on geologic studies that would be done only after public review is completed and the EIR/S is certified.

The air quality consequences of CalTrans/Metro's decision not to select a preferred Project alternative were discussed above. That decision has also crippled the DEIR/S' ability to provide the relevant information to the public about the seismic dangers the Project poses, and the viability of proposed mitigation measures for those dangers. For example, the determination of the actual ground motion that the Project might be subjected to from possible earthquakes will not be determined until a "decision is made on the final Alternative for development." (Preliminary Earthquake Acceleration Response Spectra, SR 710 North Study, Los Angeles County, California (hereafter, "Spectra Study", p. 2, found in the Geologic Hazard Evaluation.) Additional field studies "to provide more specific geotechnical information" will also wait until a specific Project alternative is chosen. CalTrans/Metro's decision not to identify a preferred Project has deprived the public of timely information about the degree of threat from possible earthquakes.

Nor is that the only information missing from the DEIR/S. Despite the DEIR/S' repeated assertions that it will use existing design standards and specifications in designing and building the alternatives that require tunnels, the Geologic Hazard Evaluation states that "[n]o Caltrans seismic design criteria for tunnels are currently available Project site-specific seismic criteria will be developed in future design phases and used for final design of the Freeway Tunnel." Here, the split between CalTrans' and Metro's jurisdiction becomes apparent. Metro has seismic design criteria, having built subway tunnels, but apparently these criteria would not be applied to the Freeway tunnels, which would be controlled by the seismic criteria CalTrans has yet to develop, and that CalTrans seemingly would develop only after CEQA review is completed. (Spectra Study, p. 8.) In addition, field studies to verify the ground motion

that can be expected from the faults crossed by the tunnels would not be performed, or the numbers calculated, until after the final alternative Project is chosen, which appears to be after the public comment period on the DEIR/S is over. (Spectra Study, p. 2.) This has the process exactly backwards.

Although lacking crucial data and relevant design criteria, CalTrans/Metro confidently assert in the body of the DEIR/S that they can solve all seismic problems, because such problems have been solved in the past for other projects. For example, problems of groundwater intrusion during construction of the tunnels, which may affect the Light Rail and Freeway tunnel alternatives, can be prevented because “linings can be designed to limit the groundwater inflows.” (DEIR/S, p. 3.10-19; the entire discussion for the Freeway tunnels is only three sentences long, the Light Rail discussion only one sentence.) No description, depiction, or examples of such linings is given. Similarly, pockets of oil and gas may be struck while tunneling, and may be classified by Cal-OSHA as areas of “Gassy or Potentially Gassy Operation,” presumably a potential hazard to workers.

The DEIR/S dismisses this problem in a single sentence, saying that such naturally occurring oil and gas is “not unusual” in the region, “and tunnels have been excavated through these conditions previously.” (DEIR/S at 3.10-13.) This is the entire discussion of this potential hazard for the Light Rail alternative, and this single sentence is echoed without elaboration in the discussion of the Freeway tunnel alternatives. (DEIR/S at 3.10-19.) Such cursory and conclusory statements cannot constitute substantial evidence that all impacts have been analyzed and disclosed, or that all feasible mitigation has been adopted. (Citizens To Preserve the Ojai v. County of Ventura (1985) 176 Cal.App.3d 421, 428, [“[a] conclusory statement unsupported by empirical or experimental data, scientific authorities, or explanatory information of any kind not only fails to crystallize the issues but affords no basis for a comparison of the problems involved with the proposed project and the difficulties involved in the alternatives”].) (Citations and internal quotation marks omitted.)

The DEIR/S acknowledges that “moderate to severe seismic shaking” (i.e., earthquakes) may occur within the life of the Project, and that such shaking “is a common hazard for every project in Southern California, and the hazard cannot be avoided.” (DEIR/S, p. 3.10-17.) However, rather than present, for example, a table or figure that would explain the severity of shaking that could be expected from the active and potentially active faults that the Project would cross, the DEIR/S states that “[b]ored tunnels generally perform well during earthquake ground shaking,” because they are “embedded in the ground [and] move with the ground. . . .” Examples of tunnels that

have fared well during earthquakes, including the Metro's Segment 1 Red Line in the 1989 Northridge quake, and the Bay Area Rapid Transit's tunnels in the 1994 Loma Prieto quake are given. (DEIR/S, p. 3.10-17.) However, no information is given to support the comparison, such as the location of these tunnels relative to the faults that ruptured in those quakes, or a comparison between their design and the design criteria that would be used here (at least, the design criteria that are now known).

The entire seismic section is filled with such conclusory statements and assurances that CalTrans/Metro would find out everything they need to know to make the tunnels survive seismic hazards, and that they would do all those things, just as other projects have done in the past. They would do all these things based on data they would gather, and criteria they would design, after the actual Project is selected, and presumably after the CEQA/NEPA public process is over.

With all due respect to CalTrans and Metro and their engineering expertise, this line of argument could be used to dispense with CEQA/NEPA review in many if not most cases, regardless of the seismic hazards presented. It is the job of an EIR/S to "demonstrate to an apprehensive citizenry that the agency has, in fact, analyzed and considered the ecological implications of its actions." (Laurel Heights Improvement Assn. v. Regents of the University of California (1989) 47 Cal.3d 376,392, quoting No Oil, Inc., v. City of Los Angeles (1974) 13 Cal.3d 68, 86.) Here, the DEIR/S essentially asks the public to take its seismic assurances on faith, not presenting so much as an illustration of the linings that CalTrans/Metro believes would keep out groundwater and oil/gas intrusions, or the boring machine face that it believes would prevent soil collapse during boring.

The Geologic section of the DEIR/S simply and utterly fails as an informative document.

VI. THE ENVIRONMENTAL JUSTICE ANALYSIS FAILS TO ADDRESS THE SERIOUS HEALTH ISSUE OF DISPARATE IMPACT OF EXPOSURE TO TOXIC AIR CONTAMINANTS.

1. Federal Law and CalTrans' Internal Agency Directives Require an Adequate Analysis of Disproportionate Impacts of the Project on Environmental Justice Populations.

The DEIR/S correctly recognizes that "[a]ll projects involving a federal action (funding, permit, or land) must comply with Executive Order (EO) 12898, Federal

Actions to Address Environmental Justice in Minority Populations and Low-Income Populations. . . .” (DEIR/S, 3.3-57.) In addition, the CEQA Guidelines require an EIR to analyze and disclose any “health and safety problems caused by the physical change” that the proposed project will cause. (Guidelines, § 15126.2, subd. (a); Bakersfield Citizens for Local Control v. City of Bakersfield (2004) 124 Cal.App.4th 1184, 1219.) The Guidelines also provide that the lead agency for a project “must use its best efforts to find out and disclose all that it reasonably can.” (Guidelines § 15144, emphasis added; Vineyard Area Citizens for Responsible Growth v. City of Rancho Cordova (2007) 40 Cal.4th 412, 428.) This should include identifying and disclosing the health risks of exposure to toxic air contaminants that are expected to result from Project operation, as well as construction. (See Berkeley Keep Jets Over the Bay Com. v. Board of Port Comrs. (2001) 91 Cal.App.4th 1344, 1367-1371.)

NEPA also requires analysis and disclosure of potential human health effects of projects, where such health effects are directly tied to changes in the physical environment, as they would be here. (Metropolitan Edison Company v. People Against Nuclear Energy, et al. (1983) 103 S.Ct. 1556, 1560.) In addition, the CalTrans Director’s Policy, number 21, dated November 5, 2001, and the Deputy Directive, number DD-63, dated November 5, 2011, also obligate CalTrans “to ensure there are no disproportionate adverse impacts, particularly on minority and low-income populations.” (Director’s Policy No. 21, p. 1.) The current, 11-page, Environmental Justice section of the DEIR/S patently fails to carry out CalTrans/Metro’s obligations under federal law, and CalTrans’ obligations under its own internal directives.

2. Possibility of Disproportionate Impacts of Toxic Air Contaminants on Environmental Justice Populations from the Project.

The Project has the potential for disproportionate health impacts on environmental justice populations resulting from exposure to traffic-related air pollutants, including MSATs, from the Project. Examination of the health effects of such exposure is especially important given that “nearly one-half of the census tracts in the study area contain one or more environmental justice populations.” (DEIR/S, at 3.3-62.)

As set out above, the CEQA Guidelines require an EIR to analyze and disclose any “health and safety problems caused by the physical change” that the proposed project will cause. (Guidelines, § 15126.2, subd. (a).) The Guidelines also provide that the lead agency for a project “must use its best efforts to find out and disclose all that it reasonably can.” (Guidelines § 15144, emphasis added.) This should include identifying

and disclosing the health risks of exposure to toxic air contaminants that are expected to result from Project operation, as well as construction.

NEPA also requires analysis and disclosure of potential human health effects of projects, where such health effects are directly tied to changes in the physical environment, as they would be here.

The DEIR/S currently contains a Health Risk Assessment for the Project, but it does not contain a specific analysis of the potential for disproportionate health risks to environmental justice populations.

A generic assessment of health risk, without making a special examination of the risk to environmental justice populations, may miss significant impacts. Environmental justice populations may have multiple risk factors that may make them more sensitive to the adverse health impacts of exposure to air pollutants, including vehicle emissions, than the general population. “[A] number of studies have reported increased sensitivity to pollution, for communities with low income levels, low education levels, and other biological and social factors. This combination of multiple pollutants and increased sensitivity in these communities can result in a higher cumulative pollution impact.” (California Office of Environmental Health Hazard Assessment, *Cumulative Impacts: Building a Scientific Foundation* (Dec. 2010), Exec. Summary at p. ix.) However, the DEIR/S includes no analysis of this potential for disproportionate impacts.

Such an analysis is feasible, and should be performed. CalTrans/Metro have data showing the location of census tracts with environmental justice populations within the Study Area, and also have modeling data showing the probable cancer risks due to MSAT emissions attributable to the Project throughout the Study Area. The DEIR/S should also use the census tract data they already possess, including the census tract data identifying environmental justice populations, to determine the differences in cancer and acute health risks that would be created by each Project alternative to the various environmental justice census tracts and the non-environmental justice census tracts. Such an analysis would allow CalTrans/Metro to determine and disclose to the public whether each Project alternative would impose a disproportionate cancer or acute health risk burden on environmental justice populations.

The DEIR/S claims that “because the long-term adverse effects of the Freeway Tunnel Alternative on all populations including environmental justice populations, can be substantially reduced, the operation of the Freeway Tunnel Alternative would not result in adverse impacts that are appreciably more severe or greater in magnitude on environmental justice populations than the adverse effects experienced by non-

environmental justice populations.” (DEIR/S, at 3.3-66.)

Until the analysis described above, or a similar one, is performed, the DEIR/S lacks substantial evidence to support this sweeping statement, at least as to health effects. The DEIR/S shows increased cancer risks resulting from vehicle emissions attributable to the Project, and has presented no actual analysis showing that the few and scanty mitigation or avoidance measures proposed by the DEIR/S will “substantially reduce[]” those cancer risks. It has made no attempt to demonstrate that there are no cancer risks, or other acute air pollution-related health impacts, that are not proportionately greater for affected environmental justice populations. This is a failure of analysis and full disclosure under both NEPA and CEQA, and of mitigation under CEQA. The DEIR/S should be revised to include the analysis described here, or an equivalent analysis, and recirculated.

3. Disproportionate Impacts on EJ Populations Related to Travel.

The DEIR/S states that selection of a tolled Freeway Tunnel alternative will not disproportionately affect environmental justice populations, because: 1) they, like other populations, will “still have travel options for reaching their destinations”; 2) surface streets, one of the other “travel options”, should have “reduced traffic” if a Freeway Tunnel is built; and 3) TDM and TSM measures, which will be part of any Build alternative, will benefit all Study Area populations. (DEIR/S, at 3.3-66.) Accepting these statements as factually correct for the sake of argument, the conclusion that selection of a tolled Freeway Tunnel alternative will not disproportionately affect environmental justice populations still does not follow. On the contrary, CalTrans/Metro do not seem to understand the concept of a disproportionate effect in this context.

The Director’s Policy cited above states that CalTrans “strives for equity and balance in transportation investments, economic prosperity, and environmental protection.” (Policy, p. 1.) However, selection of a tolled Freeway Tunnel alternative would not be equitable to the environmental justice communities that would be disrupted by its construction and operation. We will discuss the financial inequity first. The Project as set out in the DEIR/S Project would be funded at least in part through funds derived from Measure R, described in the DEIR/S as “a half-cent sales tax dedicated to transportation projects in Los Angeles County.” (DEIR/S at 1-1.) A sales tax is, by definition, a regressive tax, because it takes a higher percentage of low incomes than of higher incomes. (dictionary.com, found at www.dictionary.reference.com/browse/regressive+taxes+t.)

A sales tax is also applied across the board on taxable items, meaning that all populations must pay it in order to buy necessities such as clothing, some foods, and the cars needed to travel on a Freeway Tunnel alternative. Thus, environmental justice populations will pay towards the Project through the half-cent sales tax imposed by Measure R, whether they use the Project or not. If, in addition, a toll is imposed for use of a Freeway Tunnel alternative, it is more likely that low-income environmental justice populations will be unable to afford that toll than that non-environmental justice populations will be unable to afford it. The environmental justice populations will then be forced to contribute towards the cost of a Project whose construction will disrupt their communities, but that they cannot afford to use. The DEIR/S does not show that such an impact on environmental justice populations would not be disproportionate, and there is every reason to conclude it would be.

Environmental justice populations that could not afford to use a tolled Freeway Alternative would also lose the benefit of reduced travel time that is one of the primary benefits of the Project cited in the DEIR/S. (DEIR/S, p. 3.5-37.) In addition, while low-income environmental justice populations would still be able to use the other “travel options” referred to by the DEIR/S, they would do so not by choice, but by economic necessity. Such a deprivation of choice is in itself an impact that would fall disproportionately on low-income environmental justice populations.

CalTrans/Metro states that use of alternative alignments might result in even greater disproportionate impacts on environmental justice communities. Since the choice of funding for the Project appears fixed – and is inherently more likely to disproportionately impact environmental justice communities – La Cañada Flintridge respectfully suggests that CalTrans/Metro mitigate that impact by choosing a non-Freeway Tunnel alternative. The Bus Rapid Transit or Light Rail Transit alternatives would provide more travel options for all communities, thereby “providing transportation services in an equitable manner to all segments of society,” as directed by the CalTrans Director’s Policy cited above, without a disproportionate impact on environmental justice populations.

Both the analysis of health impacts and risks, and of financial impacts, in the DEIR/S fail to analyze the potential for disparate impacts on environmental justice populations, and, thereby, also fail to adopt all feasible mitigation measures for such impacts. The DEIR/S should be revised and recirculated.

Mr. Garrett Damrath
August 4, 2015
Page 35

VII. RECIRCULATION IS REQUIRED.

The flaws in the DEIR/S, both as a document of information and one of avoidance or mitigation of environmental damage, are so serious that the entire document must be rewritten and recirculated. As Save Our Peninsula Comm. v. Monterey Bd. of Supervisors (2001) 87 Cal.App.4th 99, 131, holds, recirculation gives the public and the decision makers a chance to review new data and the validity of the conclusions of the EIR. CEQA Guidelines § 15088.5 provides in pertinent part that recirculation is needed where a draft EIR “was so fundamentally and basically inadequate and conclusory in nature that meaningful public review and comment were precluded.” Such is the case here, including but not limited to air quality and seismic impacts.

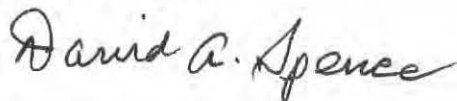
The DEIR/S must be rewritten and recirculated so that the public can evaluate the new information and comment on it. Merely providing the information in the Final EIR/S is not sufficient, given the number of issues and the amount of additional information that is required to make the DEIR/S adequate under CEQA and NEPA.

VIII. CONCLUSION.

The DEIR/S fails both to adequately inform the decision makers and the public about the environmental consequences of this Project, and to identify and propose for adoption all feasible mitigation measures for the Project’s environmental and public health harms. It buries vital air pollution and health information in unreadable appendices, omits critical seismic information altogether, ignores the duty of all California state agencies to aggressively reduce greenhouse gas emissions, fails properly to analyze traffic impacts, and gives only lip service to environmental justice. CalTrans and Metro need to go back to the drawing board to craft and recirculate a thoroughly revised DEIR/S that complies with both NEPA and CEQA, and that shows respect for the communities in which the ill-justified Project is proposed.

Sincerely,

David A. Spence



Mayor

EXHIBIT 1



STATE
OF THE **AIR**
2014

 **AMERICAN
LUNG
ASSOCIATION®**

People at Risk from Short-term Particle Pollution (24-Hour PM_{2.5})

In Counties where the Grades were:	Chronic Diseases					Poverty	Age Groups		Total Population	Number of Counties
	Adult Asthma	Pediatric Asthma	COPD	CV Disease	Diabetes		Under 18	65 and Over		
Grade A (0.0)	4,209,381	1,346,270	3,146,095	4,179,137	4,939,239	9,987,659	15,101,759	8,540,433	63,768,955	266
Grade B (0.3-0.9)	4,014,172	1,212,570	2,852,365	3,676,126	4,337,074	8,710,105	13,334,445	7,522,293	58,330,127	163
Grade C (1.0-2.0)	2,183,338	621,887	1,507,301	1,969,260	2,320,052	4,663,638	7,040,265	4,231,961	31,006,014	76
Grade D (2.1-3.2)	1,160,599	356,702	708,415	941,907	1,178,708	2,896,834	3,911,548	1,981,934	16,109,693	28
Grade F (3.3+)	2,949,649	953,276	1,732,531	2,384,411	3,162,804	7,522,859	10,915,968	5,379,279	44,156,781	50
National Population in Counties with PM _{2.5} Monitors	15,087,442	4,660,351	10,364,331	13,708,883	16,591,727	34,821,643	52,254,491	28,879,287	221,647,091	647

People at Risk from Year-Round Particle Pollution (Annual PM_{2.5})

In Counties where the Grades were:	Chronic Diseases					Poverty	Age Groups		Total Population	Number of Counties
	Adult Asthma	Pediatric Asthma	COPD	CV Disease	Diabetes		Under 18	65 and Over		
Pass	10,720,495	3,236,432	7,466,837	9,901,686	11,811,595	23,704,202	36,463,837	20,802,308	156,807,359	464
Fail	3,096,331	1,025,583	2,006,862	2,655,175	3,427,301	8,475,349	11,351,156	5,596,944	46,284,891	54
National Population in Counties with PM _{2.5} Monitors	15,087,442	4,660,351	10,364,331	13,708,883	16,591,727	34,821,643	52,254,491	28,879,287	221,647,091	647

People at Risk from Ozone

In Counties where the Grades were:	Chronic Diseases					Poverty	Age Groups		Total Population	Number of Counties
	Adult Asthma	Pediatric Asthma	COPD	CV Disease	Diabetes		Under 18	65 and Over		
Grade A (0.0)	1,320,459	371,193	905,816	1,245,680	3,119,192	4,431,907	2,881,567	19,497,130	127	
Grade B (0.3-0.9)	1,535,373	435,400	1,229,737	1,650,630	3,417,687	4,988,560	3,567,140	22,732,980	105	
Grade C (1.0-2.0)	1,639,228	486,376	1,127,194	1,475,895	3,146,416	5,488,645	3,144,579	23,403,658	115	
Grade D (2.1-3.2)	1,527,358	467,602	1,055,385	1,372,093	3,402,065	5,251,797	2,831,073	22,484,036	90	
Grade F (3.3+)	9,513,298	3,049,904	6,461,645	8,529,355	21,820,804	33,827,364	17,655,027	140,576,080	296	
National Population in Counties with Ozone Monitors	15,791,350	4,884,041	10,974,663	14,534,975	35,430,736	54,812,409	30,654,002	232,400,175	809	

Note: The State of the Air 2014 covers the period 2010-2012. The Appendix provides a full discussion of the methodology.

People at Risk In 25 U.S. Cities Most Polluted by Short-term Particle Pollution (24-hour PM_{2.5})

2014 Rank ¹	Metropolitan Statistical Areas	Total Population ²	Under 18 ³	65 and Over ³	Pediatric Asthma ^{4,5}	Adult Asthma ^{4,5}	COPD ⁷	CV Disease ⁸	Diabetes ⁹	Poverty ¹⁰
1	Fresno-Madera, CA	1,100,113	321,057	118,768	28,163	68,342	35,124	49,661	73,409	296,919
2	Visalia-Porterville-Hanford, CA	603,341	187,060	57,426	16,409	36,397	18,204	25,234	37,915	161,299
3	Bakersfield, CA	856,158	255,815	80,525	22,440	52,552	26,262	36,291	54,932	195,433
4	Los Angeles-Long Beach, CA	18,238,998	4,510,957	2,112,146	395,699	1,207,447	626,541	889,485	1,317,256	3,180,714
5	Modesto-Merced, CA	784,031	226,011	85,097	19,826	49,029	25,321	35,859	53,125	165,981
6	Pittsburgh-New Castle-Weirton, PA-OH-WV	2,661,369	522,226	472,879	53,760	214,860	149,397	207,620	229,649	327,390
7	Fairbanks, AK	100,272	24,757	7,165	2,177	6,771	3,554	4,060	4,739	8,847
8	Salt Lake City-Provo-Orem, UT	2,350,274	735,347	204,516	52,201	143,124	61,102	87,864	113,663	287,433
9	El Paso-Las Cruces, TX-NM	1,045,180	299,658	115,604	23,081	54,409	39,900	54,711	76,037	251,188
10	San Jose-San Francisco-Oakland, CA	8,370,967	1,870,295	1,071,176	164,061	574,247	305,542	440,420	646,630	1,018,010
11	Logan, UT-ID	128,306	40,072	11,141	2,919	7,736	3,286	4,635	5,919	19,089
12	Missoula, MT	110,977	21,388	13,807	1,637	8,559	4,833	6,353	5,511	16,277
13	Davenport-Moline, IA-IL	474,226	111,869	74,476	8,163	29,901	22,955	31,878	36,165	59,914
14	Chicago-Naperville, IL-IN-WI	9,899,902	2,416,660	1,205,623	224,825	637,270	446,747	576,699	691,916	1,422,025
15	Phoenix-Mesa-Scottsdale, AZ	4,329,534	1,110,210	573,413	94,629	278,199	187,356	266,697	335,194	739,213
16	Indianapolis-Carmel-Muncie, IN	2,310,360	580,360	284,320	54,927	156,574	129,262	161,629	183,582	339,595
16	New York-Newark, NY-NJ-CT-PA	23,362,099	5,226,786	3,220,554	488,177	1,662,512	1,068,245	1,392,908	1,710,199	3,232,239
18	Harrisburg-York-Lebanon, PA	1,228,559	272,205	191,293	28,289	96,565	63,765	87,181	98,027	134,306
18	Lancaster, PA	526,823	128,066	82,655	13,309	40,265	26,506	36,476	40,662	59,731
20	San Diego-Carlsbad, CA	3,177,063	726,268	380,276	63,708	215,294	111,464	158,275	233,550	465,651
21	Seattle-Tacoma, WA	4,399,332	977,724	546,985	65,294	331,831	190,214	237,015	293,198	515,767
21	Yakima, WA	246,977	74,562	29,906	4,979	16,695	9,646	12,181	14,799	55,498
23	Green Bay-Shawano, WI	357,045	85,395	49,693	6,544	23,279	13,981	21,166	22,498	40,952
23	South Bend-Ekhart-Mishawaka, IN-MI	721,296	180,494	105,222	17,084	51,094	41,574	54,437	59,597	117,073
25	Sacramento-Roseville, CA	2,462,722	595,104	325,693	52,202	165,261	89,297	130,118	189,132	408,101

Notes:

1. Cities are ranked using the highest weighted average for any county within that Combined or Metropolitan Statistical Area.
2. **Total Population** represents the at-risk populations for all counties within the respective Combined or Metropolitan Statistical Area.
3. Those **under 18** and **65 and over** are vulnerable to PM_{2.5} and are, therefore, included. They should not be used as population denominators for disease estimates.
4. Pediatric asthma estimates are for those under 18 years of age and represent the **estimated** number of people who had asthma in 2012 based on state rates (BRFSS) applied to population estimates (U.S. Census).
5. **Adult asthma** estimates are for those 18 years and older and represent the **estimated** number of people who had asthma in 2012 based on state rates (BRFSS) applied to population estimates (U.S. Census).
6. Adding across rows does not produce valid estimates, e.g., summing pediatric and adult asthma.
7. **COPD** estimates are for adults 18 and over who have been diagnosed within their lifetime, based on state rates (BRFSS) applied to population estimates (U.S. Census).
8. **CV disease** is cardiovascular disease and estimates are for adults 18 and over who have been diagnosed within their lifetime, based on state rates (BRFSS) applied to population estimates (U.S. Census).
9. **Diabetes** estimates are for adults 18 and over who have been diagnosed within their lifetime, based on state rates (BRFSS) applied to population estimates (U.S. Census).
10. **Poverty** estimates come from the U.S. Census Bureau and are for all ages.

People at Risk In 25 U.S. Cities Most Polluted by Year-Round Particle Pollution (Annual PM_{2.5})

2014 Rank ¹	Metropolitan Statistical Areas	Total Population ²	Under 18 ³	65 and Over ³	Pediatric Asthma ^{4,5}	Adult Asthma ^{5,6}	COPD ⁷	CV Disease ⁸	Diabetes ⁹	Poverty ¹⁰
1	Fresno-Madera, CA	1,100,113	321,057	118,768	28,163	68,342	35,124	49,661	73,409	296,919
2	Visalia-Porterville-Hanford, CA	603,341	187,060	57,426	16,409	36,397	18,204	25,234	37,915	161,299
3	Bakersfield, CA	856,158	255,815	80,525	22,440	52,552	26,262	36,291	54,932	195,433
3	Los Angeles-Long Beach, CA	18,238,998	4,510,957	2,112,146	395,699	1,207,447	626,541	889,485	1,317,256	3,180,714
5	Modesto-Merced, CA	784,031	226,011	85,097	19,826	49,029	25,321	35,859	53,125	165,981
6	Pittsburgh-New Castle-Weirton, PA-OH-WV	2,661,369	522,226	472,879	53,760	214,860	149,397	207,620	229,649	327,390
7	El Centro, CA	176,948	50,686	19,527	4,446	11,084	5,722	8,115	11,970	38,189
8	El Paso-Las Cruces, TX-NM	1,045,180	299,658	115,604	23,081	54,409	39,900	54,711	76,037	251,188
8	Phoenix-Mesa-Scottsdale, AZ	4,329,534	1,110,210	573,413	94,629	278,199	187,356	266,697	335,194	739,213
8	St. Louis-St. Charles-Farmington, MO-IL	2,900,605	673,074	409,326	66,572	221,038	169,514	205,856	232,181	404,224
11	Cincinnati-Wilmington-Maysville, OH-KY-IN	2,188,001	534,579	282,828	47,895	175,182	147,881	163,816	183,926	321,436
11	Philadelphia-Reading-Camden, PA-NJ-DE-MD	7,129,428	1,625,860	1,005,294	159,508	536,473	343,689	463,539	529,938	938,401
13	Louisville/Jefferson County-Elizabethtown-Madison, KY-IN	1,478,637	349,246	198,854	35,110	120,277	118,408	129,934	121,032	229,972
13	New York-Newark, NY-NJ-CT-PA	23,362,099	5,226,786	3,220,554	488,177	1,662,512	1,068,245	1,392,908	1,710,199	3,232,239
15	Macon-Warner Robins, GA	418,201	103,738	53,345	11,225	25,844	23,080	29,124	32,613	86,424
16	Birmingham-Hoover-Talladega, AL	1,309,818	308,441	183,656	34,704	85,987	98,561	117,729	122,364	221,999
16	Cleveland-Akron-Canton, OH	3,497,711	779,681	555,966	66,994	283,053	237,500	278,890	327,060	531,631
18	Atlanta-Athens-Clarke County-Sandy Springs, GA	6,092,295	1,564,174	617,176	169,253	371,132	315,121	377,489	430,790	1,017,357
19	Wheeling, WV-OH	146,420	28,482	27,019	2,327	12,122	11,661	15,527	15,329	22,988
20	Chicago-Naperville, IL-IN-WI	9,899,902	2,416,660	1,205,623	224,825	637,270	446,747	576,699	691,916	1,422,025
20	Indianapolis-Carmel-Muncie, IN	2,310,360	580,360	284,320	54,927	156,574	129,262	161,629	183,582	339,595
22	Columbus-Auburn-Opelika, GA-AL	491,852	117,334	56,877	12,930	31,310	29,973	35,489	38,431	96,604
23	Dayton-Springfield-Sidney, OH	1,079,417	246,098	170,912	21,146	86,918	72,107	84,546	98,998	172,857
23	Johnstown-Somerset, PA	218,541	41,597	42,384	4,323	17,635	12,448	17,661	19,496	28,490
23	San Diego-Carlsbad, CA	3,177,063	726,268	380,276	63,708	215,294	111,464	158,275	233,550	465,651

Notes:

1. Cities are ranked using the highest weighted average for any county within that Combined or Metropolitan Statistical Area.
2. **Total Population** represents the at-risk populations for all counties within the respective Combined or Metropolitan Statistical Area.
3. Those **under 18** and **65 and over** are vulnerable to PM_{2.5} and are, therefore, included. They should not be used as population denominators for disease estimates.
4. Pediatric asthma estimates are for those under 18 years of age and represent the **estimated** number of people who had asthma in 2012 based on state rates (BRFSS) applied to population estimates (U.S. Census).
5. **Adult asthma** estimates are for those 18 years and older and represent the **estimated** number of people who had asthma in 2012 based on state rates (BRFSS) applied to population estimates (U.S. Census).
6. Adding across rows does not produce valid estimates, e.g., summing pediatric and adult asthma.
7. **COPD** estimates are for adults 18 and over who have been diagnosed within their lifetime, based on state rates (BRFSS) applied to population estimates (U.S. Census).
8. **CV** disease is cardiovascular disease and estimates are for adults 18 and over who have been diagnosed within their lifetime, based on state rates (BRFSS) applied to population estimates (U.S. Census).
9. **Diabetes** estimates are for adults 18 and over who have been diagnosed within their lifetime, based on state rates (BRFSS) applied to population estimates (U.S. Census).
10. **Poverty** estimates come from the U.S. Census Bureau and are for all ages.

People at Risk In 25 Most Ozone-Polluted Cities

2014 Rank ¹	Metropolitan Statistical Areas	Total Population ²	Under 18 ³	65 and Over ³	Pediatric Asthma ^{4,6}	Adult Asthma ^{5,6}	COPD ⁷	CV Disease ⁸	Poverty ⁹
1	Los Angeles-Long Beach, CA	18,238,998	4,510,957	2,112,146	395,699	1,207,447	626,541	889,485	3,180,714
2	Visalia-Porterville-Hanford, CA	603,341	187,060	57,426	16,409	36,397	18,204	25,234	161,299
3	Bakersfield, CA	856,158	255,815	80,525	22,440	52,552	26,262	36,291	195,433
4	Fresno-Madera, CA	1,100,113	321,057	118,768	28,163	68,342	35,124	49,661	296,919
5	Sacramento-Roseville, CA	2,462,722	595,104	325,693	52,202	165,261	89,297	130,118	408,101
6	Houston-The Woodlands, TX	6,371,677	1,733,980	597,789	135,031	316,186	232,392	328,577	1,034,302
7	Modesto-Merced, CA	784,031	226,011	85,097	19,826	49,029	25,321	35,859	165,981
8	Dallas-Fort Worth, TX-OK	7,095,411	1,921,982	707,161	149,749	354,389	263,975	375,698	1,052,441
8	Washington-Baltimore-Arlington, DC-MD-VA-WV-PA	9,331,587	2,158,553	1,100,311	213,935	651,339	400,803	550,553	884,620
10	Las Vegas-Henderson, NV-AZ	2,247,056	538,993	307,611	35,543	127,438	124,833	150,272	373,333
11	Phoenix-Mesa-Scottsdale, AZ	4,329,534	1,110,210	573,413	94,629	278,199	187,356	266,697	739,213
12	New York-Newark, NY-NJ-CT-PA	23,362,099	5,226,786	3,220,554	488,177	1,662,512	1,068,245	1,392,908	3,232,239
13	St. Louis-St. Charles-Farmington, MO-IL	2,900,605	673,074	409,326	66,572	221,038	169,514	205,856	404,224
14	Tulsa-Muskogee-Bartlesville, OK	1,122,259	280,163	156,101	23,961	85,591	63,219	86,051	174,911
15	Cincinnati-Wilmington-Maysville, OH-KY-IN	2,188,001	534,579	282,828	47,895	175,182	147,881	163,816	321,436
16	Philadelphia-Reading-Camden, PA-NJ-DE-MD	7,129,428	1,625,860	1,005,294	159,508	536,473	343,689	463,539	938,401
17	El Centro, CA	176,948	50,686	19,527	4,446	11,084	5,722	8,115	38,189
18	Louisville/Jefferson County-Elizabethtown-Madison, KY-IN	1,478,637	349,246	198,854	35,110	120,277	118,408	129,934	229,972
19	Oklahoma City-Shawnee, OK	1,367,325	339,847	168,717	29,065	104,454	73,644	97,967	215,506
20	Chicago-Naperville, IL-IN-WI	9,899,902	2,416,660	1,205,623	224,825	637,270	446,747	576,699	1,422,025
21	Pittsburgh-New Castle-Weirton, PA-OH-WV	2,661,369	522,226	472,879	53,760	214,860	149,397	207,620	327,390
22	Fort Collins, CO	310,487	64,060	40,112	5,632	22,009	11,857	14,516	41,513
23	Birmingham-Hoover-Talladega, AL	1,309,818	308,441	183,656	34,704	85,987	98,561	117,729	221,999
24	Cleveland-Akron-Canton, OH	3,497,711	779,681	555,966	66,994	283,053	237,500	278,890	531,631
24	Sheboygan, WI	115,009	26,716	17,789	2,047	7,547	4,734	7,286	12,043

Notes:

1. Cities are ranked using the highest weighted average for any county within that Combined or Metropolitan Statistical Area.
2. **Total Population** represents the at-risk populations for all counties within the respective Combined or Metropolitan Statistical Area.
3. Those **under 18** and **65 and over** are vulnerable to PM_{2.5} and are, therefore, included. They should not be used as population denominators for disease estimates.
4. Pediatric asthma estimates are for those under 18 years of age and represent the **estimated** number of people who had asthma in 2012 based on state rates (BRFSS) applied to population estimates (U.S. Census).
5. **Adult asthma** estimates are for those 18 years and older and represent the **estimated** number of people who had asthma in 2012 based on state rates (BRFSS) applied to population estimates (U.S. Census).
6. Adding across rows does not produce valid estimates, e.g., summing pediatric and adult asthma.
7. **COPD** estimates are for adults 18 and over who have been diagnosed within their lifetime, based on state rates (BRFSS) applied to population estimates (U.S. Census).
8. **CV disease** is cardiovascular disease and estimates are for adults 18 and over who have been diagnosed within their lifetime, based on state rates (BRFSS) applied to population estimates (U.S. Census).
9. **Poverty** estimates come from the U.S. Census Bureau and are for all ages.

EXHIBIT 2

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812

SEPTEMBER 9, 2004

VOL. 351 NO. 11

The Effect of Air Pollution on Lung Development from 10 to 18 Years of Age

W. James Gauderman, Ph.D., Edward Avol, M.S., Frank Gilliland, M.D., Ph.D., Hita Vora, M.S.,
Duncan Thomas, Ph.D., Kiros Berhane, Ph.D., Rob McConnell, M.D., Nino Kuenzli, M.D., Fred Lurmann, M.S.,
Edward Rappaport, M.S., Helene Margolis, Ph.D., David Bates, M.D., and John Peters, M.D.

ABSTRACT

BACKGROUND

Whether exposure to air pollution adversely affects the growth of lung function during the period of rapid lung development that occurs between the ages of 10 and 18 years is unknown.

METHODS

In this prospective study, we recruited 1759 children (average age, 10 years) from schools in 12 southern California communities and measured lung function annually for eight years. The rate of attrition was approximately 10 percent per year. The communities represented a wide range of ambient exposures to ozone, acid vapor, nitrogen dioxide, and particulate matter. Linear regression was used to examine the relationship of air pollution to the forced expiratory volume in one second (FEV₁) and other spirometric measures.

RESULTS

Over the eight-year period, deficits in the growth of FEV₁ were associated with exposure to nitrogen dioxide (P=0.005), acid vapor (P=0.004), particulate matter with an aerodynamic diameter of less than 2.5 μm (PM_{2.5}) (P=0.04), and elemental carbon (P=0.007), even after adjustment for several potential confounders and effect modifiers. Associations were also observed for other spirometric measures. Exposure to pollutants was associated with clinically and statistically significant deficits in the FEV₁ attained at the age of 18 years. For example, the estimated proportion of 18-year-old subjects with a low FEV₁ (defined as a ratio of observed to expected FEV₁ of less than 80 percent) was 4.9 times as great at the highest level of exposure to PM_{2.5} as at the lowest level of exposure (7.9 percent vs. 1.6 percent, P=0.002).

CONCLUSIONS

The results of this study indicate that current levels of air pollution have chronic, adverse effects on lung development in children from the age of 10 to 18 years, leading to clinically significant deficits in attained FEV₁ as children reach adulthood.

From the Department of Preventive Medicine, University of Southern California, Los Angeles (W.J.G., E.A., F.G., H.V., D.T., K.B., R.M., N.K., E.R., J.P.); Sonoma Technology, Petaluma, Calif. (F.L.); Air Resources Board, State of California, Sacramento (H.M.); and the University of British Columbia, Vancouver, B.C., Canada (D.B.). Address reprint requests to Dr. Gauderman at the Department of Preventive Medicine, University of Southern California, 1540 Alcazar St., Suite 220, Los Angeles, CA 90089, or at jjmg@usc.edu.

N Engl J Med 2004;351:1057-67.

Copyright © 2004 Massachusetts Medical Society.

THERE IS MOUNTING EVIDENCE THAT air pollution has chronic, adverse effects on pulmonary development in children. Longitudinal studies conducted in Europe¹⁻³ and the United States⁴⁻⁶ have demonstrated that exposure to air pollution is associated with reductions in the growth of lung function, strengthening earlier evidence⁷⁻¹² based on cross-sectional data. However, previous longitudinal studies have followed young children for relatively short periods (two to four years), leaving unresolved the question of whether the effects of air pollution persist from adolescence into adulthood. The Children's Health Study¹³ enrolled children from 12 southern California communities representing a wide range of exposures to ambient air pollution. We documented the children's respiratory growth from the ages of 10 to 18 years. Over this eight-year period, children have substantial increases in lung function. By the age of 18 years, girls' lungs have nearly matured, and the growth in lung function in boys has slowed considerably, as compared with the rate in earlier adolescence.¹⁴ We analyzed the association between long-term exposure to ambient air pollution and the growth in lung function over the eight-year period from the ages of 10 to 18 years. We also examined whether any observed effect of air pollution on this eight-year growth period results in clinically significant deficits in attained lung function at the age of 18 years.

METHODS

STUDY SUBJECTS

In 1993, the Children's Health Study recruited 1759 fourth-grade children (average age, 10 years) from elementary schools in 12 southern California communities as part of an investigation of the long-term effects of air pollution on children's respiratory health.^{6,12,13} Data on pulmonary function were obtained by trained field technicians, who traveled to study schools annually from the spring of 1993 through the spring of 2001 to perform maximal-effort spirometric testing of the children. Details of the testing protocol have been published previously.¹² We analyzed three measures of pulmonary function: forced vital capacity (FVC), forced expiratory volume in the first second (FEV₁), and maximal midexpiratory flow rate (MMEF). Pulmonary-function tests were not performed on any child who was absent from school on the day of testing, but such a

child was still eligible for testing in subsequent years. Children who moved away from their recruitment community were classified as lost to follow-up and were not tested further. From the initial sample of the 1759 children in 1993, the number of children available for follow-up was 1414 in 1995, 1252 in 1997, 1031 in 1999, and 747 in 2001, reflecting the attrition of approximately 10 percent of subjects per year.

A baseline questionnaire, completed at study entry by each child's parents or legal guardian, was used to obtain information on the children's characteristics, including race, presence or absence of Hispanic ethnic background, level of parental education, presence or absence of a history of asthma diagnosed by a doctor, exposure to maternal smoking in utero, and household exposure to gas stoves, pets, and environmental tobacco smoke. Questions administered at the time of annual pulmonary-function testing were used to update information on asthma status, personal smoking status, and exposure to environmental tobacco smoke. The distribution of baseline characteristics of all study subjects and of two subgroups defined according to the length of follow-up (all eight years or less than eight years) is shown in the Supplementary Appendix (available with the full text of this article at www.nejm.org). The length of follow-up was significantly associated with factors related to the mobility of the population, including race, presence or absence of Hispanic ethnic background, presence or absence of exposure to environmental tobacco smoke, and parents' level of education. However, the length of follow-up was not significantly associated with baseline lung function or the level of exposure to air pollution, suggesting that the loss to follow-up did not differ with respect to the primary variables of interest.

The study protocol was approved by the institutional review board for human studies at the University of Southern California, and written informed consent was provided by a parent or legal guardian for all study subjects. We did not obtain assent from minor children, since this was not standard practice when the study was initiated.

AIR-POLLUTION DATA

Air-pollution-monitoring stations were established in each of the 12 study communities and provided continuous data, beginning in 1994. Each station measured average hourly levels of ozone, nitrogen

dioxide, and particulate matter with an aerodynamic diameter of less than 10 μm (PM_{10}). Stations also collected two-week integrated-filter samples for measuring acid vapor and the mass and chemical makeup of particulate matter with an aerodynamic diameter of less than 2.5 μm ($\text{PM}_{2.5}$). Acid vapor included both inorganic acids (nitric and hydrochloric) and organic acids (formic and acetic). For statistical analysis, we used total acid, computed as the sum of nitric, formic, and acetic acid levels. Hydrochloric acid was excluded from this sum, since levels were very low and close to the limit of detection. In addition to measuring $\text{PM}_{2.5}$, we determined the levels of elemental carbon and organic carbon, using method 5040 of the National Institute for Occupational Safety and Health.¹⁵ We computed annual averages on the basis of average levels in a 24-hour period in the case of PM_{10} and nitrogen dioxide, and a two-week period in the case of $\text{PM}_{2.5}$, elemental carbon, organic carbon, and acid vapor. For ozone, we computed the annual average of the levels obtained from 10 a.m. to 6 p.m. (the eight-hour daytime average) and of the one-hour maximal levels. We also calculated long-term mean pollutant levels (from 1994 through 2000) for use in the statistical analysis of the lung-function outcomes.

STATISTICAL ANALYSIS

The outcome data consisted of the results of 5454 pulmonary-function tests of 876 girls and 5300 tests of 883 boys over the eight-year period. We adopted a two-stage regression approach to relate the longitudinal pulmonary-function data for each child to the average air-pollution levels in each study community.

The first-stage model was a regression of each pulmonary-function measure (values were log-transformed) on age to obtain separate, community-specific average growth curves for girls and boys. To account for the growth pattern during this period, we used a linear spline model¹⁴ that consisted of four straight lines over the age intervals of younger than 12 years, 12 to 14 years, 14 to 16 years, and older than 16 years, constrained to be connected at the three "knot" points. The model included adjustments for log values for height; body-mass index (the weight in kilograms divided by the square of the height in meters); the square of the body-mass index; race; the presence or absence of Hispanic ethnic background, doctor-diagnosed asthma, any tobacco smoking by the child in the preceding year,

exposure to environmental tobacco smoke, and exercise or respiratory tract illness on the day of the test; and indicator variables for the field technician and the spirometer. In addition to these covariates, random effects were included to account for the multiple measurements contributed by each subject. An analysis of residual values confirmed that the assumptions of the model had been satisfied. The first-stage model was used to estimate the mean and variance of the growth in lung function over the eight-year period in each of the 12 communities, separately for girls and boys.

The second-stage model was a linear regression of the 24 sex- and community-specific estimates of the growth in lung function over the eight-year period on the corresponding average levels of each air pollutant in each community. Inverses of the first-stage variances were incorporated as weights, and a community-specific random effect was included to account for residual variation between communities. A sex-by-pollutant interaction was included in the model to evaluate whether there was a difference in the effect of a given pollutant between the sexes, and when this value was nonsignificant, the model was refitted to estimate the sex-averaged effect of the pollutant. Pollutant effects are reported as the difference in the growth in lung function over the eight-year period from the least to the most polluted community, with negative differences indicative of growth deficits with increasing exposure. We also considered two-pollutant models obtained by simultaneously regressing the growth in lung function over the eight-year period on pairs of pollutants.

In addition to examining the growth in lung function over the eight-year period, we analyzed the FEV_1 measurements obtained in 746 subjects during the last year of follow-up (average age, 17.9 years) to determine whether exposure to air pollution was associated with clinically significant deficits in attained FEV_1 . We defined a low FEV_1 as an attained FEV_1 below 80 percent of the predicted value, a criterion commonly used in clinical settings to identify persons who are at increased risk for adverse respiratory conditions. To determine the predicted FEV_1 , we first fitted a regression model for observed FEV_1 (using log-transformed values) with the following predictors: log-transformed height, body-mass index, the square of the body-mass index, sex, race or ethnic group, asthma status, field technician, and interactions between sex and log-transformed height, sex and asthma, and sex and

race or ethnic group. This model explained 71 percent of the variance in the attained FEV₁ level. For each subject, we then computed the predicted FEV₁ from the model and considered subjects to have a low FEV₁ if the ratio of observed to predicted FEV₁ was less than 80 percent. Linear regression was then used to examine the correlation between the community-specific proportion of subjects with a low FEV₁ and the average level of each pollutant from 1994 through 2000. This model included a community-specific random effect to account for residual variation. Regression procedures in SAS software¹⁶

were used to fit all models. Associations denoted as statistically significant were those that yielded a P value of less than 0.05, assuming a two-sided alternative hypothesis.

RESULTS

From 1994 through 2000, there was substantial variation in the average levels of study pollutants across the 12 communities, with relatively little year-to-year variation in the annual levels within each community (Fig. 1). From 1994 through 2000, the

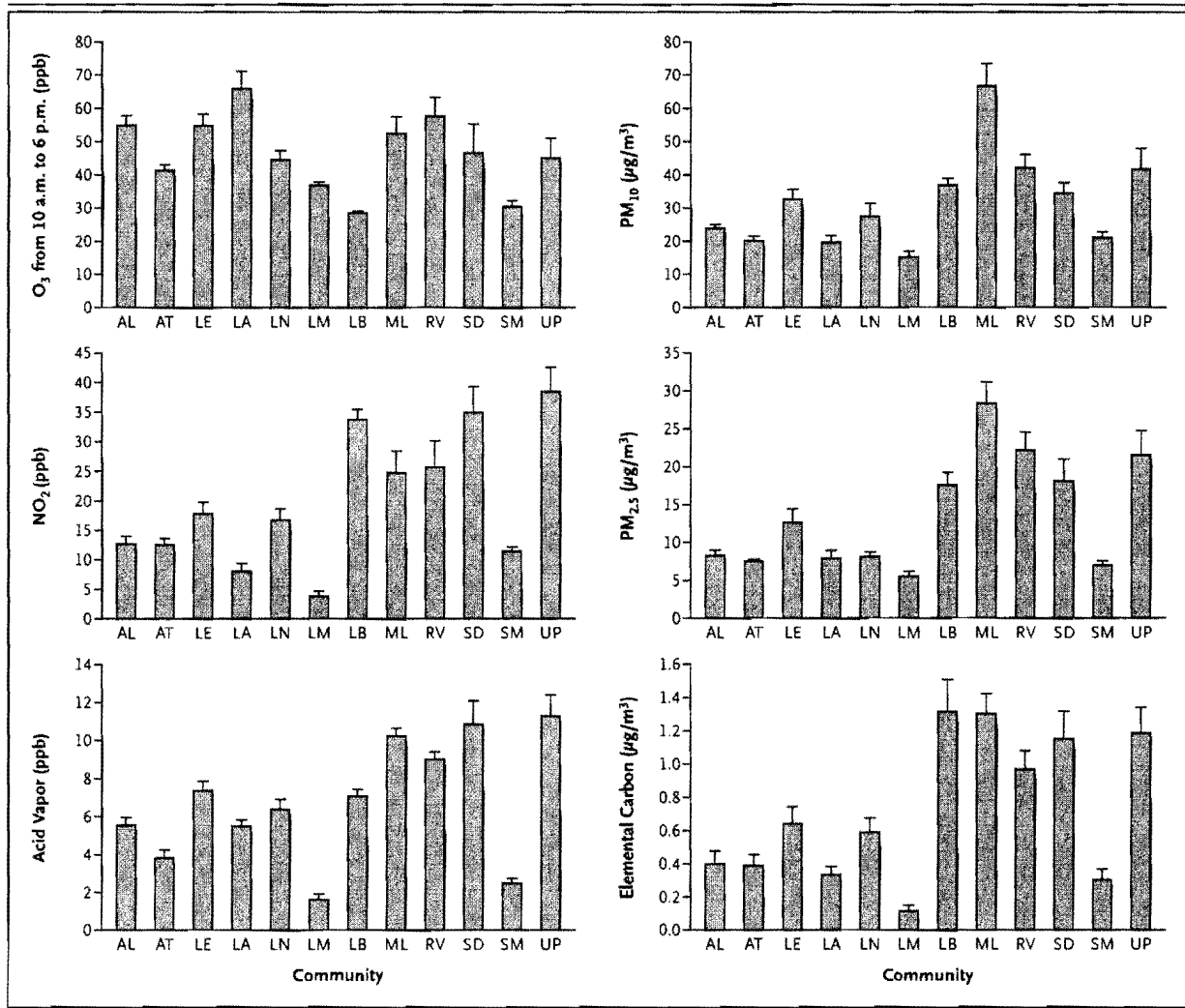


Figure 1. Mean (+SD) Annual Average Levels of Pollutants from 1994 through 2000 in the 12 Study Communities in Southern California. AL denotes Alpine, AT Atascadero, LE Lake Elsinore, LA Lake Arrowhead, LN Lancaster, LM Lompoc, LB Long Beach, ML Mira Loma, RV Riverside, SD San Dimas, SM Santa Maria, and UP Upland. O₃ denotes ozone, NO₂ nitrogen dioxide, and PM₁₀ and PM_{2.5} particulate matter with an aerodynamic diameter of less than 10 µm and less than 2.5 µm, respectively.

average levels of ozone were not significantly correlated across communities with any other study pollutant (Table 1). However, correlations between other pairs of pollutants were all significant, ranging from an R of 0.64 ($P < 0.05$) for nitrogen dioxide and organic carbon, to an R of 0.97 ($P < 0.001$) for PM_{10} and organic carbon. Thus, nitrogen dioxide, acid vapor, and the particulate-matter pollutants can be regarded as a correlated "package" of pollutants with a similar pattern relative to each other across the 12 communities.

Among the girls, the average FEV_1 increased from 1988 ml at the age of 10 years to 3332 ml at the age of 18 years, yielding an average growth in FEV_1 of 1344 ml over the eight-year period (Table 2). The corresponding averages in boys were 2082 ml and 4464 ml, yielding an average growth in FEV_1 of 2382 ml over the eight-year period. Similar patterns of growth over the eight-year period were observed for FVC and MMEF (Table 2).

Although the average growth in FEV_1 was larger in boys than in girls, the correlations of growth with air pollution did not differ significantly between the sexes, as shown for nitrogen dioxide in Figure 2. The sex-averaged analysis, depicted by the regression line in Figure 2, demonstrated a significant negative correlation between the growth in FEV_1 over the eight-year period and the average nitrogen dioxide level ($P = 0.005$). The estimated difference in the average growth in FEV_1 over the eight-year period from the community with the lowest nitrogen dioxide level to the community with the highest nitrogen dioxide level, represented by the slope

of the plotted regression line in Figure 2, was -101.4 ml.

Estimated differences in the growth of FEV_1 , FVC, and MMEF during the eight-year period with respect to all pollutants are summarized in Table 3. Deficits in the growth of FEV_1 and FVC were observed for all pollutants, and deficits in the growth of MMEF were observed for all but ozone, with several combinations of outcome variables and pollutants attaining statistical significance. Specifically, for FEV_1 we observed significant negative correlations between the growth in this variable over the eight-year period and exposure to acid vapor ($P = 0.004$), $PM_{2.5}$ ($P = 0.04$), and elemental carbon ($P = 0.007$), in addition to the above-mentioned correlation with nitrogen dioxide. As with FEV_1 , the effects of the various pollutants on FVC and MMEF did not differ significantly between boys and girls. Significant deficits in FVC were associated with exposure to nitrogen dioxide ($P = 0.05$) and acid vapor ($P = 0.03$), whereas deficits in MMEF were associated with exposure to nitrogen dioxide ($P = 0.02$) and elemental carbon ($P = 0.04$). There was no significant evidence that ozone, either the average value obtained from 10 a.m. to 6 p.m. or the one-hour maximal level, was associated with any measure of lung function. In two-pollutant models for any of the measures of pulmonary function, adjustment for ozone did not substantially alter the effect estimates or significance levels of any other pollutant (data not shown). In general, two-pollutant models for any pair of pollutants did not provide a significantly better fit to the data than the corre-

Table 1. Correlation of Mean Air-Pollution Levels from 1994 through 2000 across the 12 Study Communities.*

Pollutant	O ₃ (10 a.m.–6 p.m.)	NO ₂	Acid Vapor†	PM ₁₀	PM _{2.5}	Elemental Carbon	Organic Carbon
	<i>R value</i>						
O ₃							
1-Hour maximal level	0.98	0.10	0.53	0.31	0.33	0.17	0.25
10 a.m.–6 p.m.		-0.11	0.35	0.18	0.18	-0.03	0.13
NO ₂			0.87	0.67	0.79	0.94	0.64
Acid vapor†				0.79	0.87	0.88	0.76
PM ₁₀					0.95	0.85	0.97
PM _{2.5}						0.91	0.91
Elemental carbon							0.82

* Unless otherwise noted, values are the 24-hour average pollution levels. O₃ denotes ozone, NO₂ nitrogen dioxide, and PM₁₀ and PM_{2.5} particulate matter with an aerodynamic diameter of less than 10 μ m and less than 2.5 μ m, respectively.

† Acid vapor is the sum of nitric, formic, and acetic acid levels.

Pulmonary-Function Measure	Girls			Boys		
	Age of 10 yr	Age of 18 yr	Average 8-yr growth	Age of 10 yr	Age of 18 yr	Average 8-yr growth
FVC (ml)	2262	3790	1528	2427	5202	2775
FEV ₁ (ml)	1988	3332	1344	2082	4464	2382
MMEF (ml/sec)	2311	3739	1428	2287	4709	2422

* Levels at the ages of 10 and 18 years are derived from the growth model described in the Methods section. FVC denotes forced vital capacity, FEV₁ forced expiratory volume in one second, and MMEF maximal midexpiratory flow rate.

sponding single-pollutant models; this was not surprising, given the strong correlation between most pollutants.

The association between pollution and the growth in FEV₁ over the eight-year period remained significant in a variety of sensitivity analyses (Table 4). For example, estimates of the effect of acid vapor and elemental carbon (model 1 in Table 4) changed little with adjustment for in-utero exposure to maternal smoking (model 2), presence in the home of a gas stove (model 3) or pets (model 4), or parental level of education (model 5). To account for possible confounding by short-term effects of air pollution, we fitted a model that adjusted for the average ozone, nitrogen dioxide, and PM₁₀ levels on the three days before each child's pulmonary-function test. This adjustment also had little effect

on the estimates of the long-term effects of air pollution (model 6). Table 4 also shows that the effects of pollutants remained large and significant in the subgroups of children with no history of asthma (model 7) and those with no history of smoking (model 8). The effects of pollutants were not significant among the 457 children who had a history of asthma or among the 483 children who had ever smoked (data not shown), although the sample sizes in these subgroups were small. Model 9 demonstrates that the extremes in pollutant levels did not drive the observed associations; in other words, we found similar effect estimates after eliminating the two communities with the highest and lowest levels of each pollutant. Finally, model 10 shows the effects of pollutants in the subgroup of subjects who underwent pulmonary-function testing in both 1993 and 2001 (i.e., subjects who participated in both the first and last year of the study). The magnitudes of effects in this subgroup were similar to those in the entire sample (model 1), suggesting that observed effects of pollutants in the entire sample cannot be attributed to biased losses to follow-up across communities. These sensitivity analyses were also applied to the other pollutants and to FVC and MMEF, with similar results.

Pollution-related deficits in the average growth in lung function over the eight-year period resulted in clinically important deficits in attained lung function at the age of 18 years (Fig. 3). Across the 12 communities, a clinically low FEV₁ was positively correlated with the level of exposure to nitrogen dioxide (P=0.005), acid vapor (P=0.01), PM₁₀ (P=0.02), PM_{2.5} (P=0.002), and elemental carbon (P=0.006). For example, the estimated proportion of children with a low FEV₁ (represented by the regression line in Fig. 3) was 1.6 percent at the lowest level of exposure to PM_{2.5} and was 4.9 times as great (7.9 percent) at the highest level of exposure to PM_{2.5}

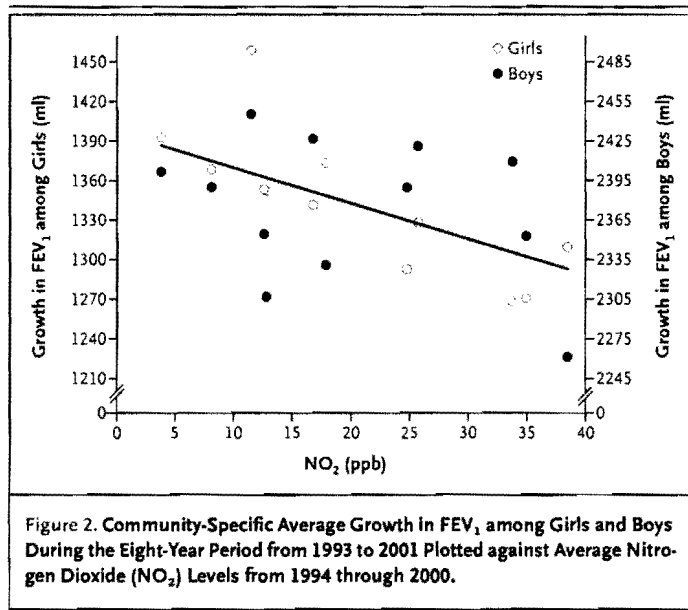


Table 3. Difference in Average Growth in Lung Function over the Eight-Year Study Period from the Least to the Most Polluted Community.*

Pollutant	FVC		FEV ₁		MMEF	
	Difference (95% CI) ml	P Value	Difference (95% CI) ml	P Value	Difference (95% CI) ml/sec	P Value
O ₃						
10 a.m.–6 p.m.	-50.6 (-171.0 to 69.7)	0.37	-22.8 (-122.3 to 76.6)	0.62	85.6 (-130.0 to 301.1)	0.40
1-Hour maximal level	-70.3 (-183.3 to 42.6)	0.20	-44.5 (-138.9 to 50.0)	0.32	45.7 (-172.3 to 263.6)	0.65
NO ₂	-95.0 (-189.4 to -0.6)	0.05	-101.4 (-164.5 to -38.4)	0.005	-211.0 (-377.6 to -44.4)	0.02
Acid vapor	-105.2 (-194.5 to -15.9)	0.03	-105.8 (-168.8 to -42.7)	0.004	-165.0 (-344.8 to 14.7)	0.07
PM ₁₀	-60.2 (-190.6 to 70.3)	0.33	-82.1 (-176.9 to 12.8)	0.08	-154.2 (-378.3 to 69.8)	0.16
PM _{2.5}	-60.1 (-166.1 to 45.9)	0.24	-79.7 (-153.0 to -6.4)	0.04	-168.9 (-345.5 to 7.8)	0.06
Elemental carbon	-77.7 (-166.7 to 11.3)	0.08	-87.9 (-146.4 to -29.4)	0.007	-165.5 (-323.4 to -7.6)	0.04
Organic carbon	-58.6 (-196.1 to 78.8)	0.37	-86.2 (-185.6 to 13.3)	0.08	-151.2 (-389.4 to 87.1)	0.19

* Values are the differences in the estimated rate of eight-year growth at the lowest and highest observed levels of the indicated pollutant. Differences are scaled to the range across the 12 study communities in the average level of each pollutant from 1994 through 2000 as follows: 37.5 ppb of O₃ (measured from 10 a.m. to 6 p.m.), 46.0 ppb of O₃ (the one-hour maximal level), 34.6 ppb of NO₂, 9.6 ppb of acid vapor, 51.4 µg of PM₁₀ per cubic meter, 22.8 µg of PM_{2.5} per cubic meter, 1.2 µg of elemental carbon per cubic meter, and 10.5 µg of organic carbon per cubic meter. CI denotes confidence interval.

($P=0.002$). Similar associations between these pollutants and a low FEV₁ were observed in the subgroup of children with no history of asthma and the subgroup with no history of smoking (data not shown). A low FEV₁ was not significantly correlated with exposure to ozone in any group.

DISCUSSION

The results of this study provide robust evidence that lung development, as measured by the growth in FVC, FEV₁, and MMEF from the ages of 10 to 18 years, is reduced in children exposed to higher levels of ambient air pollution. The strongest associations were observed between FEV₁ and a correlated set of pollutants, specifically nitrogen dioxide, acid vapor, and elemental carbon. The effects of these pollutants on FEV₁ were similar in boys and girls and remained significant among children with no history of asthma and among those with no history of smoking, suggesting that most children are susceptible to the chronic respiratory effects of breathing polluted air. The magnitude of the observed effects of air pollution on the growth in lung function during this age interval was similar to those that have been reported for exposure to maternal smoking^{17,18} and smaller than those reported for the effects of personal smoking.^{17,19}

Cumulative deficits in the growth in lung func-

tion during the eight-year study period resulted in a strong association between exposure to air pollution and a clinically low FEV₁ at the age of 18 years. In general, lung development is essentially complete in girls by the age of 18 years, whereas in boys it continues into their early 20s, but at a much reduced rate. It is therefore unlikely that clinically significant deficits in lung function at the age of 18 years will be reversed in either girls or boys as they complete the transition into adulthood. Deficits in lung function during young adulthood may increase the risk of respiratory conditions — for example, episodic wheezing that occurs during a viral infection.²⁰ However, the greatest effect of pollution-related deficits may occur later in life, since reduced lung function is a strong risk factor for complications and death during adulthood.^{21–27}

Deficits in lung function were associated with a correlated set of pollutants that included nitrogen dioxide, acid vapor, fine-particulate matter (PM_{2.5}), and elemental carbon. In southern California, the primary source of these pollutants is motor vehicles, either through direct tailpipe emissions or downwind physical and photochemical reactions of vehicular emissions. Both gasoline- and diesel-powered engines contribute to the tons of pollutants exhausted into southern California's air every day, with diesel vehicles responsible for disproportionate amounts of nitrogen dioxide, PM_{2.5}, and ele-

Table 4. Sensitivity Analysis of the Effects of Acid Vapor and Elemental Carbon on Growth in FEV₁ over the Eight-Year Study Period.*

Model	Acid Vapor	Elemental Carbon
	Difference (95% Confidence Interval)	
Main model (model 1)†	-105.8 (-168.8 to -42.7)	-87.9 (-146.4 to -29.4)
Additional covariates‡		
Main model + in-utero exposure to maternal smoking (model 2)	-108.8 (-173.3 to -44.2)	-85.8 (-147.4 to -24.1)
Main model + exposure to gas stove (model 3)	-106.0 (-181.5 to -30.6)	-84.8 (-154.7 to -14.9)
Main model + pets in home (model 4)	-108.4 (-171.6 to -45.2)	-89.8 (-149.1 to -30.6)
Main model + parental level of education (model 5)	-100.7 (-167.2 to -34.2)	-80.9 (-142.7 to -19.0)
Main model + short-term effects of pollution (model 6)§	-112.4 (-201.4 to -23.3)	-103.2 (-181.8 to -24.5)
Subgroup effects		
No history of asthma (model 7)¶	-98.1 (-166.4 to -29.8)	-88.9 (-149.2 to -28.6)
No history of smoking (model 8)‖	-115.6 (-233.7 to 2.5)	-113.3 (-214.9 to -11.6)
After exclusion of communities with lowest and highest levels of pollution (model 9)**	-106.7 (-192.3 to -21.2)	-94.7 (-173.7 to -15.7)
Complete follow-up (model 10)††	-132.4 (-226.2 to -38.7)	-97.4 (-195.6 to 0.9)

* Values are the differences in the estimated rate of eight-year growth at the lowest and highest observed levels of the indicated pollutant. Differences are scaled to the range across the 12 study communities in the average level of each pollutant from 1994 through 2000 as follows: 9.6 ppb of acid vapor and 1.2 µg of elemental carbon per cubic meter.

† Model 1 is equivalent to effect estimates for FEV₁ in Table 3 and is based on data on 1759 children.

‡ The main model was adjusted for each of the covariates listed.

§ Values were adjusted for the average levels of O₃, NO₂, and PM₁₀ on the three days before each child's pulmonary-function test.

¶ The analysis includes data on 1302 children with no history of doctor-diagnosed asthma.

‖ The analysis includes data on 1276 children with no history of active tobacco smoking at any time during follow-up.

** The analysis excludes children from the two communities with the lowest and highest levels of each pollutant. This leaves 1507 children (excluding those from Lompoc and Upland) in the analysis of acid vapor and 1484 children (excluding those from Lompoc and Long Beach) in the analysis of elemental carbon.

†† The analysis includes 713 children who underwent pulmonary-function testing in both 1993 and 2001 (i.e., those observed throughout the study).

mental carbon. In the current study, however, we could not discern the independent effects of pollutants because they came from common sources and there was a high degree of intercorrelation among them; similar difficulties have also been encountered in other studies of lung function and air-pollutant mixtures.^{1,2,9,28-30} Since ozone is also formed during photochemical reactions involving fuel-combustion products, one might expect ozone to be correlated with the other study pollutants and therefore to show similar associations with lung function. However, the Children's Health Study was specifically designed to minimize the correlation of ozone with other pollutants across the 12 study communities. Thus, although ozone has been convincingly linked to acute health effects in many other studies,¹¹ our results provide little evidence that

ambient ozone at current levels is associated with chronic deficits in the growth of lung function in children. Only a few other studies have addressed the long-term effects of ozone on lung development in children, and results have been inconsistent.³¹ Although we found little evidence of an effect of ozone, this result needs to be interpreted with caution given the potential for substantial misclassification of exposure to ozone.^{32,33}

The mechanism whereby exposure to pollutants could lead to reduced lung development is unknown, but there are many possibilities. Our observation of associations between air pollution and all three measures of lung function — FVC, FEV₁, and MMEF — suggests that more than one process is involved. FVC is largely a function of the number and size of alveoli, with differences in volume pri-

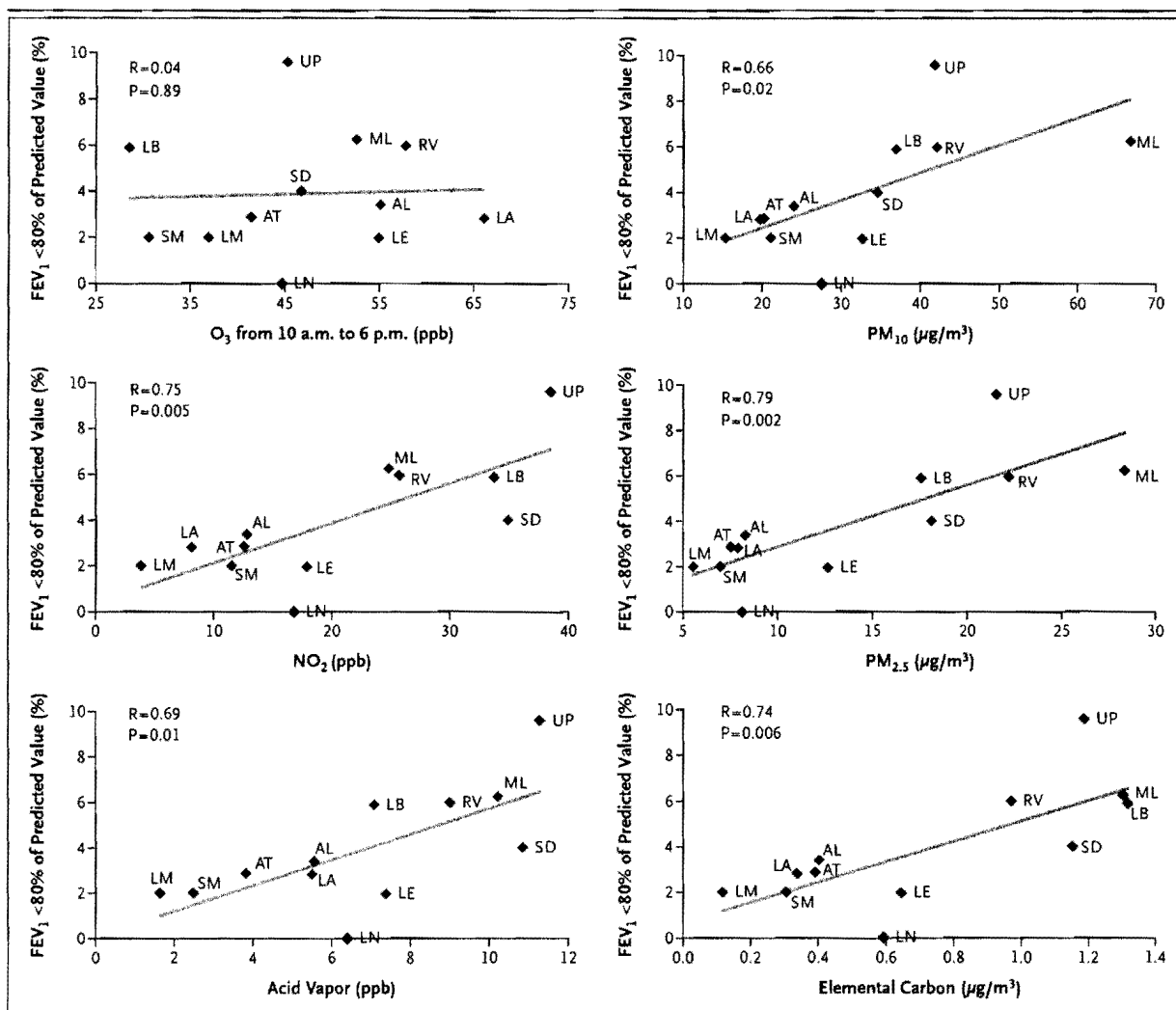


Figure 3. Community-Specific Proportion of 18-Year-Olds with a FEV₁ below 80 Percent of the Predicted Value Plotted against the Average Levels of Pollutants from 1994 through 2000.

The correlation coefficient (R) and P value are shown for each comparison. AL denotes Alpine, AT Atascadero, LE Lake Elsinore, LA Lake Arrowhead, LN Lancaster, LM Lompoc, LB Long Beach, ML Mira Loma, RV Riverside, SD San Dimas, SM Santa Maria, and UP Upland. O₃ denotes ozone, NO₂ nitrogen dioxide, and PM₁₀ and PM_{2.5} particulate matter with an aerodynamic diameter of less than 10 μm and less than 2.5 μm, respectively.

marily attributable to differences in the number of alveoli, since their size is relatively constant.³⁴ However, since the postnatal increase in the number of alveoli is complete by the age of 10 years, pollution-related deficits in the growth of FVC and FEV₁ during adolescence may, in part, reflect a reduction in the growth of alveoli. Another plausible mechanism of the effect of air pollution on lung development is airway inflammation, such as occurs in bronchiolitis; such changes have been observed in the airways

of smokers and of subjects who lived in polluted environments.^{35,36}

A strength of our study was the long-term, prospective follow-up of a large cohort, with exposure and outcome data collected in a consistent manner throughout the study period. As in any epidemiologic study, however, the observed effects could be biased by underlying associations of the exposure and outcome to some confounding variables. We adjusted for known potential confounders, includ-

ing personal characteristics and other sources of exposure to pollutants, but the possibility of confounding by other factors still exists. Over the eight-year follow-up period, approximately 10 percent of study subjects were lost to follow-up each year. Attrition is a potential source of bias in a cohort study if loss to follow-up is related to both exposure and outcome. However, we did not see evidence that the loss of subjects was related to either baseline lung function or exposure to air pollution. In addition, we observed significant associations between air pollution and lung growth in the subgroup of children who were followed for the full eight years of the study, with effects that were similar in magnitude to those in the group as a whole, thus making loss of subjects an unlikely source of bias.

We have shown that exposure to ambient air pollution is correlated with significant deficits in respiratory growth over an eight-year period, leading to clinically important deficits in lung function at the age of 18 years. The specific pollutants that

were associated with these deficits included nitrogen dioxide, acid vapor, PM_{2.5}, and elemental carbon. These pollutants are products of primary fuel combustion, and since they are present at similar levels in many other areas,^{37,38} we believe that our results can be generalized to children living outside southern California. Given the magnitude of the observed effects and the importance of lung function as a determinant of morbidity and mortality during adulthood, continued emphasis on the identification of strategies for reducing levels of urban air pollutants is warranted.

Supported in part by a contract (A033-186) with the California Air Resources Board, grants (SP30ES07048 and 1P01ES11627) from the National Institute of Environmental Health Sciences, and the Hastings Foundation.

We are indebted to Morton Lippmann, Jonathan Samet, Frank Speizer, John Spengler, Scott Zeger, Paul Enright, William Linn, and Dane Westerdahl for important advice; to the school principals, teachers, students, and parents in each of the 12 study communities for their cooperation; and especially to the members of the health testing field team for their efforts.

REFERENCES

1. Frischer T, Studnicka M, Gartner C, et al. Lung function growth and ambient ozone: a three-year population study in school children. *Am J Respir Crit Care Med* 1999;160:390-6.
2. Jedrychowski W, Flak E, Mroz E. The adverse effect of low levels of ambient air pollutants on lung function growth in preadolescent children. *Environ Health Perspect* 1999;107:669-74.
3. Horak F Jr, Studnicka M, Gartner C, et al. Particulate matter and lung function growth in children: a 3-yr follow-up study in Austrian schoolchildren. *Eur Respir J* 2002;19:838-45.
4. Gauderman WJ, McConnell R, Gilliland F, et al. Association between air pollution and lung function growth in southern California children. *Am J Respir Crit Care Med* 2000;162:1383-90.
5. Avol EL, Gauderman WJ, Tan SM, London SJ, Peters JM. Respiratory effects of relocating to areas of differing air pollution levels. *Am J Respir Crit Care Med* 2001;164:2067-72.
6. Gauderman WJ, Gilliland GF, Vora H, et al. Association between air pollution and lung function growth in southern California children: results from a second cohort. *Am J Respir Crit Care Med* 2002;166:76-84.
7. Ware JH, Ferris BG Jr, Dockery DW, Spengler JD, Stram DO, Speizer FE. Effects of ambient sulfur oxides and suspended particles on respiratory health of preadolescent children. *Am Rev Respir Dis* 1986;133:834-42.
8. Dockery DW, Speizer FE, Stram DO, Ware JH, Spengler JD, Ferris BG Jr. Effects of inhalable particles on respiratory health of children. *Am Rev Respir Dis* 1989;139:587-94.
9. Schwartz J. Lung function and chronic exposure to air pollution: a cross-sectional analysis of NHANES II. *Environ Res* 1989;50:309-21.
10. Raizenne M, Neas LM, Damokosh AI, et al. Health effects of acid aerosols on North American children: pulmonary function. *Environ Health Perspect* 1996;104:506-14.
11. Committee of the Environmental and Occupational Health Assembly of the American Thoracic Society. Health effects of outdoor air pollution. *Am J Respir Crit Care Med* 1996;153:3-50, 477-98.
12. Peters JM, Avol E, Gauderman WJ, et al. A study of twelve Southern California communities with differing levels and types of air pollution. II. Effects on pulmonary function. *Am J Respir Crit Care Med* 1999;159:768-75.
13. Peters JM, Avol E, Navidi W, et al. A study of twelve Southern California communities with differing levels and types of air pollution. I. Prevalence of respiratory morbidity. *Am J Respir Crit Care Med* 1999;159:760-7.
14. Wang X, Dockery DW, Wypij D, et al. Pulmonary function growth velocity in children 6 to 18 years of age. *Am Rev Respir Dis* 1993;148:1502-8.
15. Elemental carbon (diesel exhaust). In: NIOSH manual of analytical methods. No. 5040. Issue 3 (interim report). Cincinnati: National Institute for Occupational Safety and Health, 1999.
16. SAS/STAT user's guide, version 9. Cary, N.C.: SAS Institute, 2002.
17. Tager IB, Weiss ST, Munoz A, Rosner B, Speizer FE. Longitudinal study of the effects of maternal smoking on pulmonary function in children. *N Engl J Med* 1983;309:699-703.
18. Wang X, Wypij D, Gold DR, et al. A longitudinal study of the effects of parental smoking on pulmonary function in children 6-18 years. *Am J Respir Crit Care Med* 1994;149:1420-5.
19. Tager I, Munoz A, Rosner B, Weiss ST, Carey V, Speizer FE. Effect of cigarette smoking on the pulmonary function of children and adolescents. *Am Rev Respir Dis* 1985;131:752-9.
20. Mckean M, Leech M, Lambert PC, Hewitt C, Myint S, Silverman M. A model of viral wheeze in nonasthmatic adults: symptoms and physiology. *Eur Respir J* 2001;18:23-32.
21. Schroeder EB, Welch VL, Couper D, et al. Lung function and incident coronary heart disease: the Atherosclerosis Risk in Communities Study. *Am J Epidemiol* 2003;158:1171-81.
22. Schunemann HJ, Dorn J, Grant BJ, Winkelstein W Jr, Trevisan M. Pulmonary function is a long-term predictor of mortality in the general population: 29-year follow-up of the Buffalo Health Study. *Chest* 2000;118:656-64.
23. Knuiman MW, James AL, Davitini ML, Ryan G, Bartholomew HC, Musk AW. Lung function, respiratory symptoms, and mortality: results from the Busselton Health Study. *Ann Epidemiol* 1999;9:297-306.
24. Hole DJ, Watt GC, Davey Smith G, Hart CL, Gillis CR, Hawthorne VM. Impaired

- lung function and mortality risk in men and women: findings from the Renfrow and Paisley prospective population study. *BMJ* 1996;313:711-5.
25. Kannell WB, Hubert H, Lew EA. Vital capacity as a predictor of cardiovascular disease: the Framingham Study. *Am Heart J* 1983;105:311-5.
26. Friedman GD, Klatsky AL, Siegelau AB. Lung function and risk of myocardial infarction and sudden cardiac death. *N Engl J Med* 1976;294:1071-5.
27. Ashley F, Kannell WB, Sorlie PD, Mason R. Pulmonary function: relation to aging, cigarette habit, and mortality. *Ann Intern Med* 1975;82:739-45.
28. Detels R, Tashkin DP, Sayre JW, et al. The UCLA population studies of chronic obstructive respiratory disease. 9. Lung function changes associated with chronic exposure to photochemical oxidants: a cohort study among never-smokers. *Chest* 1987; 92:594-603.
29. Detels R, Tashkin DP, Sayre JW, et al. The UCLA population studies of *CORD*. X. A cohort study of changes in respiratory function associated with chronic exposure to SO_x, NO_x, and hydrocarbons. *Am J Public Health* 1991;81:350-9.
30. Tashkin DP, Detels R, Simmons M, et al. The UCLA population studies of chronic obstructive respiratory disease. XI. Impact of air pollution and smoking on annual change in forced expiratory volume in one second. *Am J Respir Crit Care Med* 1994;149:1209-17.
31. Tager IB. Air pollution and lung function growth: is it ozone? *Am J Respir Crit Care Med* 1999;160:387-9.
32. Avol EL, Navidi WC, Rappaport EB, Peters JM. Acute effects of ambient ozone on asthmatic, wheezy, and healthy children. *Res Rep Health Eff Inst* 1998;82:1-30.
33. Sarnat JA, Schwartz J, Catalano PJ, Suh HH. Gaseous pollutants in particulate matter epidemiology: confounders or surrogates? *Environ Health Perspect* 2001;109:1053-61.
34. Ochs M, Nyengaard JR, Jung A, et al. The number of alveoli in the human lung. *Am J Respir Crit Care Med* 2004;169:120-4.
35. Churg A, Brauer M, del Carmen Avila-Casado M, Fortoul TI, Wright JL. Chronic exposure to high levels of particulate air pollution and small airway remodeling. *Environ Health Perspect* 2003;111:714-8.
36. Sherwin RP, Richters V, Kraft P, Richters A. Centriacinar region inflammatory disease in young individuals: a comparative study of Miami and Los Angeles residents. *Virchows Arch* 2000;437:422-8.
37. Tolocka M, Solomon P, Mitchell W, Norris G, Gemmill D, Wiener R. East vs. West in the US: chemical characteristics of PM_{2.5} during the winter of 1999. *Aerosol Sci Technol* 2001;34:88-96.
38. Latest findings on national air quality: 2002 status and trends. Research Triangle Park, N.C.: Environmental Protection Agency, 2003. (Report no. 454/K-03-001.)

Copyright © 2004 Massachusetts Medical Society.

FULL TEXT OF ALL JOURNAL ARTICLES ON THE WORLD WIDE WEB

Access to the complete text of the *Journal* on the Internet is free to all subscribers. To use this Web site, subscribers should go to the *Journal's* home page (www.nejm.org) and register by entering their names and subscriber numbers as they appear on their mailing labels. After this one-time registration, subscribers can use their passwords to log on for electronic access to the entire *Journal* from any computer that is connected to the Internet. Features include a library of all issues since January 1993 and abstracts since January 1975, a full-text search capacity, and a personal archive for saving articles and search results of interest. All articles can be printed in a format that is virtually identical to that of the typeset pages. Beginning six months after publication, the full text of all Original Articles and Special Articles is available free to nonsubscribers who have completed a brief registration.

EXHIBIT 3

Particulate Matter Air Pollution and Cardiovascular Disease An Update to the Scientific Statement From the American Heart Association

Robert D. Brook, MD, Chair; Sanjay Rajagopalan, MD; C. Arden Pope III, PhD;
Jeffrey R. Brook, PhD; Aruni Bhatnagar, PhD, FAHA; Ana V. Diez-Roux, MD, PhD, MPH;
Fernando Holguin, MD; Yuling Hong, MD, PhD, FAHA; Russell V. Luepker, MD, MS, FAHA;
Murray A. Mittleman, MD, DrPH, FAHA; Annette Peters, PhD; David Siscovick, MD, MPH, FAHA;
Sidney C. Smith, Jr, MD, FAHA; Laurie Whitsel, PhD; Joel D. Kaufman, MD, MPH; on behalf of the
American Heart Association Council on Epidemiology and Prevention, Council on the Kidney in
Cardiovascular Disease, and Council on Nutrition, Physical Activity and Metabolism

Abstract—In 2004, the first American Heart Association scientific statement on “Air Pollution and Cardiovascular Disease” concluded that exposure to particulate matter (PM) air pollution contributes to cardiovascular morbidity and mortality. In the interim, numerous studies have expanded our understanding of this association and further elucidated the physiological and molecular mechanisms involved. The main objective of this updated American Heart Association scientific statement is to provide a comprehensive review of the new evidence linking PM exposure with cardiovascular disease, with a specific focus on highlighting the clinical implications for researchers and healthcare providers. The writing group also sought to provide expert consensus opinions on many aspects of the current state of science and updated suggestions for areas of future research. On the basis of the findings of this review, several new conclusions were reached, including the following: Exposure to PM <2.5 μm in diameter (PM_{2.5}) over a few hours to weeks can trigger cardiovascular disease-related mortality and nonfatal events; longer-term exposure (eg, a few years) increases the risk for cardiovascular mortality to an even greater extent than exposures over a few days and reduces life expectancy within more highly exposed segments of the population by several months to a few years; reductions in PM levels are associated with decreases in cardiovascular mortality within a time frame as short as a few years; and many credible pathological mechanisms have been elucidated that lend biological plausibility to these findings. It is the opinion of the writing group that the overall evidence is consistent with a causal relationship between PM_{2.5} exposure and cardiovascular morbidity and mortality. This body of evidence has grown and been strengthened substantially since the first American Heart Association scientific statement was published. Finally, PM_{2.5} exposure is deemed a modifiable factor that contributes to cardiovascular morbidity and mortality. (*Circulation*. 2010;121:2331-2378.)

Key Words: AHA Scientific Statements ■ atherosclerosis ■ epidemiology ■ prevention
■ air pollution ■ public policy

In 2004, the American Heart Association (AHA) published its first scientific statement regarding air pollution and cardiovascular disease (CVD).¹ The rationale was to provide

researchers, healthcare providers, and regulatory agencies with a comprehensive review of the evidence linking air pollution exposure with cardiovascular morbidity and mor-

The American Heart Association makes every effort to avoid any actual or potential conflicts of interest that may arise as a result of an outside relationship or a personal, professional, or business interest of a member of the writing panel. Specifically, all members of the writing group are required to complete and submit a Disclosure Questionnaire showing all such relationships that might be perceived as real or potential conflicts of interest.

This statement was approved by the American Heart Association Science Advisory and Coordinating Committee on February 22, 2010. A copy of the statement is available at <http://www.americanheart.org/presenter.jhtml?identifier=3003999> by selecting either the “topic list” link or the “chronological list” link (No. KB-0038). To purchase additional reprints, call 843-216-2533 or e-mail kelle.ramsay@wolterskluwer.com.

The American Heart Association requests that this document be cited as follows: Brook RD, Rajagopalan S, Pope CA 3rd, Brook JR, Bhatnagar A, Diez-Roux AV, Holguin F, Hong Y, Luepker RV, Mittleman MA, Peters A, Siscovick D, Smith SC Jr, Whitsel L, Kaufman JD; on behalf of the American Heart Association Council on Epidemiology and Prevention, Council on the Kidney in Cardiovascular Disease, and Council on Nutrition, Physical Activity and Metabolism. Particulate matter air pollution and cardiovascular disease: an update to the scientific statement from the American Heart Association. *Circulation*. 2010;121:2331-2378.

Expert peer review of AHA Scientific Statements is conducted at the AHA National Center. For more on AHA statements and guidelines development, visit <http://www.americanheart.org/presenter.jhtml?identifier=3023366>.

Permissions: Multiple copies, modification, alteration, enhancement, and/or distribution of this document are not permitted without the express permission of the American Heart Association. Instructions for obtaining permission are located at <http://www.americanheart.org/presenter.jhtml?identifier=4431>. A link to the “Permission Request Form” appears on the right side of the page.

© 2010 American Heart Association, Inc.

Circulation is available at <http://circ.ahajournals.org>

DOI: 10.1161/CIR.0b013e3181d8ece1

tality. There was also an explicit aim to educate clinicians about the importance of this issue, because the cardiovascular health consequences of air pollution generally equal or exceed those due to pulmonary diseases.¹⁻⁴ Finally, a list of key remaining scientific questions and strategic avenues for investigation were provided to help foster and guide future research.

The first AHA writing group concluded that short-term exposure to particulate matter (PM) air pollution contributes to acute cardiovascular morbidity and mortality¹ and that exposure to elevated PM levels over the long term can reduce life expectancy by a few years. Although some mechanistic details remained incompletely described, the existing science was deemed adequate to substantiate several plausible biological pathways whereby PM could instigate acute cardiovascular events and promote chronic disease.

There is mounting evidence from a rapid growth of published data since the previous statement related to the harmful cardiovascular effects of air pollution.^{3,4} Most, but not all, epidemiological studies corroborate the elevated risk for cardiovascular events associated with exposure to fine PM <2.5 μm in aerodynamic diameter (PM_{2.5}). PM_{2.5} generally has been associated with increased risks of myocardial infarction (MI), stroke, arrhythmia, and heart failure exacerbation within hours to days of exposure in susceptible individuals. Several new studies have also demonstrated that residing in locations with higher long-term average PM levels elevates the risk for cardiovascular morbidity and mortality. Some recent evidence also implicates other size fractions, such as ultrafine particles (UFPs) <0.1 μm , gaseous copollutants (eg, ozone and nitrogen oxides [NO_x]), and specific sources of pollution (eg, traffic). In addition, there have been many insights into the mechanisms whereby PM could prove capable of promoting CVDs.²⁻⁴ Air pollutants have been linked with endothelial dysfunction and vasoconstriction, increased blood pressure (BP), prothrombotic and coagulant changes, systemic inflammatory and oxidative stress responses, autonomic imbalance and arrhythmias, and the progression of atherosclerosis. In the interim, the US Environmental Protection Agency (EPA) completed its updated "Air Quality Criteria for Particulate Matter"⁵ and afterward strengthened the National Ambient Air Quality Standards (NAAQS) for daily PM_{2.5} levels starting in 2006 (down from 65 to 35 $\mu\text{g}/\text{m}^3$).⁶ The most recent scientific review coordinated by the EPA, the final report of the Integrated Science Assessment for Particulate Matter (<http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=216546>), has also been made available publicly. These numerous changes and advances provide the rationale for the present updated AHA scientific statement on PM air pollution and CVD. This updated statement is similar in scope, content, and overall structure to the first document; however, it provides many additional conclusions and recommendations that can now be made because of the expanded number and quality of studies.

Objectives and Methods

The primary objective of this scientific statement is to provide a comprehensive updated evaluation of the evidence

linking PM exposure with CVDs. The focus of this review is explicitly on PM because the majority of air pollution studies have centered on its cardiovascular effects, and the strength of the evidence makes it possible to provide consensus opinions and recommendations. Except for in a few circumstances, such as when copollutants have been shown to (or not to) modify the responses to PM exposure or to have independent cardiovascular effects in epidemiological studies of major importance, a detailed discussion of other air pollutants (eg, ozone and NO₂) is beyond the scope of this document. Additional objectives are to provide expert consensus opinions on aspects related to the current state of science, to specifically highlight the health and clinical implications of the reviewed findings, and to provide prudent and practical recommendations for measures to reduce PM exposure that might thereby lower the associated cardiovascular risk. This updated scientific statement is structured to first provide a clinical perspective on the cardiovascular risks posed by PM exposure and then briefly review the components of air pollution. The following sections highlight the major findings from epidemiological studies, including mortality, morbidity, and surrogate outcome results. Next, the animal and human mechanistic studies are reviewed, and an overall framework whereby PM exposure could cause CVDs is outlined. Finally, updated consensus opinions and conclusions are provided, followed by suggestions for areas of future research and policy considerations.

Members of the current writing group were selected from across a broad range of disciplines, including cardiovascular and environmental epidemiology and statistics, atmospheric sciences, cardiovascular and pulmonary medicine, basic science research, and public policy. The writing group identified studies published in the English language between January 1, 2004, and March 31, 2009, by a World Wide Web-based literature search using Medline, PubMed, and Google search engines. Key terms included *air pollution* or *particulate matter* plus any of the following: *cardiovascular, myocardial, heart, cardiac, stroke, heart failure, arrhythmia, heart rate variability, autonomic, sympathetic, atherosclerosis, vascular, blood pressure, hypertension, diabetes, metabolic, thrombosis, and coagulation*. Additional studies were identified within the references of these publications and by the personal knowledge of the writing group members. A few studies published after March 31, 2009, were added during the review process. All of the identified epidemiological studies that provided mortality data or hard cardiovascular outcomes (eg, MIs) and controlled human exposure protocols were included. In a few circumstances, studies before 2004 were included briefly in the discussion or tables when it was believed that they provided contextual background and/or relevant findings from earlier analyses of ongoing studies (eg, Harvard Six Cities and American Cancer Society [ACS] cohorts) from which new results after 2004 have been published. It is a limitation of the present review that it was not possible to cite all surrogate outcome human studies because of the enormous number of publications. Some were not included, without intentional bias with regard to results, when multiple referenced studies demonstrated similar findings. In such a situation (eg, heart rate variability [HRV]), this

limitation was noted within the specific section. A main theme of the present statement is to provide clinical context and recommendations for healthcare providers, and thus, it was beyond the scope and not the intent of this document to include all animal, *ex vivo*, or toxicological studies. A number of these publications were also not included, without intentional bias with regard to results. The writing group included publications that were believed to have relevant implications for human cardiovascular health, those that formed the foundation of the mechanistic hypotheses, and studies that were deemed of major importance. Finally, the "evidence summary" statements and all points in the conclusions and recommendations represent consensus expert opinions agreed on by all members of the writing group during formal discussions. It is explicitly stated when no such agreement was reached. These statements and the points within Tables 6 and 7 do not represent the result of applying the standard AHA criteria (ie, level and class) to the sum findings of the present review, because those do not apply, but rather the qualitative consensus opinions agreed on by the writing group. The purpose is to provide expert opinions on the comparative relative ranking and the strength of the overall evidence regarding different areas within this field of science.

Perspective on the Air Pollution–Cardiovascular Risk Association

Traditional cardiovascular risk factors account for the major portion of the risk for ischemic cardiac events within a population.⁷ Individuals with optimal levels of all risk factors have been shown to have a low lifetime cardiovascular event rate.⁸ Thus, control of the traditional risk factors is recognized to be of paramount importance to prevent CVDs. In this context, there has been some debate about the overall clinical relevance and utility of adding novel risk factors to risk-prediction models to incrementally improve their overall predictive value, even when assessed by multiple methodologies.⁹ On the other hand, the ability to predict future events by existing models remains imperfect. In addition to several mathematical and statistical explanations for this shortcoming,^{10,11} it is important to recognize that the development of vascular or atherosclerotic disease (the factor predicted by most statistical models) is usually a necessary but insufficient cause of future ischemic events in and of itself. Cardiovascular events must also be triggered by an additional factor at some unknowable future time, and therefore, they transpire as a stochastic process within a population.¹² This is one of several reasons why PM air pollution is a uniquely important public health issue among the list of novel risk factors; PM inhalation is an established trigger of cardiovascular events that occur within hours to days after exposure.¹² Because of the ubiquitous and involuntary nature of PM exposure, it may continuously enhance acute cardiovascular risk among millions of susceptible people worldwide in an often inconspicuous manner. Moreover, beyond serving as a simple trigger, PM elicits numerous adverse biological responses (eg, systemic inflammation) that, in premise, may further augment

future cardiovascular risk over the long term after months to years of exposure.

Effects of Short-Term Exposure

Time-series studies estimate that a 10- $\mu\text{g}/\text{m}^3$ increase in mean 24-hour $\text{PM}_{2.5}$ concentration increases the relative risk (RR) for daily cardiovascular mortality by approximately 0.4% to 1.0%.³ Despite theoretical statistical risks ascribed to all individuals, this elevated risk from exposure is not equally distributed within a population. At present-day levels, $\text{PM}_{2.5}$ likely poses an acute threat principally to susceptible people, even if seemingly healthy, such as the elderly and those with (unrecognized) existing coronary artery or structural heart disease.¹³ Therefore, the absolute risk rather than the RR of exposure may more effectively convey the tangible health burden within a population. A 10- $\mu\text{g}/\text{m}^3$ increase during the preceding day contributes on average to the premature death of approximately 1 susceptible person per day in a region of 5 million people (based on annual US death rates in 2005).^{3,14} Although the dangers to 1 individual at any single time point may be small, the public health burden derived from this ubiquitous risk is enormous. Short-term increases in $\text{PM}_{2.5}$ levels lead to the early mortality of tens of thousands of individuals per year in the United States alone.^{1,3,5}

Effects of Long-Term Exposure

Cohort studies estimate that the RR associated with living in areas with higher PM levels over the long term is of greater magnitude than that observed from short-term exposure increases (RR between 1.06 and 1.76 per 10 $\mu\text{g}/\text{m}^3$ $\text{PM}_{2.5}$).³ In this context, the World Health Organization estimated that $\text{PM}_{2.5}$ contributes to approximately 800 000 premature deaths per year, ranking it as the 13th leading cause of worldwide mortality.¹⁵ Hence, PM air pollution appears to be an important modifiable factor that affects the public health on a global scale.

Air Pollution

The first AHA statement on air pollution reviewed the size fractions, sources, and chemical constituents of PM and the main gaseous air pollutants: Nitrogen oxides (NO_x ; ie, $\text{NO} + \text{NO}_2$), carbon monoxide (CO), sulfur dioxide (SO_2), and ozone (O_3).¹ Therefore, this section within the updated statement focuses on several other contemporary aspects of air pollution characterization and exposure assessment, particularly in relation to their potential influences on cardiovascular health. In brief, PM is broadly categorized by aerodynamic diameter: All particles $<10 \mu\text{m}$ (thoracic particles [PM_{10}]), all particles $<2.5 \mu\text{m}$ (fine particles [$\text{PM}_{2.5}$]), all particles $<0.1 \mu\text{m}$ (UFP), and particles between 2.5 and $10 \mu\text{m}$ (coarse particles [$\text{PM}_{10-2.5}$]). Hence, PM_{10} contains within it the coarse and $\text{PM}_{2.5}$ fractions, and $\text{PM}_{2.5}$ includes UFP particles. The concentrations of PM_{10} and $\text{PM}_{2.5}$ are typically measured in their mass per volume of air ($\mu\text{g}/\text{m}^3$), whereas UFPs are often measured by their number per cubic centimeter (Table 1). The major source of $\text{PM}_{2.5}$ throughout

Table 1. Ambient Air Pollutants

Pollutant	US Average Range	US Typical Peak*	Most Recent NAAQS for Criteria Pollutants (Averaging Time)
O ₃ †	0–125 ppb	200 ppb	75 ppb (8 h)‡
NO ₂ †	0.5–50 ppb	200 ppb	100 ppb (1 h)§ 53 ppb (Annual mean)
NO†	0–100 ppb	200 ppb	
SO ₂ †	0.1–50 ppb	150 ppb	140 ppb (24 h)|| 30 ppb (Annual mean)
CO†	0.1–5 ppm	20 ppm	35 ppm (1 h)|| 9 ppm (8 h)||
PM ₁₀ ¶	10–100 µg/m ³	300 µg/m ³	150 µg/m ³ (24 h)#
PM _{2.5} ¶	5–50 µg/m ³ (Mean=13.4±5.6)	100 µg/m ³	15 µg/m ³ (Annual mean) 35 µg/m ³ (24 h)**
PM _{2.5} lead¶	0.5–5 ng/m ³	150 ng/m ³	0.15 µg/m ³ (Rolling 3-month average)††
NH ₃ †	0.1–20 ppb	100 ppb	
HNO ₃ †	0–5 ppb	10 ppb	
Methane†	1–2 ppm	5 ppm	
Formaldehyde†	0.1–10 ppb	40 ppb	
Acetaldehyde†	0.1–5 ppb	20 ppb	
NMHC (VOC)¶	20–100 µg/m ³	250 µg/m ³	
Propane¶	2–20 µg/m ³	500 µg/m ³	
Benzene¶	0.5–10 µg/m ³	100 µg/m ³	
1,3-Butadiene¶	0.1–2 µg/m ³	10 µg/m ³	
Total suspended particles¶	20–300 µg/m ³	1000 µg/m ³	
PM _{10-2.5} ¶	5–50 µg/m ³	200 µg/m ³	
Sulfate¶	0.5–10 µg/m ³	30 µg/m ³	
Nitrate¶	0.1–5 µg/m ³	20 µg/m ³	
Organic carbon¶	1–20 µg/m ³	30 µg/m ³	
Elemental carbon¶	0.1–3 µg/m ³	10 µg/m ³	
PAH¶	2–50 ng/m ³	200 ng/m ³	
UFF†	1000–20 000/cm ³	100 000/cm ³	

ppb indicates parts per billion; ppm, parts per million; and PAH, polycyclic aromatic hydrocarbon.

*Generally not in concentrated plumes or locations of direct source emission impact.

†Typical hourly average concentrations reached in US cities.

‡The 8-hour standard is met when the 3-year average of the 4th highest daily maximum 8-hour average is less than or equal to the indicated number. In January 2010, the EPA proposed a more stringent 8-hour standard within the range of 60 to 70 ppb (<http://www.epa.gov/air/ozonepollution/actions.html>).

§To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed this value.

||The level is not to be exceeded more than once per year.

¶Typical 24-hour average concentrations.

#The level is not to be exceeded more than once per year on average over 3 years.

**The daily standard is met when the 3-year average of the 98th percentile of 24-hour PM level is less than or equal to the indicated number.

††Although the typical concentrations shown in the table are for PM_{2.5}, the lead standard continues to be based on measurements in total suspended particulate.

the world today is the human combustion of fossil fuels from a variety of activities (eg, industry, traffic, and power generation). Biomass burning, heating, cooking, indoor activities, and nonhuman sources (eg, fires) may also be relevant sources, particularly in certain regions.

Common air pollutants and those designated as EPA criteria pollutants (ie, specifically targeted in regulations through limits on emissions or government standards such as the NAAQS) are listed in Table 1. The World Health Organization also provides ambient guidelines (<http://www.euro.who.int/Document/E90038.pdf>). As a result, many pollutant concentrations are tracked in the United States by nationwide monitoring networks, with up to approximately 1200 sites for O₃ and PM_{2.5}. Data are archived by the EPA and are available to the public (<http://www.epa.gov/ttn/airs/airsaqs/>). O₃ levels exceed the national standard in many areas, and thus, daily information is provided to assist the public in reducing their exposure. A lower standard for ozone concentrations was proposed recently, which will lead to more frequent occurrences of outdoor exposures deemed to be excessive (Table 1). The reporting of PM_{2.5} is also becoming common because of its impact on public health and frequent violations of standards. Current and forecast air quality indices and information on both PM_{2.5} and ozone are available (<http://airnow.gov/>). At the end of 2008, 211 US counties (or portions of counties) were in nonattainment of the 2006 daily PM_{2.5} NAAQS (<http://www.epa.gov/pmdesignations/2006standards/state.htm>). On a positive note, the various regulations that have been established have led to substantial reductions in PM and other pollutant levels over the past 40 years in the United States and contributed toward similar improvements in other countries. However, reducing the levels of some pollutants, such as O₃, remains a challenge because of the complex chemical processes that lead to their formation in the atmosphere.¹⁶ The population of many developing nations (China, India, Middle Eastern countries) continues to be exposed to high levels, particularly of PM, which can routinely exceed 100 µg/m³ for prolonged periods (http://siteresources.worldbank.org/DATASTATISTICS/Resources/table_3_13.pdf).

Air Pollution Mixtures, Chemistry, and Sources

Detailed information regarding PM sizes, composition, chemistry, sources, and atmospheric interactions is beyond the scope of this document but can be found in the 2004 US EPA Air Quality Criteria for Particulate Matter final report (<http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=87903>). The source for much of the information provided in this brief summary is this document, unless otherwise specifically referenced. The typical range of ambient concentrations for several air pollutants in the United States, including the latest US NAAQS for the criteria pollutants, is given in Table 1. Classification of air quality according to 1 single pollutant and by size or mass provides an incomplete picture, because ambient air pollution is a complex mixture of gases, particles, and liquids that are continually changing and interacting with each other and natural atmospheric gases. Although PM_{2.5} mass has rightfully attracted considerable attention as a target for regulation and epidemiological study, more than 98% of

the air pollutant mass in the mixture we breathe in urban settings is from gases or vapor-phase compounds such as CO, nonmethane hydrocarbons or volatile organic carbons (VOCs), NO₂, NO, O₃, and SO₂. Each of these can have independent and potentially synergistic or antagonistic effects with each other and with PM; however, at present, the cardiovascular health impact of exposure to combinations of air pollutants is not well understood.

Most of the studies linking CVDs with PM exposures have focused on particle mass; thus, this association is evaluated and reported in the majority of epidemiological and toxicological studies reviewed. Although PM is regulated by mass concentration, the aspect of PM most harmful to cardiovascular health may not be best quantified by mass measurement alone. The sum effect of many features related to chemical composition and size/morphology (eg, oxidative stress potential, solubility, charge, surface area, particle count, lung deposition, and stability within the atmosphere and biological tissues) is important to consider. With regard to specific "toxic" compounds within PM, several lines of existing evidence support the idea that transition metals, organic compounds, semiquinones, and endotoxin are likely relevant in relation to promoting CVDs. In addition, certain characteristics of UFPs (eg, high surface area, particle number, metal and organic carbon content) suggest that they may pose a particularly high cardiovascular risk after short-term exposure.¹⁷ Both the additional characterization of "criteria" pollutants and the measurement of several other pollutants (discussed below) are important to inform air quality management practices that involve air quality modeling, as well as epidemiological studies and risk assessment, which ultimately aim to improve risk-reduction strategies.

In addition to their mass concentration, pollutants can be characterized on the basis of their origin or chemical and physical properties. In terms of origin, nitrogen oxides (NO+NO₂), CO, SO₂, and PM_{2.5}, as well as carbon dioxide (CO₂), are mainly associated with combustion of fuel or other high-temperature industrial processes. Combustion PM is composed of many chemical compounds, including organic carbon species, elemental or black carbon, and trace metals (eg, lead and arsenic). They range in size from molecular clusters a few nanometers in diameter to light-scattering particles that peak on a mass contribution basis in the diameter range of 200 to 1000 nm (0.2 to 1 μm). UFP numbers are also strongly linked to fresh combustion and traffic-related pollution. Ammonia, methane, pesticides (persistent organic pollutants), reduced sulfur compounds, resuspended dust, and natural coarse particles (PM_{10-2.5}) are associated with noncombustion surface or fugitive releases that arise from a variety of human (eg, agriculture) and natural (eg, erosion) activities. Agricultural emissions and releases from a range of industrial processes and waste management are also important sources. Road and wind-blown dust from agricultural practices and from certain industrial facilities (eg, mineral industry) also contribute to these particles, which are typically in the coarse (PM_{10-2.5}) or even larger (>PM₁₀) range.

In addition to pollutants formed directly by combustion, many others are produced primarily through chemical reac-

tions in the atmosphere among directly emitted pollutants. These are known as secondary pollutants. Sunlight, water vapor, and clouds are often involved in this atmospheric chemistry, which leads to greater oxidation of the pollutants. Examples include PM-associated sulfate, nitrate, and ammonium and many of the organic compounds within PM_{2.5}. Besides O₃, which is the most prevalent secondary gaseous oxidant, a number of inorganic and organic acids and VOCs form in the atmosphere. Examples are the hydroxyl radical, peroxyacetyl nitrate, nitric acid, formic and acetic acid, formaldehyde, and acrolein.

VOCs and semivolatile organic compounds (SVOCs), the latter of which are found in both the gas and particle phase, are an additional large class of pollutants. They are associated with both combustion and fugitive emissions, as well as with secondary formation. Key examples are benzene, toluene, xylene, 1,3-butadiene, and polycyclic aromatic hydrocarbons. VOCs are among the 188 hazardous air pollutants listed by the EPA, and their main emission sources have been identified and are regulated (<http://www.epa.gov/ttn/atw/mactfnlalph.html>). VOCs can undergo reactions that convert toxic substances to less toxic products or vice versa. Many VOCs contribute to the formation of O₃ and are oxidized in the atmosphere, becoming SVOCs, and subsequently partition within particles and contribute to the composition of PM_{2.5}, as well as to its mass. A great deal of research has focused on PM_{2.5} in the past decade, which has led to advances in measurement technologies¹⁸ and greater understanding of its chemistry and atmospheric behavior.¹⁹ Nonetheless, understanding is incomplete, particularly with regard to formation of the secondary organic fraction, the relative role of anthropogenic and biogenic emissions to organics, surface chemistry, oxidative potential,²⁰ and gas-to-particle partitioning.

An alternative to attempting to identify one by one which pollutant(s) or chemical compounds are most harmful is to focus on identifying the sources, which typically emit mixtures of pollutants, of greatest concern. It may be the mixture of pollutants (along with the source from which it is derived, which determines its characteristics) that is most pertinent to human health outcomes. Such information may actually be more relevant for aiding the development of effective air quality policies. One important example reviewed in the epidemiology section is that the evidence continues to grow regarding the harmful cardiovascular effects of traffic-related pollution. Traffic is ubiquitous in modern society, with a sizeable proportion of the population, particularly persons disadvantaged by low socioeconomic status, living close enough (within 500 m) to a major road or a freeway to be chronically exposed to elevated concentrations. Additionally, daily behavior brings most people close to this source, with the average US citizen over 15 years of age spending 55 minutes each day traveling in motor vehicles.²¹ However, despite the consistent epidemiological findings, these studies have yet to elucidate which of the many pollutants or other associated risks (ie, noise) produced by traffic are responsible for the increase in risk for CVD. Until the most harmful agents are identified, the only practical manner to potentially reduce health consequences would be to reduce overall traffic and related emissions and to configure cities and lifestyles

such that there is greater separation between the people and the source, so that we could spend less time in traffic (a major source of personal exposures in our society). There are also a myriad of other important pollutant sources of known toxic pollutants that have been implicated in health-effect studies (eg, power generation, industrial sources, steel mills, and wood smoke). A better understanding of the factors that influence population exposure to these sources, of how their emissions and mixtures of different sources affect health, and about the factors that make individuals more susceptible will aid in the development of more effective environmental health policies.

Determinants of Air Pollution Exposure

Many aspects of air pollution play a role in the characteristics of population- and individual-level exposures. Pollutants vary on multiple time scales, with emission rates, weather patterns, and diurnal/seasonal cycles in solar radiation and temperature having the greatest impact on concentrations. The temporal behavior of a pollutant is also governed by its formation rate and the length of time it remains in the atmosphere. As such, the concentrations of many air pollutants tend to co-vary. For example, NO_x and CO are emitted during combustion, as are some particle constituents (eg, elemental carbon) and VOCs, and thus, their concentrations peak during rush hour. On the other hand, O_3 and other photochemical oxidants, including secondary $\text{PM}_{2.5}$ and secondary VOCs, peak in the afternoon, particularly given certain meteorologic conditions (eg, more sunshine). Among the common air pollutants, O_3 and $\text{PM}_{2.5}$ have the longest atmospheric lifetime and thus can build up over multiple days and spread, by the prevailing winds, over large geographic regions. This can lead to similarities in their temporal and spatial patterns over broad regions and to greater numbers of people being exposed to similar levels, thus lessening interindividual variability in exposure.

Periods of suppressed horizontal and vertical mixing in the lower atmosphere lead to the buildup of multiple pollutants. These situations are most common under slow-moving or stationary high-pressure systems, which bring light winds, a stable atmosphere, and more sunshine. The frequency and seasonality of these meteorologic conditions and how they affect concentrations vary geographically, which leads to differences in the characteristics of pollution episodes from the western to the eastern United States, as well as within these regions.

The commonality of meteorology and emission sources leads to covariation in pollutant concentrations on multiple temporal and spatial scales, which makes it more challenging for epidemiological studies to identify the health effects of individual pollutants and the effects of copollutants or mixtures. Studies that depend on daily counts of mortality or morbidity events have difficulties separating the effects of the different pollutants in the urban mix. Even prospective panel studies measuring specific end points on a subdaily time scale are hindered by pollutant covariation. Some of these challenges could potentially be addressed by undertaking studies covering multiple geographic locations with differences in the structure of pollutant covariation due to different meteo-

rology and source mixes. Indeed, this has been done, at least in part, by several existing multicity studies. Consistency in the findings in individual studies conducted in different cities also helps isolate the pollutants that may be more responsible for the health effects. The consistent positive findings with certain pollutants (eg, PM mass concentration) have helped strengthen the evidence regarding PM_{10} and $\text{PM}_{2.5}$ effects, but regardless of location, there remains the strong underlying commonality of fossil fuel combustion for many pollutants.

