CENTER *for* BIOLOGICAL DIVERSITY

VIA ELECTRONIC MAIL and U.S. MAIL (per POS for 08-AFC-9)

July 22, 2010

California Energy Commission
Attn: Jeffrey D. Byron, Presiding Member
Anthony Eggert, Associate Member
Docket No. 08-AFC-9
1516 Ninth Street, MS-4
Sacramento, CA 95814-5512

Re: FDOC for the Palmdale Hybrid Power Project (08-AFC-9)

Dear Committee:

On behalf of the Center for Biological Diversity, we write to voice our concerns regarding the recent Antelope Valley Air Quality Management District's ("Air District") final determination of compliance ("FDOC") for the proposed Palmdale Hybrid Power Project ("Project"). In particular, the Applicant proposed, and the Air District supported, the generation and use of emission reduction credits (ERCs) from the paving of existing unpaved public roads to offset 128 tons per year of Project induced PM_{10} emissions. As discussed below and fully shown in the attached letter from air quality expert Phyllis Fox, this mitigation scheme would violate the California Environmental Quality Act ("CEQA") as a matter of law.

In response to the FDOC, Commission staff notified the Air District that it must adopt a specific rule to show that the claimed particulate reductions would be real, enforceable, surplus, permanent and quantifiable in conformance with the federal Clean Air Act. (Letter from Matthew Layton to Alan De Salvio (June 16, 2010) at p. 3.) Staff's letter also noted that the Air District could not demonstrate compliance with its own existing rules absent adoption of a new rule expressly covering road paving ERCs. Staff requested a revised FDOC that identifies the specific roads in the Project's vicinity that would be paved to generate PM_{10} ERCs, along with calculations quantifying the paving reductions. Staff also requested documentation showing the equivalent $PM_{2.5}$ reductions as well. (Layton Letter at p. 4.)

The Center agrees with the foregoing but staff stopped short and omitted additional legal requirements. Significantly, the letter failed to point out that a recent Court of Appeals decision unequivocally required the Air District to conduct environmental review of any scheme to offset particulate matter via road paving ***before*** it issues any such ERCs. (*California Unions for Reliable Energy et al. v. Mojave Desert Air Quality Management District* (2009)178 Cal.App.4th 1225.) The Center was one of the petitioners in that case and has an ongoing interest in ensuring that the decision is fully enforced. The court specifically required the Mojave Desert Air Quality Management District to comply with CEQA before issuing road paving ERCs pursuant to its

Lisa T. Belenky •Senior Attorney • 351 California St., Suite 600 •San Francisco, CA 94104
tel: (415) 436.9682 ext. 307 *fax:* (415) 436.9683 lbelenky@biologicaldiversity.org *www.BiologicalDiversity.org*

now rescinded Rule 1406. Although Rule 1406 was invalidated as a result of the litigation, the Antelope Valley Air District is proposing to issue road paving ERCs using the nullified Rule 1406 formulation.

Not only is reliance on Rule 1406 a clear violation of law, there is no way for the Air District or the Commission to show that the PM_{10} ERCs from road paving do not pose the following potentially significant impacts on human health and the environment:

- The paving of existing unpaved public roads would lead to increased emissions of fine particulate matter $PM_{2.5}$ in the AVAQMD which may result in violations of the $PM_{2.5}$ ambient air quality standards in the AVAQMD and contribute to existing violations of the California annual ambient air quality standard for $PM_{2.5}$ in the MDAB, impeding its progress towards compliance and re-designation as a State $PM_{2.5}$ attainment area.
- The proposed methodology is inherently inaccurate which renders PERCs generated by paving existing unpaved public roads more guesswork than reliable quantification.
- The paving of existing unpaved public roads would potentially result in significant adverse impacts on biological resources.

There is no dispute that CEQA analysis is a condition precedent to a valid air permit if the Project intends to rely on road paving to offset its particulate emissions. The law on this matter could not be clearer. Therefore, we respectfully request that the Commission cease any further action on the Project application until the Air District either proposes a different strategy to offset the Project's particulate matter emissions, or it fully complies with CEQA in conformance with *CURE et al. v. MDAQMD* prior to issuing an air permit for the Project.

Thank you for your consideration of this important matter.

Sincerely,

Lisa T. Belenky, Senior Attorney
John Buse, Legal Director
Center for Biological Diversity
351 California St., Suite 600
San Francisco, CA 94104
(415) 436-9682 x307
Fax: (415) 436-9683
lbelenky@biologicaldiversity.org
jbuse@biologicaldiversity.org

Attachments:

Letter from Phyllis Fox, Consulting Engineer, to John Buse dated July 19, 2010
Proof of Service List for Docket No. 08-AFC-9 dated July 1, 2010

Phyllis Fox, Ph.D., QEP, PE, BCEE
Consulting Engineer
745 White Pine Ave.
Rockledge, FL 32955
321-626-6885

BY EMAIL

July 19, 2010

John Buse
Center for Biological Diversity
351 California Street, Suite 600
San Francisco, CA 94104

Re: Proposed Paving Emission Reduction Credits for Palmdale Hybrid Power Project

Dear Mr. Buse,

Per your request, I have reviewed a number of documents by the California Energy Commission, the Antelope Valley Air Quality Management District, and the City of Palmdale regarding the proposed use of paving emission reduction credits to offset operational emissions from the proposed Palmdale Hybrid Power Project.

Background

The City of Palmdale ("the City" or "the Applicant") submitted an Application for Certification ("AFC") for the proposed Palmdale Hybrid Power Project ("PHPP" or "the Project")[1] to the California Energy Commission ("CEC") in July 2008 and an application for New Source Review ("NSR") to the Antelope Valley Air Quality Management District ("AVAQMD" or "District") in August 2008.

The PHPP would be located in the northern portions of the City of Palmdale in the Mojave Desert air basin ("MDAB")[2] in the northern part of Los Angeles County, which is under the jurisdiction of the AVAQMD. This portion of the MDAB is designated as non-attainment for the state ambient air quality standards for particulate matter equal to or smaller than 10 micrometers ("PM_{10}"); the area is designated as unclassified/attainment for the federal ambient air quality standards for PM_{10} and for the state and federal ambient air quality standards for particulate matter equal to or smaller than 2.5 micrometers ("$PM_{2.5}$" or "fine particulate matter").

---

[1] Inland Energy, Inc., Application for Certification, Palmdale Hybrid Power Project, July 2008; http://www.energy.ca.gov/sitingcases/palmdale/documents/applicant/afc/.

[2] The Mojave Desert Air Basin is comprised of four air districts, the Mojave Desert Air Quality Management District, the Antelope Valley Air Quality Management District, the Kern County Air Pollution Control District, and the eastern portion of the South Coast Air Quality Management District.

According to the AVAQMD's Final Determination of Compliance ("FDOC"), combustion emissions from the Project's natural gas-fired turbines, duct burners, auxiliary boiler, heat transfer fluid heater, emergency generator and emergency fire water pump and entrained road dust emissions from vehicle traffic in the solar field would amount to 128 tons per year ("tons/year") of PM_{10} and 125 tons/year of $PM_{2.5}$.[3] Most of these emissions, 92.2% would be generated by the Project's combustion sources, 5.6% by the cooling tower, and 2.2% by vehicle traffic.[4] Emissions of the state non-attainment pollutant PM_{10} would exceed the AVAQMD's offset threshold of 15 tons/year specified in District Rule 1302(B)(1) and require obtaining offsets equal to the Project's potential to emit ("PTE").

The Applicant proposes, and the AVAQMD supports, the generation and use of emission reduction credits from the paving of existing unpaved public roads to offset 128 tons/year of Project PM_{10} emissions.

The AVAQMD proposes to analyze the road paving ERC quantification in a manner similar to a rule established by the Mojave Desert Air Quality Management District (Rule 1406 — Generation of Emission Reduction Credits for Paving Unpaved Public Roads), which was rescinded on March 3, 2010 pursuant to the Writ of Mandate issued in *California Unions for Reliable Energy, Center for Biological Diversity, and Frank Levius vs. MDAQMD*, Superior Court, Riverside County, Indio Branch Case No. INC 071192 (CEQA).