A final issue to consider is the cardiovascular health effects of exposures that occur at the personal level because of the different microenvironments or activities an individual experiences (eg, time in traffic, indoor sources, secondhand tobacco smoke, occupational exposure, and degree of indoor penetration of ambient PM into homes) versus the effects of exposures from less variable urban- to regional-scale ambient concentrations (ie, background pollution that most individuals encounter more uniformly). Personal monitoring demonstrates substantial variations among individual pollution exposures or characteristics among those living within the same metropolitan area and even the same neighborhood.^{22,23} However, the differing additive, synergistic, and/or confounding effects on cardiovascular health of these 2 contrasting components of a person's overall exposure have not been well described. For the most part, the magnitude of the findings reported by the major epidemiological studies (see next section) are indicative of the effects of the urban- to regional-scale ambient concentrations. Actual exposures to all pollutants also vary at the personal level. The cardiovascular health importance of these individual-level variations (above and beyond the effect of urban/regional levels) remains largely unknown, in part because it has been difficult to quantify. The degree to which measurement of personal exposures or more precise exposure assessment (eg, use of geographic information systems, land-use regression models, spatial-temporal models, and adjustments for indoor penetration) can reduce the effects of exposure misclassification in epidemiological studies also remains to be fully elucidated.^{24–26}

Epidemiological Studies of Air Pollution

Epidemiological studies of air pollution have examined the health effects of exposures observed in real-world settings at ambient levels. Associations between relevant health end points and measures of air pollution are evaluated while attempting to control for effects of other pertinent factors (eg, patient and environmental characteristics). Despite substantial study and statistical improvements and the relative consistency of results, some potential for residual confounding of variables and publication bias²⁷ of positive studies are limitations to acknowledge. Probably the most relevant, well-defined, and extensively studied health end points include mortality (all-cause and cause-specific), hospitalizations, and clinical cardiovascular events. This section reviews the results of the epidemiological research with a focus on new studies since the first AHA statement was published,¹ as well as on the cardiovascular health implications. In sum, numerous studies of varied design have been published in the interim that significantly add to the overall weight of evi-

Table 2. Comparison of Pooled Estimated of Percent Increase (and 95% CI or Posterior Interval or *t* Value) in RR of Mortality Estimated Across Meta-Analyses and Multicity Studies of Daily Changes in Exposure

	Primary Source	Exposure Increment	Percent Increases in Mortality (95% CI)		
			All-Cause	Cardiovascular	Respiratory
Meta-estimate with and without adjustment for publication bias	Anderson et al ²⁷ 2005	20 $\mu\text{g}/\text{m}^3$ PM ₁₀	1.0 (0.8–1.2) 1.2 (1.0–1.4)	...	...
Meta-estimates from COMEAP report to the UK Department of Health on CVD and air pollution	COMEAP ³¹ 2006	20 $\mu\text{g}/\text{m}^3$ PM ₁₀	...	1.8 (1.4–2.4)	...
		10 $\mu\text{g}/\text{m}^3$ PM _{2.5}	...	1.4 (0.7–2.2)	...
NMMAPS, 20 to 100 US cities	Dominici et al ³⁴ 2003	20 $\mu\text{g}/\text{m}^3$ PM ₁₀	0.4 (0.2–0.8)	0.6 (0.3–1.0)*	...
APHEA-2, 15 to 29 European cities	Katsouyanni et al ³⁵ 2003 Analitis et al ³⁶ 2006	20 $\mu\text{g}/\text{m}^3$ PM ₁₀	1.2 (0.8–1.4)	1.5 (0.9–2.1)	1.2 (0.4–1.9)
		10 $\mu\text{g}/\text{m}^3$ PM _{2.5}	1.2 (0.8–1.6)	1.3 (0.3–2.4)†	0.6 (–2.9, 4.2)‡
US, 6 cities	Klemm and Mason ³⁷ 2003	10 $\mu\text{g}/\text{m}^3$ PM _{2.5}	1.2 (0.3–2.1)	0.9 (–.1, 2.0)	1.8 (0.2, 3.4)
US, 27 cities, case-crossover	Franklin et al ³⁸ 2007	10 $\mu\text{g}/\text{m}^3$ PM _{2.5}	0.6 (0.2–1.0)	0.6 (0.0, 1.1)	2.2 (0.6, 3.9)
California, 9 cities	Ostro et al ³⁹ 2006	10 $\mu\text{g}/\text{m}^3$ PM _{2.5}	1.2 (0.5–1.8)§	1.2 (0.2–2.2)§	1.1 (–1.4, 3.2)§
France, 9 cities	Le Tertre et al ⁴⁰ 2002	20 $\mu\text{g}/\text{m}^3$ BS	1.0 (0.8–1.3)	1.1 (0.7–1.5)	1.4 (0.9–2.1)
Japan, 13 cities, age >65 y	Omori et al ⁴¹ 2003	20 $\mu\text{g}/\text{m}^3$ SPM	0.55 (0.26–0.85)	0.59 (0.22–0.93)	0.62 (0.16–1.04)
Asia, 4 cities	Wong et al ⁴² 2008	10 $\mu\text{g}/\text{m}^3$ PM ₁₀	0.98 (0.75–1.22)	0.85 (0.46–1.24)	1.68 (1.04–2.33)
		10 $\mu\text{g}/\text{m}^3$ PM _{10–2.5}||	0.46 (0.21–0.71)	0.32 (0.00–0.64)	1.16 (0.43–1.89)
		10 $\mu\text{g}/\text{m}^3$ PM _{2.5} ¶	0.77 (0.43–1.12)	0.61 (0.05–1.17)	1.63 (0.69–2.59)
		10 $\mu\text{g}/\text{m}^3$ PM _{10–2.5} ¶	0.47 (0.21–0.73)	0.29 (–0.04, 0.61)	1.14 (0.043–1.85)

CI indicates confidence interval or posterior interval.

*Cardiovascular and respiratory deaths combined.

†Ischemic heart disease deaths.

‡Chronic obstructive pulmonary disease deaths.

§Includes general additive model-based analyses with potentially inadequate convergence.

||Results for PM_{10–2.5} are from 47 cities.

¶Results of 2 pollutant models controlling for alternate PM size in 47 cities.

dence that exposure to air pollutants at present-day levels contributes to cardiovascular morbidity and mortality.

Mortality and Air Pollution

Time-Series and Related Studies

Time-series and case-crossover studies explore associations between short-term changes in air pollution and daily changes in death counts. The sum of current evidence supports the findings of an earlier review²⁸ that demonstrated that short-term elevations in daily PM levels lead to a greater absolute risk for CVD-related mortality than for all other causes. Even if similar acute RR elevations (≈ 1.01) are estimated between cardiovascular and pulmonary mortality, CVDs account for 69% of the increase in absolute mortality rates compared with 28% for pulmonary diseases attributable to short-term PM exposure. Recently, more rigorous modeling techniques have been used in attempts to better estimate pollution-mortality associations while controlling for other time-dependent confounding covariables.^{29,30} There have been well over 100 published daily time-series studies reporting small but statistically significant PM-mortality associations that have been the subject of quantitative reviews or meta-analyses.^{3,27,31–33} Table 2 summarizes recent multicity analyses and studies published since 2004.

To address concerns about city selection bias, publication bias, and influences of copollutants, several large, multicity,

daily time-series studies have been conducted worldwide. One of the largest was the National Morbidity, Mortality, and Air Pollution Study (NMMAPS). Published reports from this study included as few as 20 US cities,^{44,45} as many as 100 cities,^{46,47} and more recently, data for hundreds of counties (Table 2).⁴⁸ The observed relationship between PM exposure and excess mortality remained independent of several gaseous copollutants (NO₂, CO, or SO₂). Recent analyses suggest that O₃ may also independently contribute to cardiopulmonary mortality risk^{49,50}; however, coexposures to secondary particle pollutants may be responsible in part for this latter association.⁵¹

Several studies have also been conducted outside the United States, including the Air Pollution and Health: A European Approach (APHEA and APHEA-2) projects, which examined daily PM-related mortality effects in multiple cities.^{36,52} PM air pollution was significantly associated with daily mortality counts for all-cause, cardiovascular, and respiratory mortality (Table 2). Further analyses of the European data suggest that CVD deaths are also associated with exposure to NO₂⁵³ and CO.⁵⁴ A few new time-series studies have also confirmed similar increases in cardiovascular mortality related to short-term PM exposure in China^{55–57} and Bangkok, Thailand.⁴² Additional multicity studies have been conducted worldwide with analyses of CVD deaths (Table 2).^{38–42,58–60} Finally, in a recent analysis that included several Asian

cities, SO₂, NO₂, O₃, and PM₁₀ were all associated with excess cardiovascular mortality.⁴²

In an attempt to evaluate the coherence of multicity studies across continents, the Air Pollution and Health: A Combined European and North American Approach (APHENA) study analyzed data from the APHEA, NMMAPS, and Canadian studies.⁶¹ The combined effect on all-cause mortality ranged from 0.2% to 0.6% for a 10- $\mu\text{g}/\text{m}^3$ elevation in daily ambient PM₁₀, with the largest effects observed in Canada. Among individuals older than 75 years, the effects were greater for cardiovascular mortality than for overall and pulmonary mortality (0.47% to 1.30%). Older age (>75 years) and higher rates of unemployment were related to greater PM mortality risks in both continents. Higher NO₂ levels were associated with larger PM₁₀ effects on mortality, particularly in Europe. Finally, there appeared to be no lower-limit threshold below which PM₁₀ was not associated with excess mortality across all regions.

Evidence Summary

The overall evidence from time-series analyses conducted worldwide since publication of the first AHA statement¹ confirms the existence of a small, yet consistent association between increased mortality and short-term elevations in PM₁₀ and PM_{2.5} approximately equal to a 0.4% to 1.0% increase in daily mortality (and cardiovascular death specifically) due to a 10- $\mu\text{g}/\text{m}^3$ elevation in PM_{2.5} during the preceding 1 to 5 days (Table 2).

Cohort and Related Studies

Although short-term changes in PM concentrations have deleterious health effects, longer-term exposures may have a more pertinent clinical health effect on cardiovascular morbidity and mortality given that individuals are typically exposed to higher air pollution levels over extended periods of time. An additional source of exposure variability that has been exploited in epidemiological studies is spatial variability, which includes differences in average ambient concentrations over extended periods of time across metropolitan areas or across smaller communities within local areas. Recent emphasis has been on prospective cohort studies that control for individual differences in multiple confounding variables and cardiovascular risk factors. A summary of these studies is presented in Table 3 and Figure 1. These cohort studies generally demonstrate larger overall mortality effects than the results of time-series analyses.

Harvard Six Cities and ACS Studies

Two landmark cohort-based mortality studies, the Harvard Six Cities⁶² and the ACS studies,⁶⁶ were reported in the mid 1990s and were discussed previously.¹ In both, PM_{2.5} and sulfate particulate pollution were associated with increases in all-cause and cardiopulmonary disease (Table 3). In addition, intensive independent reanalyses⁶³ corroborated the original findings of both studies and resulted in innovative methodological contributions that demonstrated the robustness of the results to alternative modeling

approaches. In both the Harvard Six Cities^{62,64} and the ACS⁶⁷ studies, PM air pollution-related mortality was substantially higher for cardiovascular- than for pulmonary-related causes.

Since 2004, there have been further analyses of both studies. Laden et al⁶⁴ extended the mortality follow-up of the Harvard Six Cities cohort for an additional 8 years. PM_{2.5} associations, similar to those found in the original analysis, were observed for all-cause and CVD mortality (Table 3). Furthermore, reductions in PM_{2.5} concentrations for the extended follow-up period were associated with reduced mortality risk. Further analysis suggested that the health effects of changes in exposure were seen primarily within 2 years.⁸⁴ In addition to confirming the earlier mortality relationship, the recent observations suggest that the adverse health effects mediated by longer-term PM air pollution exposure can be estimated reasonably accurately by the previous few years of particle levels.

Extended analyses of the ACS cohort that emphasize efforts to control for the effects of other covariates and risk factors have corroborated the previously reported mortality associations with particulate and sulfur oxide pollution.⁶⁸ Elevated mortality risks were most strongly associated with PM_{2.5}. Coarse particles (PM_{10-2.5}) and gaseous pollutants, except for SO₂, were generally not significantly related to mortality. In another extended analysis,⁶⁷ the death certificate classifications of underlying causes of death due to PM_{2.5} exposures were observed to be principally ischemic heart disease, arrhythmias, heart failure, and cardiac arrest. Finally, recent additional analyses attempted to control for the fact that variations in exposure to air pollution across cities or within cities may correlate with socioeconomic or demographic gradients that influence health and susceptibility to environmental exposures.^{85,86} When controlled for individual risk factor data, the mortality associations for intrametropolitan PM_{2.5} concentration differences within the Los Angeles, Calif, area were generally larger than those observed in the full cohort across metropolitan areas.⁶⁹ However, the results were somewhat sensitive to the inclusion of zip code-level ecological variables, which suggests potential contextual neighborhood confounding. Krewski et al⁷⁰ subsequently observed that full adjustments for multiple ecological covariates did not reduce the estimated PM_{2.5}-related mortality effect. The association for ischemic heart disease mortality in particular was highly robust across various study areas and modeling strategies and after controlling for both individual and ecological covariates.

An additional recent analysis of the ACS cohort evaluated the health effects of ozone compared with PM_{2.5}.⁸⁷ The findings reconfirmed the independent cardiovascular mortality increase related to fine-particle exposure. However, after adjustment for PM_{2.5}, ozone was associated solely with an elevated risk of death due to respiratory causes; there was no independent risk of ozone exposure on CVD-related mortality. This suggests that the positive findings reported in NMMAPS⁵⁰ regarding cardiopulmonary mortality and short-term ozone exposure could be explained at least in part by the enhanced risk of mortality due to lung disease categories.

Table 3. Summary of Cohort Study Results

Study	Size of Cohort (000s)	Follow-Up Period	Covariates Controlled for	Percent Increases in Mortality (95% CI) Associated With 10 µg/m ³ PM _{2.5} (or Other When Indicated)			
				All-Cause	Cardiopulmonary	Cardiovascular	Ischemic Heart Disease
Harvard Six Cities, original (Dockery et al ⁶² 1993)	≈8	1974–1991	Individual (smoking + others)	13 (4.2–23)	18 (6.0–32)	...	...
Harvard Six-Cities, HEI reanalysis, Krewski et al ⁶³ 2004	≈8	1974–1991	Individual (smoking + others)	14 (5.4–23)	19 (6.5–33)	...	...
Harvard Six-Cities, extended, Laden et al ⁶⁴ 2006	≈8	1974–1998	Individual (smoking + others)	16 (7–26)	...	28 (13–44)	...
Six-Cities Medicare cohort, Eftim et al ⁶⁵ 2008	≈340	2000–2002	Individual (age, sex)	21 (15–27)	...	...	...
ACS, Original, Pope et al ⁶⁶ 1995	≈500	1982–1989	Individual (smoking + others)	6.6 (3.5–9.8)	12 (6.7–17)	...	...
ACS, HEI reanalysis, Krewski et al ⁶³ 2004	≈500	1982–1989	Individual (smoking + others) + ecological	7.0 (3.9 10)	12 (7.4–17)	13 (8.1–18)	...
ACS, extended I, Pope et al ^{67,68} 2002, 2004	≈500	1982–1998	Individual (smoking + others)	6.2 (1.6–11)	9.3 (3.3–16)	12 (8–15)	18 (14–23)
ACS, intrametro Los Angeles, Jerrett et al ⁶⁹ 2005	≈23	1982–2000	Individual (smoking + others) + ecological	17 (5–30)	12 (–3–30)	...	39 (12–73)
ACS, extended II, Krewski et al ⁷⁰ 2009	≈500	1982–2000	Individual (smoking + others) + ecological	5.6 (3.5–7.8)	13 (9.5–16)	...	24 (20–29)
ACS, Medicare cohort, Eftim et al ⁶⁵ 2008	7333	2000–2002	Individual (age, sex) + ecological + COPD	11 (9–13)	...	...	...
US Medicare cohort, east/central/west, Zeger et al ⁷¹ 2008	13 200	2000–2005	Individual (age, sex) + ecological + COPD	6.8 (4.9–8.7),* 13 (9.5–17) –1.1 (–3 to 0.8)	...	...	...
Women's Health Initiative, Miller et al ⁷² 2007	≈66	1994–2002	Individual (smoking + others)	...	...	76 (25–147), 24 (9–41)†	...
Nurses' Health Study, Puett et al ⁷³ 2008	≈66	1992–2002	Individual (smoking + others) ecological	7.0 (–3.0 to 18)‡	...	30 (0–71)‡	...
AHSMOG, males only, McDonnell et al ⁷⁴ 2000	≈4	1977–1992	Individual (smoking + others)	8.5 (–2.3 to 21)	23 (–3 to 55)	...	...
AHSMOG, females only, Chen et al ⁷⁵ 2005	≈4	1977–2000	Individual (smoking + others)	...	...	42 (6–90)	...
VA hypertensive male I study, Lipfert et al ⁷⁶ 2006	≈42	1989–1996	Individual (smoking + others) + ecological	15 (5–26)§	...	...	...
VA hypertensive male II study, Lipfert et al ⁷⁷ 2006	≈30	1997–2001	Individual (smoking + others) + ecological	6 (–6 to 22)	...	...	...
11 CA county, elderly, Enstrom ⁷⁸ 2005	≈36	1973–2002	Individual (smoking + others) + ecological	4 (1–7)||, 1 (–0.6 to 2.6)	...	...	...
French PAARC, Filleul et al ⁷⁹ 2005	≈14	1974–2000	Individual (smoking + others)	7 (3–10)‡	5 (–2 to 12)‡	...	...
German women, Gehring et al ⁸⁰ 2006	≈5	1980s, 1990s–2003	Individual smoking and socioeconomic status	12 (–8 to 38)	52 (9–115)	...	...

(Continued)

Table 3. Continued

Study	Size of Cohort (000s)	Follow-Up Period	Covariates Controlled for	Percent Increases in Mortality (95% CI) Associated With 10 $\mu\text{g}/\text{m}^3$ PM _{2.5} (or Other When Indicated)			
				All-Cause	Cardiopulmonary	Cardiovascular	Ischemic Heart Disease
Oslo, Norway, intrametro, Naess et al ⁸¹ 2007	~144	1992–1998	Individual age, occupational class, education	...	...	10 (5–16), [¶] 14 (6–21), 5 (1–8), 3 (0–5)	...
Dutch cohort, Beelen et al ⁸² 2008	~121	1987–1996	Individual (smoking+others) +ecological	6 (–3 to 16)	...	4 (–10 to 21)	...
Great Britain, Elliott et al ⁸³ 2007	~660	1966–1998	Socioeconomic status	1.3 (1.0–1.6) [‡] #	1.7 (1.3–2.2) [‡] #	1.2 (0.7–1.7) [‡] #	

HEI indicates Health Effects Institute; VA, Veterans Affairs; COPD, chronic obstructive pulmonary disease; and CA, California.

*Three estimates are for the East, Central, and West regions of the United States, respectively.

†Any cardiovascular event.

‡Associated with 10 $\mu\text{g}/\text{m}^3$ British Smoke (BS) or PM₁₀.

§Estimates from the single-pollutant model. Effect estimates were smaller and statistically insignificant in analyses restricted to counties with nitrogen dioxide data. County-level traffic density was a strong predictor of survival, and stronger than PM_{2.5} when included with PM_{2.5} in joint regressions.

¶Two estimates are for the follow-up period 1973–1982 and the follow-up period 1983–2002, respectively.

¶¶Four estimates are for men 51–70 y old, women 51–70 y old, men 71–90 y old, and women 71–90 y old, respectively.

#Using last 0- to 4-year exposure window.

Additional Cohort Studies

Several additional cohort studies have been published in the past few years (Table 3). Eftim and colleagues⁶⁵ studied 2 very large “cohorts” of US Medicare participants who lived in locations included in the Harvard Six Cities and ACS studies. Effects of PM_{2.5} exposure on mortality for the period 2000 to 2002 were estimated after controlling for multiple factors, although not at the individual patient level. For all-cause mortality, the PM_{2.5}-mortality associations were larger than those observed in the Harvard Six Cities or ACS cohorts. In an additional analysis of 13.2 million US Medicare participants for the time period 2000 to 2005,⁷¹ PM_{2.5}-mortality associations were shown to be similar to those observed in the Harvard Six Cities and ACS studies in the East and Central regions of the United States (and when the data were pooled for the entire United States). However, PM_{2.5} was not associated with mortality in the Western United States or for the oldest age group (>85 years old). These findings generally corroborate the earlier cohort studies and add evidence that aspects of exposure (PM sources or composition) and patient susceptibility might play important roles in determining the health risks.

In a cohort of postmenopausal women without prior CVD from the Women’s Health Initiative Observational Study,⁷² an association between longer-term PM_{2.5} exposure (median follow-up of 6 years) and cardiovascular events (primary end point) was observed. After adjustment for age and other risk factors, an incremental difference of 10 $\mu\text{g}/\text{m}^3$ PM_{2.5} was associated with a 24% (95% confidence interval [CI] 9% to 41%) increase in all first cardiovascular events (fatal and nonfatal, with a total of 1816 cases). Notably, an incremental difference of 10 $\mu\text{g}/\text{m}^3$ PM_{2.5} was also associated with a large 76% (95% CI 25% to 147%) increase in fatal cardiovascular events, based on 261 deaths. The risks for both coronary heart disease and strokes were found to be similarly elevated.

Interestingly, within-city PM_{2.5} gradients appeared to have larger cardiovascular effects than those between cities, although this difference was not statistically significant. Finally, overweight women (body mass index >24.8 kg/m²) were at relatively greater cardiovascular risk due to particulate air pollution than leaner women. Noteworthy aspects of this study were improved assessment of the end points by medical record review (rather than by death certificate) and long-term particle exposure estimation. The control for individual-level confounding variables was also superior to that of previous cohort studies.

In another cohort of women, a subset of the Nurses’ Health Study from the northeastern United States,⁷³ an increase of 10 $\mu\text{g}/\text{m}^3$ modeled estimates of PM₁₀ exposures was associated with an approximately 7% to 16% increased risk of all-cause mortality and a 30% to 40% increase in fatal coronary heart disease, depending on the level of adjustment for covariates. This study found that the strongest health risks for all-cause and cardiovascular mortality were seen in association with the average PM₁₀ exposure during the previous 24 months before death. Similar to the findings of the Women’s Health Initiative, the cardiovascular mortality risk estimates were larger than those of previous cohort studies. In addition, obese women (body mass index >30 kg/m²) were at greater relative risk, and the increases in mortality (all-cause and cardiovascular) were larger than the effects on nonfatal events. The results were also in accordance with the latest Harvard Six Cities analyses⁶⁴ that show that exposure over the most recent preceding 1 to 2 years can accurately estimate the majority of the health risks due to longer-term PM air pollution exposures.

The pollution-mortality association has also been assessed in several other cohort studies in the United States and Europe (Table 3).^{76–83} In a recent analysis of the Adventist Health Study of Smog (AHSMOG) cohort with a much

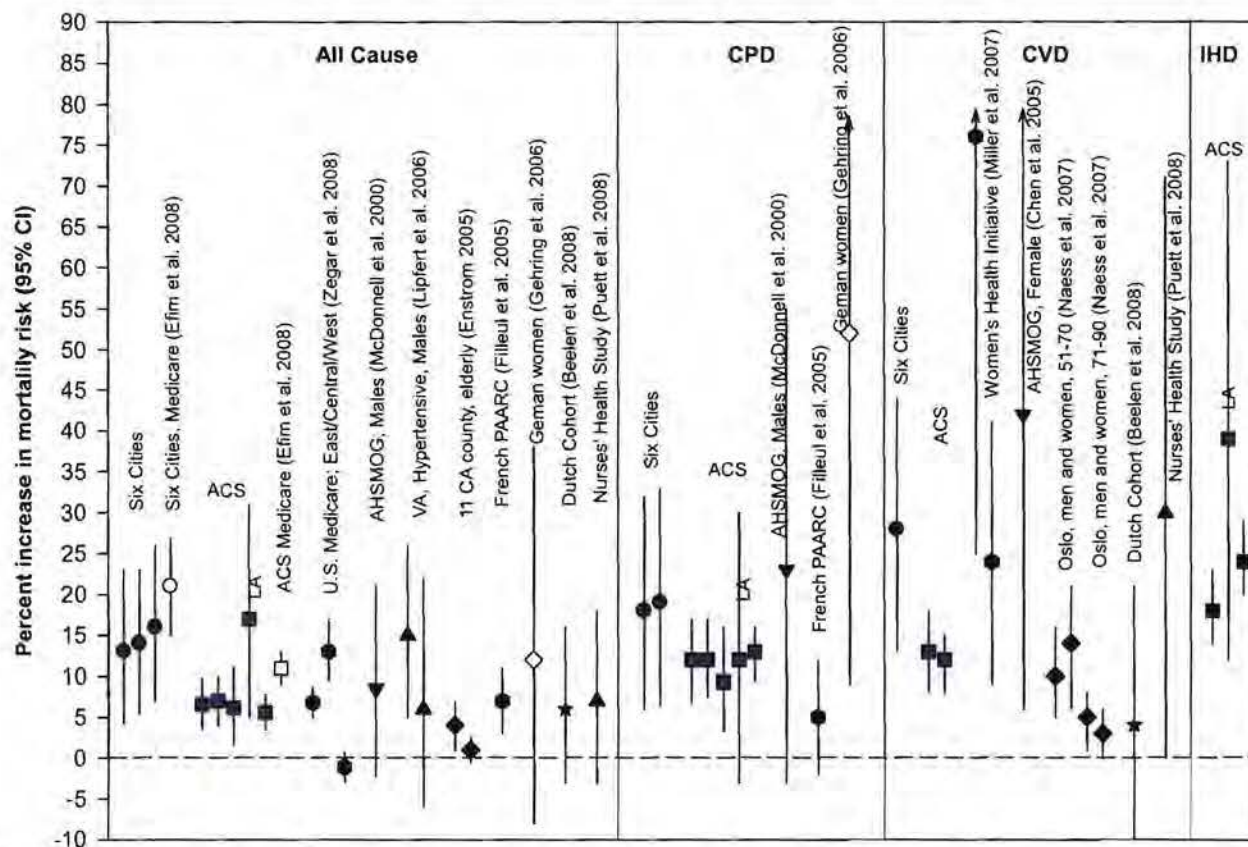


Figure 1. Risk estimates provided by several cohort studies per increment of $10 \mu\text{g}/\text{m}^3$ in $\text{PM}_{2.5}$ or PM_{10} . CPD indicates cardiopulmonary disease; IHD, ischemic heart disease.

longer follow-up than the original studies,^{74,88} fatal coronary heart disease was significantly associated with $\text{PM}_{2.5}$ among females but not males.⁷⁵ These observations along with the remarkably robust health effects in the Women's Health Initiative Observational Study and Nurses' Health Study suggest that women may be at special risk from PM exposure. The overall cohort study evidence demonstrates that a $10\text{-}\mu\text{g}/\text{m}^3$ increase in $\text{PM}_{2.5}$ exposure is in general positively associated with excess mortality, largely driven by increases in cardiopulmonary or cardiovascular deaths (Figure 1). Independent results from the Women's Health Initiative Study,⁷² the US Medicare cohorts,⁷¹ the German women cohort,⁸⁰ and the intracity Oslo (Norway) study⁸¹ contribute substantially to this evidence. Although the Dutch cohort,⁸² AHSMOG,^{74,75} French PAARC (Pollution Atmosphérique et Affections Respiratoires Chroniques [air pollution and chronic respiratory diseases]),⁷⁹ Veterans Affairs hypertensive male study,⁷⁷ and 11 CA county⁷⁸ studies observed increased mortality risks associated with higher $\text{PM}_{2.5}$ exposure that were statistically significant in some analyses, the observed health risks were less robust. A finding that is somewhat consistent across the Veterans Affairs hypertensive male study,⁷⁷ 11 CA county,⁷⁸ Oslo,⁸¹ and US Medicare cohorts⁷¹ is that the $\text{PM}_{2.5}$ -mortality effect estimates tend to decline with longer periods of follow up or in a substantially older cohort. These studies also often observed elevated mortality risks according to alternative indicators of air pollution exposure, especially metrics of traffic-related exposure.

Evidence Summary

The overall evidence from the cohort studies demonstrates on average an approximate 10% increase in all-cause mortality per $10\text{-}\mu\text{g}/\text{m}^3$ elevation in long-term average $\text{PM}_{2.5}$ exposure. The mortality risk specifically related to CVD appears to be elevated to a similar (or perhaps even greater) extent, ranging from 3% to 76% (Table 3). This broader estimated range in risk compared with the short-term effects observed in time series is due to several recent cohort studies^{72,73} that demonstrated larger cardiovascular mortality risks (eg, >30%) than in earlier cohort observations. This may reflect superior aspects of these studies that allowed for a better characterization of the cardiovascular risk of long-term exposure, the fact that these cohorts consisted of only women, or other unclear reasons. Compared with cardiovascular mortality, there is less existing evidence to support an increase in the risk for nonfatal cardiovascular events related to $\text{PM}_{2.5}$ exposure among the existing cohort studies, because many of them did not specifically investigate nonfatal outcomes, and several of the more recent studies reported nonsignificant relationships.^{72,73}

Natural Experiment and Intervention Studies

Several studies have shown improvements in health outcomes in association with exposures using well-defined natural experiments or interventions, such as abrupt reductions in air pollution⁸⁹⁻⁹¹ or changes over a longer period of time.^{64,92}

Table 4. Comparison of Pooled Estimated of Percent Increase in Risk of Hospital Admission for CVD Estimated Across Meta-Analyses and Multicity Studies of Daily Changes in Exposure

	Primary Source	Exposure Increment	% Increase (95% CI)
Cardiac admissions, meta-analysis of 51 estimates	COMEAP ³¹ 2006	20 $\mu\text{g}/\text{m}^3$ PM ₁₀	1.8 (1.4–2.2)
Cardiac admissions, 8 US cities	Schwartz ⁹⁶ 1999	20 $\mu\text{g}/\text{m}^3$ PM ₁₀	2.0 (1.5–2.5)
Cardiac admissions, 10 US cities	Zanobetti et al ⁹⁷ 2000	20 $\mu\text{g}/\text{m}^3$ PM ₁₀	2.6 (2.0–3.0)
Cardiac admissions, 14 US cities	Samet et al ⁹⁸ 2000	20 $\mu\text{g}/\text{m}^3$ PM ₁₀	2.0 (1.5–2.5)
	Schwartz et al ⁹⁹ 2003		
Cardiac admissions, 8 European cities	Le Tertre et al ⁴⁰ 2002	20 $\mu\text{g}/\text{m}^3$ PM ₁₀	1.4 (0.8–2.0)
Cardiovascular admissions, 14 Spanish cities	Ballester et al ¹⁰⁰ 2006	20 $\mu\text{g}/\text{m}^3$ PM ₁₀	1.8 (7–3.0)
Cardiovascular admission, 8 French cities	Larrieu et al ¹⁰¹ 2007	20 $\mu\text{g}/\text{m}^3$ PM ₁₀	1.6 (0.4–3.0)
Cardiovascular admissions, 202 US counties	Bell et al ¹⁰² 2008	20 $\mu\text{g}/\text{m}^3$ PM ₁₀	0.8 (0.6–1.0)
Medicare national claims history files	Dominici et al ¹⁰³ 2006	10 $\mu\text{g}/\text{m}^3$ PM _{2.5}	
Ischemic heart disease,			0.44 (0.02–0.86)
Cerebrovascular disease			0.81 (0.30–1.32)
Heart failure			1.28 (0.78–1.78)
Heart rhythm			0.57 (–0.01 to 1.15)

Small but statistically significant drops in mortality were associated with an 8½-month copper smelter strike that resulted in sharp reductions in sulfate PM and related air pollutants across 4 Southwest states, even after controlling for other factors.⁹³ Data from US Medicare enrollment files were used to estimate the association between changes in monthly mortality rates for US counties and average PM_{2.5} concentrations for the previous 12 months.⁹⁴ PM_{2.5}-mortality associations were observed at the national scale but not the local scale, which raises concerns about possible statistical confounding due to unmeasured individual and ecological variables as a cause for any positive findings in this study. However, a recent large study found that reductions in PM air pollution exposure on a local scale (across US counties) over a 2-decade period (1980s and 1990s) were associated with increased life expectancy even after controlling for changes in socioeconomic, demographic, and proxy smoking variables.⁹⁵ Indeed, a decrease of 10 $\mu\text{g}/\text{m}^3$ in the long-term PM_{2.5} concentration was related to an increase in mean life expectancy of 0.61 ± 0.20 years.

Hospitalization Rates

There are many daily time-series or case-crossover studies that have evaluated associations between cardiovascular hospitalizations and short-term changes in air pollution. Because of the great number of publications, all studies (particularly those focusing on nonparticulate air pollutants) cannot be discussed individually. Nevertheless, Table 4 presents a comparison of pooled estimates of percent increase in RR of hospital admission for general cardiac conditions across a previous meta-analysis of 51 published estimates (COMEAP [Committee on the Medical Effects of Air Pollutants]) and results from many selected multicity studies published after 2004. Several studies before 2004 are included in Table 4 only to demonstrate the consistency of effect.

Because of its comparatively large size and importance, the results of a recent analysis of Medicare files in 204 US urban

counties with 11.5 million individuals older than 65 years merit discussion. Daily changes in PM_{2.5} levels were associated with a variety of cardiovascular hospital admission subtypes.¹⁰³ A 10- $\mu\text{g}/\text{m}^3$ increase in PM_{2.5} exposure was related to increases in hospitalizations for cerebrovascular disease by 0.81% (95% CI 0.3% to 1.32%), peripheral vascular disease by 0.86% (95% CI –0.06% to 1.79%), ischemic heart disease by 0.44% (95% CI 0.02% to 0.86%), arrhythmias by 0.57% (95% CI –0.01% to 1.15%), and heart failure by 1.28 (95% CI 0.78% to 1.78%). The most rapid effects, which occurred largely on the same day of PM_{2.5} elevation, were seen for cerebrovascular, arrhythmia, and heart failure admissions. Ischemic heart disease events tended to increase to a greater extent 2 days after exposures. A consistent finding was that the cardiovascular effects of pollution were much stronger in the Northeast than in other regions. In fact, there were few significant associations in Western US regions. It was speculated that these differences reflected variations in particle composition (eg, greater sulfate in the East and nitrate components in the West) and pollution sources (eg, power generation in the East and transportation sources in the West). In a follow-up analysis by Peng et al,¹⁰⁴ PM_{10–2.5} levels were not statistically associated with cardiovascular hospitalizations after adjustment for PM_{2.5}. This suggests that the smaller particles (ie, PM_{2.5}) are principally responsible for the cardiovascular hospitalizations attributed in prior studies to the combination of both fine and coarse particles (ie, PM₁₀). Given the differences between the size fractions, the results imply that particles and their components derived from combustion sources (ie, PM_{2.5}) are more harmful to the cardiovascular system than larger coarse particles. Finally, there is some evidence that gaseous pollutants may also instigate hospitalizations. Hospital admissions for cardiovascular causes, particularly ischemic heart disease, were found to rise in relation to the previous-day and same-day level of SO₂, even after adjustment for PM₁₀ levels.¹⁰⁵

Table 5. Comparisons of Estimated Percent Increase in Risk of Ischemic Heart Disease Events due to Concurrent or Recent Daily PM Exposure

Event/Study Area	Primary Source	Exposure Increment	% Increase (95% CI)
MI events—Boston, Mass	Peters et al ¹¹⁰ 2001	10 $\mu\text{g}/\text{m}^3$ PM _{2.5}	20 (5.4–37)
MI, 1st hospitalization—Rome, Italy	D'ippoliti et al ¹¹² 2003	30 $\mu\text{g}/\text{m}^3$ TSP	7.1 (1.2–13.1)
MI, emergency hospitalizations—21 US cities	Zanobetti and Schwartz ¹¹³ 2005	20 $\mu\text{g}/\text{m}^3$ PM ₁₀	1.3 (0.2–2.4)
Hospital readmissions for MI, angina, dysrhythmia, or heart failure of MI survivors—5 European cities	Von Klot et al ¹¹⁴ 2005	20 $\mu\text{g}/\text{m}^3$ PM ₁₀	4.2 (0.8–8.0)
MI events—Seattle, Wash	Sullivan et al ¹¹⁵ 2005	10 $\mu\text{g}/\text{m}^3$ PM _{2.5}	4.0 (–4.0–14.5)
MI and unstable angina events—Wasatch Front, Utah	Pope et al ¹³ 2006	10 $\mu\text{g}/\text{m}^3$ PM _{2.5}	4.8 (1.0–6.6)
Tokyo metropolitan area	Murakami et al ¹⁰⁹ 2006	TSP >300 $\mu\text{g}/\text{m}^3$ for 1 h vs reference periods <99 $\mu\text{g}/\text{m}^3$	40 (0–97)*
Nonfatal MI, Augsburg, Germany	Peters et al ¹¹¹ 2004	Exposure to traffic 1 h before MI (note: not PM but self-reported traffic exposure)	292 (222–383)
Nonfatal MI, Augsburg, Germany	Peters et al ¹¹⁶ 2005	Ambient UFP, PM _{2.5} , and PM ₁₀ levels	No association with UFP or PM _{2.5} on same day. Positive associations with PM _{2.5} levels on 2 days prior

TSP indicates total suspended particulate matter.

*Adjusted rate ratio for MI deaths.

Evidence Summary

Excess cardiovascular mortality and increased rates of hospitalizations are similarly associated with day-to-day changes in PM air pollution (Tables 2 and 4). However, significant differences between geographic regions in the risk relationships have been observed, and more investigation is required to explain this heterogeneity.

Specific Cardiovascular Events/Conditions

Ischemic Heart Disease

Among the cohort studies that provided relevant results, the ACS study found a relationship between increased risk for ischemic heart disease death and long-term exposure to elevated PM_{2.5} levels (Table 3).^{67,69,106} Indeed, ischemic cardiac events accounted for the largest relative (RR 1.18, 95% CI 1.14 to 1.23) and absolute risk for mortality per 10- $\mu\text{g}/\text{m}^3$ elevation in PM_{2.5}.⁶⁷ A survival analysis of US Medicare data for 196 000 survivors of acute MI in 21 cities showed the risk of an adverse post-MI outcome (death, subsequent MI, or first admission for congestive heart failure) was increased with higher exposure to PM₁₀.¹⁰⁷ Data from the Worcester Heart Attack study also found that long-term exposure to traffic-related air pollution was associated with significantly increased risk of acute MI.¹⁰⁸ However, in the Women's Health Initiative⁷² and the Nurses' Health Study,⁷³ only disease categories that included fatal coronary events, but not nonfatal MI alone, were statistically elevated in relation to PM_{2.5}. The effect size for cardiovascular mortality was much larger and much more statistically robust than for nonfatal events such as MI in both studies.

Various time-series and case-crossover studies have also reported increased ischemic heart disease hospital admissions associated with short-term elevated concentrations of inhalable and/or fine PM air pollution.^{31,40,103} In the US Medicare study, a reduction of PM_{2.5} by 10 $\mu\text{g}/\text{m}^3$ was estimated to

reduce ischemic heart disease admissions in 204 counties by 1523 (95% posterior interval 69 to 2976) cases per year.¹⁰³ Several studies have also found positive associations between elevated PM or traffic exposures over a period as brief as a few hours^{109–111} or a few days and an elevated risk for MI (Table 5).^{13,110,112–115} In general, acute increases in risk for ischemic heart disease events have been observed consistently, even as rapidly as 1 to 2 hours after exposure to elevated PM, in case-crossover analyses.^{109–111} Other studies have reported an increased risk for MI shortly after exposure to traffic. Peters et al¹¹¹ reported in 691 subjects in Augsburg, Germany, a strong association (odds ratio 2.92, 95% CI 2.22 to 3.83) between onset of MI and traffic exposure within the past hour, although whether this was a result of the air pollution or a combination of other factors (eg, noise and stress) is not certain. Additional analyses did not report an association between recent UFP exposures and MI onset; however, the levels of PM_{2.5} and several gaseous pollutants 2 days earlier were related to MI risk.¹¹⁶ The lack of relationship between MI and UFPs may be due to the fact that the levels were measured regionally and remote from the localized source and may therefore reflect exposure misclassification. Finally, in the only study in which participating subjects had coronary angiograms performed previously, ischemic cardiac events were found to occur in relation to PM air pollution exposure solely among individuals with obstructive coronary atherosclerosis in at least 1 vessel.¹³ This finding suggests the importance of patient susceptibility (eg, the presence of preexisting coronary artery disease) for PM to trigger an acute ischemic event within hours to days after exposure.

Heart Failure

In the ACS cohort study, it appeared that deaths due to arrhythmias, heart failure, and cardiac arrest (RR 1.13, 95% CI 1.05 to 1.21 per 10 $\mu\text{g}/\text{m}^3$) were also associated with

prolonged exposure to PM_{2.5}, although not as strongly as ischemic heart disease mortality,⁶⁷ although potential mortality misclassification on death certificates makes the actual cause of death not entirely certain in all circumstances. Heart failure rates or mortality associations were not reported in the other cohort studies.

Daily hospitalizations for heart failure have also been associated with short-term changes in PM exposure.³¹ Heart failure associations with PM were observed in a large daily time-series analysis of PM_{2.5} and cardiovascular and respiratory hospitalizations by use of a national database constructed from US Medicare files.¹⁰³ A 10- $\mu\text{g}/\text{m}^3$ increase in concurrent-day PM_{2.5} was associated with a 1.28% (95% CI 0.78% to 1.78%) increase in heart failure admissions, the single largest cause for hospitalization in this cohort. A reduction of PM_{2.5} by 10 $\mu\text{g}/\text{m}^3$ was estimated to reduce heart failure admissions in 204 counties by 3156 (95% posterior interval 1923 to 4389) cases per year.¹⁰³ Another analysis in Medicare recipients in 7 US cities found a 10- $\mu\text{g}/\text{m}^3$ increase in concurrent-day PM₁₀ was associated with a 0.72% (95% CI 0.35% to 1.10%) increase in heart failure admissions.¹¹⁷ Traffic-related air pollution has also been shown to be significantly associated with increased mortality risk after acute heart failure.¹¹⁸ Finally, a study from Utah's Wasatch Front area explored longer lagged-exposure periods and found that a 14-day lagged cumulative moving average of 10 $\mu\text{g}/\text{m}^3$ PM_{2.5} was associated with a 13.1% (95% CI 1.3% to 26.2%) increase in heart failure admissions.¹¹⁹

Cerebrovascular Disease

Among the cohort studies that provided pertinent results, the Women's Health Initiative reported significant increases in both nonfatal stroke (hazard ratio 1.28, 95% CI 1.02 to 1.61) and fatal cerebrovascular disease (hazard ratio 1.83, 95% CI 1.11 to 3.00) per 10- $\mu\text{g}/\text{m}^3$ elevation in prolonged exposure to PM_{2.5}.⁷² However, no significant association between stroke mortality and PM air pollution was found in the ACS study.⁶⁷

Several studies have also reported small but statistically significant associations between short-term PM exposure and cerebrovascular disease. Daily time-series studies of stroke mortality in Seoul, Korea,^{120,121} observed that elevated air pollution (including measures of PM, NO₂, CO, and O₃) was associated with increases in stroke mortality. When analyzed separately by stroke type,¹²¹ the pollution association was associated with ischemic but not hemorrhagic stroke. Risk of stroke mortality was also associated with daily increases in PM₁₀ and NO₂ in Shanghai, China.⁵⁶ A daily time-series study in Helsinki, Finland,¹²² found that PM_{2.5} and CO were associated with stroke mortality in the warm but not the cold seasons. Several studies have also observed increased stroke or cerebrovascular hospital admissions associated with increased exposure to PM or related pollutants.^{31,38,40,46,123-125} For example, a study of hospital admissions for Medicare recipients in 9 US cities¹²⁵ found that several measures of air pollution (PM₁₀, CO, NO₂, and SO₂) 0 to 2 days before admission were associated with ischemic but not hemorrhagic

stroke. Studies of ischemic stroke and transient ischemic attacks based on population-based surveillance have also been conducted in Dijon, France,¹²⁶ where O₃ exposure (but not PM₁₀) was associated with ischemic stroke, and in Corpus Christi, Tex,¹²⁷ where both PM_{2.5} and O₃ were associated with ischemic strokes and transient ischemic attacks.

Peripheral Arterial and Venous Diseases

There have been only a few studies that have explored a relationship between air pollution and peripheral vascular diseases. Studies using Medicare data for 204 US counties observed nearly statistically significant positive associations between daily changes in measures of PM pollution and hospitalizations for peripheral vascular diseases.^{103,104} The ACS cohort found no association between other atherosclerotic and aortic aneurysm deaths and long-term PM_{2.5} exposure.⁶⁷

Recently, a case-control study from the Lombardy region of Italy found a 70% increase in risk of deep vein thrombosis per 10- $\mu\text{g}/\text{m}^3$ elevation in long-term PM₁₀ level.¹²⁸ This is the first observation that particulate air pollution can enhance coagulation and thrombosis risk in a manner that adversely affects the venous circulation in addition to the arterial cardiovascular system.

Cardiac Arrhythmias and Arrest

Several studies have observed associations between fine PM and related pollutants and cardiac arrhythmias, often based on data from implanted cardioverter-defibrillators.¹²⁹⁻¹³⁶ However, no clear pollution-related associations were observed in studies from a relatively clean metropolitan area, Vancouver, British Columbia, Canada,^{137,138} or from a relatively large study in Atlanta, Ga.¹³⁹ Similarly, pollution-related associations have been observed with cardiac arrest in Rome, Italy,¹⁴⁰ and Indianapolis, Ind,¹⁴¹ but not in Seattle, Wash.^{142,143} The mixed results may reflect different PM compositions due to different sources or variations among the methods used.

Evidence Summary

On the basis of the available epidemiological studies that have reported the associations between PM exposures with specific subsets of cardiovascular outcomes (morbidity, mortality, or hospitalizations), the existing level of overall evidence is strong for an effect of PM on ischemic heart disease, moderate (yet growing) for heart failure and ischemic stroke, and modest or mixed for peripheral vascular and cardiac arrhythmia/arrest (Table 6).

Ambient Air Pollution and Subclinical Pathophysiological Responses in Human Populations

It is likely that many subclinical physiological changes occur in individuals in response to PM_{2.5} exposures that do not become overtly manifest as a cardiovascular event (eg, death or MI). The illustration of these more subtle responses bolsters the plausibility of the observable outcome associations and provides insight into the pathways whereby air

Table 6. Overall Summary of Epidemiological Evidence of the Cardiovascular Effects of PM_{2.5}, Traffic-Related, or Combustion-Related Air Pollution Exposure at Ambient Levels

Health Outcomes	Short-Term Exposure (Days)	Longer-Term Exposure (Months to Years)
Clinical cardiovascular end points from epidemiological studies at ambient pollution concentrations		
Cardiovascular mortality	↑ ↑ ↑	↑ ↑ ↑
Cardiovascular hospitalizations	↑ ↑ ↑	↑
Ischemic heart disease*	↑ ↑ ↑	↑ ↑ ↑
Heart failure*	↑ ↑	↑
Ischemic stroke*	↑ ↑	↑
Vascular diseases	↑	↑ ↑
Cardiac arrhythmia/cardiac arrest	↑	↑
Subclinical cardiovascular end points and/or surrogate measures in human studies		
Surrogate markers of atherosclerosis	N/A	↑
Systemic inflammation	↑ ↑	↑
Systemic oxidative stress	↑	
Endothelial cell activation/ blood coagulation	↑ ↑	↑
Vascular/endothelial dysfunction	↑ ↑	
BP	↑ ↑	
Altered HRV	↑ ↑ ↑	↑
Cardiac ischemia	↑	
Arrhythmias	↑	

The arrows are not indicators of the relative size of the association but represent a qualitative assessment based on the consensus of the writing group of the strength of the epidemiological evidence based on the number and/or quality, as well as the consistency, of the relevant epidemiological studies.

- ↑ ↑ ↑ Indicates strong overall epidemiological evidence.
- ↑ ↑ Indicates moderate overall epidemiological evidence.
- ↑ Indicates some but limited or weak available epidemiological evidence.
- Blank indicates lack of evidence.
- N/A indicates not applicable.
- *Categories include fatal and nonfatal events.
- †Deep venous thrombosis only.

pollutants mediate CVDs. The “Biological Mechanisms” section discusses the hypothesized global pathways and reviews the studies related to the fundamental cellular/molecular mechanisms elucidated by controlled human and animal exposures and toxicological/basic science experiments. The following section reviews the recent evidence that ambient exposure to air pollution can mediate potentially harmful subclinical cardiovascular effects. In general, many positive associations are found (Table 6). Numerous complex interactions between variations in the characteristics, sources, and chemistry of the particles, coupled with diversity in time frames, mixtures of exposures, and degrees of individual

susceptibility, likely explain some of the disparity among findings.

Systemic Inflammation

There is evidence that under some circumstances, exposure to ambient PM can be associated with elevated circulating proinflammatory biomarkers that are indicative of a systemic response after PM air pollution inhalation that is not limited to the confines of the lung. Early reports found associations with day-to-day variation in acute-phase proteins, such as C-reactive protein (CRP), fibrinogen, or white blood cell counts,^{144–147} as reviewed previously.¹ Limited evidence on the association between cumulative PM exposures and fibrinogen levels and counts of platelets and white blood cells was also available.¹⁴⁸

A number of more recent studies have reported positive associations with short-term ambient PM exposure and day-to-day elevations in inflammatory markers. These include increases in CRP in an elderly population¹⁴⁹ and individuals with coronary atherosclerosis¹⁵⁰; CRP and fibrinogen in young adults¹⁵¹ and elderly overweight individuals¹⁵²; and CRP, tumor necrosis factor-α (TNF-α), and interleukin (IL)-1β in children.¹⁵³ Recent evidence has also been found for an upregulation of circulating soluble adhesion molecules (eg, intercellular adhesion molecule-1) in 92 Boston, Mass-area individuals with diabetes¹⁵⁴ and 57 male subjects with coronary artery disease in Germany.¹⁵⁰ In a larger analysis of 1003 MI survivors, also in Germany, CRP was not related to PM exposure; however, ambient particle number concentration and PM₁₀ were associated with increased IL-6 and fibrinogen, respectively.¹⁵⁵ Short-term levels of in-vehicle PM_{2.5} have also been linked to increases in CRP among healthy highway patrol troopers.¹⁵⁶ In a follow-up analysis, elevations in certain particulate components of traffic pollution (eg, chromium) were associated with increased white blood cell counts and increased IL-6 levels.¹⁵⁷ Short-term changes in ambient PM levels have also been linked to acute (1 to 3 days later) alterations in biomarkers of inflammation, oxidative stress, and platelet activation among elderly adults with coronary artery disease living in retirement communities in Los Angeles, Calif.^{158,159} Pollutants associated with primary combustion (eg, elemental and black carbon, primary organic carbon) and UFPs rather than PM_{2.5} appeared to be strongly associated with adverse responses in this population.

Regarding more long-term exposures,¹⁶⁰ a positive association between white blood cell count and estimated long-term 1-year exposure to PM₁₀ was reported in the Third National Health and Nutrition Examination Survey. Among 4814 adults in Germany, small increases in annual mean PM_{2.5} (3.9 μg/m³) were associated with increases in high-sensitivity CRP by 23.9% and in fibrinogen by 3.9% among men only. Estimated long-term traffic exposure was not related to inflammatory changes in either sex.¹⁶¹

Several studies, including some with improved exposure assessment,¹⁶² some that included analyses of large population cohorts,^{163,164} and a recent evaluation of long-term annual PM₁₀ levels in England,¹⁶⁵ have not found a relationship between particulate exposure and inflammation. It is

conceivable that differences in the magnitude or character of the inflammatory response will occur because of variations in the particulate chemistry and duration/intensity of exposures. Certain individuals may also be more susceptible. The evidence suggests that subjects with underlying cardiovascular risk factors and the metabolic syndrome may exhibit stronger associations.^{152,160,166} Conversely, antiinflammatory medications such as statins may mitigate the actions of ambient particles.^{152,155} All together, there is some evidence for a positive association between recent and long-term PM exposure and a systemic proinflammatory response; nevertheless, there is variation in the strength and consistency of changes among the variety of biomarkers and patient populations evaluated (Table 6).

Systemic Oxidative Stress

A state of oxidative stress refers to a condition in which levels of free radicals or reactive oxygen/nitrogen species (eg, O_2^- , H_2O_2 , $ONOO^-$) are higher than normal (eg, healthy individuals in whom they are countered by homeostatic processes such as antioxidants) and thus are capable of exerting many adverse biological effects (eg, lipid/protein/deoxyribonucleic acid [DNA] oxidation, initiation of proinflammatory cascades). Although many biomarkers of differing systemic responses are available (eg, lipid or protein oxidation products), oxidative stress may occur at the local cellular/tissue level and not be directly observable by circulating markers. In addition, oxidative stress is often induced by and elicits inflammatory processes. The 2 processes are biologically linked. Therefore, human studies investigating the effect of PM on oxidative stress per se are difficult to perform. Only a few studies have directly investigated the occurrence of systemic oxidative stress in humans in relation to ambient PM exposure. Three studies of young adults conducted in Denmark demonstrated elevations in biomarkers of protein, lipid, or DNA oxidation in relation to PM exposure from traffic sources.^{167–169} In a study of 76 young adults from Taipei, Taiwan,¹⁵¹ the investigators found evidence of increased levels of 8-hydroxy-2'-deoxyguanosine adducts in DNA in relation to short-term elevations in ambient PM. Two studies have also demonstrated increases in plasma homocysteine, evidence that exposure to ambient PM can elevate this circulating mediator of oxidative stress.^{170,171} Finally, Romieu et al¹⁷² found that dietary supplementation with omega-3 polyunsaturated fatty acids might be capable of altering the systemic oxidative stress response (reduction in copper/zinc superoxide dismutase and glutathione) induced by air pollutants among residents living in a nursing home in Mexico City, Mexico. Because of the relatively small number of studies, more investigation is required to make firm conclusions and to understand the nature of the systemic oxidative stress response potentially induced by ambient PM (Table 6).

Thrombosis and Coagulation

Early reports indicated that increased plasma viscosity¹⁴⁴ and elevated concentrations of fibrinogen¹⁴⁶ are associated

with short-term changes in ambient PM concentrations. More recent evidence was found for an upregulation of circulating von Willebrand factor in 57 male subjects with coronary artery disease in Germany¹⁵⁰ and 92 Boston-area individuals with diabetes.¹⁵⁴ Riediker¹⁵⁷ found that components of in-vehicle $PM_{2.5}$ were also related to increased von Willebrand factor and decreased protein C among highway patrol troopers. In the Atherosclerosis Risk in Communities study, a $12.8\text{-}\mu\text{g}/\text{m}^3$ elevation in ambient PM_{10} was associated with a 3.9% higher von Willebrand factor level,¹⁷³ but only among those with diabetes. There was no linkage between PM_{10} exposure and fibrinogen or white blood cell levels.

Alterations in other markers that indicate changes in thrombosis, fibrinolysis, and global coagulation have also been reported. An immediate elevation in soluble CD40-ligand concentration, possibly reflecting platelet activation, recently was found to be related to ambient UFP and accumulation-mode particle ($PM_{0.1-1.0}$) levels in patients with coronary artery disease.¹⁵⁵ Ambient PM_{10} levels have also been associated with augmented platelet aggregation 24 to 96 hours after exposure among healthy adults.¹⁷⁴ In this study, there were no concomitant observable changes in thrombin generation, CRP, or fibrinogen induced by PM_{10} . Increases in plasminogen activator inhibitor-1 and fibrinogen levels have been noted in healthy subjects,¹⁵¹ as well as elevated plasminogen activator inhibitor-1 in patients with coronary artery disease only,¹⁷⁵ in association with ambient PM levels in Taipei. Chronic indoor pollution exposure to biomass cooking in rural India has also been associated with elevated circulating markers of platelet activation.¹⁷⁶ Recently, Baccarelli et al^{128,177} demonstrated in healthy subjects and among individuals with deep venous thrombosis living in the Lombardy region of Italy that prothrombin time was shortened in relation to recent and long-term ambient PM_{10} concentrations. Nevertheless, some studies found no effects of ambient pollution,¹⁷⁸ nor have significant changes been reported among all the biomarkers or subgroups of individuals investigated.^{150,154,170,173} Similar to the study on systemic inflammation, the results related to thrombosis/coagulation are quite variable given the differences in study designs, patients, biomarkers evaluated, and pollutants; however, these adverse effects appear somewhat more consistent among higher-risk individuals (Table 6).

Systemic and Pulmonary Arterial BP

Several studies have reported that higher daily PM levels are related to acute increases in systemic arterial BP (approximately a 1- to 4-mm Hg increase per $10\text{-}\mu\text{g}/\text{m}^3$ elevation in PM).^{179–184} In a small study of patients with severe heart failure,¹⁸⁵ pulmonary artery and right ventricular diastolic BP were found to increase slightly in relation to same-day levels of PM. Chronic exposure to elevated $PM_{2.5}$ was associated with increased levels of circulating endothelin (ET)-1 and elevated mean pulmonary arterial pressure in children living in Mexico City.¹⁸⁶ These results may explain in part the risk for heart failure exacerbations due to PM

exposure; however, not all studies of systemic arterial BP have been positive.¹⁸⁷⁻¹⁸⁹

Recently, Dvornch et al¹⁹⁰ demonstrated significant associations between increases in systolic BP and daily elevations in PM_{2.5} across 347 adults living in 3 distinct communities within metropolitan Detroit, Mich. Much larger effects were observed 2 to 5 days after higher PM_{2.5} levels within a specific urban location of southwest Detroit (8.6 mm Hg systolic BP increase per 10- $\mu\text{g}/\text{m}^3$ PM_{2.5}) than throughout the entire region or cohort (3.2 mm Hg). This suggests that specific air pollution sources and components contribute significantly to the potential for PM exposure to raise BP. Interestingly, it was recently reported in a crossover study of 15 healthy individuals that systolic BP was significantly lower (114 versus 121 mm Hg) during a 2-hour walk in Beijing, China, while the subjects were wearing a high-efficiency particulate-filter facemask than when they were not protected.¹⁹¹ Wearing the facemask was also associated with increased HRV, which suggests that the rapid BP-raising effects of particle inhalation may be mediated through the autonomic nervous system (ANS). In a similar fashion,¹⁹² reducing exposure to particulate pollution from cooking stoves was shown to be associated with lower systolic (3.7 mm Hg, 95% CI -8.1 to 0.6 mm Hg) and diastolic (3.0 mm Hg, 95% CI -5.7 to -0.4 mm Hg) BP among Guatemalan women than among control subjects after an average of 293 days. These findings demonstrate that indoor sources of PM (eg, cooking, biomass) may have important cardiovascular health consequences and that reductions in particulate exposure are capable of lowering BP, and they suggest that chronic exposure to PM air pollution may alter long-term basal BP levels. Even given the rapid variability of BP on a short-term basis and the numerous factors involved in determining individual responses (eg, patient susceptibility, PM composition, and time frames of exposure), overall, it appears that ambient PM can adversely affect systemic hemodynamics, at least under certain circumstances (Table 6).

Vascular Function

In the first ambient PM study related to changes in vascular function, O'Neill et al¹⁹³ reported that both endothelium-dependent and -independent vasodilation were blunted in relation to air pollution levels in Boston. The largest changes occurred in association with sulfate and black carbon, suggestive of coal-burning and traffic sources, respectively. Significant adverse responses were observed within 1 day yet were still present and slightly more robust up to 6 days after exposure. Moreover, the adverse responses occurred solely among diabetic individuals and not in patients at risk for diabetes mellitus. Two other studies^{184,194} also demonstrated impaired vascular function due to short-term changes in ambient PM among diabetic patients. In the study by Schneider et al,¹⁹⁴ endothelium-dependent vasodilation was blunted during the first day, whereas small-artery compliance was impaired 1 to 3 days after elevated ambient PM levels. Interestingly, higher concentrations of blood myeloperox-

idase were related to a greater degree of endothelial dysfunction, which suggests that white blood cell sources of reactive oxygen species (ROS) may be involved.

In healthy adults, very short-term exposure to elevated levels of ambient PM from traffic sources while exercising for 30 minutes near roadways¹⁹⁵ and when resting by bus stops for 2 hours¹⁹⁶ has been related to impaired endothelium-dependent vasodilation. Daily changes in ambient gaseous pollutants (SO₂ and NO_x) in Paris, France, have also been associated with impaired endothelium-dependent vasodilation among nonsmoking men.¹⁹⁷ Finally, indoor particulate air pollution may also be harmful to vascular function. Bräuner and colleagues¹⁹⁸ recently reported that reductions in 48-hour PM_{2.5} levels due to filtering of air in subjects' homes resulted in improved microvascular vascular function among elderly subjects. Nevertheless, changes in short-term ambient PM levels have not been linked with impaired conduit¹⁹⁷ or microvascular¹⁷⁸ endothelial function in all studies. Even when the few negative studies are considered, the overall evidence supports the concept that ambient PM is capable of impairing vascular function, particularly among higher-risk individuals (eg, those with diabetes) and after traffic-related exposure (Table 6).

Atherosclerosis

A few cross-sectional studies have reported an association between measures of atherosclerosis in humans and long-term exposures to ambient air pollution levels. The first study to demonstrate this relationship was an analysis of data from 798 participants in 2 clinical trials conducted in the Los Angeles area. A cross-sectional contrast in exposure of 10 $\mu\text{g}/\text{m}^3$ PM_{2.5} was associated with an adjusted nonsignificant 4.2% (95% CI -0.2% to 8.9%) increase in common carotid intima-media thickness¹⁹⁹; however, in certain subgroups of patients, such as women, the effect was much larger (13.8%, 95% CI 4.0% to 24.5%). In a population-based sample of 4494 subjects from Germany,²⁰⁰ it was found that residential proximity to major roadways was associated with increased coronary artery calcification. A reduction in distance from a major road by half was associated with a 7% (95% CI 0.1% to 14.4%) higher coronary artery calcium score. Proximity to traffic was also related to an increased risk for peripheral artery disease in women but not men.²⁰¹ In an analysis of 3 measures of subclinical disease (carotid intima-media thickness, coronary calcium, and ankle-brachial index) among 5172 adults from the Multi-Ethnic Study of Atherosclerosis, only common carotid intima-media thickness was modestly (yet significantly) associated with 20-year exposure to PM_{2.5}.²⁰² In a related study from the same cohort, abdominal aortic calcium was associated with long-term PM_{2.5} exposure, especially for residentially stable participants who resided near a PM_{2.5} monitor.²⁰³ Although it appears that long-term exposure to higher levels of ambient PM might accelerate the progression of atherosclerosis, more investigations are needed (Table 6).

Heart Rate Variability

Numerous studies have continued to explore associations between daily changes in PM air pollution exposure and alterations (typically reductions) in HRV metrics, putative markers of cardiac autonomic balance.^{129,149,156,204–242} Recent observations in the Normative Aging Study cohort have shown strong effect modification of the PM-HRV relationship by obesity and genes that modulate endogenous oxidative stress or xenobiotic metabolism, such as glutathione S-transferase M1, methylenetetrahydrofolate reductase, and the hemochromatosis gene.^{207,243,244} Additional findings suggest protective effects of statins, dietary antioxidants, and B vitamins, as well as omega-3 polyunsaturated fatty acids.^{205,207,215,243,244} These results suggest that pathways that reduce endogenous oxidative stress have a protective effect that mitigates reductions in HRV due to ambient PM exposure.

However, the overall results are not entirely consistent. Some studies have reported increases in HRV mediated by PM, specifically among younger healthy people and patients with chronic obstructive lung disease.^{156,208,216} Nevertheless, the general pattern suggests that PM exposure is associated with increased heart rate and reductions in most indices of HRV among older or susceptible individuals, such as those with obesity and the metabolic syndrome. Typically, time-domain measures (eg, standard deviation of normal RR intervals) and total power are reduced within hours after exposure. Most, but not all, pertinent studies have also found that the largest reduction in power is within the high-frequency domain. In sum, these observations provide some evidence that ambient PM air pollution exposure rapidly reduces HRV, a surrogate marker for a worse cardiovascular prognosis (Table 6). Although studies corroborating changes in autonomic activity by other methods (eg, microneurography or norepinephrine kinetics) have not been performed, the HRV findings are perhaps reflective of the instigation of a generalized cardiovascular autonomic imbalance due to relatively greater parasympathetic than sympathetic nervous system withdrawal.

Cardiac Ischemia and Repolarization Abnormalities

There has been limited direct evidence for the actual induction of cardiac ischemia or repolarization abnormalities in the electrocardiogram (ECG) by exposure to ambient levels of PM.^{223,245} Recent follow-up analyses from the initial ULTRA study (Exposure and Risk Assessment for Fine and Ultrafine Particles in Ambient Air)²⁴⁵ suggested that traffic-related combustion pollutants were most strongly related to the promotion of ST-segment depression among elderly non-smokers during exercise stress testing.²⁴⁶ Moreover, even very acute PM_{2.5} exposure within the past 1 or 4 hours has been associated with cardiac ischemia during exercise.²⁴⁷ New findings support these associations in elderly subjects²⁴⁸ and in patients with coronary artery disease in Boston.²⁴⁹ In the latter study, traffic-related PM was most strongly related to the incidence of ST-segment depression during 24-hour Holter monitoring, and the risk for ischemia was greatest

within the first month after a cardiac event among patients with diabetes. Overall, there is a modest level of evidence that PM exposure can promote cardiac ischemia in susceptible individuals (Table 6).

Epigenetic Changes

There have been relatively few studies examining gene–air pollution exposure interactions, and most have done so while investigating a small number of loci for genetic polymorphisms. Although some studies have suggested greater air pollution susceptibility with one or another genomic polymorphism,^{207,243,244} few have evaluated the potential for epigenetic changes after exposures. Reduced levels of DNA methylation have been linked to aging, oxidative stress, and CVD. Recently, Baccarelli et al²⁵⁰ have shown among 718 elderly participants in the Normative Aging Study that short-term exposures (over 1 to 7 days) to PM_{2.5} and black carbon are associated with decreased “global” DNA methylation in long interspersed nucleotide elements. It was posited that oxidative stress from air pollution exposure could have interfered with the capacity for methyltransferases to interact with DNA or altered the expression of genes involved in the methylation process. This observed effect of pollution exposure was analogous to changes seen with 3.4 years of aging in the cohort. Additional findings among workers in a furnace steel plant support these observations.²⁵¹ Nevertheless, the mechanisms involved and the cardiovascular implications of these preliminary, although provocative, epigenetic changes require more investigation.

Traditional Cardiovascular Risk Factors

In addition to the fact that individuals with traditional risk factors are likely to be at higher risk for cardiovascular events due to PM exposure, air pollutants may also promote the development of these risk factors over a prolonged period of time. Few published studies have investigated this possibility. A report from the Multi-Ethnic Study of Atherosclerosis has demonstrated that residential proximity to major roadways was associated with a higher left ventricular mass index as measured by cardiac magnetic resonance imaging.²⁵² The degree of increase was analogous to a 5.6-mm Hg increase in systolic BP among the study participants. This suggests that traffic-related exposures may have increased left ventricular mass by chronically elevating systemic arterial BP, a common cause of left ventricular hypertrophy. However, other mechanisms cannot be excluded, such as systemic inflammation and oxidative stress, which could potentially activate neurohormonal pathways (eg, ANS imbalance, renin-angiotensin system) that could directly mediate such a finding. In addition, a recent study of adults older than 30 years of age (n=132 224) participating in the National Health Interview Survey reported a significant association between self-reported hypertension and estimated annual PM_{2.5} exposure using US EPA monitoring data.²⁵³ A 10- $\mu\text{g}/\text{m}^3$ elevation in PM_{2.5} was associated with an

adjusted odds ratio of 1.05 (CI 1.00 to 1.10) for the presence of hypertension. The increase in risk was found only among non-Hispanic whites. These studies provide some initial evidence that longer-term PM exposures may augment the risk for developing chronically elevated BP levels or even overt hypertension.

Brook et al²⁵⁴ have also demonstrated a novel relationship between a metric of long-term traffic exposure (NO₂ level by residence) and the odds of having the diagnosis of diabetes mellitus among patients in 2 respiratory clinics in Ontario, Canada. In women only, the odds ratio of diabetes was 1.04 (95% CI 1.00 to 1.08) for each increase of 1 parts per billion (ppb) of NO₂. Across the interquartile range (4 ppb NO₂), exposures were associated with nearly a 17% increase in odds for diabetes mellitus. The first biological support for this finding comes from a study in Iran that demonstrated that the previous 7-day-long exposure to PM₁₀ was independently associated with worse metabolic insulin sensitivity among 374 children 10 to 18 years of age.²⁵⁵ These findings suggest that the systemic proinflammatory and oxidative responses due to long-term PM air pollution exposure could potentially increase the risk for developing clinically important aspects of the metabolic syndrome, such as hypertension and diabetes mellitus. Further studies in this regard are warranted.

Evidence Summary

Table 6 provides a consensus qualitative synopsis based on the expert opinions of the writing group members of the overall level of existing support, linking each surrogate or intermediate cardiovascular outcome with exposures to PM at ambient concentrations, based solely on the database of observational studies.

Additional Epidemiological Findings and Areas of Continued Research

Responsible Sources and Pollution Constituents

Although PM concentration (mass per cubic meter) has been associated with cardiovascular events in numerous studies, the specific particulate constituents and the sources responsible remain less clear. Despite the fact that it is a difficult undertaking, several epidemiological studies have attempted to identify the culprit components within the PM mixtures. With regard to PM-associated inorganic ions (nitrate and sulfate), it has been suggested that the overall toxicological data do not clearly implicate these compounds as responsible for mediating the cardiovascular health effects of PM_{2.5}.²⁵⁶ Nevertheless, sulfate particles have been associated with cardiopulmonary mortality in the ACS and Harvard Six Cities studies.^{62,68} A recent time-series analysis among 25 US cities found that cardiovascular risk was increased when PM mass contained a higher proportion of sulfate, as well as some metals (aluminum, arsenic, silicon, and nickel).²⁵⁷ It is possible that these positive findings represent sulfate serving as a marker for an effect mediated by a toxic PM mixture derived from commonly associated sources (eg,

coal combustion). Nevertheless, a direct role for particle sulfate in causing cardiovascular events cannot be excluded entirely.²⁵⁶

In California, short-term exposures to several different PM constituents that likely reflect combustion-derived particulates, including organic and elemental carbon and nitrates, were most strongly associated with higher cardiovascular mortality.²⁵⁸ Certain metals (zinc, titanium, potassium, and iron) and sulfate levels in the winter months were also positively related. Similarly, ambient levels of organic and elemental carbon have been most strongly linked among PM constituents with hospitalizations for CVDs in multipollutant models in a study among 119 US cities.²⁵⁹ Finally, PM_{2.5} composed of higher levels of elemental carbon, along with the metals nickel and vanadium,⁴⁸ has also been linked with greater risks for cardiovascular hospitalizations.²⁶⁰ These results support that the chemistry or composition of the PM_{2.5} (eg, organic/elemental carbon and certain metals) along with the responsible source from which these mixtures are derived (eg, fresh combustion, traffic) may play important roles in determining the risk for cardiovascular events. However, the extent to which these constituents mediate specific responses, alone or together, and their importance beyond the concentration of PM_{2.5} mass alone represent an area of active research that requires more investigation to reach firm conclusions.

Many experiments have demonstrated the especially toxic properties and strong oxidizing potential of the smallest particle sizes (eg, UFP) and of the specific chemical species typically rich within this size fraction (eg, transition metals, organic compounds, and semiquinones).²⁶¹ Although some epidemiological evidence suggests that exposure to ultrafine compounds¹⁷ may be associated with higher cardiovascular risk (eg, an elevation of UFP count by 9748/cm³ has been associated with an increase in cardiovascular mortality of approximately 3% within 4 days in Erfurt, Germany²⁶²) and adverse responses,^{158,159} there have been few such studies because they are challenging to conduct, for numerous reasons. Moreover, there are few UFP monitors, and the levels measured at regional sites may not accurately reflect an individual person's exposure because of marked spatial heterogeneity, because the concentrations are dominated by local point sources of fresh combustion (eg, roadways). This could help explain some of the previously negative study findings.¹¹⁶

Similarly, coarse particulates between 0.25 and 1.0 μm in diameter may affect the cardiovascular system,^{221,264,265} and although the available data related to hard events and cardiovascular mortality have suggested a relationship,^{265,266} recent findings have been less consistent.¹⁰⁴ In the most recent time-series analysis of 112 US cities, coarse PM was independently associated with elevated all-cause, stroke, and pulmonary, but not cardiovascular, mortality after controlling for PM_{2.5}.⁴³ Coarse PM was also not associated with either fatal or nonfatal cardiovascular events after controlling for PM_{2.5} levels in the Nurses' Health Study²⁶⁷ or the Women's Health Initiative cohort analyses.⁷² Additional research is required to establish whether there are independent health effects of the other

particulate size fractions beyond those posed by fine particles. On the other hand, PM_{2.5} mass concentration is the metric most consistently associated with cardiovascular morbidity and mortality. It remains to be determined whether this reflects limitations of available data, the long-lived and regionally homogenous atmospheric nature of PM_{2.5}, that few studies have investigated the independent effects of the other sizes, difficulties in performing epidemiology studies with adequate UFP exposure estimates, or that specific constituents within the fine PM fraction (or another unidentified agent correlated with that fraction) are actually responsible for causing cardiovascular events. Although particles <0.1 μm (ie, UFPs) do make up a small fraction of PM_{2.5} mass, the correlation between UFP particle number and total PM_{2.5} mass concentration is often weak. Because of their minute size, UFPs make up only a small portion of the total PM_{2.5} mass, even though they represent the largest actual number of particles within fine PM. They also have the highest surface area and a differing surface chemistry. Therefore, changes in the underlying UFP concentration do not likely account for or explain the linkages between PM_{2.5} mass concentration and cardiovascular events observed in large multicentric studies. The overall epidemiological evidence thus indicates that fine PM poses an independent cardiovascular risk and that any putative effects of these other size fractions cannot fully explain the observed PM_{2.5}-cardiovascular morbidity/mortality relationship.

On the other hand, there is mounting evidence for a distinctive role played by motor vehicle traffic-related exposures in elevating cardiovascular risk.^{108,111,268,269} Lipfert et al^{76,77} interpreted the results of their analysis of the Veterans Affairs hypertensive male cohort as suggesting that traffic density was a more "significant and robust predictor of survival in this cohort" than PM_{2.5}. Analyses of the Oslo,⁸¹ Dutch,⁸² AHSMOG,^{74,75,88} French PAARC,⁷⁹ and German women cohorts⁸⁰ and related studies from areas in the United Kingdom,²⁷⁰ Canada,²⁷¹ Norway,²⁷² and Rome²⁷³ found that measures that often indicate traffic-related exposure (NO₂, NO_x, traffic density, and living near major roads) were also associated with increased mortality. Long-term 5-year average traffic-generated air pollution exposure has been associated with an increased risk of fatal MI (odds ratio 1.23, 95% CI 1.15 to 1.32 per 31-μg/m³ increase in NO₂) but not nonfatal MI in Stockholm County, Sweden.²⁷⁴ The results mirror the results of several cohort studies^{72,73} that found that air pollution exposures appeared to be more strongly linked with cardiovascular mortality than nonfatal events. Recently, an analysis from a cohort in the Netherlands demonstrated that several metrics of traffic-related air pollution exposure remained significantly associated with increased risk for cardiovascular events even after adjustment for higher levels of traffic noise.²⁷⁵

The effect of long-term traffic-related exposure on incidence of fatal and nonfatal coronary heart disease was recently assessed after adjustment for background air pollutants and cardiovascular risk factors in 13 309 adults in the Atherosclerosis Risk in Communities study.²⁷⁶ Interestingly, background chronic ambient PM_{2.5} concentrations were not

related to the interpolated traffic exposure levels or to heart disease outcomes, which supports the highly localized nature of traffic sources of exposure. After 13 years of follow-up in 4 US communities, individuals residing within the highest quartile of traffic density had a relative risk of 1.32 (95% CI 1.06 to 1.65) for fatal and nonfatal heart disease events. Despite multiple statistical adjustments, the investigators also acknowledged the possibility for residual confounding as a potential source of bias. The specific traffic-related pollution components, such as UFP or gaseous-phase chemicals (eg, SVOCs), that are responsible for the positive findings among these studies remain unknown. The close proximity to roadways within these epidemiological studies (eg, 400 m) required to observe an association with elevated cardiovascular risk, however, matches the atmospheric fate of these shorter-lived pollutants. The findings may thus suggest the existence of cardiovascular health effects mediated by specific air pollutants rather than PM_{2.5} per se. There is room for improvement in assessment of traffic exposures in epidemiological research, and better approaches are now being incorporated into research projects, such as accounting for associated factors (eg, noise or spatial autocorrelation with socioeconomic status).^{275,277}

Geographic differences in cardiovascular risk due to PM have also been observed across US regions, with more consistent or stronger effects observed in Eastern versus Western states.^{71,103,257} Differences between North American and European cities have also been reported.⁶¹ PM exposures are typically, but not always,²⁵⁸ associated with larger effects during warmer months (spring through fall) than in the winter.^{45,103,257} Variations in pollution characteristics (eg, sulfate), time spent outdoors, air conditioning usage and particle penetration indoors, ambient temperature and meteorology, and mobile (eg, diesel) or stationary (eg, coal combustion) sources of exposure may help explain these differences. Finally, variations in the cardiovascular risk posed by PM may also occur because of heterogeneity in the metric of exposure, such as personal versus background regional,²⁵ indoor versus outdoor sources, and differences in intracity versus intercity gradients.⁶⁹ A better understanding of the responsible constituents and sources is important and could potentially lead to more targeted and effective regulations. On the other hand, finding continued evidence that the adverse cardiovascular health effects cannot be linked conclusively to a particular or specific chemical species or source of pollution but rather that they occur in response to a variety of exposure types or mixtures would support the present-day policy of reducing exposure to overall fine particulate mass to achieve public health benefits.

Time Course and Concentration-Response Relationships

Many studies have demonstrated that PM air pollution exposure does not simply advance the mortality by a few days of critically ill individuals who would have otherwise died (eg, mortality displacement or "harvesting").^{278,279} There also appears to be a monotonic (eg, linear or log-linear) concentration-response relationship between PM_{2.5} and mor-

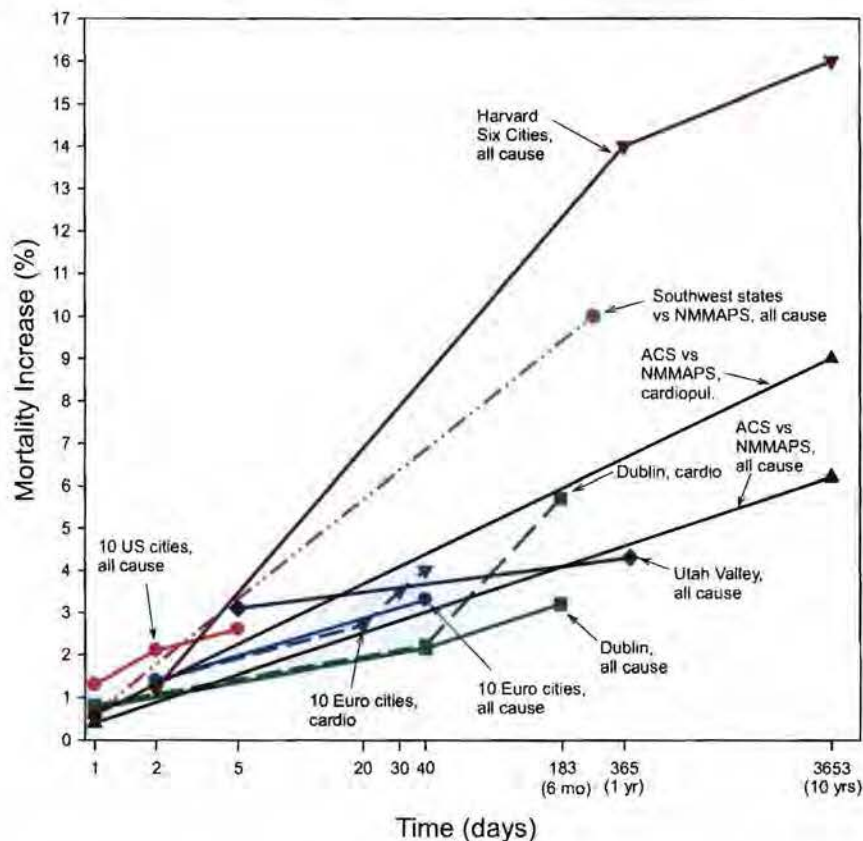


Figure 2. Comparison of estimates of percent change in mortality risk associated with an increment of $10 \mu\text{g}/\text{m}^3$ in $\text{PM}_{2.5}$ or $20 \mu\text{g}/\text{m}^3$ of PM_{10} or British Smoke (BS) for different time scales of exposure (log scale of approximate number of days, updated and adapted from Pope^{281a}). Euro indicates European; cardio, cardiovascular disease; and cardiopul, cardiopulmonary.

tality risk observed in cohort studies that extends below present-day regulations of $15 \mu\text{g}/\text{m}^3$ for mean annual levels, without a discernable "safe" threshold.^{67,70,84} Cardiovascular risk due to particle exposure was also shown to extend below $15 \mu\text{g}/\text{m}^3$ in the recent analysis of the Women's Health Initiative Observational Study.⁷² This monotonic association supports the idea that any reduction in particulate pollution will translate into health benefits within a population of people, each with their own individual level of susceptibility. It also suggests that a larger decrease in $\text{PM}_{2.5}$ exposures will produce a greater reduction in mortality. Finally, a recent analysis of the literature provided important new insights into the nature of the PM exposure-response relationship.²⁸⁰ The risk for cardiovascular mortality was shown to increase in a linear fashion across a logarithmically increasing dosage of inhaled fine-particle levels that ranged from ambient PM air pollution ($\approx 0.2 \text{ mg}/\text{d}$), through secondhand smoke ($\approx 1 \text{ mg}/\text{d}$), to active smoking ($200 \text{ mg}/\text{d}$). This means that the exposure response is extremely steep at very low PM levels (ie, ambient air pollution) and flattens out at higher concentrations (ie, active smoking). This may help explain the seemingly incongruent and comparatively very high degree of cardiovascular risk posed by the much lower levels of PM exposure from ambient pollution and secondhand smoke versus the much higher doses due to active smoking. Thus, the cardiovascular system may be extremely sensitive to very low levels of PM inhalation as encountered with ambient pollution.

At present, the underlying nature and full scope of the temporal-risk relationship posed by longer-term PM expo-

surements remain uncertain.^{2,281} The writing group members did concur that the available epidemiological studies demonstrate larger cardiovascular risks posed by more prolonged exposures to higher PM levels than observed over only a few days (Figure 2). Cohort studies using Cox regression survival analyses (over months to years) are capable of evaluating a more complete portion of the temporal-risk relationship than time-series analyses over only a few days that use Poisson regression. However, given the lack of complete information, no conclusions could be drawn on the full magnitude of the augmented risk posed by chronic exposures, the time window (a few months versus decades) required to exhibit this enhanced risk, the underlying biological causes, the extent to which statistical differences between study types explain the variations in risk, and whether clinically relevant chronic CVDs are precipitated by chronic exposures. Some writing group members believe it is important to differentiate as 2 distinct issues the potentially greater effect of long-term exposures on increasing the risk for acute events (eg, cardiovascular mortality) compared with the putative effect on initiating or accelerating the development of chronic CVD processes per se (eg, coronary atherosclerosis). As such, it is possible that the greater risks observed in cohort studies could be capturing the fact that repetitive exposures over months or years augment the risk for sudden cardiovascular events in susceptible people, without actually worsening an underlying "chronic" disease process.

On the one hand, the available studies demonstrate that the majority of the larger risk-effect sizes posed by longer-term versus short-term exposures appear to be manifested within

only 1 to 2 years of follow-up. Extending the duration of follow-up increases cardiovascular risk, but to a progressively smaller degree over time (Figure 2). The discrepancy in the effect sizes among study types (eg, cohort versus time-series studies) could also reflect differences in statistical methodologies or population susceptibilities.^{282–284} Recent attempts to investigate this matter^{64,84} suggest that the risk for acute events associated with chronic exposures may be reasonably well estimated by only the most proximal 1 to 2 years of PM levels. The most recent time frames of exposure also explain a substantial portion of the excess cardiovascular risk observed in several cohort studies.^{70,72,73,83} These findings bolster the argument that relatively rapid and pliable (and potentially reversible) biological responses, such as the instigation of plaque instability or the enhanced thrombotic potential caused by PM-mediated inflammation or endothelial dysfunction (which can occur and abate over only a few weeks to months), could explain the biology responsible for this greater relative risk.

On the other hand, cogent alternative arguments can be made to explain the differences in relative risk between the cohort and time-series studies. The likely high correlation of a recent year's exposure levels with exposures over many years, as well as the uniform rank ordering of exposure severity over time among cities, can explain why only a short period of PM exposure assessment is required to understand the risk of longer-term exposures. In addition, no studies have evaluated the potential risks of exposure over decades or a lifetime. PM augments the ability of traditional risk factors to accelerate the development of atherosclerosis in experimental settings. As such, it is also plausible that long-term exposures may enhance cardiovascular risk to an even greater extent by increasing an individual's susceptibility for future cardiovascular events or acute exposures. In addition, the full extent of this possibility may not be illustrated by the limited follow-up period (4 to 5 years) of the majority of cohort studies. The writing group thus agreed that this important issue requires more investigation.

It is also possible that these 2 explanations are not mutually exclusive. Furthermore, it cannot be concluded from available information that a long period of time is required for reductions in PM levels to translate into a decrease in cardiovascular risk. On the contrary, reductions in second-hand smoke²⁸⁵ and PM air pollution levels^{64,84,90,95} appear to produce fairly rapid decreases in cardiovascular event rates, within a few months to years.²⁸⁴ At present, the available data do not allow for firm conclusions regarding the underlying biology and the full extent of the potentially nonuniform PM exposure-to-cardiovascular risk temporal relationship.

Susceptibility to Air Pollution Exposure

Susceptibility refers to a heightened risk for a particular cardiovascular end point or event to occur compared with the general population at the same concentration of PM exposure. Typically, this is indicative of an underlying medical condition (eg, diabetes) or personal characteristic (eg, old age) that causes this enhanced risk. This is in contrast to the term

“vulnerability,” which refers to a population of individuals at greater risk for more frequent or high levels of exposures.

Earlier studies reviewed in the first AHA scientific statement¹ suggested that susceptible populations include the elderly; individuals with diabetes; patients with preexisting coronary heart disease, chronic lung disease, or heart failure; and individuals with low education or socioeconomic status. In the ACS study, current and previous smokers appeared to be at the same or greater degree of risk.⁶⁷ Among more recent studies, the Women's Health Initiative also reported positive findings among active smokers and an elevated risk for cardiovascular mortality induced by PM_{2.5}.⁷² Conversely, current smokers were found to be at no increased risk for cardiovascular mortality in response to PM_{2.5} exposure in the Nurses' Health Study.⁷³ Thus, the effect modification of smoking status requires more investigation. The APHENA study of European and North American cities recently confirmed that elderly and unemployed individuals are at higher risk of short-term PM exposure.⁶¹ In a multicity time-series study in Asia, women, the elderly, and individuals with lower education and socioeconomic status were also shown to be at elevated risk.²⁸⁶ A few additional studies have reported some evidence of susceptibility to short-term PM exposures among older individuals, people with diabetes, and those with a lower level of education.^{287–289} Finally, a recent study illustrated that present-day levels of PM_{2.5} likely increase the risk for a cardiac event within a few days of exposure principally (or even solely) among individuals with preexisting significant coronary artery disease, even if they are seemingly healthy (eg, without anginal symptoms). Patients without obstructive lesions on heart catheterization were not at any risk for PM_{2.5}-induced myocardial events over the short term.¹³ This is not surprising, because most acute cardiovascular events occur among individuals with underlying vulnerable substrate (eg, unstable plaques) and not in individuals with normal coronary arteries.

Obesity has been newly recognized as a possible susceptibility factor. Two cohort studies have shown that a greater body mass index enhances the susceptibility for PM-induced cardiovascular mortality, at least among women.^{72,73} Although individuals with diabetes showed a trend toward greater risk in the Women's Health Initiative,⁷² hypertension, high cholesterol, smoking, elderly age, education, and income did not alter the risk association. Overall, there appears to be little effect modification by race, hypercholesterolemia, or BP among the studies. Finally, sex may also be a risk-effect modifier. The particularly robust risk estimates of the 2 cohort studies that included only women,^{72,73} the fact that PM increased cardiovascular risk in female but not male participants of the AHSMOG study,⁷⁵ and the multicity time-series findings in Asia²⁸⁶ suggest that women may be at greater risk for cardiovascular mortality related to PM. Further studies are needed to clarify whether obese individuals and women are indeed susceptible populations.

Biological Mechanisms

There has been substantial improvement in our understanding of the biological mechanisms involved in PM-mediated

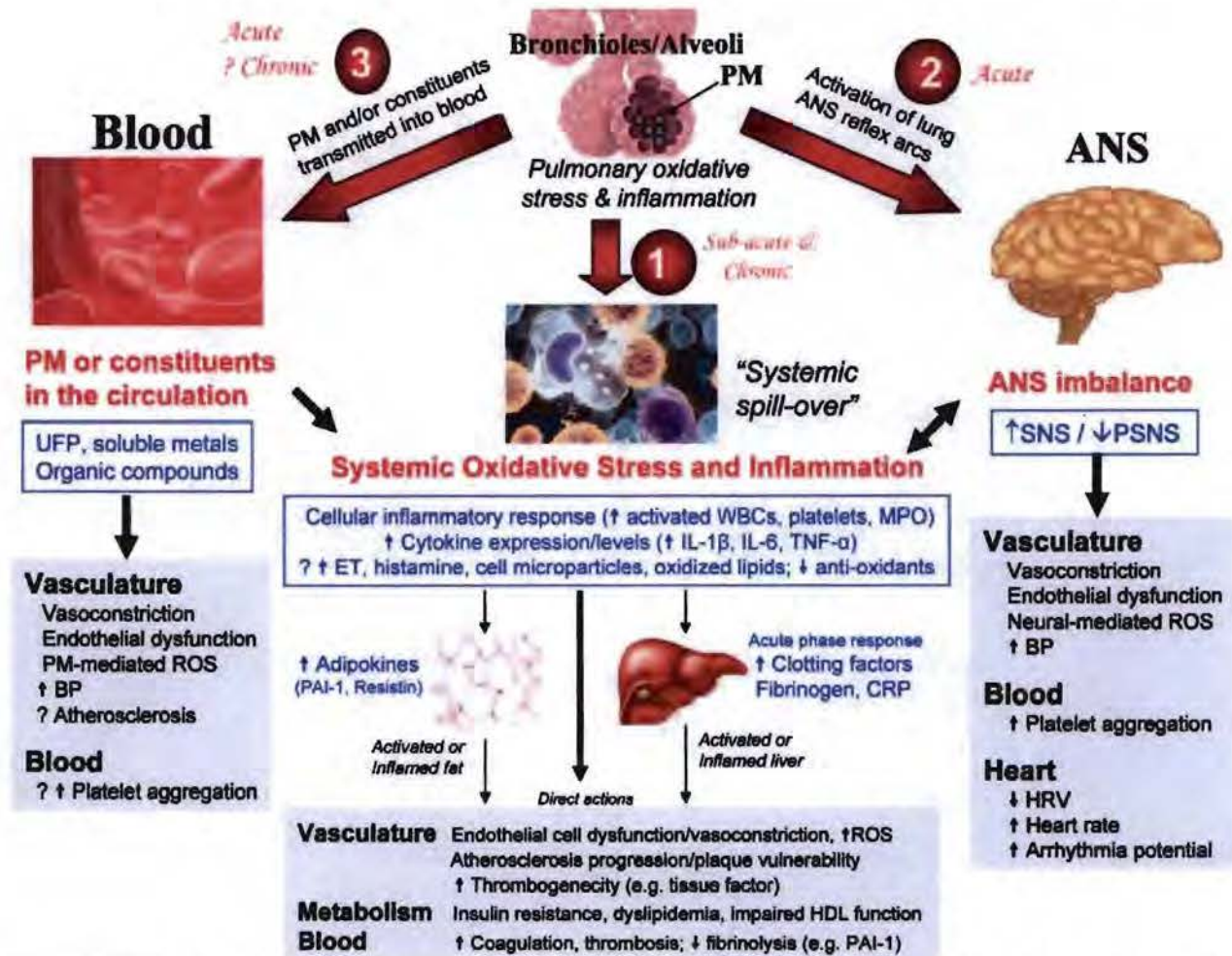


Figure 3. Biological pathways linking PM exposure with CVDs. The 3 generalized intermediary pathways and the subsequent specific biological responses that could be capable of instigating cardiovascular events are shown. MPO indicates myeloperoxidase; PAI, plasminogen activator inhibitor; PSNS, parasympathetic nervous system; SNS, sympathetic nervous system; and WBCs, white blood cells. A question mark (?) indicates a pathway/mechanism with weak or mixed evidence or a mechanism of likely yet primarily theoretical existence based on the literature.

cardiovascular effects. Studies before 2004 were reviewed previously,¹ and only some are again discussed here for contextual background. A number of new experiments have demonstrated very rapid effects of air pollution, such as vascular dysfunction, which argues for the existence of pathways that convey signals systemically within hours of PM inhalation. On the other hand, there is also support for chronic biological effects, such as the promotion of atherosclerosis. At the molecular level, persuasive evidence supports an integral role for ROS-dependent pathways at multiple stages, such as in the instigation of pulmonary oxidative stress, systemic proinflammatory responses, vascular dysfunction, and atherosclerosis. In sum, new studies continue to support the idea that inhalation of PM can instigate extrapulmonary effects on the cardiovascular system by 3 general “intermediary” pathways. These include pathway 1, the release of proinflammatory mediators (eg, cytokines, activated immune cells, or platelets) or vasoactive molecules (eg, ET, possibly histamine, or microparticles) from lung-based cells; pathway 2, perturbation of systemic ANS balance or heart rhythm by particle interactions with lung receptors or

nerves; and pathway 3, potentially the translocation of PM (ie, UFPs) or particle constituents (organic compounds, metals) into the systemic circulation (Figure 3).

Exposure Considerations

Animal and human exposure studies are discussed separately and apart from the effect of ambient PM because their methodologies and clinical relevancies vary widely. Controlled exposure studies involve exposing a subject to various size fractions of PM within a chamber connected to ambient air (concentrated or nonconcentrated) or a source of aerosolized particles. Virtual impactor systems that deliver concentrated ambient particles (CAPs) from “real-world” ambient air are a commonly used approach for mimicking exposures to higher levels of ambient particles without requiring invasive methods or the generation of artificial particles.³ Both a strength and limitation, however, is that CAPs can vary considerably from day to day in composition. Additionally, only certain particle size ranges are typically concentrated (eg, PM from 0.1 to 2.5 μm in the fine-CAP system), whereas

ambient air contains a mixture of particle sizes, volatile organics, and gases that are not concentrated (and can be lowered). Potential interactions between PM and gaseous copollutants on health end points are therefore excluded, unless the latter are reintroduced in an artificial fashion. Other methods of controlled-inhalation exposures include diesel engine exhaust (diluted and aged mixtures of high numbers of fresh combustion UFPs with vapor-phase components), roadside aerosols, and wood-burning sources. Regarding animal exposures, intratracheal instillation methods may sometimes be required because of the limited availability of inhalation exposure systems. Unfortunately, particle size and surface characteristics—mostly retained in inhalation systems with fresh sources of pollution and which may be important in influencing biological effects—are likely significantly altered in instillation systems or by methods that use previously collected particulate. However, the use of carefully modeled exposures (eg, deposition calculation) and the recognition that areas of “hot spots” containing markedly higher PM levels within the lung may occur even during normal inhalation make the results of these experiments potentially relevant.² Further detailed discussions of exposure considerations are reviewed elsewhere.²⁹⁰

The protocol details vary considerably among the studies. Many aspects of exposure, including the duration, concentration, PM size ranges and composition, and gaseous copollutants, are important to consider. A wide variety of outcomes may be anticipated depending on the biological pathways evoked by differing exposures. Moreover, there are multiple determinants of the subsequent physiological responses, including the time frames of investigation, preexisting susceptibility, animal models, and the details of the outcomes investigated. All of these factors may explain some of the heterogeneity in the reported study results and must be taken into consideration when interpreting the findings.

Animal Exposure and Toxicological Studies

Studies that investigate the effects of exposure on susceptible animals (eg, those with preexisting cardiovascular or metabolic abnormalities) may be preferable in many circumstances because of the increasing recognition that the pathways underlying the biological effects of PM overlap (ie, modify and/or enhance) those of conventional cardiovascular risk factors. Such factors (eg, hypertension or atherosclerosis) may also be necessary or at least responsible for the evocation of a more readily observable or robust response. For example, in the context of systemic oxidative stress or inflammation, the cellular machinery for the generation of excess ROS and proinflammatory responses (eg, adhesion molecule and cytokine expression) is already primed or operational in susceptible animals.

Pulmonary Oxidative Stress and Inflammation

The molecular events responsible for triggering pulmonary oxidative stress and inflammation, along with the interactions between lung and immune cells, the inhaled PM, and the protective secretions (eg, surfactant, proteins, and antioxidants), are highly complex,^{4–6} as reviewed in detail

elsewhere.^{290a,290b,414} In brief, size, charge, solubility, aggregation, ROS-producing potential, and chemistry play roles in determining the responses. These include the particle fate (eg, lung clearance versus retention rates), the nature of the PM-cell interactions (eg, immune versus lung cell uptake, host cell responses, and intracellular sequestration/location), and the dose (likely typically a small percentage of inhaled PM) and pathways of potential systemic transmission of PM or its constituents, such as in the circulation [free, intracellular within circulating cells, (lipo)protein-bound] or via lymphatic spread.^{4,5,290a,290b} Because of their nano-scale size, UFPs may directly enter multiple lung cell types via nonphagocytic pathways and adversely affect organelles, such as mitochondria.^{6,290a,290b} Larger unopsonized fine particles are more typically taken up by phagocytes through interactions with innate immunity receptors such as MARCO (macrophage receptor with collagenous structure) or other scavenger receptors.^{5,290a,290b} This may in fact be a protective mechanism that sometimes prevents harmful lung inflammation. Certain particle compounds may directly generate ROS *in vivo* because of their surface chemistry (eg, metals, organic compounds, and semiquinones) or after bioactivation by cytochrome P450 systems (eg, polycyclic aromatic hydrocarbon conversion to quinones).^{6,290a,290b} A particle surface or anions present on otherwise more inert particles may disrupt iron homeostasis in the lung and thereby also generate ROS via Fenton reactions.²⁹¹ Other PM constituents may do so indirectly by the upregulation of endogenous cellular sources (eg, nicotinamide adenine dinucleotide phosphate [NADPH] oxidase)^{292,293} or by perturbing organelle function (eg, mitochondria) by taken-up PM components.²⁶¹ Particle stimulation of irritant and afferent ANS fibers may also play a role in local and systemic oxidative stress formation.²⁹⁴ Given the rich antioxidant defenses in the lung fluid, secondarily generated oxidization products of endogenous molecules (eg, oxidized phospholipids, proteins) or a reduction in endogenous antioxidants *per se* may be responsible at least in part for the state of oxidative stress in the lungs (along with instigating the subsequent cellular responses) rather than ROS derived directly from PM and its constituents.

Subsequent to oxidative stress, antioxidant and phase II defenses may be activated (eg, inducible nitric oxide synthase, glutathione) via transcription factor Nrf2-dependent pathways.²⁶¹ When inadequate, pathological oxidative stress can initiate a variety of pulmonary inflammatory responses. For example, ROS in the lungs has been shown to augment the signal transduction of membrane ligand (eg, epidermal growth factor by disrupting phosphatases) or pattern-recognition receptors (eg, toll-like receptors [TLR])^{295–299} and/or stimulate intracellular pathways (eg, mitogen-activated protein kinases) that lead to the activation of proinflammatory transcription factors (eg, nuclear factor- κ B) that upregulate expression of a variety of cytokines and chemokines.²⁶¹ Alteration in lung cell redox status may itself stimulate nuclear factor- κ B. Biological components within coarse PM could also directly trigger inflammation (eg, nuclear factor- κ B pathways) by binding to TLR2 or TLR4 receptors or other innate immune pattern-recognition receptors.²⁹⁷ It is also possible that other components of metal-rich

PM could instigate inflammatory pathways via TLR activation directly or via the oxidation of endogenous biological compounds that then serve as TLR ligands.³⁰⁰ Finally, there is some evidence that PM can activate inflammatory mitogen-activated protein kinase signaling by angiotensin II receptor-dependent pathways.²⁹⁵ These inflammatory responses can also exacerbate the initial oxidative stress [eg, via upregulation of cellular NAD(P)H oxidase] and thus initiate a positive-feedback cycle.

Available studies support important contributions to pulmonary inflammation from innate immune cells such as neutrophils and macrophages (TNF- α , IL-6), as well as from the adaptive immune system, such as T cells (IL-1, IL-4, IL-6, and IL-10). Although the dominant source of cytokines likely represents the alveolar macrophages and lung epithelial cells, the role of other innate and adaptive immune cells cannot be ruled out.^{299,301,302} Recently, myeloperoxidase activity was shown to increase after PM exposure in the same time course of appearance of cellular inflammation (primarily neutrophils) in the lung.³⁰³ Gaseous components such as ozone may also amplify the toxicity of PM.³⁰⁴

Systemic Inflammation

In the context of examining the cardiovascular effects of air pollution, it is important to consider the inflammatory mediators that are released from lung cells after contact with PM, because some could conceivably spill over to the general circulation or increase liver production of acute-phase proteins (eg, CRP, fibrinogen). An increase in circulating proinflammatory mediators (eg, activated immune cells, cytokines) could thus serve as a pathway to instigate adverse effects on the heart and vasculature. Numerous experiments have demonstrated increased cellular and inflammatory cytokine content, such as IL-6, IL-1 β , TNF- α , interferon- γ , and IL-8, of bronchial fluid and sometimes in circulating blood after acute exposure to a variety of pollutants.^{292,305-311}

Critical roles for the elevations in systemic and pulmonary levels of IL-6 and TNF- α have been observed after PM exposure, typically coincident with pulmonary inflammation.^{292,302,306,309,311-314} There is at least some evidence that the degree of pulmonary inflammation and systemic inflammation (IL-6) correlates with the elevation of systemic cytokines and systemic vascular dysfunction.³¹⁴ In a 4-week inhalation exposure to freshly generated diesel exhaust, IL-6 knockout mice did not demonstrate increased cellular inflammation or TNF- α in bronchial fluid, which implies a role for IL-6.³¹⁵ Consistent with these findings, acute intratracheal exposure to PM₁₀ resulted in an increase in IL-6, TNF- α , and interferon- γ in the bronchial fluid.³¹⁶ However, in this study, IL-6^{-/-} mice showed roughly the same levels of TNF- α in bronchial fluid as wild-type mice, although interferon- γ was decreased to control values.³¹⁶ The results also suggested that lung macrophages play an important role, because depletion of these cells abolished the increases in some of the cytokines and systemic cardiovascular responses. Although our understanding of the source of IL-6 and TNF- α and their involvement in the systemic inflammatory response after PM exposure remains incomplete, these and other experiments appear

to suggest that at least with PM₁₀ particles, alveolar macrophages play a dominant role.^{309,314,316}

Among remaining uncertainties, the upstream signaling pathway responsible for the recognition of PM components that in turn produce the systemic inflammation has not been fully elucidated³¹⁷; however, there is some evidence with other particulates and experimental models of lung injury that ROS generated by NADPH oxidase or pattern-recognition receptors may modulate some of these responses.^{292,299,318} NADPH-oxidase knockout mice demonstrated significantly lower IL-6 and macrophage inflammatory protein-2 responses to collected PM than wild-type mice.²⁹² Extrapulmonary sources may also be involved in promulgating the systemic inflammation. PM_{2.5} exposure in a model of diet-induced obesity in C57Bl/6 mice for a duration of 24 weeks resulted in elevations in TNF- α and IL-6. In addition, there were increases in circulating adipokines, such as resistin and plasminogen activator inhibitor-1.³¹⁹ The elevation in cytokines, thought to be derived from adipose sources, in addition to findings of adipose inflammation in that study, raises the possibility of additional systemic nonpulmonary sources of such cytokines.

Systemic Oxidative Stress

Numerous in vitro studies have demonstrated activation of ROS-generating pathways by PM incubation, such as NADPH oxidases, mitochondrial sources, cytochrome P450 enzymes, and endothelial nitric oxide synthase in cultured cells or in pulmonary and vascular tissue.^{293,311,320-329} Similar to inflammation, the oxidative stress after PM inhalation may not always stay confined within the lungs.³³⁰ The sources of excess ROS within cardiovascular tissue may include circulating immune cells or cytokines, depletion of defense mechanisms (eg, impaired high-density lipoprotein function), oxidation of lipoproteins or other plasma constituents,³³¹ activation of ANS pathways,²⁹⁴ or circulating PM constituents (eg, soluble metals, organic compounds) reaching the vasculature.²⁶¹ Activation of ROS-dependent pathways modulates diverse responses with far-reaching consequences, including vascular inflammation/activation, atherosclerosis, impaired basal vasomotor balance, enhanced coagulation/thrombosis, and platelet activation.^{290b}

Recent experiments have indeed confirmed the existence of footprints or markers of oxidative stress within the cardiovascular system in the in vivo context. Acute-exposure studies³³² have shown a relationship between the vascular dysfunction in spinotrapezius microvessels and the release of myeloperoxidase from leukocytes into the vasculature within only hours after the pulmonary instillation of PM.³³² Interestingly, an insoluble particle (TiO₂) induced very similar effects. More long-term studies³³³ have demonstrated that 10 weeks of exposure to PM_{2.5} increased superoxide production in response to angiotensin II and resulted in upregulation of NAD(P)H oxidase subunits and depletion of tetrahydrobiopterin in the vasculature. These effects had functional consequences in terms of increases in systemic vascular resistance and BP. In another investigation that involved apolipoprotein E-deficient (ApoE^{-/-}) fed a high-fat diet, chronic exposure

to PM_{2.5} exacerbated vascular oxidant stress and promoted atherosclerosis progression.³³⁴ The proatherogenic effects of ambient UFPs³³¹ versus PM_{2.5} in genetically susceptible ApoE^{-/-} mice in a mobile facility close to a Los Angeles freeway have also been compared. Exposure to UFPs resulted in an inhibition of the antiinflammatory capacity of plasma high-density lipoprotein and greater systemic oxidative stress, as evidenced by increased hepatic malondialdehyde and upregulation of Nrf2-regulated antioxidant genes.³³¹

Other experiments²⁹⁴ have suggested that ANS imbalance may play an important role in PM-induced cardiac oxidative stress. Pharmacological inhibition of the ANS could significantly reduce chemiluminescence in the heart after exposure.³⁰³ More recently, an upstream modulator, the transient receptor potential vanilloid receptor-1, within the lung was identified as central to the inhaled CAP-mediated induction of cardiac chemiluminescence.³³⁵ In these studies, capsaicine was able to abrogate ECG alterations in rats during the 5-hour exposure, which suggests that neural ANS pathways are crucial.

Thrombosis and Coagulation

Earlier studies using intratracheal instillation of high concentrations of diesel exhaust particles demonstrated the induction of lung inflammation, platelet activation, and increased peripheral vascular thrombosis in both arteries and veins after photochemical injury.^{336,337} Thrombosis susceptibility was ascribed to direct passage of the instilled UFPs in the blood, because large polystyrene particles unlikely to cross the lung-blood barrier did not increase peripheral thrombosis. In a subsequent study, a persistent increase in thrombosis susceptibility to diesel exhaust particles was shown after 24 hours, an effect that was mitigated by pretreatment with sodium cromoglycate, which indicates that this response was secondary to histamine release from basophil degranulation.³³⁸ These same effects, however, were mimicked by 400-nm polystyrene particles with a low likelihood of transgressing the pulmonary barrier, which implicates pulmonary release of histamine as a mediator of thrombosis at the later time point. Because histamine was increased in the plasma at 6 and 24 hours after exposure, and diphenhydramine mitigated diesel PM-induced thrombosis at later time points but not at 1 hour, it was hypothesized that additional direct effects of PM constituents reaching the circulation may be responsible for the earliest prothrombotic effects.³³⁹ No increase in circulating von Willebrand factor was observed after instillation of both particles. Finally, pulmonary instillation of carbon nanotubes produced neutrophil lung influx 24 hours later. Circulating platelet-leukocyte conjugates were elevated 6 hours after exposure, whereas procoagulant microvesicular tissue factor activity and peripheral thrombotic potential were increased 24 hours later. Inhibition of P-selectin abrogated these responses, which demonstrates that rapid activation of circulating platelets by the pulmonary deposition of PM plays a vital role.³⁴⁰ This series of studies suggests that release of lung cell-derived mediators (eg, histamine) after several hours along with the more rapid activation of circulating platelets by lung inflammation via P-selectin-dependent

processes may mediate distant system prothrombotic effects without necessarily inducing systemic endothelial damage.

In a study using C57BL/6J mice, intratracheal PM₁₀ particles rich in transition metals decreased bleeding, prothrombin, and activated partial thromboplastin times and enhanced the levels of several coagulation factors as well as thrombosis times in response to experimental FeCl₃ injury.³¹⁶ This prothrombotic effect was mitigated in IL-6^{-/-} and macrophage-depleted mice, which suggests that IL-6, lung macrophages, and pulmonary inflammation are necessary initial steps. It is possible, however, that coarse-particle components (eg, endotoxin) could have been important mechanistically via TLR activation. The effect of fine PM or UFPs per se requires more investigation. Chronic ambient exposure to PM_{2.5} has also been shown to increase tissue factor expression in macrophages and smooth muscle cells in atherosclerotic lesions. Complementary *in vitro* studies with cultured human smooth muscle cells and monocytes demonstrate dose-dependent increases in tissue factor in response to collected ambient particles.³⁴¹ Other findings also support potential procoagulant and thrombotic effects of PM.^{342,343} These collective studies suggest that both short- and long-term PM inhalation can enhance thrombotic and coagulation tendencies, potentially via increases in circulating histamine and inflammatory cytokines and/or activated white cells and platelets. The plausibility of these pathways is supported by the well-recognized cross talk between inflammation and thrombosis.³⁴⁴ Potential additional roles for UFPs or soluble constituents that reach the circulation and directly enhance platelet aggregation or systemic oxidative stress (thus activating the endothelium and blunting platelet-derived nitric oxide) require more investigation.

Systemic and Pulmonary Hypertension

Early animal studies suggested small or inconsistent effects of PM on BP,³⁴⁵⁻³⁴⁷ sometimes dependent on the season³⁴⁸ of exposures. A potential explanation may be variations in experimental protocols, including differences in the delivery, duration, and composition of exposure and the methods used to measure BP. Moreover, PM by itself may represent a relatively weak stimulus but may act more robustly in concert with other predisposing factors to affect BP. Sun et al³³³ recently demonstrated a significant interactive effect of fine-CAP exposure with the vasoconstrictor angiotensin II in rats. Preexposure to PM_{2.5} for a 10-week period resulted in enhancement of its prohypertensive response measured continuously by intra-arterial radiotelemetry. The exaggerated BP elevation was accompanied by endothelial dysfunction, including blunted endothelium-dependent vasodilation and enhanced vasoconstrictor reactivity, along with upregulation of NAPDH oxidase and Rho-kinase-signaling pathways. *In vitro* exposure to UFPs and PM_{2.5} was also associated with an increase in Rho-kinase activity, phosphorylation of myosin light chain, and myosin phosphatase target subunit. Pretreatment with the nonspecific antioxidant *N*-acetylcysteine and Rho-kinase inhibitors prevented these responses, which suggests an ROS-mediated mechanism for particle-mediated effects on vascular smooth muscle constriction. Further

studies corroborated the role of exaggerated Rho-kinase pathway activity in potentiating the hypertensive response to angiotensin II in mice exposed to PM_{2.5}.³⁴⁹ Moreover, particle exposure augmented angiotensin-mediated cardiac hypertrophy and collagen deposition. Blockade of Rho-kinase abolished these effects. These responses suggest that chronic PM_{2.5} exposure disrupts normal vascular homeostasis and vasoactive mediator balance through ROS-dependent mechanisms in a manner that sensitizes the vessel toward vasoconstrictors. Activation of RhoA/Rho-kinase signaling pathways appears to play an important mechanistic role.

In conscious canines with implanted BP catheters, systemic arterial BP increased and baroreceptor sensitivity was rapidly altered over a few hours during CAP exposure.³⁵⁰ Interestingly, α -adrenergic antagonism abrogated the responses. The findings support a mechanistic role for acute activation of the sympathetic nervous system by inhaled particles. In a study with Wistar-Kyoto male rats, CAP exposure for 4 days upregulated ET-A receptor expression in the heart. This alteration was also weakly correlated with an increase in BP, which suggests a role for enhanced ET activity.³⁵¹ PM has also been demonstrated to alter the release of ET-1 and ET-3 from the lungs.³⁵² Elevation in pulmonary vascular resistance and pulmonary arterial pressure, which suggests constriction of the pulmonary vessels, has also been demonstrated in response to respirable carbon black particles.³⁵³ Recently, ultrafine carbon particles were shown to increase BP in spontaneously hypertensive rats 1 to 3 days after a 24-hour exposure.³⁵⁴ This response occurred concomitant with increased ET-1 messenger ribonucleic acid levels in lung tissue and small elevations in plasma renin concentration and angiotensin I and II in the systemic circulation. These findings further support the idea that ET may play a role in cardiovascular responses to PM exposure and suggest that activation of the renin-angiotensin system may also be involved. It is not clear whether the elevated circulating ET levels reflect increased release from the lungs and whether this mediates a systemic vasoconstrictor response. Alternatively, the increase may be more indicative of enhanced vascular tissue activity of these systems. Longer-term exposures of carbon black for 4 weeks in Sprague-Dawley rats has also been shown to significantly increase systolic BP concomitant with increases in serum levels of IL-6 and CRP.³⁵⁵

Finally, *in vitro* exposure to soluble and insoluble components of UFPs induces constriction in isolated pulmonary arterial rings and activates intracellular signaling pathways such as phosphorylation of extracellular signal-regulated kinase-1/2 and p38 mitogen-activated protein kinase in pulmonary endothelial cells. These effects were antagonized by losartan, and several metal components (copper and zinc) could replicate the responses.²⁹⁵ This suggests a possible role for activation of angiotensin II receptor pathways relevant for the maintenance of vasomotor tone and smooth muscle constriction after inhalation of metal constituents within PM.

In sum, the studies demonstrate that long-term PM exposures over a period of weeks are capable of enhancing vasoconstrictive responsiveness of the vasculature (eg, increased Rho-kinase activity and reduced nitric oxide bioavailability) by inflammatory and ROS-dependent cell-signaling

pathways. Shorter-term exposures over several hours to days may lead to vasoconstriction and increased pulmonary and systemic BP by pathways dependent on enhanced ET or angiotensin II signaling. Lung cells may release ET into the systemic circulation and thus increase its systemic activity, or the vascular ET system may be relatively upregulated because of increased ROS or reduced nitric oxide. Activation of the renin-angiotensin system may also occur because of systemic oxidative stress or inflammation or as a consequence of ANS imbalance. The very acute increase in BP that occurs concomitant with the inhalation of particles or within only minutes to hours after exposure appears to be mediated by autonomic imbalance that favors a relative activation of the sympathetic nervous system. No study has evaluated the effect of air pollution on renal sodium handling or long-term pressure natriuresis mechanisms, which are fundamental to the generation of chronic hypertension.

Vascular Dysfunction and Atherosclerosis

Many early experiments demonstrated the capacity of PM constituents to blunt nitric oxide-dependent dilation and enhance vasoconstrictor tone in *ex vivo* vascular studies because of excess ROS formation.¹ The first *in vivo* experiment demonstrated the proatherosclerotic actions of intratracheal PM₁₀ instillation.³⁵⁶ More recently, the pulmonary instillation of several different PM types was shown to rapidly impair microvascular endothelium-dependent vasodilation within days, likely by proinflammatory or ROS-dependent mechanisms (eg, myeloperoxidase).³³² Several animal studies have now demonstrated that long-term exposure to ambient PM_{2.5}, by use of ambient-exposure facilities without direct pulmonary instillation, not only causes endothelial dysfunction but also accelerates the progression of atherosclerosis. Sun et al³³⁴ demonstrated that exposure of atherosclerosis-prone ApoE^{-/-} mice to environmentally relevant levels of CAP, derived from regional northeastern PM_{2.5}, for 6 months in conjunction with a high-fat chow diet potentiated plaque development and heightened vascular inflammation (CD68+ macrophage infiltration and inducible nitric oxide synthase expression) and oxidant stress. The atherosclerotic plaque progression was also accompanied by alterations in vasomotor tone, including decreased endothelium-dependent vasodilation and heightened vasoconstriction to adrenergic stimuli. Importantly, the normalized average PM_{2.5} concentration over the entire period was 15.2 $\mu\text{g}/\text{m}^3$, which approximates the annual NAAQS. Similar findings were reported in other chronic CAP exposures that involved an ApoE^{-/-} model.³⁵⁷ However, exposures to a double-knockout model of ApoE-deficient and low-density lipoprotein receptor-deficient mice increased plaque cellularity, reflective of inflammation, but did not enhance plaque burden. It is possible that the atherosclerotic severity of this phenotype precluded the observation of more subtle effects of CAP exposures.

Intratracheal instillation of UFP can acutely impair aortic endothelium-dependent vasodilation.³⁵⁸ Moreover, repeated 10-week-long endotracheal dispersion of UFP carbon black increased atherosclerosis in low-density lipoprotein receptor-

knockout mice.³⁵⁹ This occurred without evidence of systemic translocation of particles into the cardiovascular tissues. UFP inhalation by use of exposure facilities has also recently been shown to augment atherosclerosis, perhaps to a greater degree than PM_{2.5}. When investigating the effects of different PM size fractions, Araujo et al³³¹ compared the proatherogenic potential of exposure over 40 days to ambient particles <0.18 μm versus PM_{2.5} in ApoE^{-/-} mice. UFPs caused more adverse cardiovascular responses (eg, systemic oxidative stress, impaired high-density lipoprotein function) and greater potency in accelerating atherosclerotic lesion formation, although PM_{2.5} did demonstrate qualitatively similar effects. Recent studies have also demonstrated that PM exposure likely promulgates systemic atherosclerosis by mechanisms that overlap those of other conventional cardiovascular risk factors.³⁶⁰ Intratracheal instillation of PM₁₀ particles caused a rapid impairment in endothelium-dependent vasodilation, stimulation of bone marrow-derived cells, and increased migration of monocytes into atherosclerotic plaques.^{361,362} Systemic inflammation (IL-6) was also related to the degree of endothelial dysfunction.³¹⁴ Finally, the most compelling evidence for rapid impairment in nitric oxide bioavailability being directly involved in the origin of PM-induced endothelial dysfunction was demonstrated recently. Both fine-PM and UFM inhalation for only a few hours in normal rats blunted agonist-stimulated nitric oxide production within the microvasculature, measured by direct electrochemical sensors, concomitant with an observed impairment in vasomotor relaxation. Inhibition of myeloperoxidase or NAD(P)H oxidase partially restored normal nitric oxide bioavailability and endothelial function, which suggests a role of activation of these endogenous radical-generating enzymes in this biological response.³⁶³

Potentially relevant adverse vascular effects of nonparticulate PM components should not be discounted. There may also exist some synergy between vapor phase, gas, and particle constituents in relation to instigation of cardiovascular responses. Recently,³⁶⁴ it was demonstrated in apoE^{-/-} mice that whole gasoline engine exhaust over 1 or 7 days increased vascular messenger ribonucleic acid expression of matrix metalloproteinase (MMP)-2 and MMP-9. Levels of ET-1 and ROS were similarly increased. The vascular ROS and MMP-2 elevations were attenuated by tempol. Endothelial receptor antagonism ameliorated the vascular expression of MMP-2, MMP-9, and ROS. In separate experiments, diesel exhaust exposure to rats for 5 hours augmented ET-induced vasoconstriction, potentially via a blunting of ET-B-induced nitric oxide release.³⁶⁵ The findings suggest that exposure to a fresh mixture of PM, gases, and vapors may play a role in rapidly triggering atherosclerotic plaque vulnerability via ROS and ET-dependent upregulation of MMP levels.

Some studies suggest that predisposed animals may be more susceptible to air pollution-mediated vascular dysfunction. Diesel exhaust particles delivered by intraperitoneal injection impaired nitric oxide-dependent vasodilation only in apoE^{-/-} mice with atherosclerosis and not in healthy control animals.³⁶⁶ Aortas from prediabetic rats were found to be more susceptible to repeated exposures to oil combustion

particles in causing noradrenergic-mediated constriction and impaired endothelium-dependent vasodilation.³⁶⁷

Taken together, the available studies suggest that short- and long-term particle exposures (including PM₁₀, PM_{2.5}, and UFP) can impair conduit and resistance arterial endothelium-dependent vasodilation. Chronic exposures have been shown to be capable of promoting atherosclerosis progression and enhancing plaque vulnerability. The underlying mechanisms likely involve vascular sequelae of systemic inflammation (due to interactions with innate immune cells and cytokines) or exaggerated oxidative stress pathways. Excess vascular ROS and inflammation will impair endogenous vasodilator bioavailability (eg, nitric oxide), enhance vasoconstrictor tone (eg, ET), and chronically activate multiple intracellular pathways that promote atherosclerosis.³⁶⁸⁻³⁷⁰

Heart Rate Variability

Some of the earliest indications of systemic effects of PM came from ECG studies in rats.³⁷¹ In general, reductions in several measures of HRV have been shown.³⁷²⁻³⁷⁶ Most of the recent research has focused on exploring the roles of susceptibility and exposure characteristics. Decreases in heart rate and HRV indices have been reported to be pronounced in senescent mice, which indicates that aging may be a susceptibility factor.³⁵³ Using an anesthetized model of postinfarction myocardium sensitivity, Wellenius and colleagues³⁷⁷ did not demonstrate an effect of 1 hour of CAP exposure on heart rate or spontaneous ventricular arrhythmias. In contrast, in a post-MI heart failure model in Sprague-Dawley rats, diesel exhaust emissions reduced HRV in both healthy and heart failure groups and increased the incidence of premature ventricular contractions. Studies in mice have also indicated a potential role for transition metals and nickel in HRV alterations³⁷⁶ and provide initial clues on the PM components that could influence autonomic tone.⁴⁸

Some beginning insight into the neural pathways involved has been reported recently. PM-induced ECG changes in rats were shown to be prevented by inhibiting the transient receptor potential vanilloid receptor in the lungs. This suggests that the relevant neural mechanism that leads to alterations in HRV or heart rhythm may be induced by activation of receptor-mediated autonomic reflexes in the lung.³³⁵ Circulating particle constituents or inflammatory mediators interacting with myocardial ion channels or electrophysiology did not appear to be a pertinent mechanism, at least in these studies.³³⁵ However, it is unknown whether similar mechanisms can account for the HRV changes observed in humans, and a more detailed understanding of the anatomic pathways involved is required. Finally, it remains unclear whether the changes in cardiac HRV are actually caused by or merely illustrate an underlying alteration in ANS balance. Experiments that clearly define the direct contribution of sympathetic and parasympathetic nervous system activities (eg, microneurography, norepinephrine spillover rates, or autonomic receptor or ganglionic blockade) are needed.

MI and Arrhythmia

PM exposure can increase experimental infarct size and potentiate myocardial ischemia and arrhythmias in experi-

mental MI models. Relatively high concentrations of intratracheal UFP instillation induced pulmonary inflammation and doubled MI size in mice.³⁵⁸ Conscious dogs exposed to fine CAP for several days experienced greater ST-segment changes during transient coronary artery occlusion.³⁷⁸ These studies suggested that particulate-related changes in myocardial blood flow may be responsible, a hypothesis recently supported by experiments in chronically instrumented dogs exposed to fine CAP before transient occlusion of the left anterior descending artery. PM exposure was associated with a small but significant decrease in total myocardial flow, especially in the ischemic zone, and increases in coronary vascular resistance without an alteration in rate-pressure product.³⁷⁹ The abnormalities were inversely related to PM mass, particle number, and black carbon concentration.

Exposure to residual oil fly ash increases arrhythmia frequency in rats with preexisting premature ventricular complexes, which suggests that PM sensitizes ischemic myocardium to abnormal automaticity³⁷²; however, CAP had no effect in rats.³⁸⁰ Nevertheless, the data suggest that PM exposure may potentially be capable increasing the sensitivity of the myocardium to ischemia, likely by impairing myocardial blood flow and perfusion. In theory, this could play a role in enhancing the propensity for ventricular arrhythmias.

Insulin Resistance

Recently, Sun et al³¹⁹ exposed C57BL/6 mice fed high-fat chow to fine CAP or filtered air for 24 weeks. Mice exposed to PM_{2.5} exhibited marked worsening of whole-body insulin resistance, systemic inflammation (increased IL-6 and TNF- α), and higher levels of adipokines, such as resistin and plasminogen activator inhibitor-1. PM_{2.5} increased visceral adiposity and inflammation (F4/80⁺ cells), with stromal vascular cells expressing higher TNF- α and IL-6 and lower IL-10 levels. Exposure also induced insulin-signaling abnormalities and reduced phosphorylation of Akt and endothelial nitric oxide synthase in aortic tissue, accompanied by abnormalities in vascular relaxation to insulin. Additionally, there was evidence that PM_{2.5} exaggerated adhesion of monocytes in mesenteric microvessels, culminating in accumulation in visceral adipose. These intriguing findings suggest that longer-term exposure to PM air pollution may promote the chronic development of insulin resistance, obesity, and the metabolic syndrome.

Controlled-Exposure Studies in Humans

Several new human exposure studies have been published, a few of which have even included patients with CVD or risk factors. Similar to the animal studies, large variations among the exposure protocols, measured outcomes, and subject susceptibilities likely explain much of the differences among findings and must be considered when interpreting the results.

Systemic Inflammation

Controlled human exposure studies have measured the effects on circulating inflammatory markers such as CRP, IL-6, and TNF- α . In many of these single-episode short-term exposures,

no overt changes in plasma cytokine levels were observed after CAP^{381–383} or diesel exhaust.^{345,384–386} Similarly, CRP levels have not consistently been found to increase in the time frame and context of most of these studies.^{313,384–386}

However, there have also been some positive findings. Increases in IL-6³¹³ and TNF- α 24 hours after exposure to diesel exhaust in healthy adults have been reported. High levels of ambient particles can stimulate the bone marrow to enhance the release of neutrophils, band cells, and monocytes into the circulation, which causes a cellular inflammatory response.^{387,388} Some controlled-exposure studies corroborate the existence of a cellular proinflammatory response that manifests as increases in circulating white blood cell or immune cell counts. In 1 study, increased peripheral basophils in healthy older adults were noted 4 hours after a 2-hour exposure to fine CAP.³⁸⁹ In a similar study, increased white blood cell counts were observed in healthy young adults 12 hours after exposure.³⁸¹ Recently, investigators observed an increase in total white blood cell and neutrophil levels immediately after a 2-hour exposure to CAP in downtown Toronto, Ontario, Canada.³⁹⁰ Conversely, decreases in blood monocytes, basophils, eosinophils, and CD54 and CD18 adhesion molecule expression on monocytes after exposure to ultrafine carbon (10 to 50 $\mu\text{g}/\text{m}^3$) among exercising asthmatic individuals and healthy adults have also been reported.³⁹¹ The authors suggested in the latter study that these results may represent the sequestration of these cells in tissue compartments such as the lung or vasculature, where there may be selective expression of the corresponding receptors for these ligands.³⁶² However, other recent human clinical studies have found no association between peripheral blood cell counts and exposure to fine PM or UFPs such as zinc oxide,³⁹² ultrafine carbon,³⁹³ or diesel exhaust.^{313,384,385}

More subtle, yet physiologically relevant or functional proinflammatory changes may be overlooked by the measurement of circulating cytokines or cell counts alone in human studies. Peretz et al³⁹⁴ recently evaluated gene expression using an expression array in monocytes after 2 hours of exposure to diesel exhaust. Although initially a small study, 10 genes involved in the inflammatory response were modulated in response to exposure (8 upregulated, 2 downregulated). These findings will need to be reproduced in larger studies and raise the possibility that functional changes in inflammatory cells may occur without discernible changes in their levels in the peripheral circulation.³⁹⁴

In sum, the findings from controlled human exposures do not demonstrate a robust inflammatory response; however, they have been limited by the fact that they are, by necessity, of short duration and relatively low concentration. Additionally, the results do not preclude an effect of higher exposures, the presence of more subtle responses, or alterations in other cellular inflammatory pathways not measurable by circulating markers.

Systemic Oxidative Stress

The demonstration of systemic oxidative stress is difficult in human studies. Nonetheless, a few studies have reported positive findings. These include an increase in urinary excre-

tion of free 8-iso-prostaglandin-2 α among healthy adults after a 4-hour exposure to concentrated wood smoke³⁹⁵ and an increase in plasma antioxidant capacity 24 hours after a 1-hour exposure to diesel exhaust in a group of healthy volunteers.³¹³ The investigators speculated that systemic oxidative stress after exposure may have been responsible for this upregulation in antioxidant defense.³¹³ Other investigators³⁹⁴ have observed significant differences in expression of genes involved in oxidative stress pathways due to diesel exhaust exposure. Bräuner et al¹⁶⁷ recently investigated the effect of ultrafine traffic particles on oxidative stress-induced damage to DNA in healthy young adults exposed to low concentrations of ambient urban particles (PM_{2.5} and PM_{10-2.5} mass of 9.7 and 12.6 $\mu\text{g}/\text{m}^3$, respectively) in an exposure chamber above a busy road with high traffic density. The authors observed increased levels of DNA strand breaks and formamidopyrimidine-DNA glycosylase sites in monocytes after exposure to PM but no changes in the DNA repair enzyme 7,8-dihydro-8-oxoguanine-DNA glycosylase. Similar to their previous findings with ambient levels,¹⁶⁸ the results suggest that short-term exposure to UFPs may result in damage to DNA. This may occur through oxidative stress pathways, although there was no increase in messenger ribonucleic acid levels in heme oxygenase-1, a gene known to be regulated by Nrf2, a transcription factor regulated by oxidative stress.³⁹⁶ Moreover, more recent observations by the same investigators failed to demonstrate significant biomarker signals for lipid or protein oxidative damage after similar near-roadway exposures.¹⁷⁸ Although not entirely consistent, the available studies demonstrate that acute exposure to PM, perhaps even at ambient levels, may be capable of inducing acute systemic oxidative stress in human subjects under certain circumstances. The assays used to assess the footprint of systemic "oxidative stress" or damage may also play a significant role in the results.

Thrombosis and Coagulation

Several new studies of controlled human exposure have evaluated the effects of PM on hemostatic markers (eg, factor VII, fibrinogen, platelet count, D-dimer, and von Willebrand factor). Although some of these studies have not observed changes after acute exposures,³⁹² others have reported increases in fibrinogen levels at 8 to 24 hours after exposure to CAP.^{381,397} Mills and colleagues^{384,385} recently demonstrated a significant effect of diesel exhaust on fibrinolytic function in response to intermittent exercise both in healthy men and in men with coronary heart disease. In both groups of volunteers, bradykinin-induced release of tissue plasminogen activator was observed to decrease compared with filtered air at 6 hours after exposure to diesel exhaust. These perturbations in tissue plasminogen activator release did not persist 24 hours after exposure.³¹³ In a randomized, controlled crossover study involving "at-risk" metabolic syndrome patients, no changes in plasminogen activator inhibitor-1 were noted over a 24-hour duration; paradoxically, a decrease in von Willebrand factor was noted in this study.³⁹⁸ In a similar experiment conducted in healthy adults, diesel exhaust had no effect on D-dimer, von Willebrand factor, CRP, or platelet counts

compared with filtered air up to 22 hours after exposure.³⁸⁶ Other investigators³⁹⁵ recently evaluated the effect of wood smoke on markers of coagulation, inflammation, and lipid peroxidation in young healthy subjects. Serum amyloid A and the ratio of factor VIII to von Willebrand factor, an indicator of an increased risk of venous thromboembolism, were increased at 4 hours after exposure.³⁹⁵ Samet et al³⁸³ reported an association between various coagulation markers and exposure to ultrafine, fine, and thoracic coarse CAP among healthy young adults. Although exposure to coarse CAP did not result in significant changes in hemostatic variables, the overall trend suggested a prothrombotic effect. Exposure to UFPs increased D-dimer levels, whereas fine-CAP effects tended to increase fibrinogen, similar to previously reported findings.³⁸¹

The measurement of blood levels of coagulation factors or biomarkers of thrombosis could potentially miss a relevant biological effect at the vascular wall. Recently, *ex vivo* thrombus formation was assessed by use of the Badimon chamber after controlled exposures to dilute diesel exhaust in healthy volunteers.³⁹⁹ This protocol measures thrombus formation in native (nonanticoagulated) whole blood triggered by exposure to a physiologically relevant substrate, under flow conditions that mimic those found in diseased coronary arteries. It may therefore provide a superior estimate of actual *in vivo* conditions related to thrombosis potential. Interestingly, dilute diesel exhaust exposure increased thrombus formation within 2 hours, in association with increased platelet activation (ie, increased circulating platelet-monocyte aggregates and soluble CD40 ligand). Taken together, these new studies have provided additional evidence that short-term exposure to PM at near-ambient levels may have small yet potentially significant effects on hemostasis in humans. Whether direct interactions of circulating PM constituents with platelets, activation of platelets due to lung inflammation or secondary to elevated systemic cytokine levels, or an increase in procoagulant factors (eg, fibrinogen) as an acute-phase response to inflammation (or a combination of these pathways) is responsible warrants attention in future studies.

Arterial BP

Although several studies have evaluated the BP response to acute exposures, many inconsistencies in results have been reported.⁴⁰⁰ This must be considered in the context that BP was not the primary outcome of interest in most studies, nor was it typically assessed with adequate sophistication. In one of the earliest studies, PM_{2.5} increased systolic BP in healthy subjects but decreased it in asthmatic individuals.⁴⁰¹ Three other controlled studies did not report changes among healthy adults.^{345,402,403} However, in a more detailed reanalysis of the changes in BP during the actual period of exposure to CAP plus ozone, Urch et al⁴⁰⁴ found a significant increase in diastolic BP of 6 mm Hg. The magnitude of response was associated with the concentration of organic carbon within PM_{2.5}.⁴⁰⁵ Recent follow-up studies redemonstrated an acute prohypertensive response during the inhalation of CAP in 2 separate cities.³⁹⁰ The PM_{2.5} mass during exposure and decreases in several HRV metrics were associated with the

magnitude of the short-lived diastolic BP elevation. This suggested that the most plausible mechanism for this acute response was CAP-induced ANS imbalance that favored sympathetic over parasympathetic cardiovascular tone. Whether this reaction occurred because of a generalized stress response, as a consequence of specific soluble PM constituents directly altering central nervous system activity, or via altered ANS reflex arcs due to the interaction of inhaled particles with lung receptors/nerve endings remains to be elucidated.

The effect of inhaled particulates on BP has also been investigated in several other recent controlled human exposure studies. Two new studies assessed BP changes after a 1-hour exposure to diesel exhaust. Mills et al³⁸⁴ found a 6-mm Hg increase in diastolic BP 2 hours after exposure, which was of marginal statistical significance ($P=0.08$); however, this trend did not persist for 24 hours,³⁸⁴ nor was it found among patients with coronary artery disease.³⁸⁵ The available data to date suggest that short-term exposure to PM_{2.5} or diesel exhaust is capable in certain circumstances of rapidly raising BP. The most consistent and largest effects were seen concomitant with the inhalation of particles. Thus far, the most likely mechanism for such rapid hemodynamic responses appears to be ANS imbalance. However, it is possible that reductions in nitric oxide bioavailability that modulate basal arterial tone toward vasoconstriction or increases in ET among other hemodynamically active molecules (eg, angiotensin II) also play a role in some circumstances.

Vascular Dysfunction

The first controlled human exposure study related to vascular function reported that CAP plus ozone exposure caused acute conduit arterial vasoconstriction in healthy adults.¹ Endothelium-dependent and -independent vasodilation remained intact. Recent follow-up experiments determined that PM_{2.5}, not ozone, was responsible for the adverse vascular effects. However, in these subsequent and larger experiments, fine-CAP exposure did prove capable of diminishing conduit artery endothelium-dependent vasodilation 24 hours (but not immediately) after exposure.³⁹⁰ Postexposure PM_{2.5} mass and TNF- α level were both associated with the degree of endothelial dysfunction, which suggests that systemic inflammation induced by higher levels of particles was likely responsible. Finally, the CAP-induced endothelial dysfunction occurred during exposures in Toronto, Canada, but not Ann Arbor, Mich, which suggests that the composition of the particles is probably an important determinant of the vascular responses.

An acute alteration in vascular function/tone after short-term controlled PM air pollution exposure was corroborated recently.⁴⁰⁶ In 27 adults (10 healthy adults and 17 with the metabolic syndrome), a 2-hour exposure to dilute diesel exhaust caused a dose-dependent constriction of the brachial artery and elevation in plasma ET level without impairing endothelium-dependent vasodilation. Contrary to the hypothesis that metabolic syndrome patients would show greater effects, vasoconstriction was greater in magnitude among the

healthy participants. In an additional study, 2-hour exposure to UFPs composed of elemental carbon impaired peak forearm blood flow response to ischemia 3.5 hours later. There were no other vascular changes or alterations at other time points. BP was also not affected.⁴⁰⁷

Several recent studies have also shown that dilute diesel exhaust can impair peripheral resistance vessel responses to acetylcholine, bradykinin, and nitroprusside 6 hours after exposure.³⁸⁴ The blunted responses to acetylcholine persisted for 24 hours in healthy adults.³¹³ In contrast, bradykinin and sodium nitroprusside-mediated vasodilation and bradykinin-induced acute plasma tissue plasminogen activator release were not altered 24 hours later. In subsequent studies, patients with stable coronary artery disease exposed to dilute diesel exhaust for 1 hour during intermittent exercise demonstrated reduced bradykinin-mediated tissue plasminogen activator release; however, microvascular endothelial function was not impaired.³⁸⁵ This may be related to some degree of preexisting endothelial dysfunction in these patients. However, exercise-induced ST-segment depression and ischemic burden were significantly greater during diesel compared with filtered air exposure. These important findings experimentally highlight that PM air pollution exposure can trigger, or augment existing, myocardial ischemia extremely rapidly (in fact, concomitant with exposure). Reduced coronary flow reserve (that was not observed or resolved at the time of the postexposure brachial artery studies) due to rapid alterations in coronary microvascular function may have contributed to the acute myocardial ischemia. Alternatively, acute ANS imbalance induced by diesel exhaust inhalation may have acutely altered coronary tone and impaired myocardial perfusion.

In a study that exposed healthy young adults to 100 $\mu\text{g}/\text{m}^3$ of diesel exhaust for 2 hours,³⁶⁴ it was recently demonstrated that this air pollution mixture acutely raised plasma ET-1 and MMP-9 expression and activity within 30 minutes. These results corroborate the animal data that even short-term exposures can rapidly alter factors, such as MMP activity, that are mechanistically linked with causing atherosclerotic plaque disruption (and thus acute MI). The increase in ET levels also corroborates previous studies⁴⁰⁶ that showed that diesel exhaust can acutely affect important endogenous regulators of vasomotor tone.

Controlled air pollution exposures have not always been shown to impair endothelial function or vasomotor tone. Despite an increase in exhaled 8-isoprostane concentrations that suggested pulmonary oxidative stress, fine CAP did not affect brachial flow-mediated dilation or basal diameter in northern Scotland exposures.³⁸² However, the PM_{2.5} consisted of relatively inert ambient sea-salt particles and was extremely low in combustion-derived sources. This is in contrast to the particle chemistry in the investigators' previous diesel exposure studies that showed positive findings.^{408,409} Moreover, 24-hour exposure to ambient pollution shunted into a chamber next to a busy street did not impair microvascular endothelial function in 29 healthy subjects, as assessed by digital tonometry.¹⁷⁸ This exposure to near-roadway ambient air, which consisted of ambient UFP and PM_{2.5}, did not alter biomarkers of inflammation, hemostasis,

or protein and lipid oxidation. The authors speculated that the relatively low concentrations of UFP numbers and PM mass or the young, healthy status of the subjects could explain the null findings. Taken together, these studies suggest that brief PM exposure can trigger conduit arterial vasoconstriction, possibly in relation to increased ET activity or augmented sympathetic ANS tone. Under certain circumstances, conduit and resistance arteriole endothelium-dependent vasodilation can also be impaired within a few hours. This abnormality is more likely due to reduced nitric oxide bioavailability as a consequence of systemic proinflammatory and oxidative responses; however, alternative mechanisms and endogenous vasoactive pathways have not been fully explored. It is also apparent that the composition, source, and concentration of pollution, along with the susceptibility of the human subjects, play important roles in determining the vascular effects of acute air pollution exposure.

Heart Rate Variability

The results of several new controlled human exposure studies provide limited evidence to suggest that acute exposure to near-ambient levels of PM may be associated with small changes in HRV. There are at least 4 studies to support this. In the first study, healthy elderly individuals experienced significant decreases in HRV immediately after exposure.²³³ Some of these changes persisted for at least 24 hours. Gong et al⁴¹⁰ studied healthy and asthmatic adults exposed to coarse CAPs with intermittent exercise. HRV was not affected immediately after the exposure but decreased in both groups at 4 and 22 hours after the end of the exposure; greater responses were observed in nonasthmatic individuals.⁴¹⁰ In another study, healthy elderly subjects and patients with chronic obstructive pulmonary disease were exposed to approximately 200 $\mu\text{g}/\text{m}^3$ CAP and filtered air for 2 hours with intermittent mild exercise. HRV over multihour intervals was lower after CAP than after filtered air in healthy elderly subjects but not in subjects with lung disease. A significant negative effect of CAP on ectopic heartbeats during or after CAP exposure relative to filtered air was noted in the healthy subjects, whereas the group with pulmonary disease experienced an improvement during or after CAP relative to filtered air.³⁸⁹ Other investigators recently compared the effects of 2-hour exposures with intermittent exercise to ultrafine (average concentration 47 $\mu\text{g}/\text{m}^3$), fine (average concentration 120 $\mu\text{g}/\text{m}^3$), and coarse (average concentration 89 $\mu\text{g}/\text{m}^3$) CAP among healthy subjects.³⁸³ In both the ultrafine and coarse studies, a crossover design was used in which each subject was exposed to both PM and filtered air. In the case of the fine-PM study, subjects did not serve as their own control but were exposed to either PM or filtered air. Thoracic coarse fraction CAP produced a statistically significant decrease in the standard deviation of normal-to-normal heart rate 20 hours after exposure compared with filtered air. No statistically significant effects on HRV were observed after exposure to UFPs as measured during controlled 5-minute intervals. However, the authors did observe a significant decrease in the standard deviation of normal-to-normal heart rate after exposure to UFPs based on an analysis of the

Table 7. Summary of Level of Evidence Supporting Global Biological Pathways and Specific Mechanisms Whereby PM_{2.5}, Traffic-Related, or Combustion-Related Air Pollution Exposure Can Affect the Cardiovascular System

	Animal Studies	Human Studies
General "intermediary" pathways whereby PM inhalation can instigate extrapulmonary effects on the cardiovascular system		
Pathway 1: Instigation of systemic proinflammatory responses	↑ ↑ ↑	↑ ↑ ↑
Pathway 2: Alterations in systemic ANS balance/activity	↑	↑ ↑
Pathway 3: PM and/or associated constituents directly reaching the systemic circulation	↑	↑
Specific biological mechanisms directly responsible for triggering cardiovascular events		
Vascular dysfunction or vasoconstriction	↑ ↑ ↑	↑ ↑
Enhanced thrombosis or coagulation potential	↑ ↑	↑ ↑
Elevated arterial BP	↑ ↑	↑ ↑
Enhanced atherosclerosis or plaque vulnerability	↑ ↑	↑
Arrhythmias	↑	↑

The arrows are not indicators of the relative size of the association but represent a qualitative assessment based on the consensus of the writing group of the strength of the mechanistic evidence based on the number and/or quality, as well as the consistency, of the relevant studies.

↑ ↑ ↑ Indicates strong overall mechanistic evidence.

↑ ↑ Indicates moderate overall mechanistic evidence.

↑ Indicates some but limited or weak available mechanistic evidence.

Blank indicates lack of evidence.

24-hour measurements. No differences were reported in HRV with fine-PM exposures. Although some controlled-exposure studies have reported either no acute changes³⁹⁰ or, on occasion, increases in HRV metrics in subsets of individuals,^{208,393,401} these studies generally demonstrate that acute PM exposure is capable of reducing HRV. More consistent reductions have been found among older adults (compared with younger subjects or those with lung diseases, who show mixed responses) and perhaps with exposures to larger particles.^{233,389} Whether pulmonary ANS reflex arcs are activated by the deposition of PM within the lung or whether other pathways are responsible for these physiological changes in human exposure studies requires more investigation.

Evidence Summary and Contextual Framework for Biological Mechanisms

Table 7 provides an outline of the level of evidence supporting the generalized intermediary pathways and specific mechanisms whereby PM exposures can be capable of eliciting

cardiovascular events. At the molecular level, oxidative stress as a critically important cause and consequence of PM-mediated cardiovascular effects has a sound experimental basis.^{261,290b,294,319,333,334,345–349,351,361–364,411} At the integrated physiological level, the collective body of evidence continues to support the existence of 3 general pathways (Figure 3). Some of these responses, such as systemic inflammation (via pathway 1), likely require antecedent pulmonary oxidative stress or inflammation in order to be initiated. Others, including ANS imbalance (via pathway 2) and PM or its constituents reaching the systemic circulation (via pathway 3), may not. Although PM-associated metals⁴¹² and certain UFPs^{261,413–415} might be capable of translocating into the blood stream, some studies have been negative in this regard.^{355,416} Many issues related to this pathway are controversial and require resolution.⁴¹⁶ These include the relevance of the dosages delivered to cardiovascular organs, the consequences of particle constituent modifications after interactions with lung tissue/fluids and plasma components, the means of transport within the circulation (eg, protein bound or within cells),⁴¹⁷ and the time course and ultimate sites of PM sequestration. It is also possible that increases in some vasoactive mediators or molecules with adverse effects on cardiovascular tissue, such as ET-1,^{351–354} may occur in the lung and systemic circulation without the need for antecedent lung inflammation. Moreover, the 3 general pathways represent a simplification of complicated biological processes. They may not be mutually exclusive, may overlap temporally, and likely exhibit synergies in causing manifest cardiovascular disease events. Many of the biological pathways are also known to exhibit mutual interactions (eg, inflammation with thrombosis/coagulation and with autonomic function). The pathways are also likely to be principally active at differing time points (eg, more rapid cardiovascular effects of autonomic imbalance than systemic inflammation) and likely vary in importance in relation to different durations of exposure and in causing different cardiovascular sequelae. The chemical characteristics and sizes of inhaled PM may also determine the pathways activated. As opposed to UFPs or some particulate components or chemicals, larger fine and coarse PM are not likely transported into the circulation to any large degree and therefore are more apt to require intermediary pathways to cause extrapulmonary effects. It may also be that surface-bound components may be delivered into the circulation, whereas larger particles themselves serve as a means to deliver the responsible constituent into the pulmonary tree.

The hyperacute physiological responses that occur minutes to hours after PM inhalation are likely mediated principally via pathways 2 and 3. These include ANS-mediated changes (eg, elevated BP, arrhythmias, and vasoconstriction), along with direct effects of circulating PM constituents on platelets (eg, procoagulant and thrombotic changes) and the endothelium (eg, oxidative stress and vasoconstriction). These responses are liable to be the dominant mechanisms responsible for the actual triggering of acute cardiovascular events. Clinically meaningful effects undoubtedly become manifest only in the context of a susceptible patient, typified by the individual with “vulnerable plaque” in the case of acute

coronary syndromes or strokes, “vulnerable myocardium” in the context of arrhythmias, or the “vulnerable circulation” in the context of a heart failure patient at risk for circulatory overload. On the other hand, the biological consequences of systemic inflammation, such as activated white cells and elevated cytokines (via pathway 1), typically require longer periods. Their penultimate effect is the induction of a chronic underlying vulnerable milieu that leads to atherosclerotic plaque vulnerability, enhanced coagulation/thrombotic and arrhythmia potential, and impaired basal vasomotor balance. These actions thereby predispose individuals for future cardiovascular events, particularly when they occur in conjunction with traditional risk factors or prompt susceptibility to the acute biological actions (via pathways 2 and 3) of later air pollution exposures.

This hypothetical segregation of the biological effects of PM exposure as acute or chronic and into the broad pathways is artificial. It is useful in the broad context of understanding potential pathways; however, there is no doubt a large degree of overlap among the mechanisms and the timing of physiological responses. This is most aptly conveyed as the influence of “acute on chronic” actions of exposure. For example, the activation of circulating platelets by the pulmonary deposition of particles or lung inflammation (eg, by P-selectin-dependent pathways, histamine, or IL-6) could occur within hours and more rapidly than typical of the other consequences of inflammation (eg, progression of atherosclerosis). In the presence of a vulnerable or eroded coronary plaque due to long-term air pollution exposure, this sudden prothrombotic tendency could instigate an acute ischemic event (alone or in conjunction with other effects of short-term PM exposure via pathways 2 and 3). Furthermore, the epidemiological cohort studies demonstrate a larger relative risk for increased cardiovascular-related mortality than for morbidity.^{72,73,227,274} If this is a true biological response and not simply a statistical phenomenon or a shortcoming of the available data, it not only suggests that exposures are capable of triggering acute cardiovascular events but that PM air pollution may also exaggerate their severity even if they would have otherwise occurred for reasons unrelated to air pollution. Therefore, exposure to PM could also be responsible for promoting fatal over nonfatal events.

Conclusions and Recommendations

A wide array of new studies that range from epidemiology to molecular and toxicological experiments have provided additional persuasive evidence that present-day levels of air pollutants contribute to cardiovascular morbidity and mortality. Although not unexpected given the numerous and heterogeneous nature of the published studies, all findings related to every single cardiovascular end point have not been consistent. However, the overall weight of scientific evidence now supports several new conclusions since the 2004 statement. These consensus points are given below by the AHA writing group after considering the strength, consistency, and coherence of the epidemiological findings, as well as in the context of evaluating the extent of the studies that provided related mechanistic support.

- The preponderance of findings indicate that short-term exposure to PM_{2.5} over a period of a few hours to weeks can trigger CVD-related mortality and nonfatal events, including myocardial ischemia and MIs, heart failure, arrhythmias, and strokes.
- The increase in risk for acute PM_{2.5}-associated cardiovascular morbidity and mortality is principally among susceptible, but not necessarily critically ill, individuals. Several studies suggest that susceptible individuals at greater risk may include the elderly, patients with preexisting coronary artery disease, and perhaps those with diabetes. Recent data suggest that women and obese individuals might also be at higher risk.
- Most studies support the idea that longer-term PM_{2.5} exposures increase the risk for cardiovascular mortality to an even greater extent than short-term exposures. Because most studies have focused on mortality data, the effect of long-term exposures on nonfatal cardiovascular events is less consistent and requires more investigation.
- The PM_{2.5} concentration–cardiovascular risk relationships for both short- and long-term exposures appear to be monotonic, extending below 15 µg/m³ (the 2006 annual NAAQS level) without a discernable “safe” threshold.
- Long-term exposure to elevated concentrations of ambient PM_{2.5} at levels encountered in the present-day environment (ie, any increase by 10 µg/m³) reduces life expectancy within a population probably by several months to a few years. Given that PM_{2.5} is most strongly associated with cardiovascular deaths in the cohort studies, the reduced life expectancy is most likely predominantly due to excess cardiovascular mortality.
- The available studies are suggestive that reductions in PM levels decrease cardiovascular mortality within a time frame as short as a few years.
- Many potential biological mechanisms exist whereby PM exposure could exacerbate existing CVDs and trigger acute cardiovascular events (over the short term) and instigate or accelerate chronic CVDs (over the long run). Experimental support is increasingly strong for several mechanisms, which lends biological plausibility for the epidemiological findings.
- The existing evidence suggests that PM air pollution is capable of augmenting the development and progression of atherosclerosis. There is some support for a potential effect on several other chronic CVDs, including hypertension, heart failure, and diabetes.
- Most recent studies support the conclusion that the overall absolute risk for mortality due to PM exposure is greater for cardiovascular than pulmonary diseases after both short- and long-term exposures.

There are several additional areas worthy of highlighting in which the study results are reasonably consistent but in which the writing group believed further research was required to formulate firm conclusions.

- Although there is only limited epidemiological evidence directly linking UFPs with cardiovascular health problems,²⁶² the toxicological and experimental exposure evi-

dence is suggestive that this size fraction may pose a particularly high risk to the cardiovascular system. The likelihood of health effects and the causal pathways mediated specifically by UFP exposure have been debated among experts recently.⁴¹⁸ Future research may help to more fully elucidate whether particles within the ultrafine size range (0.001 to 0.1 µm) and/or their constituents are more harmful to the cardiovascular system or pose a relatively greater cardiovascular risk than particles between 0.1 and 2.5 µm in diameter.

- Similarly, many studies have found a strong association between metrics of traffic-related air pollution exposure and elevated cardiovascular risk. Whether this represents the harmful effects of UFPs or diesel exhaust particulates, major components of the traffic mixture, or other pollution components is unclear. Diesel and UFPs possess toxic properties that instigate harmful biological responses in experimental models. However, the particle size fraction(s) and roles played by other copollutants (gases, VOCs, SVOCs) within the traffic-related mixture have not been fully elucidated. Nevertheless, traffic-related pollution as a whole appears to be a specific source associated with cardiovascular risk. It likely poses a major public health burden, regardless of a putative higher toxicity, because of the commonness of exposure in modern society (eg, accounting for ≈60% of daily UFP exposure; <http://www.catf.us/projects/diesel/>).
- The importance of other specific sources, regional differences in pollution composition, and other specific constituents remains less clear. However, toxicological studies have identified several transition metals (eg, iron, vanadium, nickel, copper, and zinc), organic carbon species, semiquinones, and endotoxin as specific PM-related components capable of prompting oxidative stress and inflammation and thus likely imparting biological harm. Some source-apportionment studies also demonstrate that attention should be given to these compounds as being among the most likely mediators of clinical CVD. More studies are required in this regard to clarify this issue and to better define these and other potentially responsible constituents and sources.
- Although the focus of the present statement is on PM, we recognize that other air pollutants may also pose cardiovascular risk alone or in conjunction with fine-particle exposure. In this context, we believe additional research is necessary to make firm conclusions regarding the independent cardiovascular risks posed by several gaseous pollutants (eg, ozone and NO₂). Although ozone has been linked to increased cardiopulmonary mortality,⁵⁰ strokes,¹²⁶ and MIs⁴¹⁹ in some short-term studies, long-term exposure was not associated with cardiovascular mortality after accounting for PM in a recent analysis.⁸⁷ The recent finding that small changes in low levels of ambient carbon monoxide concentrations are related to cardiovascular hospitalizations also merits further exploration.⁴²⁰
- Several secondary aerosols (eg, nitrate and sulfate) are often associated with cardiovascular mortality; however, whether these compounds are directly harmful or are surrogate markers of toxic sources of exposure requires

more investigation. Similarly, the current literature regarding the independent cardiovascular risks posed by coarse particles is mixed, with most recent findings not supporting an association after accounting for the effects of PM_{2.5}.^{43,72,104}

- Several recent cohort studies and intermediate end-point experiments suggest that obese individuals (and/or those with the metabolic syndrome) may be a susceptible population at greater risk for cardiovascular events due to PM_{2.5} exposure. This is a tremendously important public health issue to corroborate because of the enormous and growing prevalence of obesity worldwide.

This updated review by the AHA writing group corroborates and strengthens the conclusions of the initial scientific statement. In this context, we agree with the concept and continue to support measures based on scientific evidence, such as the US EPA NAAQS, that seek to control PM levels to protect the public health. Because the evidence reviewed supports that there is no safe threshold, it appears that public health benefits would accrue from lowering PM_{2.5} concentrations even below present-day annual (15 $\mu\text{g}/\text{m}^3$) and 24-hour (35 $\mu\text{g}/\text{m}^3$) NAAQS, if feasible, to optimally protect the most susceptible populations. Evaluations of the effectiveness of such efforts would be warranted as well. Within the framework of attempting to establish causality between associated variables in epidemiological studies, there are several generally accepted “aspects” that have been evaluated (the following phrases in italics per the Bradford Hill criteria)⁴²¹: With regard to cardiovascular mortality and PM_{2.5} exposure, there is a *consistent association* that satisfies both a *temporal and exposure-response relationship*. There is *coherence of findings* among several fields of science, including toxicology, human and animal exposures, and different types of epidemiological studies and time frames of exposure. Rigorous experiments demonstrate multiple *plausible biological mechanisms*. Finally, natural experiments have confirmed that a change (ie, reduction) in exposure produces a change (ie, decrease) in cardiovascular mortality. In this case, *specificity of outcomes* and *strength of the observation* are less pertinent, because PM exposure could be capable of causing multiple different types of events (eg, MIs, arrhythmias, and heart failure exacerbations), and the overall cardiovascular mortality relative risk posed for any single individual is expected to be small. Nevertheless, given the ubiquity of exposure, the overall public health consequences can be substantial and observable in population- or large cohort-based studies.

It is the opinion of the writing group that the overall evidence is consistent with a causal relationship between PM_{2.5} exposure and cardiovascular morbidity and mortality. This body of evidence has grown and has been strengthened substantially since publication of the first AHA scientific statement.¹ At present, no credible alternative explanation exists. These conclusions of our independent review are broadly similar to those found in the EPA’s Integrated Science Assessment for Particulate Matter final report (<http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=216546>). In summary, the AHA writing group deems that PM_{2.5} exposure

is a “modifiable factor contributing to cardiovascular morbidity and mortality.”

Clinical Recommendations

Several precautionary recommendations can be made for healthcare providers who interact with individuals who are at risk for CVDs. Although they have not been clinically tested or proven to reduce mortality, they are practical and feasible measures that may help to reduce exposures to air pollution and therefore potentially lower the associated cardiovascular risk. Moreover, a recent observational study found that patient awareness of air quality indices and media alerts along with health professional advice can significantly affect reported changes in outdoor activity to avoid exposure to air pollution.⁴²²

- Evidence-based appropriate treatment of the traditional cardiovascular risk factors should be emphasized. This may also lessen the susceptibility of patients to air pollution exposures.
- All patients with CVD should be educated about the cardiovascular risks posed by air pollution.
- Consideration should also be given to educating patients without CVD but who are at high risk (eg, the elderly, individuals with the metabolic syndrome or multiple risk factors, and those with diabetes).
- Part of patient education should include the provision of information regarding the available sources (local and national newspapers [*USA Today*], EPA World Wide Web site [<http://airnow.gov/>], and The Weather Channel and its World Wide Web site [<http://www.weather.com/>]) that provide a daily EPA Air Quality Index.
- On the basis of the forecast Air Quality Index, prudent recommendations for reducing exposure and limiting activity should be provided based on the patient’s level of risk. A list of such recommendations is provided on the EPA World Wide Web site (<http://airnow.gov/>). For example, when the Air Quality Index for PM is “unhealthy” (151 to 200), then the recommendations are as follows: “People with heart or lung disease, older adults, and children should avoid prolonged or heavy exertion. Everyone else should reduce prolonged or heavy exertion.” The action recommendations are as follows: “You can reduce your exposure to particles by 1) planning strenuous activity when particle levels are forecast to be lower, 2) reducing the amount of time spent at vigorous activity, or 3) choosing a less strenuous activity (eg, going for a walk instead of a jog). When particle levels are high outdoors, they also can be high indoors. Certain filters and room air cleaners are available that can help reduce particles indoors.”
- Practical recommendations to reduce air pollution exposure should be given to at-risk patients. Although unproven to reduce cardiovascular events, there are a number of prudent and feasible measures, including reducing optional or unnecessary exposures. Additional measures could include eliminating or reducing nonmandatory travel to highly polluted regions and avoiding exposures or outdoor activities (eg, exercising, commut-

ing) during highly polluted times (eg, rush hours) or in proximity to major sources of pollution (eg, roadways, industrial sources). Choosing to exercise indoors with windows closed and using efficient air conditioning and filtering systems may be prudent for certain high-risk patients, particularly during peak pollution periods. Indeed, not only can central air conditioners reduce the indoor exposure level to PM from outdoor sources, there is some evidence that they might reduce the risk for cardiovascular hospitalizations associated with higher ambient pollution levels.⁴²³ If travel/commutes cannot be avoided, maintaining optimal car filter systems, driving with windows closed, and recycling inside vehicle air may help reduce PM exposures (<http://www.catf.us/projects/diesel/>).^{424,425}

However, at present, no specific recommendations regarding the appropriateness of undertaking more aggressive measures, even those shown to provide some benefits in a few studies (eg, wearing facemasks, installing PM filters in households), can be made based on the limited evidence. Similarly, although measures that decrease long-term PM exposures may produce even greater cardiovascular health benefits than the provided recommendations that focus on reducing short-term exposures, no specific recommendations (eg, moving to less polluted regions) can be prudently made at this time given the limited evidence. We acknowledge that occupational and indoor sources along with secondhand tobacco smoke are additional significant sources of personal PM exposures that should be avoided or reduced as much as possible. Finally, in developing nations, reducing exposure to indoor cooking sources of PM and air pollution from biomass combustion is a major issue of concern.⁴²⁶ Additional suggestions are available on the EPA World Wide Web site.

Finally, although the existing evidence supports a causal relationship between PM_{2.5} and cardiovascular mortality, we acknowledge the importance of continued research in areas of controversy and uncertainty to further understand the full nature of this issue. Although numerous insights have greatly enhanced our understanding of the PM-cardiovascular relationship since the first AHA statement was published,¹ the following list represents broad strategic avenues for future investigation:

Mechanistic Studies

- Better describe the physiological relevance in humans and the fundamental details of the mechanisms underlying the intermediate general mediating pathways (ie, PM or constituent transport into the circulation versus effects of inflammatory cytokines or activated immune cells versus ANS imbalance or other pathways) through which PM inhalation might mediate cardiovascular effects remote from the site of pulmonary deposition.
- Understand the clinical significance and relative importance of the observed biological responses (eg, vascular dysfunction, thrombosis, arrhythmia, ANS imbalance) in relation to the various causes of PM-mediated cardiovascular morbidity and mortality.
- Examine the efficacy of preventive measures (eg, patient education) and treatment modalities (eg, statins, antioxidants, fish oil, treatment of traditional risk factors, and reducing exposures by engineering controls, including filtration, personal protection via facemasks, or behavior modification) on cardiovascular health outcomes.
- Investigate the interaction between preexisting traditional cardiovascular risk factors (eg, diabetes, hypertension) and PM exposure, as well as the potential of air pollutants to exacerbate or worsen these risk factors. Determine the extent to which treatment of such factors (eg, with statins, aspirin, or angiotensin-converting enzyme inhibitors), especially among patients with known CVD, may modify the risk associated with PM exposure.
- Describe the biological effects of acute on top of chronic exposures (eg, synergistic effects versus reduced susceptibility to acute exposures due to augmented protective mechanisms).
- Determine the ability of long-term exposure to precipitate the development of chronic diseases, including clinically relevant atherosclerosis, hypertension, diabetes, and other vascular, metabolic, renal, or neurological diseases.

Epidemiological and Exposure Studies

- Expand our knowledge related to the “responsible” PM pollution constituents (eg, metals, organic compounds, semiquinones, endotoxin, and VOC and SVOC compounds), size fractions (eg, UFPs), sources (eg, traffic, power generation, and biomass combustion), and mixtures of pollutants.
- Investigate the cardiovascular health implications and importance of regional and intracity differences in composition and combinations of pollutants.
- Better understand the effects of mixtures of ambient pollutants (ie, potential synergism between PM and gaseous or vapor-phase pollutants such as ozone).
- Investigate the feasibility and utility of quantifying risk coefficients (concentration-response functions) according to PM source or relevant indices of pollutant mixtures, as a function of susceptibility (eg, age, preexisting disease), for reliable application in integrated, multipollutant risk assessments.
- Investigate the relative importance of various time frames of exposure in relation to PM causing cardiovascular events, including the relevance of epochs not well described, such as ultra-acute peak PM excursions (eg, 1 to 2 hours) and exposures of intermediate duration (eg, 1 to 12 months).
- Better document the time course and specific cardiovascular health benefits induced by reductions in PM.
- Better define susceptible individuals or vulnerable populations.
- Determine whether any “safe” PM threshold concentration exists that eliminates both acute and chronic cardiovascular effects in healthy and susceptible individuals and at a population level.

Acknowledgments

We would like to thank Robert Bard Consulting for reviewing and editing the manuscript and Tom Dann from Environment Canada and Joseph Pinto from the US EPA for assistance in the preparation of Table 1.

EXHIBIT 4

San Diego UrbDeZine

Urban Planning + Design + Architecture + Historic Preservation

[HOME](#) [RESOURCES](#) [FORUM](#) [URB MAIN](#) [LOG IN](#)

[TWITTER](#)

What is a safe distance to live or work near high auto emission roads?

May 28, 2015 by [Bill Adams](#) 1 Comment



A nearby roadway may be putting your household's health at risk. The same is true of workplaces, schools, and other places where people spend significant time. This health risk is from the elevated auto emissions near high traffic roadways. It's a health risk separate and in addition to the regional air pollution from auto emissions.

We have come to draw a false sense of security from our collective sharing of regional air pollution and, perhaps, the

belief that regulatory agencies protect us. However, research continues to show that air pollution, particularly from auto emissions, has profound effects on health. Moreover, such impacts are unequally distributed among local populations, largely based on nearness to major roadways.

Discussions about whether or not to build or expand roadways are dominated by the topics of traffic congestion relief, urban planning, and greenhouse gasses. The impact of roadways on Americans' health and morbidity is often lost in the discussions. 53,000 U.S. deaths annually are attributable to automobile emission air pollution. (Calazzo, et al., 2013) Many more are ill or incapacitated from auto emissions. Ninety percent of the cancer risk from air pollution in Southern California is attributable to auto emissions. (Hulsey, et al., 2004, par. 10) For comparison, there are 35,000 U.S. deaths a year from auto collisions (NHTSA, 2012), which is the top cause of death for U.S. males between the age of 15 and 24, and in the top ten causes of death of all Americans through the age of 54.

The impact on life and safety generally from road expansion receives little attention. However, auto emission pollution based on proximity to source, i.e. *line-source* pollution, is one of the most overlooked health threats in the U.S. Current U.S. policies and regulations do little to protect susceptible populations, including children, from the dangers of nearness to auto-emission sources. Undoubtedly, the disproportionate lack of urgency concerning the health impacts of air pollution is attributable to its hidden and delayed impact. Although the health impacts of air pollution on general populations are certain, individual diagnoses of disease rarely identify air pollution as the cause. As a result, the health threat fails to take on the personal dimension of other health threats. The same was true with smoking for many decades. Additionally, awareness of line-source pollution is further hindered by confusion with regional / ambient air pollution, which typically manifests in more noticeable high ozone levels, i.e., smog.

Air pollution monitored by various agencies includes particulate matter (PM), ozone, nitrogen dioxide, carbon monoxide, sulfur dioxide, and lead. However, two of these cause the most concern due to their prevalence and health significance: 1) Ozone, which causes the brown smog commonly seen over cities and 2) Particulate matter (PM), also referred to as ultra-fine particulates (UFP).

Unlike ozone, PM exposure is directly related to proximity to source – primarily areas near to or downwind from high traffic areas. Moreover, for health impacts, PM pollution may be the worst of the lot. Heart disease, lung function impairment, leukemia, asthma, and lung cancer, are some of the conditions that have been associated with PM exposure resulting from proximity to high traffic sources. (Hulsey, et al., 2004, par. 6; Fuller, et al., 2012, pp. 257 – 265) As stated in a 2002 study about exposure to highway PMs:



[PETITION TO STOP DEMOLITIONS IN SAN DIEGO FOR PARKING LOTS.](#)



[Click the photo to sign or learn more about the Petition.](#)

Throughout the past decade, epidemiological studies have reported a consistent relationship between increases in particulate matter (PM) exposure and contemporary increases in mortality and morbidity. (Zhu, et al., 2002)

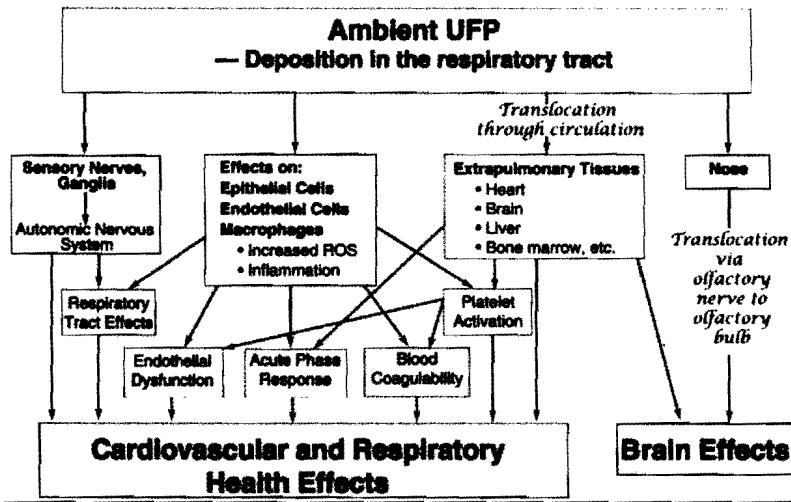


Figure 17. Hypothesized pathways via which Inhalation of UFPs may lead to effects on cardiovascular and respiratory systems and on the brain. Reprinted with permission from the Health Effects Institute, Boston MA.

Children are especially vulnerable to auto-emission health impacts because, among other reasons, they breathe more air relative to their body weight than adults, are more physically active, and spend more times outdoors during times when pollutant levels are at their highest. (Hulsey, et al., 2004) Additionally, children have many more years ahead of them in which the cumulative damage caused by auto emissions can manifest itself in disease or disability. Women who live near areas of high automobile traffic during pregnancy have a 20 – 30% higher chance of having children with lung impairment. (Morales, et al., 2014) Auto emission PM exposure from nearness to high traffic during the the third trimester of pregnancy doubles the risk for autism. (Raz, et al., 2014).

11% of U.S. residents, over 30 million people, live within 100 meters of 4 lane or greater highways. (Brugge, et al., 2007; Howard, 2011) Adding in work places, schools, and commuting, it is reasonable to extrapolate that roughly 1/3 of people spend a substantial portion of their day exposed to unhealthy levels of auto emission PMs.

So how can you determine your own exposure level or that of your children? Below are some key distances and other factors:

Ground Zero:

Curbside and in-traffic air contains high levels of all pollutants associated with auto emissions – both PMs and gaseous substances like benzene and carbon monoxide. (Hulsey, et al., 2004, par. 7) PM exposure at intersections is as much as 29 times higher than other portions of the road. (Goel & Kumar, 2015) Cyclists, auto occupants with windows down or vents open, toll booth operators, and roadside residents and businesses receive up to 25 times the level of PM exposure. (Zhu, et al., 2002) Moreover, the air inside a car typically contains higher concentrations of these pollutants than the air outside of the car – as much as 4 times the benzene and 10 times the carbon monoxide. (ICTA, 2000) Keeping the windows closed and the ventilation set to recirculate can reduce in-car pollutants to 20% that of air outside the car. (L.A. Times, 2013)

High Toxicity Zone - 300 - 500 feet:

On average, PM concentration is significantly higher within 330 feet (100 meters) of major highways than it is further away. (Zhu, et al., 2002) The smallest PMs, with a peak concentration of $1.6 \times 10^5/cm^3$, are the most dangerous. Smaller PMs carry toxic substances deeper into the lungs and body, and as a result, have more profound health effects. (Cal. EPA, Aug. 2014, p.29) They are concentrated in an area within 330 feet from highways. (Zhu, supra) Pregnant women who live

within 500 feet of high traffic areas are prone to birth complications, including premature birth, low birth weight children, and children with medical problems. (Wilhelm & Ritz, 2003) A review of a broad range of studies has correlated early mortality — from a wide range of illnesses — with living within 330 feet of a high traffic roadway and related exposure to various auto emission substances. (Beelen, et al., 2008)



Figure 3.2.6-4: Sensitive Receptor Locations (Springdale Street to Warner Avenue) May 2012, I-405 Improvement Project

Elevated Toxicity Zone - 1,000 - 1,500 feet:

PMs from auto emissions are elevated within 1,000 feet (300 meters) of a major highway. (Yifang, et al., 2002, pp. 1038-1039) A Denver study indicated that children living roughly within that distance were eight times as likely to develop leukemia and six times as vulnerable to all types of cancer. (Hulsey, et al., 2004, - par. 1) In another study, children under 5 years of age admitted to hospitals with asthma emergencies were significantly more likely to live within 500 meters (1,640 feet) of a major highway when traffic flow exceeded 24,000 vehicles per hour than those who lived further away or when traffic flow was less. (Edwards & Walters, 1994) Particle levels

return to near normal beyond that distance.

Other Factors Influencing Air Pollution Levels Near Roadways:

Wind:

People living "downwind" of highways with 4 or more lanes (2 lanes in each direction) are exposed to higher levels of fine particulate matter. (Brugge, et al. 2007) However, this circumstance does not exempt one side of a highway from PM dangers. In many regions, wind direction changes not only depending on weather conditions, but also between day and night.

Sun, Rain & Humidity:

Areas receiving higher amounts of rain or humidity can experience reduced auto-emission pollution levels, especially ultra-fine particulate pollution. The clean air you sense after a rain storm really is cleaner. This fact is regularly demonstrated in high-pollution Beijing. (USA Today, Aug. 11, 2008) Atmospheric conditions alter the size, distribution, and composition of freshly-emitted PM through condensation, evaporation, and dilution during transport to downwind locations. (Brugge, et al., 2007) Thus, higher humidity levels can tamp down the distribution of PMs. (HEI Review Panel, 2013, p.24) Conversely, sun, heat, and lack of humidity generally favor greater distribution of PM. Additionally, ground level ozone concentration is unhealthiest on sunny and warm days.

Topography:

PM, as well as gaseous air pollutants, tend to concentrate in valleys due to containment by topographical features. (HEI Review, supra) Inversions, in which a layer of cold air is trapped underneath a layer of warm air, keep PM concentrated near ground level and aggravate the concentration of PM in valley and canyon floors. Ibid. Fog is often an indicator of an inversion.



A temperature inversion in a valley – clean air poster from a Teacher's Guide to Clean Air by BC Transit, Nov. 2005 – republished permission Ministry of Environment, British Columbia Canada

Time:

The time of day can influence PM concentrations near highways – both in terms of traffic

concentrations and in terms of weather. (HEI Review Panel, supra) Of course, highways experience much higher traffic concentrations at certain times of the day. However, such concentration has become less varied as employers stagger work shifts to alleviate commuting burdens and as continued highway expansion creates **induced demand** (tendency of freeway expansion to create more demand and congestion in the long run by facilitating sprawl). Additionally, the heating and cooling of day and night effect pollution concentrations at ground level.

Auto Emission Air Pollution as a Social Justice Issue:

The unavoidable conclusion from the research is that each time a major highway is built or expanded, some of the residents living nearby will pay with their health or lives. Nevertheless, compared to industrial uses that pose potential health risks, roadway construction projects remain relatively unregulated as a direct air pollution health risk. (Hulsey, et al., 2004) The same is true of the siting of residential, employment, senior, or educational uses near highways.



Cincinnati highway proximity health hazards.
Republished permission LADCO

Low income and minority populations are disproportionately impacted by air pollution health risks. (Beleen, 2008) Suburban expansion creates a demand for road expansion through existing neighborhoods. Lower income neighborhoods and ethnic minority populations least often wield the political influence necessary to resist road expansion projects. Additionally, multifamily and affordable housing is more likely to be sited near high traffic areas than is more expensive detached housing. More recently, the construction of high density "transit oriented developments" (TODs), which are intended to reduce auto reliance and which often include affordable housing, are frequently sited near high traffic areas. There has been little acknowledgement in U.S. transportation policy of

the social inequality and the ethical issues related to sacrificing the health of members of one community to facilitate the growth and commuting of another community.

Property condemned for a road expansion project results in monetary compensation to the owner based on fair market value. However, residents put at risk by the additional traffic emissions as a result of living adjacent to or near the road project cannot recover compensation or assistance to relocate.

Construction and expansion of roadways may involve some public disclosure of health impacts via environmental reporting documents but the reporting tends to assume that "no build" highway expansion options will simply result in ever increasing congestion. However, more than a half century of highway building has demonstrated that congestion relief from road expansion tends to be temporary, and that the long term impact is increased automobile use and traffic congestion. Such "**induced demand**" is increasingly recognized as the long term effect of expanding roadways to relieve current traffic congestion.

Increasingly, line-source proximity to auto emission pollution and the refinement and improved accuracy of roadway air pollution dispersion modeling is being used in **legal and political challenges to highway expansion proposals**. Given the stakes, its hard to justify the continued expansion of roadways in urban areas, the slowness of conversion to non-combustible fuel automobiles, or the proportionately small investment in public transit. If such decisions were based solely on health criteria proportionate to other identified public risks, highways might be quarantined as an acutely elevated health hazard to those who live or work near them. Of course, such action is impractical as it would result in vast tracts of existing homes, schools, and places of employment being abandoned.

It is clear that the public is still not fully aware of the difference between ambient air pollution effecting the

WARNING:
Areas within 1 000

general populace of a city and line-source air pollution impacting health based on nearness to highways. Perhaps, if the public was more aware of the direct and unequal health impacts of high-traffic roadways, transitioning from roadway expansion to transportation alternatives would receive more urgency. One proposal for an air quality district plan in California required that builders of homes, schools, or day care centers provide notice to their customers of toxic emissions, including those emanating from busy roads, within 1,000 feet. (Hulsey, 2004, p.13)

Areas within 1,000 feet of major roadways contain substances known to cause respiratory illness, heart disease, cancer, and reproductive harm.

Without a better understanding of line-source proximity exposure by the general public, its hard to foresee substantial changes. It may take activism and information campaigns, such as posting warning notices in neighborhoods within the 1,000 foot zone, to catch the public's attention and educate it on this health issue.

Notes:

While this article cites a number of scientific articles, some "rounding" is used for the purpose of readability. In other words, this article attempts to organize and summarize current available data into a general conceptual framework for general public understanding rather than to provide new data.

References:

Caiazzo, F., Ashok, A., Waitz, I.A., Yim, S.H.L., Barrett, S.R.H. (2013) *Air pollution and early deaths in the United States. Part I: Quantifying the impact of major sectors in 2005*, Laboratory for Aviation and the Environment, Department of Aeronautics and Astronautics, Massachusetts Institute of Technology, August 2013.

Zhu, Y., Hinds, W.C., Seongheon Kim, S., and Sioutas, C. (2012) *Concentration and Size Distribution of Ultrafine Particles Near a Major Highway*, Journal of the Air & Waste Management Association, vol. 52

Fatality Analysis Reporting System (2012) fars.NHTSA.dot.gov

Morales, E., Garcia-Esteban, R., Asensio de la Cruz, O., Basterrechea, M., Lertxundi, A., Martinez Lopez de Dicastillo, M.D., Zabaleta, C., Sunyer, J. (2014) *Intrauterine and early postnatal exposure to outdoor air pollution and lung function at preschool age*. Thorax, 2014; See also, BMJ-British Medical Journal; See also *Exposure to traffic pollution during pregnancy can damage future child's lungs*. ScienceDaily, 20 October 2014.

Howard, E. (2011) *Every Breath You Take*, Tufts Now, November 2, 2011

Brugge, B., Durant, J.L., Rioux, C. (2007) *Near-highway pollutants in motor vehicle exhaust: A review of epidemiologic evidence of cardiac and pulmonary health risks*, Environmental Health, August 9, 2007, 6:23

Goel, A. and Kumar, P. (2015) *Characterisation of nanoparticle emissions and exposure at traffic intersections through fast-response mobile and sequential measurements Atmospheric Environment*, Vol. 107, April 2015, pp. 374-390

Hulsey, B., Hopkins, E., Olson, E., Burg, E., and Carlson, M. (2004) *Highway Health Hazards: How highways and roads cause health problems in our communities—and what you can do about it*, Sierra Club, 2004, 6

Draft Environmental Impact Report/ Environmental Consequences, and Environmental Impact Statement Avoidance, Minimization, And/Or Mitigation Measures, I-405 Improvement Project, May 2012 3.2.6-22

Fuller, C.H., Brugge, D., Williams, P., Mittleman, M., Durant, J.L., and Spengler, J. D.

(2012) Estimation of ultrafine particle concentrations at near-highway residences using data from local and central monitors, Atmospheric Environment, Volume 57, September 2012, Pages 257–265

Yifang, Z, Hinds, W.C., Seongheon, K., Shen, S., Sioutas, C. Concentration and size distribution of ultrafine particles near a major highway. Journal of the Air and Waste Management Association. September 2002, pp. 1038-1039.

Beelen, R., Hoek, G., A. van den Brandt, P., Goldbohm, R.A., Fischer, P., Schouten, L.J., Jerrett, M., Hughes, E., Armstrong, B., and Brunekreef, B., Long-Term Effects of Traffic-Related Air Pollution on Mortality in a Dutch Cohort (NLCS-AIR Study), Environmental Health Perspectives (vol. 116, no. 2, Feb. 2008)

Rain, rain: Beijing air pollution washes away, August 11, 2008 – USA Today

In-Car Air Pollution: The Hidden Threat to Automobile Drivers. International Center for Technology Assessment (ICTA). July 2000 , page 5.

Borboza, T., For cleaner air, set car vents to 'recirculate,' study says September 12, 2013, LA Times.

California Communities Environmental Health Screening Tool, Version 2.0 (Calenviroscreen 2.0) Guidance And Screening Tool, California Environmental Protection Agency (August 2014), p.29.

HEI Review Panel on Ultrafine Particles. 2013. Understanding the Health Effects of Ambient Ultrafine Particles. HEI Perspectives 3. Health Effects Institute, Boston, MA, p. 24

Wilhelm, M. and Ritz, B., Residential Proximity to Traffic and Adverse Birth Outcomes in Los Angeles County, Environmental Health Perspectives (vol. 111, No. 2, Feb. 2003)

Edwards, J.; S. Walters, et al., Hospital admissions for asthma in preschool children: relationship to major roads in Birmingham, United Kingdom. Archives of Environmental Health. (49(4): 223-7 1994)

San Diego Freeway (I-405) Supplemental Draft Environmental Impact Report / Environmental Impact Statement, Figure 3.2.6-4 Sensitive Receptor Locations, California Dept. of Transportation (2013) (freeway widening project)

Raz, R., Roberts, A.L., Lyall, K., Hart, J.E., Just, A.C., Laden, F., and Weisskopf, M.G., Autism Spectrum Disorder and Particulate Matter Air Pollution before, during, and after Pregnancy: A Nested Case-Control Analysis within the Nurses' Health Study II Cohort, Environmental Health Perspectives (2014)

Filed Under: Ecology, environmental health, Feature Posts, San Diego, Transportation
pollution, emissions, particulate matter, PM, UFP, ultra fine particulates

Tagged With: air



About Bill Adams

Bill Adams is the founder and chief editor of UrbDeZine. He is also a partner in the San Diego law firm of Norton, Moore, & Adams, LLP. He has been involved with land use and urban renewal for nearly 25 years, both as a professional and as a personal passion. He currently sits on the Boards of San Diego Historic Streetcars, The San Diego Architectural Foundation, The Food and Beverage Association of San Diego County, and The Gaslamp Quarter Association Land Use Planning Committee.

Norton, Moore, & Adams, LLP is a boutique land use firm which handles a wide range of land and building related matters, from permitting to litigation, including:

- Discretionary use applications and appeals, including alcoholic beverage sales, entertainment, industrial, social services, educational, hospitality, etc.
- Zoning variances
- Municipal code and regulatory amendments
- Litigation, including eminent domain, access and easements, CEQA, environmental, and

preservation

Professional website: www.nmalawfirm.com

Comments



Saam says:

May 28, 2015 at 8:39 am

Thanks for consolidating so much material and data into one place! This was truly informative.

[Log in to Reply](#)

Speak Your Mind

You must be [logged in](#) to post a comment.

[RETURN TO TOP OF PAGE](#)

COPYRIGHT © 2015 · NEWS THEME ON GENESIS FRAMEWORK · WORDPRESS · [LOG IN](#)

EXHIBIT 5



South Coast
Air Quality Management District
21865 Copley Drive, Diamond Bar, CA 91765-4182
(909) 396-2000 • www.aqmd.gov



SCAQMD Air Quality Significance Thresholds

Mass Daily Thresholds ^a		
Pollutant	Construction ^b	Operation ^c
NOx	100 lbs/day	55 lbs/day
VOC	75 lbs/day	55 lbs/day
PM10	150 lbs/day	150 lbs/day
PM2.5	55 lbs/day	55 lbs/day
SOx	150 lbs/day	150 lbs/day
CO	550 lbs/day	550 lbs/day
Lead	3 lbs/day	3 lbs/day
Toxic Air Contaminants (TACs), Odor, and GHG Thresholds		
TACs (including carcinogens and non-carcinogens)	Maximum Incremental Cancer Risk \geq 10 in 1 million Cancer Burden $>$ 0.5 excess cancer cases (in areas \geq 1 in 1 million) Chronic & Acute Hazard Index \geq 1.0 (project increment)	
Odor	Project creates an odor nuisance pursuant to SCAQMD Rule 402	
GHG	10,000 MT/yr CO ₂ eq for industrial facilities	
Ambient Air Quality Standards for Criteria Pollutants ^d		
NO ₂ 1-hour average annual arithmetic mean	SCAQMD is in attainment; project is significant if it causes or contributes to an exceedance of the following attainment standards: 0.18 ppm (state) 0.03 ppm (state) and 0.0534 ppm (federal)	
PM ₁₀ 24-hour average annual average	10.4 $\mu\text{g}/\text{m}^3$ (construction) ^e & 2.5 $\mu\text{g}/\text{m}^3$ (operation) 1.0 $\mu\text{g}/\text{m}^3$	
PM _{2.5} 24-hour average	10.4 $\mu\text{g}/\text{m}^3$ (construction) ^e & 2.5 $\mu\text{g}/\text{m}^3$ (operation)	
SO ₂ 1-hour average 24-hour average	0.25 ppm (state) & 0.075 ppm (federal – 99 th percentile) 0.04 ppm (state)	
Sulfate 24-hour average	25 $\mu\text{g}/\text{m}^3$ (state)	
CO 1-hour average 8-hour average	SCAQMD is in attainment; project is significant if it causes or contributes to an exceedance of the following attainment standards: 20 ppm (state) and 35 ppm (federal) 9.0 ppm (state/federal)	
Lead 30-day Average Rolling 3-month average	1.5 $\mu\text{g}/\text{m}^3$ (state) 0.15 $\mu\text{g}/\text{m}^3$ (federal)	

^a Source: SCAQMD CEQA Handbook (SCAQMD, 1993)

^b Construction thresholds apply to both the South Coast Air Basin and Coachella Valley (Salton Sea and Mojave Desert Air Basins).

^c For Coachella Valley, the mass daily thresholds for operation are the same as the construction thresholds.

^d Ambient air quality thresholds for criteria pollutants based on SCAQMD Rule 1303, Table A-2 unless otherwise stated.

^e Ambient air quality threshold based on SCAQMD Rule 403.

KEY: lbs/day = pounds per day ppm = parts per million $\mu\text{g}/\text{m}^3$ = microgram per cubic meter \geq = greater than or equal to
MT/yr CO₂eq = metric tons per year of CO₂ equivalents $>$ = greater than

EXHIBIT 6

Associations of Mortality with Long-Term Exposures to Fine and Ultrafine Particles, Species and Sources: Results from the California Teachers Study Cohort

Bart Ostro,¹ Jianlin Hu,² Debbie Goldberg,³ Peggy Reynolds,³ Andrew Hertz,³ Leslie Bernstein,⁴ and Michael J. Kleeman²

¹Air Pollution Epidemiology Section, California Office of Environmental Health Hazard Assessment, Oakland, California, USA;

²Department of Civil and Environmental Engineering, University of California, Davis, Davis, California, USA; ³Cancer Prevention Institute of California, Berkeley, Berkeley, California, USA; ⁴City of Hope National Medical Center, Duarte, California, USA

BACKGROUND: Although several cohort studies report associations between chronic exposure to fine particles (PM_{2.5}) and mortality, few have studied the effects of chronic exposure to ultrafine (UF) particles. In addition, few studies have estimated the effects of the constituents of either PM_{2.5} or UF particles.

METHODS: We used a statewide cohort of > 100,000 women from the California Teachers Study who were followed from 2001 through 2007. Exposure data at the residential level were provided by a chemical transport model that computed pollutant concentrations from > 900 sources in California. Besides particle mass, monthly concentrations of 11 species and 8 sources or primary particles were generated at 4-km grids. We used a Cox proportional hazards model to estimate the association between the pollutants and all-cause, cardiovascular, ischemic heart disease (IHD), and respiratory mortality.

RESULTS: We observed statistically significant ($p < 0.05$) associations of IHD with PM_{2.5} mass, nitrate, elemental carbon (EC), copper (Cu), and secondary organics and the sources gas- and diesel-fueled vehicles, meat cooking, and high-sulfur fuel combustion. The hazard ratio estimate of 1.19 (95% CI: 1.08, 1.31) for IHD in association with a 10- $\mu\text{g}/\text{m}^3$ increase in PM_{2.5} is consistent with findings from the American Cancer Society cohort. We also observed significant positive associations between IHD and several UF components including EC, Cu, metals, and mobile sources.

CONCLUSIONS: Using an emissions-based model with a 4-km spatial scale, we observed significant positive associations between IHD mortality and both fine and ultrafine particle species and sources. Our results suggest that the exposure model effectively measured local exposures and facilitated the examination of the relative toxicity of particle species.

CITATION: Ostro B, Hu J, Goldberg D, Reynolds P, Hertz A, Bernstein L, Kleeman MJ. 2015. Associations of mortality with long-term exposures to fine and ultrafine particles, species and sources: results from the California Teachers Study cohort. *Environ Health Perspect* 123:549–556; <http://dx.doi.org/10.1289/ehp.1408565>

Introduction

Several cohort studies have reported associations of long-term exposure to fine particles (PM_{2.5}; particulate matter ≤ 2.5 μm in diameter) with cardiovascular mortality (Hoek et al. 2013; Laden et al. 2006; Lipsett et al. 2011; Pope et al. 2002). Because PM_{2.5} is a heterogeneous mix of particle sizes and chemistry and is generated from multiple sources, the specific constituents and sources of concern have not been fully elucidated. Until recently, among the constituents of PM_{2.5}, long-term exposures (i.e., ≥ 1 year) for cohort studies have been generated only for sulfates and black carbon (Dockery et al. 1993; Pope et al. 1995; Smith et al. 2009). In addition, because of the difficulty in measuring exposure, there has been little focus to date on the health effects of long-term exposure to ultrafine (UF) particles (particles ≤ 0.1 μm in diameter).

Epidemiologic analysis of the effects of particulate matter constituents is hindered by their spatial heterogeneity and the reliance on a few fixed-site monitors to represent exposures in large metropolitan areas. For

example, for PM₁₀ (particles ≤ 10 μm in diameter), many metropolitan areas have only a small proportion of their total population within 15 km of a monitor, such as New York, New York (3.5%), Detroit, Michigan (23%), Boston, Massachusetts (39%), Seattle, Washington (31%), and Philadelphia, Pennsylvania (35%) [U.S. Environmental Protection Agency (EPA) 2009]. The proportion for those > 65 years of age, a well-documented susceptible subgroup, who are within 15 km are only slightly higher: New York (4%), Detroit (27%), Boston (41%), Seattle (32%), and Philadelphia (38%). Although coverage for PM_{2.5} is much higher given its spatial homogeneity, its constituents are known to be spatially variable and often very localized (Kim et al. 2005). The exposure misclassification will be even greater for measurement of mass and constituents of UF particles given their spatial heterogeneity (Sakurai et al. 2003; Sioutas et al. 2005). Some cohort studies have made use of land use regression (LUR) models to estimate PM_{2.5} or nitrogen dioxide (Beelen et al. 2014) at finer spatial scales, but LUR

models for particle sources or species are not widely available.

In a previous study, we examined the relation between mortality and long-term exposure to constituents of PM_{2.5} using data from the California Teachers Study (CTS) cohort (Ostro et al. 2010). Started in 1995, the CTS is a prospective study of > 130,000 current and former female teachers and administrators identified through the State Teachers Retirement System. Because of limited data on particle species, this earlier report relied on PM_{2.5} data collected and further analyzed by the U.S. EPA at eight fixed-site monitors as part of the Speciation Trends Network (U.S. EPA 2008). The 24-hr averaged measurements were usually obtained on an every third- or sixth-day basis. To minimize exposure misclassification, catchment buffer areas of 8 and 30 km were drawn around each monitor. The 30-km buffer is likely too large to capture exposure contrasts of many of the species, while the 8-km buffer significantly reduced the sample size, resulting in more unstable estimates and reduced statistical power. Although these buffers were an improvement over studies using a single or multiple monitors to represent exposure over large metropolitan areas, they may not sufficiently measure concentrations of many of the PM constituents, such as elemental carbon (EC) and transition metals that are known

Address correspondence to B. Ostro, OEHH, 2008 Tampa Ave., Oakland, CA 94611 USA. Telephone: (510) 339-3379. E-mail: bostro@pacbell.net

Supplemental Material is available online (<http://dx.doi.org/10.1289/ehp.1408565>).

Funding for this effort was provided by grant R01 CA77398 from the National Cancer Institute, contract 97-10500 from the California Breast Cancer Research Fund, and STAR grant R833372 from the U.S. Environmental Protection Agency (EPA).

Although the research described in the article has been partially funded by the U.S. EPA, it has not been subject to the agency's required peer and policy review and therefore does not necessarily reflect the views of the agency and no official endorsement should be inferred. All PM_{2.5} and ultrafine PM exposure data used in the present study is available free of charge at <http://faculty.engineering.ucdavis.edu/kleeman/>.

The authors declare they have no actual or potential competing financial interests.

Received: 15 April 2014; Accepted: 22 January 2015; Advance Publication: 23 January 2015; Final Publication: 1 June 2015.

to exhibit high spatial variance. Specifically, Hu et al. (2014a, 2014b) reported significant bias for several species of fine and UF particles when comparing the central-site monitor readings applied to the entire metropolitan area population versus our estimated population-weighted concentrations. The latter are derived as the product (both at the 4-km grid scale) of the population and our model-based estimates of the pollutants.

Model estimates are highly correlated ($r > 0.8$) with observations at the monitoring locations. But for the seven major California Metropolitan Statistical Areas that had available data, the estimated population-weighted concentrations for EC were generally lower than central-site monitor predictions, with a maximum bias of -50% in Los Angeles, California, and an average bias of -33% . Although measurement and model predictions were in good agreement at the monitor locations, the bias was introduced by spatial variability around the monitor.

For the present study, we combined data from the CTS with newly developed exposure data generated from the UCD/CIT (University of California Davis/California Institute of Technology) Source Oriented Chemical Transport model. The UCD/CIT chemical transport model uses calculated meteorological fields and emissions estimates for different sources to predict airborne particulate matter concentrations. Particulate matter emissions are assigned a size and composition distribution based on measurements in source-testing experiments. The source-identity of all particulate matter emissions is retained through the simulated atmosphere. In the present study, ground-level mass concentrations for 50 PM constituents were estimated over the major population regions in California at a 4-km resolution for the period of 2000–2007. For many species of fine and UF particles, model predictions are highly correlated with measured values, particularly for longer averaging times (> 2 weeks). For example, correlations were > 0.8 for comparisons between annual modeled and measured concentrations of 10 different PM_{2.5} components for five of the seven metropolitan regions with available monitoring data (Hu et al. 2014b).

Below, we report our findings of an analysis of the associations of long-term exposure to 19 constituents and sources of both PM_{2.5} and UF particles on mortality from all natural causes, cardiovascular disease, ischemic heart disease (IHD), and pulmonary disease.

Methods

Data. The CTS is a prospective study of 133,479 current and former female teachers and administrators who completed baseline questionnaires mailed to them in 1995 to

investigate the incidence of breast cancer in public school teachers and administrators, as described in detail by Bernstein et al. (2002). Subsequent questionnaires were mailed to CTS participants in 1997 and 2000. The design and ongoing follow-up of the CTS cohort is a multi-institutional collaboration involving researchers with diverse and complementary areas of expertise. Record linkage is conducted annually to mortality files administered by the California Department of Public Health. In addition, residential addresses of each CTS participant were updated annually for the mailing of newsletters. The mean age of CTS participants at enrollment was 54 years, with 90% between 30 and 80 years. The cohort is multi-ethnic but primarily non-Hispanic white (86.7%) and born in the United States (93.6%). For this study, we used cohort follow-up data from January 2001 through July 2007. Women < 30 years of age at the start of the study were excluded to focus on mid-life and older women. Use of data on human subjects in the main CTS cohort study was reviewed and initially approved by the California Committee for the Protection of Human Subjects, Health and Human Services Agency, and by the institutional review boards (IRB) for each participating institution in June 1995 and annually thereafter. Informed consent was obtained upon entry into the cohort. Analysis for this manuscript was approved in August 2013 by the IRB of the Cancer Prevention Institute of California, the center of one of the principal investigators.

Health outcomes. In this analysis, we focused on associations between long-term exposures and mortality. Deaths were assigned codes based on the *International Classification of Diseases, 10th Revision* (ICD-10) for the following outcomes: all-cause deaths excluding those with an external cause (A00–R99), cardiovascular deaths (I00–I99), IHD deaths (I20–I25), and pulmonary deaths (C34, J00–J98). Person-days at risk were calculated as the number of days starting from 1 January 2001 until the earliest of three dates: *a*) the date of death; *b*) a move out of California for at least 4 months; or *c*) 31 July 2007, the end of follow-up for this analysis. If a woman moved out of state for < 4 months, exposures during that time were not included in the calculations of the long-term average. Women who died from a cause other than the outcome of interest during the follow-up period were censored at the time of their deaths.

Air pollution exposure estimates. The UCD/CIT model was used to estimate ground-level concentrations of 50 PM constituents over the major population regions in California using a 4-km grid resolution for the period from 2000 through 2007 (Hu et al. 2014a, 2014b). A sensitivity analysis conducted at 250-m resolution over

Oakland, California (Joe et al. 2014), indicated that 4-km resolution captures 55–70% of concentration variability within the urban area.

Using the extensive emissions inventory in California, the model calculations track the mass and number concentrations of the PM constituents in particle diameters ranging from 0.01 to 10 μm through calculations that describe emissions, transport, diffusion, deposition, coagulation, gas- and particle-phase chemistry, and gas-to-particle conversion (Hu et al. 2014b). The model solves the coupled set of differential equations that describe how atmospheric processes change pollutant concentrations in regularly spaced atmospheric grid cells. Thus, the predicted exposure concentrations primarily reflect the balance between emissions inventories of fresh particles and meteorological fields that drive dispersion and chemical reaction.

Model predictions were saved at hourly time resolution and averaged to longer times as needed. Predicted concentrations were evaluated against ambient measurements at all available locations and times. PM_{2.5} mass predictions had a mean fractional bias within ± 0.3 (meeting accepted performance criteria) at 52 sites of the total 66 sites across California after correcting for bias in the dust emissions because many studies have shown that dust emissions in the current emission inventory are overestimated (Hu et al. 2015). Good correlations between predictions and measurements ($r > 0.8$) were demonstrated for many of the PM_{2.5} and UF species at most of the monitoring stations, particularly for the monthly, seasonal, and annual averages. For example, monthly PM_{2.5} nitrates were correlated with measurements with $r = 0.76$ (15 sites), monthly PM_{2.5} EC was correlated with measurements with $r = 0.94$ (8 sites), and monthly PM_{2.5} concentrations of potassium, chromium, zinc, iron, titanium, arsenic, calcium, manganese, and strontium were correlated with measurements with $r \geq 0.8$ (5 sites of a total of 8). For EC in the UF range, the correlation was above $r = 0.9$ for 117 available measurements made at 13 locations during nine intensive field campaigns that each lasted several weeks (Hu et al. 2014b). The quality of the model predictions summarized above reflects the accuracy of the emissions inventories that have been refined over three decades in California, the development of reactive chemical transport models that include important aerosol transformation mechanisms, and the development of prognostic meteorological models that allow for long simulations of historical meteorology.

Coarse particle predictions ($2.5 \mu\text{m} < D_p < 10 \mu\text{m}$) have undergone only preliminary comparisons to measurements and were not used for exposure estimates in the present study. Likewise, UF number concentrations

were not used because our modeling did not include nucleation, the process by which particles are formed directly from gas molecules, which would greatly impact this parameter. UF mass concentrations are highly correlated with particle surface area (Kuwayama et al. 2013) and serve as a good metric for the potential exposure to UF particles. The measured correlation between UF mass and particle surface was 0.97 in Sacramento, a typical city in central California. For many of the fine and UF species, Hu et al. (2014a) observed strong spatial variability within metropolitan areas (Figure 1).

On the basis of previous studies (Ostro et al. 2007, 2010; Peng et al. 2009; Zanobetti et al. 2009), we chose to examine a subset of the available constituents. Additionally, some constituents were eliminated given their high intercorrelation or low concentrations.

Thus, for each particle size, we analyzed the following constituents: copper (Cu), iron (Fe), manganese (Mn), nitrate, EC, organic carbon (OC), “other” species (i.e., mineral dusts and constituents not measured), “other” metals (those besides Cu, Fe, and Mn that were explicitly resolved), and secondary organic aerosol (SOA). SOA formation was simulated with the mechanism in the U.S. EPA’s Community Multi-scale Air Quality (CMAQ) model version 4.7 (Carlton et al. 2010). SOAs were divided into anthropogenic (SOA_ant: derived from long-chain alkanes, xylenes, toluenes, and benzene and their oligomers) and biogenic (SOA_bio: derived from isoprenes, monoterpenes, and sesquiterpenes and their oligomers). Nitrate was not estimated for the UF size fraction. Once the constituent concentrations were obtained, Positive Matrix Factorization was used to develop source profiles. Estimates were provided for sources of primary aerosols including on-road gasoline, off-road gasoline, on-road diesel, off-road diesel, wood smoke, meat cooking, high-sulfur fuel combustion (including distillate oil, marine vessel fuel, aircraft jet fuel, liquid and solid waste fuel), and “other anthropogenic.”

Ultimately, the exposure metrics were combined with the updated addresses. Monthly individual exposure estimates were developed through spatial linkage of the geocoded residential addresses. All residences within a given grid in a given month were assigned the modeled pollutant value for that grid for that period. The average long-term pollution exposure for a participant was obtained by calculating the mean of her monthly averages. At the time of each death, the long-term average for each individual remaining in the cohort was recalculated, allowing comparison between the decedent’s long-term average exposure and those of the members remaining in the risk set.

Covariates. The individual-level covariates included as explanatory variables in the regression models were based on previous results from air pollution studies for this cohort (Lipsett et al. 2011). Specifically, the covariates included twenty individual-level covariates (a total of 58 terms): age (divided into 2-year

categories between 30 and 79 years of age, 3-year categories between 80 and 88 years, and one category for women ≥ 89 years); race [non-Hispanic white, other (African American, Hispanic, Asian, Pacific Islander, and Native American), or unknown]; marital status (married/living with partner, not married, and

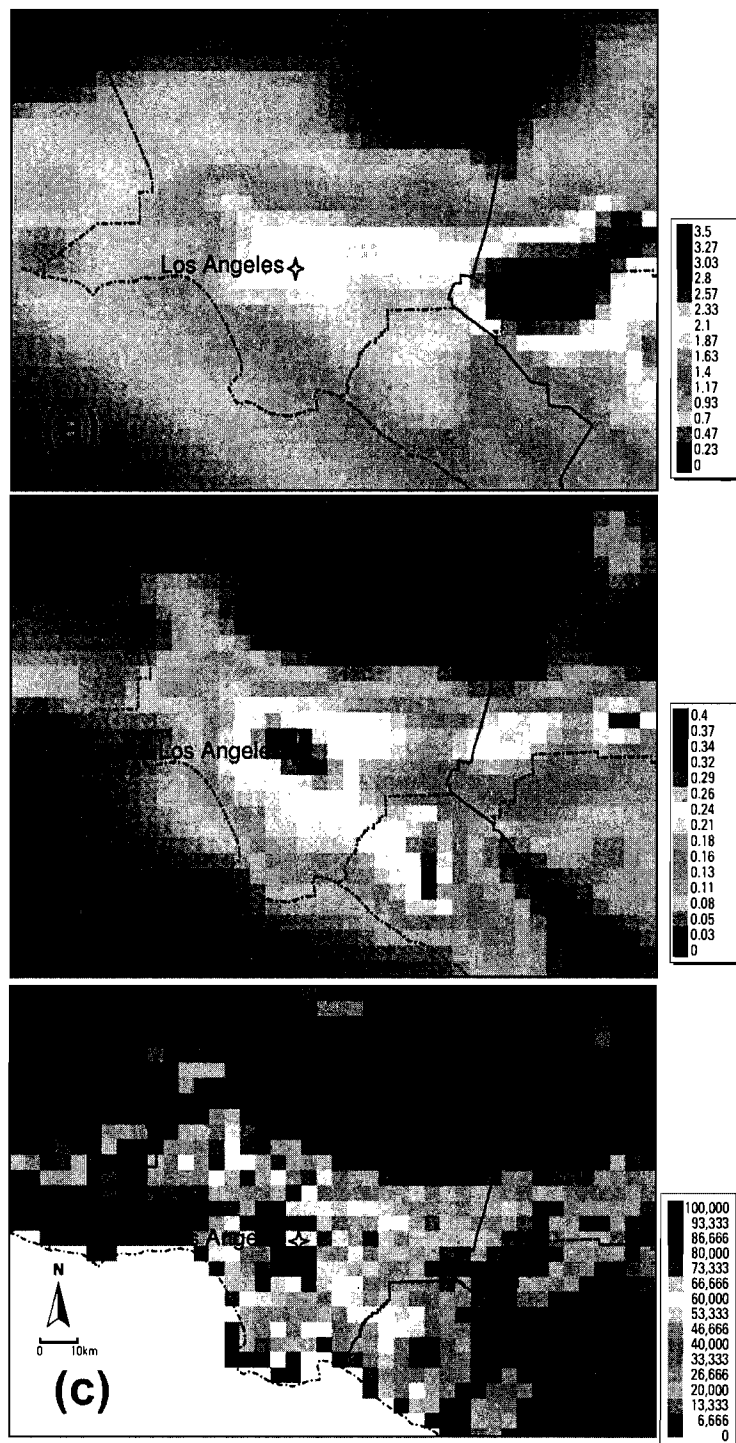


Figure 1. Modeled concentrations ($\mu g/m^3$) of $PM_{2.5}$ nitrate (A), ultrafine anthropogenic secondary organic aerosols (B), and population in the Los Angeles Basin (C) using 4-km grids (the star in the figures indicates the site of the U.S. EPA monitor).

unknown); smoking status (never, former, and current smokers) and pack-years of smoking (continuous variable for former and current smokers); secondhand smoke exposure (none, household exposure, unknown); body mass index (BMI) (16–19, 20–24, 25–29, 30–39, 40–55 kg/m²); lifetime physical activity (tertiles, unknown); alcohol consumption [beer (no/yes/unknown), wine (no/yes/unknown), liquor (no/yes/unknown)]; average daily dietary intake of fat (tertiles, unknown), fiber (tertiles, unknown), and calories (tertiles, unknown); menopausal status and hormone replacement therapy use combined (premenopausal, peri/postmenopausal and no HT use, peri/postmenopausal and past HT use, peri/postmenopausal and current use of estrogen, peri/postmenopausal and current use of estrogen plus progesterin, and unknown menopausal status or HT use); family history of myocardial infarction (yes/no) or stroke (yes/no); and use of blood pressure medication (low, medium, high, unknown) or aspirin (low, medium, high, unknown). Data on all individual-level variables except marital status (which was assessed in the 2000 questionnaire) were obtained from the baseline questionnaire.

Statistical methods. We fitted Cox proportional hazards models to estimate hazard ratios (HRs) and 95% confidence intervals (CIs) for associations between each pollutant and the outcomes of interest. We examined each pollutant with a separate regression model adjusted for the covariates described above.

Table 1. Descriptive statistics for health and covariate variables for women in the analysis.

Covariate	Percent or mean \pm SD
Age at January 2001 (years)	57.3 \pm 13.8
Race (% non-Hispanic white)	86.4
Smoking status	
Never smoker	68.4
Former smoker	26.9
Current smoker	4.7
Total pack-years	14.7 \pm 17.1
Adult secondhand smoke exposure	48
BMI (kg/m ²)	24.9 \pm 5.1
Married/living with partner	46.6
Nondrinker	32.2
Menopausal status and HT use	
Premenopausal	41.0
Peri/postmenopausal and no hormone therapy use	11.9
Peri/postmenopausal and current/past hormone therapy use	33.9
Unknown menopausal status/hormone therapy use	13.2
Dietary fat (g/day)	56.3 \pm 26.8
Dietary fiber (g/day)	15.2 \pm 6.4
Dietary calories (kcal/day)	1595.4 \pm 556.4
Physical activity (hr/week)	4.41 \pm 4.0
Family history of heart disease	54.4
Taking hypertension medication/aspirin	34.3

All characteristics were reported on baseline questionnaire, except marital status, which was reported on the 2000 questionnaire.

The Cox model was stratified by age and race/ethnicity. To ensure that we would be examining associations with chronic rather than acute exposures, study exposures began in January 2000, the cohort follow-up began in January 2001, and both continued until July 2007. Two additional sensitivity analyses were conducted. First, we reran the models after including six census-derived contextual (neighborhood) variables including income (median household income), income inequality (percent below poverty level), education (percent with college degree), population size, racial composition (percent white, percent black, percent Hispanic), and unemployment (percent unemployed). These variables were derived from the 2000 census at the block-group level based on the subject's residence at the time of the baseline questionnaire. These variables represent social, economic, and environmental settings at a group level that may be associated with disease outcomes at the individual level. As such, they may provide additional control for residual confounding. The second sensitivity analysis involved two-pollutant models for a selected set of constituents for the outcome IHD mortality. Specifically, we took the constituent of PM_{2.5} and UF particles with the highest HR and ran additional regressions that included each of the other constituents in the same particle size. The HR and CIs are presented for a change in their respective interquartile ranges (IQRs) unless otherwise noted. Statistical significance was based on a *p*-value < 0.05, and model goodness-of-fit was based on the Akaike information criterion (AIC). The analysis was conducted using PHREG in SAS software (SAS Institute Inc., Cary, NC).

Results

Of the 133,479 women who completed a baseline questionnaire, we excluded 21,302 with no pollution data (of whom 14,670 had a lack of information on residential addresses and 6,632 lived in areas for which exposure estimates were not available); 1,363 women who had died or moved before the start of follow-up; 406 who were < 30 years of age in January 2001; 4,684 who had unknown or outlier BMI; 3,609 who were missing smoking data; 14 who were excluded because they consented to be included only in breast cancer studies; and 217 who had < 6 months of pollution values during January 2000 through December 2000. The final total was 101,884 women eligible for the study. The average length of follow-up was 6.3 years, with total person-years of 642,269. A total of 6,285 deaths occurred during the follow-up from January 2001 through July 2007; of these, 2,400 were due to cardiovascular diseases, 1,085 were due to IHD, and 929 were due to pulmonary diseases. As indicated in Table 1, the average age of eligible cohort members at the start of follow-up was 57 years, 86% of these women were non-Hispanic white, and 5% were current smokers. Table 2 summarizes the mean and distributions of the concentrations of PM_{2.5} and UF constituents used in the analysis. For example, the mean of PM_{2.5} was 17.9 μ g/m³ with OC (3.9 μ g/m³) and nitrate (3.7 μ g/m³) the largest constituents. For UFs, the mean was 1.3 μ g/m³ with OC the largest contributor at 0.9 μ g/m³.

A majority of the species were moderately to highly correlated (*r* = 0.5–0.8) (see Supplemental Material, Tables S1 and S2). PM_{2.5} nitrates had correlations of 0.55, 0.43,

Table 2. Distribution of fine and UF particles species and sources.

Pollutant	PM _{2.5} (μ g/m ³)				UF (ng/m ³)			
	Mean	25th	Median	75th	Mean	25th	Median	75th
Mass	17.9	13.1	18.2	22.8	1,293	778	1,214	1,747
Cu	0.5 ^a	0.2 ^a	0.4 ^a	0.6 ^a	0.03	0.01	0.01	0.03
Fe	0.4	0.3	0.4	0.5	1.3	0.9	1.3	1.6
Mn	7.7 ^a	5.7 ^a	7.9 ^a	9.8 ^a	0.05	0.02	0.03	0.05
Nitrate	3.7	1.5	3.5	5.4	—	—	—	—
EC	1.1	0.6	1.0	1.5	113	63	103	156
OC	3.9	2.4	3.7	5.2	908	507	845	1,238
Other compounds	2.9	2.1	2.9	3.6	36	18	29	47
Other metals ^b	1.0	0.7	1.0	1.2	21	12	19	28
SOA _{bio}	0.1	0.1	0.1	0.1	17	9	16	24
SOA _{ant}	0.1	0.05	0.1	0.1	23	11	23	34
Sources of primary particles								
On-road gasoline	0.3	0.2	0.3	0.5	109	49	90	157
Off-road gasoline	0.2	0.1	0.1	0.2	34	16	29	49
On-road diesel	0.4	0.2	0.4	0.6	62	33	58	88
Off-road diesel	1.0	1.0	1.0	1.4	93	53	83	126
Wood smoke	1.4	0.5	0.9	1.8	310	105	205	437
Meat cooking	1.1	0.4	0.8	1.6	115	46	86	174
High-sulfur fuel combustion	0.4	0.1	0.3	0.5	49	10	21	64
Other anthropogenic	7.0	5.2	7.2	9.0	502	253	403	653

25th and 75th are percentiles.

^aConcentrations \times 1,000. ^bMetals besides Cu, Fe, and Mn.

0.65, and 0.84 with EC, OC, Cu, and SOA_{ant}, respectively. For UFs, EC had correlations of 0.67, 0.19, and 0.40 with OC, Cu, and SO_{ant}, respectively. The average inter-constituent correlation for PM_{2.5} was 0.59 and for UFs was 0.64. The implications of these correlations are described in "Discussion."

In the Cox proportional hazards regression analysis for PM_{2.5}, the only statistically significant association ($p < 0.05$) observed between sources and constituents and all-cause mortality was for the source of high-sulfur fuel combustion (HR = 1.03; 95% CI: 1.01, 1.05 for a change in its IQR), and there were no statistically significant associations with pulmonary disease mortality (see Supplemental Material, Table S3). For cardiovascular disease mortality, statistically significant associations were demonstrated only for nitrate (HR = 1.10; 95% CI: 1.02, 1.18) and high-sulfur fuel combustion (HR = 1.05; 95% CI: 1.02, 1.09). Associations with p -values < 0.10 were observed for PM_{2.5} mass (HR = 1.05; 95% CI: 0.99, 1.12) and SOA_{ant} (HR = 1.06; 95% CI: 0.99, 1.13) (see Supplemental Material, Table S3). As summarized in Table 3 and Figure 2, however, there were many statistically significant associations with IHD mortality. Among the constituents, nitrate (HR = 1.28; 95% CI: 1.16, 1.42) and SOA_{ant} (HR = 1.23; 95% CI: 1.11, 1.36) were the most statistically significant, and both had higher HRs and fit the data slightly better, based on the (lower) AIC, than that of PM_{2.5} mass (HR = 1.18; 95% CI: 1.08, 1.30). Among the emission sources, we found statistically significant associations between IHD and all four of the vehicle sources, meat cooking, and high-sulfur content fuel combustion.

For UFs, no statistically significant associations were observed for either all-cause or pulmonary mortality (see Supplemental Material, Table S4). For cardiovascular mortality, significant associations were noted for Cu (HR = 1.03; 95% CI: 1.00, 1.05), and the sources of high-sulfur fuel combustion (HR = 1.04; 95% CI: 1.01, 1.07). However, many statistically significant associations were again demonstrated for IHD mortality (Table 3). Among the species, this includes Cu, Fe, EC, OC, other compounds and metals, SOA_{ant}, and SOA_{bio}. The largest estimated risks were for SOA_{ant} (HR = 1.25; 95% CI: 1.13, 1.39), EC (HR = 1.15; 95% CI: 1.06, 1.26), and other metals (HR = 1.13; 95% CI: 1.05, 1.21), each of which had lower p -values and slightly better fitting models based on AIC than did UF mass (HR = 1.10; 95% CI: 1.02, 1.18). Many of the other constituents also had better model fits than PM_{2.5}. Among the sources, associations were seen for both on and off-road diesel and gasoline, meat cooking, high-sulfur fuel combustion, and other anthropogenic sources.

The analysis of IHD mortality showed that although PM_{2.5} mass had a lower p -value than UF mass, UF mass and each of the UF constituents provided a better fit and had a lower p -value than their corresponding PM_{2.5} constituent (except for Mn, for which there was no statistical significance for either particle size).

In our sensitivity analysis, we found that adding the six contextual variables to the model did not quantitatively alter any of the results (HR or p -value) except in one case where PM_{2.5} SOA_{bio} became nonsignificant (data not shown). We also examined two-pollutant models with the PM_{2.5} constituent with the largest effect estimate for IHD (PM_{2.5} nitrate) in a regression with each of the other

PM_{2.5} constituents. Likewise, we examined two-pollutant models for UF (SOA_{ant}) with each of the other UF constituents (Tables 4 and 5). For the two-pollutant models with PM_{2.5} nitrate, the HRs for nitrate were basically unchanged and none of the other PM_{2.5} constituents, including mass, were statistically significant. For UFs SOA_{ant}, the HR was again basically unchanged and only one other constituent, Cu, was also statistically significantly related to IHD mortality.

Discussion

Our analysis of long-term exposure to the mass and constituents of PM_{2.5} and UF particles revealed several statistically significant associations with all-cause, cardiovascular,

Table 3. Hazard ratios (HRs) and 95% CIs for associations of PM_{2.5} and UF particles with IHD Mortality.

Pollutant	PM _{2.5} (µg/m ³)				UF (ng/m ³)			
	IQR	HR ^a (95% CI)	p -Value	AIC	IQR	HR ^a (95% CI)	p -Value	AIC
Mass	9.6	1.18 (1.08, 1.30)	< 0.001	14,011	969	1.10 (1.02, 1.18)	0.01	13,896
Cu	0.4 ^b	1.09 (1.04, 1.15)	< 0.001	14,015	0.02	1.06 (1.03, 1.09)	< 0.001	13,890
Fe	0.2	1.06 (0.97, 1.16)	0.17	14,023	0.8	1.03 (1.00, 1.06)	< 0.05	13,899
Mn	4.0 ^b	1.06 (0.99, 1.13)	0.12	14,023	0.03	1.00 (0.99, 1.01)	0.62	13,902
Nitrate	3.9	1.28 (1.16, 1.42)	< 0.0001	14,003	—	—	—	—
EC	0.8	1.14 (1.05, 1.24)	< 0.01	14,015	93	1.15 (1.06, 1.26)	< 0.001	13,891
OC	2.8	1.08 (0.99, 1.17)	0.07	14,022	731	1.08 (1.01, 1.15)	< 0.05	13,898
Other compounds	1.4	1.07 (0.99, 1.15)	0.08	14,022	29	1.10 (1.04, 1.16)	< 0.001	13,892
Other metals ^c	0.5	1.08 (0.99, 1.18)	0.09	14,022	17	1.13 (1.05, 1.21)	< 0.01	13,892
SOA _{bio}	0.1	1.08 (1.00, 1.17)	< 0.05	14,021	14	1.10 (1.02, 1.19)	< 0.01	13,896
SOA _{ant}	0.1	1.23 (1.11, 1.36)	< 0.0001	14,009	24	1.25 (1.13, 1.39)	< 0.001	13,884
Sources of primary particles								
On-road gasoline	0.3	1.12 (1.04, 1.22)	< 0.01	14,017	108	1.12 (1.04, 1.22)	< 0.01	13,894
Off-road gasoline	0.2	1.14 (1.04, 1.24)	< 0.01	14,016	33	1.14 (1.04, 1.24)	< 0.01	13,894
On-road diesel	0.4	1.13 (1.03, 1.23)	< 0.01	14,018	56	1.13 (1.03, 1.24)	< 0.01	13,895
Off-road diesel	0.8	1.13 (1.05, 1.23)	< 0.05	14,015	73	1.14 (1.05, 1.23)	< 0.01	13,892
Wood smoke	1.3	0.97 (0.90, 1.04)	0.38	14,024	332	0.95 (0.89, 1.02)	0.20	13,900
Meat cooking	1.2	1.08 (1.00, 1.17)	< 0.05	14,021	128	1.11 (1.03, 1.20)	< 0.01	13,895
High-sulfur fuel combustion	0.4	1.08 (1.02, 1.13)	< 0.05	14,017	54	1.08 (1.04, 1.12)	< 0.0001	13,888
Other anthropogenic	3.8	1.09 (1.00, 1.19)	0.05	14,021	400	1.06 (1.01, 1.10)	0.01	13,896

^aHRs were stratified for age and race and adjusted for smoking status, smoking pack-years, adult secondhand smoke exposure, BMI, marital status, alcohol consumption, physical activity, menopausal status and HT use combined, family history of heart disease, hypertension medication/aspirin use, and dietary fat, fiber, and caloric intake. ^bConcentrations $\times 1,000$. ^cMetals other than Cu, Fe, and Mn.

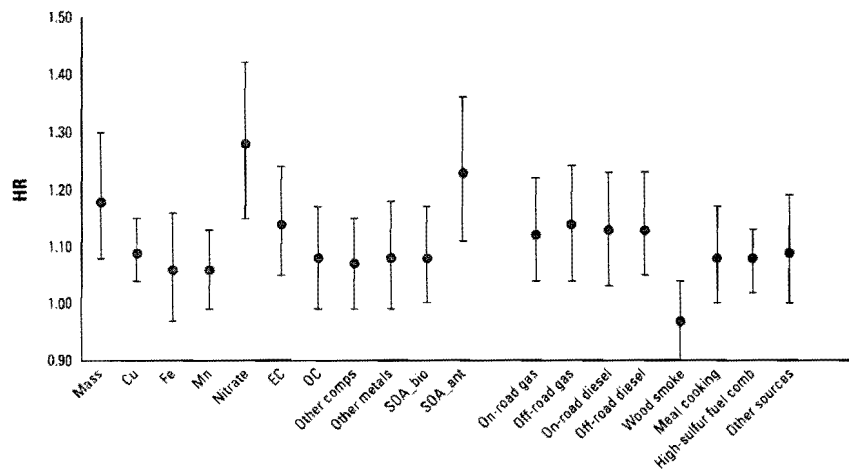


Figure 2. Association of PM_{2.5} constituents and sources with IHD mortality (HRs and 95% CIs using inter-quartile range). Abbreviations: comb, combustion; comps, components.

and IHD mortality. For PM_{2.5}, high-sulfur content fuel combustion was associated with all three end points, and nitrates were associated with cardiovascular and IHD mortality. Several other constituents reached statistical significance with IHD mortality including PM_{2.5} mass, Cu, EC, and the SOAs, as well as the sources including gas- and diesel-fueled vehicles, meat cooking, and high-sulfur fuel combustion. Among the PM_{2.5} constituents, based on their associated IQRs, nitrate had the highest HR and provided the best fit of the data. For UFs, constituents such as SOA_{ant}, EC, and "other" metals exhibited statistically significant associations with IHD mortality, as did all of the mobile sources and high-sulfur fuel combustion. For both PM_{2.5} and UF particles, several constituents generated higher HRs based on their relevant IQRs than their associated mass measurements and in some cases (e.g., UF mass vs. SOA_{ant}) the differences were statistically significant based on methodology suggested by Schenker and Gentleman (2001). In addition, for all of the constituents, there were better model fits, based on AIC, for UFs than for PM_{2.5}.