The AVAQMD would follow a similar issuance process to determine the exact amount of ERCs that can be issued to PHPP in response to the paving of any given existing unpaved road segments. Currently, the AVAQMD does not have a similar rule and the Applicant, the CEC, and the AVAQMD have issued a number of inconsistent statements regarding the necessity of promulgating a rule for this purpose. In its FDOC, the AVAQMD stated that "if required by the USEPA, the Project Applicant plans to work closely with the AVAQMD to develop a rule to allow for the banking of PM_{10} ERCs from the paving of unpaved roads." Commenting on the FDOC, the CEC notes that "it is questionable that the proposed PM_{10} ERCs could be generated under the AVAQMD's existing set of rules. Specifically, as raised in our earlier comments on the PDOC, the PHPP does not have control over most of the roads that have been preliminarily identified for paving as sources of PM_{10} ERCs. Therefore, these ERCs will

---

[3] Antelope Valley Air Quality Management District, Final Determination of Compliance (Final New Source Review Document) Palmdale Hybrid Power Project Palmdale, California, May 13, 2010, p. 14; http://www.energy.ca.gov/sitingcases/palmdale/documents/others/2010-05-13_Antelope_Valley_AQMD_Final_Determination_of_Compliance_TN-56673.PDF.

[4] Calculated from FDOC, Table "PHPP Maximum Facility Emissions without Transients (Startup/Shutdown)", p. 35.

not meet AVAQMD Rule 1305, which requires that the applicant demonstrates sufficient control over ERC sources to ensure that claimed reductions are real, enforceable, surplus, permanent and quantifiable."[5]

Compliance with AVAQMD Rule 1305 cannot be determined in the absence of approval of a rule for road paving ERCs and a detailed analysis of how the Applicant would comply with this new rule. Specifically, as CEC staff noted in their comments on the AVAQMD's FDOC, the PHPP does not have control over most of the roads that have been preliminarily identified for paving as sources of PM10 ERCs. Therefore, these ERCs will not meet AVAQMD Rule 1305, which requires that the applicant demonstrates sufficient control over ERC sources to ensure that claimed reductions are real, enforceable, surplus, permanent and quantifiable. Thus, a new rule for road paving ERCs is required. A new rule requires adequate CEQA review. As noted below, CEQA review would disclose significant unmitigated impacts.

Comments

As discussed in my comments below, the generation and use of paving emission reduction credits ("PERCs") to offset combustion emissions will have a number of adverse impacts on the environment that have not been properly reviewed, identified, or mitigated, as outlined below:

- The major difference between entrained road dust and combustion emissions is the composition of the particles. Combustion particles are mostly sulfates, nitrates, and carbon compounds that are predominantly present in the smallest particles that penetrate deep into the lungs, where they are readily dissolved. Road dust particulate matter consists mostly of sand and soil, composed of oxides of silicon, titanium, and aluminum, which are predominately present in the largest particles which cannot penetrate deep into the lung and are not lung soluble. Any emission reduction credits used for offsets must have the same qualitative health impacts as the actual emissions. Due to these differences in composition, reductions in PM10 from paving roads do not mitigate the health impacts from the increase in PM10 emissions from fuel combustion.
- The paving of existing unpaved public roads would lead to increased emissions of fine particulate matter $PM_{2.5}$ in the AVAQMD which may result in violations of the $PM_{2.5}$ ambient air quality standards in the AVAQMD and

[5] California Energy Commission, Letter to Antelope Valley Air Quality Management District, Re: Comments on Final Determination of Compliance (FDOC), Palmdale Hybrid Power Project (08-AFC-9), June 16, 2010, (hereafter "CEC Comments on FDOC") p. 3; http://www.energy.ca.gov/sitingcases/palmdale/documents/2010-06-16_Staff_Comments_on_FDOC_TN-57143.pdf.

contribute to existing violations of the California annual ambient air quality standard for $PM_{2.5}$ in the MDAB, impeding its progress towards compliance and re-designation as a State $PM_{2.5}$ attainment area.

- The proposed methodology is inherently inaccurate which renders PERCs generated by paving existing unpaved public roads more guesswork than reliable quantification.
- The paving of existing unpaved public roads would potentially result in significant adverse impacts on biological resources.

In sum, paving of existing unpaved public roads to generate PERCs would impair the air quality in the AVAQMD and MDAB, endanger the health of the region's residents, and impair their ability to enjoy the outdoor environment. These issues must be analyzed under the California Environmental Quality Act ("CEQA").

The following table of contents summarizes the organization of this letter.