In a previous analysis of the CTS (based on 73,489 women), exposures to PM_{2.5} were estimated using data from 77 existing monitors located throughout the state (Lipsett et al. 2011). Smoothed surfaces were produced through inverse distance weighting, and grids of 250 m were created. Monthly concentrations were assigned to residents within each grid with the added constraint that participants were required to be within 30 km of a monitor. That study produced an HR for the association of PM_{2.5} and IHD mortality of 1.20 (95% CI: 1.02, 1.41) for a 10- $\mu\text{g}/\text{m}^3$ increase in PM_{2.5}. This result comports with the HR estimate (converted to 10 $\mu\text{g}/\text{m}^3$ change) in the present study of 1.19 (95% CI: 1.08, 1.31). Our estimate is also similar to those for IHD mortality based on analyses of the American Cancer Society (ACS) cohort in which the HRs for a 10- $\mu\text{g}/\text{m}^3$ increase in PM_{2.5} were 1.18 (95% CI: 1.14, 1.23) for the United States and 1.11 (95% CI: 1.05, 1.18) for California (Jerrett et al. 2013; Pope et al. 2002). They were also comparable to those of the Harvard Six Cities Study of 1.26 (95% CI: 1.08, 1.47) (Laden et al. 2006) for a 10- $\mu\text{g}/\text{m}^3$ increase in PM_{2.5}.

We can also compare the estimates of a few constituents of PM_{2.5} with those obtained in a prior analysis of a smaller subset ($n = 43,220$) of the CTS (Ostro et al. 2010). In this prior analysis, we used a 30-km buffer catchment area around each of eight U.S. EPA Speciation Trends Network monitors. The HR for cardiovascular mortality associated with a 1- $\mu\text{g}/\text{m}^3$ increase in nitrate in the previous study was 1.03 (95% CI: 1.01, 1.06)

versus the present study estimate of 1.02 (95% CI: 1.01, 1.04). For EC, the previous study generated an HR of 1.11 (95% CI: 0.91, 1.36) for a 1- $\mu\text{g}/\text{m}^3$ change compared with 1.05 (95% CI: 0.98, 1.11) in the present study. Several cohort studies have estimated the effects of EC or its correlates on cardiovascular mortality. For example, Smith et al. (2009) estimated its effects among 352,000 participants in the ACS cohort and reported a relative risk (RR) of 11% (95% CI: 3, 19) per 1 $\mu\text{g}/\text{m}^3$. The estimated RR of coronary heart disease mortality associated with EC was 1.08 (95% CI: 1.04, 1.12) per 1 $\mu\text{g}/\text{m}^3$ in a cohort study in Vancouver, Canada (Gan et al. 2011). In addition, the RR of cardiovascular mortality from long-term exposure to black smoke, another EC correlate which measures the light reflectance of particles was reported in cohort studies in the Netherlands and Scotland (Beelen et al. 2008; Beverland et al. 2012). Based on a conversion factor calculated by Janssen et al. (2011), the HRs were 1.04 (95% CI: 0.95, 1.12) and 1.06 (95% CI: 1.0, 1.11) per $\mu\text{g}/\text{m}^3$ of EC, respectively. Finally, a recent study (Lippman et al. 2013) examined the effect of PM_{2.5} components and sources using a subset of

the national ACS cohort. The results of the Cox regression model for IHD were generally supportive of our findings. Among the components measured, the authors observed statistically significant associations with IHD for EC and several of the metals (e.g., iron, lead, nickel, and zinc). Nitrates were not included in the ACS study, but statistical associations were observed for sulfur, likely from the combustion of coal and residual oil, which was not included in our study. In addition, among the sources, traffic was dominant in both studies.

We did not observe any positive associations with long-term exposure to wood smoke, although associations of short-term exposure with respiratory outcomes have been reported (Naeher et al. 2007). This may be attributable to the episodic nature of the wood smoke or to possible confounding by socioeconomic status. In California, most of the population-weighted exposure occurred in relatively high-income counties, such as San Francisco, San Mateo, and Santa Clara, where greater longevity prevails.

Given its large spatial variability, assessing exposure to UF particles among participants in cohort studies has been challenging. Therefore,

Table 4. Hazard ratios (HR) and 95% CIs for ischemic heart disease mortality for two-pollutant models of PM_{2.5} nitrate with each of the other constituents.

Pollutant	PM _{2.5} constituent ($\mu\text{g}/\text{m}^3$)			PM _{2.5} nitrate ($\mu\text{g}/\text{m}^3$)		
	IQR	HR ^a (95% CI)	p-Value	IQR	HR ^a (95% CI)	p-Value
Mass	9.6	1.03 (0.91, 1.18)	0.61	3.9	1.25 (1.07, 1.45)	< 0.05
Cu	0.4 ^b	1.02 (0.94, 1.10)	0.67	3.9	1.26 (1.11, 1.44)	< 0.001
Fe	0.2	0.92 (0.82, 1.03)	0.14	3.9	1.35 (1.19, 1.54)	< 0.0001
Mn	4.0 ^b	0.94 (0.85, 1.04)	0.23	3.9	1.34 (1.18, 1.53)	< 0.0001
Nitrate	—	—	—	3.9	1.28 (1.16, 1.42)	< 0.0001
EC	0.8	1.04 (0.94, 1.14)	0.49	3.9	1.25 (1.11, 1.42)	< 0.001
OC	2.8	1.00 (0.91, 1.09)	0.94	3.9	1.29 (1.15, 1.44)	< 0.0001
Other compounds	1.4	0.96 (0.87, 1.05)	0.34	3.9	1.33 (1.17, 1.51)	< 0.0001
Other metals ^c	0.5	0.93 (0.83, 1.04)	0.21	3.9	1.35 (1.18, 1.53)	< 0.0001
SOA _{bio}	0.1	0.95 (0.86, 1.05)	0.31	3.9	1.34 (1.17, 1.53)	< 0.0001
SOA _{ant}	0.1	0.97 (0.78, 1.21)	0.78	3.9	1.32 (1.05, 1.66)	0.02

^aHRs were stratified for age and race and adjusted for smoking status, smoking pack-years, adult secondhand smoke exposure, BMI, marital status, alcohol consumption, physical activity, menopausal status and HT use combined, family history of heart disease, hypertension medication/aspirin use, and dietary fat, fiber, and caloric intake. ^bConcentrations $\times 1,000$. ^cMetals other than Cu, Fe, and Mn.

Table 5. Hazard ratios (HR) and 95% CIs for ischemic heart disease mortality for two-pollutant models of anthropogenic UF secondary organic aerosols with each of the other constituents.

Pollutant	UF constituent (ng/m^3)			UF SOA _{ant} (ng/m^3)		
	IQR	HR ^a (95% CI)	p-Value	IQR	HR ^a (95% CI)	p-Value
Mass	969	1.03 (0.94, 1.12)	0.56	24	1.19 (1.08, 1.31)	< 0.001
Cu	0.02	1.39 (1.05, 1.83)	0.02	24	1.16 (1.06, 1.28)	0.001
Fe	0.8	1.01 (0.97, 1.06)	0.63	24	1.20 (1.09, 1.31)	< 0.001
Mn	0.03	1.00 (0.99, 1.01)	0.95	24	1.21 (1.11, 1.32)	< 0.0001
EC	93	1.04 (0.93, 1.16)	0.52	24	1.18 (1.05, 1.32)	0.006
OC	731	1.02 (0.95, 1.10)	0.61	24	1.20 (1.09, 1.31)	< 0.001
Other compounds	29	1.06 (1.00, 1.13)	0.06	24	1.17 (1.07, 1.29)	< 0.001
Other metals ^b	17	1.07 (0.96, 1.18)	0.22	24	1.17 (1.06, 1.29)	0.002
SOA _{bio}	14	0.99 (0.92, 1.07)	0.82	24	1.22 (1.09, 1.36)	< 0.001
SOA _{ant}	—	—	—	24	1.25 (1.13, 1.39)	< 0.001

^aHRs were stratified for age and race and adjusted for smoking status, smoking pack-years, adult secondhand smoke exposure, BMI, marital status, alcohol consumption, physical activity, menopausal status and HT use combined, family history of heart disease, hypertension medication/aspirin use, and dietary fat, fiber, and caloric intake. ^bMetals other than Cu, Fe, and Mn.

very few studies have measured or estimated long-term exposures to UFs at a fine enough spatial gradient to examine its impact on health. As an alternative, several studies have attempted to estimate the effects of exposure to traffic, often a major source of UFs, using metrics such as nitrogen dioxide, distance to major roadways, and/or local traffic density (Health Effects Institute 2010). In general, within the first 250 m or so of a major roadway, UFs may be highly correlated with other pollutants such as black carbon, nitrogen dioxide, and carbon monoxide. However, the relation between UFs and these other pollutants, especially away from major roadways, is not precise and the correlations may be fairly low (Sioutas et al. 2005; Zhu et al. 2008).

In contrast, several studies have estimated the effects of daily changes in UFs where only the time-varying component is needed (Atkinson et al. 2010; Forastiere et al. 2005; Peters et al. 2009). The previous studies were based on counts of UFs rather than mass, so their estimates are not directly comparable to ours. In support of these and our findings on UFs, Delfino et al. (2009) followed a panel of 60 elderly subjects with coronary artery disease and reported associations between biomarkers of inflammation and several components of UF particles, including EC and primary OC. Other animal and human studies have implicated transition metals in generating inflammation and oxidative stress (Chen and Lippmann 2009; Costa and Dreher 1997; Gurgueira et al. 2002).

Our study has both strengths and limitations. Among the strengths are the relatively large size of the cohort, the low prevalence of active smoking, and the relative similarity of occupational status and activity patterns. These factors all help to reduce residual confounding in our estimates. Second, the study population included a large number of women at risk of developing cardiovascular disease by virtue of their age and postmenopausal status. Third, because of the level of spatial detail in the pollution estimates and the information on residential history, the temporal and spatial resolution of the pollution exposure is enhanced relative to many previous cohort studies.

One limitation is that the study was restricted to women, and these women were not necessarily representative of all women. Second, only about 1,000 women were diagnosed with IHD or pulmonary mortality, which may introduce some instability in the risk estimates. Third, our estimates could be impacted by possibly correlated and unmeasured co-pollutants. Fourth, there was high intercorrelation (most between 0.5 and 0.8) among the particle constituents, different levels of uncertainty and bias in their modeled estimates, and potentially different exposure

patterns. These factors could affect the estimates of their relative toxicity. The high correlations reflect *a*) a consistent chemical signature of multiple pollutants associated with PM emitted from major sources, *b*) that some elements are dominated by a small number of sources, and/or *c*) the similarity of certain pollutants from different sources such as gasoline and diesel vehicles. A similar range of intercorrelation among the constituents was reported by Ostro et al. (2010), which used monitored values for the same cohort as the present study, but only included eight metropolitan areas. Thus the high correlations are not simply a result of the modeling methodology. However, this feature does make it difficult to identify unique components and sources that are associated with adverse health effects. Fifth, stationary sources contribute < 15% of the PM_{2.5} in California (Air Resources Board 2013), so sources such as coal burning and industrial processes and their specific constituents are not included in this study. Finally, although our exposure method had some significant enhancements over previous assessments, some misclassification will continue to exist.

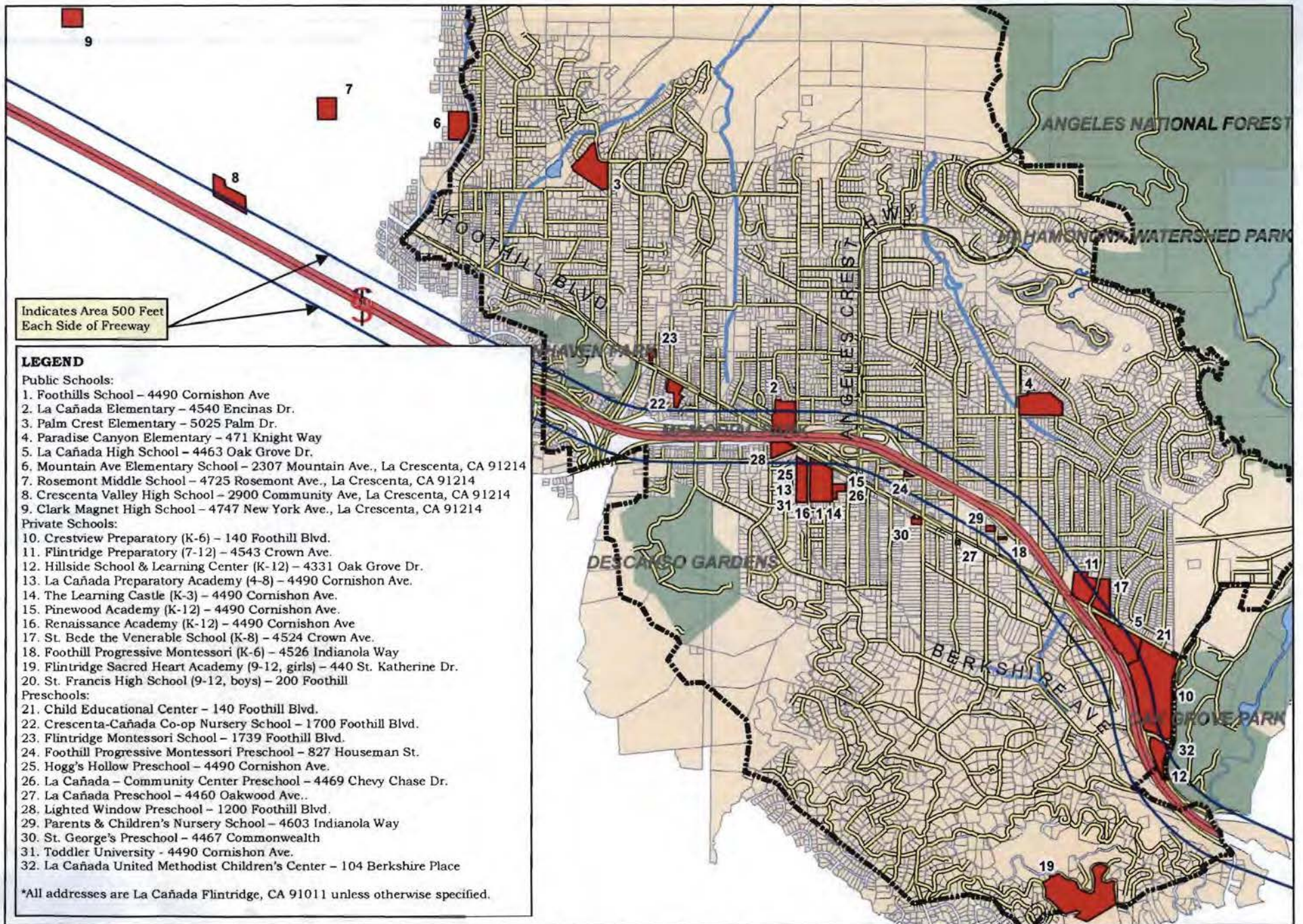
Nevertheless, this study represents an innovative effort to estimate the effects of long-term exposure to the constituents of two pollutants, fine and ultrafine particles, that are ubiquitous in our environment. As such, it provides evidence of the public health impact of a subset of these constituents and helps contribute to our understanding of air pollution-related cardiovascular disease.

REFERENCES

- Air Resources Board. 2013. 2012 Estimated Annual Average Emissions. Sacramento, CA:California Environmental Protection Agency. Available: <http://www.arb.ca.gov/ei/emsmain/emsmain.htm> [accessed 9 March 2014].
- Atkinson RW, Fuller GW, Anderson HR, Harrison RM, Armstrong B. 2010. Urban ambient particle metrics and health: a time-series analysis. *Epidemiology* 21:501–511.
- Beelen R, Hoek G, van den Brandt PA, Goldbohm RA, Fischer P, Schouten LJ, et al. 2008. Long-term effects of traffic-related air pollution on mortality in a Dutch cohort (NLCS-AIR study). *Environ Health Perspect* 116:196–202; doi:10.1289/ehp.10767.
- Beelen R, Raaschou-Nielsen O, Stafoggia M, Andersen ZJ, Weinmayr G, Hoffmann B, et al. 2014. Effects of long-term exposure to air pollution on natural-cause mortality: an analysis of 22 European cohorts within the multicentre ESCAPE project. *Lancet* 383:785–795.
- Bernstein L, Allen M, Anton-Culver H, Deapen D, Horn-Ross PL, Peel D, et al. 2002. High breast cancer incidence rates among California teachers: results from the California Teachers Study (United States). *Cancer Causes Control* 13:625–635.
- Beverland IJ, Cohen GR, Heal MR, Carder M, Yap C, Robertson C, et al. 2012. A comparison of short-term and long-term air pollution exposure associations with mortality in two cohorts in Scotland. *Environ Health Perspect* 120:1280–1285; doi:10.1289/ehp.1104509.
- Carlton AG, Bhawe PV, Napelenok SL, Edney ED, Sarwar G, Pinder RW, et al. 2010. Model representation of secondary organic aerosol in CMAQv4.7. *Environ Sci Technol* 44:8553–8560.
- Chen LC, Lippmann M. 2009. Effects of metals within ambient air particulate matter (PM) on human health. *Inhal Toxicol* 21:1–31.
- Costa DL, Dreher KL. 1997. Bioavailable transition metals in particulate matter mediate cardiopulmonary injury in healthy and compromised animal models. *Environ Health Perspect* 105(suppl 5):1053–1060.
- Delfino RJ, Staimeir N, Tjoa T, Gillen DL, Polidori A, Arhami M, et al. 2009. Air pollution exposures and circulating biomarkers of effect in a susceptible population: clues to potential causal component mixtures and mechanisms. *Environ Health Perspect* 117:1232–1238; doi:10.1289/ehp.0800194.
- Dockery DW, Pope CA III, Xu X, Spengler JD, Ware JH, Fay ME, et al. 1993. An association between air pollution and mortality in six U.S. cities. *N Engl J Med* 329:1753–1759.
- Forastiere F, Stafoggia M, Picciotto S, Bellander T, D'ippoliti D, Lanki T, et al. 2005. A case-crossover analysis of out-of-hospital coronary deaths and air pollution in Rome, Italy. *Am J Respir Crit Care Med* 172:1549–1555.
- Gan WQ, Koehoorn M, Davies HW, Demers PA, Tamburic L, Brauer M. 2011. Long-term exposure to traffic-related air pollution and the risk of coronary heart disease hospitalization and mortality. *Environ Health Perspect* 119:501–507; doi:10.1289/ehp.1002511.
- Gurgueira SA, Lawrence J, Coull B, Murthy GG, González-Flecha B. 2002. Rapid increases in the steady-state concentration of reactive oxygen species in the lungs and heart after particulate air pollution inhalation. *Environ Health Perspect* 110:749–755.
- Health Effects Institute. 2010. Traffic-Related Air Pollution: A Critical Review of the Literature on Emissions, Exposure, and Health Effects. HEI Panel on the Health Effects of Traffic-Related Air Pollution. Special Report 17. Boston, MA:Health Effects Institute. Available: <http://pubs.healtheffects.org/getfile.php?u=553> [accessed 29 April 2015].
- Hoek G, Krishnan RM, Beelen R, Peters A, Ostro B, Brunekreef B, et al. 2013. Long-term air pollution exposure and cardio-respiratory mortality: a review. *Environ Health* 12:43; doi:10.1186/1476-069X-12-43.
- Hu J, Zhang H, Chen S, Ying Q, Wiedinmyer C, Vandenbergh F, et al. 2014a. Identifying PM_{2.5} and PM_{0.1} sources for epidemiological studies in California. *Environ Sci Technol* 48:4980–4990.
- Hu J, Zhang H, Chen SH, Ying Q, Wiedinmyer F, Vandenbergh F, et al. 2014b. Predicting primary PM_{2.5} and PM_{0.1} trace composition for epidemiological studies in California. *Environ Sci Technol* 48:4971–4979.
- Hu J, Zhang H, Ying Q, Chen SH, Vandenbergh F, Kleeman MJ. 2015. Long-term particulate matter modeling for health effect studies in California—part 1: model performance on temporal and spatial variations. *Atmos Chem Phys* 15:3445–3461; doi:10.5194/acp-15-3445-2015.
- Janssen NA, Hoek G, Simic-Lawson M, Fischer P, van Bree L, ten Brink H, et al. 2011. Black carbon as an additional indicator of the adverse health effects of airborne particles compared with PM₁₀ and PM_{2.5}. *Environ Health Perspect* 119:1691–1699; doi:10.1289/ehp.1003369.
- Jerrett M, Burnett RT, Beckerman BS, Turner MC, Krewski D, Thurston G, et al. 2013. Spatial analysis

- of air pollution and mortality in California. *Am J Resp Crit Care Med* 188:593–599.
- Joe DK, Zhang H, DeNero SP, Lee HH, Chen SH, McDonald BC, et al. 2014. Implementation of a high-resolution Source-Oriented WRF/Chem model at the Port of Oakland. *Atmos Environ* 82:351–363.
- Kim E, Hopke PK, Pinto JP, Wilson WE. 2005. Spatial variability of fine particle mass, components, and source contributions during the regional air pollution study in St. Louis. *Environ Sci Technol* 39:4172–4179.
- Kuwayama T, Ruehl CR, Kleeman MJ. 2013. Daily trends and source apportionment of ultrafine particulate mass (PM_{0.1}) over an annual cycle in a typical California city. *Environ Sci Technol* 47:13957–13966.
- Laden F, Schwartz J, Speizer FE, Dockery DW. 2006. Reduction in fine particulate air pollution and mortality: extended follow-up of the Harvard Six Cities study. *Am J Respir Crit Care Med* 173:667–672.
- Lippmann M, Chen LC, Gordon T, Ito K, Thurston GD. 2013. National Particle Component Toxicity (NPACT) Initiative: Integrated Epidemiologic and Toxicologic Studies of the Health Effects of Particulate Matter Components. Research Report 177. Boston, MA:Health Effects Institute.
- Lipsett MJ, Ostro BD, Reynolds P, Goldberg D, Hertz A, Jerrett M, et al. 2011. Long-term exposure to air pollution and cardiorespiratory disease in the California Teachers Study cohort. *Am J Respir Crit Care Med* 184:828–835.
- Naeher LP, Brauer M, Lipsett M, Zelikoff JT, Simpson CD, Koenig JQ, et al. 2007. Woodsmoke health effects: a review. *Inhal Toxicol* 19:67–106.
- Ostro B, Feng WY, Broadwin R, Green S, Lipsett M. 2007. The effects of components of fine particulate air pollution on mortality in California: results from CALFINE. *Environ Health Perspect* 115:13–19; doi:10.1289/ehp.9281.
- Ostro B, Lipsett M, Reynolds P, Goldberg D, Hertz A, Garcia C, et al. 2010. Long-term exposure to constituents of fine particulate air pollution and mortality: results from the California Teachers Study. *Environ Health Perspect* 118:363–369; doi:10.1289/ehp.0901181.
- Peng RD, Bell ML, Geyh AS, McDermott A, Zeger SL, Samet JM, et al. 2009. Emergency admissions for cardiovascular and respiratory diseases and the chemical composition of fine particle air pollution. *Environ Health Perspect* 117:957–963; doi:10.1289/ehp.0800185.
- Peters A, Breitner S, Cyrys J, Stölzel M, Pitz M, Wölke G, et al. 2009. The influence of improved air quality on mortality risks in Erfurt, Germany. *Res Rep Health Eff Inst* 137:5–77.
- Pope CA III, Burnett RT, Thun MJ, Calle EE, Krewski D, Ito K, et al. 2002. Lung cancer, cardiopulmonary mortality, and long-term exposure to fine particulate air pollution. *JAMA* 287:1132–1141.
- Pope CA III, Thun MJ, Namboodiri MM, Dockery DW, Evans JS, Speizer FE, et al. 1995. Particulate air pollution as a predictor of mortality in a prospective study of U.S. adults. *Am J Respir Crit Care Med* 151(3 pt 1):669–674.
- Sakurai H, Tobias HJ, Park K, Zarling D, Docherty KS, Kittelson DB, et al. 2003. On-line measurements of diesel nanoparticle composition and volatility. *Atmos Environ* 37:1199–1210.
- Schenker N, Gentleman JF. 2001. On judging the significance of differences by examining the overlap between confidence intervals. *Am Stat* 55:182–186.
- Sioutas C, Delfino RJ, Singh M. 2005. Exposure assessment for atmospheric ultrafine particles (UFPs) and implications in epidemiologic research. *Environ Health Perspect* 113:947–955; doi:10.1289/ehp.7939.
- Smith KR, Jerrett M, Anderson HR, Burnett RT, Stone V, Derwent R, et al. 2009. Public health benefits of strategies to reduce greenhouse-gas emissions: health implications of short-lived greenhouse pollutants. *Lancet* 374:2091–2103.
- U.S. EPA (U.S. Environmental Protection Agency). 2008. Chemical Speciation. Available: <http://www.epa.gov/ttn/amtic/speciepg.html> [accessed 19 June 2013].
- U.S. EPA (U.S. Environmental Protection Agency). 2009. Integrated Science Assessment for Particulate Matter (Final Report) EPA/600/R-08/139F. Available: <http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=216546> [accessed 4 March 2013].
- Zanobetti A, Franklin M, Koutrakis P, Schwartz J. 2009. Fine particulate air pollution and its components in association with cause-specific emergency admissions. *Environ Health* 8:58; doi:10.1186/1476-069X-8-58.
- Zhu Y, Fung DC, Kennedy N, Hinds WC, Eiguen-Fernandez A. 2008. Measurements of ultrafine particles and other vehicular pollutants inside a mobile exposure system on Los Angeles freeways. *J Air Waste Manag Assoc* 58:424–434.

EXHIBIT 7



La Cañada Flintridge Schools

1" = 1/2 mi

EXHIBIT 8

June 24, 2015

Mr. Adrian Guerra
Aleshire & Wynder, LLP
Attorneys At Law
2361 Rosecrans Avenue, Suite 475
El Segundo, CA 90245

Subject: SR-710 North Study Draft Environmental Impact Report/Environmental Impact Statement (March 2015) - Transportation-Related Comments

Dear Mr. Guerra:

Willdan Engineering (Willdan) has completed our review of the *SR-710 North Study, Draft Environmental Impact Report/Environmental Impact Statement and Draft Section 4(f) De Minimis Findings* (DEIR/EIS), dated March 2015, and prepared by State of California Department of Transportation (Caltrans) and Los Angeles County Metropolitan Transportation Agency (Metro).

Our review focused on the traffic-related sections of the DEIR/EIS and found that there are a number of deficiencies that affect the traffic analysis and conclusions. This letter summarizes our findings and notes the impacts of the deficiencies on the City of La Cañada Flintridge. The traffic-related deficiencies in the DEIR/EIS and its *Transportation Technical Report* are presented and discussed below.

1. *The traffic volumes upon which the traffic analysis is based are not reliable nor valid, particularly those related to the freeway tunnel alternatives, rendering the traffic study inadequate.*

- a. *The study underestimates the project-related increase in vehicular traffic volumes and vehicle miles travelled (VMT) by not accounting for induced travel demand.***

The transportation planning community recognizes that a project that increases roadway capacity and reduces travel time induces travel on the new facility. Although the *Transportation Technical Report* assumes that the project would induce travel related to the freeway tunnel alternatives, it does not appear to include the typical one-to-one relationship that exists between roadway capacity and vehicle travel. The result is an underestimation of the future traffic volumes. Vehicular traffic volumes are the key element used to determine the level of service (LOS) at which an intersection or roadway segment would operate during the peak hours. Basically, the traffic volumes are compared to the maximum traffic volumes the intersection can handle (capacity).

For this study, the *Highway Capacity Manual* (HCM) methodology was used to determine the LOS. The LOS is provided in average seconds of delay per vehicle that would be experienced by motorists traversing the intersection. The delay is given letter grades for ease of comparison, ranging from LOS A (no delay) to LOS F (grid-

lock conditions). The table below shows how the seconds of delay per vehicle translate into LOS.

LOS	HCM Delay (secs/veh)
A	≤ 10.0
B	> 10.0 to 20.0
C	> 20.0 to 35.0
D	> 35.0 to 55.0
E	> 55.0 to 80.0
F	> 80.0

The traffic volumes are one of the primary foundations upon which the level of service analysis and traffic study findings are based. There is a direct correlation between the projected vehicular traffic volumes and the anticipated LOS, in that as traffic increases, so does the delay. If the future traffic volumes are underestimated, the future LOS would appear to be better than it would actually be.

- b. *Over half of the validation metrics for the SR-710 North travel demand model provided in Table 3-2 are outside of the recommended ranges.*

Traffic-related validation statistics for the SR-710 North travel model are provided in the study in Table 3-2. The study, as well as the Federal Highway Administration (FHWA) *Travel Model Validation and Reasonableness Checking Manual*, dated 2010, which is referenced in the study, make it clear that measures used to validate models are not “pass/fail”. Failing to meet a guideline does not mean that the model is invalid. The validity of the model is based on several factors, which must all be considered.

The study concludes that the travel demand model is “well-validated” regarding forecast traffic volumes. Our review of the validation statistics, however, indicated that many of the guidelines were not met, collectively indicating that the model is not valid.

Table 3-2, shown on the next page, includes the metrics of Count to volume ratio, %RMSE, R² and the Percent of count locations within the accepted Caltrans deviation. In the Count to Model Volume Comparison, 5 out of the 9 values are outside of the guidelines. For the %RMSE, 1 of the 3 values are outside of the guidelines. All of the R² values are within the target, however, as was pointed out, this metric does not mean much, particularly on its own. For the percent of links within Caltrans Standard Deviation, 2 of the 3 values are greater than the target deviation.

Therefore, as shown in Table 3-2, more than half (8 of 15) of the values of the meaningful metrics are outside of the target ranges/values.



TABLE 3-2
Aggregate Highway Model Validation Statistics in Study Area
SR 710 North Study, Los Angeles County, California

Agency Guidance	AM Period	PM Period	ADT
SR 710 North Model – Count to Model Volume Comparison			
Caltrans and FHWA Guidance:			
Freeways +/- 7%	3%	5%	14%
Major Arterials +/- 10%	14%	-14%	14%
Minor Arterials +/- 15%	9%	-26%	4%
SR 710 North Model – RMSE			
Caltrans and FHWA Guidance:			
FHWA <40 for Periods, <30 Daily			
Caltrans < 40			
%RMSE	39	34	42
SR 710 North Model – R²			
Caltrans and FHWA Guidance:			
R2 (Target >=0.88)	0.94	0.95	0.96
SR 710 North Model – % of Links within Caltrans Standard Deviation			
Caltrans Guidance:			
% of Links within Caltrans Standard Deviations (Target >=0.75)	74%	81%	57%
Caltrans criteria are from <i>Travel Forecasting Guidelines</i> (Caltrans, 1992).			
FHWA criteria were obtained from <i>Model Validation and Reasonableness Checking Manual</i> (FHWA, 2010).			

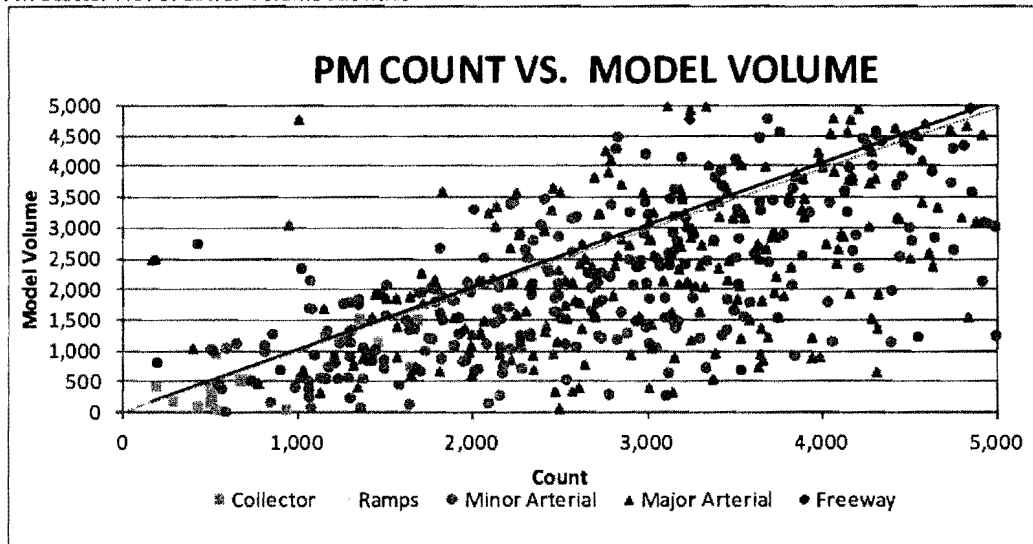
Another area of concern is the scatter plots, which were not mentioned in Section 3 of the TTR. Scatter plots comparing the model-generated segment traffic volumes to the counted volumes, for overall AM, PM and daily time periods are provided in Appendix A, Model Validation Report, of the TTR in Figures 6-1 through 6-3. These scatter plots include the freeway volumes, ramp volumes and arterial street volumes. Figures 6-4 through 6-6 limit the scatter plots to the arterial streets. According to the scatter plots, the model overestimates the AM peak hour and daily volumes, but underestimates the PM peak hour volumes. The report provides estimates of the over/under-predicted volumes for the overall scatter plots in Figures 6-1 through 6-3, but does not provide the scatter plots for the arterial streets in Figures 6-4 through 6-6. The report says that, overall, the PM peak hour volumes are under-predicted by about 5%. A visual review of the PM Count vs. Model Volume in Figure 6-5, on the next page, indicates that the PM volumes are also under-predicted for the arterial streets, but at a much larger percentage since the vast majority of the counts are below the line that indicates the volumes are equal.

Figure 6-5 indicates that the traffic volumes used for the PM peak hour intersection LOS analysis could be very low compared to what they should be. The resulting analysis would indicate much better LOS than there actually would be.

To summarize, a large number of the metrics used to validate the traffic volumes generated by the traffic model are outside of the acceptable ranges and seriously bring into question the validity of the model and volumes. Since these model-generated volumes are the foundation of the traffic analysis, the entire analysis and findings are not reliable. Further modifications to the model should be made to provide an acceptable traffic model.



FIGURE 6-5
PM Scatter Plot of Lower Volume Facilities



Effect on the City of La Cañada Flintridge

This impact due to the underestimation of induced traffic particularly relates to the freeway tunnel alternatives. The City would be among the most negatively affected since the tunnels would already guide motorists to and from the I-210 west of the SR-710, as demonstrated by the freeway operations segment analysis (see item 4). With increased traffic using a tunnel, the freeway segments serving the City would have increased congestion and slower speeds. If the congestion was great enough, the tunnel alternative could also result in motorists using Foothill Boulevard to avoid using the freeway.

An invalid traffic model nullifies all of the analysis, study findings and conclusions. It renders the traffic study results, and any environmental studies based on it, useless.

- 2. Metro and Caltrans modified the criteria for identifying adverse effects for intersections from the standard practice followed in Los Angeles County in order to artificially and wrongfully reduce the projected impacts.***

The DEIR/EIS states that the adverse effects criteria used in the study were developed in cooperation with Caltrans and Metro. The criteria, however, are not consistent with Metro or Los Angeles County Department of Public Works (LACO DPW) requirements. The result is that intersections that would otherwise be identified as having an adverse effect due to the project, are found to have no adverse effect.

Page 3.5-4 of the DEIR/EIS lists the study criteria for determining adverse effects at study intersections. The adverse effect criteria used in this study for intersections are as follows:

There would be an adverse effect at an intersection if either of the following occurs:



- *The intersection is projected to operate at LOS E under a Build Alternative and the increase in delay over the No Build Alternative is 5 seconds or more; or*
- *The intersection is projected to operate at LOS F under a Build Alternative and the increase in delay over the No Build Alternative is 2 seconds or more.*

The LACO DPW and Metro adverse effects criteria are for the Intersection Capacity Utilization (ICU) methodology, which is different than the Highway Capacity Manual (HCM) intersection delay methodology used for this study. Federal, state and industry standards for significant impact thresholds for the HCM delay methodology do not currently exist. The thresholds for the ICU methodology can, however, be adapted for the HCM delay methodology, which the study preparers did. *The intersection delay thresholds used in the study, however, are not consistent with LACO DPW or Metro standard ICU thresholds. The inconsistencies are detailed in the paragraphs below.*

Most cities in Los Angeles County do not have their own guidelines for preparing a traffic impact study and follow the LACO DPW's *Traffic Impact Analysis Report Guidelines*, which include requirements for identifying a project's adverse effects on an intersection. The City's General Plan circulation element requirements are also applied, which typically have a goal of LOS C or LOS D for all intersections. Certain Cities allow intersections to operate at LOS E. The requirements that are typically used are the LACO DPW's, as shown below, with the City's added stipulation of a maximum LOS of C or D.

- No Build LOS C: 4% or more of capacity (3.2 seconds for signalized, 2.0 seconds for unsignalized)
- No Build LOS D: 2% or more of capacity (1.6 seconds for signalized, 1.0 seconds for unsignalized)
- No Build LOSE/F: 1% or more of capacity (0.8 seconds for signalized, 0.5 seconds for unsignalized)

Metro's *Guidelines for CMP Transportation Impact Analysis*, state that "a significant impact occurs when the proposed project increases traffic demand by 2% of capacity, causing LOS F; if the facility is already LOS F a significant impact occurs when the proposed project increases traffic demand by 2% of capacity. The lead agency may apply a more stringent criteria if desired." Traffic studies in Los Angeles County are required to analyze CMP (Congestion Management Program) intersections based on the CMP requirements. Nine of the 156 study intersections are CMP intersections.

For the delay methodology, capacity is 80.0 seconds of delay for signalized intersections and 50.0 seconds of delay for unsignalized intersections. Based on these factors, the CMP criteria for the increases in traffic demand would be as follows when the Build Alternative is LOS F:

For signalized intersections

- No Build is LOS A – E: 1.6 seconds or more
- No Build is LOS F: 1.6 seconds or more



For unsignalized intersections

- No Build is LOS A – E: 1.0 seconds or more
- No Build is LOS F: 1.0 seconds or more

The City of Los Angeles Department of Transportation (LA DOT), has developed significant impact thresholds for the HCM delay methodology, apparently based on the LACO DPW requirements. The LA DOT thresholds, however, are based on percentages of the capacity, but not applied in a direct manner.

The significant impact criteria for LACO DPW, Metro, CMP, LA DOT and those used in the study are summarized in the table below. These only apply to signalized intersections.

Comparison of Significant Impact Thresholds

Agency/Source	Significant Impact Threshold (HCM) (ave secs of delay/veh) ¹			
	LOS C	LOS D	LOS E	LOS F
SR-710 North Study ²	--	--	≥ 5	≥ 2
LACO DPW ³	≥ 3.2	≥ 1.6	≥ 0.8	≥ 0.8
LACO Metro CMP ⁴	--	--	≥ 1.6	≥ 1.6
LA DOT	≥ 6.0	≥ 4.0	≥ 2.5	≥ 2.5

¹ Project-related increase in HCM intersection delay, signifying a significant project impact, requiring mitigation.

² Values used in Study

³ Cities typically modify this to a maximum of LOS C or D.

⁴ Applied to CMP intersections only.

It is clear from the table above that the thresholds used in the study are far less restrictive than those for LACO DPW, Metro CMP and LA DOT. Applying LACO DPW's criteria to the report's Table 5-71, Opening Year Intersection Operations Summary Table, shows that 193 additional "new" intersections for the various Build Alternatives would require mitigation. Disregarding the various Build Alternatives, 38 additional intersections would require mitigation for one or more Build Alternatives, with 18 due to LOS C deficiencies and 20 due to LOS D deficiencies. If a City-related maximum LOS of C or D were applied, the numbers would be greater.

Applying LA DOT's criteria would not result in as many additional intersections requiring mitigation, but it would add 132 "new" intersections for the various Build Alternatives. Disregarding the various Build Alternatives, 21 additional intersections would require mitigation for one or more Build Alternatives, with 13 due to LOS C deficiencies and 8 due to LOS D deficiencies.



3. Caltrans did not follow its own criteria for identifying adverse effects for freeway segments in order to reduce the project impact.

Freeway segments that would otherwise be identified as having an adverse effect due to the project, are found to not have an adverse effect and no mitigation is proposed.

Caltrans *Guidelines for the Preparation of Traffic Impact Studies, 2002*, uses Measures of Effectiveness (MOEs) rather than thresholds of significance. For freeway segments as well as intersections, the target MOE is between LOS C and LOS D, which means that the maximum is LOS C. If the Build Alternative LOS exceeds LOS C, it is to be mitigated back to LOS C. If the No Build Alternative is worse than LOS C (LOS D – F), then it is to be mitigated back to the existing LOS.

For this study, the adverse effect for a freeway segment is when:

- *The freeway segment is projected to operate at LOS F under a Build Alternative and the increase in traffic demand compared to the No Build Alternative is 2 percent or more.*

In other words, there is no attempt to meet the LOS C MOE. The result is that greater congestion is allowed on the affected freeways without any attempt to mitigate the increases.

Effect on the City of La Cañada Flintridge

The freeway segments serving the City, listed below, are currently operating at LOS C and would operate at LOS D with one or more Build Alternatives. None of them are included in the study as having an adverse effect due to the project. City residents and visitors would deal with noticeably greater congestion and slower speeds on the freeway serving the community.

Eastbound I-210

- a. Ocean View on-ramp to SR-2 on-ramp
- b. Angeles Crest Highway off-ramp to SB Angeles Crest Highway on-ramp
- c. SB Angeles Crest Highway on-ramp to NB Angeles Crest Highway on-ramp
- d. NB Angeles Crest Highway on-ramp to Gould off-ramp
- e. Gould off-ramp to Foothill off-ramp
- f. Foothill off-ramp to Berkshire off-ramp
- g. Berkshire off-ramp to Berkshire on-ramp

Westbound I-210

- a. Berkshire off-ramp to Berkshire on-ramp
- b. Berkshire on-ramp to Foothill off-ramp
- c. Foothill off-ramp to Gould on-ramp
- d. Gould on-ramp to Angeles Crest Highway off-ramp
- e. Angeles Crest Highway off-ramp to NB Angeles Crest Highway on-ramp
- f. NB Angeles Crest Highway on-ramp to SB Angeles Crest Highway on-ramp
- g. SB Angeles Crest Highway on-ramp to SR-2 off-ramp



The study includes a total of 30 freeway segments (each direction is considered a separate segment) serving the City. One of the remaining segments would operate at LOS F (see item 5) and the rest would continue to operate at LOS B, C or D.

4. The report is deficient regarding mitigation measures. It fails to provide a feasible mitigation measure for each traffic impact and it fails to show that the feasible mitigation measures would actually mitigate the traffic impacts.

CEQA requires that a feasible mitigation measure be provided for each identified significant impact created by the project. Accordingly, the following must be provided:

- a. Feasible mitigation measure(s)
- b. Proof that the mitigation measure(s) would actually mitigate the impact, by providing the LOS with the mitigation measure(s), compared to the LOS without the mitigation(s).

In the DEIR/EIS, Tables 3.5.12 and 3.5.13, for intersections and freeway segments, respectively, summarize the adverse impacts by alternative. Regarding mitigation measures, these tables provide the following:

- a. "Potential Improvements" instead of mitigation measures.
- b. Some "potential improvements" are not well-defined.
- c. Whether or not each "potential improvement" is recommended. If not recommended, a reason is given, which *indicates* it is infeasible, but it *never states that it is infeasible*.
 - i. In many cases, it is not clear if it is not recommended due to physical constraints or the cost of dealing with the physical constraints.
 - ii. No other "potential improvement" is provided.
- d. Where a "potential improvement" is recommended, no proof is provided, either in the table or elsewhere, that the "potential improvement" would effectively mitigate the adverse impact. Proof would consist of providing and comparing the LOS for the with-mitigation and without mitigation conditions.

Examples of these deficiencies are noted below:

- A. Table 3.5.12 (intersections), for Dual-Bore with No Tolls, No Trucks, Rosemead Blvd at Mission Rd:
 - Impact: *Increase the LOS from D to E during both the AM and PM peak hours*
 - Potential Improvement: *Add an eastbound left-turn lane, a northbound left-turn lane and an eastbound right-turn lane.*
 - Is Improvement Recommended?: *No, this improvement is not recommended for implementation because it would require one partial right-of-way acquisition from an adjacent business.*

Example A illustrates where a "potential improvement" is not recommended, but not noted as being infeasible. It appears to be infeasible due to cost. Nor is proof provided that the "potential improvement" would effectively mitigate the impact.



B. Table 3.5.12 (intersections), for Dual-Bore with No Tolls, No Trucks, San Gabriel Blvd at Huntington Dr:

- Impact: *Increase the LOS from D to E during the PM peak hour*
- Potential Improvement: *Optimize the signal system.*
- Is Improvement Recommended?: *Yes, recommended for implementation.*

Example B illustrates where a "potential improvement" is not well-defined, nor is proof provided that the "potential improvement" would effectively mitigate the impact.

C. Table 3.5.13 (freeway segments), for Dual-Bore with No Tolls, No Trucks, I-710 southbound between the Third St off-ramp and the SR-60 on-ramp:

- Impact: *Increase the LOS from E to F during the AM peak hour*
- Potential Improvement: *Add a lane between the Third St off-ramp and the SR-60 off-ramp*
- Is Improvement Recommended?: *No, this improvement is not recommended for implementation due to secondary impacts from the major construction of one bridge structure*

Example C illustrates where a "potential improvement" is not recommended, but not noted as being infeasible. It is also not clear if it is infeasible due to cost or construction. Nor is proof provided that the "potential improvement" would effectively mitigate the impact.

D. Table 3.5.13 (freeway segments), for Dual-Bore with No Tolls, No Trucks, I-210 westbound between the Maclay Ave off-ramp and the Maclay Ave on-ramp:

- Impact: *Increase the LOS from E to F during the PM peak hour*
- Potential Improvement: *Active Traffic and Demand Management*
- Is Improvement Recommended?: *Yes, recommended for implementation.*

Example D illustrates where a "potential improvement" is not well-defined, nor is proof provided that the "potential improvement" would effectively mitigate the impact.

Effect on the City of La Cañada Flintridge

Based on the study's current analysis, one segment in the vicinity of the City, the I-210 eastbound between the La Crescenta Avenue on-ramp and the Ocean View Boulevard off-ramp, would have an adverse effect due to the project for three of the freeway tunnel alternatives. The segment would operate at LOS F during the AM peak hour under all project alternatives and at LOS C or D during the PM peak hour. It currently operates at LOS F during the AM peak hour and at LOS C during the PM peak hour. The potential improvement is to add a lane to the freeway between the two ramps. The improvement is not recommended, however, *due to secondary impacts due to major construction of two tie-back walls at the Ramsdell and Rosemont overcrossings, and a retaining wall along the span of Mayfield Avenue.* No feasible mitigation measures are proposed. The analysis indicates that depending on the tunnel alternative, the AM peak hour eastbound freeway



traffic would increase as much as 4.6%, causing City residents and visitors to deal with greater congestion and slower traffic without mitigation.

5. The study area is too limited to fully account for all of the projects' impacts on the area circulation system.

The project study area does not extend far enough to include all of the freeway segments that would be impacted by the project. In particular, the freeway tunnel alternatives will impact traffic on the I-5 freeway south of the I-210 freeway and the connecting freeways. Other sections of the area freeways would also be impacted as regional travel patterns are modified by the project.

In summary, there are five key traffic-related deficiencies in the SR-710 North Study DEIR/EIS: the traffic volume data is invalid, criteria for evaluating the project's traffic impacts are not consistent with County and Metro standards, many of the mitigation measures are infeasible and they all are unproven, and the study area is too small. Each of these deficiencies on its own casts doubt on the study's findings, particularly for the freeway tunnel alternatives. Taken together, they invalidate the results of the traffic study.

We appreciate this opportunity to be of service. Should you have any questions regarding this letter, please contact me at (657) 223-8525 (new phone number).

Respectfully submitted,

WILLDAN ENGINEERING

Ruth M. Smith

Ruth Smith, TE, PTP
Project Manager

Copy: Mark Steres
Ann Wilson



2016 PEIR

From: Wetzel, Niki <nwetz@lakeforestca.gov>
Sent: Monday, February 01, 2016 5:51 PM
To: 2016 PEIR
Subject: 2016RTP/SCS Comments From City of Lake Forest
Attachments: RTP.SCS.2.1.16.pdf



Mayor
Andrew Hamilton

Mayor Pro Tem
Scott Voigts

Council Members
Dr. Jim Gardner
Adam Nick
Dwight Robinson

City Manager
Robert C. Dunek

February 1, 2016

Ms. Lijin Sun, Senior Regional Planner
Southern California Association of Governments
818 West Seventh Street, 12th Floor
Los Angeles, CA 90017-3435

RE: 2016-2040 Regional Transportation Plan/Sustainable Communities Strategy

Dear Ms. Sun:

Thank you for the opportunity to comment on the 2016-2040 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS).

We appreciate the ongoing coordination on the growth forecast between SCAG and the Center for Demographic Research (CDR) at California State University, Fullerton to ensure that the 2014 Orange County Projections (OCP) and its updates were included in the 2016 RTP/SCS. In addition, we appreciate that all entitlements, development agreements, and projects recently completed or under construction, as provided to you in our July 10, 2015 correspondence, were properly reflected in the 2016 RTP/SCS growth forecast.

1

Again thank you for the opportunity to comment, and we look forward to working with SCAG and CDR on any future growth forecast needs.

Sincerely,

Gayle Ackerman, AICP
Director of Development Services

Anita Au

From: Lijin Sun
Sent: Monday, February 1, 2016 5:23 PM
To: Anita Au
Subject: FW: City of Mission Viejo PEIR Comments

From: Daniel Tran
Sent: Monday, February 01, 2016 5:18 PM
To: Lijin Sun
Cc: Courtney Aguirre
Subject: RE: City of Mission Viejo PEIR Comments

Courtney saved it on the M:Drive at around 3:30pm today so I am assuming around that time, but if you need exact time I would ask her.

Daniel Tran
Associate Regional Planner
SOUTHERN CALIFORNIA ASSOCIATION OF GOVERNMENTS
818 West 7th Street, 12th Floor, Los Angeles, CA 90017
T: (213) 236-1883 | F: (213) 236-1963
E: tran@scag.ca.gov

Stay Connected 

From: Lijin Sun
Sent: Monday, February 1, 2016 5:11 PM
To: Daniel Tran <tran@scag.ca.gov>
Cc: Courtney Aguirre <Aguirre@scag.ca.gov>
Subject: RE: City of Mission Viejo PEIR Comments

What time did the City of MV come in?

From: Daniel Tran
Sent: Monday, February 01, 2016 5:03 PM
To: Lijin Sun
Cc: Courtney Aguirre
Subject: City of Mission Viejo PEIR Comments

Hi Lijin,

The City of Mission Viejo had comments pertaining to the PEIR. Please see attached.

Daniel Tran
Associate Regional Planner
SOUTHERN CALIFORNIA ASSOCIATION OF GOVERNMENTS
818 West 7th Street, 12th Floor, Los Angeles, CA 90017
T: (213) 236-1883 | F: (213) 236-1963
E: tran@scag.ca.gov

Stay Connected    



City of Mission Viejo

Office of the City Manager

Frank Ury
Mayor

Wendy Bucknum
Mayor Pro Tem

Greg Rath
Council Member

Edward Sachs
Council Member

Cathy Schlicht
Council Member

January 28, 2016

Mr. Hasan
Ikhrata *Executive*
Director
Southern California Association of Governments
818 West Seventh Street, 12th Floor Los Angeles,
California 90017-3435

Subject: City of Mission Viejo Comments on the Draft 2016 Regional Transportation Plan/Sustainable Communities Strategy and Program Environmental Impact Report

Dear Mr. Ikhrata:

The City of Mission Viejo appreciates the opportunity to review and comment on the Southern California Association of Governments' (SCAG) draft 2016-2040 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS) and the associated draft Program Environmental Impact Report (PEIR).

In providing these comments, the City of Mission Viejo values the opportunities that SCAG has provided to elected officials and to technical staff, to discuss and receive clarification on preliminary questions and issues relating to the draft RTP/SCS documents.

The City of Mission Viejo comments are as follows:

- 1) **Support for the RTP/SCS Comments Submitted by OCTA and OCCOG:**
The City of Mission Viejo supports the comments on the draft 2016 RTP/SCS and draft Program EIR, as outlined in the Orange County Transportation Authority's (OCTA) January 11, 2016 comment letter and the Orange County Council of Government's (OCCOG) January 28, 2016 comment letter. These comments identify policy and technical issues that are of concern to Orange County, and the City of Mission Viejo respectfully requests that SCAG respond to the comments detailed in said referenced transmittals. 1

- 2) **RTP/SCS Growth Forecasts:**
 - a) **2016 RTP/SCS:** The 2016 RTP/SCS incorporates a growth forecast for the City of Mission Viejo that the City of Mission Viejo has reviewed, corrected, and fully supports. Our review concludes that the 2016-2040 RTP/SCS growth forecast accurately reflects the amount and distribution of population, households and employment at the citywide and traffic analysis zone levels for the City of Mission Viejo, from Year 2012 (Existing) through Year 2040. 2

Further, the 2016-2040 RTP/SCS growth forecast accurately reflects the amount and location of all residential and non-residential entitlements, development agreements, and projects

recently completed and constructed within the City of Mission Viejo during the plan timeframe.

The City of Mission Viejo thus fully supports the 2016-2040 RTP/SCS growth forecast, and fully supports the adoption of this growth forecast at a geographic level no lower than the jurisdictional level.

- b) Program EIR Project Alternatives: Intensified Land Use Alternative: The draft Program EIR for the 2016 RTP/SCS also includes a discussion and analysis of 2016 RTP/SCS plan alternatives, including an Alternative 3: Intensified Land Use Alternative. The draft Program EIR identifies the Intensified Land Use Alternative as the Environmentally Superior Alternative, an alternative that is expected to generate the fewest adverse environmental impacts, including and as compared to the 2016 RTP/SCS Plan.

According to the draft PEIR, the Intensified Land Use Alternative comprises the same list of financially constrained transportation projects and programs that are included in the 2016 RTP/SCS. However, from a land use perspective, the Intensified Land Use Alternative incorporates a more aggressive growth forecast than the 2016 RTP/SCS. While maintaining the citywide totals of population, households and employment that is represented in the 2016 RTP/SCS Plan, the Intensified Land use Alternative is represented as a more compact growth pattern that shifts growth to existing urban centers around transit centers and activity centers.

The City of Mission Viejo has completed a review of the Intensified Land Use Alternative database at the traffic analysis zone geography, which was made available to the City on December 3, 2015 with SCAG's official release of the draft 2016 RTP/SCS documents.

Based upon a review of the database, the City of Mission Viejo cannot support the Intensified Land Use Alternative as a reasonable PEIR Alternative. The City finds that this Alternative fails to accurately reflect Existing (Year 2012) housing units and employment, and fails to incorporate approved residential and non-residential entitlements, development agreements, and projects that have been recently completed and constructed in the City of Mission Viejo. Because of these deficiencies, the development intensities and land use patterns incorporated in the Intensified Land Use Alternative are speculative, unlikely, and unrealistic.

Examples of the land use deficiencies within the PEIR Intensified Land Use Alternative include the following:

- (1) Los Alisos Apartments fSCAG TAZ 33049200J: The Intensified Land Use Alternative eliminates a 320-unit residential project, the Los Alisos Apartments, which the City identified for future growth within TAZ 33049200 after Year 2012, as part of the City's Local Input to SCAG. This project was issued building permits on 9/11/2012 and finalized for occupancy on 9/2/2014. This 320-unit apartment project is on-the-ground, and the development is located on an approved RHNA site that is identified in the City's certified Housing Element.

In contrast, the Intensified Land Use Alternative incrementally redistributes the household growth from this existing apartment site to 35 traffic analysis zones within the

City that represent built-out, residential communities, in addition to a traffic analysis zone near the 1-5 freeway.

- (2) Watermarke Adagio on the Green Apartments fSCAG TAZ 330301001: The Intensified Land Use Alternative eliminates a 256-unit residential project, the Watermarke Adagio on the Green Apartments, which the City identified for future growth within TAZ 33030100 after Year 2012, as part of the City's Local Input to SCAG. This project was approved on March 11, 2013; building permits were issued in 2013, and all the residential units were finalized for occupancy in Year 2015. These units are on the ground, and the development is located on an approved RHNA site that is identified in the City's certified Housing Element.

In contrast, the Intensified Land Use Alternative incrementally redistributes the household growth from this existing apartment site to 35 traffic analysis zones within the City that represent built-out, residential communities, in addition to a traffic analysis zone near the 1-5 freeway.

- (3) The Ridge Townhomes/Target Retail Site fSCAG TAZ 330272001: The Intensified Land Use Alternative eliminates the balance of household growth (83 households) from a 144-unit townhome site, The Ridge Townhomes, which the City identified for future growth within TAZ 33027200 after Year 2012, as part of the City's Local Input to SCAG. This project has been under construction in phases since 2011, and the remaining units were finalized for occupancy in 2013. The Ridge Townhomes are on-the-ground, and the development is located on an approved RHNA site that is identified in the City's certified Housing Element.

In contrast, the Intensified Land Use Alternative incrementally redistributes the household growth from this existing townhome site to 35 traffic analysis zones within the City that represent built-out, residential communities, in addition to a traffic analysis zone near the 1-5 freeway.

- (4) Mission Hospital Master Plan fSCAG TAZ 33032100: The Intensified Land Use Alternative eliminates growth representing approximately 851 employees from the Mission Hospital Master Plan, which the City identified for future growth within TAZ 33032100 after Year 2012, as part of the City's Local Input to SCAG. The Mission Hospital Master Plan was approved by the City of Mission Viejo City Council on 1/19/2004. Further, on 2/2/2004, the City of Mission Viejo City Council adopted Ordinance 04-224 approving Development Agreement DA2003-1 between the City of Mission Viejo and the Mission Hospital Regional Medical Center, governing the Mission Hospital Master Plan development. Mission Hospital has been securing city approvals and building and completing medical facilities consistent with the Master Plan, with the additional medical development square footage allowed pursuant to the approved Master Plan and Development Agreement.

In contrast, the Intensified Land Use Alternative fails to recognize the development entitlement allowed per the City's approved Master Plan and Development Agreement for Mission Hospital, and instead redistributes Mission Hospital's entitled growth in employment to a traffic analysis zone across the street in the Shops at Mission Viejo (TAZ 33032300) and to a traffic analysis zone near the 1-5 freeway (TAZ 33032400).

4
cntd

5

6

7

In summary, the examples provided above illustrate that the Draft EIR's Intensified Land Use Alternative is unrealistic and speculative, and is based upon a land use pattern that does not honor existing development agreements, entitlements, or areas recently constructed since Year 2012. The City of Mission Viejo thus recommends that applicable sections of the 2016 RTP/SCS and EIR add language that clarifies that the land use pattern of the Intensified Land Use Alternative was built upon a policy growth forecast that does not take into consideration existing development agreements, entitlements, and construction.

7
cntd

3) Priority and Funding Preference for Transportation Projects:

To address the significant impacts of increasing Vehicle Miles Traveled (VMT) and traffic congestion, the draft Program EIR for SCAG's 2016-2040 RTP/SCS proposes project-level mitigation measures that include language allowing for:

- a) Giving priority to transportation projects that would contribute to a reduction in vehicle miles traveled per capita [Mitigation Measure MM-TRA-1(b)]; and,
- b) Giving funding preference to improvements in public transit over other new infrastructure for private automobile traffic [Mitigation Measure MM-TRA-2(b)].

The City of Mission Viejo recommends that these project selection and funding priority provisions in Mitigation Measure MM-TRA-1(b) and Mitigation Measure MM-TRA-2(b) be deleted, unless the language in these provisions is modified to recognize that they would only be considered if they are found by the Lead Agency to be appropriate and consistent with local transportation priorities.

The language in these provisions implies a targeted emphasis towards the prioritization, selection and funding of transportation projects that, to our knowledge, has not been discussed nor endorsed by SCAG's Transportation Committee or Regional Council, as a regional strategy for the implementation of the 2016 RTP/SCS. While the 2016 RTP/SCS recognizes that safety, adequate maintenance and efficiency of operations should be the highest RTP/SCS priorities for any incremental funding in the region (page 61), the City of Mission Viejo does not recall any SCAG policy discussion or actions that would elevate project selection and funding priority to transportation projects that reduce VMT, or to public transit infrastructure over highway infrastructure.

8

Moreover, the language in these provisions fails to recognize that several counties in the SCAG region implement transportation projects and programs that are mandated through voter-approved sales tax measures (i.e., Renewed Measure M2 in Orange County), and that are identified through long-range transportation plans.

Finally, the language in these provisions could compromise the delivery of committed transportation projects, by creating opportunities for potential delay and legal challenge. To avoid these kinds of potential, unintended consequences, the City of Mission Viejo recommends that SCAG either delete these provisions in language in Mitigation Measure MM-TRA-1(b) and Mitigation Measure MM-TRA-2(b), or modify these provisions to make it clear that they are only for consideration when determined to be appropriate by the Lead Agency.

The City of Mission Viejo appreciates SCAG's work on the 2016 RTP/SCS and associated Program EIR, and welcomes the adoption of revised, final documents that incorporate the considerations, comments and recommendations as noted in this transmittal and in the January 2016 transmittals submitted by OCCOG and

&

OCTA. Should you have any questions, please do not hesitate to contact Community Development Director
City Manager

c: City of Mission Viejo City Council
Elaine Lister at 949/470-3029 or by email at elister@cityofmissionviejo.org.

Respectfully submitted by,



DENNIS WILBERG

Keith Rattay, Assistant City Manager
William Curley, City Attorney
Elaine Lister, Community Development Director
Mark Chagnon, Public Works Director
Lariy Longenecker, Planning Manager
Rich Schlesinger, City Engineer
Joe Ames, Assistant City Engineer
Philip Nitollama, City Traffic Engineer
Marnie O'Brien Primmer, OCCOG Interim Executive Director (edocog@gmail.com]
Gail Shiomoto-Lohr, GSL Associates (GSLassoc@gmail.com]
Courtney Aguirre, SCAG (RTPSCS@scag.ca.gov]



Anita Au

From: Grahn, Tom <Tom.Grahn@cityofrc.us>
Sent: Monday, February 1, 2016 1:41 PM
To: 2016 PEIR
Subject: RE: Notice of Availability for the Draft PEIR

Ping
Thank you for the opportunity to review the 2016 RTP/SCS. At this time, the City of Rancho Cucamonga does not have any comments on the Draft Program EIR for the RTP/SCS.

1

Thomas Grahn
City of Rancho Cucamonga
10500 Civic Center Drive
PO Box 807
Rancho Cucamonga, CA 91729-0807
t: 909.477.2750 ext. 4312
f: 909.477.2847
tom.grahn@cityofrc.us

From: Ping Chang, SCAG [mailto:2016PEIR=scag.ca.gov@cmail20.com] **On Behalf Of** Ping Chang, SCAG
Sent: Friday, December 04, 2015 6:01 AM
To: Grahn, Tom <Tom.Grahn@cityofrc.us>
Subject: Notice of Availability for the Draft PEIR



Email not displaying correctly? [View online version.](#)

UPDATE

on the 2016-2040 Regional Transportation Plan/Sustainable Communities Strategy

Dear Interested Parties,

The Southern California Association of Governments (SCAG) as Lead Agency, has prepared a Draft Program Environmental Impact Report (PEIR) (SCH#2015031035) in accordance with the California Environmental Quality Act (CEQA) for the proposed 2016–2040 Regional Transportation Plan/Sustainable Communities Strategy (“2016 RTP/SCS”). The Draft PEIR is available for a **60-day public review and comment period**, which **begins December 4, 2015 and ends February 1, 2016**.

To expedite the distribution process and reduce printing and postage costs, SCAG is primarily using electronic mail to notify interested parties of the availability of the Draft PEIR. Copies of the Notice of Availability (NOA), including the translated NOA in Spanish, Chinese, Korean and Vietnamese, are available at SCAG’s Los Angeles and regional offices. The Draft PEIR is available for review on SCAG’s website at:

<http://scagrtpscscs.net/Pages/Draft2016PEIR.aspx>, and at SCAG's Los Angeles office. CDs are available for review at major libraries in the region. Hard copies and CDs are also available upon request. Please direct requests and written comments on the Draft PEIR to: Attn. Ms. Lijin Sun, Senior Regional Planner, Southern California Association of Governments, 818 West Seventh Street, 12th Floor, Los Angeles, California 90017-3435. Comments may be submitted electronically to 2016PEIR@scag.ca.gov.

Two public workshops, each providing the same information, will take place at SCAG's Los Angeles office, located at 818 West Seventh Street, 12th Floor Board Room, Los Angeles, California 90017 on **Tuesday, January 19, 2016, from 2:00 p.m. to 4:00 p.m., and from 5:00 p.m. to 7:00 p.m.** Video conferencing of the public workshops will be made available at SCAG's regional offices. For more information on the public workshops and locations of SCAG's regional offices, please visit:

<http://scagrtpscscs.net/Pages/Draft2016PEIR.aspx>.

In accordance with the Americans with Disabilities Act, SCAG is committed to providing reasonable accommodations to those who are interested in participating in the public workshops. SCAG is also committed to helping those with limited proficiency in the English language by providing translation services at the workshops in accordance with Title VI of the Civil Rights Act. We ask that you provide such requests at least 72 hours prior to the workshops so that SCAG has sufficient time to make arrangements. Please contact Ms. Lijin Sun, Senior Regional Planner, at (213) 236-1882, or 2016PEIR@scag.ca.gov.

SCAG is also updating and will continue to maintain an email distribution list for the PEIR. To be added to or removed from the distribution list, request hard copies of future CEQA notices, or request general assistance, please send an email to 2016PEIR@scag.ca.gov and provide your full name, telephone number, email and mailing addresses.

Sincerely,

Ping Chang

Acting Manager

Compliance and Performance Assessment Land Use

& Environmental Planning Division

Southern California Association of Governments



818 West 7th Street, 12th Floor
Los Angeles, CA 90017
(213) 236-1800 | www.scag.ca.gov

Copyright © 2015, Southern California Association of Governments

[Unsubscribe](#)

Anita Au

From: Wright, Christopher <WrightC@san-clemente.org>
Sent: Monday, February 1, 2016 4:23 PM
To: Ping Chang
Cc: 2016 PEIR; Huasha Liu; Jianhong Sun; Courtney Aguirre
Subject: RTP/SCS/PEIR comments
Attachments: SCAGletter_CGD20160201.pdf

Dear Mr. Chang,

Attached are the City of San Clemente's comments on the 2016 RTP/SCS/PEIR. If you have any questions, please contact me.

Sincerely,
Christopher Wright
Associate Planner
Community Development
City of San Clemente
949-361-6193

174 total comments



City of San Clemente Community Development

Cecilia Gallardo-Daly, Community Development Director
Phone: (949) 361-8200; Fax: (949) 361-8309
gallardo-dalyc@san-clemente.org

February 1, 2016

Mr. Hasan Ikhata
Executive Director
Southern California Association of Governments
818 West Seventh Street, 12th Floor
Los Angeles, California 90017-3435

Subject: Comments on the Draft 2016-2040 Regional Transportation Plan/Sustainable Communities Strategy and Program Environmental Impact Report

Dear Mr. Ikhata:

The City of San Clemente appreciates the opportunity to review and provide comments on the Draft 2016-2040 Regional Transportation Plan/Sustainable Communities Strategy (2016 RTP/SCS) and Draft Program Environmental Impact Report (PEIR). The City of San Clemente commends the Southern California Association of Governments (SCAG) staff for the tremendous amount of work and effort in preparing the documents. The following general comments and recommendations are offered by the City of San Clemente on the Draft 2016 RTP/SCS, associated appendices, and the Draft PEIR. In support of this letter, please find attached more specific detailed comments from the City of San Clemente that are consistent with the comments provided by the Orange County Council of Governments (OCCOG). The City of San Clemente requests that this letter and all of its attachments be included in the public record as our collective comments on the Draft 2016 RTP/SCS, PEIR, all associated appendices and documents, and online inventory of maps.

RTP/SCS

1. Concurrence with OCTA/OCCOG comments

The City of San Clemente concurs with the comments SCAG will receive from the Orange County Council of Governments (OCCOG) and the Orange County Transportation Authority (OCTA). The City requests that SCAG respond to all of the comments detailed in the OCCOG and OCTA

letters and to act upon any changes advocated by OCCOG, of which the City is a member agency.

3 cont.

2. Growth Forecasts

Overall, the City of San Clemente supports the 2016-2040 RTP/SCS growth forecast and the adoption of the growth forecast at a geographic level no lower than the jurisdictional level. The City of San Clemente supports The Plan since the growth forecast accurately reflects Orange County's Projections dataset. The Plan growth forecast reflects entitlements, development agreements, and projects recently completed or under construction in Orange County. The City of San Clemente appreciates the ongoing coordination between SCAG and the Center for Demographic Research (CDR) at California State University Fullerton on behalf of all Orange County jurisdictions. The Orange County Projections have been used by the Orange County Transportation Authority (OCTA) in the development of its Orange County Long-Range Transportation Plan demonstrating that Orange County has integrated transportation and land use planning for decades.

4

OCCOG representatives on the Regional Council and SCAG Policy Committees repeatedly requested that the growth forecasts in the 2016 RTP/SCS and all PEIR alternatives be based on the technically corrected growth forecast submitted to SCAG in August 2015 by the CDR on behalf of all Orange County jurisdictions. Because the draft PEIR's Intensified Land Use Alternative (Alternative 3) does not include the technically corrected growth forecast for Orange County, the City of San Clemente would not support consideration of Alternative 3 as the preferred alternative.

5

3. Maintain Unbiased, Objective Tone

Language throughout the draft 2016 RTP/SCS and the associated appendices has a tendency to be leading and dramatic in its emphasis of certain key issues such as active transportation and public health. While these issues are important, it is recommended that the document utilize a more unbiased, objective tone. For example, the City of San Clemente recommends the removal of "Our Vision" and "Our Overarching Strategy" from the Executive Summary of the document. These two sections are highly speculative and are not necessary to the document. "Our Vision" and "Our Overarching Strategy" go above and beyond the requirements of the RTP. Additional examples of overly emphatic language are outlined in Attachment 1.

6

General Comments

4. “Can and Should”

As indicated in the PEIR, state law provides that it is appropriate to indicate in mitigation measures that they “can and should” be implemented where the authority to implement the measures rest with agencies other than SCAG. The language conveys to local agencies an affirmative obligation to address each mitigation measure, irrespective of whether such agencies deem the measures applicable to a particular project or duplicative of their own or other governmental agencies’ regulatory measures. The City of San Clemente recognizes SCAG’s use of the words “can and should” are derived from California Environmental Quality Act (CEQA), at Public Resources Code sections 21081 and 2155.2(b)(5)(B)(ii) and CEQA Guidelines, including section 15091(a)(2). Nevertheless, given the express limitation of SB 375 upon respective local agencies’ land use authority, the City of San Clemente deems inappropriate any language seemingly imposing affirmative obligations contrary to SB 375 inappropriate. As such, the use of the language “can and should” for mitigation measures addressed to local agencies is overreaching.

7

“Can and Should” Recommendations:

Change language in all project level mitigation measures to read “~~can and should~~ consider where applicable and feasible.” This change will clarify that the project level mitigation measures are a menu of options.

5. 500 foot “Buffer”

The Draft RTP assumes that almost no new growth will occur within 500 feet of a freeway or busy transportation corridor. The Draft RTP states that a “buffer” is consistent with the California Air Resources Board’s 2005 advisory guidance that housing be discouraged within 500 feet of high volume roadways such as freeways. It is important to note that CARB’s guidance is not a prohibition of development near high-volume roadways; nevertheless, SCAG’s “buffer” strategy eradicates growth in these areas that are otherwise rich in connections to jobs, retail and housing accessible by many transportation modes. Furthermore, the proposed “buffer” does not reflect the availability of mitigation measures to address near-roadway emissions that remain despite a dramatic reduction of diesel emissions in the last decade. At best, this strategy is a short-term response and problematic because it prevents the kind of density and proximity between land uses that actually reduce trips and associated VMT. As vehicle engines and fuels become cleaner, the “buffer” strategy will become obsolete yet will leave behind a legacy of inefficient land use patterns. Moreover, throughout the SCAG Region, the prevailing existing land use patterns include residential and sensitive receptor uses within

8

500 feet of a major transportation corridor. In many cases, these areas demonstrate compact development form and serve as affordable housing. Removing this massive portion of land from availability for use is premature and counter to the overarching principles of SB375 to locate housing near job centers and previously urbanized areas.	8 cont.
There needs to be consistency throughout all the documents regarding the 500 foot “buffer”:	9
<ul style="list-style-type: none"> • The word “buffer” should not be used. • Clarify the amount of distance (the documents have various ranges from 500 feet to 1,000 feet) 	10
<ul style="list-style-type: none"> • Clarification on where distance is measured from (e.g. centerline, edge of roadway, edge of right of way) 	11
<ul style="list-style-type: none"> • Types of transportation corridors being identified (e.g. freeways, high quality transit corridors, high volume corridors, rail etc.) 	12
<ul style="list-style-type: none"> • Clarify that the emphasis should be on mitigation, not on discouraging development. <ul style="list-style-type: none"> ○ Resolve the conflict with discouraging development within 500 feet of transportation corridors and regional goals for emission reductions. With reductions in emissions and fleet changes over time, it will be unnecessary and counterproductive to use this mitigation approach. 	13
6. Remain Neutral on Technology	
Throughout the documents, specific examples of technology are identified. It should be noted that these are only examples and that future technologies should not be ignored or excluded from meeting the goals of the RTP/SCS. This will allow the document, including mitigation measures, to be more flexible.	14
7. Roundabouts	
a. Under plan sections of LIVABLE CORRIDORS, NEIGHBORHOOD MOBILITY AREAS, LOOKING AHEAD, and “Encouraging Active Transportation for Short Trips”, include roundabouts and Intersection Control Evaluations similar to Caltrans Directive 13-02. Under Livable Corridors and neighborhood mobility areas- Change graphics to replace traffic signal with a modern day roundabout. Refer to the following resources:	15
<ul style="list-style-type: none"> • Alternative Intersections/Interchanges: Informational Report (AIIR) 	
<ul style="list-style-type: none"> • FHWA Roundabout Website (http://safety.fhwa.dot.gov/intersection/roundabouts/) 	

- [Roundabouts: An Informational Guide, Second Edition \(NCHRP Report 672\) \(.pdf file\)](http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_672.pdf) 15 cont.
- b. To address all the goals mentioned in the plan, the plan should include a strategy to replace traffic signals with modern day roundabouts where feasible. This one action would do more to further the principal goals mentioned in this Plan more than any other strategy mentioned. 16
- c. Under MOBILITY INNOVATIONS – include in the white paper the analysis and benefits of replacing traffic signals and all way stops with roundabouts. 17
- d. Include Roundabout Intersection Evaluation projects in the project list throughout SCAGs communities. 18
- e. Evaluate the potential environmental benefits of implementing roundabouts. 19

PEIR

8. PEIR Mitigation Measures

- a. Please state that in the event a state law referenced in the mitigation measure is updated or changed, the most current state law requirements prevails. 20
- b. For all “Project-level Mitigation Measures”, replace the word “require” with “encourage” or “it is recommended”. Examples include: MM-AES-3(b), MM-Air-2(b), MM-Air-4(b), MM-BIO-1(b), MM-BIO-2(b), MM-BIO-3(b), MM-BIO-4(b), MM-BIO-5(b), MM-GHG-3(a)(11), MM-TRA-1(b), MM-TRA-2(b), MM-USS-6(b) 21
A redline version identifying the location of the exact language is provided in the matrix of comments in Attachment 1.
- c. Priority and Funding Preference for Transportation Projects:
To address the significant impacts of increasing Vehicle Miles Traveled (VMT) and traffic congestion, the draft Program EIR for SCAG’s 2016 - 2040 RTP/SCS proposes project-level mitigation measures that include language allowing for: 22
 - 1) Giving priority to transportation projects that would contribute to a reduction in vehicle miles traveled per capita [Mitigation Measure MM-TRA-1(b)]; and,
 - 2) Giving funding preference to improvements in public transit over other new infrastructure for private automobile traffic [Mitigation Measure MM-TRA-2(b)].

Please delete these provisions in Mitigation Measure MM-TRA-1(b) and Mitigation Measure MM-TRA-2(b), unless the language in these provisions is modified to recognize that they would only be considered if they are found by the Lead Agency to be appropriate and consistent with local transportation priorities.

The language in these provisions implies a specific emphasis towards policy consideration to the prioritization, selection and funding of transportation projects that, to our knowledge, has not been discussed nor endorsed by SCAG's Transportation Committee, or Regional Council, as a regional strategy for the implementation of the 2016 RTP/SCS.

Moreover, the language in these provisions fails to recognize that several counties in the SCAG region implement transportation projects and programs that are mandated through voter-approved sales tax measures (i.e., Renewed Measure M2 in Orange County), and that are identified through long-range transportation plans.

Finally, the language in these provisions could compromise the delivery of committed transportation projects, by creating opportunities for potential delay and legal challenge. To avoid these kinds of potential, unintended consequences, we request that SCAG either delete these provisions, or modify these provisions to make it abundantly clear that they are only for consideration when determined to be appropriate by the Lead Agency.

22 cont.

9. Fees and Taxes

Several mitigation measures indicate that local jurisdictions or other entities should implement new fees or propose taxes to pay for a variety of programs or for acquisition of land for preservation. Increases to fees or taxes are issues that could require voter approval, and therefore it should not be assumed that they will be approved.

Fees and Taxes Recommendations:

- a. Reword measures to indicate that a new or increased fee, new tax, or other increase is only an option as a way to implement the mitigation.
- b. Clarify whether it was assumed that these additional fees were considered feasible and if the new fees that are suggested were considered in the financial plan or economic analysis of the RTP.

23

10. Duplicative/Existing Regulations

It is noted that many of the mitigation measures are duplicative of existing regulation or processes (e.g. CEQA review requirements). Under CEQA,

24

it is intended that measures be identified that will mitigate impacts of the project. Existing regulations are already assumed to be abided by in the evaluation of the impact, and the significance of the impact is after all existing regulation is applied. Therefore, mitigation measures should address those actions that need to be undertaken in addition to existing regulation in order to mitigate the impact. Therefore, mitigation measures that simply restate existing regulation are not valid mitigation for purposes of CEQA. Further, it is possible for regulations to change over time. Because of this, restatement of the regulation in the mitigation measures could result in future conflict between the stated mitigation and regulation. It has become common practice to state that existing regulation will be implemented. When this is done, it is common practice when compliance is used as a mitigation measure to simply state that the responsible entity will simply comply with the regulation. If mitigation measures that restate existing regulation are not removed, then it is requested that the wording of the measures be restated to simply read that compliance with all applicable laws and regulations will be undertaken. Language that could be used is: “Local jurisdictions, agencies, and project sponsors shall comply, as applicable, with existing federal, state, and local laws and regulations.” Similar language is included in some mitigation measures.

24 cont.

Examples of existing regulations included as mitigation measures are found within the Hydrology section of the draft PEIR. For example, Section 3.10.6, Mitigation Measures (page 3.10-56): Parts of this section list mitigation measures that are already being required by municipal storm water programs across the region. Instead of listing specific mitigation measures, the PEIR should make reference to these programs. In Orange County, for example, this program is detailed in the DAMP/Model WQMP. The Model WQMP describes the process that cities and County employ for requiring a WQMP, which is a plan for minimizing the adverse impacts of urbanization on site hydrology, runoff flow rates, and pollutant loads at the project level. A reference to the Model WQMP and equivalent documents in the region's other counties, should replace the last ten bullet points of section MM-HYD-1(b).

Additionally, there are specific mitigation measures included in the Hydrology section that may be in conflict with Storm Water Permits issued by Regional Water Quality Control Boards. In the SCAG region, there are five water quality control boards each with its own Municipal NPDES Storm Water Permit. The regulations and requirements contained in these permits vary from each other. By listing specific measures in the PEIR that are not included in a project's applicable Municipal NPDES Storm Water Permit, the PEIR creates conflicting compliance requirements. To eliminate potential conflict with existing regulations, the mitigation measures regarding specific BMPs should be removed and replaced with a single requirement that each project must comply with its applicable Municipal NPDES Storm Water Permit.

25

The City of San Clemente appreciates your consideration of all the comments provided in this letter and its attachments and looks forward to your responses. It is a shared goal to have a Regional Transportation Plan and Sustainable Communities Strategy adopted on April 7, 2016 that represents the best in regional planning developed collaboratively with local jurisdictions and stakeholders in a manner that is credible and defensible on all levels. If you have any questions, please do not hesitate to contact me.

Sincerely,



Cecilia Gallardo-Daly
Community Development Director

Enclosures

Attachment 1: Detailed Comments on the RTP/SCS, PEIR, and related Appendices

cc: City Council
James Makshanoff, City Manager (email)
Eric Sund, Assistant City Manager (email)
Bill Cameron, Director of Public Works (email)
Jim Pechous, City Planner (email)
Christopher Wright, Associate Planner (email)
Marnie Primmer, Interim Executive Director OCCOG (email)
Naresh Amatya, Acting Director, Transportation Planning, SCAG (email)
Huasha Liu, Director, Land Use & Environmental Planning, SCAG (email)
Linjin Sun, Senior Regional Planner, SCAG (email)
Courtney Aguirre, SCAG (email)

ATTACHMENT 1

Detailed comments on RTP/SCS, PEIR, & related appendices

Same table as in OCCOG
Original Letter

2016 RTP/SCS

"2016 RTP/SCS" Table Comments 1-48

#	TOPIC	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
1	General Comment	p.2	Delete Our Vision & Our Overarching Strategy strategies. These sections are highly speculative and not necessary for the rest of the document.
2	Clarification	p.3, column 2, bullet 5	"Millions of people are in poor health... Millions of more people live with chronic diseases, such as asthma, every day." Define 'poor health' Cite numbers or share of population for region instead of saying "millions". Provide reference to what chronic diseases include.
3	Clarification	P. 4, column 2, paragraph 2	"Among the milestones: a one-year demonstration of the tolled Express Lanes in Los Angeles County along Interstate 10 and Interstate 110 was made permanent in 2014..."
4	Clarification	p. 7, column 2, paragraph 1	"In many instances, the additional these <u>chargers will create the opportunity to increase</u> may double the electric range of PHEVs, reducing vehicle miles traveled that produce tail-pipe emissions."
5	Clarification	p. 13, column 2, paragraph 2	"Since 2009, every MPO <u>in California</u> has been required to develop a Sustainable Communities Strategy...Once implemented along with the rest of the Plan, it will improve the <u>overall</u> quality of life for all residents of the region."
6	Clarification	p. 13, column 2, paragraph 3	"But these advances in mobility also have the potential to help Baby Boomers, <u>and the generations that follow them,</u> maintain their independence as they age."
7	Clarification	p. 14, column 1, paragraph 2	"In Southern California, striving for sustainability <u>includes</u> will require achieving state-mandated targets for reducing greenhouse gas emissions from vehicles and federal air quality conformity requirements, and also adapting wisely to a changing environment and climate."
8	Clarification	p. 14, column 2, paragraph 5	"It is particularly important that the Plan consider <u>and minimize</u> the <u>negative impacts</u> consequences of transportation projects, <u>especially</u> on low-income and minority communities and minimize negative impacts. "

#	TOPIC	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
9	Clarification	p. 16, column 2	<p>“2. Collaborating with Member Agencies, Jurisdictions and Stakeholders. Implementing the Plan will require SCAG to continue working closely with its <u>all jurisdictions member agencies...</u>”</p> <p>“The agency will also have to work with key stakeholders to ensure the Plan benefits the economy and promotes <u>ensures</u> social equity. To ensure that the region makes progress on its goals, SCAG will monitor its own progress toward achieving its targets and will share this information with <u>its relevant partners and the public.</u>”</p>
10	Clarification	p. 20, column 1, paragraph 3	<p>“However, of the remaining developable land, only a small portion of it can be developed <u>as transit-ready infill sustainably</u> – meaning it can be reached via planned transit service and that it can readily access existing infrastructure (water resources, sewer facilities, etc.). According to SCAG <u>land use data collected by SCAG</u>, only two percent of the total developable land in the region is located in High Quality Transit Areas (HQTAs). A more compact land development strategy is needed, which will be discussed in Chapter 5.”</p>
11	Clarification	p. 20, column 1, paragraph 4	<p>“SCAG supports the fact that local jurisdictions conduct much of the planning for land use in our region. However, aAs the agency prepared the 2016 RTP/SCS, it needed to organize the many different <u>land use types and classifications of land uses in...</u>”</p>
12	Clarification	p. 20, column 1, paragraph 5	<p>“To accurately represent land uses throughout the region, SCAG aggregated reviewed information from jurisdictions and simplified the types and classifications of land use <u>into a consolidated set of land use types</u>. The agency <u>then converted these consolidated land uses into identified</u> 35 “Place Types”... the Urban Footprint <u>Scenario Sustainability Planning Model (SPM), to demonstrate which guided and evaluated</u> urban development in the Plan in terms of form, scale and function in the built environment.”</p>
13	Clarification	p. 20, column 2, paragraph 2	<p>“SCAG then <u>classified sorted</u> the 35 Place Types into three Land Development Categories. The agency used these categories to: describe the general conditions that exist and/or are likely to exist within a specific area; SCAG did not intend to have them represent detailed policies for land use, development or growth. Rather, they and reflect the varied conditions of buildings and roadways, transportation options, and the mix of housing and employment throughout the region.”</p>

#	TOPIC	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
14	Clarification	p. 21, column 1, paragraph 3	<p>Conversely, s Some areas, especially near the edge of existing urbanized areas, do not have plans for conservation and <u>may be slated for development</u> are susceptible to development pressure. ... – meaning these are areas that are home to a high number of species and serve as highly functional habitats.”</p> <p>“Some key habitat types are underrepresented within the 35 percent of the region already under protection.” Clarify why does there need to be an equal share of types of protected land? If not, delete sentence.</p>
15	Clarification	p. 22, column 1, paragraph 1	<p>“However, although these housing units are planned and zoned for, historical data shows that less than ten percent of the needed affordable housing has been built. In contrast, housing construction measured by building permits issued meets nearly 90 percent of projected market rate housing needs.”</p> <p>What is the data source that reports on building finals by income category? What is the time frame for the “less than ten percent”? What is the time period for the data on the market rate housing?</p>
16	Clarification	p. 22, column 2, paragraph 1	“... of our region’s jurisdictions have <u>certified</u> adopted housing elements.”
17	Define	p. 22, column 2, paragraph 3	Define “high quality” housing
18	Define	p. 23, Figure	Define “demand response” in “Passenger Miles by Mode” figure
19	Clarification	p. 25, column 2, paragraph 2	“This network includes fixed-route local bus lines, community circulators, express and rapid buses, Bus Rapid Transit (BRT), demand response <u>paratransit</u> , ³ light rail transit, heavy rail transit (subway) and commuter rail. ⁴ ”
20	Clarification	p. 26, column 1, paragraph 2	“ <u>Transit users directly</u> typically pay <u>about 25</u> percent of the operating and maintenance cost of their travel, with the remaining 75 percent paid for by state and local public subsidies. Most capital expenditures are also funded <u>through various taxes and</u> with public subsidies, including a larger share of federal grants.”

#	TOPIC	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
21	Clarification	p. 28, column 1, paragraph 2	<p>"The regional bike network is <u>expanding</u> evolving but remains fragmented. Nearly 500 additional miles of bikeways were built since SCAG's 2012 RTP/SCS, but only 3,919 miles of bikeways exist regionwide, of which 2,888 miles are bike paths/ lanes (see EXHIBIT 2.3). This is compared with more than 70,000 roadway lane miles. One way to quantify bikeway quality and density is to calculate a ratio of bike path to lane miles. SCAG's ratio of bike path/lane miles ratio is 0.039. To put this in perspective, Portland, Oregon and San Francisco have bike path/lane ratios to lane miles at 0.054 and 0.078, which are 38 percent and 100 percent higher than the SCAG region, respectively. Our region's lack of consistent infrastructure discourages all but the most fearless people to bike."</p> <p>Comment: There is typically only one bike lane in each direction whereas there could be multiple traffic lanes in each direction. It is not appropriate to compare lane miles to bike lane miles. Comparison, if any, should be to centerline miles. Comparison of bike path/lane miles ratio for SCAG region to individual cities is not appropriate.</p>
22	Clarification	p. 28, column 1, paragraph 2	<p>"Most walk trips (83 percent) are less than one half mile; walkers are <u>less likely to travel</u> often discouraged from traveling farther. Routes to <u>bus stops</u> and stations are often..."</p>
23	Delete	p. 33, column 1, paragraph 2	<p>"A significant amount of travel in the region is still by people who choose to drive alone (42 percent of all trips and nearly 77 percent of work trips). So, the challenge of getting individuals to seek more environmentally friendly alternatives of travel remains."</p>
24	Clarification	p. 54, column 2, paragraph 4	<p>Certainly, tThe overall quality of life <u>is expected to will</u> increase for many people."</p>
25	Clarification	p. 55, column 1, paragraph 3	<p>"Chronic diseases including heart disease, stroke, cancer, chronic lower respiratory disease and diabetes are responsible for 72 percent of all deaths in our region. Millions of more people live with chronic diseases every day."</p> <p>Cite number and source or delete sentence.</p>
26	Clarification	p. 56, column 1, paragraph 1	<p><u>"California is experiencing o</u>Ongoing drought conditions, water shortages due to less rainfall as well as declining snowpack in our mountains, and an agriculture industry in crisis have become hard realities in recent years."</p>
27	Clarification	p. 61, column 1, paragraph 2	<p>Add statement that says <u>"These preliminary scenarios are not the ones modeled in the PEIR."</u></p>

#	TOPIC	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
28	Clarification	p. 64, column 1, paragraph 1	Clarification should be made that attendance was self-selected as was the survey participation. Attendees were strongly encouraged by SCAG staff to fill out a survey. A more detailed description should be included that explains that these results are not scientific.
29	Clarification	p. 64, column 2, paragraph 2	<p>“...was also a principal concern, as was access to healthy food.”</p> <p>What percentage of respondents elevates an item to a ‘principle concern’?</p>
30	Clarification	p. 64, column 2, paragraph 4	<p>“Collectively, the survey responses offered an invaluable guide to help finalize the Plan’s investments, strategies and priorities. They reflect how regional stakeholders want us to address priority areas such as transit and roadway investments, system management, active transportation, land use and public health.”</p> <p>Did the survey responses change the Plan? Clarify if a higher priority in making changes was afforded to survey respondents’ feedback over jurisdictional and CTC input?</p>
31	Clarification	p. 65, column 1, paragraph 4	<p>“Jurisdictions were asked to provide input on the growth scenario, including information on specific planned development projects with entitlements, other planned projects, or recently completed developments.”</p> <p>Comment: During the local input process, SCAG requested feedback on the distribution of new households and employment. SCAG did not request information from jurisdictions on specific planned development projects with entitlements, other planned projects, and recently completed developments. During review of the draft policy growth forecast (PGF) in summer 2015, technical errors throughout the draft PGF were identified. These “technical errors” in the dataset were that entitlements, development agreements, and projects currently under construction or recently completed were not properly reflected. It was then that SCAG stated that jurisdictions could provide the information if jurisdictions wanted corrections made to the PGF.</p>

#	TOPIC	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
32	Clarification	p. 65, column 2, bottom note	<p>“*With the exception of the 6 percent of TAZs that have average density below the density range of local general plans.”</p> <p>Please clarify the footnote. Did SCAG lower the growth or is General Plan buildout expected after 2040?</p>
33	Clarification	p. 70, column 1, paragraph 1	<p>“In addition, local jurisdictions <u>are encouraged to</u> should pursue the production of permanent affordable housing through deed restrictions or development by non-profit developers, which will ensure that some units will remain affordable to lower-income households.”</p>
34	Clarification	p. 70, Table 5.1	Add note to table “Adopted in 2013”
35	Define	p. 73, column 2, paragraph 4	Define “riparian”
36	Clarification	p. 76, paragraph 1	How many of these trips are alone vs. with others? Are these linked trips/trip segments?
37	Clarification	p. 76, paragraph 3	The narrative implies that Neighborhood Mobility Areas (NMAs) are needed for Neighborhood Electric Vehicles (NEVs). If this is not true, reword section to allow for flexibility that one is not tied to another exclusively.
38	Clarification	p. 77	Figure needs title
39	Clarification	p. 79, Figure 5.2	Clarify if the preservation and operations expenditures apply to the SCAG region or California State.
40	Clarification	p. 83, column 2, paragraph 5	<p>“Bus lanes are even more effective at increasing speeds, however in our region there is a dearth of such lanes. Transit agencies should heavily lobby <u>SCAG encourages transit agencies and local jurisdictions in which they operate to implement them, where appropriate at least for peak period operation.</u>”</p>
41	Clarification	p. 88, column 1, paragraph 4	<p>“The 2016-Active Transportation <u>portion of the 2016 Plan updates the 2012 Active Transportation Plan...</u>”</p>
42	Clarification	p. 89, column 2, paragraph 2	<p>“SCAG has <u>identified</u> developed 12 regionally significant bikeways that connect the region.”</p>
43	Clarification	p. 92, column 1, paragraph 2	<p>“The launch date coincided with the <u>end of daylight savings time</u> decline in daylight hours, a period when bicycle and pedestrian collisions peak during the year.”</p>
44	Define	p. 93, column 1, paragraph 4	Define “no-maintenance exercise spots”
45	Clarification	p. 103, column 1, paragraph 3	<p>“...figure “2040 Airport Demand Forecasts” on the previous page...”</p> <p>Properly label figure and page reference.</p>

#	TOPIC	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
46	Clarification	p. 105, column 1, paragraph 1	<p>"In recent years, airport operators, CTCs and SCAG have all undertaken their own initiatives to improve ground access at the region's aviation facilities."</p> <p>Clarify what initiatives SCAG has undertaken.</p>
47	Clarification	p. 111, column 1, paragraph 2	<p>"Building on its strong commitment to the environment as demonstrated in the 2012 RTP/SCS, SCAG's mitigation program is intended to function as a resource for lead agencies to consider in identifying mitigation measures to reduce impacts anticipated to result from future <u>transportation</u> projects as deemed applicable and feasible by such agencies."</p>
48	Clarification	p.111-119 & PEIR	Update language on the mitigation measures to be consistent with any language changes to the PEIR document.

"Active Transportation Appendix"
Table Comments 1-14

ACTIVE TRANSPORTATION APPENDIX

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
1	General Comment	all	<p>Needs to include statement saying that pedestrians and bikes are also responsible (e.g. distracted walking by cell phones; bikers with headphones) and isn't always vehicles as cause</p> <p>Everyone needs to be educated and follow the rules and enforcement needs to happen for all modes</p>
2	General Comment	all	Acknowledge the improvement over time of AT usage and the lowering of accident and death rates
3	Clarification	p. 5	<p>"Class I Bikeways</p> <p>...A Class I Bikeway provides a completely separated <u>right-of-way</u> designated for the exclusive use of bicycles and/or pedestrians with cross flows by motorists minimized. Some of the region's rivers include Class 1 Bikeways. Increasing the number of bikeways in <u>along</u> rivers, <u>utility corridors</u>, and <u>flood control channels</u> may provide additional opportunities for "interested but concerned" cyclists."</p>
4	Clarification	p.6, column 1	<p>"INTERSECTION TREATMENTS</p> <p>...In the SCAG region, nearly 44 percent of all pedestrian injuries are at intersections."</p> <p>Define how far away from the intersection an accident may occur to be included in the count of pedestrian injuries at intersections</p>

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
5	Clarification	p.6, column 1	<p>“COMPLETE STREETS</p> <p>In recognition of the need to accommodate various types and needs of roadway users, the State of California adopted the Complete Streets Act of 2008 (AB 1358) requiring cities and counties to incorporate the concept of Complete Streets to any general plan’s <u>substantive update to their General Plan’s circulation element.</u>”</p>
6	Clarification	p.8, column 1	<p>“COLLISIONS AND FATALITIES</p> <p>While the numbers of bicyclists and pedestrians are increasing, so are injuries and fatalities, although not as fast as the growth in active transportation. In California, 64,127 pedestrians were injured and 3,219 were killed between 2008 and 2012. In 2012 alone, 702 pedestrians were killed and 13,280 pedestrians were injured <u>and 702 pedestrians were killed.</u>”</p>
7	Clarification	p. 17, Table 5	Create separate tables for columns 1 to 3 and columns 3 to 10.
8	Define	p. 24, column 1, paragraph 1	<p>“2012 RTP/SCS PROGRESS</p> <p>The 2016 Active Transportation <u>portion of the Plan</u> ...The Plan examined access to transit, noting that 95 percent of SCAG residents would be within walking (0.5 mile) or biking (2 mile) distance from a transit station.”</p> <p>Define what constitutes a ‘transit station’</p>
9	Clarification	P. 25, second column, top bullet (last under #4)	<p>“Success of this program depends on cities and counties conducting these counts and providing the data to SCAG.”</p> <p>Identify funding source and acknowledge that this is voluntary effort and may not be a priority, especially without funding</p>
10	Add bullet	P. 25, second column, Bullet 6	Add 4 th bullet under #6: <u>“OCCOG is working on a comprehensive Complete Streets design manual for the entire county which will be completed in 2016.”</u>
11	Correction	P.26, Table 9	Change language for Orange County: Not yet Planned. In Process
12	Clarification	p. 27, column 1, and any other references	Clarify that the ‘2016 Action Transportation Plan’ is not a standalone plan, but is a portion within the RTP.
13	Clarification	P.66-67, Tables 16 & 17	Add note to Table: “These draft scenarios are not the alternatives that were evaluated in the PEIR.”

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
14	Clarification	P. 71	Delete "Strategic Plan Beyond 2040" section. The inclusion of this section is not consistent with other appendices. It creates confusion as to what the RTP's Strategic Plan is.

"Demographics/Growth Forecast"
Appendix Comments 1-2

DEMOGRAPHICS/GROWTH FORECAST APPENDIX

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
1	General Comment	All	Label Y axis on all figures
2	Clarification	P. 2, column 1, paragraph 3	Add text: " <u>The forecasted land use development patterns shown are based on Transportation Analysis Zone (TAZ) level data utilized to conduct required modeling analyses. Data at the TAZ level or at a geography smaller than the jurisdictional level are advisory only and non-binding, because SCAG sub-jurisdictional forecasts are not to be adopted as part of the 2016 RTP/SCS. The advisory sub-jurisdictional data shall not be required for purposes of qualifying for future grant funding or other incentives or for determining a proposed project's consistency with the 2016 RTP/SCS for any impact analysis required pursuant to the California Environmental Quality Act (CEQA).</u> "

"Goods Movement" Appendix
Comment 1

GOODS MOVEMENT

#	TOPIC	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
1	Clarification	p. 4, Exhibit 2	Exhibit is labeled warehouse & distribution centers but shows manufacturing firms total employment. Correct.

"Performance Measures" Appendix
Comments 1-4

PERFORMANCE MEASURES APPENDIX

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
1	Clarification	P.8-10, Table 4	Label all Performance Measures that were new in 2016 Plan
2	Clarification	P.11	Add definition of HQTAs to map.
3	Clarification	p.20	LSPT was used for 2012 RTP. Add information on the SPM.
4	Clarification	p. 31, Table 12	Add model sources to bottom of table.

PUBLIC HEALTH APPENDIX

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
1	General Comment	All	Final document should contain hyperlinks to other documents.
2	General Comment	All	Spell out Acronyms in Tables/Figures Titles e.g. CHIS
3	Clarification	p.1, column 1	"Public health is increasingly an area of emphasis for Metropolitan Planning Organizations (MPOs) and Departments of Transportation (DOTs) across the country, have an opportunity to impact due to the prevalence of chronic diseases such as obesity, hypertension, asthma and heart disease through transportation planning which promotes increased physical activity."
4	Clarification	p.2, column 1	Introduction- first paragraph sentence beginning with "Public health outcomes are the product of Social Determinants of Health....." consider adding "and other factors.
5	Clarification	p.1, column 2	"Climate Adaptation: Support efforts to prevent <u>mitigate</u> -climate change and make the region more resilient to future changes with reductions in VMT and greenhouse gas emissions."
6	Correction	p.2, Figure 1	Arrows should go both ways.
7	Clarification	p.3, column 1, paragraph 2	"Evidence shows that healthier lifestyles and improved air quality can improve outcomes, and built environment factors <u>and related conditions</u> can play a role in supporting healthy behaviors."
8	Clarification	p.3, column 2, paragraph 3	"Access to healthy food environments such as grocery stores, farmers' markets and community gardens decreases <u>can play an important role in</u> food insecurity and obesity."
9	Define	p.7, column 1, first line	Define "weather insurance"
10	Clarification	p.7, column 2, paragraph 2	"... Providing access to <u>education and job training aligned with job opportunities in the region</u> jobs with a living wage is critical to ensuring communities become and stay healthy."
11	Clarification	p.7, column 2, paragraph 3	"...Creating infrastructure <u>policies and community conditions</u> and facilities that encourage active transportation such as biking and walking provides opportunities for residents to increase their daily physical activity."
12	Clarification	p.8, paragraph 3	Consider adding the recommendations for children which has a higher standard of one hour per day. This is valuable as jurisdictions look at health co-benefits of safe routes to school infrastructure changes and related programming.

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
13	Clarification	p.9, all figures	Recommend using the more current 2014 data. Also, it might be helpful to look at these metrics on a smaller level of geography and/or by poverty and/or by race/ethnicity. Especially since there are often funding set asides to reach disadvantaged communities, it might be interesting to see what each of these indicators looks like at a more refined level. The need is not equally distributed throughout any jurisdiction.
14	Clarification	p.9	Add table with data for walking.
15	Clarification	p.10, column 2	Consider including funding as both a challenge and an opportunity.
16	Clarification	p.10, column 1, last sentence	"Much of our local arterial system is also in need of pavement improvements, as local roadways in the SCAG region average a score of 69 out of 100 in the Pavement Condition Index (PCI), where a score of 70 or less typically translates to conditions that are <u>inadequate more costly to repair.</u> "
17	Clarification	p.10, column 2, paragraph 4	"With more than 18 million people, 191 cities, six counties and hundreds of local and regional agencies, Southern California is one of the most complex regions on earth <u>a diverse region</u> . Within the region, health outcomes vary widely based on <u>many things, such as geography, income and race.</u> "
18	Clarification	p. 15, column 2, paragraph 3; & throughout all	"500 foot buffer"- be consistent with usage and description throughout all documents in whether this is adjacent to just freeways or freeways, rail, and high frequency transit corridors.
19	Clarification	p. 16, column 1, paragraph 1	"Region-wide, about ten percent of the land area within HQTAs is also within the 500 feet foot buffer of the freeway. To balance regional policy goals, the Plan accommodates the vast majority of growth within HQTAs <u>but beyond outside of the 500 feet buffer</u> of freeways..."
20	Clarification	p. 17, column 1	"Water Consumption" and "Land Consumption" Specify the time period for the change or difference in numbers. Compare this to 2040 Baseline.
21	Clarification	p. 19, column 2	"Public Health Work Program" Clarify if this work program was approved by the RC or SCAG staff is pursuing these tasks under direction of RC to incorporate more public health into RTP.

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
22	Clarification	p. 22-29	Are these all “best practices” or are they local examples of promising practices? Since some of these are in process, are the results there to show that this particular practice has proven efficacy over another? These may have the potential to be best practices. If the project is based upon a best practice, it is recommended to link to the best practice so other jurisdictional leaders could consider for replication. If it is not already a proven practice, suggest calling it something different such as “local promising practices”. Add the Complete Streets Guidelines that are being developed in Orange County (which integrates in best practices.)

"SCS Background Documentation"
Appendix Comments 1-11

SCS BACKGROUND DOCUMENTATION APPENDIX

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
1	Clarification	P.42-43	How do the SPM Place Types nest into the Land Development Categories?
2	General Comment	All maps	“Note: The forecasted land use development patterns shown are based on Transportation Analysis Zone (TAZ) level data utilized to conduct required modeling analyses. Data at the TAZ level or at a geography smaller than the jurisdictional level are advisory only and non-binding, because SCAG sub-jurisdictional forecasts are not to be adopted as part of the 2016 RTP/SCS. <u>The advisory sub-jurisdictional data shall not be required</u> should not be used for purposes of <u>qualifying for future grant funding or other incentives.</u> The data is controlled to be within the density ranges of local general plans and/or input received from local jurisdictions. the purpose of <u>or for determining a proposed project’s consistency with the 2016 RTP/SCS for any impact analysis required pursuant to the California Environmental Quality Act (CEQA) streamlining, lead agencies have the sole discretion in determining a local project’s consistency with the 2016 RTP/SCS.”</u>
3	Clarification	p.6/43	Move the definitions of Urban, Compact Walkable, and Standard Suburban from page 43 to page 6 before the maps
4	Clarification	p. 41, column 1, paragraph 4	“Scenario modeling with UrbanFootprint brings meaningful, comprehensible, and timely results to those <u>local jurisdictions</u> wanting to understand how growth and development choices will impact their community, city, or region in the coming years and decades.”

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
5	Correction	p. 41, column 2, paragraph 2	"Since 2012... Developers of UrbanFootprint have also met with regional agencies, such as SCAG, Sacramento Area Council of Governments (SACOG), and San Diego Association of Governments (SANDAG); Orange County Council of Governments (OCCOG). "
6	Clarification	p. 50, 51, 54, 56 maps	Clarify in map legends if growth refers to population, housing and/or employment.
7	Correction	p. 56 column 1, last paragraph	"The scope of these four scenarios were developed in early 2015 by SCAG and their consultant and shared, which were developed in consultation with the CEHD Committee and the SCAG's Technical Working Group (TWG), evolved throughout the first five months of 2015."
8	Clarification	p. 56 column 2, paragraph 2	"Conversely, growth focused in urban areas often takes advantage of existing infrastructure and more efficient service to higher concentrations of jobs and housing, <u>but sometimes modernization of utilities needs to be considered and completed to accommodate the additional usage.</u> "
9	Clarification	P. 58, column 2, paragraph 4	"Saving water also saves on costs, and the RTP/SCS saves about \$1.2 billion over the span of the plan, and saves households in the SCAG region \$93 million on annual water bills." Add " <u>Notwithstanding, infrastructure operations and maintenance costs require continued funding; further, these costs could offset ratepayer savings resulting from the implementation of RTP/SCS policies, conservation efforts, or installation and use of efficient appliances.</u> "
10	Clarification	P. 83, column 2, paragraph 2	"The SPM includes a suite of tools and analytical engines that help to quickly illustrate alternative plans and policies and to estimate their transportation, environmental, fiscal, <u>and public health and community regional impacts.</u> "
11	Clarification	P. 83, column 2, last sentence	"SPM will serve as a common platform for communications between SCAG and local jurisdictions in the process of local input and public outreach, providing local planners advanced analytical capabilities."

PEIR

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
1	General Comment	All	Any changes to mitigation measure language should be updated in both the Executive Summary and the chapters throughout the PEIR, as well as the RTP/SCS document.
2	General Comment	All	Cite original source data, not other documents, e.g. SCAG's Local Profiles
3	Clarification	ES-14	"MM-AES-1(b): Consistent ... the Lead Agency can and should consider mitigation measures..."
4	Clarification	ES-14 & 15	"MM-AES-3(b): Consistent ...the Lead Agency can and should consider mitigation measures... <ul style="list-style-type: none"> •Require <u>Encourage</u> development of design guidelines... •Require <u>Encourage</u> that sites are kept in a... ""
5	Define	ES-16	Define 'Natural Resource Inventory Database and Conservation Framework & Assessment'
6	Define	ES-16	Define 'Conservation Plan'
7	Define	ES-16	Define 'mitigation banks'
8	Clarification	ES-19	MM-Air-2(b): <ul style="list-style-type: none"> •Require <u>Encourage</u> contractors to assemble... •As appropriate require <u>encourage</u> that..."
9	Clarification	ES-19	MM-Air-4(b): <ul style="list-style-type: none"> •Require <u>Encourage</u> clean fuels, and reduce petroleum dependency."
10	Clarification	ES-19	"MM-Air-4(b): Consistent with the provisions of Section 15091 of the State CEQA Guidelines, SCAG has identified mitigation measures that are within the jurisdiction and authority of the air quality management district(s) where proposed 2016 RTP/SCS <u>transportation</u> projects or development projects resulting from the land use patterns in the 2016 RTP/SCS would be located."
11	Clarification	ES-20	MM-BIO 1(b): <ul style="list-style-type: none"> •Require <u>Encourage</u> project design to avoid occupied habitat, potentially suitable habitat, and designated critical habitat, wherever practicable and feasible."
12	Clarification	ES-22	MM-BIO-2(b): <ul style="list-style-type: none"> •Require <u>Encourage</u> project design to avoid sensitive natural communities and riparian habitats, wherever practicable and feasible."
13	Clarification	ES-22	MM-BIO-3(b): <ul style="list-style-type: none"> •Require <u>Encourage</u> project design to avoid federally protected wetlands consistent with the provisions of Section 404..." •Require <u>Encourage</u> review of construction drawings by a certified wetland delineator..."
14	Clarification	ES-23	MM-BIO-4(b): <ul style="list-style-type: none"> •Require <u>Encourage</u> review of construction drawings and habitat connectivity mapping provided by the CDFW or CNDDB..."

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
15	Clarification	ES-24	<p>MM-BIO-5(b):</p> <p>“•Require <u>Ensure</u> that no change in existing ground level occur from the base of any protected tree at any time. Require <u>It is recommended</u> that no burning or use of equipment with an open flame occur near or within the protected perimeter of any protected tree.”</p> <p>“•Require <u>Encourage</u> that no storage or dumping of oil, gas, chemicals, or other substances that may be harmful to trees occur from the base of any protected trees, or any other location on the site from which such substances might enter the protected perimeter. Require <u>It is recommended</u> that no heavy construction equipment or construction materials be operated or stored within a distance from the base of any protected trees. Require <u>It is recommended</u> that wires, ropes, or other devices not be attached to any protected tree, except as needed for support of the tree. Require <u>It is recommended</u> that no sign, other than a tag showing the botanical classification, be attached to any protected tree.”</p> <p>“... require <u>ensure</u> replacement of any tree removed with another tree or trees on the same site deemed adequate by the local agency to compensate for the loss of the tree that is removed.”</p>
16	Clarification	ES-31	<p>MM-GHG-3(a)(11):</p> <p>“•Require <u>Encourage</u> amenities for non-motorized transportation, such as secure and convenient bicycle parking.”</p>
17	Clarification	ES-40	<p>MM-LU-1(a)(3): “SCAG shall work with its member cities and counties to encourage <u>but not require</u> that transportation projects and growth are consistent with the RTP/SCS.”</p>
18	Clarification	ES-40	<p>MM-LU-1(a)(4): “SCAG shall coordinate with member cities and counties to encourage <u>but not require</u> that general plans consider and reflect as appropriate RTP/SCS policies and strategies. SCAG will work to encourage <u>but not require</u> consistency between general plans and RTP/SCS policies.”</p>
19	Clarification	ES-40	<p>MM-LU-1(a)(8): “SCAG shall continue to use its Intergovernmental Review Process to provide comments to lead agencies on regionally significant projects, that may be considered for determining consistency with the RTP/SCS.”</p>
20	Clarification	ES-52	<p>MM-TRA-1(b):</p> <p>“... bicyclist accommodations, and require <u>encourage</u> new development and redevelopment projects to include bicycle facilities...”</p>

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
21	Clarification	ES-53	MM-TRA-1(b): “• Require <u>Encourage</u> new office developments with more than 50 employees to offer a Parking “Cash-out” Program to discourage private vehicle use.”
22	Clarification	ES-53	MM-TRA--2(b) “•Where traffic signals or streetlights are installed, require <u>encourage</u> the use of Light Emitting...”
23	Clarification	ES-54	MM-TRA--2(b) “• <u>Diode (LED) technology, or similar technology.</u>
24	Clarification	ES-55	MM-TRA--2(b) “• Require <u>Encourage</u> the development of Transportation Management Associations for large employers and commercial/ industrial complexes;”
25	Clarification	ES-59	MM-USS-6(b): “• Require <u>Encourage</u> the reuse and recycle construction and demolition waste (including, but not limited to, soil, vegetation, concrete, lumber, metal, and cardboard).”
26	Clarification	ES-59	MM-USS-6(b): “Discourage exporting of locally generated waste outside of the SCAG region during the construction and implementation of a project. Encourage disposal within the county where the waste originates as much as possible.” Comment: Trash disposal should be addressed regionally while considering distance instead of being limited to within the SCAG region. It is possible that disposal could be done nearby while crossing regional boundaries.
27	Delete	P. 3.3-26 Regional Air Quality	It is not appropriate to use the American Lung Association grading system to rate the region’s the transportation plan. This section (paragraph and Table 3.3.2-1) should be deleted.
28	Clarification	P. 3.3-29 Sensitive Receptors & Table 3.3.2-3	“Sensitive Receptors by County” Clarify what the source data was and how the tally of sensitive receptors was made.
29	Clarification	Figure 3.3.2-3	Figure needs legend, labels, source of data and definition of sensitive receptors
30	Clarification	P. 3.10-5 Section 3.10.1, Regulatory Framework	The definition of a Municipal Separate Storm Sewer System (MS4) is incomplete and incorrectly cited.

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
31	Clarification	p. 3.10-15 Section 3.10.1, Orange County General Plan	Specific mention of the Orange County Stormwater Program's Drainage Area Management Plan (DAMP) should be made under PEIR heading Orange County General Plan. The DAMP is Orange County's principle policy and program guidance document for urban nonpoint source pollution mitigation. The PEIR should reference the DAMP's agreements, structure, and programs, and, at the project level, make note to consider the specific water pollution control elements of the DAMP that apply to land development and redevelopment projects. Transportation infrastructure projects deemed to be Priority Projects, in accordance with DAMP designation (Exhibit 7.1 Table 7-1.1), would require the development of a Project Water Quality Management Plan (WQMP) in conformance with Orange County's Model WQMP.
32	Clarification	p. 3.10-17 Section 3.10.2, Existing Conditions	Table 3.10.2-1 lists San Juan Creek as a surface water resource within Santa Ana (Region 8) jurisdiction. San Juan Creek is located within the San Diego Regional Water Quality Control Board (Region 9) jurisdictional boundary.
33	Clarification	p. 3.10-56 Section 3.10.6, Mitigation Measures	Mitigation Measures: Parts of this section list mitigation measures that are already being required by municipal stormwater programs across the region. Instead of listing specific mitigation measures, the PEIR should make reference to these programs. In Orange County, for example, this program is detailed in the DAMP/Model WQMP. The Model WQMP describes the process that the cities and County employ for requiring a Project WQMP, which is a plan for minimizing the adverse impacts of urbanization on site hydrology, runoff flow rates, and pollutant loads at the project level. A reference to the Model WQMP and equivalent documents in the region's other counties, should replace the last ten bullet points of section MM-HYD-I(b).
34	Clarification	p. 3.10-56 Section 3.10.6, Mitigation Measures	If a proposed project has the potential to create a major new stormwater discharge to a water body with an established Total Maximum Daily Load (TMDL), a quantitative analysis of the anticipated pollutant loads in the stormwater discharges to the receiving waters should be carried out.

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
35	Clarification	p. 3.10-56 Section 3.10.6, Mitigation Measures & Table ES 4-1 (page ES-37)	The PEIR states that "where feasible, restore or expand riparian areas such that there is no net loss of impervious surface as a result of the project." While the intent with many mitigative measures is to preserve (emphasis added) perviousness, the PEIR should not be establishing performance measures for land development/redevelopment outside of established local stormwater programs.
36	Clarification	3.11-8&9, 3.11-13 3.11-16 & 17	Need to specify the vacant areas that are permanently preserved or undevelopable, even park space that is vacant <ul style="list-style-type: none"> i. Identify the source of the data used to identify vacant land. ii. What are the following items classified as (e.g. vacant, open space): HOA open space, HOA streets, private parking lots, lakes. <p>Table 3.11.2-2- Break out vacant land category into permanently preserved/undevelopable or developable</p> <p>Figure 3.11.2-7 Need to correctly label national forests as permanently preserved open space. Areas labeled vacant need to be reviewed to correctly allocate lands that are permanently preserved/undevelopable and which are developable.</p>
37	Clarification	3.11-10	Table 3.11.2-1- Define 'Established Communities'; Correct label or number of square miles by county
38	Define	3.11-11	Define 'carbon sinks'
39	Define	3.11-14	Define medium, high, and low density housing within text
40	Clarification	3.11-34	3.11.7 LEVEL OF SIGNIFICANCE AFTER MITIGATION IMPACT LU-1... It is likely that in some instances currently adopted general plans and other adopted plans will not General Plans are not required to be consistent with the 2016 RTP/SCS policies and land use strategies, and they are not required to be consistent for purposes of the SCS pursuant to SB 375. Implementation of mitigation measures MM-LU- 1(a)(1), MM-LU-1(a)(2), MM-LU-1(a)(3), MM-LU-1(a)(4), MM-LU-1(a)(5), MM-LU-1(a)(6), MM-LU- 1(a)(7), MM-LU-1(a)(8), and MM-LU-1(b) would may reduce some of these impacts. However, direct, indirect, and cumulative impacts would remain significant and unavoidable.
41	Correction	3.14-9	Update Table 3.14.2-1 with May 2015 DOF data and label columns as 'Households' not 'Housing Units'
42	Correction	3.14-12	Update Table 3.14.2-3 with May 2015 DOF data
43	Correction	3.14-13	Update Table 3.14.2-5 with May 2015 DOF data

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
44	Define	Figures 3.14.2-1 3.14.2-2 3.14.2-3	Define subjects of maps
45	Clarification	3.14.22, paragraph 4	Clarify if discussion is on new lane miles or existing; Define “additional transportation facilities”
46	Clarification	4-1, 4.1 add after last bullet	<u>“If an alternative is rejected and the project approved, it is the EIR for the proposed project that is to be used for future tiering purposes.”</u>
47	Clarification	P. 4-6, and all related documents’ references to Alternative 3.	<p>Alternative 3: Intensified Land Use Alternative “The <u>hypothetical</u> land use pattern in this Alternative builds on the land use strategies as described in the 2016 RTP/SCS and beyond. Specifically, it increases densities and intensifies land use patterns of the Plan, especially around high quality transit areas (HQTAs) in an effort to maximize transit opportunities. The <u>hypothetical</u> growth pattern associated with this Alternative...”</p> <p>Comment: Update all references to Alternative 3 in all RTP/SCS documents where it mentions that the land use pattern was developed based on the Plan to say that Alternative 3’s land use plan is hypothetical.</p>

Anita Au

From: Joseph Gonzales <councilmangonzales@gmail.com>
Sent: Monday, February 1, 2016 4:59 PM
To: 2016 PEIR
Subject: Comment on 2016 RTP/SCS-SR60 Dedicated Truck Lanes
Attachments: RTP2-1-16.pdf

Please see my attached comment.

--

Sincerely,
Joseph J. Gonzales
Councilman
City of South El Monte
"Friends of Joseph J. Gonzales for City Councilmember 2017"
FPPC# 1279320
City of South El Monte
C 626-422-1253
F 626-956-0559
www.councilmangonzales.org



February 1, 2016
Mr. Hasan Ikhata
Executive Director
Southern California Association of Governments
818 W. 7th St., 12th Floor
Los Angeles, CA 90017

RE: 2016 RTP/SCS

Dear Hasan:

The SR60 Coalition Cities have been advocating for the SR60 Light Rail Alternative since 2007. Our coalition has been successful in having the SR60 Light Rail Alternative selected as one of the two alternatives selected for further study. In November of 2014, the Metro Board voted to move our alternative to the next phase of technical study and analysis.

Our Coalition is very concerned about the proposed dedicated truck lanes on the SR60 Highway as proposed in the 2016 RTP/SCS . We have stated that SR60 Highway can not be the solution to all the transportation needs in the region. There are plans for the highway expansion and possible HOV lanes. The SR60 Coalition is concerned that many of these proposals, especially the dedicated truck lanes will be in direct conflict with the SR60 Light Rail Project.

We ask that further discussion on transportation proposals on the SR60 State Highway be addressed with our SR60 Coalition and San Gabriel Valley Council of Governments.

Sincerely

Joseph J. Gonzales
Chair, SR60 Coalition
City of South El Monte, City Councilmember



CITY OF SOUTH PASADENA

OFFICE OF THE CITY COUNCIL
1414 MISSION, SOUTH PASADENA, CA 91030
TEL: 626.403.7210 ▪ FAX: 626.403.7211
WWW.SOUTHPASADENACA.GOV

January 29, 2016

Courtney Aguirre and Lijin Sun
Southern California Association of Governments
818 West 7th Street, 12th Floor
Los Angeles, CA 90017

RE: Southern California Association of Governments Draft 2016 Regional Transportation Plan and Sustainable Communities Strategy; and Draft Program Environmental Impact Report (SCH#2015031035) – City of South Pasadena Comments

Dear Ms. Aguirre and Ms. Sun,

The City of South Pasadena (City) appreciates the opportunity to review and comment on the Southern California Association of Governments (SCAG) Draft 2016 Regional Transportation Plan and Sustainable Communities Strategy (RTP/SCS); and Draft Program Environmental Impact Report (SCH#2015031035, PEIR). As a member of the 5-Cities Alliance (Glendale, La Cañada Flintridge, Pasadena, Sierra Madre, and South Pasadena), the City adopts the comments provided in the letter submitted by Shute, Mihaly, and Weinberger, LLP on behalf of the 5-Cities Alliance regarding the SCAG Draft 2016 RTP/SCS and PEIR.

The City provides the following additional comments, and requests that SCAG make clear in its Final 2016 RTP/SCS and PEIR that the State Route 710 Tunnel Alternative (SR-710 Tunnel) has been excluded from the list of constrained projects. While the longstanding SR-710 debate spans decades, in the four years since SCAG last developed an RTP/SCS, actions by the Legislature and other agencies now hasten an end to the controversy and point SCAG and the corridor communities toward a series of constructive and non-harmful transportation improvements.

Below, the City reiterates the comments that it made during the 2008 and 2012 RTP/SCS comment periods regarding the lack of “committed, available, or reasonably available” funding for freeway projects; and the adverse air quality impacts associated with the inclusion of the SR-710 freeway in the RTP/SCS, jeopardizing the Clean Air Act (CAA) localized conformity in the San Gabriel Valley. The City also summarizes developments in the intervening four years that reinforce the City's 2008 and 2012 comments, and remove any remaining doubt that the SR-710 Tunnel lacks funds and threatens localized CAA nonconformity. The City next challenges SCAG's assertion that the alignment is "to be determined," establishing from the draft RTP/SCS and PEIR that the true project proposed by SCAG remains the SR-710 Tunnel. The City then details its comments on SCAG's air quality analysis, and concludes with a solution that will work

for SCAG and the corridor communities: developing a "Beyond the 710 series of corridor improvements.

1 Cont.

The SR-710 Tunnel Should Be Removed from the Constrained List

The following developments establish that it is unrealistic -- legally, economically, and environmentally -- to expect that an SR-710 Tunnel would ever be funded or constructed. For these reasons SCAG should remove the tunnel from its constrained list in the Final RTP/SCS and PEIR, and invest the region's limited financial resources in projects that have earned enthusiastic community support.

Within the past four years the City's ability to veto any freeway construction within its jurisdiction has been restored through the Legislature's repeal of Streets and Highway Code section 100.4 and its restoration of rights under Streets and Highways Code section 100.2. In addition, enactment of Government Code section 54237.8 in 2013 eliminated any further consideration of a surface freeway within the SR-710 North Draft Environmental Impact Report/Environmental Impact Statement (EIR/EIS). The State's commitment terminating the surface freeway has been confirmed in the May 13, 2015 judgment dismissing *City of South Pasadena v. Slater*, United States District Court (U.S.D.C.) no. CV-98-6996-DP.

The formal opposition of the three principal cities (Los Angeles, Pasadena, and South Pasadena) through which the SR-710 Tunnel would course precludes its lawful construction. Indeed, Caltrans has acknowledged that the SR-710 tunnel cannot be constructed without "modifications to freeway agreements from Alhambra, Los Angeles, South Pasadena, and Pasadena." (Caltrans Draft EIR/EIS p. 2-113) Freeway agreements are required by Caltrans regulations whether or not city streets are closed. (Streets and Highways Code, §100.2; Caltrans Project Development Procedures Manual, p. 24-4; *City of South Pasadena v. Department of Transportation* (1994) 29 Cal. App. 4th 1280, 1284.) By formal actions the City Councils and Mayors of Los Angeles, Pasadena, and South Pasadena have explicitly opposed construction of the SR-710 North Tunnel Alternative. (Los Angeles Resolution 12-0002-S82 of August 28, 2012; Pasadena Motion of April 13, 2015; and South Pasadena Resolution 7420 of July 15, 2015.)

2

Moreover, the SR-710 Tunnel cannot be advanced as "closing the 710 gap", as the Draft RTP/SCS signifies at page 37 of Appendix B; nor can the wishbone construction in Pasadena be described, as the Caltrans Draft EIR/EIS attempted at page 1-5, as "[e]xisting SR-710." By order of the United States District Court for the Central District of California, the wishbone construction was allowed in 1976 as an exception to the 1973 injunction as a component of the I-210 interchange, sponsored by the I-210 contract. The U.S.D.C. opinion records that "only the southern portion of the Long Beach Freeway has been completed and now terminates at Valley Boulevard." (*City of South Pasadena v. Volpe* (C.D. Cal. 1976) 417 F. Supp. 854, 858.)

Only \$740 million of Los Angeles County Measure R funds remain for construction of a San Gabriel Valley transportation project. These Measure R funds are *not* specifically designated for the SR-710 Tunnel, as the Second District Court of Appeal found when it denied the claims of the Cities of South Pasadena and La Cañada Flintridge that the Los Angeles County Metropolitan Transportation Authority (Metro) had pre-determined selection of the SR-710 Tunnel in violation of the California Environmental Quality Act (CEQA). In its

trial and appellate briefs, Metro represented that “Measure R ... does not commit Metro to any projects,” and that “if a 710 Tunnel is not pursued ... the funds ‘earmarked’ for a possible tunnel can be applied to other projects or programs.” The appellate court ruled that, notwithstanding the inclusion of the SR-710 tunnel in the 2008 RTP and in Measure R, “[Metro] did not promise the public a 710 tunnel. Measure R literature includes the I-710 North Gap Closure (Tunnel) in a list of ‘*Proposed Projects and Programs.*’ (Italics added.) Ordinance Section 11, paragraph (a) discloses that [Metro] ‘may amend this Ordinance, including Attachment A [the expenditure plan] . . . for any purpose.’” (*City of South Pasadena, City of La Cañada Flintridge v. Los Angeles County Metropolitan Transportation Authority; California Department of Transportation RPI*) (2011) 2d Civil No. B221118, unpublished opinion.)¹

2 Cont.

On August 20, 2015 San Gabriel Valley Council of Governments’ (SGVCOG) Governing Board voted to omit the SR-710 Tunnel project from its Mobility Matrix Transportation Project Priority List. This momentous change reflects the SGVCOG’s realization that the SR-710 Tunnel project poses a significant drain on future transportation funding in the region. Similarly, the Los Angeles County Metropolitan Transportation Authority (Metro) has omitted the SR-710 from the Subregional Stakeholder Draft Project Priorities list for the potential 2016 sales tax measure. As SCAG moves forward finalizing its Draft 2016 RTP/SCS, SCAG should replace the controversial SR-710 Tunnel with a more financially responsible and sustainable transportation solution.

In sum, beyond the SR-710 Tunnel’s legal infeasibility, the funds necessary to design and build the SR-710 Tunnel have not been identified, let alone committed. Continued inclusion of the SR-710 Tunnel fails to meet the federal requirement that any project listed as fiscally constrained must establish that funds for it are “committed, available, or reasonably available.” (23 C.F.R. §450.104.) For these reasons the project cannot remain on the constrained list of RTP/SCS projects.

Although the RTP/SCS Claims to be SR-710 Alternative Neutral, It and the PEIR Repeatedly Identify the Project as the SR-710 Tunnel

Perhaps recognizing the legal and political vulnerability of expressly propounding the SR-710 Tunnel as part of the RTP/SCS, Appendix B page 149 describes the project as "SR-710 North Extension (Alignment TBD)." A footnote seeks to explain this agnosticism by claiming that project environmental review will select the project, which will be subsequently amended into the RTP/SCS.

3

Notwithstanding the purported agnosticism regarding SR-710 alternatives, the body of the RTP/SCS and PEIR reveal that the Appendix B listing is at best inaccurate, and possibly deceptive and dishonest. As shown below, from "alternative neutral," the draft documents actually select the SR-710 Tunnel:

4

¹ This unpublished opinion may be viewed at <http://www.leagle.com/decision/In%20CACO%2020110322011/CITY%20OF%20SOUTH%20PASADENA%20v.%20LOS%20ANGELES%20COUNTY%20METROPOLITAN%20TRANSPORTATION%20AUTHORITY>

The draft FTIP, Appendix B page 37, seeks funding "to close the 710 freeway gap." Listing the project as a "freeway gap closure" only maintains the fiction that the project itself is a freeway, the only version of which remains is the SR-710 Tunnel. 5

The Appendix B "System" designation of the project as a "State Highway," like the "Route #" of SR-710 (appendix B, pp. 37, 149) further defines the actual project as the SR-710 Tunnel, which is the only state highway alternative identified in the Caltrans 710 North Study. 6

The draft PEIR describes the SR-710 North Project as a toll lane. (See, e.g., Figure 2.4.2-1: Major Highway Projects; Figure 2.4.2-5: Major Toll Projects.) The only Caltrans 710 North Project alternative that calls for a toll road is the Freeway Tunnel. 7

The draft PEIR relies on tolls received from the SR-710 North Project to partially fund its "financially constrained Plan." (See Figure 2.4.2-5.) Specifically, the draft PEIR at page 2-26 identifies \$23.5 billion from highway tolls as part of its "innovative funding strategies." Again, only the SR-710 Tunnel is proposed to generate tolls, revealing that the tunnel forms the project included in the 2016 RTP/SCS. In addition to the above references the City submits the attached Supplemental Questions and Comments regarding the Draft RTP/SCS and PEIR as Attachment 1. 8

SCAG's modeling for the RTP/SCS is premised on an SR-710 project consisting of four toll lanes in each direction -- the SR-710 Tunnel -- and no other project alternative. (Email correspondence between C. Aguirre and M. Lin, included herein as Attachment 2.)

SCAG's RTP/SCS stated project cost of \$5.6 billion, at Appendix B page 149 also identifies the SR-710 Tunnel as the selected *alternative*, as that is the only alternative whose estimated cost matches that amount. The other alternatives are less than half that cost. See SR-710 North Study, Executive Summary at pp. 5,8,10 and 14. 9

The SR-710 Tunnel Is Inconsistent with Most Goals Expressed in the Draft 2016 RTP/SCS

SCAG's Initiatives

Inclusion of the Tunnel Alternative in the Final RTP/SCS and PEIR would go against many of the valid major initiatives established by the Draft 2016 RTP/SCS, including:

- Preserving the Transportation System We Already Have (Fixing it First) – continuing to allocate funding towards the study and construction of the Tunnel Alternative diverts scarce funding resources away from important system preservation projects and further expands the highway system beyond what may reasonably be maintained based on current funding projections
 - Expanding Our Regional Transit System to Give People More Alternatives to Driving Alone – the proposed Tunnel Alternative fails to expand the regional transit system
 - Expanding Passenger Rail – the proposed Tunnel Alternative fails to expand passenger rail and further propagates single-occupancy vehicle usage
 - Improving Highway and Arterial Capacity – the Tunnel Alternative does not focus on technology and system/demand management strategies that would effectively increase highway and arterial capacity, rather the expansion of the highway system would further induce demand along already congested highways and arterials causing significant strain on the operations and maintenance of the existing system
- 10

- Managing Demand on the Transportation System – contrary to this initiative the Tunnel Alternative would induce demand, resulting in an increase in Vehicle Miles Traveled (VMT)
- Optimizing the Performance of the Transportation System – the high cost of the proposed Tunnel Alternative would reduce available highway funding for Transportation System Management (TSM), Intelligent Transportation Systems (ITS) improvements, and other key transportation projects in the region
- Promoting Walking, Biking and Other Forms of Active Transportation – the proposed Tunnel Alternative would not promote short trips or the use of active transportation in the region
- Strengthening the Regional Transportation Network for Goods Movement – many proponents of the Tunnel Alternative have stated that they would not support the inclusion of truck traffic in the tunnel
- Focusing New Growth Around Transit – development of a highway alternative reduces the amount of opportunities for growth around new transit in the San Gabriel Valley

10 Cont.

SR-710 Tunnel is Inconsistent with Recent Legislation

Furthermore, inclusion of the SR-710 Tunnel conflicts with the principles and goals of recent legislation including Assembly Bill 32 (AB 32) and Senate Bill 375 (SB 375). The SR-710 Tunnel would induce demand, increase vehicle miles traveled (VMT), and result in an increase in greenhouse gas (GHG) emissions. This inclusion is contrary to the requirements set forth by AB 32 to reduce GHG emissions. A SR-710 freeway is a mid-20th Century project that is not capable of achieving the state's goals of improved air quality or the transportation demands of the region. Similarly, the California Supreme Court's recent rejection of the EIR for the Newhall Ranch project (*Center for Biological Diversity v. California Dept. of Fish and Wildlife* (2015) 62 Cal.4th 204) indicates that impacts of induced demand and their relation to GHG emissions must be taken seriously.

11

In addition to conflicting with recent legislation, inclusion of the SR-710 would directly contradict the Caltrans Strategic Management Plan and California Air Resources Board reduction goals to implement AB 32. As the Metropolitan Planning Organization for the region, SCAG should take the lead in developing policies that are able to efficiently and effectively improve air quality, by promoting and advocating transportation projects that would actually reduce VMT and GHG emissions. By including the SR-710 Tunnel in the Draft 2016 RTP/SCS simply because the project was included in the 2012 RTP/SCS or Metro's 2009 Long Range Transportation Plan (LRTP), SCAG is defaulting into a passive role in the planning process.

SR-710 Tunnel Project Cost Is Not Committed, Available or Reasonably Available

Although RTP ID 1M0101 states "Alignment TBD," as stated on page 4 above, the project cost of \$5.6 billion identifies the SR-710 Tunnel as the selected alternative. Furthermore, as set forth on pages 2-3 above, the \$5.6 billion is not "committed, available, or reasonably available."

Additional tunnel "commitments" are highly unlikely to be forthcoming from the anticipated sales tax measure (Measure R2) on the November 2016 ballot, since Metro has omitted the project from its Subregional Stakeholder Draft Project Priorities list for Measure R2. SCAG'S previous error of including the SR-710 in the 2012 Constrained Plan should be remedied in the Draft 2016 RTP/SCS by moving the project to the Strategic Plan. Even if the

12

remaining \$740 million Measure R funds were truly “committed” to the SR-710 Tunnel (which they are not, as discussed earlier), they are woefully inadequate to meet the project cost of the single-bore tunnel, let alone the dual-bore tunnel variation. Thus, the California Transportation Commission (CTC) in its April 1, 2015 letter to former Assemblymember Anthony Portantino pointed to the ongoing lack of a defensible project cost determination, a deficiency that also ignores the Federal Highway Administration (FHWA) further requirement in the 710 corridor to cure “[c]ontinued uncertainty regarding the financing of [the SR-710 freeway] project and the failure to develop a comprehensive financial plan for its implementation.” (FHWA environmental re-evaluation withdrawing the 1998 federal approval, p. 7 (December 17, 2003).)

12 Cont.

The Highways and Arterials Appendix Consistently Identifies the SR-710 Tunnel as the Transportation Project in the 710 Corridor

The Accuracy of the Transportation Model Results Is in Question

The inappropriate inclusion of the SR-710 Tunnel in the Draft 2016 RTP/SCS further calls into question the accuracy of the SCAG Transportation Model. This error is especially relevant since the SR-710 North Draft EIR/EIS was released many months before the Draft RTP/SCS and PEIR were issued. Although SCAG does not specifically state that the SR-710 project has been identified as the SR-710 Tunnel as set forth at pages 3-4 above, the exhibits and project descriptions all and uniformly indicate that the project included in the Draft 2016 RTP/SCS is the SR-710 Tunnel. Nevertheless, the SR-710 North Draft EIREIS demonstrates that the SR-710 Tunnel would not improve traffic but would simply shift traffic congestion to other areas in the region. Indeed, certain streets in the cities of Alhambra, Rosemead, Pasadena, San Marino, and South Pasadena would become more congested as a result of cut-through traffic associated with the Tunnel Alternative.

13

Failure to remove the SR-710 Tunnel from the 2016 RTP/SCS would raise questions regarding the validity of the Transportation Model since the SR-710 Tunnel would induce demand, increase VMT, and worsen air quality in the region. While SCAG staff has cited federal conformity requirements as the reasoning for including the SR-710 Tunnel in the Transportation Model and Draft 2016 RTP/SCS, no state or federal authority requires SCAG to include all of the projects listed in Metro’s 2009 LRTP.

Finally, inclusion of the SR-710 Tunnel is not necessary to secure regional air quality conformity. Indeed, comments of the federal and regional air quality authorities, summarized on page 7 below, conclude that the SR-710 Tunnel would produce localized air quality non-conformity.

The Draft 2016 PEIR Is Inadequate for It Fails to Reconcile Contradictory Conclusions Contained in the SR-710 North Draft EIR/EIS

SR-710 North Draft EIR/EIS Comments

The 5-Cities Alliance, Environmental Protection Agency, South Coast Air Quality Management District (SCAQMD), and other organizations have each provided substantial comments on the inadequacies of the Caltrans/Metro SR-710 North Draft EIR/EIS. These comments called into question the air quality, environmental justice, geotechnical, hydrological, legal, and transportation findings that were provided.

14

Although the Draft 2016 PEIR made the following Air Quality Impact Analysis findings, they are inconsistent with SR-710 North Draft EIR/EIS:

- “Air-1: Potential to conflict with or obstruct implementation of the applicable air quality plan. *Less Than Significant Impact*.” (2016 RTP/SCS PEIR, at p. 3.3-38.) However, inclusion of the SR-710 would increase GHG emissions due to induced demand from the Tunnel Alternative. 15
- Air-2: “Potential to violate any air quality standard or contribute substantially to an existing or projected air quality violation”, Significant and Unavoidable – SCAG has included mitigation measures in the form of Transportation Control Measures (TCMs) such as “Programs for improved use of public transit”, and “Programs and ordinances to facilitate non-automobile travel, provision and utilization of mass transit, and to generally reduce the need for single-occupant vehicle travel...”. South Pasadena notes that inclusion of the SR-710 Tunnel would contradict the goals of the Mitigation Measure and TCMs 16
- Air-4; “Expose sensitive receptors to substantial pollutant concentrations and harm public health outcomes substantially”; Significant and Unavoidable – However, the Los Angeles County Department of Public Health (LADPH) has found that the SR-710 Tunnel would result in “Potential disease impacts from this project include cancer; cardiovascular disease; asthma and other respiratory diseases, impaired child lung development; adverse pregnancy outcomes such as birth defects and low-birth-weight births; obesity and diabetes; and neurological disease. Automobile-oriented transportation projects often limit active; included herein as Attachment 3 transportation modalities such as walking and bicycling, and raise the risk of injuries to pedestrians and cyclists.” (LADPH SR-710 North Draft EIR/EIS Comment letter, p. 2.) SCAQMD stated that “...the tunnel alternative will present a significant health risk to local residents when compared to a No Build scenario...[c]ancer risks could reach up to 149 chances per million at the maximum exposed residential receptor, which is above SCAQMD’s recommended CEQA threshold of 10 chances per million for all freeway alternatives.” (SCAQMD SR-710 North Draft EIR/EIS Comment Letter, p. 1, 3., included herein as Attachment 4.) 17

The Environmental Protection Agency (EPA) designated the SR-710 Tunnel Alternative as a “Category 3 (Inadequate)” and stated that the “...preliminary information shared with EPA during interagency coordination indicates that the Freeway Tunnel Alternative may impact the PM_{2.5} NAAQS, and as a result, face conformity challenges” (EPA Comment Letter, p. 2 (emphasis added; included herein as Attachment 5.) EPA additionally found that “There is not enough information in the Draft EIS for EPA to validate the modeling results; and “... the Draft EIS does not clearly describe the potential direct, indirect, and cumulative impact of the [tunnel] project on children’s health.” (EPA Detailed Comment Letter, pp. 2, 8.) 18

The Greenhouse Gas Emissions and Climate Change chapter failed to analyze the impacts of induced demand. Implementation of the SR-710 would increase capacity, however, the increased capacity would also result in increased travel demand and GHG emissions. Although there has been some debate regarding the validity of induced demand, the recent Newhall Ranch decision, *Center for Biological Diversity v. California Dept. of Fish and Wildlife, supra*,) reaffirms the need to analyze the generation of increased VMT and GHG emissions must be taken into serious consideration when evaluating environmental impacts. The air quality analysis in the SCAG Draft PEIR must have addressed the degree to which SCAG 19

followed the air quality analysis specified by SCAQMD in its April 2, 2015 response to the SCAG notice of preparation.

The mitigation measures provided under the Transportation, Traffic, and Safety chapter of the Draft 2016 PEIR included giving "...priority to transportation projects that would contribute to a reduction in vehicle miles traveled per capita, while maintaining economic vitality and sustainability." Given that the SR-710 Tunnel would increase VMT, the project should be given a low priority and be removed from the constrained plan. In addition, mitigation measure TRA—2(b) states: "Before funding transportation improvements that increase roadway capacity and VMT, evaluate the feasibility and effectiveness of funding projects that support alternative modes of transportation and reduce VMT, including transit, and bicycle and pedestrian access." SCAG should reconsider the inclusion of the SR-710 project and evaluate the possibility of developing a multi-modal alternative that is capable of reducing VMT and promoting active transportation and public transit.

SCAG Should Consider Inclusion of the Beyond the 710 Initiative

As a member of the Connected Cities and Communities (C3) the City has participated in the development of the *Beyond the 710: Moving Forward – New Initiative for Mobility and Community* (Beyond the 710, included herein as Attachment 6). This initiative was developed in collaboration with nongovernmental advocates such as the National Trust for Historic Preservation, Natural Resources Defense Council, 5-Cities Alliance, and other public stakeholders. The Beyond the 710 initiative provides a valid starting point to engage local communities and explores potential solutions to enhance the quality of life for communities through innovative strategies similar to SCAG's 2016 Draft RTP/SCS Land Use Strategies, including:

- Reflect the Changing Population and Demands – most of Los Angeles County is already developed and leaves little room for new forms of development, the Beyond the 710 Initiative provides the cities of Los Angeles and Pasadena with the opportunity to revitalize underutilized land with strategic infill and investment that may benefit the region
- Focus New Growth Around Transit – the Beyond the 710 Initiative promotes the development of compatible land uses around new transit hubs, in areas that currently do not provide substantial public transit
- Plan for Growth Around Livable Corridors – the Beyond the 710 aims to use innovative and sustainable transportation strategies such as "Complete Streets" or "Complete Corridors" to promote the use of active transportation and create more livable communities
- Provide More Options for Short Trips – by replacing the focus on a car dependent mode, such as the SR-710 Tunnel, the Beyond the 710 aims to provide stakeholders with greater mobility options such as transit and active transportation by building up the transit and bicycle network in the area
- Support Local Sustainability Planning– the C3 has worked with local stakeholder groups to develop an understanding of the type of development that is desired around the north and south stub
- Protect Natural Land – the Beyond the 710 includes strategies to create new open space and restoration of the Arroyo Rosa de Castilla creek.

SCAG could take a leadership role with the SR-710 by adopting the Beyond the 710 Initiative as a starting point to further develop an East Los Angeles/Pasadena or West San Gabriel Valley Mobility Plan similar to SCAG's previous Corridor Planning studies. By evaluating the SR-710 corridor SCAG may clearly identify the mobility problems of the region and develop sustainable solutions that adhere to the goals and objectives outlined in the Draft 2016 RTP/SCS.

22


We appreciate the opportunity to provide comments on the Draft 2016 RTP/SCS and PEIR and look forward to working with SCAG to develop a sustainable, feasible, and community-approved solution to the longstanding transportation needs in our region.


If you have any questions or comments please feel free to contact Sergio Gonzalez, City Manager, at sgonzalez@southpasadenaca.gov or (626)403-7210.


Sincerely,


Diana Mahmud
Mayor


Michael A. Cacciotti
Mayor Pro Tem


Robert S. Joe
Councilmember


Marina Khubesrian, M.D.
Councilmember


Richard D. Schneider, M.D.
Councilmember

Attachments:

1. City of South Pasadena Supplemental Questions and Comments
2. Email Correspondence from C. Aguirre to M. Lin
3. County of Los Angeles Department of Public Health – SR-710 North Draft EIR/EIS Comment Letter
4. South Coast Air Quality Management District – SR-710 North Draft EIR/EIS Comment Letter
5. Environmental Protection Agency – SR-710 North Draft EIR/EIS Comment Letter
6. Beyond the 710 Initiative

cc: Governor Jerry Brown
Secretary Brian P. Kelly, California State Transportation Agency
Will Kempton, Executive Director, California Transportation Commission
The Honorable Carol Liu, Senator, 25th District
The Honorable Chris Holden, Assembly Member, 41st District
Metro Board Members
Phillip A. Washington, Metro Chief Executive Officer
Connected Cities and Communities Members
5-Cities Alliance Members
South Pasadena City Manager



ATTACHMENT 1
City of South Pasadena Supplemental Questions and
Comments

City of South Pasadena Supplemental Questions and Comments:

2016 RTP/SCS

- Page 6 – Major Initiatives: Improving Highway and Arterial Capacity; “The 2016 RTP/SCS calls for investing \$54.5 billion in capital improvements... This includes focusing on achieving maximum productivity by adding capacity primarily by closing gaps in the system...” 23
 - Does the \$54.5 billion estimate include the \$5.636 billion needed to complete the Tunnel Alternative?
- Page 38 – Our Progress Since 2012: Highways; “The expansion of highways has slowed considerably over the last decade because of land, financial, and environmental constraints. Still, several projects have been completed since 2012 to improve access and close critical gaps and congestion chokepoints in the regional network. These include the Interstate 5 South Corridor Project in Los Angeles County;... among others.” 24
 - Clarify; which other projects are considered “highway gaps”? Does SCAG consider the SR-710 North a “highway gap”?
- Exhibit 2.2: 2012 Base Year Transit Network; includes a “Rapid Bus and Bus Rapid Transit” for 2012 Base Year 25
 - Clarify; is this the BRT alternative from the SR-710 North Project EIR?
- Exhibit 5.2: 2040 Transit Network Planned and Existing; includes a “Rapid Bus and Bus Rapid Transit” for 2012 Base Year 26
 - Clarify; is this the BRT alternative from the SR-710 North Project EIR?
- Exhibit 5.4: Major highway Projects; includes an “Improvement TBD” 27
 - Should be removed since the alignment/mode has yet to be determined and may not necessarily be a highway project.
- Page 95 – Highways and Arterials “However, given that critical gaps and congestion chokepoints still existing with the network, improvements beyond TSM and TDM strategies need to be considered. Closing these gaps to complete the system will allow residents and visitors alike to enjoy improved access to opportunities such as jobs, education, recreation and healthcare.” 28
 - Does SCAG consider the SR-710 North a “highway gap”? If so, what is the reasoning it is considered a “gap”? What is the basis for determining if there is a “gap” in the system?
- Page 95 – Highways and Arterials “Although we recognize that we can no longer rely on system expansion alone to address our mobility needs, critical gaps and congestion chokepoints in the network still hinder access to certain parts of the region. County transportation plans have identified projects to close the gaps, eliminate congestion chokepoints and complete the system. Such improvements are included in the 2016 RTP/SCS.” 29
 - Does this mean that ALL projects included in Metro’s Long Range Plan will be included in the 2016 RTP/SCS?
- Table 5.5: Sample Major Highway Projects Committed by the Counties 30
 - Does not include the SR-710 North

- Why does SCAG include the SR-710 in their Exhibit 5.4: Major Highway Projects if it is not included as a County committed project?
- Are there additional projects that are currently not included in this list?

30 Cont.

Highways and Arterials Appendix

- Exhibit 3: Major Toll Projects by Counties; includes toll lanes (plan 2040) for the SR-710 North project
 - Should be removed since the alignment/mode has yet to be determined.
- Exhibit 5: Major Highway Projects; includes a “Improvement TBD”
 - Should be removed since the alignment/mode has yet to be determined and may not necessarily be a highway project.
- Exhibit 9: Baseline 2040 to Plan 2040 Freeway Speed Changes, PM Peak; includes a “5.0 or greater increase” in speed along the SR-710 North
 - Clarification regarding which alignment/mode should be provided.
 - Should be removed since the alignment/mode has yet to be determined.
- Exhibit A2: Plan 2040 Number of Freeway Lanes (mixed-flow and toll); includes a 4-lane in each direction freeway along the SR-710 North
 - Should be removed since the alignment/mode has yet to be determined.
- Exhibit A7: Baseline 2040 to Plan 2040 Freeway Speed Changes, AM Peak; includes a “5.0 or greater increase” in speed along the SR-710 North
 - Clarification regarding which alignment/mode should be provided.
 - Should be removed since the alignment/mode has yet to be determined.
- Exhibit A12: Baseline 2040 to Plan 2040 Freeway Speed Changes – PM peak; includes a “5.0 or greater increase” in speed along the SR-710 North
 - Clarification regarding which alignment/mode should be provided.
 - Should be removed since the alignment/mode has yet to be determined.

31

32

33

34

35

36

Project List

- Page 37 – FTIP Project ID: 18790 “to close the 710 freeway gap”
 - Remove “freeway gap” language
 - Change the project description to the SR-710 North Project
- Page 148 – Financially-Constrained RTP Projects ID 18790 “Route 710: Study to perform alternative analysis, engineering and environmental studies to close 710 freeway gap”, completion year 2025, \$70,454
 - Remove “freeway gap” language
 - Change the project description to the SR-710 North Project
- Page 149 – Financially-Constrained RTP Projects ID 1M0101 “SR-710 North Project Study Alternatives (Alignment TBD)”, completion year 2025, \$5,636,000
 - Change the System from “State Highway” to “Other”
 - Move the RTP Project ID 1M0101 to the Strategic Project list
 - Why is the Project Cost listed as \$5.636 billion? Does this indicate that the project is the Tunnel Alternative?

37

38

39

- Page 340 – Strategic Projects RTP ID S1120082 “SR-710 Transportation Improvement Options”
 - Clarify which improvements? Is this related to the SR-710 North Project? 40
- Page 345 – Strategic Projects RTP ID S1120031 “North-South Rail Corridor between Port Communities of Los Angeles/Long Beach and Arroyo Verdugo Subregion-SR-710 Transportation Improvement Options”
 - Clarify; is this the LRT alternative from the SR-710 North Project EIR? 41

PEIR

- Figure 2.4.2-1: Major Highway Projects; includes a Toll Lanes along the SR-710 North
 - Clarification regarding which alignment/mode should be provided. 42
 - Should be removed since the alignment/mode has yet to be determined.
- Figure 2.4.2-5: Major Toll Projects; includes Toll lanes along the SR-710 north
 - Clarification regarding which alignment/mode should be provided. 43
 - Should be removed since the alignment/mode has yet to be determined.
- 3.11 Land Use and Planning, Page 681, Impact LU-2: Potential to physically divide an established community, Significant Impact; “Although the 2016 RTP/SCS includes major highway projects that are intended to reduce travel delay by adding capacity or lanes to highways and arterials, and create complete streets such that vehicles and non-motorized transit can both use the streets simultaneously, construction and implementation of new transportation facilities or expansion of existing facilities could disrupt or dive established communities. For example, such impacts could occur as a result of the implementation of the 710 Freeway mixed flow project in Los Angeles County...”
 - Clarification regarding which alignment/mode should be provided. 44
- 3.17 Transportation, Traffic, and Safety, Page 881 “the SR-710 Gap Closure in Los Angeles County”
 - Remove “Gap Closure” language 45
 - Change the project description to SR-710 North Project
- Figure 3.17.4-2: Existing and Proposed Toll Projects; includes Toll Lanes along the SR-710 North
 - Should be removed since the alignment/mode has yet to be determined. 46

Los Angeles County Fact Sheet

- Page 4: County RTP Projects; includes “SR-710 north project (improvements TBD) from Valley Blvd. to California Blvd./Pasadena Ave.”; and Cost “\$5.3 B”.
 - Remove “from Valley Blvd. to California Blvd./Pasadena Ave.” language 47
 - Why is the Project Cost listed as \$5.636 billion? Does this indicate that the project is the Tunnel Alternative?

ATTACHMENT 2

Email Correspondence from C. Aguirre to M. Lin

From: [Courtney Aguirre](#)
To: [Margaret Lin](#)
Subject: RE: Transportation model project list
Date: Monday, December 14, 2015 8:04:36 AM
Attachments: [image008.png](#)
[image012.png](#)
[image013.png](#)
[image015.png](#)

Margaret,

To achieve federal conformity, SCAG is required to model regionally significant and federally funded projects contained within the Federal Transportation Improvement Program (FTIP), including the Los Angeles County Metropolitan Transportation Authority's (LA Metro's) SR-710 North Project Study Alternatives project (RTP Project ID: 1M0101). The SR-710 North Project Study Alternatives project is currently modeled as four toll lanes in each direction as a place holder for this project based on its current description in the 2012 RTP/SCS, which is at present the conforming plan for the region. We understand that the project is currently under environmental review and that a preferred alternative is to-be-determined through this process. As with other projects included within the Draft 2016 RTP/SCS Project List, once the SR-710 North Project Study environmental process is complete, the 2016 RTP/SCS will be updated to reflect the Locally Preferred Alternative as identified within the environmental document.

Sincerely,

Courtney Aguirre
Senior Regional Planner
SOUTHERN CALIFORNIA ASSOCIATION OF GOVERNMENTS
818 West 7th Street, 12th Floor, Los Angeles, CA 90017
T: (213) 236-1804
E: aguirre@scag.ca.gov

Stay Connected 

From: Margaret Lin [mailto:mmlin@southpasadenaca.gov]
Sent: Tuesday, December 8, 2015 3:44 PM
To: Courtney Aguirre <Aguirre@scag.ca.gov>
Subject: Transportation model project list

Courtney,

Would you mind sending me the project details that were included in the transportation model associated with the following projects please:

- FTIP and RTP Project ID: 18790
- RTP Project ID: 1M0101

Please let me know if you have any questions or comments.

Sincerely,

Margaret Lin

Principal Management Analyst
City of South Pasadena
1414 Mission Street
South Pasadena, CA 91030
(626) 403-7236
MLin@SouthPasadenaCA.gov



PRIVILEGED AND CONFIDENTIAL COMMUNICATION: This electronic transmission, and any documents attached hereto, may contain confidential and/or legally privileged information. The information is intended only for use by the recipient named above. If you have received this electronic message in error, please notify the sender and delete the electronic message. Any disclosure, copying, distribution, or use of the contents of information received in error is strictly prohibited.

ATTACHMENT 3

County of Los Angeles Department of Public Health –
SR-710 North Draft EIR/EIS Comment Letter



CYNTHIA A. HARDING, M.P.H.
Interim Director

JEFFREY D. GUNZENHAUSER, M.D., M.P.H.
Interim Health Officer

ANGELO J. BELLOMO, REHS, QEP
Director of Environmental Health

5050 Commerce Drive
Baldwin Park, California 91706
TEL (626) 430-5100 • FAX (626) 813-3000

www.publichealth.lacounty.gov

BOARD OF SUPERVISORS

Hilda L. Solis
First District

Mark Ridley-Thomas
Second District

Sheila Kuehl
Third District

Don Knabe
Fourth District

Michael D. Antonovich
Fifth District

August 5, 2015

Mr. Garrett Damrath
Chief Environmental Planner
Caltrans District 7
Division of Environmental Planning
100 S. Main Street, MS-16A
Los Angeles, CA 90012

SUBJECT: REVIEW OF STATE ROUTE 710 NORTH PROJECT DRAFT EIR/EIS BY THE LOS ANGELES COUNTY DEPARTMENT OF PUBLIC HEALTH

Dear Mr. Damrath,

The Los Angeles County Department of Public Health (DPH) Bureau of Toxicology and Environmental Assessment is submitting this comment letter on the SR-710 DEIR/EIS. DPH has reviewed the DEIR/EIS for potential health impacts that may arise from this transportation project. Our review reveals a number of deficiencies that must be addressed in order to ensure the protection of the public's health.

1) Environmental exposures

- a) The DEIR/EIS does not adequately address the production of airborne emissions and noise that may be produced by this project. Particulate pollution from fibers, coarse particles, fine particles, and ultrafine particles from both construction and operation have notable impacts on cardiovascular, respiratory, and neurological health. The DEIR/EIS should include measures specifically to mitigate exposures to particulate pollution.
- b) Excavation during construction may lead to the liberation of radon gas, a known human carcinogen which is formed in soil. The DEIR/EIS does not adequately address the risk of radon exposure during construction, and provides no surveillance for radon after project completion.
- c) The DEIR/EIS does not adequately address dust suppression measures to prevent the transmission of Valley Fever and other soil-borne infectious diseases.

d) The DEIR/EIS does not adequately address the production of noise and vibrations, from construction, traffic, and ventilation/maintenance systems, which present significant short and long-term health risks. Ground vibrations present additional risks, such as amplification of radon migration; and damage to structures such as older housing, historical buildings, and unique facilities such as laboratories.

2) Worker health and safety

The DEIR/EIS should implement a comprehensive plan to protect the health and safety of workers during construction and operation of the project. Construction and maintenance workers are at risk for numerous exposures such as asbestos, radon, air & soil emissions, noise, and vibrations. A worker safety plan should be prepared, with review and input from the appropriate state regulatory agencies, to mitigate potential hazards to site workers and the public.

3) Impacts on human health

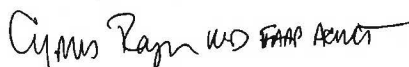
The DEIR should include a broader and more balanced analysis of all of the the health benefits and negative impacts of the project on both workers and community members, with consideration of relevant published scientific and medical research. Potential disease impacts from this project include cancer; cardiovascular disease; asthma and other respiratory diseases, impaired child lung development; adverse pregnancy outcomes such as birth defects and low-birth-weight births; obesity and diabetes; and neurological disease. Automobile-oriented transportation projects often limit active transportation modalities such as walking and bicycling, and raise the risk of injuries to pedestrians and cyclists. Further analysis should be directed to the impact of this project on active transportation and injury risks. The DEIR/EIS should analyze the baseline health status of the surrounding communities, including identification of vulnerable populations, such as children, pregnant females, seniors, and people with disabilities; and assess the impact of the project on the rates of acute and chronic diseases.

4) Impacts on communities

The DEIR/EIS includes a community impact assessment but does not adequately address how these impacts may affect the health of the residents of the impacted communities. For example, changes in the community that reduce opportunities for physical activity, reduce access to healthy food options, or reduce access to medical clinics or hospitals all could adversely impact health. In addition, changes to the community that reduce community cohesion and increase social isolation could also profoundly impact health in negative ways. The DEIR/EIS should include an assessment of how the project's impacts on the overall character of the community will in turn impact community health, and provide recommendations for how these health impacts can be minimized.

For further questions, please contact Cyrus Rangan M.D. at (213) 738-3220.

Sincerely,



Cyrus Rangan M.D., FAAP, FACMT
Director, Bureau of Toxicology and Environmental Assessment
Los Angeles County Department of Public Health

ATTACHMENT 4
South Coast Air Quality Management District – SR-710
North Draft EIR/EIS Comment Letter



**South Coast
Air Quality Management District**

21865 Copley Drive, Diamond Bar, CA 91765-4178
(909) 396-2000 • www.aqmd.gov

SENT VIA EMAIL AND USPS: AUGUST 5, 2015

August 5, 2015

Garrett Damrath, Chief Environmental Planner
Caltrans District 7, Division of Environmental Planning
100 South Main St., MS-16A
Los Angeles, CA 90012

**Draft Environmental Impact Report/Environmental Impact Statement (EIR/EIS)
for the State Route 710 North Study**

The South Coast Air Quality Management District (SCAQMD) staff appreciates the opportunity to comment on the above-mentioned document. The following comments are intended to provide guidance to the lead agency and should be incorporated into the Final Environmental Impact Report/Statement (Final EIR/EIS) as appropriate.

The California Department of Transportation (Caltrans), in cooperation with the Los Angeles County Metropolitan Transportation Authority (Metro), proposes transportation improvements to enhance mobility and relieve congestion. The study area for the SR-710 North Study is approximately 100 square miles and generally bounded by I-210 on the north, I-605 on the east, I-10 on the south, and I-5 and SR-2 on the west. The proposed alternatives for the project include the No Build Alternative, the Transportation System Management/Transportation Demand Management (TSM/TDM) Alternative, the Bus Rapid Transit (BRT) Alternative, the Light Rail Transit (LRT) Alternative, and the Freeway Tunnel Alternative. Components of the TSM/TDM Alternative will also be included with the BRT, LRT, and Freeway Tunnel Alternatives.

After reviewing the Draft EIR/EIS, SCAQMD staff is very concerned about the inadequate analysis of two key aspects of the CEQA document. First, the Health Risk Assessment (HRA) for the project shows that the tunnel alternatives will present a significant health risk to local residents when compared to a No Build scenario, however the Draft EIR/EIS concludes that this impact is less than significant, and no mitigation is required. Second, localized air quality impacts are not adequately analyzed, and decision-makers would not be able to use the EIR/EIS as written to determine if the project will adversely affect air quality in the local area. For example, there is no quantitative analysis of localized impacts for the freeway tunnel alternatives to determine if ambient air quality standards are exceeded for NO₂ or CO. For these reasons, the analysis should be revised, taking into consideration comments contained in this letter and additional detailed comments presented in the attachment.

Finally, the proposed air pollution control equipment for the freeway tunnel alternatives in the Draft EIR/EIS will require permits from SCAQMD. As a responsible agency, we request that

the project proponents meet with SCAQMD staff to discuss details of the permitting requirements so that they can be included in the Final EIR/EIS.

Staff is available to work with the lead agency to address these issues (including the detailed comments in the attachment) and any other air quality questions that may arise. Please contact me at (909) 396-3244, if you have any questions regarding these comments.

50 Cont.

Sincerely,



Ian MacMillan
Planning and Rules Manager

Attachment
IM:JW:JC
LAC150306-02
Control Number

Attachment

Health Risk Assessment Demonstrates Significant Impact But Draft EIR/EIS Concludes Impacts Are Not Significant

1. SCAQMD staff appreciates that the lead agency chose to include a Health Risk Assessment (HRA) with this Draft EIR/EIS. Table 3-4 of this HRA shows the incremental cancer risk between project alternatives and the No Build alternative. This table shows that cancer risks could reach up to 149 chances per million at the maximum exposed residential receptor, which is above SCAQMD's recommended CEQA threshold of 10 chances per million for all freeway alternatives. Despite this conclusion, the Draft EIR/EIS determines that cancer risks are less than significant, based on an inappropriate consideration of the CEQA baseline.

The Draft EIR/EIS incorrectly uses a static 2012 year in comparison to project impacts. This approach is inappropriate because existing regulations (e.g., ARB's Truck and Bus Rule) will lower this health risk, even in the absence of this project. By using a static 2012 baseline, the Draft EIR/EIS is taking credit for other projects (e.g., ARB regulations) as a component of the build alternatives for the SR710. This approach is inconsistent with previous LA Metro projects. For example, LA Metro successfully defended a case in the California Supreme Court on this very issue, holding that use of a future baseline was proper in some cases (*Neighbors for Smart Rail v. Exposition Metro Line Construction* (2013) 57 Cal.4th 439). Because the No Build-Build Alternative comparison shows health risk impacts that are substantially above SCAQMD's recommended significance thresholds, SCAQMD staff recommends that the lead agency find that this impact is significant, and identify mitigation to reduce this impact to a less than significant level.

Localized Air Quality Impacts Not Analyzed

2. The proposed project is surrounded by sensitive land uses (i.e., residential dwellings north, south, east and west of the project site); however, the Draft EIR/EIS did not evaluate potential localized air quality impacts that could result from construction and operation of the proposed project. Without this analysis, the lead agency does not have information to make a determination of significance about potential air quality impacts from this project. This lack of analysis is especially concerning as the tunnel alternatives will focus all of the vehicle emissions along the entire tunnel to the portal and ventilation stack areas.

Therefore, SCAQMD staff recommends that the lead agency revise the air quality analysis to include an assessment of potential localized air quality impacts during construction and operation of the proposed project. This issue was raised in Technical Advisory Committee meetings and in a direct meeting between SCAQMD staff and LA Metro and Caltrans staff. This type of localized analysis is regularly conducted by other lead agencies for CEQA and was also conducted for the I-710 Corridor project Draft EIR/EIS just south of this project site.

These potential localized air quality impacts should be assessed using SCAQMD's Localized Significance Methodology and compared to the localized significance thresholds specific to

the project area¹. Furthermore, the lead agency should ensure that all future projects include a localized air quality analysis, if warranted. In the event that the lead agency determines the proposed project will result in significant localized construction and operational air quality impacts, the SCAQMD staff recommends that the lead agency require mitigation to minimize these impacts to a less than significant level.

SCAQMD is not Listed as a Responsible Agency

3. The Draft EIR/EIS does not discuss SCAQMD's role as a responsible agency for the tunnel alternatives for this project. These alternatives are proposing to install ventilation stacks with air pollution control devices that require permits from SCAQMD. It is our understanding from discussions at Technical Advisory Committee meetings that the lead agency would meet directly with SCAQMD staff to discuss SCAQMD's role regarding permitting requirements for this project. As a responsible agency, we will need to rely on the EIR/EIS for this project before any permits can be issued. We recommend that the lead agency schedule a meeting with us to discuss the detailed permitting requirements for this project.

Health Risk Assessment Methodology

4. The HRA conducted for this Draft EIR/EIS used an older methodology from the state Office of Environmental Health Hazard Assessment for calculating risks. This older methodology was replaced with a newer version in March 2015. This updated HRA guidance uses more recent scientific findings to evaluate children's greater susceptibility to cancer risks from exposure to air pollution. In general, residential cancer risks from pollutants like diesel particulate matter are found to increase between two and three times compared to the old methodology. The EIR should consider revising the calculated cancer risks using this updated guidance.

Air Quality Analysis Does Not Include All Areas Potentially Impacted by This Project or Cumulative Impacts from Other Projects

5. While the 710-North study area primarily covers northeast Los Angeles and western San Gabriel Valley, the lead agency did not analyze impacts from the tunnel alternatives in the surrounding areas. Completing the SR 710 would result in traffic and air quality impacts throughout wide portions of Los Angeles County. For example, the Draft EIR/EIS states that regardless of build alternatives, passenger vehicles will continue using arterial roads to transverse north and south through the region. This project includes alternatives which will allow trucks to now travel on the SR-710 between I-10 and I-210 and would introduce new truck trips in the area which did not exist without the project. In conjunction with Cumulative Projects such as the I-710 South Corridor Project and Port expansion projects, overall traffic and demand would increase along the I-710. SCAQMD staff recommends that the lead agency expand the study area and provide a more robust analysis of the potential cumulative air quality impacts in the surrounding areas from this project and other reasonably foreseeable projects.

¹ The Localized Significance Threshold (LST) methodology and Mass Rate LST Look Up Tables are available at: <http://www.aqmd.gov/ceqa/handbook/LST/LST.html>

Transportation Conformity

6. The quantitative transportation conformity analysis contained within the Draft EIR/EIS has not yet been approved or submitted to the Transportation Conformity Working Group (TCWG). The protocol for this project was only submitted July 22, 2015 to the TCWG, but it has not yet been approved. SCAQMD staff identified potential errors in the conformity analysis contained within the Draft EIR/EIS, as identified below. This comment does not preclude any comments we may provide to the TCWG on either the protocol or the conformity analysis.

The conformity analysis results as presented in Table 5.8 through 5.10 in the Air Quality Assessment Report only show a comparison between maximum concentrations for each scenario, without accounting for where the maximum impact occurs. The conformity analysis must instead demonstrate that there are no increased air quality impacts at any receptor, not just a comparison between the maximum receptors, which may be located miles apart from one another.

Dispersion Modeling

7. Some of the receptors were incorrectly placed within the volume source exclusion zone and their results would be invalid. Since there are modeled volume sources which extend beyond the Project boundary, care should be taken to ensure that no receptors are placed within the volume source exclusion zone. This can be done by using smaller, adjacent volume sources or by using an area source instead to model the freeway emissions.
8. Highway Interchanges were modeled with a 30 foot release height to capture over and under passes of the interchange. The lead agency should instead use an elevated volume release height to properly model emissions from trucks on an interchange.
9. AERMOD file SR710_RoadwaysOperation_DTA_5yrs_OTHER.DTA models the scrubber/ventilation system with a stack velocity ranging from 14.72 – 34 m/s and a flow rate of 565 – 1,312 m³/s. The Tunnel System Report describes the system as having an exiting stack velocity of 1,780 – 3,690 ft/min (9.04 – 18.75 m/s) and a flow rate ranging from 762,800 – 1,652,700 cfm (360 – 780 m³/s). The modeled scrubber/ventilation system stack velocities and flow rates are greater than the proposed values identified in the Tunnel System Report. A higher exit velocity and flow rate would tend to result in an underestimation of modeled concentrations. SCAQMD staff recommends the lead agency revise the modeling by using the actual exit velocity and flow rate in the report.

Emission Estimation

10. In the Health Risk Assessment (HRA), when comparing project impacts to a 2012 CEQA baseline, health risks were estimated using a long-term average emission rate based on a weighted average after calculating emissions each year. However, when comparing project impacts to the NEPA No Build baseline, long-term average emissions were linearly interpolated using values only for years 2012, 2020, 2025 and 2035. Because emission

51 Cont.

estimates do not follow linear patterns over time, the estimation methodology may underestimate potential health risks. SCAQMD staff recommends using a consistent emission estimate methodology (i.e. analyze emissions every year, rather than just milestone years) for both the CEQA and NEPA baselines.

Scrubber/Ventilation System

Although the DEIR/EIS has scrubber/ventilation system design discussion in the Tunnel Systems Report, specifics are unclear and additional information is required.

11. The proposed air pollution control system does not control gaseous pollutants, and it is not as effective at reducing ultrafine particles as it is with coarser particulate matter. If pollution from the entire tunnel system will be vented through limited release points, then additional controls should be added that will also reduce gaseous pollutants and ultrafine particles. The EIR should review studies prepared for SCAQMD that evaluate different types of controls for roadway tunnel pollution, and implement any that are found feasible for this project.²
12. According to the *Development of Electrostatic Precipitator [ESP] for Road Tunnel*³ the type of electrodes (wire or spike plate type) used is a factor for the proper operation of the ESP. A spike plate type electrode provides an optimum electrode configuration with stable and uniform corona discharge. As a result, spike plate electrodes have greater performance, reliability and stability. The Tunnel Systems Report for the Freeway Tunnel Alternative does not discuss or analyze electrode type. SCAQMD staff recommends evaluating and considering both plate styles.
13. The operation of an ESP would generate ground-level ozone (O₃) which adversely affects human health. Since ozone generation is directly related to ESP power consumption, increased ESP power consumption would create higher ozone emissions. SCAQMD staff recommends additional discussion and details on minimizing ozone generated in the ESP⁴.
14. With high flow rates indicated in the Tunnel Systems Report for the Freeway Tunnel Alternative, the efficiency is expected to only be as low as approximately 80%. The flow through the ESP should be slow and evenly distributed for adequate particle collection (2-8 ft/sec). Normally gas velocity is reduced by expansion in the inlet plenum.
15. To prevent re-entrainment of the particles, the aspect ratio (length to height of ESP) should be greater than 1. SCAQMD staff recommends maintaining an aspect ratio greater than 1 during the ESP design stages.
16. Additionally, there may be a need to remove the large particles (chunks of rubber, etc.) to prevent clogging the ESP. SCAQMD staff recommends analyzing particle size distribution found in tunnels. The lead agency should discuss the impacts of large particles on the ESP.

²Near-Road Mitigation Measures and Technologies studies and webcast found here:

<http://www.aqmd.gov/home/library/technology-research/technology-forums>

³ Miyake, A (2006) Development of Electrostatic Precipitator for Road Tunnel [PDF]

<http://www.isesp.org/ICESP%20X%20PAPERS/PDFS/Paper%2010B1%20030%20Miyake.pdf>

⁴ Ibid

17. The Tunnel Systems Report indicates that a waste water treatment system will be required to maintain the air cleaning equipment. The lead agency does not discuss the materials collection and discharge process. Furthermore, the lead agency should provide additional discussion and design specifications of the waste water treatment system and cleaning process.
18. Since moisture can lower the efficiency of the ESP as well as the resistivity and affect the operation, the lead agency should address measures to remove high moisture from the inlet gas stream.
19. The lead agency should discuss and evaluate the potential reduction of NO₂ with dry adsorbent that has been used in tunnels with ESP in Japan (Delivery Truck Record).⁵
20. While the Tunnel Systems Report addresses the fire and safety features procedures for the tunnel, it does not explore the potential for explosions due to build-up carbon or carbon monoxide in the ESP (Electrostatic Precipitators).⁶ The lead agency should discuss equipment maintenance and equipment breakdown procedures and the risk of upset events. Additionally, the lead agency should evaluate the need for back-up power, redundant systems and any associated equipment.

Modification of Construction Mitigation Measures

21. Section 4.2.3 of the CEQA Evaluation III(b) states that short-term degradation of air quality may occur during construction activities and Measures AQ-1 through AQ-5 would reduce construction emissions to less than significant levels. Table 3.13.4 of the Draft EIR/EIS and Tables 5.1-5.5 of the Air Quality Analysis also indicate that construction emissions exceed the daily maximum construction emission thresholds. While SCAQMD staff appreciates the Green Construction Policy that LA Metro has committed to using for this project, the Draft EIR/EIS did not provide any supporting documentation or emissions calculations to support claims that Measures AQ-1 through AQ-5 would reduce construction emissions to less than significant levels. SCAQMD staff recommends updating the Air Quality Analysis to demonstrate that the mitigation measures are adequate to reduce impacts to a less than significant level. In addition, the mitigation measures proposed for this project should be modified to include the underlined comments in numbers 22-25 below.
22. Measure AQ-1 – Fugitive Dust (applies to all four Build Alternatives)
During clearing, grading, earthmoving, or excavation operations, the Resident Engineer will require the construction contractor to control excessive fugitive dust emissions by regular watering or other dust preventive measures using the following procedures, as specified in the South Coast Air Quality Management District Rule 403. The Construction Contractor will be required to:

⁵ Delivery Truck Record. Retrieved July 22, 2015.

<http://panasonic.net/ecosolutions/air/tunnel/records.html>

⁶ Buckens, A (Pollution Control Technologies – Vol. I – Electrostatic Precipitators

<http://www.eolss.net/sample-chapters/c09/e4-14-01-08.pdf>

- Prevent dust from being visible in the atmosphere beyond the property line of the emission source
 - Prevent dust emissions from exceeding 20 percent opacity
 - Prevent track-out from extending 25 feet or more in cumulative length from the point of origin from an active operation
 - Utilize best available control measures included in Table 1, 2, & 3 of SCAQMD Rule 403
 - Submit Large Operations Notification (Form 403N)
 - Comply with all Large Operations requirements
23. Measure AQ-2 – Equipment and Vehicle Emissions (applies to all four Build Alternatives)
 During all site preparation, grading, excavation, and construction, either the Resident Engineer for the TSM/TDM, BRT, and LRT Alternatives or the Resident Engineer for the Freeway Tunnel Alternative, as applicable, will require the Construction Contractor to:
- Require the use of 2010 and newer diesel haul trucks (e.g., material delivery trucks and soil import/export) and if the lead agency determines that 2010 model year or newer diesel trucks cannot be obtained, the lead agency shall use trucks that meet EPA 2007 model year NOx emissions requirements.
24. Measure AQ-4 – California Department of Transportation (Caltrans) Standard Specification for Construction (applies to ~~Freeway Tunnel Alternative~~ all Build Alternatives)
25. Measure AQ-5 – Metro Green Construction Policy (applies to ~~TSM/TDM, BRT, and LRT Alternatives~~ all Build Alternatives)

51 Cont.

ATTACHMENT 5
Environmental Protection Agency – SR-710 North
Draft EIR/EIS Comment Letter



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

AUG 27 2015

OFFICE OF THE
REGIONAL ADMINISTRATOR

Carrie Bowen, Director
Department of Transportation, District 7
100 S. Main Street, MS-16A
Los Angeles, California 90012

Subject: EPA Comments on the Draft Environmental Impact Statement for the SR 710 North Study, Los Angeles County, California (CEQ #20150061)

Dear Ms. Bowen:

The Environmental Protection Agency (EPA) has reviewed the above-referenced document pursuant to the National Environmental Policy Act (NEPA), Council on Environmental Quality (CEQ) regulations (40 CFR Parts 1500-1508), and Section 309 of the Clean Air Act. The California Department of Transportation (Caltrans) granted EPA an extension until August 28, 2015 to submit comments on this document. Our detailed comments are enclosed. EPA appreciates Caltrans' consideration of transit and tunnel alternatives that seek to reduce the adverse air quality and health impacts that additional lane capacity may create. Our review of this project has identified missing information that is needed to demonstrate that the project can meet this goal. EPA believes that transit options in conjunction with regionwide zero- and near-zero emissions corridors, can collectively contribute to long term strategies for improved air quality in the South Coast Air Basin, which has some of the worst air quality in the nation. Capturing and controlling roadway emissions through tunneling and ventilation technology may also reduce some of the project's impact.

Freeway Tunnel Alternative

The proposed ventilation system with air scrubbers has the potential to substantially mitigate operational air quality impacts from the Freeway Tunnel Alternative. However, the Draft EIS does not fully evaluate whether the project alternatives could cause or contribute to localized National Ambient Air Quality Standard (NAAQS) exceedances in the project area, such as near the entrances to the tunnel or in the vicinity of the SR 710/I-10 and I-210/SR 134 interchanges. The additional materials provided by Caltrans to EPA during our review of the Draft EIS supported the need for refined analysis and disclosure to the public of impacts in anticipated hotspot locations, as well as the potential need for Freeway Tunnel Alternative design changes to eliminate identified impacts.

For these reasons, and because the project area's existing air quality is so poor, we have rated the Freeway Tunnel Alternative as "3"- *Inadequate Information*, and recommend preparation of a focused Supplemental Draft EIS, to 1) analyze whether or not the project will contribute to NAAQS exceedances, 2) demonstrate how the tunnel design and emissions controls will reduce and capture emissions to the highest extent possible, and 3) commit to mitigation to reduce remaining air quality impacts. We also provide several recommendations to further analyze and disclose impacts related to tunneling, including impacts from construction and haul routes. These issues are common to all design options that include tunneling.

EPA appreciates Caltrans' responsiveness to EPA through interagency coordination during the review period of this Draft EIS and we encourage continued coordination to further address the issues raised in this letter. We note that preliminary information shared with EPA during interagency coordination indicates that the Freeway Tunnel Alternative may impact the PM_{2.5} NAAQS, and as a result, face conformity challenges. We understand that Caltrans intends to demonstrate that the preferred action meets the Clean Air Act requirements of EPA's transportation conformity regulations prior to publication of a Final EIS for this project and we encourage Caltrans to continue working on this issue and consider including a conformity determination in a Supplemental Draft EIS.

Light Rail Transit (LRT) Alternative

We commend Caltrans and Metro on the inclusion of transit alternatives that could address some of the traffic issues in the project area, as well as reduce emissions from single occupant vehicles. However, we have concerns with potential community impacts from the above-ground portions of the Light Rail Transit Alternative, including disruption of community cohesion and the number of displaced businesses. In light of these issues, the enclosed detailed comments recommend including a more robust discussion of the transit alternatives that were considered, but rejected, from further analysis in the Draft EIS. As noted above, we also provide several recommendations to further analyze and disclose impacts related to tunneling, including impacts from construction and haul routes. We have rated the Light Rail Transit (LRT) Alternative as EC-2, *Environmental Concerns, Insufficient Information*.

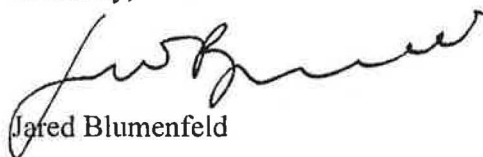
52 Cont.

Transportation System Management/Transportation Demand Management (TSM/TDM) and Bus Rapid Transit (BRT) Alternatives

EPA provides no further comments on the Transportation System Management/Transportation Demand Management (TSM/TDM) and Bus Rapid Transit (BRT) Alternatives and provides a rating of LO, *Lack of Objections* for these alternatives.

We appreciate the opportunity to review this Draft EIS. When the Supplemental Draft EIS and/or Final EIS is released for public review, please send one hard copy and one electronic copy to the address above (mail code: ENF-4-2). If you have any questions, please contact Carolyn Mulvihill, the lead reviewer for this project, at 415-947-3554 or mulvihill.carolyn@epa.gov.

Sincerely,



Jared Blumenfeld

Enclosures:

Summary of EPA Rating Definitions
EPA's Detailed Comments

cc via email: Malcolm Dougherty, Caltrans
Ron Kosinski, Caltrans
Brenda Powell-Jones, Caltrans
Vince Mammano, FHWA
Bryan Pennington, Metro
Dr. Barry Wallerstein, South Coast Air Quality Management District
Susan Nakamura, South Coast Air Quality Management District
Kurt Karperos, California Air Resources Board
LB Nye, Los Angeles Regional Water Quality Control Board
Hasan Ikhata, Southern California Association of Governments
Dr. Paul Simon, Los Angeles County Department of Public Health

SUMMARY OF EPA RATING DEFINITIONS*

This rating system was developed as a means to summarize the U.S. Environmental Protection Agency's (EPA) level of concern with a proposed action. The ratings are a combination of alphabetical categories for evaluation of the environmental impacts of the proposal and numerical categories for evaluation of the adequacy of the Environmental Impact Statement (EIS).

ENVIRONMENTAL IMPACT OF THE ACTION

"LO" (Lack of Objections)

The EPA review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

"EC" (Environmental Concerns)

The EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce the environmental impact. EPA would like to work with the lead agency to reduce these impacts.

"EO" (Environmental Objections)

The EPA review has identified significant environmental impacts that should be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

"EU" (Environmentally Unsatisfactory)

The EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of public health or welfare or environmental quality. EPA intends to work with the lead agency to reduce these impacts. If the potentially unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the Council on Environmental Quality (CEQ).

53

ADEQUACY OF THE IMPACT STATEMENT

"Category 1" (Adequate)

EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis or data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

"Category 2" (Insufficient Information)

The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analysed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses, or discussion should be included in the final EIS.

"Category 3" (Inadequate)

EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analysed in the draft EIS, which should be analysed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the NEPA and/or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

*From EPA Manual 1640, Policy and Procedures for the Review of Federal Actions Impacting the Environment.

EPA provides the following comments and recommendations for consideration as Caltrans finalizes the environmental review process for this project.

- I. Freeway Tunnel Alternative**
- II. Light Rail Alternative**
- III. Other Comments**

I. Freeway Tunnel Alternative

Demonstrating Tunnel Design/Effectiveness in Reducing Air Quality Impacts

The Draft EIS does not fully evaluate whether the Freeway Tunnel Alternative could cause or contribute to localized National Ambient Air Quality Standard (NAAQS) exceedances in the immediate project area, such as near the entrances to the tunnel or in the vicinity of the SR 710/I-10 and I-210/SR 134 interchanges. Furthermore, the Draft EIS and Tunnel Systems Report describe the goals and general design of the tunnel ventilation system and controls, but further information is needed for purposes of ensuring air quality mitigation and evaluating the modeling analysis.

Air Quality Modeling –Presentation of Impacts

The Draft EIS presents quantitative modeling results in Tables 5.8-5.10; however, the Draft EIS doesn't provide any information to the public describing what these modeling results mean in terms of air quality. The Draft EIS does not include predicted concentrations for several of the design variations: (1) Single-Bore Tunnel without Tolls, (2) Single-Bore Tunnel without Tolls, without Trucks, (3) Dual-Bore Tunnel with Tolls, without Trucks and (4) Dual-Bore Tunnel with Tolls with express bus. Further, the modeling results presented in the Draft EIS mischaracterize the full impacts of the project. The results presented in the tables do not appear to include background concentrations combined with the predicted modeled concentrations. Based on EPA's understanding of ambient air quality concentrations within the study area, it appears that the total concentrations would be above the NAAQS for particulate matter smaller than 2.5 micrometers (PM_{2.5}) standards. Presenting the modeled concentrations without background values does not clearly indicate to the public the full impacts from the project.

53 Cont.

In addition, there is no information regarding where the impacts of the projects were predicted and why some design variations show higher or lower PM concentrations. For example, it is not clear why the results from the tunnel variations, without trucks, are higher than with trucks. The Draft EIS should clearly present information showing where localized concentrations will both increase and decrease, such as due to the shifting of traffic from existing roadways to the tunnel. The Draft EIS should explain these results so that the public understands the regional air quality impacts of the project.

We appreciate the additional information that Caltrans shared with EPA during our review of the Draft EIS, including preliminary modeled PM_{2.5} concentrations from the build minus no-build alternatives focused on areas with the largest potential concern, such as the tunnel entrances. We encourage Caltrans to provide these additional maps, analyses, and conclusions to the public and decision-makers.

Recommendations:

- Clearly present information showing where localized concentrations will both increase and decrease and explain these results for the public and decision-makers. Include maps with modeled isopleths showing the full (background plus modeled) concentrations for the study

area as well as anticipated changes (future build minus future no-build) in concentrations for 24-hour and annual PM_{2.5} and PM₁₀. In addition to presenting information on the entire study area, include maps that include isopleths targeted to the areas of largest potential impact, such as the tunnel entrances, and provide clear information on the locations of the proposed tunnel and ventilation towers.

- Include more information explaining the differences in modeled concentrations for each of the design variations and why some concentrations are not included
- Please continue to consult with EPA on the emissions and air quality modeling, including the presentation of results for the public and decision-makers.

Air Quality Modeling - Design Assumptions, Modeling Inputs, and Verification of Results

There is not enough information in the Draft EIS for EPA to validate the modeling results. The Draft EIS does not contain maps or figures showing spacing and location of emission sources and tunnel vents, and there are no details regarding how emissions at tunnel entrances and exits were estimated and handled in modeling. It is not clear how fugitive emissions were determined and if centerline miles or VMT were used to predict growth in fugitive PM_{2.5} and PM₁₀ emissions.

The Draft EIS states that the tunnel ventilation tower emissions for the north and south tunnel portals were modeled as point sources, however there is no information provided regarding how these point sources were characterized, such as emissions rate, release height, exit temperature, etc. There is also no information about how the emissions at the tunnel entrances and exits were treated in the modeling. The Supplemental Draft EIS or Final EIS should include information on the tunnel entrances and exits displayed with the modeling outputs (e.g. concentration isopleths), to facilitate evaluation of the modeling treatment and performance in the entrance areas.

The Tunnel Systems Report emphasizes that the primary purpose of the tunnel ventilation system is to reduce the level of harmful gases within the tunnel, such as carbon monoxide (CO) from routine tunnel operations, or smoke from a tunnel fire. The Report also acknowledges an additional goal of “avoid[ing] concentration of noxious gases outside the tunnel at the portal areas.” While maintaining safe air quality levels within the tunnel is critical, we also encourage Caltrans to consider ambient air quality (i.e. air quality outside of the tunnel) as a primary design goal, to further insure that the predicted effectiveness of the air ventilation system and controls are achieved in practice. Furthermore, while the Draft EIS and Tunnel Systems Report appear to only commit to particulate matter controls via an electrostatic precipitator, we note that it is also critical for the ventilation system to capture and control oxides of nitrogen (NO_x), volatile organic carbons (VOCs), and air toxic emissions, due to the project’s location in the air basin with the worst ozone air quality in the U.S.

Recommendations:

- Clarify that ambient air quality is a primary purpose of the tunnel ventilation system, in addition to air quality within the tunnel.
- Commit to implementing tunnel ventilation system controls for particulate matter, CO, NO_x, VOCs, and air toxics.
- Provide additional information regarding how emissions from the tunnel ventilation towers were characterized in AERMOD and the resulting modeled concentrations in the vicinity of the towers for each tunnel variation. In the presentation of modeling results, label the sources of emissions.
- Provide additional information regarding the characterization of emissions leading up to and immediately inside of the tunnel entrances and exits and the resulting modeled concentrations in the nearby vicinity.

53 Cont.

- Include calculations used to determine the emissions modeled for each alternative.
- Provide information supporting assumptions on the effectiveness of the tunnel's air ventilation system and the control efficiency of the tunnel ventilation towers. To the extent that similar tunnel ventilation systems and controls are in operation in other locations, provide information on the effectiveness of those systems for capturing and controlling air pollutant emissions.

Air Quality Modeling - Potential Incorrect Use of Volume Emission Source

The Draft EIS states that “The operational vehicle exhaust emissions from roadways were modeled as a line of volume sources. The line source spacing, or separation of the volume sources, was twice the width of each individual volume source.” While either area or volume sources can be used to represent roadways, in general, we recommend using area sources rather than volume sources as area sources are easier to characterize correctly. Spacing the volume sources twice the width is incorrect; the volume sources should be one source width apart. The additional modeling output isopleths that Caltrans provided to EPA indicate that the volume sources were potentially treated incorrectly in the modeling.

Recommendations:

- Before a Supplemental Draft EIS or a Final EIS is issued, a PM hot-spot analysis that meets the requirements of EPA's transportation conformity regulations is necessary. Please continue to consult with EPA on the development of this analysis. See additional comments about the PM hot-spot analysis below.
- Provide information in the Supplemental Draft, or Final EIS, on the results of the PM hot-spot analysis. Indicate how the emission sources were modeled graphically. The following link contains examples of how to characterize and model the emission sources: <http://www.epa.gov/otaq/stateresources/documents/hotspot-lessons-learned-trb.pdf>.
- Make AERMOD input and output files available for public review along with these results in the Supplemental Draft or Final EIS.

53 Cont.

Construction – Complete Characterization of Construction Impacts

In the Draft EIS, Tables 5.1 – 5.5 indicate that daily construction emissions for the build alternatives increase significantly with the Freeway Tunnel Alternative variations, however a complete characterization of the emissions is not provided. The construction emission tables provided show only the maximum daily emissions in lb/day, but the duration of construction for each alternative is different. Alternatives that take longer to build will produce higher total construction emissions.

Construction of the Freeway Tunnel Alternative would be from 2020-2025. We note that the years 2021 and 2025 are important milestone years for attainment of the 2012 PM_{2.5} standard. Evaluation of whether the area has attained the 2012 PM_{2.5} NAAQS will be based on ambient data from 2019, 2020, and 2021. Minimization and mitigation of emissions impacts from construction will be important to help insure that the area will attain the standard. Compliance with South Coast Air Quality Management District (SCAQMD) Rule 403 and standard construction measures to reduce fugitive emissions should be discussed in the context of what options are appropriate, given the current drought conditions. Additional mitigation should also be considered to reduce NOx emissions.

Recommendations:

- The duration of construction for each alternative should be incorporated into the tables to show the total construction emissions for each alternative.
- Discuss whether, due to current drought conditions, dust control during construction will occur under additional requirements, such as use of recycled water, or use of non-water dust

palliative compounds. If water control methods aren't proposed, then discuss the relative effectiveness of other compounds in dust mitigation.

- Include additional mitigation measures in Chapter 6, including the following as applicable:
 - Meet and ideally go beyond CARB requirements for in-use diesel engines and equipment, particularly for non-road construction fleets.
 - Insure that all construction equipment meets or exceeds equivalent emissions performance to that of U.S. EPA Tier 4 standards for non-road engines.
 - Implement a strong anti-idling policy at *all* construction sites for this project.
 - Provide training for contractors and their employees on air quality impacts from construction activities and potential health risks to nearby receptors, and ways to reduce emissions (e.g., no idling, using PM filters, using alternative fuels, etc.).
 - Solicit construction bids that include use of energy and fuel-efficient fleets and zero-emission technologies.
 - Use lighting systems that are energy efficient, such as LED technology.
 - Use the minimum feasible amount of greenhouse gas (GHG)-emitting construction materials.
 - Use cement blended with the maximum feasible amount of flash or other materials that reduce GHG emissions from cement production.
 - Use lighter-colored pavement where feasible.
 - Recycle construction debris to the maximum extent feasible.
 - Plant shade trees in or near construction projects where feasible.

53 Cont.

Tunnel Air Quality

Section 3.13 of the Draft EIS does not address air quality in the tunnel. However, the Tunnel Systems Report provides extensive information about the tunnel ventilation system, tunnel air quality, and standards for the ventilation system. Page 38 of the Tunnel Systems Report states, "When CO emissions are controlled, other air contaminants are also maintained at acceptable levels." More detail should be provided on the other air contaminants in the tunnel and what is defined as acceptable levels, including any relevant ventilation or air quality standards.

Recommendation:

- Section 3.13 should be revised to include a description of air quality in the tunnel, including relevant ventilation and air quality standards and predicted concentrations of CO, NO_x, air toxics, and PM_{2.5}.

Recommendations for Interagency Completion of Project-Level Transportation Conformity Analysis and Associated Consultation

Discussion of Conformity

As the Draft EIS states, the Freeway Tunnel Alternative with either the Single or Dual-Bore design variations were determined to be projects of air quality concern (POAQC) by the Southern California Association of Government's Transportation Conformity Working Group (TCWG), meaning they require a PM hot-spot analysis. The language in the Draft EIS implies that this analysis has not yet been conducted, yet also seems to indicate that conformity was completed and demonstrated by the modeling results included in the Draft EIS: (see italic text below) and in several other sections of the document.

If the Freeway Tunnel Alternative with either the single-bore or dual-bore design variation is identified as the preferred alternative, a quantitative PM hot-spot analysis *will be conducted* to demonstrate that the project would not delay attainment of or worsen existing violation of or cause an exceedance of the PM_{2.5} or PM₁₀ national ambient air quality standards and meets

conformity requirements. *In addition to the demonstration of conformity requirement, PM_{2.5} and PM₁₀, 24-hour PM_{2.5}, annual PM_{2.5}, and 24-hour PM₁₀ concentration values were calculated along the existing and proposed roadways within the project area. These values were calculated based on the EPA Transportation Conformity Guidance for Quantitative Hot-Spot Analyses in PM_{2.5} and PM₁₀ Nonattainment and Maintenance Areas (EPA Guidance November 2013).*

Since this is a major new transportation facility located in an area that is designated as nonattainment for multiple ozone and PM_{2.5} standards as well as maintenance for CO and PM₁₀, it is critically important that impacts to air quality be accurately analyzed, disclosed, and reduced as much as possible. As discussed, the SCAG TCWG has already determined that there are multiple project design variations that have been determined to be POAQC's. However, despite the referenced section of the Draft EIS included above, it has not yet been shown that these design variations meet the Clean Air Act requirements for transportation projects in PM nonattainment areas. Furthermore, the results presented in the Draft EIS are not presented for all receptors, included only the contribution from the project, and do not demonstrate that conformity was met.

Completion of PM_{2.5}/PM₁₀ Hot Spot Conformity Analysis We understand that Caltrans has just started coordinating with the TCWG to address this issue by sharing a modeling protocol for the project. EPA's quantitative PM hot-spot guidance describes a series of analytical and modeling steps that a project sponsor can follow to ensure that the project meets the statutory and regulatory conformity requirements. First, impacts of the project should be modeled, combined with background concentrations as described in Section 9 of EPA's guidance, and compared to the relevant NAAQS. A hot-spot analysis for this project should consider traffic impacts not only in the tunnel, but also on facilities outside the tunnel, including at the tunnel approaches. The information in Appendix D indicates that some of the largest truck traffic increases are north or south of the tunnel portals, regardless of design variation. If the design values for the build scenario are less than or equal to the relevant NAAQS at all receptors, the project meets the conformity rule's hot spot requirements and no further modeling is needed.

53 Cont.

If the build scenario results in design values greater than the NAAQS, then the no-build scenario will also need to be modeled. The modeling results of the build and no-build scenarios should be combined with background concentrations as appropriate. If the design values for the build scenario are less than or equal to the design values for the no-build scenario on a receptor by receptor basis, then the project meets the conformity rule's hot spot requirements.

Once the SCAG TCWG has concurred on the analysis, the quantitative analysis is typically considered as being acceptable for inclusion in the NEPA document.

Recommendations:

- The Supplemental Draft EIS or Final EIS should: 1) state that the conformity analysis is completed and concurred upon by the SCAG TCWG; and 2) accurately assess and disclose whether the proposed tunnel design variations will cause or contribute to any new localized violation of the PM NAAQS.
- Include predicted concentrations for *all* proposed Freeway Tunnel Alternative design variations, including background concentrations at all receptor locations near the tunnel facility.
- If the PM Hot-Spot Analysis is not completed upon publishing a Supplemental Draft EIS or Final EIS, a status of the analysis should be provided.

Construction Emissions Considerations for Conformity

Section 93.123(c)(5) of the conformity rule states that construction-related PM emissions due to a particular project are not required to be included in a hot-spot analysis, if such emissions are considered temporary (i.e., emissions which occur only during the construction phase and last five years or less at any individual site). The Draft EIS states that construction is predicted to last 57-59 months for the Freeway Tunnel Alternative, which is just short of the 5-year limit for including impacts in conformity. Considering that a 1-3 month delay would push the project period beyond 5 years, EPA encourages Caltrans to consider the potential need for construction-related emissions to be addressed in the conformity analysis.

Recommendations:

- In light of the need to include construction emissions in conformity-related analyses if the construction window is in excess of 60 months, EPA recommends that Caltrans provides more information on construction phasing.
- Confirm that there is no likelihood of construction delay. For example, include a schedule or timeline for various construction phases, and a description of how time estimates for each phase were developed. Discuss whether any potential delays have already been accounted for in this timeline.

Tolling

The Draft EIS does not include an equity assessment of the toll lanes included in the tolled variations of the Freeway Tunnel Alternative. In considering the implementation of high-occupancy/toll (HOT) lanes, there are nearby examples where analyses were completed in order to insure that a new toll system is implemented with awareness of possible disproportionate effects. For example, on the I-10 and I-15 corridors, the San Bernardino Association of Governments conducted an equity assessment to determine if the proposed I-10 and I-15 HOT lanes would benefit or adversely affect low-income travelers. For the impacts that were considered adverse, the equity assessment recommended measures to address the identified impacts. Metro also conducted an equity assessment to address concerns about fairness to low-income residents with regard to the proposed HOT lane on the I-5 North corridor.

53 Cont.

The Draft EIS is also lacking information on how revenue from the tolls would be used, which could be helpful in describing equitable implementation of a tolling program. The Freeway Tunnel Alternative is included in the Southern California Association of Governments' regional transportation plan (RTP) and the tolled operational variation of the dual bore Freeway Tunnel Alternative is consistent with the scope in the RTP. Forecasted revenues in the RTP's financial plan include toll revenues from the proposed freeway tunnel.

Recommendations:

- If a tolled variation of the Freeway Tunnel Alternative is chosen as the preferred alternative, Caltrans should conduct an equity assessment of the toll lanes to better inform equitable implementation of future tolling. Alternatively, if the equity issues related to the I-10, I-15 and I-5 HOT lanes are similar enough to what is proposed for the Freeway Tunnel Alternative, then the recommendations from the previous equity assessments could be characterized and discussed within the context of this project.
- Describe the range of additional services or improvements that would be funded by possible tolling revenues, including who would benefit from those services or improvements.

Health Effects

Health Effects - Mobile Source Air Toxics During Construction

The Air Quality Assessment Report does not appear to include the quantification of temporarily elevated MSATs during the construction period. While toxic air contaminants are mentioned in the introductory paragraph, they are not mentioned throughout the rest of the section. TACs, and particularly diesel PM, should be mentioned when discussing the pollutants generated by heavy trucks and construction equipment.

Recommendations:

- Reference MSATs (or TACs) as appropriate. For example, in the paragraph that begins, “Site preparation and construction...,” the following edit should be made: “If not properly controlled, these activities would temporarily generate PM₁₀, PM_{2.5}, ~~and small amounts of~~ as well as CO, SO₂, NO_x, VOCs, and TACs, including diesel particulate matter.” Alternatively, clarify how it was determined that only small amounts of these pollutants would be emitted.
- Include TAC emissions, including diesel PM, in the analysis of construction emissions. Report results along with the other pollutants in Tables 5.1-5.5.
- Discuss TACs, including diesel PM, in the analysis of long-term regional emissions.

EPA recommends removing “Qualitative” from the title of Section 5.4 since there is a quantitative estimation of emissions in this section. However, the quantitative estimation of MSAT emission impacts during the construction phase of each of the build alternatives (Section 5.4.4) is not presented. The short-term criteria pollutant impacts analysis presented in Section 5.1 (and in Tables 5.1 – 5.5) indicates that concentrations of criteria pollutants in the study area would increase by a significant amount, which suggests that MSAT emissions in these areas would increase as well. An expansion of the existing discussion, by including MSATs in the scope of short-term impacts analysis, would inform the public and decision-makers about possible location-specific increases in MSAT emissions.

Recommendations:

- EPA recommends that MSATs be included in the discussion of short-term impacts related to the construction of each build alternative.
- Specifically, discuss what impacts receptors would experience directly adjacent to the construction sites and how this compares with impacts they may experience currently, in the absence of an adjacent high-intensity construction project. This type of analysis is especially relevant to potential environmental justice communities adjacent to the build alternatives and in determining locations for prioritizing mitigation.

Health Effects - Mobile Source Air Toxics During Operation

Regarding long-term air quality impacts, page 5-29 of the Draft EIS states that MSAT emissions are estimated to decline by as much as 73 percent in the study area due to existing vehicle and fuel regulations coupled with fleet turnover (and not due to the build alternatives). Despite the fact that, as stated in the Draft EIS, with each build alternative, “regionwide MSAT levels [would be] substantially lower than they are today,” there would be increases in localized MSAT emissions in each of the build alternatives relative to the no build alternative.

Recommendation:

- Clarify where increases in localized MSAT emissions would result from the build alternatives.

53 Cont.

As stated above with regard to decreases in MSATs over time due to vehicle and fuel regulations and fleet turnover, the Health Risk Assessment states that the no build and build alternatives would cause a net decrease in cancer risks compared to 2012 existing conditions. Chapter 4.2.3 is also misleading regarding its conclusions that the build alternatives would “cause” a net decrease in cancer risks impacts. This statement should be rephrased, as discussed above. As demonstrated in the air quality analysis, there would be increases in localized MSAT emissions in each of the build alternatives relative to the no build alternative. Furthermore, in the Health Risk Assessment (see Table 3-4), maximum risks from the Freeway Tunnel Alternative have the potential to be greater than 100-in-a-million compared to the no build alternative. The Supplemental Draft EIS or Final EIS should clarify whether or not the build alternatives truly yield less than significant impacts in light of the information presented.

Recommendation:

- EPA recommends comparing the build alternatives and the no build alternative to determine the incremental impact from the alternatives themselves.
- Text should be revised to state that the build alternatives would not cause the decrease in cancer risks. EPA recommends rephrasing to say that “Cancer risks in both the no build and build alternatives decrease compared to 2012 existing conditions due to existing control requirements and fleet turnover.”

Health Effects – Children’s Health

Executive Order 13045 on Children’s Health and Safety directs each Federal agency, to the extent permitted by law, to make it a high priority to identify and assess environmental health and safety risks that may disproportionately affect children, and to ensure that its policies, programs, activities, and standards address these risks. Analysis and disclosure of these potential effects under NEPA is recommended because some physiological and behavioral traits of children render them more susceptible and vulnerable than adults to environmental health and safety risks. Although the Draft EIS identifies communities and schools located near the proposed project area, the Draft EIS does not clearly describe the potential direct, indirect, and cumulative impacts of the project on children’s health.

53 Cont.

Recommendations:

- Evaluate the potential direct, indirect, and cumulative health impacts of the construction and operation of the various project alternatives on children’s health. Obtain and discuss relevant health data (e.g., asthma data) for children living near the proposed project area, if available. The analysis may consider the following:
 - Potential respiratory impacts, including asthma, from air pollutant emissions and generation of fugitive dust;
 - Potential noise impacts to health and learning, especially in areas where the alternatives are located near homes, schools, childcare centers, and parks; and
 - Potential impacts from the use of chemicals, such as dust suppressants, and hazardous materials to children living near the proposed project areas.
- Further evaluate the proposed project alternatives in order to compare potential impacts to children’s health. Clearly identify the project alternatives that have the least impact to children, as well as those alternatives that have the least impact on areas already significantly impacted by existing air pollution, high disease rates, and indicators of social vulnerability.
- Identify mitigation measures to reduce impacts from the proposed project’s construction and operation to schools and child care centers near the proposed project area, including measures identified in the voluntary EPA School Siting Guidelines (<http://www.epa.gov/schools/guidelinestools/siting/>), and voluntary EPA Guidelines for States: Development and Implementation of a School Environmental Health Program

(<http://www.epa.gov/schools/guidelinstools/ehguide/>). Engage local school districts, child care providers, and others to discuss mitigation measures.

On March 6, 2015, California's Office of Environmental Health Hazard Assessment (OEHHA) adopted a new "Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments," which can be found here: http://oehha.ca.gov/air/hot_spots/hotspots2015.html. The guidance was updated to reflect advances in science which have shown that early-life exposures to air toxics contribute to an increased lifetime risk of developing cancer or other adverse health effects, compared to exposures that occur in adulthood. Children are typically more sensitive than adults to chemicals and this is true of air toxics. Children's defenses are not as developed, they breathe more air and eat and drink more per pound of body weight, and they are far more active than adults. In addition, they have a longer lifetime ahead of them, during which delayed health effects may become apparent. We also note that the Health Risk Assessment in the Draft EIS does not include an assessment of the risks associated with the construction impacts of each build alternative.

Along with the updated guidance, OEHHA and CARB updated its "Hotspots Analysis Reporting Program" (HARP) to reflect the updates. The latest version of HARP can be downloaded here: <http://www.arb.ca.gov/toxics/harp/harp.htm>.

Recommendations:

- The Health Risk Assessment may incorporate the updates identified above into the health risk analysis.
- The analysis may also be revised to include health impacts during construction.

Integration of Tunnel Alternative with 710 South Corridor Project

Because the proposed project is located directly north of the proposed 710 South Corridor Project and that project has the potential to directly affect the proposed project, the analysis should be more clear regarding the integration of the two projects.

Recommendation:

- If the Freeway Tunnel Alternative is selected as the preferred alternative, discuss how this project will integrate with the proposed I-710 South Corridor Project. For example, discuss how infrastructure to support zero emissions vehicles, which is being discussed for I-710 South, could be integrated into this project.

II. Light Rail (LRT) Alternative Comments

Property Acquisition and Business Displacement

EPA notes that the LRT Alternative will result in a large amount of property acquisitions. The Draft EIS states that because the LRT Alternative would result in a minimal number of nonresidential displacements, it would not adversely affect the character or cohesion of most of the communities in which the project would be located. It also states that the LRT Alternative would not result in permanent adverse effects related to relocations and real property acquisitions.

Table 3.3.6 indicates that Property Acquisitions Required for the LRT Alternative would result in the displacement of 73 businesses and 645 employees. The Draft EIS states that the LRT Alternative would result in the displacement of 15 neighborhood-oriented businesses in the community of East Los Angeles, adversely affecting community character and cohesion, and disrupting the social fabric of the community, due to the lack of relocation opportunities in the immediate vicinity and the high percentage of transit-dependent residents in the area. However, the Draft EIS concludes that most of the business

53 Cont.

displacements in other cities (Monterey Park, Pasadena, South Pasadena) “would not disrupt the social fabric of the communities” due to the nonessential nature of businesses or other businesses offering the same services in the vicinity. EPA has concerns about the displacements that would result from construction of the LRT Alternative in all of the communities discussed. These displacements would likely adversely impact both businesses and customers as relationships likely exist between neighboring businesses and neighboring residents. Regardless of the nature of the services, the displacement of many businesses in these communities could adversely affect community character and cohesion and negatively impact businesses that would have to relocate.

Recommendations:

- EPA recommends that Caltrans consider a more comprehensive analysis of community character and cohesion that includes other impacts, including visual, noise, and transportation, including the impacts of haul trucks during construction.
- If the LRT Alternative is chosen as the preferred alternative, additional efforts should be made to avoid and minimize property acquisition and business displacement. We encourage Caltrans to work with the local communities to encourage transit oriented development that could accommodate displaced businesses.
- The Final EIS should include information about whether partial acquisitions of property would impact the operations of businesses that exist on those properties, including information from business owners.

The Draft EIS states that the southern portion of the LRT Alternative is elevated due to the difficulty of getting a tunnel boring machine in to the area and the necessity of excavating a hill if the southern portion were to be tunneled. Due to the significant impacts to properties that would result from the elevated section of the LRT, if LRT is chosen as the preferred alternative, Caltrans should describe the other LRT alternatives that were considered and why they were eliminated from further study.

53 Cont.

Recommendation:

- If the LRT Alternative is chosen as the preferred alternative, include a discussion in the Final EIS of the other LRT alternatives that were considered and why they were eliminated from further study, including quantitative information about what impacts led to those alternatives being eliminated.

III. Other Comments

Transportation Impacts

The Draft EIS states that in 2035, the TSM/TDM, BRT, and LRT Alternatives would all result in minor increases in AM and PM peak-hour vehicles miles traveled (VMT) in the project study area. The Freeway Tunnel Alternative single-bore variation would result in a 1 percent increase in combined AM and PM peak-period VMT and the dual-bore variation would result in a 2 percent increase. The Draft EIS states that by shifting trips to freeways, the Freeway Tunnel Alternative would divert VMT from local arterials; however, the Draft EIS does not quantify the amount of VMT that would be shifted from local arterials to the Freeway Tunnel Alternatives in the Executive Summary and other summary statements. Tables 3.5.6 and 3.5.11 include daily volumes of vehicles that would travel on arterials and freeways and other quantitative information about travel on arterials. This information should be summarized in the text conclusions for increased clarity for the public.

The transportation section also does not include information about annual average daily traffic on individual segments of freeway and arterials in the study area. This information is important to determine whether certain areas of the study area, for instance the areas where the new freeway

alignment would connect to the existing freeway under the Freeway Tunnel Alternative, would experience significant increases in traffic and resulting air quality and noise impacts.

Recommendations:

- The Final EIS Executive Summary and other summary text should include a discussion, including percentages and other quantitative data, on how much traffic would be diverted from local arterials to the Freeway Tunnel Alternative.
- The Final EIS should include information about annual average daily traffic on individual segments of freeway and arterials in the study area, including which segments would experience increases in traffic and potential impacts resulting from that traffic.

Community Impacts Along Haul Routes

The Draft EIS states that the Freeway Tunnel Alternative would result in between 380 (single-bore variation) and 620 (dual-bore variation) haul trips per day during excavation, to transport excavated soil to the proposed disposal sites, two former rock quarries in Irwindale. The Draft EIS does not, however, appear to quantify the number of haul trips that would be required under the LRT Alternative. Tunnel boring operations, and subsequent haul trips, could occur 24 hours a day, 7 days a week. EPA is concerned that this amount of haul trips would have adverse impacts on communities near the disposal sites. Although the routes to the disposal sites would primarily run along freeways, EPA is concerned about the segments that run along local streets, and about traffic and community impacts in general along the haul routes.

Recommendation:

- If the LRT or Freeway Tunnel Alternatives are chosen as the preferred alternative, Caltrans should include a discussion in the Final EIS of the land uses on the local streets near the proposed disposal sites. The discussion should analyze potential impacts to residents and businesses in those areas and commit to mitigation measures for noise, air, traffic, and other potential impacts.

53 Cont.

Environmental Justice Impacts

The Draft EIS states that no environmental justice (EJ) impacts were identified with any of the alternatives. Chapter 7 of the Community Impact Assessment contains maps which show each of the alternatives overlaid on (1) Racial Minority Population; (2) Hispanic/Latino Population; (3) Low Income Population; and (4) Census Tracts with One or More Environmental Justice Population Characteristics. These maps are very helpful in understanding potential impacts to the EJ communities. The local communities may be concerned about the location of the tunnel vents and the haul routes (rail and truck) for the tunnel bore material. Therefore, EPA recommends that these features also be indicated on the EJ maps for the LRT or Freeway Tunnel Alternative. As discussed above, the Freeway Tunnel Alternative with the dual-bore design variation would result in approximately 620 haul trips per day. Any EJ communities and/or sensitive populations located along the haul route could be impacted by the increased truck traffic.

Recommendations:

- Include maps in the EJ section of the Final EIS that show the preferred alternative overlaid on the various data included in the Community Impact Assessment. If the Freeway Tunnel Alternative is chosen, include the location of tunnel vents and haul routes on the maps.
- If the LRT Alternative is chosen as the preferred alternative, the Final EIS should also include a map in the EJ section of Chapter 3.3 that overlays EJ communities with proposed property acquisitions and haul routes.

- Any potential impacts to these communities should be discussed and mitigated, especially if there are any sensitive receptors impacted, such as schools, child care centers, or senior centers.

Dewatering During Tunnel Construction

The Draft EIS states that temporary dewatering will be required during construction of the LRT and Freeway Tunnel Alternatives. It states that the Los Angeles Regional Water Quality Control Board requires a permit for discharging wastes to surface waters from activities involving groundwater extraction. Order No. R4-2013-0095 (NPDES No. CAG994004) covers treated or untreated groundwater generated from permanent or temporary dewatering operations or other appropriate wastewater discharge not specifically covered in other general National Pollutant Discharge Elimination System (NPDES) permits in the Los Angeles region.

To be eligible for coverage under this order, a discharger must:

- Demonstrate that pollutant concentrations in the discharge shall not cause violation of any applicable water quality objective for the receiving waters, including discharge prohibitions;
- Demonstrate that the discharge shall not exceed, or have the reasonable potential to exceed, the applicable water quality objectives/criteria for the receiving waters; and
- Conduct water quality screening of a representative sample of the discharge to prove that a reasonable potential for discharge of toxics does not exist.

The Draft EIS states that the soil conditioners that may be injected into the ground at the face of the excavation would be nontoxic and biodegradable, and therefore would not adversely impact groundwater quality. Groundwater monitoring will be performed routinely during tunnel excavation to ensure that the activities are not affecting groundwater levels and quality.

53 Cont.

The Draft EIS states that the concrete lining of the LRT and Freeway Tunnel Alternatives would be designed and constructed to be watertight and that after excavation the space between the outside of the tunnel lining and the soil is typically grouted to prevent groundwater flow along the tunnel bores. The Draft EIS states that no permanent dewatering would be required. Because groundwater basins in the area are already impaired by VOCs, nitrates, and other contaminants, it is critical that Caltrans insure no pollutants will enter groundwater during construction and operation of the project.

Recommendations:

- The Final EIS should discuss whether Caltrans/Metro have submitted a notice of intent (NOI) to be covered under the permit and how Caltrans will fulfill the requirements of the above Order (R4-2013-0095 (NPDES No. CAG994004), given the existing impairment of the local groundwater basins.
- The Final EIS should discuss how much dewatering is expected (duration or amount), whether the groundwater will be reused or re-injected, and whether there are any additional requirements on dewatering due to the existing statewide drought.
- Clearly identify what actions will be taken if groundwater monitoring indicates groundwater levels and/or quality are impacted during tunnel excavation.

Soil Disposal During Tunnel Construction

The Draft EIS states that the “excavated soil would be disposed of at the Manning and Olive Pits in the City of Irwindale. These pits are former rock quarries that have been previously environmentally cleared and licensed to accept clean soil from construction projects.” However, no detail is provided about the environmental clearance. Page 2-53 states that “The Manning Pit is accessible by both rail and truck.”

However, no additional information is provided about whether rail or trucks will be used for hauling bore material to the Manning Pit, or the potential environmental impacts of rail versus trucks.

Recommendations:

- The Final EIS should provide detailed information on the environmental clearance that has been completed for the Manning and Olive Pits in the City of Irwindale, including whether any additional permits will be required for soil disposal resulting from this project.
- As these sites have been licensed to accept clean soil, the Final EIS should discuss alternative disposal sites for soil that is found to be contaminated, and the timing and haul routes for that disposal, if necessary.
- The Final EIS should also discuss potential environmental impacts associated with hauling excavated soil by rail versus truck, and discuss how the decision will be made about whether rail or trucks are used.

Noise and Vibration Impacts

The Draft EIS discusses the locations of receptors that would experience noise impacts due to the various alternatives. It also discusses which locations were considered for noise abatement, and where noise barriers are considered reasonable and feasible, according to characteristics of the sites and cost considerations. We note that many of the noise barrier locations considered feasible were not found to be reasonable based on cost considerations. EPA encourages the consideration of noise barriers and other mitigation of noise impacts in areas of sensitive receptors, and in particular in areas of sensitive receptors located in environmental justice communities. The Cumulative Impact section discusses projects that have the potential to contribute to cumulative noise impacts. Again, we encourage mitigation of noise impacts in particular in areas that would experience cumulative noise impacts from this project and other projects.

With regard to temporary impacts, EPA is concerned about potential noise impacts along the haul routes during construction and vibration impacts from tunneling. The Draft EIS considers a 24-hour operation, and the resulting number of trucks per hour (30 trucks). The Final EIS should discuss whether adverse noise impacts would occur if a 24 hour operation does not occur and there were more trucks per hour.

Recommendations:

- EPA recommends that Caltrans include noise barriers and other mitigation of noise and vibration impacts in areas of sensitive receptors, and in particular in areas of sensitive receptors located in environmental justice communities or in areas that would experience cumulative noise impacts. We encourage mitigation of both permanent impacts from operation of the project alternative, and temporary impacts from construction.
- Include an analysis in the Final EIS of potential noise impacts resulting from different construction operations, including a less than 24-hour operation, which would result in more trucks per hour on roads and increased noise levels. If adverse impacts were to occur under those conditions, we encourage Caltrans to provide mitigation for those impacts.

Wetlands and Water Quality

Wetlands and Waters of the US

The Draft EIS states that while the total area of wetland and nonwetland areas meeting the criteria for US Army Corps of Engineers (USACE) jurisdiction in the Biological Study Area is approximately 4.8 acres (0.4 acre of wetlands and 4.4 acres of nonwetland waters of the US), potential impacts are much less, with the highest impacts being 0.5 acre of permanent and 0.2 acre temporary nonwetland water impacts anticipated from the dual-bore design variation of the Freeway Tunnel Alternative. The Draft

53 Cont.

EIS also states that the alternatives would not permanently alter the values and functions of the waters in the area, which primarily function as conveyance of urban runoff and stormwater flows. EPA appreciates that, as stated in the Draft EIS, the Freeway Tunnel Alternative variations were refined during design development to avoid and minimize impacts to wetlands and other waters in the Laguna Channel.

Recommendation:

- Once a preferred alternative is selected, Caltrans should coordinate with the USACE to verify the jurisdictional delineation of wetlands and impacts in the study area, prior to publication of the Final EIS. Caltrans should also coordinate with USACE and EPA to determine appropriate mitigation for wetland impacts.

Water Quality

The Draft EIS states that best management practices would treat widely varying percentages of newly created or replaced impervious surfaces under the various alternatives.

Recommendation:

- Include a discussion in the Final EIS of the percentage of impervious surface that will be treated for the preferred alternative and how that fulfills local permit requirements.

Climate Change

The Draft EIS states that neither EPA nor the Federal Highway Administration (FHWA) have issued guidance or methods to conduct project-level greenhouse gas (GHG) analysis; however, the Council on Environmental Quality released revised draft guidance in December 2014 that describes how Federal departments and agencies should consider the effects of GHG emissions and climate change in their NEPA reviews. EPA recommends that Caltrans review that guidance to see whether it can be used to help outline the framework for its analysis of these issues. EPA appreciates the quantitative analysis included in the CEQA Evaluation chapter of the Draft EIS and encourages Caltrans to include this information as a part of the NEPA review. We support Caltrans' and Metro's efforts to reduce energy consumption and GHG emissions. As Caltrans continues to assess the risks to transportation facilities from climate change effects, we encourage Caltrans to adapt the design standards of this project to mitigate any effects.

Recommendations:

- We believe the Council on Environmental Quality's December 2014 guidance discussed above outlines a reasonable approach, and we recommend that Caltrans use that draft guidance to help outline the framework for its analysis of these issues.
- EPA encourages Caltrans to include the information in the CEQA Evaluation chapter as a part of the NEPA review.
- EPA encourages Caltrans to adapt the design standards of this project to mitigate climate change effects as feasible.

Other Items: Please address the following in the Final EIS.

Monitored Air Quality. The Draft EIS contains information regarding monitoring stations and air quality trends in the study area, however it is not clear in the document where the stations are located with respect to the new transportation facilities.

53 Cont.

Recommendation:

- The Final EIS should include a map showing the local air quality monitoring stations discussed (i.e., the South Wilson Avenue Pasadena Station, the North Main Street Los Angeles Station, and any other stations located within the project study area) and their relationship to the project location.

Air Quality – Identification of Sensitive Receptors. The Draft EIS includes one paragraph describing where sensitive receptors are expected to occur in the study area but does not include any specifics on where those receptors are located.

Recommendation:

- The Final EIS should include a map showing sensitive receptors.

Air Quality Management Plan. The Draft EIS discusses the 2012 AQMP but not the most recent update or state or federal actions on that plan.

Recommendation:

- The Final EIS should update the information to include ARB adoption and EPA actions on the 2012 AQMP.

CO Screening Analysis. The flow chart was used incorrectly in the Level 4 portion of the analysis.

Recommendation:

- Since the study area is a CO Maintenance area, the lower part of the flow chart (levels 3 and 4) should be used. Please reapply the flow chart correctly and update the CO air quality analysis in the Final EIS.

Transportation Conformity. The Draft EIS indicates that SO₂ is a transportation-related criteria pollutant, which is not correct. The document also references national rulemakings regarding the transportation conformity rule, and ozone and particulate standard that occurred in 2003-2004. Multiple major federal rulemakings that have occurred since this time. Overall the discussion of EPA and ARB standards on pages 2-9 and 2-10 appears to conflate conformity and NAAQS updates.

Recommendation:

- The Final EIS should correct the text to indicate that SO₂ and lead are not required to be included in transportation conformity analyses. In addition, please update the document to include the most recent updates to federal and state NAAQS and the most recent amendments to the transportation conformity rule. Information on the conformity regulations can be found here: <http://www.epa.gov/otaq/stateresources/transconf/conf-regs.htm>. The latest NAAQS updates can be found here: <http://www.epa.gov/air/criteria.html>.

53 Cont.

ATTACHMENT 6
Beyond the 710 Initiative



NEW INITIATIVE FOR MOBILITY AND COMMUNITY

www.nelsonnygaard.com

SUMMARY

The San Gabriel Valley is an area of diverse cities and neighborhoods that trace the history of Southern California. New homes mingle with historic downtowns and educational institutions to create a lively sub-region. All of that activity, however, creates demand for ever-increasing mobility and access. The economic might of our region means we will continue to have opportunities to invest in transportation. Doing so in ways that serve our economy and environment, while supporting our health and quality of life, will require sound decisions. This initiative is a starting point that changes the conversation to focus on the transportation needs of the area and the opportunities that may be explored by the local community as they develop their vision for community mobility.