I. Use of PERCs Would Lead to Increased $PM_{2.5}$ Emissions and Result in Significant Adverse Impacts on the Region's Air Quality

The Applicant and the AVAQMD propose to offset PM_{10} emissions from the PHPP including combustion emissions, which account for 99.2% of the Project's PTE, by reducing entrained dust PM_{10} emissions in the District through paving of existing unpaved public roads. These PERCs would be acceptable for offsetting PM_{10} emissions anywhere in the District, regardless of the location of the source, the location of the unpaved road, or the type of PM_{10} emissions. This leads to a number of problems affecting the air quality in the AVAQMD and MDAB and the health of their residents.

I.A PM_{10} and $PM_{2.5}$ Size Fractions in Entrained Road Dust and Combustion Emissions

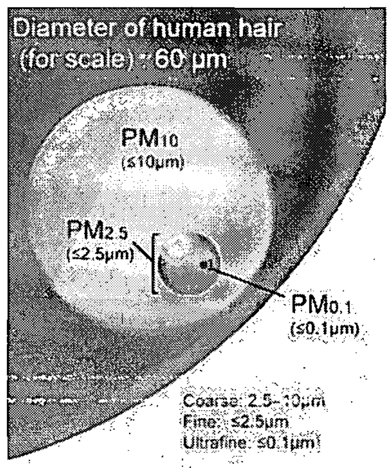
Particulate matter ("PM") is a collective term for very small solid or liquid particles suspended in the atmosphere. Particulate matter can be classified according to physical (size, mode of formation, settling properties and optical qualities), chemical (organic or inorganic composition), and biological (bacteria, viruses, spores, pollens etc.) characteristics. Among the most common categorizations imposed on particulate matter are those with respect to size, referred to as fractions. The size of the particles is very important because it determines the ability of the particles to penetrate into the lungs, thus determining health impacts.

The notation PM_{10} is used to describe particles 10 micrometers or less in aerodynamic diameter (thoracic fraction) and the notation $PM_{2.5}$ represents particles of 2.5 micrometers or less in aerodynamic diameter, so-called fine particles.[6] The notation $PM_{0.1}$ represents ultrafine particles with an aerodynamic diameter of 0.1 micrometers or less. Thus, the smaller size fractions are contained within the larger size fractions, as

[6] Aerodynamic diameter is a physical property of a particle in a viscous fluid such as air. In general, particles have irregular shapes with actual geometric diameters that are difficult to measure. Aerodynamic diameter is an expression of a particle's aerodynamic behavior as if it were a perfect sphere with unit-density and diameter equal to the aerodynamic diameter.

illustrated in the figure below; *i.e.* the $PM_{2.5}$ fraction of emissions is contained within the PM_{10} fraction of emissions. The remaining fraction of PM_{10}, *i.e.* the size fraction of 2.5 to 10 micrometers is termed coarse particulate matter or $PM_{2.5\text{-}10}$. The U.S. EPA and the State of California have promulgated separate ambient air quality standards for PM_{10} and $PM_{2.5}$ based on mass concentrations in ambient air.

Fraction		**Size Range**
$PM_{0.1}$	ultrafine	≤0.1 micrometers
$PM_{2.5}$	fine (respirable)	≤2.5 micrometers
$PM_{2.5\text{-}10}$	coarse	2.5-10 micrometers
PM_{10}	thoracic	≤10 micrometers



Graph from Greenfacts; http://snipurl.com/4n31c

Numerous studies have shown that fugitive dust PM_{10} consists of about 90 percent coarse particulate matter, *i.e.* $PM_{2.5\text{-}10}$, and only about 10 percent $PM_{2.5}$ or fine particulate matter.[7] In contrast, combustion emissions from fossil fuel-fired sources are almost entirely composed of very small particulates. For example, PM_{10} emissions from a diesel-fired stationary internal combustion engine consist of 97.6 percent $PM_{2.5}$ and only 2.3 percent of $PM_{2.5\text{-}10}$.[8] Emissions from gas-fired stationary combustion engines contain an even larger fraction of fine particulate matter: 99.8 percent of PM_{10} consists of fine particulate matter, *i.e.* $PM_{2.5}$, and only 0.2 percent of PM_{10} consist of the coarse

[7] Western Governors' Association, Western Regional Air Partnership (WRAP), Background Document for Revisions to Fine Fraction Ratios Used for AP-42 Fugitive Dust Emission Factors, MRI Project No. 110397, Finalized November 1, 2006, p. 5; http://snipurl.com/4idkp or http://www.epa.gov/ttn/chief/ap42/ch13/bgdocs/b13s02.pdf.

[8] California Air Resources Board, 2006 Inventory: Main Speciation Profiles, for "Stat. I.C. Engine-Diesel"; http://arb.ca.gov/ei/speciate/profphp20/pmprof_list.php:
(fraction of $PM_{2.5}$ in total PM: 0.937) / (fraction of PM_{10} in total PM: 0.960)
= **fraction of $PM_{2.5}$ in PM_{10}: 0.976**; $PM_{2.5\text{-}10}$ = (PM_{10}: 1.00) - (fraction of $PM_{2.5}$ in PM_{10}: 0.976) = **0.023**

fraction, *i.e.* $PM_{2.5-10}$.[9] Figure 1 illustrates the fraction of $PM_{2.5}$ contained in the PM_{10} emissions from entrained road dust from unpaved roads and combustion emissions from a gas-fired stationary internal combustion engine.

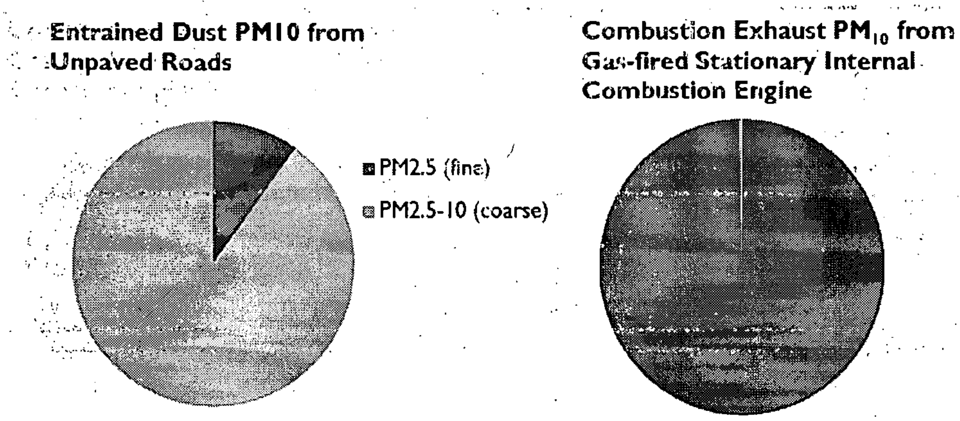


Figure 1:
Fraction of $PM_{2.5}$ (fine) and $PM_{2.5-10}$ (coarse) in PM_{10} emissions contained in entrained road dust from unpaved roads (left) and combustion exhaust from gas-fired stationary internal combustion engines (right)

I.B Health Effects of PM2.5 and PM10 and Ambient Air Quality Standards

From a health perspective, the major difference between entrained road dust and combustion emissions is the composition of the particles: combustion particles are mostly sulfates, nitrates, and carbon compounds that are predominantly present in the smallest particles and are readily dissolved in the lungs. Unpaved road dust PM is mostly sand and soil, composed of oxides of silicon, titanium, and aluminum,[10] which are predominantly present in the largest particles and are not lung soluble.[11] Any

---

[9] California Air Resources Board, 2006 Inventory: Main Speciation Profiles, for "Stat. I.C. Engine-Gas"; http://arb.ca.gov/ei/speciate/profphp20/pmprof_list.php:
(fraction of $PM_{2.5}$ in total PM: 0.992) / (fraction of PM_{10} in total PM: 0.994)
= **fraction of $PM_{2.5}$ in PM_{10}: 0.998;**
$PM_{2.5-10}$ = (PM_{10}: 1.00) - (fraction of $PM_{2.5}$ in PM_{10}: 0.976) = **0.023**

[10] Gunseli Sagun Shareef and Luis A. Bravo, Air Emissions Species Manual, Volume II: Particulate Matter Species Profiles, Report EPA-450/2-88-003b, April 1988, pp. 194-201.

[11] *See*, for example, O.M.C. Chang and G.C. England, Development of Fine Particulate Emission Factors and Speciation Profiles for Oil and Gas-fired Combustion Systems, Update: Critical Review of Source Sampling and Analysis Methodologies for Characterizing Organic Aerosol and Fine Particulate Source Emission Profiles, February 12, 2004, pp. 2-6 to 2-9. Available at: http://www.nyserda.org/programs/environment/emep/08_CriticalReviewUpdate_R1-V0.pdf

emission reduction credits used for offsets must have the same qualitative health impacts as the actual emissions. Due to these composition differences, PM10 reductions from road paving do not offset or mitigate the health impacts from the increase in PM10 emissions from combustion sources.