Transit – Building out the area’s rapid transit network (particularly some missing north-south options) will make car ownership an option rather than a necessity – potentially improving life quality and household finance.



Active Transportation – Every trip starts by walking, and the people of this community deserve to be able to walk safely and comfortably. What better use of dollars is there than those spent to reduce injuries and deaths while taking cars off our congested roads?



Managing Demand – Sometimes it costs less to convince people not to drive than it does to accommodate driving with more road construction. Five-Hundred Million well spent dollars can take more cars off the roads than could be carried on a comparably priced new facility.



Congestion – While spending to create more choice, we can’t lose sight of the fact that sometimes you just need to drive. Dollars spent smartly can help make those drives less miserable without encouraging the development sprawl that can result from less focused projects.

DIVERSE COMMUNITY, DIVERSE SOLUTIONS

For many years, the idea of a 710 freeway connection has been misleadingly touted as a solution to the transportation woes of the San Gabriel Valley. The publication of the 710 Environmental Impact Report has made clear, however, that this 50-year old project is no solution. It does not help a community craving transit access. It does not address east-west mobility problems. It prohibits trucks, bikes, pedestrians and charges tolls for cars. Perhaps most importantly, it will consume all of the available financial resources for this area.

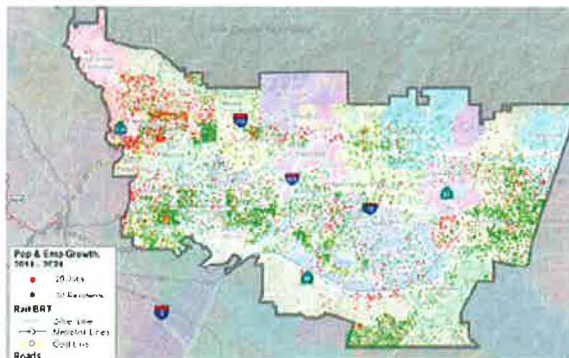
Problems with the tunnel proposal include:

- The tunnel does not “pay for itself” through tolls as some have asserted.
- According to the EIR, the tunnel does not address congestion issues in Alhambra.
- The tunnel bypasses the very destinations people want to go to.

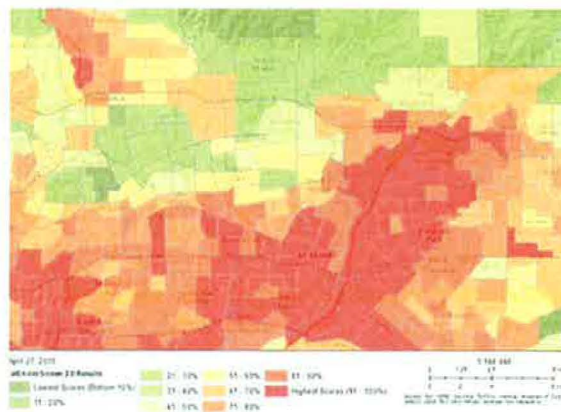
The San Gabriel Valley is a community of diverse people, with widely varying commute patterns. Employees need to make short commutes to Pasadena and long commutes to Burbank (Metro has found that 70 percent of study area vehicle trips start and end within the San Gabriel Valley). Students attending Cal State LA and East LA College need ways to make short commutes to school. Communities need to be able to walk safely to transit and want to be able to invest in ways that can improve air quality.

The set of ideas outlined in the pages that follow are intended as a starting point for the development of a real, community-based transportation vision. This is a compilation of many good ideas that have emerged from community and agency processes over the years. This diverse set of solutions should be refined based on community input and community needs in order to accommodate community aspirations. A community-based solution represents the best investment of our transportation dollars to connect and create community in the San Gabriel Valley.

It strains credibility that, despite holding scores of public open houses filled with community comment, no changes of substance have been made to any of the alternatives under evaluation. The 710 tunnel is not a community solution.



The addition of a 710 freeway linkage could bring the same level of environmental risk to local residents as that faced by residents in corridors such as I-605.



Analysis by Metro indicates the greatest population growth in the San Gabriel Valley will be in Pasadena - a community that has passed a resolution against 710 tunnel.

THE NORTH STUB

For fifty years this community has been held hostage to the wrong-headed idea of a freeway extension – an idea which has precluded all sensible solutions. Allowing these “complete street” connections to happen would improve access and reconnect neighborhoods as the land relinquished by Caltrans is put back into productive use. The plan could even facilitate a trail connection from Pasadena, along the Arroyo to the LA river.

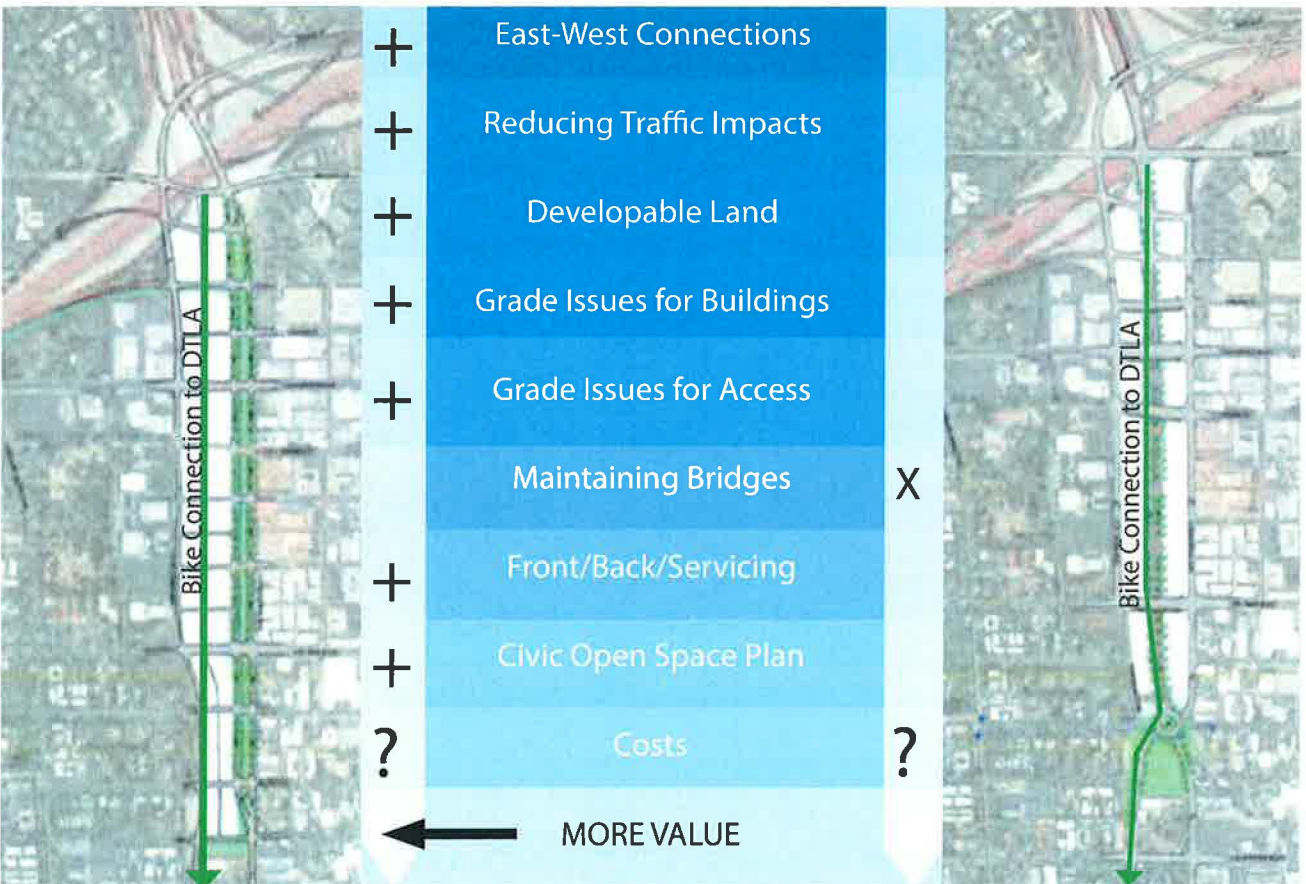
As an example of the kind of solution that can be developed from the grass roots community, this vision of Pasadena’s future stands in stark contrast to the 710 tunnel envisioned by planners (not influenced by community input).

This vision of reconnected streets supporting redevelopment would bridge the gap between downtown and West Pasadena.

QUICK COMPARISON

OPTION A:
FILL THE DITCH

OPTION B:
RETAIN CURRENT GRADES



THE SOUTH STUB

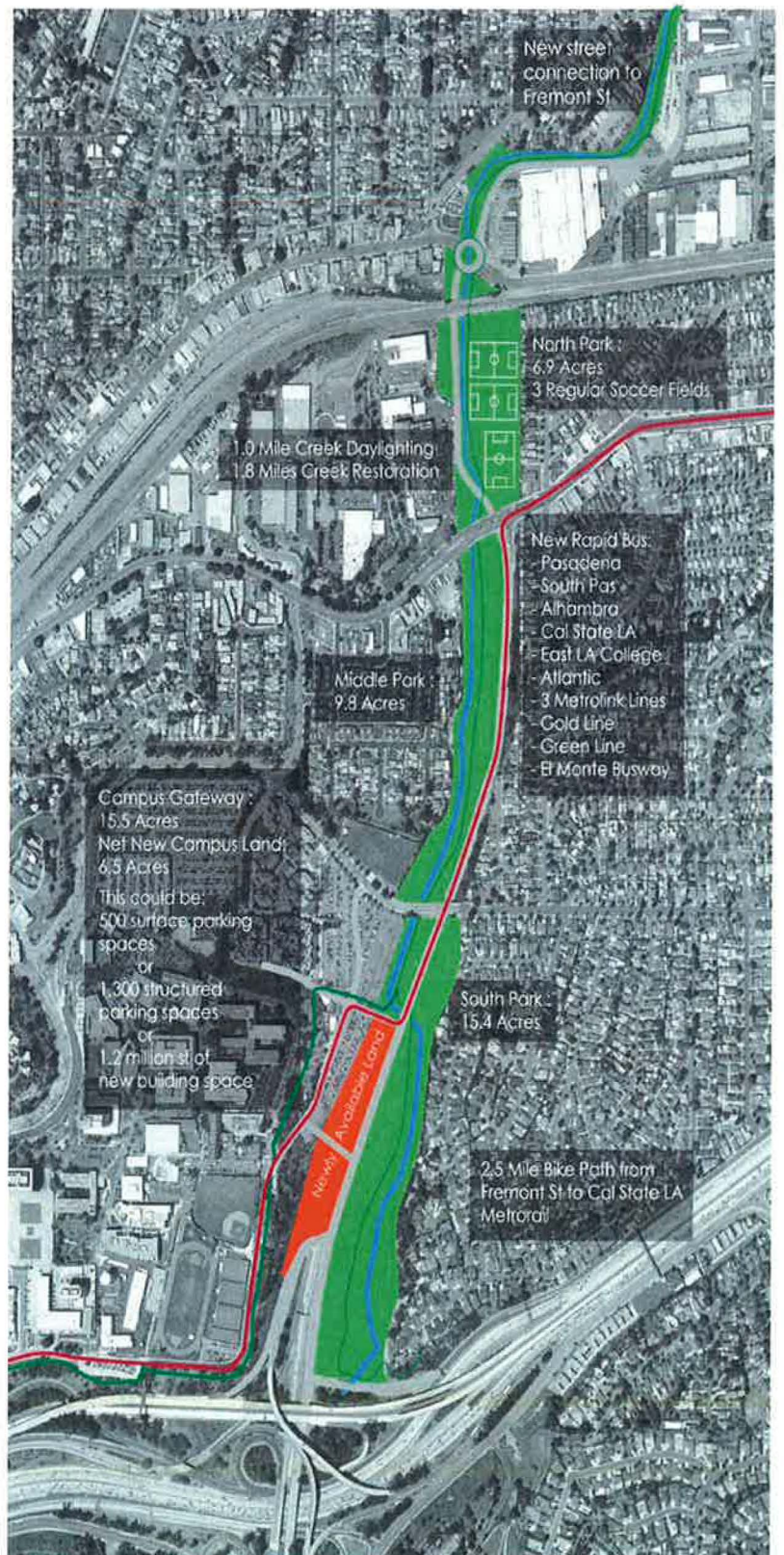
The 710 freeway stub north of the 10 is oversized, and dumps all its traffic onto Valley Blvd, creating a congestion bottleneck. Converting the freeway into a boulevard allows us to solve its traffic problems by providing direct access to Cal State LA, and a 2-lane complete street connection to Alhambra Ave/Mission Rd, allowing traffic to be distributed into the arterial grid while protecting residential neighborhoods. A complete street connection through the emerging "Biotech Triangle" can reduce traffic at Fremont/Mission and cut-through along Concord Ave.

These changes also allow the restoration of Arroyo Rosa de Castilla, the year-round creek that runs alongside and under the 710, and the creation of over 30 acres of new parklands, three regular soccer fields, and a 2.5 mile bike path connecting Alhambra, El Sereno, and South Pasadena.

The boulevard also allows the creation of a new front door for Cal State LA, including 6.7 acres of flat, developable campus land.

Changing the disconnected south 710 Freeway stub into a connected boulevard would free up space for Cal State LA campus expansion, more efficiently disperse area traffic, provide space for premium transit including the opportunity to expand Dash service to El Sereno and Cal State LA. Perhaps more importantly it would connect communities, provide needed greenspace.

LEGEND	
	New Rapid Bus
	Restored Arroyo Rosa de Castilla
	Golden Eagle Boulevard Complete Street
	Bike Path



THE NORTH STUB

Offers the potential to create 35 "new acres" of developable land to link the vibrant West Pasadena neighborhoods with Old Pasadena. This could create as much as 2.5 million square feet of new housing, retail, and office space.



**Nearly 1,300
Residential units**



New Parks and Open Space



**Retail equivalent of expanding
Old Pasadena by one-third**

JOB CREATION

Building this development program will create more than 8,000 construction job years and more than \$275 million in wages. Property and sales taxes are estimated to be more than \$12 million per year.

Commercial space in the north stub could potentially house more than 4,000 on-going office and retail jobs.



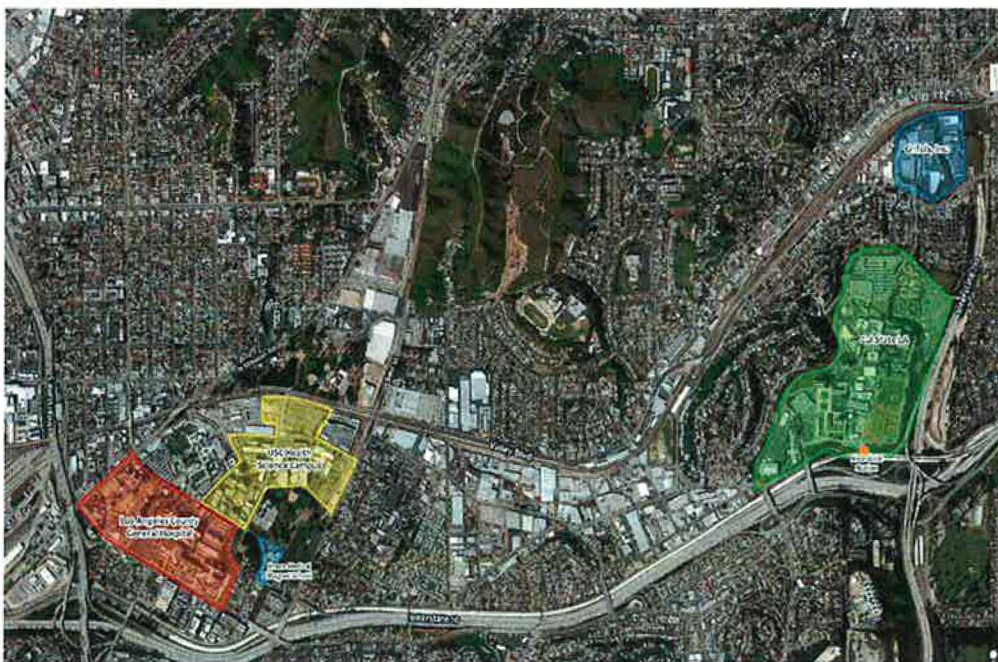


THE SOUTH STUB

Enhanced quality of life and home values from proximity to parks, open space, and transit.



Construction jobs from the development of a gateway for Cal State LA and buildout of the bus rapid transit system.



Support for the emerging Valley Boulevard Biosciences Corridor, connecting LAC/USC Medical Center, Keck School of Medicine, Bravo Medical Magnet High School, Grifols, Inc. and other private sector biotech firms.



SCALE OF GOLDEN EAGLE BLVD 45,000 VEHICLES PER DAY

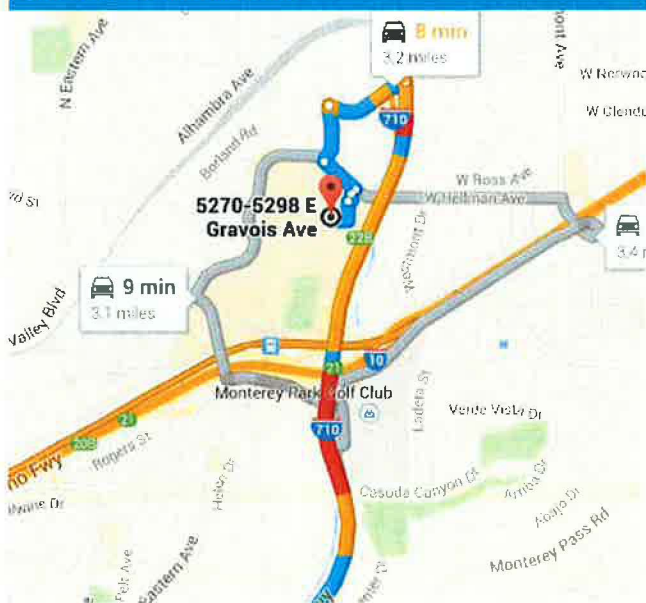
SCALE OF GOLDEN EAGLE BLVD/ MISSION RD

CONGESTION RELIEF

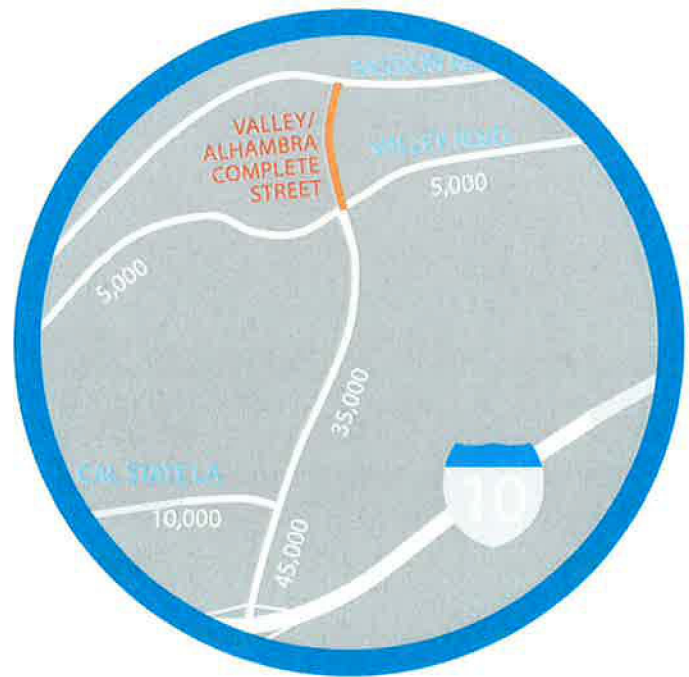
DISAPPEARING TRAFFIC

By replacing the freeway stub with a connected local street, "Golden Eagle Boulevard" would allow drivers to reach their destinations sooner – reducing traffic on the northern connector so much that a two-lane complete street (potentially ending in a traffic calming roundabout) could handle the reduced traffic. Measure R tax money was set aside for improvements to this corridor, but has gone unused so that the idea of a tunnel wouldn't be harmed. The citizens have already paid the taxes – it's time to get the benefit.

CAL STATE LA TRAFFIC



Currently, a query to Google would send a driver on a round about trip to Cal State LA, adding miles to the roads and congestion to local streets.



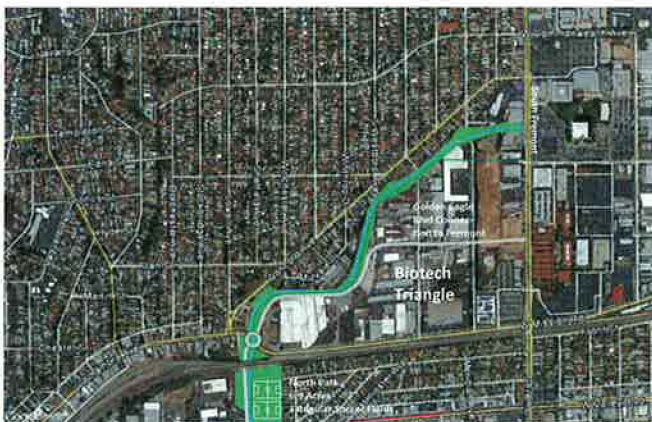
Changing the Freeway stub to a connected street and adding a complete street link to Mission Road is the real solution to area congestion.

RESTORATION



Restoration of the Arroyo Rosa de Castilla will provide local residents with increased open space, beautiful vistas, opportunities for active mobility, areas for community gatherings and overall improved quality of life.

BIOTECH TRIANGLE



Rebuilding the stub as a complete street would allow the restoration of the Arroyo Rosa de Castilla – a natural waterway that was piped and channelized to make room for the freeway stub.

The new street connection will provide a link between the University and the emerging “Biotech Triangle.” Connecting these minds to the investment outcomes of their thinking allows this cycle of creativity to happen in the San Gabriel Valley. The new network along “Golden Eagle Boulevard” can reduce traffic at Fremont/ Mission and cut-through traffic along Concord Ave. The resulting complete street intersection on Mission will have such a manageable level of traffic entering that it could likely be handled by a single lane roundabout.

ON-GOING COMMUNITY DEVELOPMENT BENEFITS



Creation of a diverse mobility plan provides long-term economic benefits that cannot be duplicated with the tunnel solution.

- Thousands of permanent transit jobs for operators, maintenance workers, and administrators

Opportunities for transit oriented development at each transit station

- Phase 1 of the Gold Line to Pasadena has already generated \$1.4B in private investment, with a potential of many times this amount as the light rail system develops regionally.
- Phase 2A and B is estimated to generate over twice the investment of Phase 1.
- The Gold Line Eastside Extension, proposed BRT, and increased Metrolink service create significant additional opportunities for sustainable community development.





ADDITIONAL BENEFITS

PUBLIC HEALTH

- Reduces air pollution and greenhouse gases
- Increases physical activity through walking and biking
- Reduces traffic-related injuries and fatalities
- Provides access to medical facilities
- Reduces the stress of commuting



QUALITY OF LIFE

- Open space and recreation promote healthy lifestyles
- Access to transit makes regional destinations more accessible
- Parks and complete streets reduce the noise, stress, and vibration associated with living near a freeway.

ECONOMIC OPPORTUNITIES

- The average transit pass holder in Los Angeles saves about \$11,000 per year on commuting costs
- Transit access and nearby parks create a premium for housing values
- Transit supports sustainable community development and more opportunities for housing





WALKING

SUPPORTED BY ENHANCED PRIORITY CROSSINGS

This budget could improve safety for pedestrians throughout the San Gabriel Valley. Crossings of major arterials, accessibility improvements to intersections and dignified transit stops could all be achieved.

PEDESTRIAN FATALITIES IN CALIFORNIA



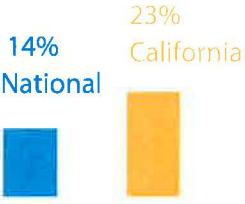
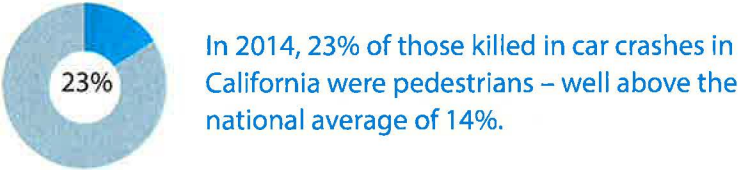
COLLISIONS IN LA

5,000 collisions involving pedestrians, in an average year in LA County

\$25 M



CAR CRASHES AND PEDESTRIANS IN CALIFORNIA



NORTH-SOUTH CONNECTIONS



LEGEND	
●	Activity Centers

This option would be different from the transit alternative shown in the EIR. Rather than a disruptive aerial structure, this would be a fast, surface, community-serving alternative.

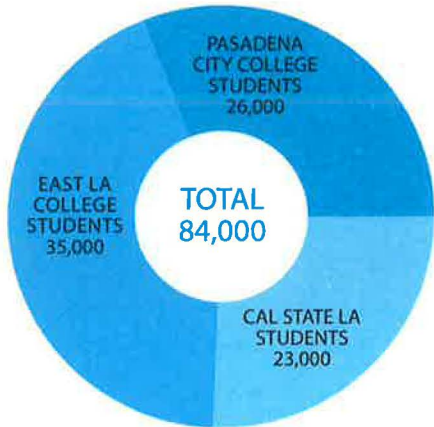
This area's great east-west transit connectivity could be supplemented by a north-south corridor that would connect both legs of the Gold Line, MetroLink's San Bernardino, Riverside and Orange County Lines, the El Monte Busway, the Green Line and the Blue Line. In addition to all those transit linkages, activity centers along the line such as Huntington Hospital, Cal State LA, East LA College, St. Francis Medical Center and the communities of Bell, Maywood and Southgate and Long Beach would all become better connected. As ridership continues to grow, the community may explore the possibility of a light rail option that could further enhance the existing transit network.



The community supports an enhanced, surface transit solution that connects to employment centers, recreational opportunities and educational institutions, not a disruptive aerial structure as proposed in the EIR.

DEMAND MANAGEMENT

CAN TDM SOLVE THE PROBLEM?



20%

VEHICLE TRIP
REDUCTION ESTIMATE

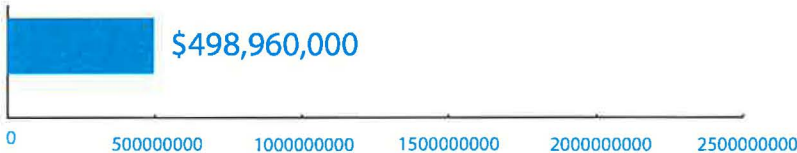
33,600 TRIPS
SAVED PER DAY

302,400 TRIPS
SAVED PER YEAR

YES

COST
\$500 M

30 YEAR COST AT MARGINAL COST RATE



\$73.00

COST PER YEAR PER
RIDER - MARGINAL

CASE STUDY:

Cal State Long Beach has offered unlimited free rides on Long Beach Transit to all faculty, staff and students since 2008, achieving great results.

RESULTS



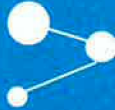



ANNUAL PROGRAM COST
\$525,000

COST PER AVOIDED TRIP PER YEAR
\$0.52


98,860	LONG BEACH TRANSIT RIDERSHIP 07-08
1,114,709	LONG BEACH TRANSIT RIDERSHIP 09-10
1,015,849	ANNUAL RIDERSHIP INCREASE

CASE STUDY: CAL STATE LONG BEACH

WHAT CAN HAPPEN NOW?

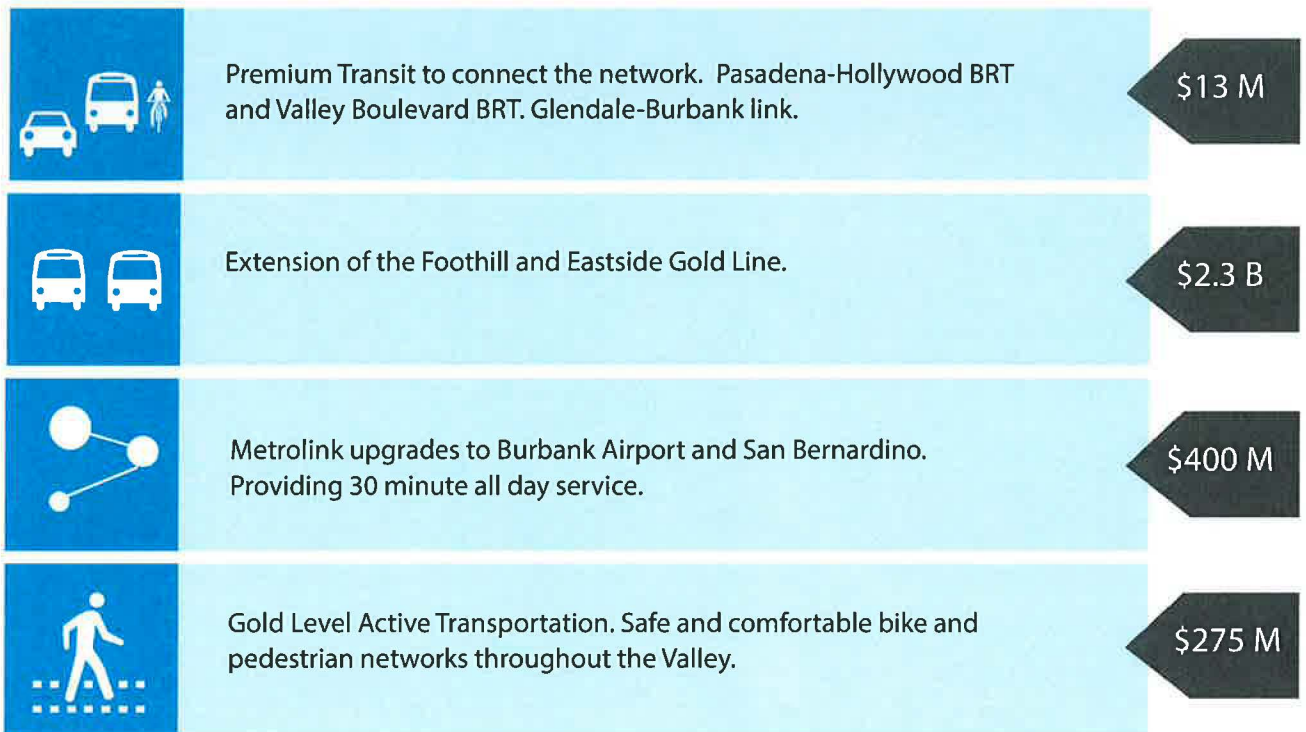
	<p>Remove the South Stub and build "Golden Eagle Boulevard," including a connection to Mission Road, as a "complete street." (bus lanes and separated bike path included)</p>	<p>\$200 M</p>
	<p>Expanded DASH service to CalState LA</p>	<p>\$15 M</p>
	<p>Rebuild street connections to stitch together the North Stub</p>	<p>\$95 M</p>
	<p>Add 30 safe, pedestrian arterial crossings, 10 miles of new sidewalks and build the planned network of bike lanes and paths within one mile of either side of the 710 alignment</p>	<p>\$25 M</p>
	<p>Deliver real Rapid Surface Transit (Improved Route 762) north-south service to include greater frequency, longer hours, weekend service and some dedicated bus lanes</p>	<p>\$170 M</p>
	<p>Rosemead Boulevard is the main north-south street in the San Gabriel Valley, connecting the City of Rosemead to Temple City, East San Gabriel and East Pasadena. It is also served by Metro Lines 266 and 489, and a segment in Temple City features the region's first protected bike lanes.</p>	<p>\$200 M</p>

FUTURE PHASES: Moving forward the sale of surplus Caltrans properties could generate up to an additional \$250 million to fund effective approaches such as student transit passes in the corridor:

	<p>Transit passes for 10 years for students of Pasadena City Collage, Cal State LA and East LA Collage</p>	<p>\$170 M</p>
---	--	----------------

WHAT COULD HAPPEN WITH MORE FUNDING

With an initiative such as Measure R2, the following projects can address the regional transportation issues throughout the area.

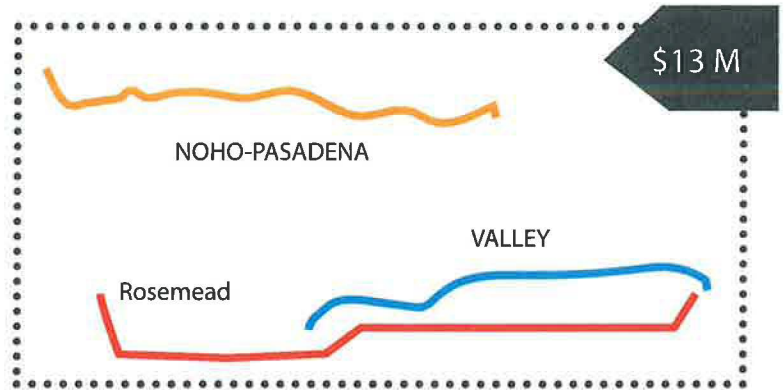


PREMIUM TRANSIT CONNECTIVITY

- North Hollywood to Pasadena BRT (including Burbank and Glendale)
- Valley Boulevard BRT (Downtown LA to El Monte Transit Center)
- Rosemead BRT (Boyle Heights to El Monte Station)

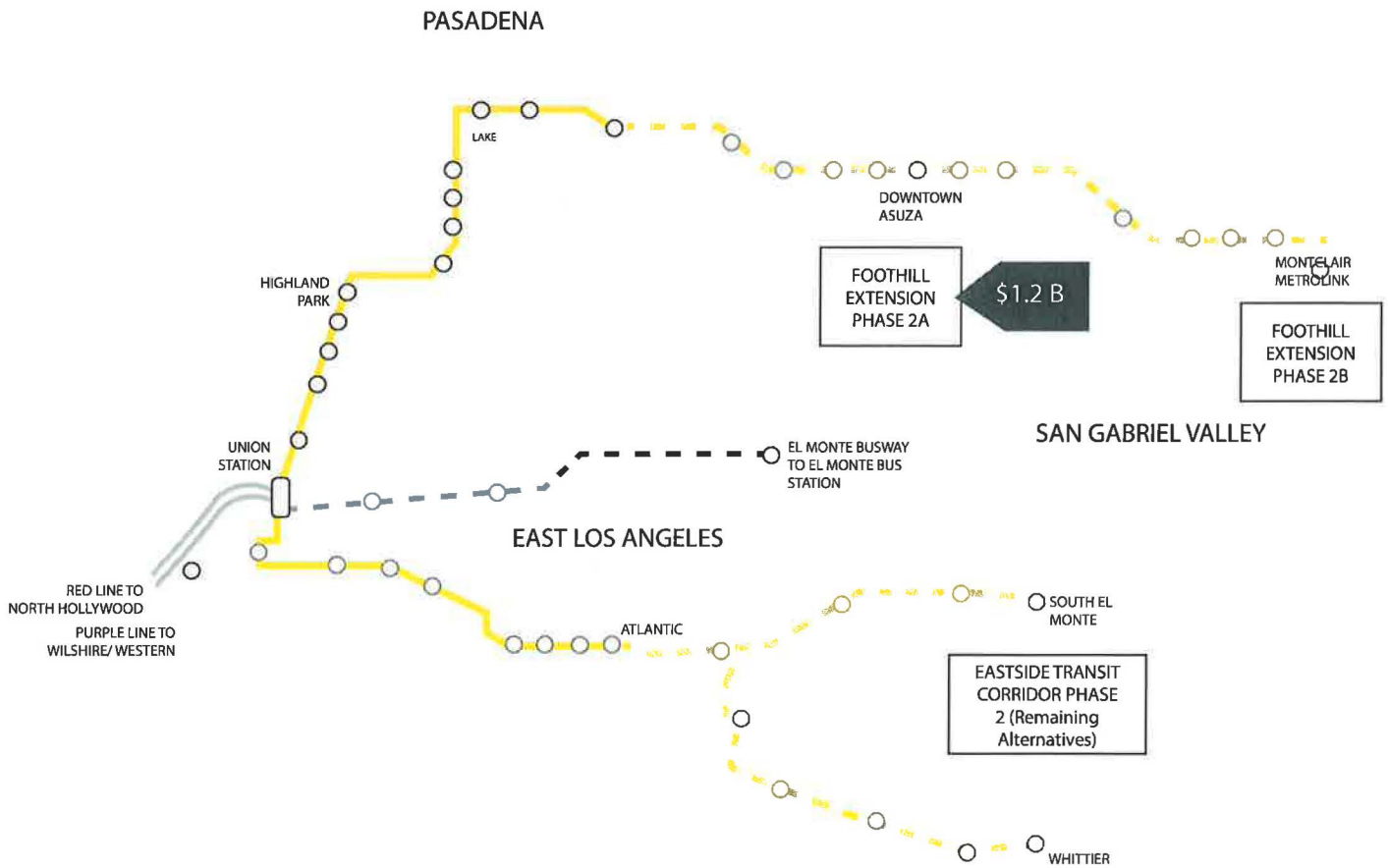
Rapid Bus Transit along the sub-region's key corridors can connect communities that are a bit farther from the rail network. These corridors involve more than just buses. Improvements to transit stops/stations can assure that all riders have a safe and dignified experience. Improvement of sidewalk connectivity and quality can assure people can get to the system and safely cross streets at stations. Once the sidewalks are improved, consolidating stations can make the ride much faster and more reliable.

As illustrated in this 1990 Metro Rail Plan, there has always been a "V" shaped missing link in rail planning that bypasses Glendale and Burbank. The time has come to bridge the missing link and connect communities.



LOS ANGELES METRO RAIL PLAN





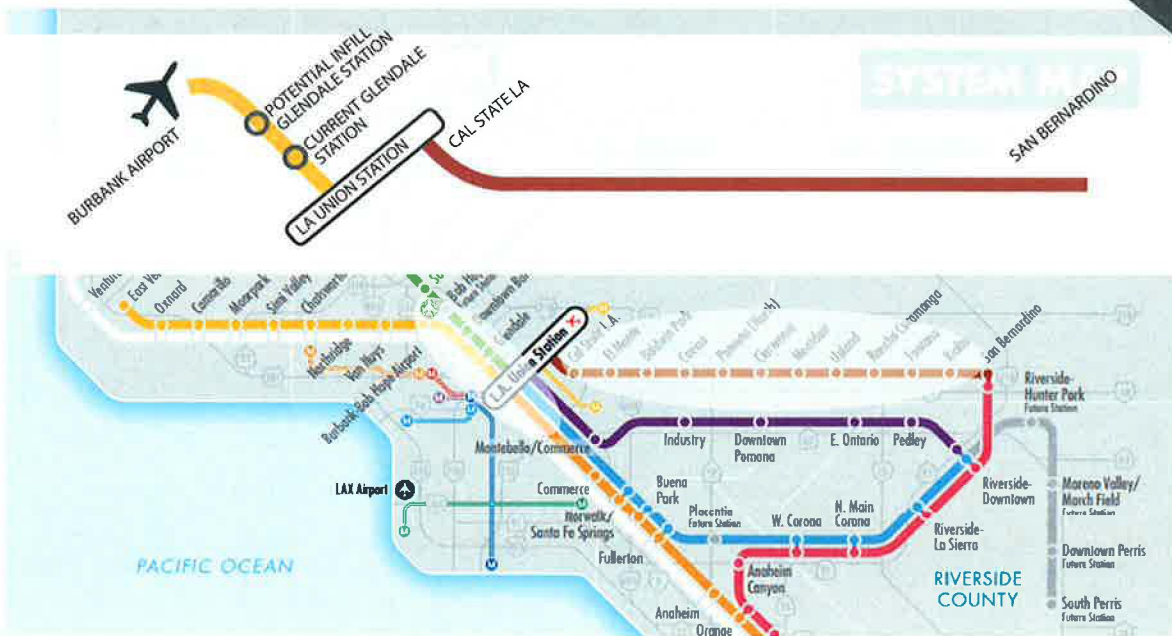
GOLD LINE COMPLETION

Premium Transit Access for the east end of the San Gabriel Valley will connect many more residents to jobs throughout Los Angeles County.

The long-planned completion of the Gold Line will connect the eastern San Gabriel Valley into the rest of the region's rapidly expanding transit network.

All day, frequent service to Burbank Airport, San Bernardino and points between will represent a significant improvement to quality of life.

\$400 M



METROLINK UPGRADES

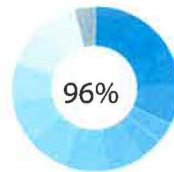
Upgrades to service on the Ventura County Line could provide 30 minute all day (and evening) service to the Burbank Airport. It might also make sense to supplement the current Glendale station (which is closer to Atwater Village) with an infill station closer to downtown Glendale. Improvements to the San Bernardino Line could provide hourly reverse commute and mid-day service. Both would represent a tremendous improvement to the usability of these valuable existing systems.

GOLD LEVEL ACTIVE TRANSPORTATION

This budget would be enough to create a premier, nationally-competitive bike network connecting the entire San Gabriel Valley. This system would focus on "low-stress" facilities that are comfortable to a wide range of potential users.

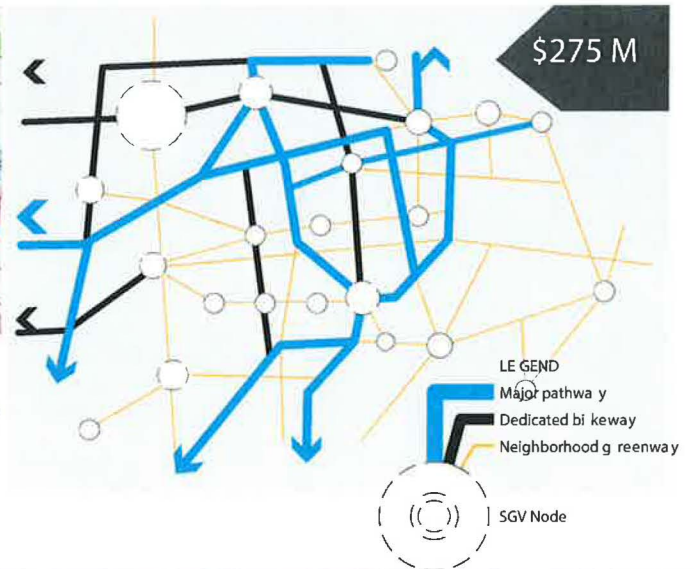
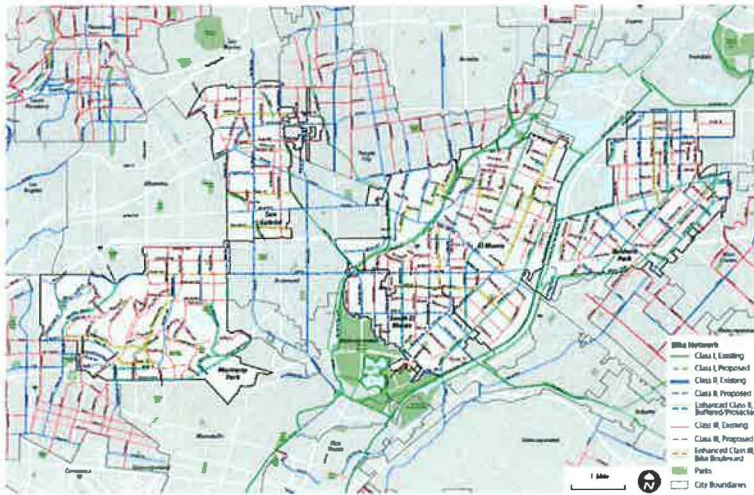


In its first year, a protected bike lane increases bicycle traffic on a street by an average of 75%



Most people riding in protected bike lanes feel safer on the street because of the lanes

SGV ACTIVE TRANSPORTATION FRAMEWORK



NETWORK PRINCIPLES

A collage of images showing people biking in various settings, overlaid with a central diagram of an "All Ages Abilities" Active Transportation Network. The central blue circle contains the text "AN 'ALL AGES ABILITIES' ACTIVE TRANSPORTATION NETWORK". Surrounding this circle are eight terms: DIRECT, CONNECTED, SAFE, COMFORTABLE, EXPERIENTIAL, LEGIBLE, and SEPARATED. Below the collage, the word "BIKING" is written in large white letters. At the bottom, two phrases are displayed: "NEIGHBORHOOD GREENWAYS EVERY 1/2 MILE" and "SEPARATED BACKBONE - EVERY 1 MILE".

Since the initial release of the Beyond the 710: New Initiative for Mobility and Community during the May 28, 2015, press conferences at Gateway Plaza, the Connected Cities and Communities has met with numerous stakeholders to refine the projects and strategies identified in the Initiative to build consensus, provide opportunities for stakeholder engagement and collaboration.

Future revisions and refinements will be provided to reflect ongoing public input of impacted communities and interested stakeholders.

The Beyond the 710: New Initiative for Mobility and Community and associated economic analysis was produced in conjunction with the internationally recognized transportation firm Nelson\Nygaard Consulting Associates, and The Maxima Group LLC, Real Estate and Business Solutions.

For more information:

<http://www.beyondthe710.org/>

info@beyondthe710.org

(626) 788-5231

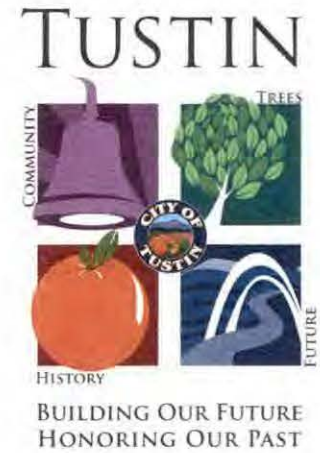
Anita Au

From: Reekstin, Scott <SReekstin@tustinca.org>
Sent: Monday, February 1, 2016 4:41 PM
To: 2016 PEIR; Courtney Aguirre
Cc: Hasan Ikhata; Kevin J. Gilhooley; Marika Poynter (MPoynter@ci.irvine.ca.us); edoccog@gmail.com; Ping Chang; Diep, Deborah
Subject: FW: Draft 2016 SCAG RTP/SCS and Draft PEIR
Attachments: SCAG.pdf

I have attached comments on the Draft RTP/SCS and PEIR from the City of Tustin.

SCOTT REEKSTIN | PRINCIPAL PLANNER
City of Tustin | Community Development Department
300 Centennial Way | Tustin, CA 92780
P. 714 - 573 - 3016 | F. 714 - 573 - 3113 <http://www.tustinca.org>

Community Development Department



February 1, 2016

Ms. Courtney Aguirre
Southern California Association of Governments
818 West Seventh Street, 12th Floor
Los Angeles, CA 90017

SUBJECT: REVIEW OF DRAFT 2016 SCAG RTP/SCS AND DRAFT PEIR

Dear Ms. Aguirre:

Thank you for the opportunity to provide comments on the Draft 2016 Southern California Association of Governments (SCAG) Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS) and the Draft Program Environmental Impact Report (DPEIR) for the Draft 2016 SCAG RTP/SCS.

The City of Tustin has prepared the following comments for your consideration at this time:

1. The City of Tustin supports the 2016-2040 RTP/SCS growth forecast for Orange County and the adoption of the growth forecast at a geographic level no lower than the jurisdictional level. This level of the growth forecast accurately reflects Orange County's Projections dataset. Because the Intensified Land Use Alternative (Alternative 3) in the DPEIR does not include the technically corrected growth forecast for Orange County, the City of Tustin would not support the consideration of Alternative 3 as the preferred alternative or for any other purpose. 1
2. Although state law provides that it is appropriate to indicate in mitigation measures that they "can and should" be implemented where the authority to implement the measures rests with agencies other than the lead agency, it seems inappropriate and overreaching to use the term "can and should" in the DPEIR given the express limitation of Senate Bill 375 upon local agencies' land use authority. The City of Tustin requests that "can and should" be changed to read "can and should consider where applicable and feasible" in all project level mitigation measures in the DPEIR. 2
3. The Draft RTP/SCS incorrectly assumes that most new housing in the SCAG region will be constructed more than 500 feet from a freeway or other major transportation corridor. This assumption is based on the California Air Resources Board's (CARB) 2005 advisory guidance that new housing be discouraged within 500 feet of high volume roadways, including freeways, due to roadway emissions. This guidance from CARB does not prohibit housing development near major roadways. However, SCAG's "buffer" strategy 3

assumes little growth in these areas, which are often highly accessible to employment, retail, and housing centers that are connected through various transportation modes. Further, the use of the “buffer” strategy does not take into account the many mitigation measures that are available to address roadway emissions, nor the significant reduction in diesel emissions over the last decade. The implementation of a “buffer” strategy will discourage proximity and accessibility between different land uses that often reduce vehicle trips and vehicle miles traveled. As technology advances and vehicle engines and fuels become less polluting, the “buffer” strategy will become more obsolete. The “buffer” strategy is also contrary to the overarching principles of SB 375 to locate housing near job centers, existing urban areas, and transportation opportunities. Therefore, the City of Tustin urges that the “buffer” strategy be removed from the Draft RTP/SCS and that the Draft RTP/SCS emphasize the use of mitigation for housing developments that may be exposed to higher levels of roadway emissions, rather than discourage such development.

3 cont.

4. Several mitigation measures in the DPEIR indicate that local jurisdictions and other entities should implement new fees or propose taxes to pay for a variety of programs or for the acquisition of land for mitigation purposes. However, many fee increases or taxes require voter approval, and therefore it should not be assumed that they will be approved by the voters. The City of Tustin requests that the mitigation measures indicate that any new or increased fee or new tax be left as an option for jurisdictions, if desired. It is also suggested that the DPEIR clarify whether these additional fees were considered feasible and whether the suggested new fees were considered in the financial plan or economic analysis for the Draft RTP/SCS.
5. Proposed mitigation measures that are duplicative of existing regulations already required by State and Federal law or are regulated by other agencies such as the South Coast Air Quality Management District, California Department of Housing and Community Development, California Department of Fish and Game, and the Regional Water Quality Control Boards should be removed from the PEIR, because existing regulations are not valid mitigation measures under the California Environmental Quality Act.
6. The City of Tustin participates on the Orange County Council of Governments (OCCOG) Board and OCCOG Technical Advisory Committee. Although the comments from the OCCOG Board on the Draft RTP/SCS and PEIR are not fully restated in this comment letter, the City of Tustin concurs with the comments identified by the OCCOG Board in its letter to SCAG, dated January 28, 2016. A copy of the OCCOG letter is attached for reference.

Again, thank you for the opportunity to review and comment on the Draft 2016 Southern California Association of Governments Regional Transportation Plan/Sustainable Communities Strategy and the Draft Program Environmental Impact Report for the 2016 SCAG RTP/SCS. We look forward to receiving a copy of the Final PEIR, with responses to our comments and the

Ms. Courtney Aguirre
SCAG 2016 RTP/SCS and DPEIR
February 1, 2016
Page 3

requested modifications to the RTP/SCS and PEIR. If you have any questions regarding the City's comments, please call me at (714) 573-3031, or Scott Reekstin, Principal Planner, at (714) 573-3016.

Sincerely,

A handwritten signature in blue ink that reads "Elizabeth A. Binsack". The signature is fluid and cursive, with the first name being the most prominent.

Elizabeth A. Binsack
Community Development Director

Attachment: OCCOG Board Letter to SCAG dated January 28, 2016

cc: Hasan Ikhata, SCAG
Marnie Primmer, OCCOG
Tustin City Council
Jeffrey C. Parker
Doug S. Stack
Justina Willkom
Scott Reekstin

SR:environmental etc\SCAG 2016 RTP SCS and PEIR Letter.doc



See OCCOG Original Letter for
response to comments

January 28, 2016

Mr. Hasan Ikhata
Executive Director
Southern California Association of Governments
818 West Seventh Street, 12th Floor
Los Angeles, California 90017-3435

Subject: Orange County Council of Governments Comments for RTP/SCS and PEIR

Dear Mr. Ikhata:

On behalf of the Orange County Council of Governments (OCCOG), I would like to thank you for the opportunity to comment on the Southern California Association of Governments (SCAG) draft 2016-2040 Regional Transportation Plan/Sustainable Communities Strategy (2016 RTP/SCS or "The Plan") and the associated Program Environmental Impact Report (PEIR). The draft 2016 RTP/SCS and PEIR is a monumental effort and the OCCOG recognizes that the documents are critical to the region's ability to receive federal funding for transportation projects, improve mobility, support sustainable development, operate and maintain the transportation system, and meet the region's greenhouse gas emission reduction targets and other air conformity standards.

The OCCOG is comprised of 34 cities, the County of Orange, and six special districts. The OCCOG Technical Advisory Committee (OCCOG TAC), made up of member agency planning staff, created an ad hoc committee dedicated to the review of the draft 2016 RTP/SCS and PEIR. The ad hoc committee membership was extended to partner agencies within Orange County that serve as ex-officio members on the OCCOG Board. The ad hoc committee includes representation from the OCCOG, the County of Orange, the cities of Anaheim, Irvine, and Mission Viejo, the Orange County Health Care Agency, the Orange County Transportation Authority, the Transportation Corridor Agencies, the Association of California Cities Orange County, the League of California Cities Orange County Division, the Building Industry Association, and the Center for Demographic Research at California State University Fullerton. This committee met six times since December 3, 2015, and has collectively spent hundreds of hours reviewing the draft Plan and documents, and preparing comments which incorporated additional feedback provided by Orange County jurisdictions and agencies, such as the Orange County Business Council. The OCCOG TAC review and analysis was considered in late January by the OCCOG Board and serves as the basis for OCCOG's comments.

The following general comments and recommendations are offered by OCCOG on the draft 2016 RTP/SCS, PEIR, and all associated appendices. OCCOG requests that the letter and attachments be included in the public record as our collective comments on the draft 2016 RTP/SCS, PEIR, and associated documents.



RTP/SCS

1. Growth Forecasts

Overall, the OCCOG supports the 2016-2040 RTP/SCS growth forecast and the adoption of the growth forecast at a geographic level no lower than the jurisdictional level. The OCCOG supports The Plan since the growth forecast accurately reflects Orange County's Projections dataset. The Plan growth forecast reflects entitlements, development agreements, and projects recently completed or under construction in Orange County. OCCOG appreciates the ongoing coordination between SCAG and the Center for Demographic Research (CDR) at California State University Fullerton on behalf of all Orange County jurisdictions. The Orange County Projections have been used by the Orange County Transportation Authority (OCTA) in the development of its Orange County Long-Range Transportation Plan demonstrating that Orange County has integrated transportation and land use planning for decades.

OCCOG representatives on the Regional Council and SCAG Policy Committees repeatedly requested that the growth forecasts in the 2016 RTP/SCS and all PEIR alternatives be based on the technically corrected growth forecast submitted to SCAG in August 2015 by the CDR on behalf of all Orange County jurisdictions. Because the draft PEIR's Intensified Land Use Alternative (Alternative 3) does not include the technically corrected growth forecast for Orange County, the OCCOG would not support consideration of this Alternative as the preferred alternative.

Growth Forecast Recommendations: OCCOG supports the adoption of the 2016 RTP/SCS growth forecast at the jurisdictional level. OCCOG does not support the use of Alternative 3 for any purposes.

2. Maintain Unbiased, Objective Tone

Language throughout the draft 2016 RTP/SCS and the associated appendices has a tendency to be leading and dramatic in its emphasis of certain key issues such as active transportation and public health. While these issues are important, it is recommended that the document utilize a more unbiased, objective tone. For example, OCCOG recommends the removal of "Our Vision" and "Our Overarching Strategy" from the Executive Summary of the document. These two sections are highly speculative and are not necessary to the document. "Our Vision" and "Our Overarching Strategy" go above and beyond the requirements of the RTP. Additional examples of overly emphatic language are outlined in Attachment 1.

General Comments

3. Concurrence with the Comments from the Orange County Transportation Authority

The OCCOG concurs with the comments identified by OCTA in its letter of January 11, 2016. OCTA has identified policy and technical issues related to the draft 2016 RTP/SCS and PEIR that are of concern to Orange County. These are focused on the regional strategies that go above and beyond the projects submitted by the county transportation commissions (CTC). The OCTA comment letter is included for reference as Attachment 2.



4. “Can and Should”

As indicated in the PEIR, state law provides that it is appropriate to indicate in mitigation measures that they “can and should” be implemented where the authority to implement the measures rest with agencies other than SCAG. The language conveys to local agencies an affirmative obligation to address each mitigation measure, irrespective of whether such agencies deem the measures applicable to a particular project or duplicative of their own or other governmental agencies’ regulatory measures. OCCOG recognizes SCAG’s use of the words “can and should” are derived from California Environmental Quality Act (CEQA), at Public Resources Code sections 21081 and 2155.2(b)(5)(B)(ii) and CEQA Guidelines, including section 15091(a)(2). Nevertheless, given the express limitation of SB 375 upon respective local agencies’ land use authority, OCCOG deems inappropriate any language seemingly imposing affirmative obligations contrary to SB 375 inappropriate. As such, the use of the language “can and should” for mitigation measures addressed to local agencies is overreaching.

“Can and Should” Recommendations: Change language in all project level mitigation measures to read “can and should consider where applicable and feasible.” This change will clarify that the project level mitigation measures are a menu of options.

5. 500 foot “buffer”

The Draft RTP assumes that almost no new growth will occur within 500 feet of a freeway or busy transportation corridor. The Draft RTP states that a “buffer” is consistent with the California Air Resources Board’s 2005 advisory guidance that housing be discouraged within 500 feet of high volume roadways such as freeways. It is important to note that CARB’s guidance is not a prohibition of development near high-volume roadways; nevertheless, SCAG’s “buffer” strategy eradicates growth in these areas that are otherwise rich in connections to jobs, retail and housing accessible by many transportation modes. Furthermore, the proposed “buffer” does not reflect the availability of mitigation measures to address near-roadway emissions that remain despite a dramatic reduction of diesel emissions in the last decade. At best, this strategy is a short-term response and problematic because it prevents the kind of density and proximity between land uses that actually reduce trips and associated VMT. As vehicle engines and fuels become cleaner, the “buffer” strategy will become obsolete yet will leave behind a legacy of inefficient land use patterns. Moreover, throughout the SCAG Region, the prevailing existing land use patterns include residential and sensitive receptor uses within 500 feet of a major transportation corridor. In many cases, these areas demonstrate compact development form and serve as affordable housing. Removing this substantial portion of developable land from availability for use is premature and counter to the overarching principles of SB375 to locate housing near job centers and previously urbanized areas.

There needs to be consistency throughout all the documents regarding the 500 foot “buffer.” To that end, OCCOG offers the following **recommendations and requests for additional clarification**:



- The word “buffer” should not be used.
- Use consistent radius/demarcation throughout the documents
- Clarify where distance is measured from (e.g. centerline, edge of roadway, edge of right of way)
- Clearly articulate the types of transportation corridors being identified (e.g. freeways, high quality transit corridors, high volume corridors, rail etc.)
- Emphasis should be on mitigation not prohibition of development.
 - Resolve the conflict with discouraging development within 500 feet of transportation corridors now and future reductions in emissions and fleet changes over time which will negate the need to utilize this mitigation measure, so that the mitigation approach allows for flexibility with the changing fleet mix in the future.

6. Cities vs. Jurisdiction

Throughout the 2016 RTP/SCS, PEIR, and associated appendices, there are references to “cities”. Since the SCAG region also includes counties, it is recommended that references to “city” or “cities” are changed to “jurisdiction” or “jurisdictions” where appropriate.

Recommendation: Change references to “city” or “cities” to “jurisdiction” or “jurisdictions” where appropriate.

7. Remain Neutral on Technology

Throughout the documents, there are specific examples of technology identified. It is not SCAG’s purview to pick winner and losers in technology; the marketplace will determine dominant technologies. Therefore, it should be noted that these are only examples and that future technologies should not be ignored or excluded from meeting the goals of the RTP/SCS. This will allow the document, including mitigation measures, to be more flexible.

PEIR

8. PEIR Mitigation Measures

- a. Please state that in the event a state law referenced in the mitigation measure is updated or changed, the most current state law requirements prevails.
- b. For all “Project-level Mitigation Measures”, replace the word “require” with “encourage” or “it is recommended”. Examples include:
MM-AES-3(b), MM-Air-2(b), MM-Air-4(b), MM-BIO-1(b), MM-BIO-2(b), MM-BIO-3(b),
MM-BIO-4(b), MM-BIO-5(b), MM-GHG-3(a)(11), MM-TRA-1(b), MM-TRA-2(b), MM-USS-6(b)

A redline version identifying the location of the exact language is provided in the matrix of comments in Attachment 1.



c. Priority and Funding Preference for Transportation Projects:

To address the significant impacts of increasing Vehicle Miles Traveled (VMT) and traffic congestion, the draft Program EIR for SCAG's 2016 - 2040 RTP/SCS proposes project-level mitigation measures that include language allowing for:

- (1) Giving priority to transportation projects that would contribute to a reduction in vehicle miles traveled per capita [Mitigation Measure MM-TRA-1(b)]; and,
- (2) Giving funding preference to improvements in public transit over other new infrastructure for private automobile traffic [Mitigation Measure MM-TRA-2(b)].

Please delete these provisions in Mitigation Measure MM-TRA-1(b) and Mitigation Measure MM-TRA-2(b), unless the language in these provisions is modified to recognize that they would only be considered if they are found by the Lead Agency to be appropriate and consistent with local transportation priorities.

The language in these provisions implies a specific emphasis towards policy consideration to the prioritization, selection and funding of transportation projects that, to our knowledge, has not been discussed nor endorsed by SCAG's Transportation Committee, or Regional Council, as a regional strategy for the implementation of the 2016 RTP/SCS.

Moreover, the language in these provisions fails to recognize that several counties in the SCAG region implement transportation projects and programs that are mandated through voter-approved sales tax measures (i.e., Renewed Measure M2 in Orange County), and that are identified through long-range transportation plans.

Finally, the language in these provisions could compromise the delivery of committed transportation projects, by creating opportunities for potential delay and legal challenge. To avoid these kinds of potential unintended consequences, **we request that SCAG either delete these provisions, or modify these provisions to make it abundantly clear that they are only for consideration when determined to be appropriate by the Lead Agency.**

9. Fees and Taxes

Several mitigation measures indicate that local jurisdictions or other entities should implement new fees or propose taxes to pay for a variety of programs or for acquisition of land for preservation. Increases to fees or taxes are issues that could require voter approval, and therefore it should not be assumed that they will be approved.

Fees and Taxes Recommendations: a) Reword measures to indicate that a new or increased fee, new tax, or other increase is only an option as a way to implement the mitigation. b) Clarify whether it was assumed that these additional fees were considered feasible and if the new fees that are suggested were considered in the financial plan or economic analysis of the RTP.

10. Duplicative/Existing Regulations

It is noted that many of the mitigation measures are duplicative of existing regulation or processes



(e.g. CEQA review requirements). Under CEQA, it is intended that measures be identified that will mitigate impacts of the project. Existing regulations are already assumed to be abided by in the evaluation of the impact, and the significance of the impact is after all existing regulation is applied. Therefore, mitigation measures should address those actions that need to be undertaken in addition to existing regulation in order to mitigate the impact. Therefore, mitigation measures that simply restate existing regulation are not valid mitigation for purposes of CEQA. Further, it is possible for regulations to change over time. Because of this, restatement of the regulation in the mitigation measures could result in future conflict between the stated mitigation and regulation. It has become common practice to state that existing regulation will be implemented. When this is done, it is common practice when compliance is used as a mitigation measure to simply state that the responsible entity will simply comply with the regulation. If mitigation measures that restate existing regulation are not removed, then it is requested that the wording of the measures be restated to simply read that compliance with all applicable laws and regulations will be undertaken. Language that could be used is: “Local jurisdictions, agencies, and project sponsors shall comply, as applicable, with existing federal, state, and local laws and regulations.” Similar language is included in some mitigation measures.

Examples of existing regulations included as mitigation measures are found within the Hydrology section of the draft PEIR. For example, Section 3.10.6, Mitigation Measures (page 3.10-56): Parts of this section list mitigation measures that are already being required by municipal storm water programs across the region. Instead of listing specific mitigation measures, the PEIR should make reference to these programs. In Orange County, for example, this program is detailed in the DAMP/Model WQMP. The Model WQMP describes the process that cities and County employ for requiring a WQMP, which is a plan for minimizing the adverse impacts of urbanization on site hydrology, runoff flow rates, and pollutant loads at the project level. A reference to the Model WQMP and equivalent documents in the region’s other counties, should replace the last ten bullet points of section MM-HYD-1(b).

Additionally, there are specific mitigation measures included in the Hydrology section that may be in conflict with Storm Water Permits issued by Regional Water Quality Control Boards. In the SCAG region, there are five water quality control boards each with its own Municipal NPDES Storm Water Permit. The regulations and requirements contained in these permits vary from each other. By listing specific measures in the PEIR that are not included in a project’s applicable Municipal NPDES Storm Water Permit, the PEIR creates conflicting compliance requirements. To eliminate potential conflict with existing regulations, the mitigation measures regarding specific BMPs should be removed and replaced with a single requirement that each project must comply with its applicable Municipal NPDES Storm Water Permit.

Conclusion

The OCCOG recognizes the immense efforts SCAG undertook to prepare the 2016-2040 RTP/SCS documents. They represent incredibly complex technical work and have important and far-reaching policy impacts for our region. However, because of this importance and complexity, we would like to express concern about the timing of the release of the documents, and our desire that the preparation of future RTP/SCS documents in future RTP/SCS cycles will take into account the need to accommodate adequate review, discussion and revision time for all of the documents. The current timeline of document



releases, public comment period, and time allowed for the response to comments results makes it challenging to have credible discussion regarding possible changes, because the timeline does not allow for recirculation or full discussion of requested changes. While OCCOG is appreciative of the extended public comment period through February 1, 2016, there remains concern that only a few weeks remain for SCAG to prepare responses to comments and amend the documents to ensure that the Regional Council may consider the certification of the PEIR and the approval of the draft RTP/SCS on April 7, 2016. With that, we look forward to working with SCAG collaboratively to achieve the schedule.

We appreciate your consideration of all the comments provided in this letter and its attachments and look forward to your responses. It is a shared goal to have a RTP/SCS adopted that is credible and defensible on all levels. If you have any questions, please do not hesitate to contact me or Marnie Primmer, OCCOG's Interim Executive Director.

Sincerely,

A handwritten signature in black ink that reads "Arthur C. Brown". The signature is written in a cursive, flowing style.

Art Brown
Chairman

Cc: OCCOG Member Agencies
OCCOG Board of Directors
OCTA Board of Directors
Orange County City Managers Association



This table is the same as City of San Clemente tables

Attachment 1: Detailed comments on RTP/SCS, PEIR, & related appendices

2016 RTP/SCS

#	TOPIC	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
1	General Comment	p.2	Delete Our Vision & Our Overarching Strategy strategies. These sections are highly speculative and not necessary for the rest of the document.
2	Clarification	p.3, column 2, bullet 5	“Millions of people are in poor health... Millions of more people live with chronic diseases, such as asthma, every day.” Define ‘poor health’ Cite numbers or share of population for region instead of saying “millions”. Provide reference to what chronic diseases include.
3	Clarification	P. 4, column 2, paragraph 2	“Among the milestones: a one-year demonstration of <u>the tolled Express Lanes in Los Angeles County along Interstate 10 and Interstate 110 was made permanent in 2014...</u> ”
4	Clarification	p. 7, column 2, paragraph 1	“In many instances, <u>the additional these chargers will create the opportunity to increase</u> may double the electric range of PHEVs, reducing vehicle miles traveled that produce tail-pipe emissions.”
5	Clarification	p. 13, column 2, paragraph 2	“Since 2009, every MPO <u>in California</u> has been required to develop a Sustainable Communities Strategy...Once implemented along with the rest of the Plan, it will improve the <u>overall quality of life for all residents of the region.</u> ”
6	Clarification	p. 13, column 2, paragraph 3	“But these advances in mobility also have the potential to help Baby Boomers, <u>and the generations that follow them,</u> maintain their independence as they age.”
7	Clarification	p. 14, column 1, paragraph 2	“In Southern California, striving for sustainability <u>includes</u> will require achieving state-mandated targets for reducing greenhouse gas emissions from vehicles and federal air quality conformity requirements, and also adapting wisely to a changing environment and climate.”
8	Clarification	p. 14, column 2, paragraph 5	“It is particularly important that the Plan consider <u>and minimize the negative impacts</u> consequences of transportation projects, <u>especially</u> on low-income and minority communities <u>and minimize negative impacts.</u> ”



#	TOPIC	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
9	Clarification	p. 16, column 2	<p>“2. Collaborating with Member Agencies, Jurisdictions and Stakeholders. Implementing the Plan will require SCAG to continue working closely with its <u>all jurisdictions member agencies...</u>”</p> <p>“The agency will also have to work with key stakeholders to ensure the Plan benefits the economy and <u>promotes ensures</u> social equity. To ensure that the region makes progress on its goals, SCAG will monitor its own progress toward achieving its targets and will share this information with <u>its relevant partners and the public.</u>”</p>
10	Clarification	p. 20, column 1, paragraph 3	<p>“However, of the remaining developable land, only a small portion of it can be developed as <u>transit-ready infill sustainably</u> – meaning it can be reached via planned transit service and that it can readily access existing infrastructure (water resources, sewer facilities, etc.). According to SCAG land use data <u>collected by SCAG</u>, only two percent of the total developable land in the region is located in High Quality Transit Areas (HQTAs). <u>A more compact land development strategy is needed, which will be discussed in Chapter 5.</u>”</p>
11	Clarification	p. 20, column 1, paragraph 4	<p>“<u>SCAG supports the fact that local jurisdictions conduct much of the planning for land use in our region. However, as</u> the agency prepared the 2016 RTP/SCS, it needed to organize the many different <u>land use types and classifications of land uses in...</u>”</p>
12	Clarification	p. 20, column 1, paragraph 5	<p>“To accurately represent land uses throughout the region, SCAG <u>aggregated reviewed</u> information from jurisdictions and simplified the types and classifications of land use <u>into a consolidated set of land use types</u>. The agency <u>then converted these consolidated land uses into identified</u> 35 “Place Types”... the Urban Footprint <u>Scenario Sustainability Planning Model (SPM), to demonstrate which guided and evaluated</u> urban development in the Plan in terms of form, scale and function in the built environment.”</p>
13	Clarification	p. 20, column 2, paragraph 2	<p>“SCAG then <u>classified sorted</u> the 35 Place Types into three Land Development Categories. The agency used these categories to: describe the general conditions that exist and/or are likely to exist within a specific area; SCAG did not intend to have them represent detailed policies for land use, development or growth. Rather, they and, reflect the varied conditions of buildings and roadways, transportation options, and the mix of housing and employment throughout the region.”</p>



#	TOPIC	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
14	Clarification	p. 21, column 1, paragraph 3	<p>Conversely, s Some areas, especially near the edge of existing urbanized areas, do not have plans for conservation and <u>may be slated for development</u> are suseceptible to development pressure. ... – meaning these are areas that are home to a high number of species and serve as highly functional habitats.”</p> <p>“Some key habitat types are underrepresented within the 35 percent of the region already under protection.” Clarify why does there need to be an equal share of types of protected land? If not, delete sentence.</p>
15	Clarification	p. 22, column 1, paragraph 1	<p>“However, although these housing units are planned and zoned for, historical data shows that less than ten percent of the needed affordable housing has been built. In contrast, housing construction measured by building permits issued meets nearly 90 percent of projected market rate housing needs.”</p> <p>What is the data source that reports on building finals by income category? What is the time frame for the “less than ten percent”? What is the time period for the data on the market rate housing?</p>
16	Clarification	p. 22, column 2, paragraph 1	“... of our region’s jurisdictions have <u>certified</u> adopted housing elements.”
17	Define	p. 22, column 2, paragraph 3	Define “high quality” housing
18	Define	p. 23, Figure	Define “demand response” in “Passenger Miles by Mode” figure
19	Clarification	p. 25, column 2, paragraph 2	“This network includes fixed-route local bus lines, community circulators, express and rapid buses, Bus Rapid Transit (BRT), demand response paratransit, ³ light rail transit, heavy rail transit (subway) and commuter rail. ⁴ ”
20	Clarification	p. 26, column 1, paragraph 2	“ <u>Transit users directly</u> typically pay about 25 percent of the operating and maintenance cost of their travel, with the remaining 75 percent paid for by state and local public subsidies. Most capital expenditures are also funded <u>through various taxes and</u> with public subsidies, including a larger share of federal grants.”



#	TOPIC	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
21	Clarification	p. 28, column 1, paragraph 2	<p>“The regional bike network is expanding <u>evolving</u> but remains fragmented. Nearly 500 additional miles of bikeways were built since SCAG’s 2012 RTP/SCS, but only 3,919 miles of bikeways exist regionwide, of which 2,888 miles are bike paths/ lanes (see EXHIBIT 2.3). This is compared with more than 70,000 roadway lane miles. One way to quantify bikeway quality and density is to calculate a ratio of bike path to lane miles. SCAG’s ratio of bike path/ lane miles ratio is 0.039. To put this in perspective, Portland, Oregon and San Francisco have bike path/ lane ratios to lane miles at 0.054 and 0.078, which are 38 percent and 100 percent higher than the SCAG region, respectively. Our region’s lack of consistent infrastructure discourages all but the most fearless people to bike.”</p> <p>Comment: There is typically only one bike lane in each direction whereas there could be multiple traffic lanes in each direction. It is not appropriate to compare lane miles to bike lane miles. Comparison, if any, should be to centerline miles. Comparison of bike path/ lane miles ratio for SCAG region to individual cities is not appropriate.</p>
22	Clarification	p. 28, column 1, paragraph 2	<p>“Most walk trips (83 percent) are less than one half mile; walkers are <u>less likely to travel</u> often discouraged from <u>traveling</u> farther. Routes to <u>bus stops</u> and stations are often...”</p>
23	Delete	p. 33, column 1, paragraph 2	<p>“A significant amount of travel in the region is still by people who choose to drive alone (42 percent of all trips and nearly 77 percent of work trips). So, the challenge of getting individuals to seek more environmentally friendly alternatives of travel remains.”</p>
24	Clarification	p. 54, column 2, paragraph 4	<p>“Certainly, <u>The overall quality of life is expected to will</u> increase for many people.”</p>
25	Clarification	p. 55, column 1, paragraph 3	<p>“Chronic diseases including heart disease, stroke, cancer, chronic lower respiratory disease and diabetes are responsible for 72 percent of all deaths in our region. Millions of more people live with chronic diseases every day.”</p> <p>Cite number and source or delete sentence.</p>
26	Clarification	p. 56, column 1, paragraph 1	<p>“<u>California is experiencing o</u>Ongoing drought conditions, water shortages due to less rainfall as well as declining snowpack in our mountains, and an agriculture industry in crisis have become hard realities in recent years.”</p>
27	Clarification	p. 61, column 1, paragraph 2	<p>Add statement that says “<u>These preliminary scenarios are not the ones modeled in the PEIR.</u>”</p>



#	TOPIC	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
28	Clarification	p. 64, column 1, paragraph 1	Clarification should be made that attendance was self-selected as was the survey participation. Attendees were strongly encouraged by SCAG staff to fill out a survey. A more detailed description should be included that explains that these results are not scientific.
29	Clarification	p. 64, column 2, paragraph 2	<p>“...was also a principal concern, as was access to healthy food.”</p> <p>What percentage of respondents elevates an item to a ‘principle concern’?</p>
30	Clarification	p. 64, column 2, paragraph 4	<p>“Collectively, the survey responses offered an invaluable guide to help finalize the Plan’s investments, strategies and priorities. They reflect how regional stakeholders want us to address priority areas such as transit and roadway investments, system management, active transportation, land use and public health.”</p> <p>Did the survey responses change the Plan? Clarify if a higher priority in making changes was afforded to survey respondents’ feedback over jurisdictional and CTC input?</p>
31	Clarification	p. 65, column 1, paragraph 4	<p>“Jurisdictions were asked to provide input on the growth scenario, including information on specific planned development projects with entitlements, other planned projects, or recently completed developments.”</p> <p>Comment: During the local input process, SCAG requested feedback on the distribution of new households and employment. SCAG did not request information from jurisdictions on specific planned development projects with entitlements, other planned projects, and recently completed developments. During review of the draft policy growth forecast (PGF) in summer 2015, technical errors throughout the draft PGF were identified. These “technical errors” in the dataset were that entitlements, development agreements, and projects currently under construction or recently completed were not properly reflected. It was then that SCAG stated that jurisdictions could provide the information if jurisdictions wanted corrections made to the PGF.</p>



#	TOPIC	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
32	Clarification	p. 65, column 2, bottom note	<p>“*With the exception of the 6 percent of TAZs that have average density below the density range of local general plans.”</p> <p>Please clarify the footnote. Did SCAG lower the growth or is General Plan buildout expected after 2040?</p>
33	Clarification	p. 70, column 1, paragraph 1	<p>“In addition, local jurisdictions <u>are encouraged to should</u> pursue the production of permanent affordable housing through deed restrictions or development by non-profit developers, which will ensure that some units will remain affordable to lower-income households.”</p>
34	Clarification	p. 70, Table 5.1	Add note to table “Adopted in 2013”
35	Define	p. 73, column 2, paragraph 4	Define “riparian”
36	Clarification	p. 76, paragraph 1	How many of these trips are alone vs. with others? Are these linked trips/trip segments?
37	Clarification	p. 76, paragraph 3	The narrative implies that Neighborhood Mobility Areas (NMAs) are needed for Neighborhood Electric Vehicles (NEVs). If this is not true, reword section to allow for flexibility that one is not tied to another exclusively.
38	Clarification	p. 77	Figure needs title
39	Clarification	p. 79, Figure 5.2	Clarify if the preservation and operations expenditures apply to the SCAG region or California State.
40	Clarification	p. 83, column 2, paragraph 5	<p>“Bus lanes are even more effective at increasing speeds, however in our region there is a dearth of such lanes. Transit agencies should heavily lobby <u>SCAG encourages transit agencies and local jurisdictions in which they operate to implement them, where appropriate at least for peak period operation.</u>”</p>
41	Clarification	p. 88, column 1, paragraph 4	<p>“The 2016 <u>Active Transportation</u> portion of the <u>2016 Plan</u> updates the 2012 Active Transportation Plan...”</p>
42	Clarification	p. 89, column 2, paragraph 2	<p>“SCAG has <u>identified</u> developed 12 regionally significant bikeways that connect the region.”</p>
43	Clarification	p. 92, column 1, paragraph 2	<p>“The launch date coincided with the <u>end of daylight savings time</u> decline in daylight hours, a period when bicycle and pedestrian collisions peak during the year.”</p>
44	Define	p. 93, column 1, paragraph 4	Define “no-maintenance exercise spots”
45	Clarification	p. 103, column 1, paragraph 3	<p>“...figure “2040 Airport Demand Forecasts” on the previous page...”</p> <p>Properly label figure and page reference.</p>



#	TOPIC	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
46	Clarification	p. 105, column 1, paragraph 1	<p>“In recent years, airport operators, CTCs and SCAG have all undertaken their own initiatives to improve ground access at the region’s aviation facilities.”</p> <p>Clarify what initiatives SCAG has undertaken.</p>
47	Clarification	p. 111, column 1, paragraph 2	<p>“Building on its strong commitment to the environment as demonstrated in the 2012 RTP/SCS, SCAG’s mitigation program is intended to function as a resource for lead agencies to consider in identifying mitigation measures to reduce impacts anticipated to result from future <u>transportation projects as deemed applicable and feasible by such agencies.</u>”</p>
48	Clarification	p.111-119 & PEIR	Update language on the mitigation measures to be consistent with any language changes to the PEIR document.

ACTIVE TRANSPORTATION APPENDIX

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
1	General Comment	all	Needs to include statement saying that pedestrians and bikes are also responsible (e.g. distracted walking by cell phones; bikers with headphones) and isn’t always vehicles as cause Everyone needs to be educated and follow the rules and enforcement needs to happen for all modes
2	General Comment	all	Acknowledge the improvement over time of AT usage and the lowering of accident and death rates
3	Clarification	p. 5	<p>“Class I Bikeways ...A Class I Bikeway provides a completely separated <u>right-of-way</u> designated for the exclusive use of bicycles and/or pedestrians with cross flows by motorists minimized. Some of the region’s rivers include Class I Bikeways. Increasing the number of bikeways in <u>along</u> rivers, utility corridors, and flood <u>control channels</u> may provide additional opportunities for “interested but concerned” cyclists.”</p>
4	Clarification	p.6, column 1	<p>“INTERSECTION TREATMENTS ...In the SCAG region, nearly 44 percent of all pedestrian injuries are at intersections.” Define how far away from the intersection an accident may occur to be included in the count of pedestrian injuries at intersections</p>



#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
5	Clarification	p.6, column 1	<p>“COMPLETE STREETS</p> <p>In recognition of the need to accommodate various types and needs of roadway users, the State of California adopted the Complete Streets Act of 2008 (AB 1358) requiring cities and counties to incorporate the concept of Complete Streets to any <u>general plan’s substantive update to their General Plan’s circulation element.</u>”</p>
6	Clarification	p.8, column 1	<p>“COLLISIONS AND FATALITIES</p> <p>While the numbers of bicyclists and pedestrians are increasing, so are injuries and fatalities, although not as fast as the growth in active transportation. In California, 64,127 pedestrians were injured and 3,219 were killed between 2008 and 2012. In 2012 alone, 702 pedestrians were killed and 13,280 pedestrians were injured and 702 pedestrians were killed.”</p>
7	Clarification	p. 17, Table 5	Create separate tables for columns 1 to 3 and columns 3 to 10.
8	Define	p. 24, column 1, paragraph 1	<p>“2012 RTP/SCS PROGRESS</p> <p>The 2016 Active Transportation <u>portion of the Plan</u> ... The Plan examined access to transit, noting that 95 percent of SCAG residents would be within walking (0.5 mile) or biking (2 mile) distance from a transit station.”</p> <p>Define what constitutes a ‘transit station’</p>
9	Clarification	P. 25, second column, top bullet (last under #4)	<p>“Success of this program depends on cities and counties conducting these counts and providing the data to SCAG.”</p> <p>Identify funding source and acknowledge that this is voluntary effort and may not be a priority, especially without funding</p>
10	Add bullet	P. 25, second column, Bullet 6	Add 4 th bullet under #6: <u>“OCCOG is working on a comprehensive Complete Streets design manual for the entire county which will be completed in 2016.”</u>
11	Correction	P.26, Table 9	Change language for Orange County: Not yet Planned. <u>In Process</u>
12	Clarification	p. 27, column 1, and any other references	Clarify that the ‘2016 Action Transportation Plan’ is not a standalone plan, but is a portion within the RTP.
13	Clarification	P.66-67, Tables 16 & 17	Add note to Table: “These draft scenarios are not the alternatives that were evaluated in the PEIR.”
14	Clarification	P. 71	Delete “Strategic Plan Beyond 2040” section. The inclusion of this section is not consistent with other appendices. It creates confusion as to what the RTP’s Strategic Plan is.



DEMOGRAPHICS/GROWTH FORECAST APPENDIX

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
1	General Comment	All	Label Y axis on all figures
2	Clarification	P. 2, column 1, paragraph 3	Add text: “ <u>The forecasted land use development patterns shown are based on Transportation Analysis Zone (TAZ) level data utilized to conduct required modeling analyses. Data at the TAZ level or at a geography smaller than the jurisdictional level are advisory only and non-binding, because SCAG sub-jurisdictional forecasts are not to be adopted as part of the 2016 RTP/SCS. The advisory sub-jurisdictional data shall not be required for purposes of qualifying for future grant funding or other incentives or for determining a proposed project’s consistency with the 2016 RTP/SCS for any impact analysis required pursuant to the California Environmental Quality Act (CEQA).</u> ”

GOODS MOVEMENT

#	TOPIC	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
1	Clarification	p. 4, Exhibit 2	Exhibit is labeled warehouse & distribution centers but shows manufacturing firms total employment. Correct.

PERFORMANCE MEASURES APPENDIX

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
1	Clarification	P.8-10, Table 4	Label all Performance Measures that were new in 2016 Plan
2	Clarification	P.11	Add definition of HQTA to map.
3	Clarification	p.20	LSPT was used for 2012 RTP. Add information on the SPM.
4	Clarification	p. 31, Table 12	Add model sources to bottom of table.

PUBLIC HEALTH APPENDIX

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
1	General Comment	All	Final document should contain hyperlinks to other documents.
2	General Comment	All	Spell out Acronyms in Tables/Figures Titles e.g. CHIS



#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
3	Clarification	p.1, column 1	“Public health is increasingly an area of emphasis for Metropolitan Planning Organizations (MPOs) and Departments of Transportation (DOTs) across the country, <u>have an opportunity to impact due to</u> the prevalence of chronic diseases such as obesity, hypertension, asthma and heart disease <u>through transportation planning which promotes increased physical activity.</u> ”
4	Clarification	p.2, column 1	Introduction- first paragraph sentence beginning with “Public health outcomes are the product of Social Determinants of Health....” consider adding “and other factors.”
5	Clarification	p.1, column 2	“Climate Adaptation: Support efforts to prevent <u>mitigate</u> climate change and make the region more resilient to future changes with reductions in VMT and greenhouse gas emissions.”
6	Correction	p.2, Figure 1	Arrows should go both ways.
7	Clarification	p.3, column 1, paragraph 2	“Evidence shows that healthier lifestyles and improved air quality can improve outcomes, and built environment factors <u>and related conditions</u> can play a role in supporting healthy behaviors.”
8	Clarification	p.3, column 2, paragraph 3	“Access to healthy food environments such as grocery stores, farmers’ markets and community gardens decreases <u>can play an important role in</u> food insecurity and obesity.”
9	Define	p.7, column 1, first line	Define “weather insurance”
10	Clarification	p.7, column 2, paragraph 2	“... Providing access to <u>education and job training aligned with job opportunities in the region</u> jobs with a living wage is critical to ensuring communities become and stay healthy.”
11	Clarification	p.7, column 2, paragraph 3	“...Creating infrastructure <u>policies and community conditions</u> and facilities that encourage active transportation such as biking and walking provides opportunities for residents to increase their daily physical activity.”
12	Clarification	p.8, paragraph 3	Consider adding the recommendations for children which has a higher standard of one hour per day. This is valuable as jurisdictions look at health co-benefits of safe routes to school infrastructure changes and related programming.
13	Clarification	p.9, all figures	Recommend using the more current 2014 data. Also, it might be helpful to look at these metrics on a smaller level of geography and/or by poverty and/or by race/ethnicity. Especially since there are often funding set asides to reach disadvantaged communities, it might be interesting to see what each of these indicators looks like at a more refined level. The need is not equally distributed throughout any jurisdiction.



#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
14	Clarification	p.9	Add table with data for walking.
15	Clarification	p.10, column 2	Consider including funding as both a challenge and an opportunity.
16	Clarification	p.10, column 1, last sentence	“Much of our local arterial system is also in need of pavement improvements, as local roadways in the SCAG region average a score of 69 out of 100 in the Pavement Condition Index (PCI), where a score of 70 or less typically translates to conditions that are inadequate more costly to repair.”
17	Clarification	p.10, column 2, paragraph 4	“With more than 18 million people, 191 cities, six counties and hundreds of local and regional agencies, Southern California is one of the most complex regions on earth a <u>diverse region</u> . Within the region, health outcomes vary widely based on <u>many things, such as</u> geography, income and race.”
18	Clarification	p. 15, column 2, paragraph 3; & throughout all	“500 foot buffer”- be consistent with usage and description throughout all documents in whether this is adjacent to just freeways or freeways, rail, and high frequency transit corridors.
19	Clarification	p. 16, column 1, paragraph 1	“Region-wide, about ten percent of the land area within HQTAs is also within the 500 feet <u>foot</u> buffer of the freeway. To balance regional policy goals, the Plan accommodates the vast majority of growth within HQTAs <u>but beyond</u> outside of the 500 feet <u>buffer</u> of freeways...”
20	Clarification	p. 17, column 1	“Water Consumption” and “Land Consumption” Specify the time period for the change or difference in numbers. Compare this to 2040 Baseline.
21	Clarification	p. 19, column 2	“Public Health Work Program” Clarify if this work program was approved by the RC or SCAG staff is pursuing these tasks under direction of RC to incorporate more public health into RTP.
22	Clarification	p. 22-29	Are these all “best practices” or are they local examples of promising practices? Since some of these are in process, are the results are there to show that this particular practice has proven efficacy over another? These may have the potential to be best practices. If the project is based upon a best practice, it is recommended to link to the best practice so other jurisdictional leaders could consider for replication. If it is not already a proven practice, suggest calling it something different such as “local promising practices”. Add the Complete Streets Guidelines that are being developed in Orange County (which integrates in best practices.)



SCS BACKGROUND DOCUMENTATION APPENDIX

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
1	Clarification	P.42-43	How do the SPM Place Types nest into the Land Development Categories?
2	General Comment	All maps	“Note: The forecasted land use development patterns shown are based on Transportation Analysis Zone (TAZ) level data utilized to conduct required modeling analyses. Data at the TAZ level or at a geography smaller than the jurisdictional level are advisory only and non-binding, because SCAG sub-jurisdictional forecasts are not to be adopted as part of the 2016 RTP/SCS. The advisory sub-jurisdictional data <u>shall not be required should not be used for purposes of qualifying for future grant funding or other incentives.</u> The data is controlled to be within the density ranges of local general plans and/or input received from local jurisdictions. the purpose of or for determining a proposed project’s consistency with the 2016 RTP/SCS for any impact analysis required pursuant to the California Environmental Quality Act (CEQA) streamlining, lead agencies have the sole discretion in determining a local project’s consistency with the 2016 RTP/SCS. ”
3	Clarification	p.6/43	Move the definitions of Urban, Compact Walkable, and Standard Suburban from page 43 to page 6 before the maps
4	Clarification	p. 41, column 1, paragraph 4	“Scenario modeling with UrbanFootprint brings meaningful, comprehensible, and timely results to those <u>local jurisdictions</u> wanting to understand how growth and development choices will impact their community, city, or region in the coming years and decades.”
5	Correction	p. 41, column 2, paragraph 2	“Since 2012... Developers of UrbanFootprint have also met with regional agencies, such as SCAG, Sacramento Area Council of Governments (SACOG), and San Diego Association of Governments (SANDAG); Orange County Council of Governments (OCCOG). ”
6	Clarification	p. 50, 51, 54, 56 maps	Clarify in map legends if growth refers to population, housing and/or employment.
7	Correction	p. 56 column 1, last paragraph	“ The scope of t These four scenarios were developed in early 2015 by SCAG and their consultant and shared, which were developed in consultation with the CEHD Committee and the SCAG’s Technical Working Group (TWG), evolved throughout the first five months of 2015. ”
8	Clarification	p. 56 column 2, paragraph 2	“Conversely, growth focused in urban areas often takes advantage of existing infrastructure and more efficient service to higher concentrations of jobs and housing, <u>but sometimes modernization of utilities needs to be considered and completed to accommodate the additional usage.</u> ”



#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
9	Clarification	P. 58, column 2, paragraph 4	<p>“Saving water also saves on costs, and the RTP/SCS saves about \$1.2 billion over the span of the plan, and saves households in the SCAG region \$93 million on annual water bills.”</p> <p>Add “<u>Notwithstanding, infrastructure operations and maintenance costs require continued funding; further, these costs could offset ratepayer savings resulting from the implementation of RTP/SCS policies, conservation efforts, or installation and use of efficient appliances.</u>”</p>
10	Clarification	P. 83, column 2, paragraph 2	<p>“The SPM includes a suite of tools and analytical engines that help to quickly illustrate alternative plans and policies and to estimate their transportation, environmental, fiscal, <u>and public health and community regional impacts.</u>”</p>
11	Clarification	P. 83, column 2, last sentence	<p>“SPM will serve as a common platform for communications between SCAG and local jurisdictions in the process of local input and public outreach, providing local planners advanced analytical capabilities.”</p>

PEIR

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
1	General Comment	All	Any changes to mitigation measure language should be updated in both the Executive Summary and the chapters throughout the PEIR, as well as the RTP/SCS document.
2	General Comment	All	Cite original source data, not other documents, e.g. SCAG’s Local Profiles
3	Clarification	ES-14	“MM-AES-1(b): Consistent ... the Lead Agency can <u>and</u> should consider mitigation measures...”
4	Clarification	ES-14 & 15	<p>“MM-AES-3(b): Consistent ...the Lead Agency can <u>and</u> should consider mitigation measures...</p> <ul style="list-style-type: none"> •Require <u>Encourage</u> development of design guidelines... •Require <u>Encourage</u> that sites are kept in a... “”
5	Define	ES-16	Define ‘Natural Resource Inventory Database and Conservation Framework & Assessment’
6	Define	ES-16	Define ‘Conservation Plan’
7	Define	ES-16	Define ‘mitigation banks’
8	Clarification	ES-19	<p>MM-Air-2(b):</p> <ul style="list-style-type: none"> •Require <u>Encourage</u> contractors to assemble... •As appropriate require <u>encourage</u> that...”
9	Clarification	ES-19	<p>MM-Air-4(b):</p> <ul style="list-style-type: none"> •Require <u>Encourage</u> clean fuels, and reduce petroleum dependency.”



#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
10	Clarification	ES-19	“MM-Air-4(b): Consistent with the provisions of Section 15091 of the State CEQA Guidelines, SCAG has identified mitigation measures that are within the jurisdiction and authority of the air quality management district(s) where proposed 2016 RTP/SCS <u>transportation projects</u> or development projects resulting from the land use patterns in the 2016 RTP/SCS would be located.”
11	Clarification	ES-20	MM-BIO 1(b): <ul style="list-style-type: none"> • Require <u>Encourage</u> project design to avoid occupied habitat, potentially suitable habitat, and designated critical habitat, wherever practicable and feasible.”
12	Clarification	ES-22	MM-BIO-2(b): <ul style="list-style-type: none"> “• Require <u>Encourage</u> project design to avoid sensitive natural communities and riparian habitats, wherever practicable and feasible.”
13	Clarification	ES-22	MM-BIO-3(b): <ul style="list-style-type: none"> “• Require <u>Encourage</u> project design to avoid federally protected wetlands consistent with the provisions of Section 404...” “• Require <u>Encourage</u> review of construction drawings by a certified wetland delineator...”
14	Clarification	ES-23	MM-BIO-4(b): <ul style="list-style-type: none"> “• Require <u>Encourage</u> review of construction drawings and habitat connectivity mapping provided by the CDFW or CNDDB...”



#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
15	Clarification	ES-24	<p>MM-BIO-5(b):</p> <p>“•-Require <u>Ensure</u> that no change in existing ground level occur from the base of any protected tree at any time. <u>Require</u> It is recommended that no burning or use of equipment with an open flame occur near or within the protected perimeter of any protected tree.”</p> <p>“•-Require <u>Encourage</u> that no storage or dumping of oil, gas, chemicals, or other substances that may be harmful to trees occur from the base of any protected trees, or any other location on the site from which such substances might enter the protected perimeter. <u>Require</u> It is recommended that no heavy construction equipment or construction materials be operated or stored within a distance from the base of any protected trees. <u>Require</u> It is recommended that wires, ropes, or other devices not be attached to any protected tree, except as needed for support of the tree. <u>Require</u> It is recommended that no sign, other than a tag showing the botanical classification, be attached to any protected tree.”</p> <p>“... require <u>ensure</u> replacement of any tree removed with another tree or trees on the same site deemed adequate by the local agency to compensate for the loss of the tree that is removed.”</p>
16	Clarification	ES-31	<p>MM-GHG-3(a)(11):</p> <p>“•-Require <u>Encourage</u> amenities for non-motorized transportation, such as secure and convenient bicycle parking.”</p>
17	Clarification	ES-40	<p>MM-LU-1(a)(3): “SCAG shall work with its member cities and counties to encourage <u>but not require</u> that transportation projects and growth are consistent with the RTP/SCS.”</p>
18	Clarification	ES-40	<p>MM-LU-1(a)(4): “SCAG shall coordinate with member cities and counties to encourage <u>but not require</u> that general plans consider and reflect as appropriate RTP/SCS policies and strategies. SCAG will work to encourage <u>but not require</u> consistency between general plans and RTP/SCS policies.”</p>
19	Clarification	ES-40	<p>MM-LU-1(a)(8): “SCAG shall continue to use its Intergovernmental Review Process to provide comments to lead agencies on regionally significant projects, that may be considered for determining consistency with the RTP/SCS.”</p>
20	Clarification	ES-52	<p>MM-TRA-1(b):</p> <p>“... bicyclist accommodations, and require <u>encourage</u> new development and redevelopment projects to include bicycle facilities...”</p>



#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
21	Clarification	ES-53	MM-TRA-1(b): “ Require Encourage new office developments with more than 50 employees to offer a Parking “Cash-out” Program to discourage private vehicle use.”
22	Clarification	ES-53	MM-TRA--2(b) “Where traffic signals or streetlights are installed, require encourage the use of Light Emitting...”
23	Clarification	ES-54	MM-TRA--2(b) “Diode (LED) technology, or similar technology.”
24	Clarification	ES-55	MM-TRA--2(b) “ Require Encourage the development of Transportation Management Associations for large employers and commercial/ industrial complexes;”
25	Clarification	ES-59	MM-USS-6(b): “ Require Encourage the reuse and recycle construction and demolition waste (including, but not limited to, soil, vegetation, concrete, lumber, metal, and cardboard).”
26	Clarification	ES-59	MM-USS-6(b): “Discourage exporting of locally generated waste outside of the SCAG region during the construction and implementation of a project. Encourage disposal within the county where the waste originates as much as possible.” Comment: Trash disposal should be addressed regionally while considering distance instead of being limited to within the SCAG region. It is possible that disposal could be done nearby while crossing regional boundaries.
27	Delete	P. 3.3-26 Regional Air Quality	It is not appropriate to use the American Lung Association grading system to rate the region’s the transportation plan. This section (paragraph and Table 3.3.2-1) should be deleted.
28	Clarification	P. 3.3-29 Sensitive Receptors & Table 3.3.2-3	“Sensitive Receptors by County” Clarify what the source data was and how the tally of sensitive receptors was made.
29	Clarification	Figure 3.3.2-3	Figure needs legend, labels, source of data and definition of sensitive receptors
30	Clarification	P. 3.10-5 Section 3.10.1, Regulatory Framework	The definition of a Municipal Separate Storm Sewer System (MS4) is incomplete and incorrectly cited.



#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
31	Clarification	p. 3.10-15 Section 3.10.1, Orange County General Plan	Specific mention of the Orange County Stormwater Program's Drainage Area Management Plan (DAMP) should be made under PEIR heading Orange County General Plan. The DAMP is Orange County's principle policy and program guidance document for urban nonpoint source pollution mitigation. The PEIR should reference the DAMP's agreements, structure, and programs, and, at the project level, make note to consider the specific water pollution control elements of the DAMP that apply to land development and redevelopment projects. Transportation infrastructure projects deemed to be Priority Projects, in accordance with DAMP designation (Exhibit 7.1 Table 7-1.1), would require the development of a Project Water Quality Management Plan (WQMP) in conformance with Orange County's Model WQMP.
32	Clarification	p. 3.10-17 Section 3.10.2, Existing Conditions	Table 3.10.2-1 lists San Juan Creek as a surface water resource within Santa Ana (Region 8) jurisdiction. San Juan Creek is located within the San Diego Regional Water Quality Control Board (Region 9) jurisdictional boundary.
33	Clarification	p. 3.10-56 Section 3.10.6, Mitigation Measures	Mitigation Measures: Parts of this section list mitigation measures that are already being required by municipal stormwater programs across the region. Instead of listing specific mitigation measures, the PEIR should make reference to these programs. In Orange County, for example, this program is detailed in the DAMP/Model WQMP. The Model WQMP describes the process that the cities and County employ for requiring a Project WQMP, which is a plan for minimizing the adverse impacts of urbanization on site hydrology, runoff flow rates, and pollutant loads at the project level. A reference to the Model WQMP and equivalent documents in the region's other counties, should replace the last ten bullet points of section MM-HYD-l(b).
34	Clarification	p. 3.10-56 Section 3.10.6, Mitigation Measures	If a proposed project has the potential to create a major new stormwater discharge to a water body with an established Total Maximum Daily Load (TMDL), a quantitative analysis of the anticipated pollutant loads in the stormwater discharges to the receiving waters should be carried out.



#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
35	Clarification	p. 3.10-56 Section 3.10.6, Mitigation Measures & Table ES 4-1 (page ES-37)	The PEIR states that "where feasible, restore or expand riparian areas such that there is no net loss of impervious surface as a result of the project." While the intent with many mitigative measures is to preserve (emphasis added) perviousness, the PEIR should not be establishing performance measures for land development/redevelopment outside of established local stormwater programs.
36	Clarification	3.11-8&9, 3.11-13 3.11-16 & 17	Need to specify the vacant areas that are permanently preserved or undevelopable, even park space that is vacant <ul style="list-style-type: none"> i. Identify the source of the data used to identify vacant land. ii. What are the following items classified as (e.g. vacant, open space): HOA open space, HOA streets, private parking lots, lakes. Table 3.11.2-2- Break out vacant land category into permanently preserved/undevelopable or developable Figure 3.11.2-7 Need to correctly label national forests as permanently preserved open space. Areas labeled vacant need to be reviewed to correctly allocate lands that are permanently preserved/undevelopable and which are developable.
37	Clarification	3.11-10	Table 3.11.2-1- Define 'Established Communities'; Correct label or number of square miles by county
38	Define	3.11-11	Define 'carbon sinks'
39	Define	3.11-14	Define medium, high, and low density housing within text
40	Clarification	3.11-34	3.11.7 LEVEL OF SIGNIFICANCE AFTER MITIGATION IMPACT LU-1... It is likely that in some instances currently adopted general plans and other adopted plans will not General Plans are not required to be consistent with the 2016 RTP/SCS policies and land use strategies, and they are not required to be consistent for purposes of the SCS pursuant to SB 375. Implementation of mitigation measures MM-LU- 1(a)(1), MM-LU-1(a)(2), MM-LU-1(a)(3), MM-LU-1(a)(4), MM-LU-1(a)(5), MM-LU-1(a)(6), MM-LU- 1(a)(7), MM-LU-1(a)(8), and MM-LU-1(b) would may reduce some of these impacts. However, direct, indirect, and cumulative impacts would remain significant and unavoidable.
41	Correction	3.14-9	Update Table 3.14.2-1 with May 2015 DOF data and label columns as 'Households' not 'Housing Units'



#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
42	Correction	3.14-12	Update Table 3.14.2-3 with May 2015 DOF data
43	Correction	3.14-13	Update Table 3.14.2-5 with May 2015 DOF data
44	Define	Figures 3.14.2-1 3.14.2-2 3.14.2-3	Define subjects of maps
45	Clarification	3.14.22, paragraph 4	Clarify if discussion is on new lane miles or existing; Define "additional transportation facilities"
46	Clarification	4-1, 4.1 add after last bullet	<u>"If an alternative is rejected and the project approved, it is the EIR for the proposed project that is to be used for future tiering purposes."</u>
47	Clarification	P. 4-6, and all related documents' references to Alternative 3.	<p>Alternative 3: Intensified Land Use Alternative</p> <p>"The <u>hypothetical</u> land use pattern in this Alternative builds on the land use strategies as described in the 2016 RTP/SCS and beyond. Specifically, it increases densities and intensifies land use patterns of the Plan, especially around high quality transit areas (HQTAs) in an effort to maximize transit opportunities. The <u>hypothetical</u> growth pattern associated with this Alternative..."</p> <p>Comment: Update all references to Alternative 3 in all RTP/SCS documents where it mentions that the land use pattern was developed based on the Plan to say that Alternative 3's land use plan is hypothetical.</p>

Attachment 2: OCTA Comment Letter



AFFILIATED AGENCIES

*Orange County
Transit District*

*Local Transportation
Authority*

*Service Authority for
Freeway Emergencies*

*Consolidated Transportation
Service Agency*

*Congestion Management
Agency*

*Service Authority for
Abandoned Vehicles*

January 11, 2016

**Mr. Hasan Ikhata
Executive Director
Southern California Association of Governments
818 West Seventh Street, 12th Floor
Los Angeles, CA 90017-3435**

**Re: Comments on the Draft 2016-2040 Regional Transportation Plan/
Sustainable Communities Strategy and Program Environmental
Impact Report**

Dear Mr. Ikhata:

Thank you for the opportunity to comment on the Southern California Association of Governments' (SCAG) draft 2016-2040 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS), and associated Program Environmental Impact Report (PEIR). The draft RTP/SCS and PEIR reflect the transportation and funding challenges that the region will face in the coming years. These documents are critical to the region's ability to improve mobility, and to operate and maintain the transportation system.

The Orange County Transportation Authority (OCTA) appreciates that SCAG has included the commitments identified in OCTA's 2014 Long-Range Transportation Plan (LRTP), as well as the demographic forecasts approved and submitted by the Orange County Council of Governments. Additionally, OCTA recognizes the hard work and cooperation of SCAG staff throughout the RTP/SCS and PEIR development process.

OCTA has identified policy and technical issues related to the draft RTP/SCS and PEIR that are of concern to Orange County. These are focused on the regional strategies that go above and beyond the projects submitted by the county transportation commissions (CTC). The strategies include the assumed mileage-based user fee, regional express lane network, California High-Speed Rail, and the additional investments in transit, active transportation, and congestion management. OCTA's concerns and comments regarding each of the regional strategies are discussed below.

Innovative Financing and New Revenue Sources

The draft RTP/SCS suggests that \$130.8 billion of the approximately \$200.4 billion regional shortfall can be addressed through actions at either the state or federal level. The innovative financing strategy, included in the RTP/SCS, assumes that a \$0.10 gas tax increase will be implemented by 2020. Additionally, by 2025, it assumes that the state or federal government would either replace the gas tax with an indexed mileage-based user fee of \$0.04 per mile, or further increase fuel taxes to generate revenues equivalent to the mileage-based user fee.

OCTA cannot support an increase in fees, including the introduction of a mileage-based user fee, until a comprehensive economic impact study is completed and presented to the OCTA Board of Directors for discussion. When considering support for any kind of a new user-based fee program, the region should place an emphasis on the need for return-to-source criteria that guarantee funds generated within a county are reinvested in that county's transportation system. Moreover, any user-based fees should be indexed appropriately to provide a justifiable and sustainable source of funding. Finally, throughout the development of any new funding mechanisms, opportunities should be sought to accelerate project delivery and reduce costs, consistent with OCTA's Breaking Down Barriers initiative. While these comments are generally consistent with SCAG's guiding principles for identifying reasonably available funding in the RTP/SCS, OCTA would like to reinforce these principles, particularly in consideration of the mileage-based user fee.

California High-Speed Rail

The draft RTP/SCS identifies Phase I of the California High-Speed Rail Authority (CHSRA) Project as a potential solution for improving interregional and intercity ground transportation. As described in the draft RTP/SCS, the project includes completing the first section through the San Joaquin Valley by 2018, extending to Palmdale and the Burbank Bob Hope Airport by 2022, connecting to San Jose/San Francisco by 2026, and finally reaching Los Angeles Union Station (Union Station) by 2028.

This also assumes upgraded commuter rail connections between Union Station and the Anaheim Regional Transportation Intermodal Center along the Los Angeles-San Diego-San Louis Obispo (LOSSAN) corridor. This upgraded service will be achieved through a \$1 billion program of projects identified in a memorandum of understanding (MOU) between the CHSRA and nine Southern California agencies. This investment is part of a phased delivery,

known as the "blended approach", which OCTA supports through the adopted Resolution 2012-020.

OCTA recommends that SCAG continue to provide regular updates to the Transportation Committee and Regional Council regarding the CHSRA business plan, financial status, implementation progress, and any changes in assumptions by the CHSRA. These updates should focus particularly on the status of the MOU.

Regional Express Lane Network

The draft RTP/SCS includes implementation of a regional express lane network. This network proposes to increase occupancy requirements from 2+ to 3+ persons per vehicle on select existing and planned high-occupancy vehicle (HOV) lanes throughout the region. Pricing for single-occupancy and dual-occupancy vehicles will then be used to increase the throughput of the corridor and reduce emissions from congestion. As a result, this concept would generate additional revenues. When combined with tolls from a new east-west freight corridor in Los Angeles County, the projected revenues would total \$23.5 billion. These funds are assumed to contribute toward the \$200.4 billion regional shortfall.

The proposed Regional Express Lane Network focuses on converting specific existing and planned HOV facilities to express lanes. However, the segment of State Route 55 (SR-55), between Interstate 405 (I-405) and State Route 91 (SR-91), is noted as a potential single or dual express lane facility. The potential for a dual lane facility is inconsistent with the projects submitted by OCTA in December 2014. The submittal identifies general purpose lane additions on SR-55, between I-405 and Interstate 5 (I-5), as well as between I-5 and State Route 22 (SR-22). OCTA did not submit any new capacity enhancements on SR-55 north of SR-22. If new capacity is proposed, over and above the OCTA LRTP, new funding would be required that is likely dependent on state and federal legislative action.

The 2016-2040 RTP/SCS should consistently recognize the capacity enhancements along SR-55, between I-405 and I-5, and between I-5 and SR-22, as general purpose lanes. This is consistent with how these projects are characterized in OCTA's LRTP, OCTA's 2006 program-level environmental document, and the current 2012-2035 RTP/SCS. Furthermore, the 2016-2040 RTP/SCS should clearly recognize that the proposed express lane network is subject to further study to evaluate right-of-way impacts, community issues, and overall feasibility before any final decisions on implementation can be made.

Other Regional Strategies

SCAG proposes a number of other investments within the draft RTP/SCS that affect Orange County, and go beyond the LRTP. These include additional investments in congestion management projects, transit service, and active transportation.

The congestion management projects were identified by the California Department of Transportation through studies required for corridors receiving Proposition 1B Corridor Mobility Improvement Account funding. In Orange County, these corridors included State Route 57, SR-22, I-5, Interstate 605, SR-91, and I-405.

The improvements consist of relatively low-cost operational improvements, such as ramp metering, auxiliary lanes, and other ramp and interchange enhancements. The draft 2016-2040 RTP/SCS estimates that an investment of \$5 billion is necessary to implement the improvements throughout the SCAG region. These are in addition to capacity and operational improvements submitted by the CTCs, and would be funded through the draft 2016-2040 RTP/SCS innovative financing strategy.

The draft 2016-2040 RTP/SCS also proposes additional transit enhancements throughout the region. The improvements consist of expanded local bus service, additional Bravol and bus rapid transit services, and new express bus service. SCAG states that the additional cost to the region for these services, including capital and operations and maintenance costs, is estimated at about \$8.5 billion, which is again assumed to be funded with innovative sources. It should be noted that the proposed improvements in Orange County are generally consistent with the financially unconstrained element of the OCTA 2014 LRTP.

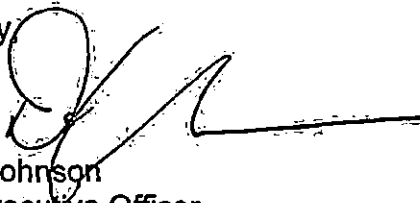
An additional emphasis is also placed on active transportation improvements, with the draft 2016-2040 RTP/SCS proposing to invest \$12.9 billion. Compared to the previous RTP/SCS, the active transportation investment has more than doubled. About \$1.7 billion of the total investment reflects active transportation projects submitted by CTCs. SCAG proposes investing another \$6.4 billion from the draft 2016-2040 RTP/SCS innovative financing strategy. SCAG then estimates that the remaining \$4.8 billion would be invested through active transportation elements from roadway operations and maintenance efforts. The \$12.9 billion investment results in more trips made by walking or bicycling, increasing from 11.9 percent of all trips in 2012, to 15.7 percent of all trips by 2040.

Mr. Hasan Ikhata
January 11, 2016
Page 5

OCTA recognizes that it is within SCAG's purview to plan for regional strategies that enhance transportation; however, it should be noted that OCTA is committed to delivering the projects within the LRTP. The 2016-2040 RTP/SCS should clearly state that the regional strategies suggest improvements beyond the projects submitted by OCTA, and that the implementation of the strategies is subject to availability of new revenue sources and the necessary project development and review processes by the implementing agencies. OCTA will only consider additional investments after new revenues are realized and identified to account for these additional improvements.