The effects of inhaling particulate matter have been widely studied in humans and animals and include asthma, lung cancer, cardiovascular issues, and premature death. The health risk from an inhaled dose of PM depends on the size, composition, and concentration of the particulate. The size of the particle is a main determinant of where in the respiratory tract the particle will come to rest when inhaled. Larger particles are generally filtered in the nose and throat and do not cause problems, but particulate matter smaller than about 10 micrometers in diameter, PM_{10} or the so-called thoracic fraction, can settle in the bronchi and lungs and cause health problems.[12] $PM_{2.5}$, or the respirable fraction, tends to penetrate into the gas-exchange regions of the lung, and ultrafine particles, $PM_{0.1}$, may pass through the lungs to affect other organs. Most combustion particulate matter emissions, including diesel exhaust, consist mostly of particles smaller than 0.1 micrometers. Particulates generated during combustion of fossil fuels and entrained road dust particles have fundamentally different physical and chemical properties with larger particles causing less severe health impacts.

Historically, health impacts due to particulate matter were regulated through mass-based PM_{10} ambient air quality standards. However, a substantial amount of new research has been published, documenting new health impacts at much lower concentrations and for different size fractions of particulate matter than was previously known and reflected in PM_{10} ambient air quality standards.[13,14] This new research documents that the inhalation of particulate matter, particularly the smallest particles, causes a variety of health effects, including premature mortality, aggravation of respiratory (*e.g.*, cough, shortness of breath, wheezing, bronchitis, asthma attacks) and cardiovascular disease, declines in lung function, changes to lung tissues and structure, altered respiratory defense mechanisms, and cardiopulmonary and lung cancer mortality, among others.[15,16] Since 1996, more than 2,000 peer-reviewed studies have

---

[12] The 10 micrometer size does not represent a strict boundary between respirable and non-respirable particles, but has been agreed upon for monitoring of airborne particulate matter by most regulatory agencies.

[13] U.S. Environmental Protection Agency, Air Quality Criteria for Particulate Matter, Report EPA/600/P-95-001aF through 001cF, April 1996.

[14] U.S. Environmental Protection Agency, Air Quality Criteria for Particulate Matter, Second External Review Draft, March 2001.

[15] National Ambient Air Quality Standards for Particulate Matter: Proposed Decision, Federal Register, v. 61, no. 241, December 13, 1996, pp. 65638-65675.

[16] A.A. Pope and others, Lung Cancer, Cardiopulmonary Mortality, and Long-term Exposure to Fine Particulate Air Pollution, Journal of the American Medical Association, v. 287, no. 9, pp. 1132-1141.

been published validating earlier epidemiologic studies that link both acute and chronic fine particle pollution with serious morbidity and mortality. This research has also expanded the list of health effects associated with fine particle pollution and has identified health effects at considerably lower exposure levels than previously reported. Overwhelming scientific evidence shows that long-term exposure to fine particulate air pollution contributes to pulmonary and systemic oxidative stress, inflammation, progression of atherosclerosis, and risk of ischemic heart disease and death. A recent study found that an increase in $PM_{2.5}$ air pollution of 10 micrograms per cubic meter ("µg/m³") was associated with approximately a 6 percent increase in cardiopulmonary mortality and an 8 percent increase in lung cancer mortality.[17]

Short-term exposure is equally damaging and contributes to complications of atherosclerosis, such as plaque vulnerability, thrombosis, and acute ischemic events. The U.S. Environmental Protection Agency ("U.S. EPA") concluded with respect to short-term exposure studies, that epidemiological evidence supported likely causal associations between $PM_{2.5}$ and both mortality and morbidity from cardiovascular and respiratory diseases."[18] A recently published study of almost 13,000 patients evaluated the role of fine particulate matter exposure in triggering acute ischemic heart disease event. The study found a sharply elevated risk of heart attacks for people with clogged arteries after just a day or two of short-term exposure to fine particulate matter. This study was published in the American Heart Association's peer-reviewed journal *Circulation*.[19] One coauthor of the study stated that the results should prompt heart doctors to advise those with coronary heart disease to stay indoors as much as possible on particularly sooty days and that he was already changing his advice to patients based on the results even advising in severe cases to move to a less polluted environment.[20]