OCTA appreciates SCAG's work on the RTP/SCS and PEIR, and looks forward to the adoption of the final 2016-2040 RTP/SCS and PEIR in April. If you have further questions, please contact Gregory Nord, Senior Transportation Analyst, at (714) 560-5885.

Sincerely,

A handwritten signature in black ink, appearing to read 'Darrell Johnson', with a long horizontal flourish extending to the right.

Darrell Johnson
Chief Executive Officer

DJ:gn

c: OCTA Board of Directors
Executive Staff

Anita Au

From: Alexis Lantz <alantz@ph.lacounty.gov>
Sent: Monday, February 1, 2016 4:26 PM
To: 2016 PEIR; Rye D. Baerg; Alan Thompson
Cc: Armbruster, Jean
Subject: LA County DPH - Draft 2016 RTP/SCS Comments
Attachments: LAC DPH_ SCAG_ 2016.RTP.SCS Comment Letter.pdf

Hello,

Thank you so much for the opportunity to comments on the DRAFT 2016 RTP/SCS. Please find the Los Angeles County Department of Public Health's comment letter attached. We will also provide our comments through the online system.

We look forward to continuing to work with you on the RTP/SCS.

Sincerely,

Alexis Lantz

Policy Analyst
PLACE Program
(Policies for Livable Active Communities and Environments)

LA County Dept. of Public Health
695 S. Vermont (14th Floor - south tower)
LA, CA 90005
213.738.4085 (ph)
213.637.4879 (fax)

website: www.publichealth.lacounty.gov/place



COUNTY OF LOS ANGELES

Public Health

CYNTHIA A. HARDING, M.P.H.
Interim Director

JEFFREY D. GUNZENHAUSER, M.D., M.P.H.
Interim Health Officer

Division of Chronic Disease and Injury Prevention
Paul Simon, M.D., M.P.H.
Director

3530 Wilshire Blvd., Suite 800
Los Angeles, California 90010
TEL (213) 351-7825 • FAX (213) 351-2713
www.publichealth.lacounty.gov



BOARD OF SUPERVISORS

Hilda L. Solis
First District

Mark Ridley-Thomas
Second District

Shella Kuehl
Third District

Don Knabe
Fourth District

Michael D. Antonovich
Fifth District

February 1, 2016

Cheryl Viegas-Walker, President
Regional Council
Southern California Association of Governments
818 W. 7th Street, 12th Floor
Los Angeles, CA 90017

Dear President Viegas-Walker:

The Los Angeles County Department of Public Health (DPH) commends the Southern California Association of Governments (SCAG) and the Regional Council for your efforts in developing the 2016-2040 Draft Regional Transportation Plan and Sustainable Communities Strategy (RTP/SCS).

We are pleased to see the inclusion of the Public Health Appendix, which describes the impact of different land use and transportation scenarios on public health outcomes such as physical activity, chronic disease, and air quality. Furthermore, the inclusion of performance measures helps demonstrate the health impacts of the RTP/SCS and measure progress as projects are implemented. While we are pleased with many aspects of the RTP/SCS, we offer the following comments to ensure the plan maximizes the potential health benefits of this \$555.6 billion investment into our region.

The RTP/SCS has the potential to improve health outcomes in our region by planning for transportation investments that will improve access to jobs, schools, parks, natural environments, nutritious foods, and health care. However, these same transportation investments may also create unintended negative health impacts by decreasing housing affordability and increasing displacement of minority and low-income residents.

Households that pay more than 30% of their income on housing are considered to have a high housing burden. According to the American Community Survey, 52.1% of households in Los Angeles County have a high housing burden.¹ This is a significant public health concern, as

1

2

housing affordability, stability, and quality are essential for human health and well-being.² Unaffordable housing reduces the income available for other subsistence needs such as nutritious foods, health care expenses, and transportation. Families that cannot afford their housing may have to move frequently, which can lead to psychological stress and depression, especially in children. The experiences of eviction and foreclosure can negatively impact mental health. Lacking a stable place to live may increase anxiety and depression. Homelessness may cause physical and mental distress and can lead to acute and chronic health problems. For all of these reasons, protecting the current supply of affordable housing and creating new affordable housing around transit is essential both for public health and for the health of the transit system, whose core ridership is most often low income residents.

2

In the Environmental Justice Appendix, SCAG identifies gentrification as an issue in transit oriented communities (TOCs) and states that this could cause the displacement of minority and low-income households. We applaud SCAG for identifying a gentrification and displacement performance measure in the RTP/SCS and for stating that the agency will continue to monitor growth in TOCs. However, we recommend that SCAG track the number of very low, low, and moderate income housing units available and constructed as a way of gauging progress toward implementation of the 2013-2021 Regional Housing Needs Assessment.

3

We also encourage SCAG, as our regional planning agency, to play a leadership role in working with local jurisdictions on land use and affordable housing strategies that prevent and reduce gentrification and displacement of minority and low income residents. We encourage SCAG and the Regional Council to identify ways to do this within the RTP/SCS or in the work plan to be created upon its adoption. Technical assistance programs, tools, and policies must be identified to assist member jurisdictions in maximizing the benefits of transit investments for housing and decrease the potential for displacement of minority and low-income populations.

4

SCAG is well positioned to encourage jurisdictions to develop local affordable housing policies near transit. For example, the County of Los Angeles is currently developing a comprehensive plan to combat homelessness that includes consideration of land use strategies that could be adopted by local jurisdictions throughout the SCAG region.

These policies include options such as:

- An affordable housing benefit fee program, also known as a linkage fee, which would charge a fee on all new development to support the production of affordable housing.
- An incentive zoning and “value capture” strategy based on the concept that infrastructure and planning actions such as zone changes can increase land values which can be redirected toward the public good, such as affordable housing.
- A density bonus ordinance that can incentivize the development of affordable housing in exchange for greater density.³

5

SCAG could play a key regional leadership role in encouraging member jurisdictions to develop policies such as these in communities where transit investments have or will be made. SCAG could also play a role at the State level with respect to housing policies near transit.

5 cont.

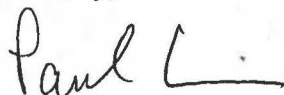
Finally, we recommend that SCAG convene a task force specifically to assist local jurisdictions with best practice tools to address the complex issues of gentrification and displacement around transit. The task force should include affordable housing experts, transit agencies, city officials, public health practitioners, and others.

6

Overall, we are pleased with the direction of the RTP/SCS and offer these comments to maximize our region's investments and further improve the health and vitality of our region. We provide these recommendations because housing unaffordability, instability, and quality have significant public health impacts that disproportionately impact minority and low-income people. We look forward to continuing to work with you as you finalize and begin implementation of the 2016-2040 RTP/SCS.

7

Sincerely,



Paul Simon, M.D., M.P.H.
Director, Division of Chronic Disease and Injury Prevention

PS:ap

-
- ¹ Office of Health Assessment and Epidemiology, Los Angeles County Department of Public Health. Analyses of 2008-2012 American Community Survey 5-Year Estimates, U.S. Census Bureau.
 - ² Housing and Health in Los Angeles County. Social Determinants of Health, Issue no. 2. Los Angeles: Los Angeles County Department of Public Health; February 2015.
 - ³ County of Los Angeles Homeless Initiative; Draft Recommended Strategies to Combat Homelessness; January 2015.

county of ventura

Planning Division

Kimberly L. Prillhart
Director

February 1, 2016

Southern California Association of Governments
Land Use and Environmental Planning Division
Attn: Ms. Lijin Sun, Senior Regional Planner
818 West Seventh Street, 12th Floor
Los Angeles, CA 90017-3435

Email: 2016PEIR@scag.ca.gov

Subject: Comments on the NOA of a DPEIR for the 2016-2040 Regional Transportation Plan/Sustainable Communities Strategy (2016 RTP/SCS)

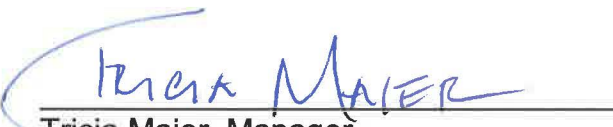
Dear Ms. Sun:

Thank you for the opportunity to review and comment on the subject document. Attached are the comments that we have received resulting from intra-county review of the subject document. Additional comments may have been sent directly to you by other County agencies.

Your proposed responses to these comments should be sent directly to the commenter, with a copy to Laura Hocking, Ventura County Planning Division, L#1740, 800 S. Victoria Avenue, Ventura, CA 93009.

If you have any questions regarding any of the comments, please contact the appropriate respondent. Overall questions may be directed to Laura Hocking at (805) 654-2443.

Sincerely,


Tricia Maier, Manager
Planning Programs Section

Attachments

County RMA Reference Number 15-024





**PUBLIC WORKS AGENCY
TRANSPORTATION DEPARTMENT
Traffic, Advance Planning & Permits Division
MEMORANDUM**

DATE: January 14, 2016

TO: RMA – Planning Division
Attention: Laura Hocking

FROM: Transportation Department *Ban*

SUBJECT: **REVIEW OF DOCUMENT 15-024** Notice of Availability of Draft Program Environmental Impact Report (NOA/DPEIR)
Project: **2016-2040 Regional Transportation Plan/
Sustainable Communities Strategy (2016 RTP/SCS)**
Lead Agency: **Southern California Association of Governments (SCAG)**
First-tier CEQA document that serves as long-range regional transportation plan for six southern California counties in SCAG through horizon year 2040.

Pursuant to your request, the Public Works Agency Transportation Department (PWATD) has reviewed the DPEIR prepared by Sapphos Environmental dated November 24, 2015, for the 2016 RTP/SCS published by SCAG and updated every four (4) years.

SCAG is one (1) of eighteen (18) Metropolitan Planning Organizations (MPOs) in the State of California designated for the six-county 38,000-square-mile region of Southern California that includes the counties of Imperial, Los Angeles, Orange, Riverside, San Bernardino, and Ventura, sixteen (16) federally recognized tribal nations, fifteen (15) sub-regional entities, 191 cities, and 19 million Californians (49% of total state population). The PEIR for the 2016 RTP/SCS is intended to serve as an informational document to inform decision-makers and the public of the potential environmental consequences of approving the proposed Plan. The PEIR is a first-tier California Environmental Quality Act (CEQA) document with mitigation measures designed to help avoid or minimize significant cumulative impacts on a regional-scale leaving project-specific details to subsequent EIRs.

We have the following comments:

1. There may be a math error in Table 3.17.4-6 on Page 3.17-49. "Active Transportation" is the summation of "Walk" and "Bike." "Active Transportation" plus "Transit" does not equal the "Total." 1
2. The PWATD has jurisdiction over transportation-related facilities on County-maintained roadways in the unincorporated areas of Ventura County. We offer the following comments with regard to our projects that are or are not listed in Appendix B. 2
 - a. The intersection improvement project at Pleasant Valley Road and Fifth Street in Table 1 on Page 95 (VEN 130104) has a Total Project Cost (TPC) of \$2.96 million (not \$1.76 million).

- b. It is our understanding that bicycle lane and pedestrian improvement projects that are not specifically listed in the tables would be grouped in the Call for Projects listings in Table 2 on Page 136 (RTP IDs 101007 and 101008). If this is not true, then the following two (2) CMAQ and locally funded pedestrian/safe-routes-to-school improvement projects in Camarillo Heights and El Rio should be added to the appropriate table.
 - i. Camarillo Heights Elementary School Pedestrian Improvements – TPC of \$452,000.
 - ii. Rio Real Elementary School Pedestrian Improvements – TPC of \$365,000.
- c. The following two (2) HSIP and locally funded road/bicycle improvement projects in Casitas Springs should be added to the appropriate table.
 - i. Santa Ana Road Pavement Widening and Bike Lanes (MP 0.05 to MP 1.7) – TPC of \$980,000.
 - ii. Santa Ana Road Pavement Widening and Bike Lanes (MP 3.81 to MP 5.81) – TPC of \$1.3 million.
- d. The following two (2) unfunded road improvement projects in the Oxnard Plain and Oxnard Beach Areas should be added to the appropriate table.
 - i. Hueneme Road Widening Project – Rice Road to Las Posas Road – TPC of \$22.34 million.
 - ii. Harbor Boulevard Widening Project – Oxnard City Limits to Ventura City Limits – TPC of \$58.7 million.
- e. The following two (2) projects are listed in two tables in Appendix B (Table 1, Page 95; Table 2, Page 319):
 - i. Hueneme Road (VEN 011202) for \$6.953 million
 - ii. Pleasant Valley Road at Fifth Street (RTP ID 5A0709 / VEN 130104) for \$1.76 million.

3

4

5

6

Our review is limited to the impacts this project may have on the County of Ventura Regional Road Network.

T:\Planning\Land Development\Non_County\15-024 (SCAG).doc



Memorandum

County of Ventura • Resource Management Agency • Planning Division
800 S. Victoria Avenue, Ventura, CA 93009-1740 • (805) 654-2478 • ventura.org/rma/planning

DATE: January 28, 2016

TO: Laura Hocking, RMA/Planning Technician

FROM: Kari Finley, Senior Planner

SUBJECT: Environmental Document Review, RMA Ref. #15-024
2016-2040 Regional Transportation Plan/Sustainable Communities
Strategy (2016 RTP/SCS)

We would like to thank the Southern California Association of Governments (SCAG) for the opportunity to review the Draft 2016 RTP/SCS and Program EIR. This memo provides comments on the Draft 2016 RTP/SCS from the Ventura County Planning Division for consideration by SCAG.

In September 2015, the Ventura County Board of Supervisors adopted a comprehensive update to the Saticoy Area Plan. The Saticoy community is defined as a “severely economically disadvantaged community”. The Saticoy Area Plan has a 20-year time horizon that extends from 2015 to 2035. Within the Saticoy Area Plan, project objectives are called “guiding principles” that must be used when evaluating future Area Plan amendments. The four guiding principles developed for the Saticoy Area Plan update 1) sustainable development that supports a healthy community, 2) economic revitalization, 3) improved housing opportunities and, 4) improved infrastructure systems. The Area Plan update was primarily funded through a combination of Compass Blueprint Program Grant and the Strategic Growth Council Sustainable Communities Planning Grant Program. Significant planning efforts were focused on reducing vehicle miles travelled.

One of the unavoidable, significant impacts that was identified in the Saticoy Area Plan Program EIR, includes traffic impacts on State Route 118 (SR118) in the Saticoy Community. One potential mitigation measure that was identified includes the widening/re-striping of SR118 in the Saticoy community (e.g., generally between Vineyard Avenue to Darling Road). Although the Board of Supervisors adopted a statement of overriding considerations for this impact, the following implementation program (highlight added) was included in the Area Plan to help mitigate the impact in the future:

No.	Program Description	Responsibility	Priority	Timeframe
MOBILITY ELEMENT				
MOB-P2	<p>Reclassify Portion of SR 118: To mitigate significant project and cumulative traffic impacts on SR 118 between Vineyard Avenue and Darling Road, the County should review and process a General Plan Amendment that would reclassify that segment of SR 118 from 4 to 6 lanes on the Regional Road Network. The road reclassification should be incorporated into the next General Plan Update, tentatively scheduled for completion in 2020. Finally, the County shall work with VCTC and Caltrans to reprioritize the re-striping of SR 118 from Vineyard Avenue to Darling Road on the Ventura County Congestion Management Plan and the Caltrans list of projects. Although the re-striping project is currently listed in the Congestion Management Plan, the prioritization and timing for construction should be modified to occur within the 20-year horizon of the Saticoy Area Plan.</p>	<p>PWA/ Transportation; RMA/Planning; VCTC; Caltrans; City of Ventura</p>	A	0-5 years

As indicated in the adopted Saticoy Area Plan program, it is critical for implementation of the recently adopted Saticoy Area Plan and future development in the Saticoy community that the re-striping project be included as a prioritized project in the 2016 RTP/SCS (FTIP Projects). The Saticoy Area Plan guiding principles are consistent with the RTP/SCS overarching strategy that calls for “more compact communities in existing urban areas”. The Saticoy Area Plan includes a land use plan with more compact development and improved mobility in an existing urban area. Peak-hour traffic impacts are already significant in this area and will impede future revitalization of this disadvantaged community if improvements to SR118 are not constructed.

As such, we respectfully request that the re-striping and any other critical intersection improvements in the Saticoy area be included in the RTP/SCS or FTIP Projects list as necessary, to make this a priority project. If you have any questions concerning these comments, you may contact Kari Finley at kari.finley@ventura.org or 805/654-3327.

Anita Au

From: Angel, Martin <Martin.Angel@ocpw.ocgov.com>
Sent: Monday, February 1, 2016 4:58 PM
To: 2016 PEIR; Courtney Aguirre; Lijin Sun
Cc: Alonso, Laree
Subject: Orange County RTP SCS and PIER comments
Attachments: Orange County RTP SCS Comment letter and matrix.pdf; ATTACHMENT 1 County of Orange Comments Matrix.pdf; Midway City TAZ_32683200_32683300.pdf; Ranch Plan PC PA 1 TAZ_33046800.pdf

Please see attached Orange County RTP SCS and PIER comments review comments. Please contact Laree Alonso or myself with any questions.
Thanks

Martin R. Angel
OC Public Works / Development Services
(714) 667-8864
Martin.Angel@ocpw.ocgov.com

157 total comments

February 1, 2016

Mr. Hasan Ikhata
Executive Director
Southern California Association of Governments
818 West Seventh Street, 12th Floor
Los Angeles, California 90017-3435

Dear Mr. Ikhata:

Thank you for the opportunity for the County of Orange (County) to review and comment on the Southern California Association of Governments (SCAG) Draft 2016-2040 Regional Transportation Plan/Sustainable Communities Strategy (2016 RTP/SCS) and the associated Program Environmental Impact Report (PEIR). Development of the Draft 2016 RTP/SCS and PEIR is a huge undertaking and the County recognizes the significant role these documents play in the region's ability to receive federal funding for transportation projects, improve mobility, support sustainable development, operate and maintain the transportation system, and meet the region's greenhouse gas emission reduction target and other air conformity standards.

The County not only submits its comments listed below and in Attachment 1, the County also concurs with the comments identified by the Orange County Transportation Authority (OCTA) and the comments submitted by the Orange County Council of Governments (OCCOG). Both OCTA and OCCOG have identified policy and technical issues which are of concern to all of the Orange County.

The County requests that this comment letter and attachments be included in the public record regarding SCAG's Draft 2016 RTP/SCS, PEIR, and all associated appendices.

GENERAL COMMENTS

1. Cities vs. Jurisdiction

Throughout the Draft 2016 RTP/SCS, PEIR, and associated appendices, there are references to "cities." Since the SCAG region also includes counties, it is recommended that references to "city" or "cities" are changed to "jurisdiction" or "jurisdictions" where appropriate.

Recommendation: Change references to "city" or "cities" to "jurisdiction" or "jurisdictions" where appropriate.

1

2. "Can and Should"

As indicated in the PEIR, state law provides that it is appropriate to indicate in mitigation measures that they "can and should" be implemented where the authority to implement the measures rest with agencies other than SCAG. The language conveys to local agencies an affirmative obligation to address each mitigation measure, irrespective of whether such agencies deem the measures applicable to a particular project or duplicative of their own or other governmental agencies' regulatory measures. The County recognizes SCAG's use of the words "can and should" are derived from California Environmental Quality Act (CEQA), at Public Resources Code sections 21081 and 2155.2(b)(5)(B)(ii) and CEQA Guidelines, including section 15091(a)(2). Nevertheless, given the express limitation of SB 375 upon respective local agencies' land use authority, any language seemingly imposing affirmative obligations contrary to SB 375 is inappropriate. As such, the use of the language "can and should" for mitigation measures addressed to local agencies is inappropriate.

Recommendation: Change language in all project level mitigation measures to read "~~can and should~~ consider where applicable and feasible." To clarify the intent that the project level mitigation measures are a menu of options for which feasibility has not been established for any given project, the "can and should" language should be changed in all project level mitigation measures to read "should consider where applicable and feasible."

3. Undevelopable/Protected Land Labeled as Vacant

This continues to be an ongoing issue with data and maps produced by SCAG for use in its various projects. The County is especially concerned about this issue due to the effort its staff has expended over the last several years to ensure that protected, and therefore undevelopable, land in the unincorporated area is not depicted on any land use maps as "vacant" and therefore available for development. During the outreach process for the Draft 2016 RTP/SCS, the County received a "SCAG Data/Map Book" from SCAG which included several maps for review and comment. In this Map Book, SCAG had included its list of General Plan Land Use Categories which included the category "8888 Undevelopable." County staff applied this category to all areas that are protected open space and submitted this data and maps to SCAG for use in the RTP/SCS and PEIR.

A review of the various figures (i.e., exhibits or maps) contained throughout the Draft 2016 RTP/SCS and PEIR has revealed the "8888 Undevelopable" category was not applied consistently to protected open space in the unincorporated area. For example, in the RTP/SCS Appendix titled "SCS Background Document," Exhibits 23 and 24 correctly identify the protected open space areas in the unincorporated area including the Cleveland National Forest (CNF). However, in the PEIR, Figure 3.11.2-2 "Existing Land Uses" and Figure 3.11.2-5 "General Plan Land Use Designations" both identify CNF as open space instead of undevelopable. Just a few pages later in the PEIR, Figure 3.11.2-7 "SCAG Region Open Space, Recreation, and Agricultural Land Uses" labels the CNF as "vacant." The CNF is not vacant land, it is protected open space and therefore undevelopable.

Recommendation: Revise all figures, exhibits and maps to correctly identify protected open space in the unincorporated area as undevelopable. No undevelopable areas should be depicted as vacant, which has a connotation that it is available for future development.

3 cont.

4. Consistent Use of 500 Foot Buffer Reference

Throughout the Draft 2016 RTP/SCS and PEIR there are references to a possible 500, or even 1,000, foot buffer. The terminology "buffer" implies that there is a negative condition that needs to be addressed and that development is prohibited within this area. There is currently no requirement from the California Air Resources Board (CARB) or the South Coast Air Quality Management District (SCAQMD) that prohibit development near high quality transit areas or major transportation corridors.

There are numerous references to prohibiting certain uses (including residential and mixed use) within 500 feet of a major transportation corridor (like a freeway). This language should be eliminated or at least made more flexible and it should be indicated that additional study is pending by air quality agencies and SCAG. It should be made clear that is measure from the edge of travel lands and not the right-of-way. Precluding development within 500 feet takes a massive amount of land out of play where often times the greatest need for affordable housing exists. Furthermore, precluding development in these areas is directly contrary to the primary objectives of SB 375 to locate housing near job centers within previously urbanized areas.

4

Recommendation: Define the word "buffer" and use it consistently throughout all documents and clarity that development is not currently prohibited adjacent to transportation corridors.

DRAFT 2016 RTP/SCS

5. Growth Forecasts

Overall, the County supports the Draft 2016-2040 RTP/SCS ("The Plan") growth forecast and the adoption of the growth forecast at a geographic level no lower than the jurisdictional level. The County supports The Plan since the growth forecast accurately reflects Orange County's Projections dataset. The Plan growth forecast reflects all entitlements, development agreements, and projects recently completed or under construction in the unincorporated area. The County appreciates the ongoing coordination between SCAG and the Center for Demographic Research (CDR) at California State University Fullerton on behalf of all Orange County jurisdictions. The Orange County Projections has been used by OCTA in the development of its Orange County Long-Range Transportation Plan demonstrating that Orange County has integrated transportation and land use planning for decades.

On behalf of all Orange County jurisdictions, OCCOG representatives on the Regional Council and SCAG Policy Committees repeatedly requested that the growth forecast in the Draft 2016 RTP/SCS and all PEIR alternatives be based on the technically corrected growth forecast submitted to SCAG in August 2015 by the CDR. Use of any other growth forecast could result in unrealistic land use

5

Page 4

proposals such as depicted in Attachment 2, the proposed increase in the numbers of population, dwelling units and employment in long-established single-family residential areas such as Midway City and decrease in these numbers for newly built planned communities protected by development agreements.

The PEIR itself makes the following statements as to why Alternative 3 should not be supported:

- “Alternative 3 would result in a greater chance for there to be conflicts with existing plans or regulations including local general plans as a result of the policies encouraging a much more compact land use development pattern in urbanized areas such as HQTAs.”
- “Additionally, there would be a greater chance for there to be conflicts with an existing plan or regulation including local general plans because of the much more compact and aggressive land use development pattern in urbanize areas such as HQTAs.”
- “Alternative 3 would result in somewhat more adverse impacts as The Plan from the potential to displace substantial amounts of existing housing...Alternative 3 would result in greater impacts as The Plan from the potential to displace substantial numbers of people...”
- “However, Alternative 3 would have much more severe impacts on the built environment.”

Because the draft PEIR’s Intensified Land Use Alternative (Alternative 3) does not include the technically corrected growth forecast for Orange County, the County would not support consideration of this Alternative as the preferred alternative.

Recommendation: The County supports the adoption of the Draft 2016 RTP/SCS “The Plan” growth forecast at the jurisdictional level.

6. Maintain Unbiased, Objective Tone

Language throughout the Draft 2016 RTP/SCS and the associated appendices is leading and dramatic to emphasis certain key issues such as active transportation and public health. It is recommended that the document utilize an unbiased, objective tone. For example, the County recommends the removal of “Our Vision” and “Our Overarching Strategy” from the Executive Summary of the document. These two sections are highly speculative and are not necessary to the document. “Our Vision” and “Our Overarching Strategy” go above and beyond the requirements of the RTP/SCS when the focus of the document should be on the challenges we face and how the SCAG region can address those challenges through the adoption of the Draft 2016 RTP/SCS.

Recommendation: The Draft 2016 RTP/SCS should only contain unbiased and objective language throughout the document and associated appendices.

5 cont.

6

PEIR

7. PEIR Mitigation Measures

It should be stated that in the event a mitigation measure is inconsistent with California State law, California law prevails. In addition, for all "Project-level Mitigation Measures," the word "require" should be replaced with "encourage" or "ensure." Examples include:

MM-AES-3(b), MM-Air-2(b), MM-Air-4(b), MM-BIO-1(b), MM-BIO-2(b), MM-BIO-3(b), MM-BIO-4(b), MM-BIO-5(b), MM-GHG-3(a)(11), MM-TRA-1(b), MM-TRA-2(b), MM-USS-6(b)

Recommendation: Revise mitigation measures as shown in the redline version provided in the matrix of comments in Attachment1.

8. Fees and Taxes

Several mitigation measures indicated that local jurisdictions or other entities should implement new fees of propose taxes to pay for a variety of programs or for acquisition of land for preservation. Increases to fees or taxes are issues that could require voter approval, and thus not be approved. They also represent prescriptive means to accomplish the mitigation.

Recommendations: a) Reword measures to indicate that a new or increased fee, new tax, or other increase is only an option as a way to implement the mitigation. b) Clarify whether it was assumed that these additional fees were considered feasible and if the new fees that are suggested were considered in the financial plan or economic analysis of the RTP.

9. Duplicative/Existing Regulations

It is noted that many of the mitigation measures are duplicative of existing regulation or processes (e.g. CEQA review requirements). Under CEQA, it is intended that measures identified will mitigate impacts of the project. Existing regulations are assumed to already be complied with in the evaluation of the impact and the significance of the impact is after all existing regulation is applied. Therefore, mitigation measures should address those actions that need to be undertaken in addition to existing regulation in order to mitigate the impact. Mitigation measures that simply restate existing regulation are not valid mitigation for purposes of CEQA. Further, it is possible for regulations to change over time. Because of this, restatement of the regulation in the mitigation measures could result in future conflict between the stated mitigation and regulation. It is common practice when compliance is used as a mitigation measure to simply state that the responsible entity will simply comply with the regulation. If mitigation measures that restate existing regulation are not removed from the PEIR, then it is requested that the wording of the measures be restated to simply read that compliance with all applicable laws and regulations will be undertaken. Language that could be used is: "Local jurisdictions, agencies, and project sponsors shall comply, as applicable, with existing federal, state, and local laws and regulations." Similar language is included in some mitigation measures.

7

8

9

Examples of existing regulations included as mitigation measures are found within the Hydrology section of the draft PEIR. For example, Section 3.10.6, Mitigation Measures (page 3.10-56): Parts of this section list mitigation measures that are already being required by municipal storm water programs across the region. Instead of listing specific mitigation measures, the PEIR should make reference to these programs. In Orange County, for example, this program is detailed in the Drainage Area Management Plan (DAMP)/Model Water Quality Management Plan (WQMP). The Model WQMP describes the process that cities and County employ for requiring a WQMP, which is a plan for minimizing the adverse impacts of urbanization on site hydrology, runoff flow rates, and pollutant loads at the project level. A reference to the Model WQMP and equivalent documents in the region's other counties, should replace the last ten bullet points of section MM-HYD-1(b).

There are specific mitigation measures included in the Hydrology section that may be in conflict with Storm Water Permits issued by Regional Water Quality Control Boards. In the SCAG region, there are five water quality control boards each with its own Municipal NPDES Storm Water Permit. The regulations and requirements contained in these permits vary from each other. By listing specific measures in the PEIR that are not included in a project's applicable Municipal NPDES Storm Water Permit, the PEIR creates conflicting compliance requirements. To eliminate potential conflict with existing regulations, the mitigation measures regarding specific Best Management Practices (BMPs) should be removed and replaced with a single requirement that each project must comply with its applicable Municipal NPDES Storm Water Permit.

Recommendation: Because restatement of the current regulation in the proposed mitigation measures could result in future conflict between the stated mitigation and regulation, proposed mitigation measures should be revised with the language: "Local jurisdictions, agencies, and project sponsors shall comply, as applicable, with existing federal, state, and local laws and regulations."

Conclusion

The County recognizes the amount of work put into preparing these documents. They represent incredibly complex technical work and have important and far-reaching policy impacts for our region. However, because of this importance and complexity, the County would like to express concern about the timing of the release of the documents and hope that preparation of future RTP/SCS documents will take into account the need to accommodate adequate review, discussion and revision time for all of the documents. The current timeline of document releases, public comment period, and time allowed for the response to comments results in an inability to have credible discussion regarding possible changes because the timeline does not allow for recirculation or full discussion of requested changes. While the County is appreciative of the extended public comment period through February 1, 2016, there remains concern that only a few weeks are provided to prepare responses to comments and amend the documents to ensure that the Regional Council may consider the certification of the PEIR and the approval of the Draft RTP/SCS on April 7, 2016.

9
cont.

10

Mr. Hasan Ikhata
Responses for Draft 2016 RTP/SCS and PEIR
February 1, 2016

Page 7

We appreciate your consideration of all the comments provided in this letter and its attachments and look forward to your responses. It is a shared goal to have a RTP/SCS adopted that is credible and defensible on all levels. If you have any questions, please do not hesitate to contact me or Colby Cataldi, Deputy Director, OC Public Works/OC Development Services, at 714-667-8860.

Sincerely,

A handwritten signature in blue ink that reads "Shane L. Silsby". The signature is written in a cursive style.

Shane L. Silsby, Director, OC Public Works

Attachments

ATTACHMENT 1

COUNTY OF ORANGE

DETAILED COMMENTS ON DRAFT 2016 RTP/SCS, PEIR, AND RELATED DOCUMENTS

2016 RTP/SCS

"2016 RTP/SCS" Table Comments 1-48

#	TOPIC	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
1.	General Comment	p.2	Delete Our Vision & Our Overarching Strategy strategies. These sections are highly speculative and not necessary for the rest of the document.
2.	Clarification	p.3, column 2, bullet 5	“Millions of people are in poor health... Millions of more people live with chronic diseases, such as asthma, every day.” Define ‘poor health’ Cite numbers or share of population for region instead of saying “millions”. Provide reference to what chronic diseases include.
3.	Clarification	P. 4, column 2, paragraph 2	“Among the milestones: a one-year demonstration of <u>the tolled Express Lanes</u> in Los Angeles County along Interstate 10 and Interstate 110 was made permanent in 2014...”
4.	Clarification	p. 7, column 2, paragraph 1	“In many instances, <u>the additional these chargers will create the opportunity to increase</u> may double the electric range of PHEVs, reducing vehicle miles traveled that produce tail-pipe emissions.”
5.	Clarification	p. 13, column 2, paragraph 2	“Since 2009, every MPO <u>in California</u> has been required to develop a Sustainable Communities Strategy...Once implemented along with the rest of the Plan, it will improve the <u>overall</u> quality of life for all residents of the region.”
6.	Clarification	p. 13, column 2, paragraph 3	“But these advances in mobility also have the potential to help Baby Boomers, <u>and the generations that follow them,</u> maintain their independence as they age.”

#	TOPIC	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
7.	Clarification	p. 14, column 1, paragraph 2	<p>“In Southern California, striving for sustainability includes <u>will require</u> achieving state-mandated targets for reducing greenhouse gas emissions from vehicles and federal air quality conformity requirements, and also adapting wisely to a changing environment and climate.”</p>
8.	Clarification	p. 14, column 2, paragraph 5	<p>“It is particularly important that the Plan consider the negative impacts consequences <u>negative impacts</u> of transportation projects, <u>especially</u> on low-income and minority communities and minimize negative impacts.”</p>
9.	Clarification	p. 16, column 2	<p>“2. Collaborating with Member Agencies, Jurisdictions and Stakeholders. Implementing the Plan will require SCAG to continue working closely with its all jurisdictions member agencies... <u>all jurisdictions</u>...”</p> <p>“The agency will also have to work with key stakeholders to ensure the Plan benefits the economy and ensures social equity. To ensure that the region makes progress on its goals, SCAG will monitor its own progress toward achieving its targets and will share this information with its relevant <u>its relevant</u> partners and the public.”</p>
10.	Clarification	p. 20, column 1, paragraph 3	<p>“However, of the remaining developable land, only a small portion of it can be developed as transit-ready infill sustainably <u>as transit-ready infill</u> – meaning it can be reached via planned transit service and that it can readily access existing infrastructure (water resources, sewer facilities, etc.). According to SCAG land use data collected by SCAG, only two percent of the total developable land in the region is located in High Quality Transit Areas (HQTAs). A more compact land development strategy is needed, which will be discussed in Chapter 5.”</p>
11.	Clarification	p. 20, column 1, paragraph 4	<p>“SCAG supports the fact that local jurisdictions conduct much of the planning for land use in our region. However, as the agency prepared the 2016 RTP/SCS, it needed to organize the many different <u>land use</u> types and classifications of land uses in...”</p>

#	TOPIC	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
12.	Clarification	p. 20, column 1, paragraph 5	<p>“To accurately represent land uses throughout the region, SCAG aggregated reviewed information from jurisdictions and simplified the types and classifications of land use <u>into a consolidated set of land use types</u>. The agency then <u>converted these consolidated land uses into identified</u> 35 “Place Types”... the Urban Footprint <u>Scenario Sustainability Planning Model (SPM), to demonstrate which guided and evaluated</u> urban development in the Plan in terms of form, scale and function in the built environment.”</p>
13.	Clarification	p. 20, column 2, paragraph 2	<p>“SCAG then <u>classified sorted</u> the 35 Place Types into three Land Development Categories. The agency used these categories to describe the general conditions that exist and/or are likely to exist within a specific area. SCAG did not intend to have them represent detailed policies for land use, development or growth. Rather, they and reflect the varied conditions of buildings and roadways, transportation options, and the mix of housing and employment throughout the region.”</p>
14.	Clarification	p. 21, column 1, paragraph 3	<p>Conversely, sSome areas, especially near the edge of existing urbanized areas, do not have plans for conservation and <u>may be slated for development are susceptible to development pressure</u>. ... – meaning these are areas that are home to a high number of species and serve as highly functional habitats.”</p> <p>“Some key habitat types are underrepresented within the 35 percent of the region already under protection.”</p> <p>Clarify why does there need to be an equal share of types of protected land? If not, delete sentence.</p>

#	TOPIC	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
15.	Clarification	p. 22, column 1, paragraph 1	<p>“However, although these housing units are planned and zoned for, historical data shows that less than ten percent of the needed affordable housing has been built. In contrast, housing construction measured by building permits issued meets nearly 90 percent of projected market rate housing needs.”</p> <p>What is the data source that reports on building finals by income category? What is the time frame for the “less than ten percent”? What is the time period for the data on the market rate housing?</p>
16.	Clarification	p. 22, column 2, paragraph 1	<p>“... of our region’s jurisdictions have adopted housing elements.”</p> <p>Adopted or certified?</p>
17.	Define	p. 22, column 2, paragraph 3	Define “high quality” housing
18.	Define	p. 23, Figure	Define “demand response” in “Passenger Miles by Mode” figure
19.	Clarification	p. 25, column 2, paragraph 2	<p>“This network includes fixed-route local bus lines, community circulators, express and rapid buses, Bus Rapid Transit (BRT), demand responseparatransit,³ light rail transit, heavy rail transit (subway) and commuter rail.⁴”</p>
20.	Clarification	p. 26, column 1, paragraph 2	<p>“<u>Transit users directly typically pay about 25 percent</u> of the operating and maintenance cost of their travel, with the remaining 75 percent paid for by state and local public subsidies. Most capital expenditures are also funded <u>through various taxes with public subsidies</u>, including a larger share of federal grants.”</p>

#	TOPIC	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
21.	Clarification	p. 28, column 1, paragraph 2	<p>“The regional bike network is expanding evolving but remains fragmented. Nearly 500 additional miles of bikeways were built since SCAG’s 2012 RTP/SCS, but only 3,919 miles of bikeways exist regionwide, of which 2,888 miles are bike paths/ lanes (see EXHIBIT 2.3). This is compared with more than 70,000 roadway lane miles. One way to quantify bikeway quality and density is to calculate a ratio of bike path to lane miles. SCAG’s ratio of bike path/lane miles ratio is 0.039. To put this in perspective, Portland, Oregon and San Francisco have bike path/lane ratios to lane miles at 0.054 and 0.078, which are 38 percent and 100 percent higher than the SCAG region, respectively. Our region’s lack of consistent infrastructure discourages all but the most fearless people to bike.”</p> <p>Comment: There is typically only one bike lane in each direction whereas there could be multiple traffic lanes in each direction. It is not appropriate to compare lane miles to bike lane miles. Comparison, if any should be to centerline miles.</p> <p>Comparison of bike path/lane miles ratio for SCAG region to individual cities is not appropriate.</p>
22.	Clarification	p. 28, column 1, paragraph 2	<p>“Most walk trips (83 percent) are less than one half mile; walkers are less likely to travel often discouraged from traveling farther. Routes to <u>bus</u> stops and stations are often...”</p>
23.	Delete	p. 33, column 1, paragraph 2	<p>“A significant amount of travel in the region is still by people who choose to drive alone (42 percent of all trips and nearly 77 percent of work trips). So, the challenge of getting individuals to seek more environmentally friendly alternatives of travel remains.”</p>
24.	Clarification	p. 54, column 2, paragraph 4	<p>“Certainly, †The overall quality of life <u>is expected to</u> will increase for many people.”</p>

#	TOPIC	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
25.	Clarification	p. 55, column 1, paragraph 3	<p>“Chronic diseases including heart disease, stroke, cancer, chronic lower respiratory disease and diabetes are responsible for 72 percent of all deaths in our region. Millions of more people live with chronic diseases every day.”</p> <p>Cite number and source or delete sentence.</p>
26.	Clarification	p. 56, column 1, paragraph 1	<p>“<u>California is experiencing o</u>Ongoing drought conditions, water shortages due to less rainfall as well as declining snowpack in our mountains, and an agriculture industry in crisis have become hard realities in recent years.”</p>
27.	Clarification	p. 61, column 1, paragraph 2	<p>Add statement that says “<u>These preliminary scenarios are the not ones modeled in the PEIR.</u>”</p>
28.	Clarification	p. 64, column 1, paragraph 1	<p>Clarification should be made that attendance was self-selected as was the survey participation. Attendees were strongly encouraged by SCAG staff to fill out a survey. A more detailed description should be included that explains that these results are not scientific.</p>
29.	Clarification	p. 64, column 2, paragraph 2	<p>“...was also a principal concern, as was access to healthy food.”</p> <p>What percentage of respondents elevates an item to ‘principle concern’?</p>
30.	Clarification	p. 64, column 2, paragraph 4	<p>“Collectively, the survey responses offered an invaluable guide to help finalize the Plan’s investments, strategies and priorities. They reflect how regional stakeholders want us to address priority areas such as transit and roadway investments, system management, active transportation, land use and public health.”</p> <p>Did the survey responses change the Plan? Was priority in making changes given to survey respondents’ feedback over jurisdictional and CTC input?</p>

#	TOPIC	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
31.	Clarification	p. 65, column 1, paragraph 4	<p>“Jurisdictions were asked to provide input on the growth scenario, including information on specific planned development projects with entitlements, other planned projects, or recently completed developments.”</p> <p>Comment: During the local input process, SCAG requested feedback on the distribution of new households and employment. SCAG <u>did not</u> request information from jurisdictions on specific planned development projects with entitlements, other planned projects, and recently completed developments. During review of the draft policy growth forecast (GPF) in summer 2015, technical errors throughout the draft GPF were identified. These “technical errors” in the dataset were that entitlements, development agreements, and projects currently under construction or recently completed were not properly reflected. It was then that SCAG stated that jurisdictions could provide the information if jurisdictions wanted corrections made to the PGF.</p>
32.	Clarification	p. 65, column 2, bottom note	<p>“*With the exception of the 6 percent of TAZs that have average density below the density range of local general plans.”</p> <p>Please clarify the footnote. Did SCAG lower the growth or is General Plan buildout expected after 2040?</p>
33.	Clarification	p. 70, column 1, paragraph 1	<p>“In addition, local jurisdictions <u>are encouraged to</u> should pursue the production of permanent affordable housing through deed restrictions or development by non-profit developers, which will ensure that some units will remain affordable to lower-income households.”</p>
34.	Clarification	p. 70, Table 5.1	Add note to table “Adopted in 2013”
35.	Define	p. 73, column 2, paragraph 4	Define “riparian”

#	TOPIC	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
36.	Clarification	p. 76, paragraph 1	How many of these trips are alone vs. with others? Are these linked trips/trip segments?
37.	Clarification	p. 76, paragraph 3	The narrative implies that Neighborhood Mobility Areas (NMAs) are needed for Neighborhood Electric Vehicles (NEVs). If this is not true, reword section to allow for flexibility that one is not tied to another exclusively.
38.	Clarification	p. 77	Figure needs title
39.	Clarification	p. 79, Figure 5.2	Clarify if the preservation and operations expenditures apply to the SCAG region or California State.
40.	Clarification	p. 83, column 2, paragraph 5	“Bus lanes are even more effective at increasing speeds, however in our region there is a dearth of such lanes. Transit agencies should heavily lobby <u>SCAG encourages transit agencies and local jurisdictions in which they operate to implement them, at least for peak-period operation.</u> ”
41.	Clarification	p. 88, column 1, paragraph 4	“The 2016 Active Transportation <u>portion of the 2016 Plan</u> updates the 2012 Active Transportation Plan... ”
42.	Clarification	p. 89, column 2, paragraph 2	“SCAG has identified <u>developed</u> 12 regionally significant bikeways that connect the region.”
43.	Clarification	p. 92, column 1, paragraph 2	“The launch date coincided with the <u>end of daylight savings time</u> decline in daylight hours , a period when bicycle and pedestrian collisions peak during the year.”
44.	Define	p. 93, column 1, paragraph 4	Define “no-maintenance exercise spots”
45.	Clarification	p. 103, column 1, paragraph 3	“...figure “2040 Airport Demand Forecasts” on the previous page...” Properly label figure and page reference

#	TOPIC	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
46.	Clarification	p. 105, column 1, paragraph 1	<p>“In recent years, airport operators, CTCs and SCAG have all undertaken their own initiatives to improve ground access at the region’s aviation facilities.”</p> <p>Clarify what initiatives SCAG has undertaken.</p>
47.	Clarification	p. 111, column 1, paragraph 2	<p>“Building on its strong commitment to the environment as demonstrated in the 2012 RTP/SCS, SCAG’s mitigation program is intended to function as a resource for lead agencies to consider in identifying mitigation measures to reduce impacts anticipated to result from future <u>transportation</u> projects as deemed applicable and feasible by such agencies.”</p>
48.	Clarification	p.111-119 & PEIR	Update language on the mitigation measures to be consistent with any language changes to the PEIR document.

ACTIVE TRANSPORTATION APPENDIX

"Active Transportation Appendix"
Table Comments 1-13

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
1.	General Comment	all	<p>Needs to include statement saying that pedestrians and bikes are also responsible (e.g. distracted walking by cell phones; bikers with headphones) and isn’t always vehicles as cause</p> <p>Everyone needs to be educated and follow the rules and enforcement needs to happen for all modes</p>
2.	General Comment	all	Acknowledge the improvement over time of AT usage and the lowering of accident and death rates

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
3.	Clarification	p. 5	<p>“Class I Bikeways</p> <p>...A Class I Bikeway provides a completely separated <u>right-of-way</u> designated for the exclusive use of bicycles and/or pedestrians with cross flows by motorists minimized. Some of the region’s rivers include Class 1 Bikeways. Increasing the number of bikeways in <u>along rivers, utility corridors, and flood control channels</u> may provide additional opportunities for “interested but concerned” cyclists.”</p>
4.	Clarification	p.6, column 1	<p>“INTERSECTION TREATMENTS</p> <p>...In the SCAG region, nearly 44 percent of all pedestrian injuries are at intersections.”</p> <p>Define how far away from the intersection an accident may occur to be included in the count of pedestrian injuries at intersections</p>
5.	Clarification	p.6, column 1	<p>“COMPLETE STREETS</p> <p>In recognition of the need to accommodate various types and needs of roadway users, the State of California adopted the Complete Streets Act of 2008 (AB 1358) requiring cities and counties to incorporate the concept of Complete Streets to any general plan’s substantive update <u>to their General Plan’s circulation element.</u>”</p>
6.	Clarification	p.8, column 1	<p>“COLLISIONS AND FATALITIES</p> <p>While the numbers of bicyclists and pedestrians are increasing, so are injuries and fatalities, although not as fast as the growth in active transportation. In California, 64,127 pedestrians were injured and 3,219 were killed between 2008 and 2012. In 2012 alone, 702 pedestrians were killed and <u>13,280 pedestrians were injured and 702 pedestrians were killed.</u>”</p>
7.	Clarification	p. 17, Table 5	<p>Create separate tables for columns 1 to 3 and columns 3 to 10.</p>

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
8.	Define	p. 24, column 1, paragraph 1	<p>“2012 RTP/SCS PROGRESS</p> <p>The 2016 Active Transportation <u>portion of the Plan</u> ...The Plan examined access to transit, noting that 95 percent of SCAG residents would be within walking (0.5 mile) or biking (2 mile) distance from a transit station.”</p> <p>Define what constitutes a ‘transit station’</p>
9.	Clarification	p. 25, second column, top bullet (last under #4)	<p>“Success of this program depends on cities and counties conducting these counts and providing the data to SCAG.”</p> <p>Identify funding source and acknowledge that this is voluntary effort and may not be a priority, especially without funding</p>
10.	Add bullet	p. 25, second column, Bullet 6	<p>Add 4th bullet under #6: <u>“OCCOG is working on a comprehensive Complete Streets design manual for the entire county which will be completed in 2016.”</u></p>
11.	Correction	p.26, Table 9	<p>Change language for Orange County: Not yet Planned. <u>In Process</u></p>
12.	Clarification	p. 27, column 1, and any other references	<p>Clarify that the ‘2016 Action Transportation Plan’ is not a standalone plan, but is a portion within the RTP.</p>
13.	Clarification	p.66-67, Tables 16 & 17	<p>Add note to Table: “These draft scenarios are not the alternatives that were evaluated in the PEIR.”</p>

DEMOGRAPHICS/GROWTH FORECAST APPENDIX

"Demographics/Growth Forecast"
Appendix Comments 1-2

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
1.	General Comment	All	Label Y axis on all figures
2.	Clarification	p. 2, column 1, paragraph 3	Add text: <u>"The forecasted land use development patterns shown are based on Transportation Analysis Zone (TAZ) level data utilized to conduct required modeling analyses. Data at the TAZ level or at a geography smaller than the jurisdictional level are advisory only and non-binding, because SCAG sub-jurisdictional forecasts are not to be adopted as part of the 2016 RTP/SCS. The advisory sub-jurisdictional data shall not be required for purposes of qualifying for future grant funding or other incentives or determining a proposed project's consistency with the 2016 RTP/SCS for any impact analysis required pursuant to the California Environmental Quality Act (CEQA)."</u>

PERFORMANCE MEASURES APPENDIX

"Performance Measures" Appendix
Comments 1-4

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
1.	Clarification	p.8-10, Table 4	Label all Performance Measures that were new in 2016 Plan
2.	Clarification	p.11	Add definition of HQTAs to map
3.	Clarification	p.20	LSPT was used for 2012 RTP. Add information on the SPM.
4.	Clarification	p. 31, Table 12	Add model sources to bottom of table

PUBLIC HEALTH APPENDIX

"Public Health" Appendix Comments
1-22

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
1.	General Comment	All	Final document should contain hyperlinks to other documents
2.	General Comment	All	Spell out Acronyms in Tables/Figures Titles e.g. CHIS
3.	Clarification	p.1, column 1	“Public health is increasingly an area of emphasis for Metropolitan Planning Organizations (MPOs) and Departments of Transportation (DOTs) across the country, <u>have an opportunity to impact</u> due to the prevalence of chronic diseases such as obesity, hypertension, asthma and heart disease <u>through transportation planning which promotes increased physical activity.”</u>
4.	Clarification	p.2, column 1	Introduction- first paragraph sentence beginning with “Public health outcomes are the product of Social Determinants of Health.....” consider adding “and other factors.
5.	Clarification	p.1, column 2	“Climate Adaptation: Support efforts to prevent <u>mitigate</u> climate change and make the region more resilient to future changes with reductions in VMT and greenhouse gas emissions.”
6.	Correction	p.2, Figure 1	Arrows should go both ways
7.	Clarification	p.3, column 1, paragraph 2	“Evidence shows that healthier lifestyles and improved air quality can improve outcomes, and built environment factors <u>and related conditions</u> can play a role in supporting healthy behaviors.”
8.	Clarification	p.3, column 2, paragraph 3	“Access to healthy food environments such as grocery stores, farmers’ markets and community gardens decreases <u>can play an important role in</u> food insecurity and obesity.”
9.	Define	p.7, column 1, first line	Define “weather insurance”
10.	Clarification	p.7, column 2, paragraph 2	“... Providing access to <u>education and job training aligned with job opportunities in the region</u> jobs with a living wage is critical to ensuring communities become and stay healthy.”

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
11.	Clarification	p.7, column 2, paragraph 3	"...Creating infrastructure <u>policies and community conditions</u> and facilities that encourage active transportation such as biking and walking provides opportunities for residents to increase their daily physical activity."
12.	Clarification	p.8, paragraph 3	Consider adding the recommendations for children which has a higher standard of one hour per day. This is valuable as jurisdictions look at health co-benefits of safe routes to school infrastructure changes and related programming.
13.	Clarification	p.9, all figures	Recommend using the more current 2014 data. Also, it might be helpful to look at these metrics on a smaller level of geography and/or by poverty and/or by race/ethnicity. Especially since there are often funding set asides to reach disadvantaged communities, it might be interesting to see what each of these indicators looks like at a more refined level. The need is not equally distributed throughout any jurisdiction.
14.	Clarification	p.9	Add table with data for walking.
15.	Clarification	p.10, column 2	Consider including funding as both a challenge and an opportunity.
16.	Clarification	p.10, column 1, last sentence	"Much of our local arterial system is also in need of pavement improvements, as local roadways in the SCAG region average a score of 69 out of 100 in the Pavement Condition Index (PCI), where a score of 70 or less typically translates to conditions that are inadequate <u>more costly to repair.</u> "
17.	Clarification	p.10, column 2, paragraph 4	"With more than 18 million people, 191 cities, six counties and hundreds of local and regional agencies, Southern California is one of the most complex regions on earth <u>a diverse region</u> . Within the region, health outcomes vary widely based on <u>many things, such as geography, income and race.</u> "

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
18.	Clarification	p. 15, column 2, paragraph 3; & throughout all	“500 foot buffer”- be consistent with usage and description throughout all documents in whether this is adjacent to just freeways or freeways, rail, and high frequency transit corridors.
19.	Clarification	p. 16, column 1, paragraph 1	“Region-wide, about ten percent of the land area within HQTAs is also within the 500 feet <u>foot</u> buffer of the freeway. To balance regional policy goals, the Plan accommodates the vast majority of growth within HQTAs <u>but beyond outside of</u> the 500 feet buffer of freeways...”
20.	Clarification	p. 17, column 1	“Water Consumption” and “Land Consumption” Specify the time period for the change or difference in numbers. Compare this to 2040 Baseline.
21.	Clarification	p. 19, column 2	“Public Health Work Program” Clarify if this work program was approved by the RC or SCAG staff is pursuing these tasks under direction of RC to incorporate more public health into RTP.
22.	Clarification	p. 22-29	Are these all “best practices” or are they local examples of promising practices? Since some of these are in process, are the results are there to show that this particular practice has proven efficacy over another? These may have the potential to be best practices. If the project is based upon a best practice, it is recommended to link to the best practice so other jurisdictional leaders could consider for replication. If it is not already a proven practice, suggest calling it something different such as “local promising practices”. Add the Complete Streets Guidelines that are being developed in Orange County (which integrates in best practices.)

SCS BACKGROUND DOCUMENTATION APPENDIX

"SCS Background Documentation"
Appendix Comments 1-11

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
---	-------	----------------	-------------------------------------

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
1.	Clarification	p.42-43	How do the SPM Place Types nest into the Land Development Categories?
2.	General Comment	All maps	<p>“Note: The forecasted land use development patterns shown are based on Transportation Analysis Zone (TAZ) level data utilized to conduct required modeling analyses. Data at the TAZ level or at a geography smaller than the jurisdictional level are advisory only and non-binding, because SCAG sub-jurisdictional forecasts are not to be adopted as part of the 2016 RTP/SCS. <u>The advisory sub-jurisdictional data shall not be required should not be used for purposes of qualifying for future grant funding or other incentives.</u> The data is controlled to be within the density ranges of local general plans and/or input received from local jurisdictions. the purpose of or determining a proposed project’s consistency with the 2016 RTP/SCS for any impact analysis required pursuant to the California Environmental Quality Act (CEQA) streamlining, lead agencies have the sole discretion in determining a local project's consistency with the 2016 RTP/SCS.”</p>
3.	Clarification	p.6/43	Move the definitions of Urban, Compact Walkable, and Standard Suburban from page 43 to page 6 before the maps
4.	Clarification	p. 41, column 1, paragraph 4	“Scenario modeling with UrbanFootprint brings meaningful, comprehensible, and timely results to those <u>local jurisdictions</u> wanting to understand how growth and development choices will impact their community, city, or region in the coming years and decades.”
5.	Correction	p. 41, column 2, paragraph 2	“Since 2012... Developers of UrbanFootprint have also met with regional agencies, such as SCAG, Sacramento Area Council of Governments (SACOG), and San Diego Association of Governments (SANDAG), Orange County Council of Governments (OCCOG). ”
6.	Clarification	p. 50, 51, 54, 56 maps	Clarify in map legends if growth refers to population, housing and/or employment.

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
7.	Correction	p. 56 column 1, last paragraph	“The scope of t These four scenarios were developed in early 2015 by SCAG and their consultant and shared, which were developed in consultation with the CEHD Committee and the SCAG’s Technical Working Group (TWG), evolved throughout the first five months of 2015.”
8.	Clarification	p. 56 column 2, paragraph 2	“Conversely, growth focused in urban areas often takes advantage of existing infrastructure and more efficient service to higher concentrations of jobs and housing, <u>but sometimes modernization of utilities needs to be considered and completed to accommodate the additional usage.”</u>
9.	Clarification	p. 58, column 2, paragraph 4	“Saving water also saves on costs, and the RTP/SCS saves about \$1.2 billion over the span of the plan, and saves households in the SCAG region \$93 million on annual water bills.” <u>Add “Notwithstanding, infrastructure operations and maintenance costs need continued funding; these costs could offset ratepayer savings resulting from the implementation of such things as the RTP/SCS policies, conservation efforts, or installation and use of efficient appliances.”</u>
10.	Clarification	p. 83, column 2, paragraph 2	“The SPM includes a suite of tools and analytical engines that help to quickly illustrate alternative plans and policies and to estimate their transportation, environmental, fiscal, <u>and public health and community regional</u> impacts.”
11.	Clarification	p. 83, column 2, last sentence	“SPM will serve as a common platform for communications between SCAG and local jurisdictions in the process of local input and public outreach, providing local planners advanced analytical capabilities.”

PEIR

"PEIR" Appendix Comments 1-47

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
1.	General Comment	All	Any changes to mitigation measure language should be updated in both the Executive Summary and the chapters throughout the PEIR, as well as the RTP/SCS document.
2.	General Comment	All	Cite original source data, not other documents, e.g. SCAG's Local Profiles
3.	Clarification	ES-14	"MM-AES-1(b): Consistent ... the Lead Agency can and should consider mitigation measures..."
4.	Clarification	ES-14 & 15	"MM-AES-3(b): Consistent ...the Lead Agency can and should consider mitigation measures... <ul style="list-style-type: none"> •Require <u>Encourage</u> development of design guidelines... •Require <u>Encourage</u> that sites are kept in a... ""
5.	Define	ES-16	Define 'Natural Resource Inventory Database and Conservation Framework & Assessment'
6.	Define	ES-16	Define 'Conservation Plan'
7.	Define	ES-16	Define 'mitigation banks'
8.	Clarification	ES-19	MM-Air-2(b): <ul style="list-style-type: none"> “•Require <u>Encourage</u> contractors to assemble... •As appropriate require <u>encourage</u> that...”
9.	Clarification	ES-19	MM-Air-4(b): <ul style="list-style-type: none"> “•Require <u>Encourage</u> clean fuels, and reduce petroleum dependency.”
10.	Clarification Gail verify this is only MM this applies to	ES-19	"MM-Air-4(b): Consistent with the provisions of Section 15091 of the State CEQA Guidelines, SCAG has identified mitigation measures that are within the jurisdiction and authority of the air quality management district(s) where proposed 2016 RTP/SCS <u>transportation</u> projects or development projects resulting from the land use patterns in the 2016 RTP/SCS would be located."

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
11.	Clarification	ES-20	<p>MM-BIO 1(b):</p> <ul style="list-style-type: none"> • Require <u>Encourage</u> project design to avoid occupied habitat, potentially suitable habitat, and designated critical habitat, wherever practicable and feasible.”
12.	Clarification	ES-22	<p>MM-BIO-2(b):</p> <p>“• Require <u>Encourage</u> project design to avoid sensitive natural communities and riparian habitats, wherever practicable and feasible.”</p>
13.	Clarification	ES-22	<p>MM-BIO-3(b):</p> <p>“• Require <u>Encourage</u> project design to avoid federally protected wetlands consistent with the provisions of Section 404...”</p> <p>“• Require <u>Encourage</u> review of construction drawings by a certified wetland delineator...”</p>
14.	Clarification	ES-23	<p>MM-BIO-4(b):</p> <p>“• Require <u>Encourage</u> review of construction drawings and habitat connectivity mapping provided by the CDFW or CNDDB...”</p>

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
15.	Clarification	ES-24	<p>MM-BIO-5(b):</p> <p>“• Require <u>Ensure</u> that no change in existing ground level occur from the base of any protected tree at any time. Require <u>It is recommended</u> that no burning or use of equipment with an open flame occur near or within the protected perimeter of any protected tree.”</p> <p>“• Require <u>Encourage</u> that no storage or dumping of oil, gas, chemicals, or other substances that may be harmful to trees occur from the base of any protected trees, or any other location on the site from which such substances might enter the protected perimeter. Require <u>It is recommended</u> that no heavy construction equipment or construction materials be operated or stored within a distance from the base of any protected trees. Require <u>It is recommended</u> that wires, ropes, or other devices not be attached to any protected tree, except as needed for support of the tree. Require <u>It is recommended</u> that no sign, other than a tag showing the botanical classification, be attached to any protected tree.”</p> <p>“... require <u>ensure</u> replacement of any tree removed with another tree or trees on the same site deemed adequate by the local agency to compensate for the loss of the tree that is removed.”</p>
16.	Clarification	ES-31	<p>MM-GHG-3(a)(11):</p> <p>“• Require <u>Encourage</u> amenities for non-motorized transportation, such as secure and convenient bicycle parking.”</p>
17.	Clarification	ES-40	<p>MM-LU-1(a)(3): “SCAG shall work with its member cities and counties to encourage <u>but not require</u> that transportation projects and growth are consistent with the RTP/SCS.”</p>

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
18.	Clarification	ES-40	MM-LU-1(a)(4): "SCAG shall coordinate with member cities and counties to encourage <u>but not require</u> that general plans consider and reflect as appropriate RTP/SCS policies and strategies. SCAG will work to encourage <u>but not require</u> consistency between general plans and RTP/SCS policies."
19.	Clarification	ES-40	MM-LU-1(a)(8): "SCAG shall continue to use its Intergovernmental Review Process to provide comments to lead agencies on regionally significant projects, that may be considered for determining consistency with the RTP/SCS. "
20.	Clarification	ES-52	MM-TRA-1(b): "•... bicyclist accommodations, and require <u>encourage</u> new development and redevelopment projects to include bicycle facilities..."
21.	Clarification	ES-53	MM-TRA-1(b): "• Require <u>Encourage</u> new office developments with more than 50 employees to offer a Parking "Cash-out" Program to discourage private vehicle use."
22.	Clarification	ES-53	MM-TRA--2(b) "•Where traffic signals or streetlights are installed, require <u>encourage</u> the use of Light Emitting..."
23.	Clarification	ES-54	MM-TRA--2(b) "•Diode (LED) technology, <u>or similar technology.</u>
24.	Clarification	ES-55	MM-TRA--2(b) "• Require <u>Encourage</u> the development of Transportation Management Associations for large employers and commercial/ industrial complexes;"
25.	Clarification	ES-59	MM-USS-6(b): "• Require <u>Encourage</u> the reuse and recycle construction and demolition waste (including, but not limited to, soil, vegetation, concrete, lumber, metal, and cardboard)."

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
26.	Clarification	ES-59	<p>MM-USS-6(b): “Discourage exporting of locally generated waste outside of the SCAG region during the construction and implementation of a project. Encourage disposal within the county where the waste originates as much as possible.”</p> <p>Comment: Trash disposal should be addressed regionally while considering distance instead of being limited to within the SCAG region. It is possible that disposal could be done nearby while crossing regional boundaries.</p>
27.	Delete	p. 3.3-26 Regional Air Quality	It is not appropriate to use the American Lung Association grading system to rate the region’s transportation plan. This section (paragraph and Table 3.3.2-1) should be deleted.
28.	Clarification	p. 3.3-29	<p>“Sensitive Receptors by County”</p> <p>Clarify what the source data was and how the tally of sensitive receptors was made.</p>
29.	Clarification	Figure 3.3.2-3	Figure needs legend, labels, source of data and definition of sensitive receptors
30.	Clarification	p. 3.10-5 Section 3.10.1, Regulatory Framework	The definition of a Municipal Separate Storm Sewer System (MS4) is incomplete and incorrectly cited.

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
31.	Clarification	p. 3.10-15 Section 3.10.1, Regulatory Framework	Specific mention of the Orange County Stormwater Program's Drainage Area Management Plan (DAMP) should be made under PEIR heading Orange County General Plan. The DAMP is Orange County's principal policy and program guidance document for urban nonpoint source pollution mitigation. The PEIR should reference the DAMP's agreements, structure, and programs, and, at the project level, make note to consider the specific water pollution control elements of the DAMP that apply to land development and redevelopment projects. Transportation infrastructure projects deemed to be Priority Projects, in accordance with DAMP designation (Exhibit 7.1Table 7-1.1), would require the development of a Project Water Quality Management Plan (WQMP) in conformance with Orange County's Model WQMP.
32.	Clarification	p. 3.10-17 Section 3.10.2, Existing Conditions	Table 3.10.2-1 lists San Juan Creek as a surface water resource within Santa Ana (Region 8) jurisdiction. San Juan Creek is located within the San Diego Regional Water Quality Control Board (Region 9) jurisdictional boundary.
33.	Clarification	p. 3.10-56 Section 3.10.6, Mitigation Measures	Mitigation Measures: Parts of this section list mitigation measures that are already being required by municipal stormwater programs across the region. Instead of listing specific mitigation measures, the PEIR should make reference to these programs. In Orange County, for example, this program is detailed in the DAMP/Model WQMP. The Model WQMP describes the process that the cities and County employ for requiring a Project WQMP, which is a plan for minimizing the adverse impacts of urbanization on site hydrology, runoff flow rates, and pollutant loads at the project level. A reference to the Model WQMP and equivalent documents in the region's other counties, should replace the last ten bullet points of section MM-HYD-I(b).

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
34.	Clarification	p. 3.10-56 Section 3.10.6, Mitigation Measures	If a proposed project has the potential to create a major new stormwater discharge to a water body with an established Total Maximum Daily Load (TMDL), a quantitative analysis of the anticipated pollutant loads in the stormwater discharges to the receiving waters should be carried out.
35.	Clarification	p. 3.10-56 Section 3.10.6, Mitigation Measures & Table ES 4-1 (page ES-37)	The PEIR states that "where feasible, restore or expand riparian areas such that there is no net loss of impervious surface as a result of the project." While the intent with many mitigative measures is to preserve (emphasis added) perviousness, the PEIR should not be establishing performance measures for land development/redevelopment outside of established local stormwater programs.
36.	Clarification	3.11-8&9, 3.11-13 3.11-16 & 17	<p>Need to specify the vacant areas that are permanently preserved or undevelopable, even park space that is vacant</p> <ul style="list-style-type: none"> i. Identify the source of the data used to identify vacant land. ii. What are the following items classified as (e.g. vacant, open space): HOA open space, HOA streets, private parking lots, lakes. <p>Table 3.11.2-2- Break out vacant land category into permanently preserved/undevelopable or developable</p> <p>Figure 3.11.2-7</p> <p>Need to correctly label national forests as permanently preserved open space.</p> <p>Areas labeled vacant need to be reviewed to correctly allocate lands that are permanently preserved/undevelopable and which are developable.</p>
37.	Clarification	3.11-10	Table 3.11.2-1- Define 'Established Communities'; Correct label or number of square miles by county
38.	Define	3.11-11	Define 'carbon sinks'

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
39.	Define	3.11-14	Define medium, high, and low density housing within text
40.	Clarification	3.11-34	<p>3.11.7 LEVEL OF SIGNIFICANCE AFTER MITIGATION IMPACT LU-1...</p> <p>It is likely that in some instances currently adopted general plans and other adopted plans will not General Plans are not required to be consistent with the 2016 RTP/SCS policies and land use strategies, and they are not required to be consistent for purposes of the SCS pursuant to SB 375. Implementation of mitigation measures MM-LU- 1(a)(1), MM-LU-1(a)(2), MM-LU-1(a)(3), MM-LU-1(a)(4), MM-LU-1(a)(5), MM-LU-1(a)(6), MM-LU- 1(a)(7), MM-LU-1(a)(8), and MM-LU-1(b) would may reduce some of these impacts. However, direct, indirect, and cumulative impacts would remain significant and unavoidable.</p>
41.	Correction	3.14-9	Update Table 3.14.2-1 with May 2015 DOF data and label columns as 'Households' not 'Housing Units'
42.	Correction	3.14-12	Update Table 3.14.2-3 with May 2015 DOF data
43.	Correction	3.14-13	Update Table 3.14.2-5 with May 2015 DOF data
44.	Define	Figures 3.14.2-1 3.14.2-2 3.14.2-3	Define subjects of maps
45.	Clarification	3.14.22, paragraph 4	Clarify if discussion is on new lane miles or existing; Define "additional transportation facilities"
46.	Clarification	4-1, 4.1 add after last bullet	<u>"If an alternative is rejected and the project approved, it is the EIR for the proposed project that is to be used for future tiering purposes."</u>







#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
47.	Clarification	P. 4-6, and all related documents' references to Alternative 3	<p>Alternative 3: Intensified Land Use Alternative</p> <p>“The <u>hypothetical</u> land use pattern in this Alternative builds on the land use strategies as described in the 2016 RTP/SCS and beyond. Specifically, it increases densities and intensifies land use patterns of the Plan, especially around high quality transit areas (HQTAs) in an effort to maximize transit opportunities. The <u>hypothetical</u> growth pattern associated with this Alternative....</p> <p>Comment: Update all references to Alternative 3 in all RTP/SCS documents where it mentions that the land use pattern was developed based on the Plan to indicate that Alternative 3’s land use plan is hypothetical.</p>

Differences in Growth 2012-2040
 SCAG Draft 2040 Policy Growth Forecast
 Less OCP-2014 (Local Input)
 Unincorporated






RED TEXT= Numeric Difference Population, Households, and Employment
 BLUE TEXT= Percent Difference Population, Households, and Employment

TAZ: 33046800
 POP: -1,501 -69%
 DU: -259 -33%
 EMP: -1 -17%

Legend

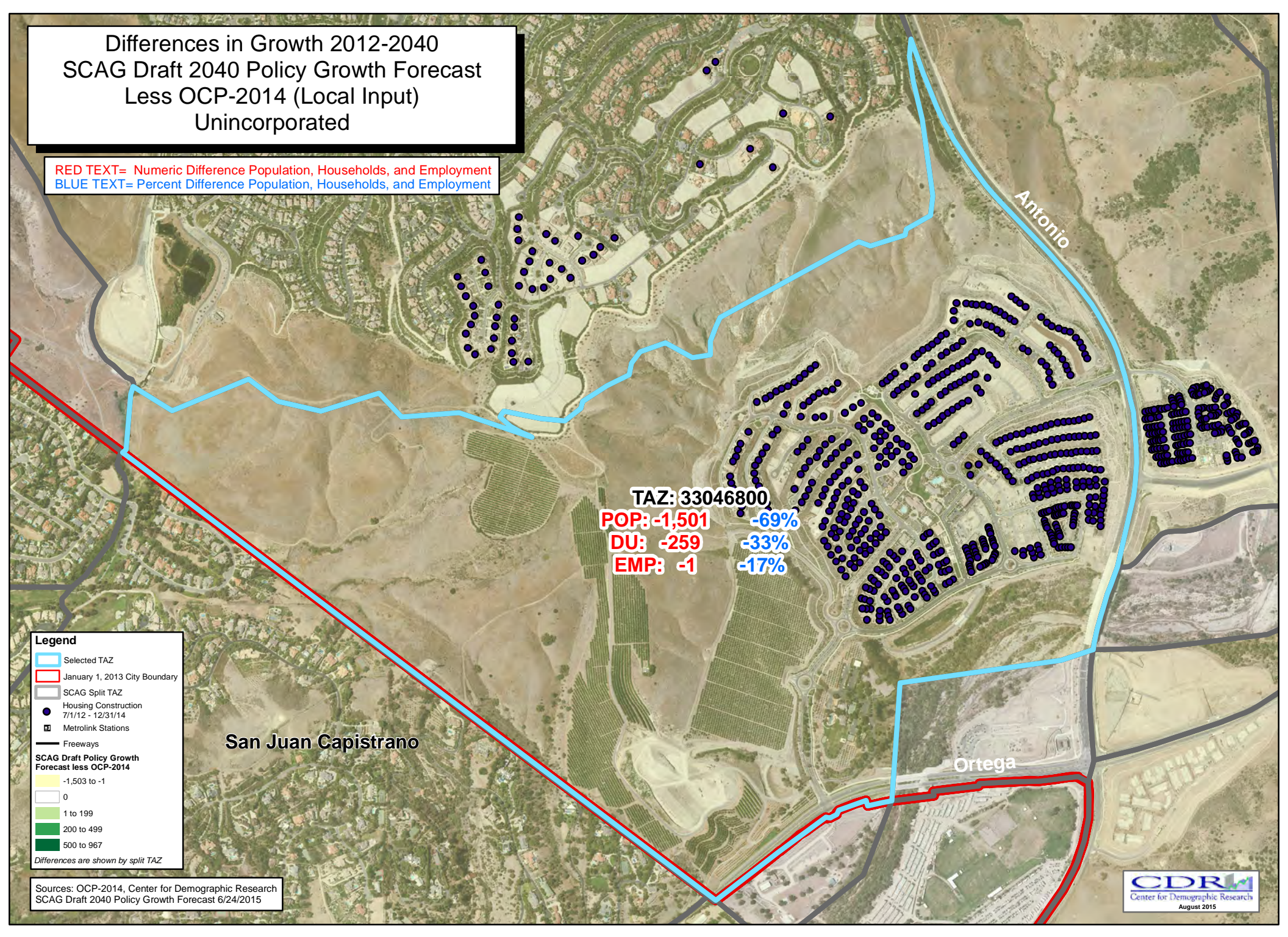
-  Selected TAZ
-  January 1, 2013 City Boundary
-  SCAG Split TAZ
-  Housing Construction 7/1/12 - 12/31/14
-  Metrolink Stations
-  Freeways

SCAG Draft Policy Growth Forecast less OCP-2014

-  -1,503 to -1
-  0
-  1 to 199
-  200 to 499
-  500 to 967

Differences are shown by split TAZ

Sources: OCP-2014, Center for Demographic Research
 SCAG Draft 2040 Policy Growth Forecast 6/24/2015



Legend

- Selected TAZ
 - January 1, 2013 City Boundary
 - SCAG Split TAZ
 - Housing Construction 7/1/12 - 12/31/14
 - MetroLink Stations
 - Freeways
- SCAG Draft Policy Growth Forecast less OCP-2014**
- 1,503 to -1
 - 0
 - 1 to 199
 - 200 to 499
 - 500 to 967
- Differences are shown by split TAZ*

Differences in Growth 2012-2040 SCAG Draft 2040 Policy Growth Forecast Less OCP-2014 (Local Input) Midway City

RED TEXT= Numeric Difference Population, Households, and Employment
BLUE TEXT= Percent Difference Population, Households, and Employment

Sources: OCP-2014, Center for Demographic Research
SCAG Draft 2040 Policy Growth Forecast 6/24/2015

Beach

Bolsa

Newland

Hazard

Bolsa

TAZ: 32683200

POP: +1,543 **+2,114%**
DU: +535 **+1,981%**
EMP: +599 **+1,815%**

TAZ: 32683300

POP: +907 **+1,395%**
DU: +292 **+1,825%**
EMP: +260 **+2,364%**

Anita Au

From: Hernandez, Karlene <KHERNAND@rctlma.org>
Sent: Monday, February 1, 2016 4:31 PM
To: 2016 PEIR
Subject: 2016 Regional Transportation Plan Draft EIR
Attachments: 020116 Letter to SCAG.pdf

Good afternoon,

Please see the attached letter.

Thank you,

Karlene Hernandez
Executive Assistant

Riverside County Planning Dept.

Phone: (951) 955-6097

Email: khernand@rctlma.org

Website: <http://planning.rctlma.org>

[Follow us on Twitter!](#) 



RIVERSIDE COUNTY PLANNING DEPARTMENT

Steve Weiss, AICP
Planning Director

February 1, 2016

Southern California Association of Governments (SCAG)
818 West Seventh Street, 12th Floor
Los Angeles, CA 90017-3435

RE: 2016 Regional Transportation Plan Draft EIR

Thank you for the opportunity to review and comment on the Draft Programmatic Environmental Impact Report (Draft PEIR) for the 2016 Regional Transportation Plan (RTP). The County of Riverside has reviewed the Draft PEIR and has the following comments and concerns on its CEQA adequacy:

- 1. Data Associated with EIR Chapters.** All source data cited in the Draft PEIR should be made available down to the level of individual counties and cities, and the EIR should indicate in the text where such data may be viewed. A number of the EIR chapters rely on specific data gathered, modeled and analyzed by SCAG for the CEQA analysis in the EIR. The individual EIR chapters do not clearly reference the location of the source data. For example, see “Methodology” discussion on page 3.17-38, which discusses Regional Transportation Demand Model (RTDM) data, such as VMT and VHD values, but does not indicate where such data may be examined. How is a reviewer to find the applicable data used for the given EIR chapter’s analyses, particularly for items that list “SCAG, 2015” as the only source? 1
- 2. GHG Data Availability.** All such data should be made available down to the level of individual counties and cities, and the EIR should indicate in the text where such data may be viewed. The Greenhouse Gas Emissions and Climate Change chapter of the EIR references “Appendix C, Air Quality and Greenhouse Gas Emissions and Climate Change Technical Appendix,” as the source for the data it uses. Further, paragraph 1, on the first page of chapter 3.8, states, “GHG emissions and climate change within the SCAG region were evaluated at a programmatic level of detail, in relation to the General Plans of the six counties and the 191 cities within the SCAG region; a review of related literature germane to the SCAG region, as well as review of SCAG’s 2012 RTP/SCS PEIR.” This comment leads the reader to believe data GHG exists for each of the “six counties and the 191 cities within the SCAG region.” However, Appendix C does not contain such data. It only contains summary data aggregated by county. Where is the rest of the GHG data? How can the public view it? 2

3. **GHG Data Adequacy. Identify specifically in this Draft PEIR where missing data can be viewed.** In conjunction with the above comment #3, this lack of data makes it nearly impossible for the individual jurisdictions within each of the six counties discussed to determine what data, assumptions or model results SCAG used in reaching the various totals cited in the Draft PEIR. This is particularly evident in Table 3.8.4-1, "Greenhouse Gas Emissions From Transportation by County," which merely lists "SCAG modeling, 2015" as its source. This source data is not in the EIR or Appendix C. Are there data indicating what these results are for each city and unincorporated county? Or were results modeled directly from whole-county scenarios? Again, without being able to see the base data it is difficult for a municipality or county to determine their share of the total impacts. 3

4. **GHG Transportation Emissions.** As presented, it is impossible to tell what the true level of CO₂ emissions are within the SCAG region. Why wasn't this data included in the Draft PEIR? The totals for "light and medium duty vehicles and heavy duty truck" emissions are presented in Table 3.8.4-1 (page 3.8-35) as tons/day by county. The totals for "cars and light duty trucks" are presented in Table 3.8.1-3 (page 3.8-38) as *per-capita* pounds/day. Where is the equivalent tons/day by county data for the cars and light-duty trucks? Further, the text of the Draft PEIR states on page 3.8-36, para. 1, that: "Across the six counties in the SCAG region, GHG emissions *from transportation* are expected to decrease by approximately 24 percent..." [emphasis added]. This conclusion seems premature at best, since it only includes one sector of transportation; the sector that is *least* reflective of the suburban patterns of transportation prevalent in much of the outlying portions of the SCAG region. At worst, this indicates a plan being presented in a manner that skews the benefits of central metropolitan densification at the expense of the looming need for solutions that adequately address growth in both housing and traffic (VMTs) in the outlying areas. 4

5. **Riverside County GHG Plan Error.** Correct with a proper description of *Riverside County's* greenhouse gas plans. On page 3.8-22, the Draft PEIR describes a "Green Action Plan" which it attributes to Riverside County. This plan is that of *the City* of Riverside, *not* the County of Riverside County. Include a discussion of the County's Climate Action Plan that was adopted as part of an overall General Plan update in 2015 and the existing Air Quality Element was expanded to address greenhouse gases and carbon reduction measures as well. The Riverside County Climate Action Plan is available online at:
<http://planning.rctlma.org/ZoningInformation/GeneralPlan/GeneralPlanAmendmentNo960EIRNo521CAPFebruary2015/ClimateActionPlan.aspx>. 5

6. **Scenario Planning Model Metrics Assumptions.** Provide documentation to support various assumptions, such as economic reports or CARB documents? Table 6-1 of Appendix C (Air Quality and Greenhouse Gas Emissions Technical Report) presents a number of modeling assumptions used to determine GHG reductions over time. As an example, vehicle efficiency increases over time: are there any studies showing that the vehicle conversion/upgrade rates predicted are realistically achievable? 6

7. **Building Energy Efficiency Assumptions.** In Table 6-1 of Appendix C, it is assumed that existing buildings achieve “10/20/25%” improvements in energy efficiency by 2020, 2035 and 2040 respectively. Given that cities and counties have very little discretionary authority over *existing* buildings what evidence does the model use to base these assumptions upon? Are these levels achievable at the current rate of retrofit/remodel/reuse permit issuance for existing structures within the SCAG region? Or are these barriers taken into account in the overall percent reductions indicated (-3%, -9%, -14%) for combined new and existing structures? 7
8. **Land Use Data.** Provide full accounting of the land uses, residents and types of receptors being affected by the 2016 RTP. As with the greenhouse gas analysis, it is similarly difficult to determine the full impact of some of the conclusions made in the Land Use and Planning section (Chapter 3.11) because of the lack of data presented in the Draft PEIR. In particular, Table 3.11.3-1 (page 3.11-23) presents “Land Uses Located Within 500 Feet of 2016 RTP/SCS Major Transportation Projects.” While valuable for assessing direct impacts, it does not illustrate the entirety of the project area in terms of CEQA; that is, the entirety of the SCAG six-county region. Where in the Draft PEIR are the full land use data for the SCAG region presented? It was not evident from chapter 3.11 nor in the technical appendices particularly in terms of CEQA impacts related to traffic and regional growth-related impacts. Since the major transportation projects skew heavily towards already urbanized areas, this absent data may prevent adequate analysis of the suburban and rural portions of the SCAQ region, particularly in the outlying counties. Though more than 500 feet away from these major transportation projects, such land uses and residents will nonetheless be affected by the policies and plans of the 2016 RTP/SCS. While a “project list” approach may be appropriate for spatial impacts, such as direct loss of habitat, geohazards, roadway noise, etc., for cumulative and regional impacts, such as traffic increases, GHG emissions and, above all, growth-inducing impacts, analysis limited to just land uses within 500 feet of major transportation projects is incomplete and likely underestimates the magnitude of these impacts. 8
9. **Exhibit Adequacy.** Include large scale legible maps since such a large portion of the SCAG territory not shown for analysis. Without maps of appropriate scale for the eastern half of the SCAG territory, it is difficult to view and analyze much of the data presented in the Draft PEIR, which is heavily map dependent in its presentation of the data. It would be more appropriate for these figures to each be accompanied by a second page showing the eastern region in main and the western region in an inset box. Throughout the Draft PEIR exhibits generally show the majority of the six-county area on a single map with a small inset box to show the eastern-most portions of San Bernardino and Riverside counties, as well as all of Imperial County. The scale is much smaller for the inset box, making it hard to decipher. As an example, see Figures 3.17.2-1 through 3.17.4 on pages 3.17-19 through 3.17-22. Geographically, the eastern area in the inset box is similar in size to the western area shown in the main map. 9
10. **OTS Rankings.** Footnote explaining OTS data to the tables. On pages 3.17-32 and 3.17-33, tables of pedestrian safety data are presented. They include a column labeled “OTS Ranking” 10

followed by a series of fractions (44/58, 4/58, etc.). There is no explanation in either the text of the EIR or the tables themselves as to the meaning of this column and its data. What does this column denote and what is its relevance to the CEQA document?

10
cntd

11. Miscellaneous Comments.

- a. On page 3.17-11, para. 1, states "Goals of the Active Transportation Plan are to reduce the number of bicycle and pedestrian facilities to less than 50 percent of current levels by 2035." Is this correct? Seems backwards.
- b. Provide justification as to why is the City of Los Angeles' bike plan discussed in the PEIR is the only plan identified for the region. On page 3.17-16, two paragraphs are devoted to detailing the City of Los Angeles' 2010 Bicycle Plan. There are 197 cities within the SCAG territory.

11

12

Thank you again for the opportunity to comment on the Draft PEIR for the SCAG 2016 Regional Transportation Plan. We look forward to participating in the public hearing process, receiving responses to these and other comments, and commenting on those responses at the appropriate public hearings. Please include the Planning Department on all mailing lists for notices of further environmental documents for this project and for the RTP, as well as any and all hearings on this project.

For questions or information concerning the issues raised in this letter, please feel free to contact me at (951) 955-6097.

Sincerely,



Steve Weiss, AICP
Planning Director

Anita Au

From: Marnie Primmer <edoccog@gmail.com>
Sent: Monday, February 1, 2016 4:31 PM
To: 2016 PEIR
Cc: Courtney Aguirre; Lijin Sun
Subject: Comments for RTP/SCS PEIR
Attachments: OCCOG RTPSCS PEIR Comments_020116.pdf

Attached please find OCCOGH's comments for the 2016 RTP/SCS PEIR. Thank you.
marnie

Marnie O'Brien Primmer
Interim Executive Director
Orange County Council of Governments
edoccog@gmail.com



January 28, 2016

Mr. Hasan Ikhata
Executive Director
Southern California Association of Governments
818 West Seventh Street, 12th Floor
Los Angeles, California 90017-3435

Subject: Orange County Council of Governments Comments for RTP/SCS and PEIR

Dear Mr. Ikhata:

On behalf of the Orange County Council of Governments (OCCOG), I would like to thank you for the opportunity to comment on the Southern California Association of Governments (SCAG) draft 2016-2040 Regional Transportation Plan/Sustainable Communities Strategy (2016 RTP/SCS or “The Plan”) and the associated Program Environmental Impact Report (PEIR). The draft 2016 RTP/SCS and PEIR is a monumental effort and the OCCOG recognizes that the documents are critical to the region’s ability to receive federal funding for transportation projects, improve mobility, support sustainable development, operate and maintain the transportation system, and meet the region’s greenhouse gas emission reduction targets and other air conformity standards.

The OCCOG is comprised of 34 cities, the County of Orange, and six special districts. The OCCOG Technical Advisory Committee (OCCOG TAC), made up of member agency planning staff, created an ad hoc committee dedicated to the review of the draft 2016 RTP/SCS and PEIR. The ad hoc committee membership was extended to partner agencies within Orange County that serve as ex-officio members on the OCCOG Board. The ad hoc committee includes representation from the OCCOG, the County of Orange, the cities of Anaheim, Irvine, and Mission Viejo, the Orange County Health Care Agency, the Orange County Transportation Authority, the Transportation Corridor Agencies, the Association of California Cities Orange County, the League of California Cities Orange County Division, the Building Industry Association, and the Center for Demographic Research at California State University Fullerton. This committee met six times since December 3, 2015, and has collectively spent hundreds of hours reviewing the draft Plan and documents, and preparing comments which incorporated additional feedback provided by Orange County jurisdictions and agencies, such as the Orange County Business Council. The OCCOG TAC review and analysis was considered in late January by the OCCOG Board and serves as the basis for OCCOG’s comments.

The following general comments and recommendations are offered by OCCOG on the draft 2016 RTP/SCS, PEIR, and all associated appendices. OCCOG requests that the letter and attachments be included in the public record as our collective comments on the draft 2016 RTP/SCS, PEIR, and associated documents.



RTP/SCS

1. Growth Forecasts

Overall, the OCCOG supports the 2016-2040 RTP/SCS growth forecast and the adoption of the growth forecast at a geographic level no lower than the jurisdictional level. The OCCOG supports The Plan since the growth forecast accurately reflects Orange County’s Projections dataset. The Plan growth forecast reflects entitlements, development agreements, and projects recently completed or under construction in Orange County. OCCOG appreciates the ongoing coordination between SCAG and the Center for Demographic Research (CDR) at California State University Fullerton on behalf of all Orange County jurisdictions. The Orange County Projections have been used by the Orange County Transportation Authority (OCTA) in the development of its Orange County Long-Range Transportation Plan demonstrating that Orange County has integrated transportation and land use planning for decades.

1

OCCOG representatives on the Regional Council and SCAG Policy Committees repeatedly requested that the growth forecasts in the 2016 RTP/SCS and all PEIR alternatives be based on the technically corrected growth forecast submitted to SCAG in August 2015 by the CDR on behalf of all Orange County jurisdictions. Because the draft PEIR’s Intensified Land Use Alternative (Alternative 3) does not include the technically corrected growth forecast for Orange County, the OCCOG would not support consideration of this Alternative as the preferred alternative.

2

Growth Forecast Recommendations: OCCOG supports the adoption of the 2016 RTP/SCS growth forecast at the jurisdictional level. OCCOG does not support the use of Alternative 3 for any purposes.

2. Maintain Unbiased, Objective Tone

Language throughout the draft 2016 RTP/SCS and the associated appendices has a tendency to be leading and dramatic in its emphasis of certain key issues such as active transportation and public health. While these issues are important, it is recommended that the document utilize a more unbiased, objective tone. For example, OCCOG recommends the removal of “Our Vision” and “Our Overarching Strategy” from the Executive Summary of the document. These two sections are highly speculative and are not necessary to the document. “Our Vision” and “Our Overarching Strategy” go above and beyond the requirements of the RTP. Additional examples of overly emphatic language are outlined in Attachment 1.

3

General Comments

3. Concurrence with the Comments from the Orange County Transportation Authority

The OCCOG concurs with the comments identified by OCTA in its letter of January 11, 2016. OCTA has identified policy and technical issues related to the draft 2016 RTP/SCS and PEIR that are of concern to Orange County. These are focused on the regional strategies that go above and beyond the projects submitted by the county transportation commissions (CTC). The OCTA comment letter is included for reference as Attachment 2.

4



4. “Can and Should”

As indicated in the PEIR, state law provides that it is appropriate to indicate in mitigation measures that they “can and should” be implemented where the authority to implement the measures rest with agencies other than SCAG. The language conveys to local agencies an affirmative obligation to address each mitigation measure, irrespective of whether such agencies deem the measures applicable to a particular project or duplicative of their own or other governmental agencies’ regulatory measures. OCCOG recognizes SCAG’s use of the words “can and should” are derived from California Environmental Quality Act (CEQA), at Public Resources Code sections 21081 and 2155.2(b)(5)(B)(ii) and CEQA Guidelines, including section 15091(a)(2). Nevertheless, given the express limitation of SB 375 upon respective local agencies’ land use authority, OCCOG deems inappropriate any language seemingly imposing affirmative obligations contrary to SB 375 inappropriate. As such, the use of the language “can and should” for mitigation measures addressed to local agencies is overreaching.

5

“Can and Should” Recommendations: Change language in all project level mitigation measures to read “can and should consider where applicable and feasible.” This change will clarify that the project level mitigation measures are a menu of options.

5. 500 foot “buffer”

The Draft RTP assumes that almost no new growth will occur within 500 feet of a freeway or busy transportation corridor. The Draft RTP states that a “buffer” is consistent with the California Air Resources Board’s 2005 advisory guidance that housing be discouraged within 500 feet of high volume roadways such as freeways. It is important to note that CARB’s guidance is not a prohibition of development near high-volume roadways; nevertheless, SCAG’s “buffer” strategy eradicates growth in these areas that are otherwise rich in connections to jobs, retail and housing accessible by many transportation modes. Furthermore, the proposed “buffer” does not reflect the availability of mitigation measures to address near-roadway emissions that remain despite a dramatic reduction of diesel emissions in the last decade. At best, this strategy is a short-term response and problematic because it prevents the kind of density and proximity between land uses that actually reduce trips and associated VMT. As vehicle engines and fuels become cleaner, the “buffer” strategy will become obsolete yet will leave behind a legacy of inefficient land use patterns. Moreover, throughout the SCAG Region, the prevailing existing land use patterns include residential and sensitive receptor uses within 500 feet of a major transportation corridor. In many cases, these areas demonstrate compact development form and serve as affordable housing. Removing this substantial portion of developable land from availability for use is premature and counter to the overarching principles of SB375 to locate housing near job centers and previously urbanized areas.

6

There needs to be consistency throughout all the documents regarding the 500 foot “buffer.” To that end, OCCOG offers the following **recommendations and requests for additional clarification**:



- The word “buffer” should not be used. | 7
- Use consistent radius/demarcation throughout the documents | 8
- Clarify where distance is measured from (e.g. centerline, edge of roadway, edge of right of way) | 9
- Clearly articulate the types of transportation corridors being identified (e.g. freeways, high quality transit corridors, high volume corridors, rail etc.) | 10
- Emphasis should be on mitigation not prohibition of development. | 11
 - Resolve the conflict with discouraging development within 500 feet of transportation corridors now and future reductions in emissions and fleet changes over time which will negate the need to utilize this mitigation measure, so that the mitigation approach allows for flexibility with the changing fleet mix in the future.

6. Cities vs. Jurisdiction

Throughout the 2016 RTP/SCS, PEIR, and associated appendices, there are references to “cities”. Since the SCAG region also includes counties, it is recommended that references to “city” or “cities” are changed to “jurisdiction” or “jurisdictions” where appropriate. | 12

Recommendation: Change references to “city” or “cities” to “jurisdiction” or “jurisdictions” where appropriate.

7. Remain Neutral on Technology

Throughout the documents, there are specific examples of technology identified. It is not SCAG’s purview to pick winner and losers in technology; the marketplace will determine dominant technologies. Therefore, it should be noted that these are only examples and that future technologies should not be ignored or excluded from meeting the goals of the RTP/SCS. This will allow the document, including mitigation measures, to be more flexible. | 13

PEIR

8. PEIR Mitigation Measures

- a. Please state that in the event a state law referenced in the mitigation measure is updated or changed, the most current state law requirements prevails. | 14
- b. For all “Project-level Mitigation Measures”, replace the word “require” with “encourage” or “it is recommended”. Examples include:
MM-AES-3(b), MM-Air-2(b), MM-Air-4(b), MM-BIO-1(b), MM-BIO-2(b), MM-BIO-3(b), MM-BIO-4(b), MM-BIO-5(b), MM-GHG-3(a)(11), MM-TRA-1(b), MM-TRA-2(b), MM-USS-6(b) | 15

A redline version identifying the location of the exact language is provided in the matrix of comments in Attachment 1.



c. Priority and Funding Preference for Transportation Projects:

To address the significant impacts of increasing Vehicle Miles Traveled (VMT) and traffic congestion, the draft Program EIR for SCAG's 2016 - 2040 RTP/SCS proposes project-level mitigation measures that include language allowing for:

- (1) Giving priority to transportation projects that would contribute to a reduction in vehicle miles traveled per capita [Mitigation Measure MM-TRA-1(b)]; and,
- (2) Giving funding preference to improvements in public transit over other new infrastructure for private automobile traffic [Mitigation Measure MM-TRA-2(b)].

Please delete these provisions in Mitigation Measure MM-TRA-1(b) and Mitigation Measure MM-TRA-2(b), unless the language in these provisions is modified to recognize that they would only be considered if they are found by the Lead Agency to be appropriate and consistent with local transportation priorities.

The language in these provisions implies a specific emphasis towards policy consideration to the prioritization, selection and funding of transportation projects that, to our knowledge, has not been discussed nor endorsed by SCAG's Transportation Committee, or Regional Council, as a regional strategy for the implementation of the 2016 RTP/SCS.

Moreover, the language in these provisions fails to recognize that several counties in the SCAG region implement transportation projects and programs that are mandated through voter-approved sales tax measures (i.e., Renewed Measure M2 in Orange County), and that are identified through long-range transportation plans.

Finally, the language in these provisions could compromise the delivery of committed transportation projects, by creating opportunities for potential delay and legal challenge. To avoid these kinds of potential unintended consequences, **we request that SCAG either delete these provisions, or modify these provisions to make it abundantly clear that they are only for consideration when determined to be appropriate by the Lead Agency.**

9. Fees and Taxes

Several mitigation measures indicate that local jurisdictions or other entities should implement new fees or propose taxes to pay for a variety of programs or for acquisition of land for preservation. Increases to fees or taxes are issues that could require voter approval, and therefore it should not be assumed that they will be approved.

Fees and Taxes Recommendations: a) Reword measures to indicate that a new or increased fee, new tax, or other increase is only an option as a way to implement the mitigation. b) Clarify whether it was assumed that these additional fees were considered feasible and if the new fees that are suggested were considered in the financial plan or economic analysis of the RTP.

10. Duplicative/Existing Regulations

It is noted that many of the mitigation measures are duplicative of existing regulation or processes

16

17

18



(e.g. CEQA review requirements). Under CEQA, it is intended that measures be identified that will mitigate impacts of the project. Existing regulations are already assumed to be abided by in the evaluation of the impact, and the significance of the impact is after all existing regulation is applied. Therefore, mitigation measures should address those actions that need to be undertaken in addition to existing regulation in order to mitigate the impact. Therefore, mitigation measures that simply restate existing regulation are not valid mitigation for purposes of CEQA. Further, it is possible for regulations to change over time. Because of this, restatement of the regulation in the mitigation measures could result in future conflict between the stated mitigation and regulation. It has become common practice to state that existing regulation will be implemented. When this is done, it is common practice when compliance is used as a mitigation measure to simply state that the responsible entity will simply comply with the regulation. If mitigation measures that restate existing regulation are not removed, then it is requested that the wording of the measures be restated to simply read that compliance with all applicable laws and regulations will be undertaken. Language that could be used is: “Local jurisdictions, agencies, and project sponsors shall comply, as applicable, with existing federal, state, and local laws and regulations.” Similar language is included in some mitigation measures.

18 cont.

Examples of existing regulations included as mitigation measures are found within the Hydrology section of the draft PEIR. For example, Section 3.10.6, Mitigation Measures (page 3.10-56): Parts of this section list mitigation measures that are already being required by municipal storm water programs across the region. Instead of listing specific mitigation measures, the PEIR should make reference to these programs. In Orange County, for example, this program is detailed in the DAMP/Model WQMP. The Model WQMP describes the process that cities and County employ for requiring a WQMP, which is a plan for minimizing the adverse impacts of urbanization on site hydrology, runoff flow rates, and pollutant loads at the project level. A reference to the Model WQMP and equivalent documents in the region’s other counties, should replace the last ten bullet points of section MM-HYD-1(b).

Additionally, there are specific mitigation measures included in the Hydrology section that may be in conflict with Storm Water Permits issued by Regional Water Quality Control Boards. In the SCAG region, there are five water quality control boards each with its own Municipal NPDES Storm Water Permit. The regulations and requirements contained in these permits vary from each other. By listing specific measures in the PEIR that are not included in a project’s applicable Municipal NPDES Storm Water Permit, the PEIR creates conflicting compliance requirements. To eliminate potential conflict with existing regulations, the mitigation measures regarding specific BMPs should be removed and replaced with a single requirement that each project must comply with its applicable Municipal NPDES Storm Water Permit.

19

Conclusion

The OCCOG recognizes the immense efforts SCAG undertook to prepare the 2016-2040 RTP/SCS documents. They represent incredibly complex technical work and have important and far-reaching policy impacts for our region. However, because of this importance and complexity, we would like to express concern about the timing of the release of the documents, and our desire that the preparation of future RTP/SCS documents in future RTP/SCS cycles will take into account the need to accommodate adequate review, discussion and revision time for all of the documents. The current timeline of document

20



releases, public comment period, and time allowed for the response to comments results makes it challenging to have credible discussion regarding possible changes, because the timeline does not allow for recirculation or full discussion of requested changes. While OCCOG is appreciative of the extended public comment period through February 1, 2016, there remains concern that only a few weeks remain for SCAG to prepare responses to comments and amend the documents to ensure that the Regional Council may consider the certification of the PEIR and the approval of the draft RTP/SCS on April 7, 2016. With that, we look forward to working with SCAG collaboratively to achieve the schedule.

20 cont.

We appreciate your consideration of all the comments provided in this letter and its attachments and look forward to your responses. It is a shared goal to have a RTP/SCS adopted that is credible and defensible on all levels. If you have any questions, please do not hesitate to contact me or Marnie Primmer, OCCOG's Interim Executive Director.

Sincerely,

A handwritten signature in blue ink that reads "Arthur C. Brown".

Art Brown
Chairman

Cc: OCCOG Member Agencies
OCCOG Board of Directors
OCTA Board of Directors
Orange County City Managers Association



Attachment 1: Detailed comments on RTP/SCS, PEIR, & related appendices

"2016 RTP/SCS" Table Comments 1-48

2016 RTP/SCS

#	TOPIC	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
1	General Comment	p.2	Delete Our Vision & Our Overarching Strategy strategies. These sections are highly speculative and not necessary for the rest of the document.
2	Clarification	p.3, column 2, bullet 5	<p>“Millions of people are in poor health... Millions of more people live with chronic diseases, such as asthma, every day.”</p> <p>Define ‘poor health’ Cite numbers or share of population for region instead of saying “millions”. Provide reference to what chronic diseases include.</p>
3	Clarification	P. 4, column 2, paragraph 2	“Among the milestones: a one-year demonstration of <u>the tolled Express Lanes in Los Angeles County along Interstate 10 and Interstate 110 was made permanent in 2014...</u> ”
4	Clarification	p. 7, column 2, paragraph 1	“In many instances, <u>the additional these</u> chargers <u>will create the opportunity to increase</u> may double the electric range of PHEVs, reducing vehicle miles traveled that produce tail-pipe emissions.”
5	Clarification	p. 13, column 2, paragraph 2	“Since 2009, every MPO <u>in California</u> has been required to develop a Sustainable Communities Strategy...Once implemented along with the rest of the Plan, it will improve the <u>overall</u> quality of life for all residents of the region.”
6	Clarification	p. 13, column 2, paragraph 3	“But these advances in mobility also have the potential to help Baby Boomers, <u>and the generations that follow them</u> , maintain their independence as they age.”
7	Clarification	p. 14, column 1, paragraph 2	“In Southern California, striving for sustainability <u>includes</u> will require achieving state-mandated targets for reducing greenhouse gas emissions from vehicles and federal air quality conformity requirements, and also adapting wisely to a changing environment and climate.”
8	Clarification	p. 14, column 2, paragraph 5	“It is particularly important that the Plan consider <u>and minimize</u> the <u>negative impacts</u> consequences of transportation projects, <u>especially</u> on low-income and minority communities <u>and minimize negative impacts.</u> ”



#	TOPIC	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
9	Clarification	p. 16, column 2	<p>“2. Collaborating with Member Agencies, Jurisdictions and Stakeholders. Implementing the Plan will require SCAG to continue working closely with its <u>all jurisdictions member agencies...</u>”</p> <p>“The agency will also have to work with key stakeholders to ensure the Plan benefits the economy and <u>promotes ensures</u> social equity. To ensure that the region makes progress on its goals, SCAG will monitor its own progress toward achieving its targets and will share this information with <u>its relevant partners and the public.</u>”</p>
10	Clarification	p. 20, column 1, paragraph 3	<p>“However, of the remaining developable land, only a small portion of it can be developed <u>as transit-ready infill sustainably</u> – meaning it can be reached via planned transit service and that it can readily access existing infrastructure (water resources, sewer facilities, etc.). According to <u>SCAG land use data collected by SCAG</u>, only two percent of the total developable land in the region is located in High Quality Transit Areas (HQTAs). <u>A more compact land development strategy is needed, which will be discussed in Chapter 5.</u>”</p>
11	Clarification	p. 20, column 1, paragraph 4	<p>“<u>SCAG supports the fact that local jurisdictions conduct much of the planning for land use in our region. However, as</u> the agency prepared the 2016 RTP/SCS, it needed to organize the many different <u>land use</u> types and classifications <u>of land uses in...</u>”</p>
12	Clarification	p. 20, column 1, paragraph 5	<p>“To accurately represent land uses throughout the region, SCAG <u>aggregated reviewed</u> information from jurisdictions and simplified the types and classifications of land use <u>into a consolidated set of land use types</u>. The agency <u>then converted these consolidated land uses into identified</u> 35 “Place Types”... the Urban Footprint <u>Scenario Sustainability Planning Model (SPM), to demonstrate which guided and evaluated</u> urban development in the Plan in terms of form, scale and function in the built environment.”</p>
13	Clarification	p. 20, column 2, paragraph 2	<p>“SCAG then <u>classified sorted</u> the 35 Place Types into three Land Development Categories. The agency used these categories to: describe the general conditions that exist and/or are likely to exist within a specific area; <u>SCAG did not intend to have them represent detailed policies for land use, development or growth. Rather, they and</u> reflect the varied conditions of buildings and roadways, transportation options, and the mix of housing and employment throughout the region.”</p>



#	TOPIC	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
14	Clarification	p. 21, column 1, paragraph 3	<p>Conversely, s Some areas, especially near the edge of existing urbanized areas, do not have plans for conservation and <u>may be slated for development</u> are susceptible to development pressure. ... – meaning these are areas that are home to a high number of species and serve as highly functional habitats.”</p> <p>“Some key habitat types are underrepresented within the 35 percent of the region already under protection.” Clarify why does there need to be an equal share of types of protected land? If not, delete sentence.</p>
15	Clarification	p. 22, column 1, paragraph 1	<p>“However, although these housing units are planned and zoned for, historical data shows that less than ten percent of the needed affordable housing has been built. In contrast, housing construction measured by building permits issued meets nearly 90 percent of projected market rate housing needs.”</p> <p>What is the data source that reports on building finals by income category? What is the time frame for the “less than ten percent”? What is the time period for the data on the market rate housing?</p>
16	Clarification	p. 22, column 2, paragraph 1	“... of our region’s jurisdictions have <u>certified</u> adopted housing elements.”
17	Define	p. 22, column 2, paragraph 3	Define “high quality” housing
18	Define	p. 23, Figure	Define “demand response” in “Passenger Miles by Mode” figure
19	Clarification	p. 25, column 2, paragraph 2	“This network includes fixed-route local bus lines, community circulators, express and rapid buses, Bus Rapid Transit (BRT), demand response <u>paratransit</u> , ³ light rail transit, heavy rail transit (subway) and commuter rail. ⁴ ”
20	Clarification	p. 26, column 1, paragraph 2	“ <u>Transit users directly</u> typically pay <u>about</u> 25 percent of the operating and maintenance cost of their travel, with the remaining 75 percent paid for by state and local public subsidies. Most capital expenditures are also funded <u>through various taxes and</u> with public subsidies, including a larger share of federal grants.”



#	TOPIC	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
21	Clarification	p. 28, column 1, paragraph 2	<p>“The regional bike network is expanding <u>evolving</u> but remains fragmented. Nearly 500 additional miles of bikeways were built since SCAG’s 2012 RTP/SCS, but only 3,919 miles of bikeways exist regionwide, of which 2,888 miles are bike paths/ lanes (see EXHIBIT 2.3). This is compared with more than 70,000 roadway lane miles. One way to quantify bikeway quality and density is to calculate a ratio of bike path to lane miles. SCAG’s ratio of bike path/lane miles ratio is 0.039. To put this in perspective, Portland, Oregon and San Francisco have bike path/lane ratios to lane miles at 0.054 and 0.078, which are 38 percent and 100 percent higher than the SCAG region, respectively. Our region’s lack of consistent infrastructure discourages all but the most fearless people to bike.”</p> <p>Comment: There is typically only one bike lane in each direction whereas there could be multiple traffic lanes in each direction. It is not appropriate to compare lane miles to bike lane miles. Comparison, if any, should be to centerline miles. Comparison of bike path/lane miles ratio for SCAG region to individual cities is not appropriate.</p>
22	Clarification	p. 28, column 1, paragraph 2	<p>“Most walk trips (83 percent) are less than one half mile; walkers are <u>less likely to travel</u> often discouraged from traveling farther. Routes to <u>bus</u> stops and stations are often...”</p>
23	Delete	p. 33, column 1, paragraph 2	<p>“A significant amount of travel in the region is still by people who choose to drive alone (42 percent of all trips and nearly 77 percent of work trips). So, the challenge of getting individuals to seek more environmentally friendly alternatives of travel remains.”</p>
24	Clarification	p. 54, column 2, paragraph 4	<p>“Certainly, <u>The overall quality of life is expected to</u> will increase for many people.”</p>
25	Clarification	p. 55, column 1, paragraph 3	<p>“Chronic diseases including heart disease, stroke, cancer, chronic lower respiratory disease and diabetes are responsible for 72 percent of all deaths in our region. Millions of more people live with chronic diseases every day.”</p> <p>Cite number and source or delete sentence.</p>
26	Clarification	p. 56, column 1, paragraph 1	<p>“<u>California is experiencing</u> ongoing drought conditions, water shortages due to less rainfall as well as declining snowpack in our mountains, and an agriculture industry in crisis have become hard realities in recent years.”</p>
27	Clarification	p. 61, column 1, paragraph 2	<p>Add statement that says “<u>These preliminary scenarios are not the ones modeled in the PEIR.</u>”</p>



#	TOPIC	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
28	Clarification	p. 64, column 1, paragraph 1	Clarification should be made that attendance was self-selected as was the survey participation. Attendees were strongly encouraged by SCAG staff to fill out a survey. A more detailed description should be included that explains that these results are not scientific.
29	Clarification	p. 64, column 2, paragraph 2	<p>“...was also a principal concern, as was access to healthy food.”</p> <p>What percentage of respondents elevates an item to a ‘principle concern’?</p>
30	Clarification	p. 64, column 2, paragraph 4	<p>“Collectively, the survey responses offered an invaluable guide to help finalize the Plan’s investments, strategies and priorities. They reflect how regional stakeholders want us to address priority areas such as transit and roadway investments, system management, active transportation, land use and public health.”</p> <p>Did the survey responses change the Plan? Clarify if a higher priority in making changes was afforded to survey respondents’ feedback over jurisdictional and CTC input?</p>
31	Clarification	p. 65, column 1, paragraph 4	<p>“Jurisdictions were asked to provide input on the growth scenario, including information on specific planned development projects with entitlements, other planned projects, or recently completed developments.”</p> <p>Comment: During the local input process, SCAG requested feedback on the distribution of new households and employment. SCAG did not request information from jurisdictions on specific planned development projects with entitlements, other planned projects, and recently completed developments. During review of the draft policy growth forecast (PGF) in summer 2015, technical errors throughout the draft PGF were identified. These “technical errors” in the dataset were that entitlements, development agreements, and projects currently under construction or recently completed were not properly reflected. It was then that SCAG stated that jurisdictions could provide the information if jurisdictions wanted corrections made to the PGF.</p>



#	TOPIC	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
32	Clarification	p. 65, column 2, bottom note	<p>“*With the exception of the 6 percent of TAZs that have average density below the density range of local general plans.”</p> <p>Please clarify the footnote. Did SCAG lower the growth or is General Plan buildout expected after 2040?</p>
33	Clarification	p. 70, column 1, paragraph 1	<p>“In addition, local jurisdictions <u>are encouraged to</u> should pursue the production of permanent affordable housing through deed restrictions or development by non-profit developers, which will ensure that some units will remain affordable to lower-income households.”</p>
34	Clarification	p. 70, Table 5.1	Add note to table “Adopted in 2013”
35	Define	p. 73, column 2, paragraph 4	Define “riparian”
36	Clarification	p. 76, paragraph 1	How many of these trips are alone vs. with others? Are these linked trips/trip segments?
37	Clarification	p. 76, paragraph 3	The narrative implies that Neighborhood Mobility Areas (NMAs) are needed for Neighborhood Electric Vehicles (NEVs). If this is not true, reword section to allow for flexibility that one is not tied to another exclusively.
38	Clarification	p. 77	Figure needs title
39	Clarification	p. 79, Figure 5.2	Clarify if the preservation and operations expenditures apply to the SCAG region or California State.
40	Clarification	p. 83, column 2, paragraph 5	<p>“Bus lanes are even more effective at increasing speeds, however in our region there is a dearth of such lanes. Transit agencies should heavily lobby <u>SCAG encourages transit agencies and local jurisdictions in which they operate to implement them, where appropriate at least for peak period operation.</u>”</p>
41	Clarification	p. 88, column 1, paragraph 4	<p>“The 2016 Active Transportation <u>portion of the 2016 Plan</u> updates the 2012 Active Transportation Plan...”</p>
42	Clarification	p. 89, column 2, paragraph 2	<p>“SCAG has identified developed 12 regionally significant bikeways that connect the region.”</p>
43	Clarification	p. 92, column 1, paragraph 2	<p>“The launch date coincided with the <u>end of daylight savings time decline in daylight hours</u>, a period when bicycle and pedestrian collisions peak during the year.”</p>
44	Define	p. 93, column 1, paragraph 4	Define “no-maintenance exercise spots”
45	Clarification	p. 103, column 1, paragraph 3	<p>“...figure “2040 Airport Demand Forecasts” on the previous page...”</p> <p>Properly label figure and page reference.</p>



#	TOPIC	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
46	Clarification	p. 105, column 1, paragraph 1	<p>“In recent years, airport operators, CTCs and SCAG have all undertaken their own initiatives to improve ground access at the region’s aviation facilities.”</p> <p>Clarify what initiatives SCAG has undertaken.</p>
47	Clarification	p. 111, column 1, paragraph 2	<p>“Building on its strong commitment to the environment as demonstrated in the 2012 RTP/SCS, SCAG’s mitigation program is intended to function as a resource for lead agencies to consider in identifying mitigation measures to reduce impacts anticipated to result from future <u>transportation projects</u> as deemed applicable and feasible by such agencies.”</p>
48	Clarification	p.111-119 & PEIR	Update language on the mitigation measures to be consistent with any language changes to the PEIR document.

"Active Transportation Appendix"
Table Comments 1-14

ACTIVE TRANSPORTATION APPENDIX

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
1	General Comment	all	Needs to include statement saying that pedestrians and bikes are also responsible (e.g. distracted walking by cell phones; bikers with headphones) and isn’t always vehicles as cause Everyone needs to be educated and follow the rules and enforcement needs to happen for all modes
2	General Comment	all	Acknowledge the improvement over time of AT usage and the lowering of accident and death rates
3	Clarification	p. 5	<p>“Class I Bikeways ...A Class I Bikeway provides a completely separated <u>right-of-way</u> designated for the exclusive use of bicycles and/or pedestrians with cross flows by motorists minimized. Some of the region’s rivers include Class 1 Bikeways. Increasing the number of bikeways in <u>along rivers, utility corridors, and flood control channels</u> may provide additional opportunities for “interested but concerned” cyclists.”</p>
4	Clarification	p.6, column 1	<p>“INTERSECTION TREATMENTS ...In the SCAG region, nearly 44 percent of all pedestrian injuries are at intersections.” Define how far away from the intersection an accident may occur to be included in the count of pedestrian injuries at intersections</p>



#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
5	Clarification	p.6, column 1	<p>“COMPLETE STREETS</p> <p>In recognition of the need to accommodate various types and needs of roadway users, the State of California adopted the Complete Streets Act of 2008 (AB 1358) requiring cities and counties to incorporate the concept of Complete Streets to any general plan’s substantive update <u>to their General Plan’s circulation element.</u>”</p>
6	Clarification	p.8, column 1	<p>“COLLISIONS AND FATALITIES</p> <p>While the numbers of bicyclists and pedestrians are increasing, so are injuries and fatalities, although not as fast as the growth in active transportation. In California, 64,127 pedestrians were injured and 3,219 were killed between 2008 and 2012. In 2012 alone, 702 pedestrians were killed and 13,280 pedestrians were injured <u>and 702 pedestrians were killed.</u>”</p>
7	Clarification	p. 17, Table 5	Create separate tables for columns 1 to 3 and columns 3 to 10.
8	Define	p. 24, column 1, paragraph 1	<p>“2012 RTP/SCS PROGRESS</p> <p>The 2016 Active Transportation <u>portion of the Plan</u> ... The Plan examined access to transit, noting that 95 percent of SCAG residents would be within walking (0.5 mile) or biking (2 mile) distance from a transit station.”</p> <p>Define what constitutes a ‘transit station’</p>
9	Clarification	P. 25, second column, top bullet (last under #4)	<p>“Success of this program depends on cities and counties conducting these counts and providing the data to SCAG.”</p> <p>Identify funding source and acknowledge that this is voluntary effort and may not be a priority, especially without funding</p>
10	Add bullet	P. 25, second column, Bullet 6	Add 4 th bullet under #6: <u>“OCCOG is working on a comprehensive Complete Streets design manual for the entire county which will be completed in 2016.”</u>
11	Correction	P.26, Table 9	Change language for Orange County: Not yet Planned. <u>In Process</u>
12	Clarification	p. 27, column 1, and any other references	Clarify that the ‘2016 Action Transportation Plan’ is not a standalone plan, but is a portion within the RTP.
13	Clarification	P.66-67, Tables 16 & 17	Add note to Table: “These draft scenarios are not the alternatives that were evaluated in the PEIR.”
14	Clarification	P. 71	Delete “Strategic Plan Beyond 2040” section. The inclusion of this section is not consistent with other appendices. It creates confusion as to what the RTP’s Strategic Plan is.



"Demographics/Growth Forecast"
Appendix Comments 1-2

DEMOGRAPHICS/GROWTH FORECAST APPENDIX

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
1	General Comment	All	Label Y axis on all figures
2	Clarification	P. 2, column 1, paragraph 3	Add text: <u>"The forecasted land use development patterns shown are based on Transportation Analysis Zone (TAZ) level data utilized to conduct required modeling analyses. Data at the TAZ level or at a geography smaller than the jurisdictional level are advisory only and non-binding, because SCAG sub-jurisdictional forecasts are not to be adopted as part of the 2016 RTP/SCS. The advisory sub-jurisdictional data shall not be required for purposes of qualifying for future grant funding or other incentives or for determining a proposed project's consistency with the 2016 RTP/SCS for any impact analysis required pursuant to the California Environmental Quality Act (CEQA)."</u>

"Goods Movement" Appendix
Comments 1-2

GOODS MOVEMENT

#	TOPIC	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
1	Clarification	p. 4, Exhibit 2	Exhibit is labeled warehouse & distribution centers but shows manufacturing firms total employment. Correct.

"Performance Measures" Appendix
Comments 1-4

PERFORMANCE MEASURES APPENDIX

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
1	Clarification	P.8-10, Table 4	Label all Performance Measures that were new in 2016 Plan
2	Clarification	P.11	Add definition of HQTA to map.
3	Clarification	p.20	LSPT was used for 2012 RTP. Add information on the SPM.
4	Clarification	p. 31, Table 12	Add model sources to bottom of table.

"Public Health" Appendix Comments
1-22

PUBLIC HEALTH APPENDIX

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
1	General Comment	All	Final document should contain hyperlinks to other documents.
2	General Comment	All	Spell out Acronyms in Tables/Figures Titles e.g. CHIS



#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
3	Clarification	p.1, column 1	“Public health is increasingly an area of emphasis for Metropolitan Planning Organizations (MPOs) and Departments of Transportation (DOTs) across the country, have an opportunity to impact due to the prevalence of chronic diseases such as obesity, hypertension, asthma and heart disease through transportation planning which promotes increased physical activity.”
4	Clarification	p.2, column 1	Introduction- first paragraph sentence beginning with “Public health outcomes are the product of Social Determinants of Health....” consider adding “and other factors.
5	Clarification	p.1, column 2	“Climate Adaptation: Support efforts to prevent <u>mitigate</u> climate change and make the region more resilient to future changes with reductions in VMT and greenhouse gas emissions.”
6	Correction	p.2, Figure 1	Arrows should go both ways.
7	Clarification	p.3, column 1, paragraph 2	“Evidence shows that healthier lifestyles and improved air quality can improve outcomes, and built environment factors <u>and related conditions</u> can play a role in supporting healthy behaviors.”
8	Clarification	p.3, column 2, paragraph 3	“Access to healthy food environments such as grocery stores, farmers’ markets and community gardens decreases <u>can play an important role in</u> food insecurity and obesity.”
9	Define	p.7, column 1, first line	Define “weather insurance”
10	Clarification	p.7, column 2, paragraph 2	“... Providing access to <u>education and job training aligned with job opportunities in the region</u> jobs with a living wage is critical to ensuring communities become and stay healthy.”
11	Clarification	p.7, column 2, paragraph 3	“...Creating infrastructure <u>policies and community conditions</u> and facilities that encourage active transportation such as biking and walking provides opportunities for residents to increase their daily physical activity.”
12	Clarification	p.8, paragraph 3	Consider adding the recommendations for children which has a higher standard of one hour per day. This is valuable as jurisdictions look at health co-benefits of safe routes to school infrastructure changes and related programming.
13	Clarification	p.9, all figures	Recommend using the more current 2014 data. Also, it might be helpful to look at these metrics on a smaller level of geography and/or by poverty and/or by race/ethnicity. Especially since there are often funding set asides to reach disadvantaged communities, it might be interesting to see what each of these indicators looks like at a more refined level. The need is not equally distributed throughout any jurisdiction.



#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
14	Clarification	p.9	Add table with data for walking.
15	Clarification	p.10, column 2	Consider including funding as both a challenge and an opportunity.
16	Clarification	p.10, column 1, last sentence	“Much of our local arterial system is also in need of pavement improvements, as local roadways in the SCAG region average a score of 69 out of 100 in the Pavement Condition Index (PCI), where a score of 70 or less typically translates to conditions that are <u>inadequate more costly to repair.</u> ”
17	Clarification	p.10, column 2, paragraph 4	“With more than 18 million people, 191 cities, six counties and hundreds of local and regional agencies, Southern California is <u>one of the most complex regions on earth a diverse region.</u> Within the region, health outcomes vary widely based on <u>many things, such as geography, income and race.</u> ”
18	Clarification	p. 15, column 2, paragraph 3; & throughout all	“500 foot buffer”- be consistent with usage and description throughout all documents in whether this is adjacent to just freeways or freeways, rail, and high frequency transit corridors.
19	Clarification	p. 16, column 1, paragraph 1	“Region-wide, about ten percent of the land area within HQTAs is also within the 500 feet <u>foot buffer</u> of the freeway. To balance regional policy goals, the Plan accommodates the vast majority of growth within HQTAs <u>but beyond outside of the 500 feet buffer</u> of freeways...”
20	Clarification	p. 17, column 1	“Water Consumption” and “Land Consumption” Specify the time period for the change or difference in numbers. Compare this to 2040 Baseline.
21	Clarification	p. 19, column 2	“Public Health Work Program” Clarify if this work program was approved by the RC or SCAG staff is pursuing these tasks under direction of RC to incorporate more public health into RTP.
22	Clarification	p. 22-29	Are these all “best practices” or are they local examples of promising practices? Since some of these are in process, are the results are there to show that this particular practice has proven efficacy over another? These may have the potential to be best practices. If the project is based upon a best practice, it is recommended to link to the best practice so other jurisdictional leaders could consider for replication. If it is not already a proven practice, suggest calling it something different such as “local promising practices”. Add the Complete Streets Guidelines that are being developed in Orange County (which integrates in best practices.)



"SCS Background Documentation"
Appendix Comments 1-11

SCS BACKGROUND DOCUMENTATION APPENDIX

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
1	Clarification	P.42-43	How do the SPM Place Types nest into the Land Development Categories?
2	General Comment	All maps	“Note: The forecasted land use development patterns shown are based on Transportation Analysis Zone (TAZ) level data utilized to conduct required modeling analyses. Data at the TAZ level or at a geography smaller than the jurisdictional level are advisory only and non-binding, because SCAG sub-jurisdictional forecasts are not to be adopted as part of the 2016 RTP/SCS. <u>The advisory sub-jurisdictional data shall not be required</u> should not be used for purposes of qualifying for future grant funding or other incentives. The data is controlled to be within the density ranges of local general plans and/or input received from local jurisdictions. the purpose of or for determining a proposed project’s consistency with the 2016 RTP/SCS for any impact analysis required pursuant to the California Environmental Quality Act (CEQA) streamlining, lead agencies have the sole discretion in determining a local project’s consistency with the 2016 RTP/SCS. ”
3	Clarification	p.6/43	Move the definitions of Urban, Compact Walkable, and Standard Suburban from page 43 to page 6 before the maps
4	Clarification	p. 41, column 1, paragraph 4	“Scenario modeling with UrbanFootprint brings meaningful, comprehensible, and timely results to those <u>local jurisdictions</u> wanting to understand how growth and development choices will impact their community, city, or region in the coming years and decades.”
5	Correction	p. 41, column 2, paragraph 2	“Since 2012... Developers of UrbanFootprint have also met with regional agencies, such as SCAG, Sacramento Area Council of Governments (SACOG), and San Diego Association of Governments (SANDAG); Orange County Council of Governments (OCCOG). ”
6	Clarification	p. 50, 51, 54, 56 maps	Clarify in map legends if growth refers to population, housing and/or employment.
7	Correction	p. 56 column 1, last paragraph	“ The scope of t <u>These four scenarios were developed in early 2015 by SCAG and their consultant and shared, which were developed in consultation</u> with the CEHD Committee and the SCAG’s Technical Working Group (TWG); evolved throughout the first five months of 2015. ”
8	Clarification	p. 56 column 2, paragraph 2	“Conversely, growth focused in urban areas often takes advantage of existing infrastructure and more efficient service to higher concentrations of jobs and housing, <u>but sometimes modernization of utilities needs to be considered and completed to accommodate the additional usage.</u> ”



#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
9	Clarification	P. 58, column 2, paragraph 4	<p>“Saving water also saves on costs, and the RTP/SCS saves about \$1.2 billion over the span of the plan, and saves households in the SCAG region \$93 million on annual water bills.”</p> <p>Add “<u>Notwithstanding, infrastructure operations and maintenance costs require continued funding; further, these costs could offset ratepayer savings resulting from the implementation of RTP/SCS policies, conservation efforts, or installation and use of efficient appliances.</u>”</p>
10	Clarification	P. 83, column 2, paragraph 2	<p>“The SPM includes a suite of tools and analytical engines that help to quickly illustrate alternative plans and policies and to estimate their transportation, environmental, fiscal, <u>and public health and community regional impacts.</u>”</p>
11	Clarification	P. 83, column 2, last sentence	<p>“SPM will serve as a common platform for communications between SCAG and local jurisdictions in the process of local input and public outreach, providing local planners advanced analytical capabilities.”</p>

"PEIR" Comments Table 1-47

PEIR

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
1	General Comment	All	Any changes to mitigation measure language should be updated in both the Executive Summary and the chapters throughout the PEIR, as well as the RTP/SCS document.
2	General Comment	All	Cite original source data, not other documents, e.g. SCAG’s Local Profiles
3	Clarification	ES-14	“MM-AES-1(b): Consistent ... the Lead Agency can and should consider mitigation measures...”
4	Clarification	ES-14 & 15	<p>“MM-AES-3(b): Consistent ...the Lead Agency can and should consider mitigation measures...</p> <ul style="list-style-type: none"> •Require <u>Encourage</u> development of design guidelines... •Require <u>Encourage</u> that sites are kept in a... “”
5	Define	ES-16	Define ‘Natural Resource Inventory Database and Conservation Framework & Assessment’
6	Define	ES-16	Define ‘Conservation Plan’
7	Define	ES-16	Define ‘mitigation banks’
8	Clarification	ES-19	<p>MM-Air-2(b):</p> <ul style="list-style-type: none"> •Require <u>Encourage</u> contractors to assemble... •As appropriate require <u>encourage</u> that...”
9	Clarification	ES-19	<p>MM-Air-4(b):</p> <ul style="list-style-type: none"> •Require <u>Encourage</u> clean fuels, and reduce petroleum dependency.”



#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
10	Clarification	ES-19	“MM-Air-4(b): Consistent with the provisions of Section 15091 of the State CEQA Guidelines, SCAG has identified mitigation measures that are within the jurisdiction and authority of the air quality management district(s) where proposed 2016 RTP/SCS <u>transportation</u> projects or development projects resulting from the land use patterns in the 2016 RTP/SCS would be located.”
11	Clarification	ES-20	MM-BIO 1(b): <ul style="list-style-type: none"> •Require <u>Encourage</u> project design to avoid occupied habitat, potentially suitable habitat, and designated critical habitat, wherever practicable and feasible.”
12	Clarification	ES-22	MM-BIO-2(b): <ul style="list-style-type: none"> “•Require <u>Encourage</u> project design to avoid sensitive natural communities and riparian habitats, wherever practicable and feasible.”
13	Clarification	ES-22	MM-BIO-3(b): <ul style="list-style-type: none"> “•Require <u>Encourage</u> project design to avoid federally protected wetlands consistent with the provisions of Section 404...” “•Require <u>Encourage</u> review of construction drawings by a certified wetland delineator...”
14	Clarification	ES-23	MM-BIO-4(b): <ul style="list-style-type: none"> “•Require <u>Encourage</u> review of construction drawings and habitat connectivity mapping provided by the CDFW or CNDDB...”



#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
15	Clarification	ES-24	<p>MM-BIO-5(b):</p> <p>“•Require <u>Ensure</u> that no change in existing ground level occur from the base of any protected tree at any time. Require It is recommended that no burning or use of equipment with an open flame occur near or within the protected perimeter of any protected tree.”</p> <p>“•Require <u>Encourage</u> that no storage or dumping of oil, gas, chemicals, or other substances that may be harmful to trees occur from the base of any protected trees, or any other location on the site from which such substances might enter the protected perimeter. Require It is recommended that no heavy construction equipment or construction materials be operated or stored within a distance from the base of any protected trees. Require It is recommended that wires, ropes, or other devices not be attached to any protected tree, except as needed for support of the tree. Require It is recommended that no sign, other than a tag showing the botanical classification, be attached to any protected tree.”</p> <p>“... require <u>ensure</u> replacement of any tree removed with another tree or trees on the same site deemed adequate by the local agency to compensate for the loss of the tree that is removed.”</p>
16	Clarification	ES-31	<p>MM-GHG-3(a)(11):</p> <p>“•Require <u>Encourage</u> amenities for non-motorized transportation, such as secure and convenient bicycle parking.”</p>
17	Clarification	ES-40	<p>MM-LU-1(a)(3): “SCAG shall work with its member cities and counties to encourage <u>but not require</u> that transportation projects and growth are consistent with the RTP/SCS.”</p>
18	Clarification	ES-40	<p>MM-LU-1(a)(4): “SCAG shall coordinate with member cities and counties to encourage <u>but not require</u> that general plans consider and reflect as appropriate RTP/SCS policies and strategies. SCAG will work to encourage <u>but not require</u> consistency between general plans and RTP/SCS policies.”</p>
19	Clarification	ES-40	<p>MM-LU-1(a)(8): “SCAG shall continue to use its Intergovernmental Review Process to provide comments to lead agencies on regionally significant projects, that may be considered for determining consistency with the RTP/SCS.”</p>
20	Clarification	ES-52	<p>MM-TRA-1(b):</p> <p>“... bicyclist accommodations, and require <u>encourage</u> new development and redevelopment projects to include bicycle facilities...”</p>



#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
21	Clarification	ES-53	MM-TRA-1(b): “ •Require <u>Encourage</u> new office developments with more than 50 employees to offer a Parking “Cash-out” Program to discourage private vehicle use.”
22	Clarification	ES-53	MM-TRA--2(b) “•Where traffic signals or streetlights are installed, require <u>encourage</u> the use of Light Emitting...”
23	Clarification	ES-54	MM-TRA--2(b) “•Diode (LED) technology, <u>or similar technology.</u> ”
24	Clarification	ES-55	MM-TRA--2(b) “• Require <u>Encourage</u> the development of Transportation Management Associations for large employers and commercial/ industrial complexes;”
25	Clarification	ES-59	MM-USS-6(b): “• Require <u>Encourage</u> the reuse and recycle construction and demolition waste (including, but not limited to, soil, vegetation, concrete, lumber, metal, and cardboard).”
26	Clarification	ES-59	MM-USS-6(b): “Discourage exporting of locally generated waste outside of the SCAG region during the construction and implementation of a project. Encourage disposal within the county where the waste originates as much as possible.” Comment: Trash disposal should be addressed regionally while considering distance instead of being limited to within the SCAG region. It is possible that disposal could be done nearby while crossing regional boundaries.
27	Delete	P. 3.3-26 Regional Air Quality	It is not appropriate to use the American Lung Association grading system to rate the region’s the transportation plan. This section (paragraph and Table 3.3.2-1) should be deleted.
28	Clarification	P. 3.3-29 Sensitive Receptors & Table 3.3.2-3	“Sensitive Receptors by County” Clarify what the source data was and how the tally of sensitive receptors was made.
29	Clarification	Figure 3.3.2-3	Figure needs legend, labels, source of data and definition of sensitive receptors
30	Clarification	P. 3.10-5 Section 3.10.1, Regulatory Framework	The definition of a Municipal Separate Storm Sewer System (MS4) is incomplete and incorrectly cited.



#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
31	Clarification	p. 3.10-15 Section 3.10.1, Orange County General Plan	Specific mention of the Orange County Stormwater Program's Drainage Area Management Plan (DAMP) should be made under PEIR heading Orange County General Plan. The DAMP is Orange County's principle policy and program guidance document for urban nonpoint source pollution mitigation. The PEIR should reference the DAMP's agreements, structure, and programs, and, at the project level, make note to consider the specific water pollution control elements of the DAMP that apply to land development and redevelopment projects. Transportation infrastructure projects deemed to be Priority Projects, in accordance with DAMP designation (Exhibit 7.1 Table 7-1.1), would require the development of a Project Water Quality Management Plan (WQMP) in conformance with Orange County's Model WQMP.
32	Clarification	p. 3.10-17 Section 3.10.2, Existing Conditions	Table 3.10.2-1 lists San Juan Creek as a surface water resource within Santa Ana (Region 8) jurisdiction. San Juan Creek is located within the San Diego Regional Water Quality Control Board (Region 9) jurisdictional boundary.
33	Clarification	p. 3.10-56 Section 3.10.6, Mitigation Measures	Mitigation Measures: Parts of this section list mitigation measures that are already being required by municipal stormwater programs across the region. Instead of listing specific mitigation measures, the PEIR should make reference to these programs. In Orange County, for example, this program is detailed in the DAMP/Model WQMP. The Model WQMP describes the process that the cities and County employ for requiring a Project WQMP, which is a plan for minimizing the adverse impacts of urbanization on site hydrology, runoff flow rates, and pollutant loads at the project level. A reference to the Model WQMP and equivalent documents in the region's other counties, should replace the last ten bullet points of section MM-HYD-1(b).
34	Clarification	p. 3.10-56 Section 3.10.6, Mitigation Measures	If a proposed project has the potential to create a major new stormwater discharge to a water body with an established Total Maximum Daily Load (TMDL), a quantitative analysis of the anticipated pollutant loads in the stormwater discharges to the receiving waters should be carried out.



#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
35	Clarification	p. 3.10-56 Section 3.10.6, Mitigation Measures & Table ES 4-1 (page ES-37)	The PEIR states that "where feasible, restore or expand riparian areas such that there is no net loss of impervious surface as a result of the project." While the intent with many mitigative measures is to preserve (emphasis added) perviousness, the PEIR should not be establishing performance measures for land development/redevelopment outside of established local stormwater programs.
36	Clarification	3.11-8&9, 3.11-13 3.11-16 & 17	<p>Need to specify the vacant areas that are permanently preserved or undevelopable, even park space that is vacant</p> <ol style="list-style-type: none"> i. Identify the source of the data used to identify vacant land. ii. What are the following items classified as (e.g. vacant, open space): HOA open space, HOA streets, private parking lots, lakes. <p>Table 3.11.2-2- Break out vacant land category into permanently preserved/undevelopable or developable</p> <p>Figure 3.11.2-7 Need to correctly label national forests as permanently preserved open space. Areas labeled vacant need to be reviewed to correctly allocate lands that are permanently preserved/undevelopable and which are developable.</p>
37	Clarification	3.11-10	Table 3.11.2-1- Define 'Established Communities'; Correct label or number of square miles by county
38	Define	3.11-11	Define 'carbon sinks'
39	Define	3.11-14	Define medium, high, and low density housing within text
40	Clarification	3.11-34	<p>3.11.7 LEVEL OF SIGNIFICANCE AFTER MITIGATION IMPACT LU-1...</p> <p>It is likely that in some instances currently adopted general plans and other adopted plans will not General Plans are not required to be consistent with the 2016 RTP/SCS policies and land use strategies, and they are not required to be consistent for purposes of the SCS pursuant to SB 375. Implementation of mitigation measures MM-LU- 1(a)(1), MM-LU-1(a)(2), MM-LU-1(a)(3), MM-LU-1(a)(4), MM-LU-1(a)(5), MM-LU-1(a)(6), MM-LU- 1(a)(7), MM-LU-1(a)(8), and MM-LU-1(b) would may reduce some of these impacts. However, direct, indirect, and cumulative impacts would remain significant and unavoidable.</p>
41	Correction	3.14-9	Update Table 3.14.2-1 with May 2015 DOF data and label columns as 'Households' not 'Housing Units'



#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
42	Correction	3.14-12	Update Table 3.14.2-3 with May 2015 DOF data
43	Correction	3.14-13	Update Table 3.14.2-5 with May 2015 DOF data
44	Define	Figures 3.14.2-1 3.14.2-2 3.14.2-3	Define subjects of maps
45	Clarification	3.14.22, paragraph 4	Clarify if discussion is on new lane miles or existing; Define “additional transportation facilities”
46	Clarification	4-1, 4.1 add after last bullet	“ <u>If an alternative is rejected and the project approved, it is the EIR for the proposed project that is to be used for future tiering purposes.</u> ”
47	Clarification	P. 4-6, and all related documents’ references to Alternative 3.	<p>Alternative 3: Intensified Land Use Alternative “The <u>hypothetical</u> land use pattern in this Alternative builds on the land use strategies as described in the 2016 RTP/SCS and beyond. Specifically, it increases densities and intensifies land use patterns of the Plan, especially around high quality transit areas (HQTAs) in an effort to maximize transit opportunities. The <u>hypothetical</u> growth pattern associated with this Alternative...”</p> <p>Comment: Update all references to Alternative 3 in all RTP/SCS documents where it mentions that the land use pattern was developed based on the Plan to say that Alternative 3’s land use plan is hypothetical.</p>



AFFILIATED AGENCIES

Orange County
Transit District

Local Transportation
Authority

Service Authority for
Freeway Emergencies

Consolidated Transportation
Service Agency

Congestion Management
Agency

Service Authority for
Abandoned Vehicles

January 11, 2016

Mr. Hasan Ikhata
Executive Director
Southern California Association of Governments
818 West Seventh Street, 12th Floor
Los Angeles, CA 90017-3435

Re: **Comments on the Draft 2016-2040 Regional Transportation Plan/
Sustainable Communities Strategy and Program Environmental
Impact Report**

Dear Mr. Ikhata:

Thank you for the opportunity to comment on the Southern California Association of Governments' (SCAG) draft 2016-2040 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS), and associated Program Environmental Impact Report (PEIR). The draft RTP/SCS and PEIR reflect the transportation and funding challenges that the region will face in the coming years. These documents are critical to the region's ability to improve mobility, and to operate and maintain the transportation system.

The Orange County Transportation Authority (OCTA) appreciates that SCAG has included the commitments identified in OCTA's 2014 Long-Range Transportation Plan (LRTP), as well as the demographic forecasts approved and submitted by the Orange County Council of Governments. Additionally, OCTA recognizes the hard work and cooperation of SCAG staff throughout the RTP/SCS and PEIR development process.

OCTA has identified policy and technical issues related to the draft RTP/SCS and PEIR that are of concern to Orange County. These are focused on the regional strategies that go above and beyond the projects submitted by the county transportation commissions (CTC). The strategies include the assumed mileage-based user fee, regional express lane network, California High-Speed Rail, and the additional investments in transit, active transportation, and congestion management. OCTA's concerns and comments regarding each of the regional strategies are discussed below.

Innovative Financing and New Revenue Sources

The draft RTP/SCS suggests that \$130.8 billion of the approximately \$200.4 billion regional shortfall can be addressed through actions at either the state or federal level. The innovative financing strategy, included in the RTP/SCS, assumes that a \$0.10 gas tax increase will be implemented by 2020. Additionally, by 2025, it assumes that the state or federal government would either replace the gas tax with an indexed mileage-based user fee of \$0.04 per mile, or further increase fuel taxes to generate revenues equivalent to the mileage-based user fee.

OCTA cannot support an increase in fees, including the introduction of a mileage-based user fee, until a comprehensive economic impact study is completed and presented to the OCTA Board of Directors for discussion. When considering support for any kind of a new user-based fee program, the region should place an emphasis on the need for return-to-source criteria that guarantee funds generated within a county are reinvested in that county's transportation system. Moreover, any user-based fees should be indexed appropriately to provide a justifiable and sustainable source of funding. Finally, throughout the development of any new funding mechanisms, opportunities should be sought to accelerate project delivery and reduce costs, consistent with OCTA's Breaking Down Barriers initiative. While these comments are generally consistent with SCAG's guiding principles for identifying reasonably available funding in the RTP/SCS, OCTA would like to reinforce these principles, particularly in consideration of the mileage-based user fee.

21

California High-Speed Rail

The draft RTP/SCS identifies Phase I of the California High-Speed Rail Authority (CHSRA) Project as a potential solution for improving interregional and intercity ground transportation. As described in the draft RTP/SCS, the project includes completing the first section through the San Joaquin Valley by 2018, extending to Palmdale and the Burbank Bob Hope Airport by 2022, connecting to San Jose/San Francisco by 2026, and finally reaching Los Angeles Union Station (Union Station) by 2028.

22

This also assumes upgraded commuter rail connections between Union Station and the Anaheim Regional Transportation Intermodal Center along the Los Angeles-San Diego-San Louis Obispo (LOSSAN) corridor. This upgraded service will be achieved through a \$1 billion program of projects identified in a memorandum of understanding (MOU) between the CHSRA and nine Southern California agencies. This investment is part of a phased delivery,

known as the “blended approach”, which OCTA supports through the adopted Resolution 2012-020.

OCTA recommends that SCAG continue to provide regular updates to the Transportation Committee and Regional Council regarding the CHSRA business plan, financial status, implementation progress, and any changes in assumptions by the CHSRA. These updates should focus particularly on the status of the MOU.

22
cont.

Regional Express Lane Network

The draft RTP/SCS includes implementation of a regional express lane network. This network proposes to increase occupancy requirements from 2+ to 3+ persons per vehicle on select existing and planned high-occupancy vehicle (HOV) lanes throughout the region. Pricing for single-occupancy and dual-occupancy vehicles will then be used to increase the throughput of the corridor and reduce emissions from congestion. As a result, this concept would generate additional revenues. When combined with tolls from a new east-west freight corridor in Los Angeles County, the projected revenues would total \$23.5 billion. These funds are assumed to contribute toward the \$200.4 billion regional shortfall.

The proposed Regional Express Lane Network focuses on converting specific existing and planned HOV facilities to express lanes. However, the segment of State Route 55 (SR-55), between Interstate 405 (I-405) and State Route 91 (SR-91), is noted as a potential single or dual express lane facility. The potential for a dual lane facility is inconsistent with the projects submitted by OCTA in December 2014. The submittal identifies general purpose lane additions on SR-55, between I-405 and Interstate 5 (I-5), as well as between I-5 and State Route 22 (SR-22). OCTA did not submit any new capacity enhancements on SR-55 north of SR-22. If new capacity is proposed, over and above the OCTA LRTP, new funding would be required that is likely dependent on state and federal legislative action.

23

The 2016-2040 RTP/SCS should consistently recognize the capacity enhancements along SR-55, between I-405 and I-5, and between I-5 and SR-22, as general purpose lanes. This is consistent with how these projects are characterized in OCTA's LRTP, OCTA's 2006 program-level environmental document, and the current 2012-2035 RTP/SCS. Furthermore, the 2016-2040 RTP/SCS should clearly recognize that the proposed express lane network is subject to further study to evaluate right-of-way impacts, community issues, and overall feasibility before any final decisions on implementation can be made.

Other Regional Strategies

SCAG proposes a number of other investments within the draft RTP/SCS that affect Orange County, and go beyond the LRTP. These include additional investments in congestion management projects, transit service, and active transportation.

The congestion management projects were identified by the California Department of Transportation through studies required for corridors receiving Proposition 1B Corridor Mobility Improvement Account funding. In Orange County, these corridors included State Route 57, SR-22, I-5, Interstate 605, SR-91, and I-405.

24

The improvements consist of relatively low-cost operational improvements, such as ramp metering, auxiliary lanes, and other ramp and interchange enhancements. The draft 2016-2040 RTP/SCS estimates that an investment of \$5 billion is necessary to implement the improvements throughout the SCAG region. These are in addition to capacity and operational improvements submitted by the CTCs, and would be funded through the draft 2016-2040 RTP/SCS innovative financing strategy.

The draft 2016-2040 RTP/SCS also proposes additional transit enhancements throughout the region. The improvements consist of expanded local bus service, additional Bravo! and bus rapid transit services, and new express bus service. SCAG states that the additional cost to the region for these services, including capital and operations and maintenance costs, is estimated at about \$8.5 billion, which is again assumed to be funded with innovative sources. It should be noted that the proposed improvements in Orange County are generally consistent with the financially unconstrained element of the OCTA 2014 LRTP.

25

An additional emphasis is also placed on active transportation improvements, with the draft 2016-2040 RTP/SCS proposing to invest \$12.9 billion. Compared to the previous RTP/SCS, the active transportation investment has more than doubled. About \$1.7 billion of the total investment reflects active transportation projects submitted by CTCs. SCAG proposes investing another \$6.4 billion from the draft 2016-2040 RTP/SCS innovative financing strategy. SCAG then estimates that the remaining \$4.8 billion would be invested through active transportation elements from roadway operations and maintenance efforts. The \$12.9 billion investment results in more trips made by walking or bicycling, increasing from 11.9 percent of all trips in 2012, to 15.7 percent of all trips by 2040.

26

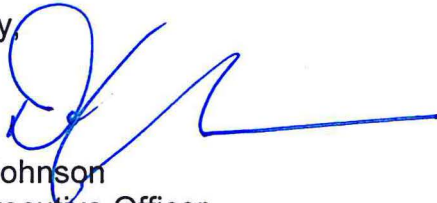
Mr. Hasan Ikhata
January 11, 2016
Page 5

OCTA recognizes that it is within SCAG's purview to plan for regional strategies that enhance transportation; however, it should be noted that OCTA is committed to delivering the projects within the LRTP. The 2016-2040 RTP/SCS should clearly state that the regional strategies suggest improvements beyond the projects submitted by OCTA, and that the implementation of the strategies is subject to availability of new revenue sources and the necessary project development and review processes by the implementing agencies. OCTA will only consider additional investments after new revenues are realized and identified to account for these additional improvements.

27

OCTA appreciates SCAG's work on the RTP/SCS and PEIR, and looks forward to the adoption of the final 2016-2040 RTP/SCS and PEIR in April. If you have further questions, please contact Gregory Nord, Senior Transportation Analyst, at (714) 560-5885.

Sincerely,



Darrell Johnson
Chief Executive Officer

DJ:gn

c: OCTA Board of Directors
Executive Staff

Submitter	Affiliation (Submitter)	Comment
Rick Bishop	Western Riverside Council of Governments 2/3/2016 9:24:32 AM	<p>(text that follows copied/pasted for clarity) First, WRCOG asks that SCAG compile a distinct listing of all commitments explicitly made of SCAG and/or others in the document that could affect WRCOG and/or our member agencies. Several examples of these occurrences are listed below: (Page 111) Consistent with the provisions of Section 15091 of the State CEQA Guidelines and review of county and city general plans and Caltrans designated scenic vistas, aesthetics performance standards-based mitigation measures may include, but are not limited to: • Design landscaping along highway corridors to add significant natural elements and visual interest to soften the hard-edged, linear transportation corridors. • Remove blight or nuisances that compromise visual character or visual quality of project areas including graffiti abatement, trash removal, landscape management, maintenance of signage and billboards in good condition, and replacing compromised native vegetation and landscape. WRCOG asks that commitments such as these be called out in a separate document and that SCAG denote an action plan to fulfill such commitments.</p>

1

2016 PEIR

From: Joseph Alcock <JAlcock@octa.net>
Sent: Monday, February 01, 2016 10:54 AM
To: Naresh Amatyia; 'dtran@scag.ca.gov'; 2016 PEIR
Cc: Nord, Gregory; Larwood, Charlie; kbrotcke@octa.net
Subject: OCTA technical comments on 2016 RTP/SCS
Attachments: OCTA technical comments.xlsx

Hi Naresh, Daniel, and Lijin:

Attached are OCTA staff's technical comments on the 2016 Draft RTP/SCS. Please contact Greg Nord should you have any questions.

Thanks,

Joe Alcock
Section Manager, Corridor Studies and Long Range Planning
Orange County Transportation Authority
550 S. Main Street
P.O. Box 14184
Orange, CA 92863-1584
(714) 560-5372
jalcock@octa.net

The information in this e-mail and any attachments are for the sole use of the intended recipient and may contain privileged and confidential information. If you are not the intended recipient, any use, disclosure, copying or distribution of this message or attachment is strictly prohibited. If you believe that you have received this e-mail in error, please contact the sender immediately and delete the e-mail and all of its attachments.

OCTA Table Comments 1-149

#	Chapter/ Appendix	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
1	Ch. 2	P.26, third paragraph	The service decline for OCTA looks low at 11%. Please indicate the source and specific years for this data. Our data indicates that service declined about 17% between FY 2007/8 and FY 2014/15.
2	Ch. 2	P.29, Exhibit 2.2	Bus routes are hard to see. Use a different color.
3	Ch. 2	P.32, Exhibit 2.4	SR-57 should be identified as a "Major Goods Movement Highway Corridor". The California Freight Mobility Plan identifies it as a Tier 1 freight facility, defined as "portions of the (highway and freight rail) network having the highest truck and rail volumes"
4	Insert: Our Progress Since 2012	P.40, Our Progress Since 2012 - Mobility Projects in the SCAG Region	OCTA's Bravo! route 543 should be included on this map. This map also looks like it includes projects under construction (i.e. Metro's I-5 project). Therefore, the HOV lane additions on I-5 from PCH to Pico should be also be included.
5	Ch. 3	P.51, Exhibit 3.1	SR-57 volumes should be included.
6	Ch. 5	P.74, third column	Replace "Bravo" with "Bravo!" Replace "Santa Ana Streetcar" with "OC Streetcar"
7	Ch. 5	P.83, second column, first paragraph	Replace "New BRT routes will provide..." with "New BRT and rapid bus routes will provide..."
8	Ch. 5	P.84, Table 5.2	Replace "Santa Ana and Garden Grove Streetcar" with "OC Streetcar"
9	Ch. 5	P.85, Exhibit 5.2	Bus routes are hard to see. Use a different color.
10	Ch. 5	P.91, second column, second paragraph	Clarify that OCTA's Non-motorized Metrolink Accessibility Strategy was completed in 2013, and that it identifies improvements specific to each of the 11 Metrolink stations in Orange County.
11	Ch. 5	P.91, second column, second paragraph	"The regional strategy builds upon these planned investments, proposing enhancements at 224 high quality transit stations by 2040. These stations include all Los Angeles County light rail, subway and fixed guideway bus stations and Metrolink stations; all Orange County Metrolink Stations and OC Bravo busways..." Comment - Rather than proposing first/last mile enhancements along Bravo! routes, it may be more practical to focus on making the enhancements at transportation centers that multiple routes and services access.
12	Ch. 5	P.93, first paragraph	Replace "Metro and various cities are working to implement bike share within the county, beginning in 2016." with "OCTA recently completed a bike share pilot in the City of Fullerton, and Metro and various cities are working to implement bike share within Los Angeles county, beginning in 2016."

#	Chapter/ Appendix	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
13	Ch. 5	P.94, Exhibit 5.4	The SR-241/SR-91 express lane connector is a "Planned/ Proposed HOT Direct Connector". Please remove the "HOV Connector" indication. Mixed-flow lane additions on I-5, from SR-55 to I-405, should be included. The HOV lane addition on I-5, from El Toro to Alicia, should be included.
14	Ch. 5	P.98, Table 5.7	Label the table "Regional Express/HOT Lane Network" Eliminate the note on the SR-55 project (SR-91 to I-405) that states "May be either single or dual Express lanes" as there are no plans to add capacity to SR-55 north of SR-22.
15	Ch. 5	P.99, Express Lane Network	Modify the header to "Regional Express/HOT Lane Network"
16	Ch. 5	P.99, Express Lane Network, second paragraph	"Additional efforts underway include the extension of the State Route 91 Express Lanes to Interstate 15, as well planned Express Lanes on Interstate 15 in Riverside County. Express Lanes are also planned for Interstate 15 and Interstate 10 in San Bernardino County." Comment - It would seem appropriate to mention the I-405 express lane project with the "Additional efforts underway".
17	Ch. 9	P.170, first bullet	"Since the 2012 RTP/SCS was adopted, active transportation has been recognized as a regional priority, not just a local priority. Orange County has developed a strategic bikeway network consistent with the 2012 RTP/SCS and it is fully incorporated into the 2016 RTP/SCS." Comment - OCTA began development of Orange County regional bikeways network prior to the 2012 RTP/SCS.
18	Ch. 9	P.170, second bullet	"The 2012 Strategic Plan recommended expanding our regionwide HOV lane network, although these improvements were unfunded. The 2016 RTP/SCS now fully funds an HOV expansion project within Orange County as part of its Constrained Plan." Comment - The 2012 RTP/SCS also includes fully funded HOV expansion projects within Orange County, and probably elsewhere.
19	2016 RTP/SCS and PEIR		Please reflect the comments on the various appendices in the main document and PEIR, as appropriate.
20	Active Transportation	P. 3, first bullet	Many of these trips rely on transit to connect longer distances.
21	Active Transportation	P. 3, Types of Bikeways	Change title to "Level of Traffic Stress"
22	Active Transportation	P. 5, Class IV Cycletracks	Caltrans has already added Cycletracks to the MUTCD and HDM
23	Active Transportation	P. 8, first paragraph	Please confirm the bike/ped fatality and injury statistics, and provide the source.
24	Active Transportation	Page 12	Please confirm that Orange County's "hot spots" are accurately reflected.

#	Chapter/ Appendix	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
25	Active Transportation	Page 15, Existing Bikeway Network, first paragraph	"There are about 3,919 bikeway miles in the region, with the majority in Los Angeles County, followed by Riverside County, then Orange County as seen in EXHIBIT 3." Comment - Los Angeles has the most bikeway miles in the region, but not the "majority" (not over 50%). Also, our data indicates that LA has the most, followed by OC, and then San Bernardino.
26	Active Transportation	Page 15, Existing Bikeway Network, first paragraph	Nearly 500 additional miles of bikeways were built since the last plan. Comment - Clarify if the 500 miles of additional bikeways since the last plan account for those that were built as well as those that were added to the map because they were not reflected in the 2012 RTP/SCS.
27	Active Transportation	Page 15, Existing Bikeway Network, fifth paragraph	Replace "Orange County Transportation Authority has developed a regional strategic bikeway system, similar to SCAG's Regional Bikeway Network, and is in the first stage of implementing a bikeway loop in north Orange County." with "Orange County Transportation Authority has developed a regional strategic bikeway system, consisting of 41 corridors that cover about 500 miles. The Orange County Loop initiative is also underway to close gaps in a 66-mile linkage of major bikeways in northern Orange County."
28	Active Transportation	Page 21, second paragraph	Clarify that unprotected left turns are most common in LA. Most OC intersections have protected left turns.
29	Active Transportation	Page 24, 2012 RTP/SCS Progress, Goals for implementing the 2012 Plan	"specific actions that were taken over the last four years to advance these goals" Comment - Consider also including: - ATP Cycle 2 funding results - OCTA was awarded a \$163,000 grant to conduct an inventory of sidewalks near transit and along major roadways in Orange County. - OCCOG is developing the Complete Streets Initiative to help OC local jurisdictions accommodate all travel modes. - OCTA is coordinating with local jurisdictions to promote implementation of the 66-mile OC Loop initiative. - OCTA developed the Non-motorized Metrolink Accessibility Strategy, in 2013.
30	Active Transportation	Page 24, 2012 RTP/SCS Progress, Goals for implementing the 2012 Plan, #4	Replace "Orange County is developing a strategic bikeway network throughout the county." with "Orange County has developed a regional bikeway network of 41 corridors, covering about 500 miles throughout the county."

#	Chapter/ Appendix	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
31	Active Transportation	Page 25, RTP/SCS Progress, Goals for implementing the 2012 Plan, Continued #4	Replace "Imperial and San Bernardino counties have county-wide bicycle plans." with "Orange, Imperial and San Bernardino counties have county-wide bicycle plans."
32	Active Transportation	Page 25, RTP/SCS Progress, Goals for implementing the 2012 Plan, Continued #4	"The Los Angeles County Metropolitan Transportation Authority (Metro) has developed a bicycle to transit access plan (2006) and is currently developing an Active Transportation Strategic Plan." Comment - Wasn't Metro's plan completed just a year or two ago?
33	Active Transportation	Page 26, Table 10	Clarify what constitutes a "complete streets policy". Clarify if some cities have multiple policies, or if the numbers need to be corrected.
34	Active Transportation	Page 27, 2016 Active Transportation Plan, Overview, Transit Integration Strategies	Replace "First/Last Mile (to rail)" with "First/Last Mile (to transit)"
35	Active Transportation	Page 28, Sidewalks	Proposed Improvements should also include new sidewalks.
36	Active Transportation	Page 29, second paragraph	"The regional greenway network (RGN) is a 2,233-mile network designed to increase walking and biking by creating separated bikeways designed for most potential bicyclists, and making use of available open space such as rivers, drainage canals, cycle tracks (separated bikeways) and utility corridors." Add "rail right-of-way" to the list.
37	Active Transportation	Page 34, Exhibit 8	Change title from "EXHIBIT 8 Orange County Loop" to "EXHIBIT 8 OC Loop"
38	Active Transportation	Page 36, Exhibit 10	The red mark in downtown should probably be removed.
39	Active Transportation	Page 40	Change title "OC LOOP" to "OC Loop"
40	Active Transportation	Page 40	"BR8" - Spell out title
41	Active Transportation	Page 40	"BR1111" - Spell out title

#	Chapter/ Appendix	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
42	Active Transportation	Page 40, OC Loop	Replace The OC Loop is a class 1 bikeway that connects to local networks throughout northern Orange County and southern Los Angeles County." with "The OC Loop is mostly a class 1 bikeway that connects to local networks throughout northern Orange County and southern Los Angeles County."
43	Active Transportation	Page 48, California Coastal Trail, Orange County	Please also note that OCTA, Caltrans, and local cities completed a coordinated study for multimodal improvements along the Pacific Coast Highway corridor.
44	Active Transportation	Page 52, First/Last Mile (Rail)	Change title to "First/Last Mile (to Transit)"
45	Active Transportation	Page 52, First/Last Mile (Rail), Orange County	Replace "The Orange County Transportation Authority (OCTA) has developed a report listing recommendations to 11 cities as well as area wide recommendations around their Metro Link stations." with "The Orange County Transportation Authority (OCTA) has developed a report listing recommendations to improve access for people walking or bicycling to Orange County Metrolink stations."
46	Active Transportation	Page 52, First/Last Mile (Rail), Orange County	Replace "Their research of existing conditions indicates that many of their Metro Link stations are not bicycle or pedestrian friendly." with "Their research of existing conditions indicates varying conditions for access to Orange County's 11 Metrolink stations."
47	Active Transportation	Page 52, First/Last Mile (Rail), Orange County	Replace "They include a detailed listing of recommendations, similar to Metro, but leave it to local jurisdictions on how to coordinate and combine strategies as shown in TABLE 13." with "The report includes a detailed listing of recommendations, but leave it to local jurisdictions on how to coordinate and combine strategies as shown in TABLE 13."
48	Active Transportation	Page 53, Exhibit 24	Verify that all of the OC Streetcar and ARC stations are accounted for.
49	Active Transportation	Page 53, Exhibit 24	Show the rail network (in OC)
50	Active Transportation	Page 53, Exhibit 24	Remove duplicate legends (sbx_bffrs, BUFFER, 0.5 Miles, 1 Mile)
51	Active Transportation	Page 53, Exhibit 24	Replace legend "SBx and OC Bravo Stops" with "SBx and OC Bravo! Stops"
52	Active Transportation	Page 53	Remove Bravo stops, and add bus transportation centers.
53	Active Transportation	Page 54, second bullet	Replace "...and OC Bravo busway", with ", transportation centers, and new fixed guideway stations."
54	Active Transportation	Page 54, Investments to Fixed- Guideways	Change all "Metro-Link" to "Metrolink" (4 occurrences)

#	Chapter/ Appendix	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
55	Active Transportation	Page 54, Livable Corridors (Bus), second paragraph	"Sixteen corridors are considered as part of this strategy, as they have completed studies funded through SCAG's Compass Blueprint studies." Comment - Provide map showing the sixteen corridors
56	Active Transportation	Page 55, first paragraph	Replace "These programs exist or will exist in the next year at U.C. Irvine (ZotWheels), Occidental College and UCLA; and in the cities of Long Beach, Santa Monica, Los Angeles and Fullerton (no longer active)." with "These programs exist or will exist in the next year at U.C. Irvine (ZotWheels), Occidental College and UCLA; and in the cities of Long Beach, Santa Monica, Los Angeles, Anaheim (no longer active), and Fullerton (no longer active)."
57	Active Transportation	Page 55	Consider noting that while the Fullerton bikeshare pilot has ended, it provided some lessons learned that can be built off of.
58	Active Transportation	Page 60	Clarify that "Regional Bikeways" refers to SCAG's regional bikeways, as opposed to OCTA's.
59	Active Transportation	Page 64, Table 15	Clarify if this represents school bus only, or if public bus service is included. It should be noted that as school bus service is reduced, students often become more dependent on public transit.
60	Active Transportation	Page 68	Clarify if the tables (18, 19, 20) represent all trips, or journey to work.
61	Active Transportation	Page 65, first sentence	Replace "These investments complement the land use and transportation strategies proposed for four scenarios, which are further described in the Sustainable Communities Strategy chapter." with "Education and encouragement investments complement the land use and transportation strategies proposed for the four scenarios, which are further described in the Sustainable Communities Strategy chapter."
62	Active Transportation	Page 65, Evaluation, third paragraph	Replace "For active transportation, an active transportation enhancement to the SPM was developed and used for post processing evaluation for the preferred plan to compare it against the baseline." with "An active transportation enhancement to the SPM was developed and used for post processing evaluation for the preferred plan to compare it against the baseline."
63	Active Transportation	Page 65, sixth paragraph	Spell out "CHTS"
64	Active Transportation	Page 66, Table 16	Why are there no values for the Sidewalks row?
65	Active Transportation	Page 67, Table 17	(Transit Integration) All of the "0% complete" and "n/a" cells need to be explained. There are lots of efforts underway (existing and as part of the 2012 RTP/SCS) that do not appear to be reflected here.
66	Active Transportation	Page 67, Table 17, Scenario 1, Short-Trip Strategies, Sidewalks	Replace "7,576 miles of bikeways repaired/constructed" with "7,576 miles of sidewalks repaired/constructed" ?

#	Chapter/ Appendix	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
67	Active Transportation	Page 68, Financial Plan, second paragraph	Replace "For example, the City of Los Angeles has been pursuing non-transportation related federal funds for the Los Angeles River revitalization. The Army Corps of Engineers plan for the river has passed committee" with "For example, the City of Los Angeles has been pursuing non-transportation related federal funds for the Los Angeles River revitalization, and the City of Santa Ana secured CDC funding for enhanced bikeway accommodations within their downtown."
69	Transit	Page 1, Public Transportation Modes in the SCAG Region	Add Bus Rapid Transit, as defined by NTD
70	Transit	Page 3, last paragraph/ Page 4, first paragraph	Replace "The cities of Irvine and Laguna Beach operate local circulator service and the cities of Anaheim, Garden Grove and Santa Ana are working with OCTA to implement rail circulators. In addition, a 501c(4) non-profit entity composed of stakeholders throughout the Anaheim Resort area, the Anaheim Transit Network, operates Anaheim Resort Transit." with "The cities of Irvine, La Habra, and Laguna Beach operate local circulator service, and the cities of Anaheim, Garden Grove and Santa Ana are working with OCTA to implement rail circulators. In addition, a 501c(4) non-profit entity composed of stakeholders throughout the Anaheim Resort area, the Anaheim Transit Network, operates Anaheim Resort Transit. OCTA also provides funds through Measure M for cities to plan and operate seasonal transit services (Project V), as well as a program to provide specialized transit service for seniors and persons with disabilities (Project U)."
71	Transit	Page 8, Exhibit 3	Bus routes are hard to see. Use a different color.
72	Transit	Page 21, third paragraph	"The dramatic spikes in crude oil prices after 2005 have had large impacts on the retail price of gasoline, as displayed in FIGURE 8." Comment- This section should describe the recent drop in oil prices shown on the chart below.
73	Transit	Page 25, second paragraph	"Total transit boardings have grown by about 26 percent since 1991, but are roughly 6 percent below their high point in 2008. As noted above, service cuts and the economic recession have had negative effects on ridership. FY 2011-2012 represents an annual uptick in ridership, a growth of 1.7 percent total trips taken and 0.3 percent per capita trips. This gain is still 7.2 percent below the pre-recession high of 42 per capita trips." Comment- This section should talk about the recent ridership declines. Ridership figures can come from the APTA Ridership reports.
74	Transit	Page 27, fourth paragraph	"Partners from smaller agencies note that the measure of seat miles is closely related to vehicle size, and that where they employ smaller vehicles for operational reasons, performance is made to look worse." Comment- This seems counterintuitive. Operating less seats with same number of passengers increases passenger miles per seat mile. Please clarify.

#	Chapter/ Appendix	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
75	Transit	Page 28, Changing Patterns of Service Provision	"Similarly, the share of operating expenses devoted to demand response also doubled, from 5 percent to 10 percent over the same period, as shown in TABLE 13 on page 35 of this appendix." Comment- Should note why this is happening. Passage of ADA and trip dumping by social service agencies are major contributors. This should also note the high cost of paratransit trips and the fact they compete for operating resources with other transit modes.
76	Transit	Page 28, Changing Patterns of Service Provision, Figure 21, Modal Share of Service Provided in the SCAG Region	Chart should include all modes as shown below. (Commuter Rail, Metro Rail, and Bus)
77	Transit	Page 30, Geographic Distribution of Transit Trips, second paragraph	Correct Figure number reference
78	Transit	Page 30, Increasing Average Trip Length, first paragraph	Correct Figure number reference
79	Transit	Page 31, first paragraph	Correct Figure number reference
80	Transit	Page 31, fifth paragraph	Correct Figure number reference
81	Transit	Page 46, Availability Analysis, second paragraph	"performed using a .25 buffer file" Comment- Clarify why a .25 mile buffer was used. It is usually assumed that people will walk up to .5 miles for high quality transit.
82	Transit	Page 46, Availability Analysis, third paragraph	"A majority of residents" Comment- This seems to contradict figures in next sentence.
83	Transit	Page 46, Availability Analysis,	"only 5.3 percent of Orange County residents have access to transit service with 15 minutes or better frequency" Comment- This seems really low. If numbers are based on the incorrect map on the next page, this may be why.

#	Chapter/ Appendix	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
84	Transit	Page 47, Exhibit 7	Service indicated on map in Irvine Clarify what service is being shown in Irvine and why. Comment-
85	Transit	Page 47, Exhibit 7	This map does not accurately show Orange County 15 minute routes.
86	Transit	Page 48, Exhibit 8	This map does not accurately show Orange County 15 minute routes.
87	Transit	Page 49, Exhibit 9	This map does not accurately show Orange County 15 minute routes.
88	Transit	Page 52, 2012 RTP/SCS Major Capital Investments in Other Counties, first paragraph	The Bravo! routes should be categorized as rapid bus service, not BRT.
89	Transit	Page 55, Orange County, first paragraph	Replace "Key outcomes were new transit service and expanded service hours for areas with high ridership potential." with "Key outcomes were new transit service and more frequent service in areas with high ridership potential. OCTA is proposing to implement many of these recommendations in 2016."
90	Transit	Page 56, Table 22	Replace "Anaheim Service Expansion" with "Anaheim Resort Transit Service Expansion"
91	Transit	Page 59, second paragraph	Replace "Bristol Street and Beach and State College Boulevards" with "Bristol/State College and Bolsa/1st corridors"
92	Transit	Page 59, second paragraph	Replace "Longer term strategies include additional Bravo! Rapid and flexible routing on lower productivity routes." with "Longer term strategies include additional Bravo! and reallocating service from lower productivity routes to higher ridership corridors."
93	Transit	Page 70, Exhibit 14	Hard to see light blue routes on this map. Change colors
94	Transit	Page 79, Exhibit 19	Irvine - Not sure what these routes are. This comment also applies for the next couple of maps.
95	Highways/ Arterials	Page 1, third paragraph	Replace "Our top priority is preserving our existing system, which has cost us so much to build and is critical for helping us maintain the overall viability of our region." with "SCAG works with partner agencies to encourage preserving our existing system, which has cost us so much to build and is critical for helping us maintain the overall viability of our region."
96	Highways/ Arterials	Page 1, third paragraph	Replace "These priorities have become elevated in recent years as resource constraints and environmental concerns have made expanding our system both infeasible and impractical." with "These priorities have become elevated in recent years as resource constraints and environmental concerns have made expanding our system more difficult ."

#	Chapter/ Appendix	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
97	Highways/ Arterials	Page 1, third paragraph	Replace "Rather, we now prioritize the strategic expansion of our roadways, with the intention of closing critical gaps within our existing network." with "Rather, as the regional planning agency, we encourage implementing agencies to prioritize the strategic expansion of roadways, with the intention of closing critical gaps within the existing network."
98	Highways/ Arterials	Page 3, Deteriorating Infrastructure, first paragraph	Please define "distressed"
99	Highways/ Arterials	Page 3, Deteriorating Infrastructure, second paragraph	Replace "The compromised condition of our highways and bridges is due to years of underfunding our statewide preservation needs." with "The compromised condition of our highways and bridges is due to years of the state and federal governments underfunding our statewide preservation needs."
100	Highways/ Arterials	Page 3, Deteriorating Infrastructure, second paragraph	"...(primarily due to fuel efficiency)" Comment - The primary reason usually has to do with the fact that the gas tax has not been adjusted for inflation.
101	Highways/ Arterials	Page 3, Figure 3 and 4	Provide sources for Figures 3 and 4.
102	Highways/ Arterials	Page 3, Deteriorating Infrastructure, second paragraph	Replace "As part of the 2016 RTP/SCS, additional investments have been allocated to address funding gaps in order to bring our region's roadways to a state of good repair." with "As part of the 2016 RTP/SCS, additional investments, paid for through SCAG's innovative financing strategy, have been assumed in order to bring our region's roadways to a state of good repair."
103	Highways/ Arterials	Page 4, Figure 5	Labels "Non-deficient" and "Deficient" Comment - Please define
104	Highways/ Arterials	Page 4, Corridor Mobility and Sustainability Improvement Plans, first paragraph	Replace "Historically, the response to congestion has been to add additional capacity. However, CSMPs provided a lower cost, higher benefit option toward making highways and parallel arterial systems, transit and incident response management more efficient and were designed to focus primarily on operational strategies to optimize corridor performance through ITS strategies, in conjunction with operational and capacity improvements towards improving productivity along highway corridors." with "Historically, the response to congestion has been to add capacity. However, CSMPs focused on identifying lower cost, higher benefit options for making highways and parallel arterial systems, transit, and incident response management more efficient. The CSMPs accomplish this by identifying ITS strategies, in conjunction with operational and capacity improvements."
105	Highways/ Arterials	Page 5, Table 1	Orange - SR-57 and SR-91 should also have completed CSMPs

#	Chapter/ Appendix	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
106	Highways/ Arterials	Page 5, second full paragraph	"SCAG encourages the development of Corridor Sustainability Studies (CSS) which will build upon the existing CSMP framework by analyzing the corridor from a multi-modal perspective." Comment - Who would develop the CSS?
107	Highways/ Arterials	Page 6, first partial paragraph (continued Integrated Corridor Management, first paragraph)	"Over the next 10 years Caltrans plans to implement similar projects on 25 additional congested corridors statewide." Comment - Should this say that Caltrans will implement these projects in partnership with local agencies?
108	Highways/ Arterials	Page 11, Table 6	Orange County - \$3.4 Does not appear to include maintenance Comment -
109	Highways/ Arterials	Page 14, Exhibit 2, Major HOV Projects Proposed by Counties	Missing 5/405, 22/405 and 405/605 connectors. The 22/405 and 405/605 might count as Plan Connectors since they opened post 2012. Also, there is an HOV extension on I-5 from El Toro to Alicia that should be reflected.
110	Highways/ Arterials	Page 16, Exhibit 4	Missing I-5 (405 to 55)
111	Highways/ Arterials	Page 17, Exhibit 5	91/241 connector is proposed as HOT, not HOV. The legend should note that the HOV Connectors are planned/proposed
112	Highways/ Arterials	Page 20, Exhibit 8	Remove dashing on SR-55 and the associated footnote
113	Goods Movements	Page 2, Primary Freight Network	Replace "Federal Highway Administration (FHA)" with "Federal Highway Administration (FHWA)"
114	Goods Movements	Page 4, Exhibit 2	Please clarify what this map is intended to depict. Title refers to warehouses and distribution centers, but the legend below refers to employment at manufacturing firms.
115	Goods Movements	Page 14, Exhibit 4	SR-57 through OC - Are volumes available for SR-57? This is one of the busier trucking corridors in OC.
116	Goods Movements	Page 31, Table 11	Replace "Mainline Rain Improvements" header with "Mainline Rail Improvements"
117	Goods Movements	Page 62, Table 20	Add a "route" column. The descriptions don't always say what the route is.
118	Congestion Management	Page ii	Clarify why there are two toolbox sections and why CMP under MAP-21 isn't described in the introduction.

#	Chapter/ Appendix	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
119	Congestion Management	Page 2, County Congestion Management Programs, first paragraph	define "urbanized areas"
120	Congestion Management	Page 2, County Congestion Management Programs, Multi-Modal Performance	"In addition to roadway performance, each county program contains an element to evaluate the performance of other transportation" Comment - Clarify that statute requires performance metrics for transit, and that monitoring of other modes is optional.
121	Congestion Management	Page 3, Land Use Programs and Analysis	Replace "...local land use decisions on the regional transportation system." with "...local land use decisions on the transportation system."
122	Congestion Management	Page 3, Capital Improvement Program (CIP)	Replace "Using data and performance measures developed through the activities identified above, each county program develops a CIP" with "The CMAs coordinate with local jurisdictions to develop a CIP that addresses system deficiencies and local needs."
123	Congestion Management	Page 3, Roles and Responsibilities of Partner Agencies, first paragraph	Change "SGAG" to "SCAG" (2 occurrences)
124	Congestion Management	Page 7, Roadways, first paragraph	TABLE 2 shows the LOS definitions OCTA does not use these definitions. Consider eliminating this table, or stating which agencies use these. Comment -
125	Congestion Management	Page 8, Causes of Congestion, first paragraph	Eliminate "Southern California is just beginning to move away from its "car culture," so". Begin the sentence with "Our region's rail and..."
126	Congestion Management	Page 10, County Congestion Management Program Trends, first paragraph	Eliminate "For example, OCTA includes the arterials that are part of its "Smart Street" network."

#	Chapter/ Appendix	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
127	Congestion Management	Page 10, County Congestion Management Program Trends, second paragraph	OCTA last completed a CMP in 2015, not 2013. Update this paragraph to reflect OCTA's 2015 CMP.
128	Congestion Management	Page 10, Major Bottlenecks	"Major Bottlenecks" Title - Consider using a different term like "congestion hot spots"
129	Congestion Management	Page 10, Major Bottlenecks	Eliminate "There are many major bottlenecks in the SCAG region that further increase congestion and delay."
130	Congestion Management	Page 10, Major Bottlenecks	Replace "An analysis was done using PeMS data for 2012. The top 100 locations were ranked by annual hours of vehicle delay and are illustrated in EXHIBIT 1 and TABLE 5." with "An analysis was done using PeMS data for 2012 to identify and rank the top 100 locations by annual hours of vehicle delay. These locations are illustrated in EXHIBIT 1 and TABLE 5."
131	Congestion Management	Page 10, Major Bottlenecks	Eliminate "They are categorized as "very active," "somewhat active" or "not active." Most bottlenecks are active in the am or pm peak periods, or both, and some are active mid-day."
132	Congestion Management	Page 10, Major Bottlenecks	Replace "The top ranked bottleneck in the SCAG region is on the San Diego Freeway. (I-405) at Getty Center Dr./ Sepulveda Blvd." with "The top ranked location in the SCAG region is on the San Diego Freeway (I-405), at Getty Center Dr./ Sepulveda Blvd."
133	Congestion Management	Page 10, Major Bottlenecks	Replace "There are no bottlenecks in Imperial and Ventura Counties." with "There are no congestion hot spots in Imperial and Ventura Counties."
134	Congestion Management	Page 10, Major Bottlenecks	Replace "The length of the bottleneck queues also varies, with severity and lane configuration as major factors" with "The length of the queues also varies, with severity and lane configuration as major factors."
135	Congestion Management	Page 10, Non-Recurrent Congestion, first paragraph	Eliminate "Non-recurrent congestion is a major issue in our region." This is a subjective statement.
136	Congestion Management	Page 10, Non-Recurrent Congestion, first paragraph	"The cost of physically adding this lost capacity by expanding existing roadways would exceed \$500 million." Comment - Consider removing this estimate, as it doesn't add value to the discussion. Also, the cost would be well into the billions.
137	Congestion Management	Page 12, Table 5	Source needed

#	Chapter/ Appendix	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
138	Congestion Management	Page 19, Corridor System Management Plans, third paragraph	"SR-57, SR-91, and SR-22/I-405/I-605 in Orange County;" Comment - Page 20 states that CSMPs were also completed in OC for I-5 and SR-55.
139	Congestion Management	Page 20, System Management Initiatives, first bullet	"CSMPs were completed for State Route 55 and Interstate 5 in Orange County." Comment - Page 19 states CSMPs were also completed in OC for SR-57, SR-91, SR-22/I-405/I-605.
140	Congestion Management	Page 28, Transit and Rail	Replace "Anaheim/Garden Grove Streetcar" with "OC Streetcar"
141	Congestion Management	Page 28, Transit and Rail	Replace "Santa Ana Streetcar" with "Anaheim Rapid Connection streetcar"
142	Congestion Management	Page 28, Transit and Rail	Replace "New BRT services in Orange, Riverside and San Bernardino Counties" with "New BRT and BRT Lite services in Orange, Riverside and San Bernardino Counties"
143	Congestion Management	Page 28, Active Transportation and First/Last Mile	"SCAG partnered with Metro on its 2015 First/Last Mile Strategic Plan that examines different rail and transit station types to develop recommendations tailored toward these particular station types." Comment - In 2013, OCTA completed the Non-motorized Metrolink Accessibility Strategy to identify first/last mile active transportation improvements at each of Orange County's 11 Metrolink stations.
144	Congestion Management	Page 28, Bike Share	"The City of Santa Monica is implementing its bike share program in early 2016, and Metro will roll out its county system in 2016-2017." Comment - OCTA implemented a bike share pilot in the City of Fullerton, which is no longer active, but provided useful data for future consideration of bike share in Orange County.
145	Congestion Management	Page 31, New Infrastructure	Replace "Santa Ana/Garden Grove and Anaheim Modern Streetcars in Orange County" with "OC Streetcar and Anaheim Rapid Connection in Orange County"
146	Transportation Conformity	Page 14, Transit Fares, second paragraph	OCTA's general fare is currently \$2.00. LACMTA's general fare is currently \$1.75. If the document is referring to 2012 fares, please add clarifying language.
147	Transportation Conformity	Table 78	Add: ORA085001 - Orange Transportation Center Parking Structure. Completion date of 3/31/2018. Delay due to the City having to get a decision from the State Department of Finance on if the City's Redevelopment Agency money could be used to complete the project. Other delays to the project are due to complications resulting from the project being in a historic district. These obstacles have been overcome, but resulted in delays.

#	Chapter/ Appendix	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
148	PEIR	ES-51; 3.17-54; ES-55; 3.17-60	<p>MM-TRA-1(b) - "Give priority to transportation projects that would contribute to a reduction in vehicle miles traveled per capita, while maintaining economic vitality and sustainability."</p> <p>MM-TRA-2(b) - "Give funding preference to improvements in public transit over other new infrastructure for private automobile traffic"</p> <p>Comment - Please delete these provisions in Mitigation Measure MM-TRA-1(b) and Mitigation Measure MM-TRA-2(b), unless the language in these provisions is modified to recognize that they would only be considered if they are found by the Lead Agency to be appropriate and consistent with local transportation priorities.</p>
149	PEIR	3.14-22	<p>Replace "These additional transportation facilities could displace homes and businesses in the region, constituting a significant impact requiring the consideration of mitigation measures." with "The addition of transportation facilities could displace homes and businesses in the region, constituting a significant impact requiring the consideration of mitigation measures."</p>



San Bernardino Associated Governments
1170 W. 3rd Street, 2nd Fl, San Bernardino, CA 92410
Phone: (909) 884-8276 Fax: (909) 885-4407 Web:
www.sanbag.ca.gov



- San Bernardino County Transportation Commission •San Bernardino County Transportation Authority
- San Bernardino County Congestion Management Agency •Service Authority for Freeway Emergencies

Mr. Hasan Ikhrata
Southern California Association of Governments 818 W. 7th , 12th
Floor Los Angeles, CA 90017

Subject: Comments by San Bernardino Associated Governments on the draft 2016-2040 Regional Transportation Plan/Sustainable Communities Strategy and draft Program Environmental Impact Report

San Bernardino Associated Governments (SANBAG) appreciates the opportunity to provide comments on the Southern California Association of Governments’ (SCAG’s) draft 2016-2040 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS) and draft Program Environmental Impact Report (PEIR). Both documents have been very professionally prepared, with substantial input over the last several years from County Transportation Commissions (CTCs), councils of governments (COGs), local jurisdictions, other transportation agencies, advocacy groups, and the public. We appreciate the working relationship we have had with SCAG to bring the 2016 RTP/SCS to this point in its development. We look forward to the Regional Council’s approval of the RTP/SCS in April.

Our comments can be classified into three general themes:

- A summary of SANBAG’s activities over the last several years regarding the SANBAG/SCAG Sustainability Memorandum of Understanding (MOU). The MOU involves “Collaboration between SANBAG and SCAG to Implement the 2012-2035 Regional Transportation Plan/Sustainable Communities Strategy,” and delineates a list of 16 activities demonstrating our commitment to implement the RTP/SCS.
- Overall perspectives on the 2016-2040 RTP/SCS
- Specific comments on the content of the draft RTP/SCS and PEIR.

STATUS OF THE SANBAG/SCAG SUSTAINABILITY MOU

We would like to begin our comments with a status report on the Sustainability MOU that SCAG and SANBAG jointly executed in early 2014 titled “Collaboration between SANBAG and SCAG to Implement the 2012-2035 Regional Transportation Plan/Sustainable Communities Strategy.” The MOU delineates a list of 16 activities demonstrating SANBAG’s commitment to implement the RTP/SCS. Although the draft 2016 RTP/SCS provides an overview of some of these activities region wide, it is useful to provide a more specific status report for San Bernardino County in SANBAG’s comment letter.

1

HI160128 - SS

Cities of: Adelanto, Barstow, Big Bear Lake, Chino, Chino Hills, Colton, Fontana, Grand Terrace, Hesperia, Highland, Loma Linda, Montclair Needles, Ontario, Rancho Cucamonga, Redlands, Rialto, San Bernardino, Twentynine Palms, Upland, Victorville, Yucaipa Towns of: Apple Valley, Yucca Valley
County of San Bernardino

The San Bernardino Countywide Vision is a centerpiece of our sustainability activities. The Vision was adopted by the County of San Bernardino and SANBAG in June, 2011, even prior to the approval of the 2012-2035 RTP/SCS. It is very consistent with the direction of the RTP/SCS and gave San Bernardino County an important foundation for the activities listed in the Sustainability MOU. Extensive information is available on the Countywide Vision site at <http://cms.sbcounty.gov/cao-vision/Home.aspx>. The status report on our MOU activities is provided as Attachment 1 to this letter, and a copy of the MOU is included along with the status report.

1 cont.

OVERALL PERSPECTIVES ON THE 2016 RTP/SCS

Prior to the more detailed comments, SANBAG has some suggestions for how the RTP/SCS can be used to achieve the mobility, safety, and sustainability goals of the region in the coming years. These comments relate to our own Countywide Transportation Plan, funding issues, transit service and transit oriented development (TOD), and greenhouse gas (GHG) reduction.

SANBAG's Countywide Transportation Plan and Relationship to the 2016 RTP/SCS

SANBAG recently completed its Countywide Transportation Plan (CTP) and provided it to SCAG as background and input to the RTP/SCS. The CTP analyzed two future scenarios: a "baseline scenario" that assumed traditional revenue sources (generally consistent with what the RTP/SCS defines as "core revenues") and an "aggressive scenario" (generally consistent with RTP/SCS "Plan" revenues, including the innovative sources identified in the Plan).

The projects and programs in the aggressive scenario of SANBAG's CTP are consistent with the lists in SCAG's 2016 RTP/SCS. In addition, the jurisdiction-level growth forecasts for the CTP are consistent with the jurisdiction-level growth forecasts for the RTP/SCS. SANBAG has provided SCAG with technical corrections to the San Bernardino County portion of the RTP/SCS project list in a separate communication so that the changes can be incorporated into the modeling for the final RTP/SCS. It should be noted that agreement was reached in 2015 for the Los Angeles World Airports to transfer control of Ontario International Airport (ONT) to the Ontario International Airport Authority (OIAA). SANBAG and our partner agencies appreciate the regional support that has been provided by SCAG and other agencies around the region. We look forward to continuing local and regional efforts to make ONT a truly regional asset.

2

SCAG also indicates that the Program Environmental Impact Report (PEIR) for the RTP/SCS may be useful as a basis for streamlining CEQA clearance for certain types of projects. SANBAG looks forward to collaborating with SCAG to take advantage of this opportunity, where possible.

Funding Issues

Although the SCAG innovative revenue sources are projections of "reasonably available" revenue under the federal definition, much is unknown about how these will play out in the long run. In terms of project implementation, SANBAG bases its programs and budgets on the core revenues, but will be working with SCAG, the State, and federal agencies on options to 1) derive the most benefit from the funds that have been entrusted to us by the public, 2) seek additional

3

State and federal funding for projects that are of statewide and national significance (e.g. expansion of highway facilities that serve international goods movement), and 3) work with policy makers to determine if and when additional funding is needed and ways to provide that funding so as to minimize taxpayer burdens and fairly distribute project funding. Transportation infrastructure is fundamental to our competitiveness as a county and as a region. Infrastructure represents an asset that needs to be protected and invested in to sustain our economy, a significant portion of which is logistics-based. At the same time, it must be acknowledged that support for the overall RTP/SCS financial plan does not imply support for any individual piece of legislation related to the funding of transportation projects.

Fixing America's Surface Transportation Act (FAST Act) recently passed by Congress is an opportunity to continue to upgrade our transportation infrastructure, as it provides a stable source of federal revenue and includes a revenue stream for freight projects that are critical to San Bernardino County's economy. We believe that the regional freight collaboration that has worked so well for our regional project funding through the State's Trade Corridor Improvement Fund (TCIF) program should be re-invigorated to craft a program of projects that can be most competitive for these new federal freight program funds.

3 cont.

As highlighted in the RTP/SCS, a future funding mechanism based on vehicle miles of travel (VMT) is viewed to be one of the most significant innovative funding sources for the future. SANBAG has provided comments to the California Transportation Commission related to the SB 1077 "Road Charge" pilot program. One of our comments was that, depending on the results of the pilot, the State should consider phasing in this program, beginning with alternative fuel vehicles. We recognize that the State has accelerated the schedule for the Road Charge pilot, but it should not be at the expense of taking shortcuts or skipping steps that are important to designing an ultimate program that has a high probability of success. This is potentially a very complex program, and it is more important to do it right than to do it fast. SCAG can play an important role in suggesting ways to make this transition successful and acceptable to the public if, in fact, the pilot program concludes that replacement of the gas tax with a road charge is a viable path forward.

Transit Service and Transit Oriented Development (TOD)

As highlighted in Attachment 1, SANBAG and our partner agencies are investing heavily in passenger rail and premium bus services. Capital investments for premium transit, including rail and bus rapid transit (BRT) projects in the San Bernardino Valley will exceed \$600 million in the decade beginning in 2012. This will enable the planning and implementation of more transit-oriented development in the Valley subarea of the County.

This is a bold step for San Bernardino County, and we look forward to partnering with SCAG to encourage the State to invest in the suburban portions of the transit system, not just the more urban portions. San Bernardino County jurisdictions are supportive of TOD, but need additional flexibility from the State if we are to be able to compete for funding under the Affordable Housing/Sustainable Communities (AHSC) program and related cap-and-trade programs. SANBAG and the County of San Bernardino have been involved in commenting on the AHSC grant guidelines which, unfortunately, are not friendly to TOD in suburban areas such as the Inland Empire, even though densities are increasing. Transit headways and density requirements

4

for the TOD portion of the AHSC program are still too stringent for the Inland Empire market, even around passenger rail stations. That said, several of our local jurisdictions have built and are pursuing TOD projects around Valley transit stations at densities the market can support. Our jurisdictions also need enabling tools to lay further groundwork for TOD, in light of the dissolution of redevelopment agencies (RDAs) several years ago. In summary, we are highly supportive of transit/TOD development, but need additional help if our local jurisdictions are to be successful.

4 cont.

Greenhouse Gas (GHG) Reduction

The 2016 RTP/SCS demonstrates that the SB 375 GHG reduction targets for the region are met for 2020 and 2035. SANBAG has been aggressively working on greenhouse gas reduction strategies and implementation within San Bernardino County through our Regional Greenhouse Gas Reduction Plan (now being implemented through individual city climate action plans), the Home Energy Renovation Opportunity (HERO) program, truck retrofit programs, and other energy/GHG-related initiatives. As highlighted in Attachment 1, we are being very proactive on sustainability and GHG reduction initiatives.

At the same time, it is important to recognize that we need a robust highway network to remain competitive from a logistics standpoint. A strong economy is required for both the private and public sectors to afford the technology needed to meet air quality standards and achieve the requisite GHG reductions. It should also be understood that a thriving economy in a growing county like San Bernardino can result in an increase in vehicle miles of travel (VMT). While we understand that reductions in VMT can be helpful to GHG reduction, it should be noted that VMT has steadily increased in southern California at the same time that air quality has been dramatically improved over the last several decades.

5

The same thing could be true with our GHG reduction strategy if we do it right. We can achieve both GHG reduction and mobility/economic development goals, even if VMT should increase in some of the faster growing areas of the State like San Bernardino County. The GHG analysis in the draft 2040 California Transportation Plan demonstrated that vehicle and fuels technology will be the primary way in which GHG reduction goals will need to be met. VMT reduction is an appropriate goal, but technology will be the principal path to long term GHG reduction. See SANBAG's comments on the draft 2040 California Transportation Plan, previously provided to SCAG.

We make this point because individual transportation projects may increase VMT, but these projects are very necessary from a mobility standpoint. In terms of GHG reduction, it is the net result at the regional and statewide level that is most important, not the effect of an individual project. In other words, because SB 375 GHG reduction is evaluated at the regional level, individual transportation projects should not be held to a GHG reduction or VMT reduction standard. We request that SCAG keep that in mind in ongoing discussions with the air districts, the California Air Resources Board, and other state agencies. SANBAG strongly supports initiatives to advance vehicle and fuels technology and to see that technology penetrating into the fleets of light duty and heavy duty vehicles. This is the path to success in GHG reduction for mobile sources.

SPECIFIC COMMENTS ON THE RTP/SCS AND

PEIR Comments on the RTP/SCS

1. Page 22 - It would be useful to provide the definition that SCAG uses to distinguish single family vs. multi-family 6
2. Page 23, Exhibit 2.1 - Putting county boundaries on the map would be helpful for geographic perspective 7
3. Page 40 - Legend - The blue dot may be better labeled “Transit Centers” 8
4. Page 41 - For I-10 widening, add the word “westbound” to the description; for Downtown San Bernardino Transit Center, add “and Metrolink extension” since the text mentions the extension. Also, under Omnitrans E Street sbX state: “A 16-mile bus rapid transit project ...” 9
5. Page 43, grant no. 50 - add “and Safe Routes to School Study” to the description. 10
6. Page 48 - it would be helpful to add definitions of “distressed,” “failed condition,” “functionally obsolete,” and “structurally deficient” in the text or on the graphic. 11
7. Page 50 - Preserving our Transportation System - SANBAG agrees with stressing the importance of system preservation. The statement on Page 50 says: *“Moving forward, the region needs to continue to make “fixing it first ” a top priority - that is, focusing its funds on preserving the existing transportation network prior to investing in system expansions. Failing to adequately invest in the preservation of Southern California’s roads, highways, bridges, railways, bicycle and pedestrian facilities and transit infrastructure will only lead to further deterioration, which has the potential to worsen our congestion challenges.”* Page 79 further references the consideration of life-cycle costs beyond construction.
However, it should be noted that “prior to investing in system expansions” does not mean that capital projects can be put on hold while maintenance funding catches up to a defined state of good repair. Both need to proceed in parallel. A possible re-phrasing could be: *“focusing the necessary funds on preserving the existing transportation network while strategic investments are made in system expansions”* 12
In addition, identification of a regional need for system preservation funding does not imply that a regional or sub-regional entity will be responsible for raising the funds needed for system preservation. Responsibility for system preservation funding will still need to rest with the facility owner except in cases where maintenance/operations costs are explicitly identified in agreements between the owner and a third party (e.g. an operator of express toll lanes). Caltrans needs to remain responsible for the funding of maintenance and operation of state highways, and local jurisdictions need to remain responsible for local roads. It is suggested that this clarification be added to the text.
8. Page 50 - Logistics Epicenter - The last paragraph on the page states that 750 million of the 1.2 billion square feet of industrial space is occupied. This seems like a low percentage of occupied square feet. Please clarify. 13
9. Page 95 - The first paragraph under Highways and Arterials states: *“Active transportation has grown in recent years, but the majority of trips in our region today is still made on our region’s highways and arterials. Yet, the expansion of our highways and arterials has slowed down over the last decade. Revenue from traditional sources to fund transportation improvements is declining and costly expansions to address congestion are no longer financially feasible. However, given that critical gaps and* 14

congestion chokepoints still exist within the network, improvements beyond TSM and TDM strategies need to be considered. Closing these gaps to complete the system will allow residents and visitors alike to enjoy improved access to opportunities such as jobs, education, recreation and healthcare.” Please change “are no longer financially feasible” to “may not always be financially feasible” or similar language. Many transportation improvements are costly, but they are also important to regional mobility and the economy and are also financially feasible.

14
cont.

10. Page 95 near the bottom of the page states: - “The 2016 RTP/SCS highways and local arterials framework and guiding principles are summarized here:

- a. *Focus on achieving maximum productivity through strategic investments in system management and demand management.*
- b. *Focus on adding capacity primarily (but not exclusively) to:*
 - i. *Close gaps in the system; and*
 - ii. *Improve access where needed.*
- c. *Support policies and system improvements that will encourage the seamless operation of our roadway network from a user perspective.*
- d. *Any new roadway capacity project must be developed with consideration and incorporation of congestion management strategies, including demand management measures, operational improvements, transit and ITS, where feasible. Focus on addressing non-recurring congestion with new technology.*
- e. *Support complete streets opportunities where feasible and practical.”*

15

SANBAG concurs with this language. While we are aggressively pursuing sustainability initiatives, as described earlier, highway capacity improvements are also needed particularly to support the mobility improvements required to sustain economic growth. This is particularly important for the movement of freight, as the logistics sector supports about one third of San Bernardino County’s economy.

Comments on the PEIR

The PEIR is comprehensive and very well done overall.

- PEIR, page 3.3-42 - The next-to-last paragraph on this page states that “the 2016 RTP/SCS aims to limit placing new growth within 500 feet” (i.e. within 500 feet of freeways). The actual statement on page 112 of the 2016 RTP/SCS is that “SCAG shall pursue activities to reduce the impacts associated with health risks for sensitive receptors within 500 feet of freeways and high-traffic volume roadways.” The PEIR statement should be revised to be consistent with the statement in the RTP/SCS. The RTP/SCS

16

does not seek to limit growth in any particular area. In addition, as this region gets closer to attainment, the air quality impact of high-volume roadways will diminish. One could argue that the 500-foot guideline established by CARB should also be reduced as air quality improves. SCAG should examine this relationship in future RTP/SCSs.

- **Table ES.4-1, Page ES-50, MM-TRA-1(a)(7):** The mitigation measure states that SCAG shall develop a vanpool program for employees for commute trips. Perhaps this is intended to apply only to SCAG employees, and if so, this should be stated. If not, the statement should be removed, as there are vanpool programs throughout the region already managed by other entities. However, SCAG could encourage development and expansion of vanpool programs.

16
cont.

17

As stated earlier, SANBAG appreciates all the efforts by the SCAG Regional Council and SCAG staff to make the 2016 RTP/SCS a reflection of where the region is headed over the next 24 years. We look forward to continuing partnerships with SCAG to implement the projects and programs in the RTP/SCS.

Regards,



Raymond Wolfe
Executive Director

Attachment 1

SANBAG Initiatives to Implement the 2012-2035 RTP/SCS

The attachment provides a status report on the Sustainability Memorandum of Understanding (MOU) that SCAG and SANBAG jointly executed in early 2014. The MOU concerns “Collaboration between SANBAG and SCAG to Implement the 2012-2035 Regional Transportation Plan/Sustainable Communities Strategy,” and delineates a list of 16 activities demonstrating the commitment to implement the RTP/SCS. Although the 2016 RTP/SCS provides an overview of some of these activities region wide, it is useful to provide a more specific status report for San Bernardino County in SANBAG’s comment letter. A copy of the MOU is included at the end of this attachment.

In overview, SANBAG and our partner agencies are investing in a growing network of rail and high-capacity bus transit routes to serve our population and employment base. This will enable the planning and implementation of more transit-oriented development (TOD) in the Valley subarea of the County.

For example, the San Bernardino Metrolink line is the highest ridership line on the Southern California commuter rail system. The line is being extended to downtown San Bernardino by 2016, and a nine-mile Redlands Passenger Rail system will be in operation between San Bernardino and Redlands by 2020. We are also initiating project development on the double tracking of a Metrolink segment in Rialto. Additionally, we are working with SCAG on the Los Angeles and San Bernardino Inter-County Transit and Rail Connectivity Study to coordinate planning and implementation for the Gold Line and Metrolink services in this corridor, including consideration of rail to Ontario International Airport.

The E Street sbX bus rapid transit (BRT) system began revenue service in April 2014 between Loma Linda and Cal State San Bernardino, and an additional express bus/BRT line is being advanced serving the West Valley subarea (Fontana, Rancho Cucamonga, Ontario including ONT, Montclair, and Pomona). We also now have four transit hubs in the Valley: Montclair, Fontana, San Bernardino (completed in 2015), and Yucaipa. The collective investment in high-capacity transit (rail and bus) from 2012 through 2020 will be over \$600 million in capital improvements, not counting the commitment to transit operations. This is a very substantial investment in an upgraded transit backbone for San Bernardino County agencies.

Our local jurisdictions are fully supportive of these transit initiatives and understand the importance of affordable housing, infill development, and mixed-use, pedestrian-oriented development focused in transit station areas. We have been involved in commenting on the state’s Affordable Housing and Sustainable Communities grant guidelines which, unfortunately, are not friendly to TOD in densifying, but still suburban, areas such as the Inland Empire. Transit headways and density requirements for the TOD portion of the AHSC program are still too stringent for the Inland Empire market, even around rail transit stations. Yet several of our local jurisdictions have built and are pursuing TOD projects around Valley transit stations.

The following highlight progress for specific initiatives referenced in the MOU:

1. Countywide Vision - All elements of the Countywide Vision are in action and our efforts are moving us closer to achieving the goals of a complete county. We are partnering with local business and educators to help us produce an educated workforce capable of sustaining our economic prosperity in the future. We are partnering with state and federal resource agencies, water agencies, local jurisdictions, the business community, and advocacy groups to provide direction on habitat conservation and open space. The water agencies are coordinating to conserve and plan for the future of our communities and environment. The County and local jurisdictions have made substantial progress on the health and wellness element and are implementing the Community Vital Signs initiative. Extensive information is available on the Countywide Vision site at <http://cms.sbcounty.gov/cao-vision/Home.aspx>.
2. Active Transportation - SANBAG and our local jurisdiction partners have aggressively pursued funding for pedestrian and bicycle improvements countywide. As a result, we have received over \$40 million in state Active Transportation Program (ATP) grant funds in Cycles 1 and 2 of that program. This includes over \$4 million for projects identified in the: SANBAG/SCAG report: "Improvement to Transit Access for Cyclists and Pedestrians," which are focused around the stations along the Metrolink San Bernardino Line. Many of these projects are now in design.
3. Countywide Safe Routes to School Inventory - This project has been completed through means of the SCAG Sustainability Grant Program. It has led to a subsequent ATP grant that will be conducting inventories of existing conditions and bicycle/pedestrian improvement needs at schools throughout the County.
4. Conservation Planning - SANBAG has been an active participant in SCAG's regional conservation planning initiative leading up to the 2016 RTP/SCS. In addition, SANBAG and the County of San Bernardino completed Phase 1 of the Countywide Habitat Preservation/Conservation Framework in 2015 funded, in part, with a SCAG grant. The Framework is led by the Environment Element Group, consisting of a cross-section of resource agencies, water agencies, local jurisdictions, the business community, and advocacy groups. Phase II is beginning in early 2016.
5. Additional Pedestrian/Bicycle initiatives - SANBAG has initiated the "Points of Interest Pedestrian Plan." This project is identifying bicycle/pedestrian improvements around major activity centers in San Bernardino County (e.g. shopping centers, office/mixed-use areas, other employment areas, colleges/universities, etc.). It will result in an update of SANBAG's Non-Motorized Transportation Plan (to be retitled Active Transportation Plan), including a more robust treatment of pedestrians.
6. (6 and 7 reported jointly) High Quality Transit Areas (HQTAs), including stations along the San Bernardino Metrolink Line - Exploration of TOD opportunities has now occurred on several existing and future transit corridors: Metrolink San Bernardino Line, Redlands Passenger Rail corridor, and bus rapid transit (sbX) lines in San Bernardino/Loma Linda (E Street) and Fontana/Rancho Cucamonga/Ontario/Montclair (West Valley Connector). Each of these corridors have HQTAs, and the demographic forecasts for these initiatives have been incorporated into the 2016 RTP/SCS growth forecasts. In the Metrolink corridor, the ARRIVE Corridor Study (ARRIVE = Advanced Regional Rail Integrated Vision - East) was completed, documenting specific land use, infrastructure, and environmental challenges and associated strategies to encourage

development at the six (soon to be seven) stations on our Metrolink line. A number of the challenges are related to site assembly, infrastructure readiness, and other market-related issues. The dissolution of redevelopment agencies (RDAs) has also dealt a serious blow to local jurisdictions being able to fund the types of economic and financial initiatives that are needed to lay the groundwork for TOD and infill development. Nevertheless, substantial TOD activity has occurred at the Montclair, Upland, and Rancho Cucamonga Metrolink stations. The ARRIVE Corridor study has explored public-private partnership models that may be of assistance in these areas. The specifics are documented in the ARRIVE Corridor Final Report, available at: http://www.sanbag.ca.gov/planning2/study_arrive.html.

7. Status included in Number 6.
8. Performance Measurement and Monitoring - Substantial progress has been made in performance measurement and monitoring processes since the adoption of the 2012 RTP/SCS. Community Indicators reports have been published through the Countywide Vision initiative. A travel time and congestion monitoring system (SANBAG iPeMS) has been implemented for arterial roadways on the Congestion Management Program (CMP) network. An update on the Community Vital Signs initiative can be found at <http://communityvital.signs.org/>. SANBAG is also involved with SCAG in the further development of both the CALOTS/REVISION program (for monitoring land use activity and other community characteristics) and the Scenario Planning Model (SPM).
9. Complete Streets - SANBAG prepared a Complete Streets Strategy in 2015, supported in part by a SCAG Sustainability Grant. Appendix A of the 2015 update to the Non-Motorized Transportation Plan presents the results of that study, which can be found at: http://www.sanbag.ca.gov/planning2/plan_non-motor.html. The Complete Streets Strategy will help jurisdictions comply with Assembly Bill (AB) 1358, also known as the Complete Streets Act of 2008, which requires consideration of complete streets with any substantive revision to general plan circulation elements.
10. Funding and legislative initiatives - SANBAG has been proactively involved with Cap-and-Trade program funding opportunities that relate to the implementation of the RTP/SCS. This includes programs to fund transit capital improvements and operations (e.g. Low Carbon Transit Operations Program/LCTOP, Transit and Intercity Rail Capital Program/TIRCP, Affordable Housing/Sustainable Communities Program/AHSC, and Urban Forestry Grant Program). SANBAG regularly has provided comments on cap- and-trade grant guidelines to provide decision-makers with an understanding of the needs of San Bernardino County as we seek to address regional and statewide sustainability goals.
11. Clean energy for freight vehicles - SANBAG served as the lead agency on the acquisition of 204 natural gas trucks by Ryder and the construction of two natural gas fueling stations and one natural gas truck maintenance facility through state and federal grant programs. We are pursuing funding through a Caltrans Sustainable Transportation Planning grant to develop a strategy for implementation of clean fuels initiatives for both passenger vehicles and trucks. This will be an implementation element of the Climate Action Plans (CAPs) being approved by local jurisdictions subsequent to the Regional Greenhouse Gas Reduction Plan and EIR completed by SANBAG in 2014.
12. Progress reports - SANBAG has reported progress on the Sustainability MOU periodically at the CEOs sustainability Working Group and has provided periodic updates

- on sustainability initiatives to SANBAG policy committees. An overview of sustainability initiatives is provided in the SANBAG Countywide Transportation Plan.
13. Regional Sustainability Working Group - SANBAG has a seat at the Sustainability Working Group and regularly participates in these meetings.
 14. San Bernardino County Active Transportation Network (SBCATN) - As stated in the MOU, the Network is a convening of county agencies, community organizations, residents and cities interested in improving the experience of and increasing facilities for walking and bicycling in San Bernardino County. The Network aims to: expand on the region's multi-modal planning efforts, especially for bicyclists and pedestrians; improve safety and accessibility for bicyclists and pedestrians; assist in the county implementation of the RTP/SCS; and further improve the quality of life in the county, including economic development, air quality, public health and connectivity. Meetings are held quarterly and have included walk audit tours as well as presentations on the activities of the partners.
 15. Regional PEV Readiness Plan - SANBAG is seeking funding for more focused planning, facilitation, and implementation of plug-in electric vehicles. The SCAG PEV Readiness Plan is an important take-off point for these more focused efforts with the utilities, property managers, and funding partners.
 16. Climate Action Plans - In 2014, SANBAG completed a 21-city partnership effort to develop a Regional Greenhouse Gas Emissions Inventory and Reduction Plan and its associated Environmental Impact Report. The Plan and EIR are being used as the foundation for the local jurisdictions' CAPs. Subsequent to the preparation of the regional Plan, SANBAG obtained a SCAG Sustainability Program grant to develop a set of Climate Action Plan implementation tools, including a model CAP for one of the participating cities that tiers off of the programmatic EIR. City councils in several cities have now adopted their CAPs.

Aside from the specific activities referenced in the MOU, it should be noted that SANBAG completed its Countywide Transportation Plan (CTP) in 2015. The CTP is built on a foundation of economic and environmental sustainability. It recognizes that mobility and smart land development are needed to sustain the economic growth and competitiveness necessary for survival within the global economy. This economic growth is needed, in turn, to fund the array of statewide and regional sustainability commitments. San Bernardino County must invest in all modes of transportation, including highways, to support its businesses and growing population.

MEMORANDUM OF UNDERSTANDING NO. M-008-14-00

**BETWEEN THE SOUTHERN CALIFORNIA ASSOCIATION OF GOVERNMENTS (SCAG)
AND THE
SAN BERNARDINO ASSOCIATED GOVERNMENTS (SANBAG)
CONCERNING COLLABORATION BETWEEN SANBAG AND SCAG TO IMPLEMENT
THE 2012-2035 REGIONAL TRANSPORTATION PLAN/SUSTAINABLE COMMUNITIES
STRATEGY (RTP/SCS)**

Whereas, the development of a regional Sustainable Communities Strategy is required by state law under California's Sustainable Communities Strategy and Climate Protection Act, commonly referred to as Senate Bill 375, and is a critical element of achieving statewide greenhouse gas (GHG) reduction goals established in the Global Warming Solutions Act of 2006 (Nunez, Chapter 488, Statutes of 2006), commonly referred to as AB 32;

Whereas, a regional Sustainable Communities Strategy is a component of the Regional Transportation Plan that specifies how the GHG reduction targets established for a region by the California Air Resources Board (CARB) will be achieved;

Whereas, on April 4, 2012, the Southern California Association of Governments Regional Council unanimously approved the region's first RTP/SCS;

Whereas, the adopted RTP/SCS includes land-use and transportation strategies that will support the region in meeting the established GHG reduction targets of 8% per capita by 2020 and 13% per capita by 2035;

Whereas the Air Resources Board on June 4, 2012, accepted the SCAG Sustainable Communities Strategy as having met the GHG target;

Whereas, by virtue of having met the state established GHG target, local governments in the SCAG region may choose to access a streamlined process under the California Environmental Quality Act (CEQA) for certain types of qualifying development projects;

Whereas, the RTP/SCS provides additional co-benefits including reducing land consumption, infrastructure costs, household costs, health incidences as well as improving mobility and creating jobs;

Whereas, SCAG developed the RTP/SCS in collaboration with SANBAG, other County Transportation Commissions, and local governments from the six-county Southern California region through a bottom-up, collaborative process that engaged a wide range of stakeholder groups, elected officials, special interest groups, and the general public through a series of workshops and public meetings;

Whereas, the RTP/SCS addresses many challenges including projected growth, changing demographics, climate change adaptation, housing needs, and transportation demands;

Whereas, the RTP/SCS includes a land-use strategy and growth forecast that focuses growth in High-Quality Transit Areas and along main streets, downtowns and other appropriate

infill locations; recognizes a shift in development from single-family toward multi-family residential development to reflect recent market trends; and promotes the implementation of Compass Blueprint Demonstration projects and other supportive land use implementation;

Whereas, the RTP/SCS includes transportation policies and investments that: reflect the investments being made by the County Transportation Commissions through 2035; triple the amount of funding available in the previous RTP to support Active Transportation; emphasize and provide additional resources for transportation demand management strategies and transportation systems management; maintain a focus on efficient goods movement; and establish a financial plan that addresses deferred maintenance and includes new revenue sources and innovative financing techniques to transition our fuel tax- based system to a more direct, user fee approach;

Whereas, while SCAG develops the RTP/SCS, the land-use and transportation changes within it are largely driven by the actions of local governments and County Transportation Commissions, like SANBAG, that program the majority of transportation funds flowing into the region;

Whereas, it is therefore critical that SANBAG be engaged in the implementation of the RTP/SCS in order for the RTP/SCS's benefits to be realized, as well as to ensure the region continues to make progress that can be reflected in the 2016 RTP/SCS;

Whereas, CARB through the AB 32 Cap-and-Trade Program may be providing funding for programs and projects throughout the state that reduce GHG emissions and help implement local climate action plans;

Whereas, SANBAG submitted a letter to SCAG dated February 14, 2012, supporting approval of the RTP/SCS by the April 2012 deadline and has committed staff support in the implementation of the RTP/SCS;

Whereas, SANBAG has demonstrated leadership and strong support for advancing sustainable transportation options in the region through a broad range of actions including: adopting the San Bernardino Countywide Vision (Countywide Vision), which includes multiple elements related to sustainability; investing in transit; preparation of the countywide Non-Motorized Transportation Plan; coordinating with local jurisdictions on land use strategies for transit corridors; participating in 14 local Compass Blueprint Projects since 2006; collaborating with the San Bernardino County Active Transportation Network; leading the effort to develop the San Bernardino County Regional Greenhouse Gas Inventory and Reduction Plan; programming federal funding for clean fuel buses; programming federal and State funding for bicycle infrastructure; advancing bicycle policies; supporting applications for sustainability grant programs; implementing the San Bernardino County HERO (Home Energy and Renovation Opportunity) program and joint Solar Power Purchase Agreement program; developing countywide public health framework; applying state and federal grants in partnership with a private fleet to deploy a clean fuel truck fleet; and adopting policies that reduce the agency's environmental footprint as well as promote cleaner air, GHG reduction, healthier communities, and a stronger economy through transportation planning and programming, among others;

Whereas, to continue to demonstrate countywide leadership on sustainability issues,

SANBAG will continue to implement the Countywide Vision in partnership with local jurisdictions and stakeholder groups. Five Vision Elements are pertinent to sustainability in varying degrees: the Environment, Housing, Infrastructure, Quality of Life and Wellness Elements. Although the Vision will not contain a stand-alone sustainability policy, sustainability principles will be integrated within the elements listed above. In addition, individual jurisdictions incorporate sustainability planning policies into their General Plans. The further development and sharing of this information will continue to occur through regular meetings of the SANBAG Planning/Community Development Directors and SANBAG policy committees;

Whereas, implementation of the Countywide Vision, in conjunction with the implementation of the RTP/SCS, will advance SANBAG's mission of creating a more efficient and effective transportation system in concert with a broad set of sustainability priorities that are increasingly important to SANBAG's member agencies and constituents; and

Whereas, SANBAG and SCAG currently collaborate on a broad range of initiatives to advance common transportation objectives, and it is in the interest of both agencies to continue to leverage resources toward achieving the common goals expressed in the RTP/SCS and the Countywide Vision and toward creating a more sustainable transportation system.

Now, therefore, be it resolved by the Board of Directors of the San Bernardino Associated Governments that the Executive Director is authorized to initiate and/or continue the following RTP/SCS implementation activities, to be referred to collectively as the **RTP/SCS Joint-Work Program**:

PLANNING WORK/PRODUCTS

(1) Continue SANBAG's leadership role in the development and implementation of the San Bernardino Countywide Vision. The SANBAG role is to facilitate several of the Vision Elements and to serve as a convener of leadership and ideas for moving the county forward with Countywide Vision implementation. The Vision effort includes groups working in the following subject areas: education, environment, housing, jobs/economy, public safety, water, and wellness. SANBAG will be involved in all elements to link these subject specific groups to the elected leadership and policy makers from every city. SANBAG will also be the lead on the environment and jobs/economy groups.

(2) Initiate implementation of the recommendations in the Final Report entitled "Improvement to Transit Access for Cyclists and Pedestrians" to "extend" the station areas and expand the reach of transit in transit catchment areas and at transit stops in the Metrolink and E Street sbX corridors. The report documents processes, guidelines, and specific improvements that serve as a resource for local governments seeking to partner with the SANBAG, Omnitrans, and SCAG on bicycle/pedestrian improvements in

high-capacity transit station catchment areas. Additional funding will be sought to advance implementation of these improvements. Opportunities to optimize access through programmatic, technology and/or marketing solutions in the transit catchment areas will also be explored.

(3) Develop a Countywide Safe Routes to School Inventory to help local communities identify SRTS needs and to prioritize the most cost-effective and competitive projects. The Inventory will: document current SRTS efforts and needs; coordinate with agencies, organizations, and stakeholders for exchange of information and ideas; and identify options for pursuing additional funding sources to increase SRTS investment in San Bernardino County.

(4) Support SCAG in developing a Conservation Planning Policy, as recommended in the 2012-2035 RTP/SCS. This policy is intended to build upon already-established programs that assist with more efficient transportation project delivery, including but not limited to, OCTA's Measure M Environmental Mitigation Program and Riverside County's Multiple Species Habitat Conservation Plans (MSHCP). The policy will explore opportunities to optimize the use of transportation mitigation funds to support natural land restoration, conservation, protection and acquisition, and will offer GHG emissions reduction benefits. The deliverables will likely include identification of priority conservation areas and the development of regional mitigation policies or approaches for the 2016 RTP/SCS. SANBAG will coordinate with SCAG on the development of policies appropriate for San Bernardino County in conjunction with proposals for more comprehensive habitat preservation/conservation approaches undertaken within the Environment Element of the Countywide Vision.

(5) Explore opportunities, together with SCAG, to expedite Active Transportation funding planned in the RTP/SCS for local infrastructure to support the operation and expansion of the rail and Express Bus/Bus Rapid Transit systems and for improved bicycle/pedestrian connectivity county-wide. SANBAG will complete a bicycle system "Gap-closure Analysis" in conjunction with local jurisdictions, and will amend the San Bernardino County Non-Motorized Transportation Plan (NMTP) accordingly. SANBAG will develop a funding strategy for specific Active Transportation priority projects in the NMTP and identify specific funding opportunities for each project, such as grant applications, calls for projects, and allocation of Federal, State, and local formula funds, as appropriate. This will include pursuing funding for improvements identified in the study "Improvement to Transit Access for Cyclists and Pedestrians". A mobile bicycle map application will also be developed under the SCAG Sustainability Grant program, as funding becomes available.

(6) Support SCAG in conducting a High Quality Transit Area Study to review possible incentive programs that could be offered by SANBAG and SCAG to help realize the RTP/SCS vision for reducing GHG emissions and capturing growth in High Quality Transit Areas (as defined in the RTP/SCS). The study should document existing rules and practices, consider best practices, and provide recommendations for program modifications. The study will be initiated when additional SCAG funding or staff resources become available.

(7) Conduct the study "**Creating a Vision and Implementation Strategy for Sustainability in the San Bernardino Metrolink Corridor**" under the Caltrans Statewide or Urban Transportation Planning Grant program. The purpose of the effort is to provide focus on the corridor in San Bernardino County with the greatest near-term opportunities for transit-oriented development. The study will identify ways to overcome barriers to further TOD implementation in Metrolink station areas and will identify investment needs for additional transit infrastructure to

stimulate the additional TOD planned for in the RTP/SCS.

(8) Continue collaborative efforts to improve **Performance Measurement and Monitoring** of the benefits and co-benefits (health, greenhouse gas reduction, etc.) of transportation projects and plans through efforts such as: monitoring of travel time on major highways through upgrades to the Congestion Management Program (CMP); monitoring of transit performance; collection of bicycle use data through the bicycle data clearinghouse; monitoring of milestones for the Countywide Vision; continuation of the San Bernardino County Community Indicators Reports, and preparation of the San Bernardino County Community Vital Signs Report.

(9) Support the SCAG RTP/SCS through the coordinated development of complete streets policies and implementable strategies by identifying the following: achievable opportunities for deployment of complete streets strategies in a way that recognizes the diversity of urban and rural contexts in San Bernardino County; principles for integration of “complete streets thinking” into arterial network and land use planning within the County; specific locations that could serve as opportunities for low cost “early action” complete streets projects; possible incentives for the planning and development of complete streets projects in the County.

ADVOCACY

(10) Seek funding and support legislative initiatives to assist local agencies with planning, programming, and/or capital funds to implement Compass Blueprint projects or other innovative, multimodal approaches that exemplify the direction of the Countywide Vision and transit-oriented development (TOD).

(11) Pursue grant funding to incentivize additional freight vehicle conversion to clean energy sources and to support the installation of associated fueling stations, similar to the Ryder fleet conversion previously sponsored by SANBAG. SANBAG will track advancements in technology in the clean fuels arena and will work with public and private sector partners to marry funding opportunities with cost-effective fleet conversion opportunities.

(12) Work with state and federal representatives to **Develop Legislation** in support of the above activities and the broader goals of the RTP/SCS. Progress on these items shall be reported to the SANBAG General Policy Committee, or other appropriate ad hoc committee, and SCAG's Energy and Environment Committee on a quarterly basis starting January 2014. An interim report on the RTP/SCS Joint-Work Program shall be prepared by January 2015 and include recommendations to the SANBAG Board and SCAG Regional Council for inclusion in the 2016 RTP/SCS.

COORDINATION

(13) Appoint a representative to the **Regional Sustainability Working Group**, an effort initiated by the CEOs of County Transportation Commissions and led by SCAG, to actively work on the implementation of the RTP/SCS, document and monitor progress, and develop recommendations for opportunities in the upcoming 2016-2040 RTP/SCS.

(14) Continue SANBAG's involvement in the San Bernardino Active Transportation Network (Network). The Network is a convening of county agencies, community organizations, residents and cities interested in improving the experience of and increasing facilities for walking and

bicycling in San Bernardino County. In addition to SANBAG, some of the stakeholders include Omnitrans, San Bernardino County Public Health Department, Safe Routes to School (SRTS) National Partnership, American Lung Association and Inland Empire Bicycle Alliance. The Network aims to: expand on the region's multi-modal planning efforts, especially for bicyclists and pedestrians; improve safety and accessibility for bicyclists and pedestrians; assist in the county implementation of the RTP/SCS; and further improve the quality of life in the county, including economic development, air quality, public health and connectivity. It is also intended to create a space for cities, agencies, organizations and communities to collaborate, educate and impact local and regional policies as partners.

(15) Continue to support SCAG and collaborate with regional stakeholders on the Regional Plug-In Electric Vehicle (PEV) Readiness Plan, to identify the best locations for charging infrastructure based on market demand and travel patterns. The Regional PEV Readiness Plan will become part of a larger effort to support regional sustainability while promoting economic development within the green technology sector. SCAG will continue to work with a diverse group of stakeholders to serve as a clearinghouse for zero and near-zero emission vehicle resources and implementation strategies. The key deliverables include a Regional PEV Readiness Plan and two model Subregional PEV Readiness Plans (South Bay and Western Riverside COGs). This effort is funded with grants obtained from the California Energy Commission and the U.S. Department of Energy.

(16) Support local jurisdictions in developing Climate Action Plans (CAPs) that would serve as the local implementation and monitoring documents for the reduction of greenhouse gases in response to Assembly Bill 32, the Global Warming Solutions Act of 2006. SANBAG will collaborate with local jurisdictions to develop templates jurisdictions may use as starting points for incorporation of specific schedule, funding, and implementation action items into their CAPs. SANBAG is nearing completion on a 21-city partnership effort to develop a Regional Greenhouse Gas Emissions Inventory and Reduction Plan and its associated Environmental Impact Report. The Plan and EIR will be used as the foundation for the local jurisdictions' CAPs.

Be it further resolved by the Regional Council of the Southern California Association of Governments that its Executive Director or his designee is authorized to lead the work effort of Items No. 4 (Conservation Planning Policy), No. 6 (High Quality Transit Area Study), No. 9 (Complete Streets policies and implementation strategies) and No. 15 (PEV Readiness Plan) of the above-referenced RTP/SCS Joint Work Program, and to work cooperatively with SANBAG on all other remaining Items as appropriate.

This Memorandum of Understanding (MOU) No. M-008-14-00 is executed by duly authorized representatives of SANBAG and SCAG to memorialize the partnership of the two agencies in the RTP/SCS Joint Work Program, and shall be effective as of the last date signed below by the parties. This MOU may be amended only by the execution of the parties of a written amendment.

San Bernardino Associated Governments (SANBAG)



Bill Jahn
President

Date: 3-12-14

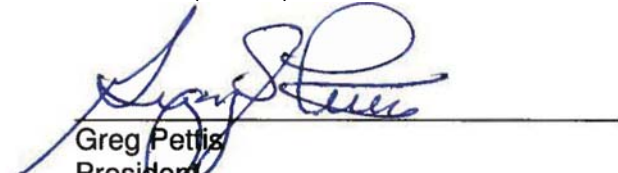
APPROVED AS TO LEGAL FORM:



Eileen Monaghan Telchert
General Counsel

Date: _____

Southern California Association of
Governments (SCAG)



Greg Pettis
President
Councilmember, Cathedral City

Date: 2/26/14



MAIN OFFICE

818 West 7th Street, 12th Floor

Los Angeles, CA 90017

Phone: (213) 236-1800

Fax: (213) 236-1825

www.scag.ca.gov

REGIONAL OFFICES

Imperial County

1405 North Imperial Avenue, Suite 1
El Centro, CA 92243

Phone: (760) 353-7800

Fax: (760) 353-1877

Orange County

OCTA Building
600 South Main Street, 9th Floor
Orange, CA 92868

Phone: (714) 542-3687

Fax: (714) 560-5089

Riverside County

3403 10th Street, Suite 805
Riverside, CA 92501

Phone: (951) 784-1513

Fax: (951) 784-3925

San Bernardino County

Santa Fe Depot
1170 West 3rd Street, Suite 140
San Bernardino, CA 92418

Phone: (909) 806-3556

Fax: (909) 806-3572

Ventura County

950 County Square Drive, Suite 101
Ventura, CA 93003

Phone: (805) 642-2800

Fax: (805) 642-2260