The U.S. EPA and the California Air Resources Board ("CARB"), in their review and analysis of the new information on health impacts of particle pollution, concluded that coarse and fine particles have fundamentally distinct physical and chemical properties and health effects, and thus should be separately regulated and measured so

---

[17] A.A. Pope III, R.T. Burnett, M.J. Thun, E.E. Calle, D. Krewski, K. Ito, G.D. Thurston, Lung Cancer, Cardiopulmonary Mortality, and Long-term Exposure to Fine Particulate Air Pollution, Journal of the American Medical Association, v. 287, no. 9, pp. 1132-1141, 2002.

[18] U.S. Environmental Protection Agency, National Center for Environmental Assessment, Office of Research and Development, Provisional Assessment of Recent Studies on Health Effects of Particulate Matter Exposure, EPA/600/R-06/063, July 2006.

[19] Pope A.A. III, Muhlestein J.B., May H.T., Renlund D.G., Anderson J.L., Horne B.D., Ischemic Heart Disease Events Triggered by Short-Term Exposure to Fine Particulate Air Pollution, Circulation, No. 114, pp. 2443–2448; abstract available at http://circ.ahajournals.org/cgi/content/abstract/114/23/2443, accessed July 19, 2010.

[20] Los Angeles Times, Dire Health Effects of Pollution Reported; Diesel Soot from Construction Equipment Is Blamed for Illnesses and Premature Deaths, December 6, 2006.

that effective control strategies could be developed. As a result, the U.S. EPA and CARB promulgated new ambient air quality standards for $PM_{2.5}$ and the CARB lowered the standards for PM_{10}. The $PM_{2.5}$ standards are *not* subsets of the PM_{10} standards, but new standards for a separate pollutant with distinguishable impacts.

Ultrafine particles, less than 0.1 micrometers, or $PM_{0.1}$, may be even more damaging to the cardiovascular system. There is evidence that ultrafine particles can pass through cell membranes and migrate into other organs, including the brain. It has been suggested that particulate matter can cause similar brain damage as that found in Alzheimer patients. Particles emitted from combustion sources are typically in this size range. It is becoming increasingly clear that the ambient air quality standards, which mass-based are not a proper measure of the health hazard. Proposals for new regulations exist in some countries, with suggestions to limit the particle surface area or the particle number.

Particularly damaging are the ultrafine particles in diesel exhaust, which contains nearly 40 toxic substances and carry carcinogenic components adsorbed to their surface. As early as 1988, the National Institute for Occupational Safety and Health identified diesel exhaust as a potential occupational carcinogen. In 1998, CARB formally identified the particulate fraction of diesel exhaust as a toxic air contaminant and concluded that exposure to diesel exhaust particulate matter ("DPM") causes cancer and acute respiratory effects.[21] The U.S. EPA followed suit in 2002 and determined diesel exhaust as a probable human carcinogen. Diesel exhaust is estimated to contribute to more than 75% of the added cancer risk from air toxics in the United States.[22]

Under the AVAQMD's proposed approach, PERCs would be used to offset PM_{10} emissions from the Project's diesel-fired emergency generator and emergency fire pump. (In addition, diesel exhaust would be emitted from construction equipment during road paving and maintenance.)

I.C Use of PERCs Would Result in Increased PM2.5 Emissions in the District and Impede MDAQMD's Compliance with State Ambient Air Quality Standards for PM2.5

The MDAQMD's Rule 1406 proposes to offset PM_{10} emissions at a 1:1 ratio regardless of the source of emissions. Figure 2 below illustrates how offsetting PM_{10}

---

[21] California Air Resources Board, Initial Statement of Reasons for Rulemaking, Proposed Identification of Diesel Exhaust as a Toxic Air Contaminant, Staff Report, June 1998.

[22] Environmental Defense Fund, Cleaner Diesel Handbook, Bring Cleaner Fuel and Diesel Retrofits into Your Neighborhood, April 2005, p. IV; http://www.environmentaldefense.org/documents/4941_cleanerdieselhandbook.pdf.

emissions from, for example, a natural gas-fired power plant with entrained road dust-based PERCs would increase $PM_{2.5}$ emissions in the District.

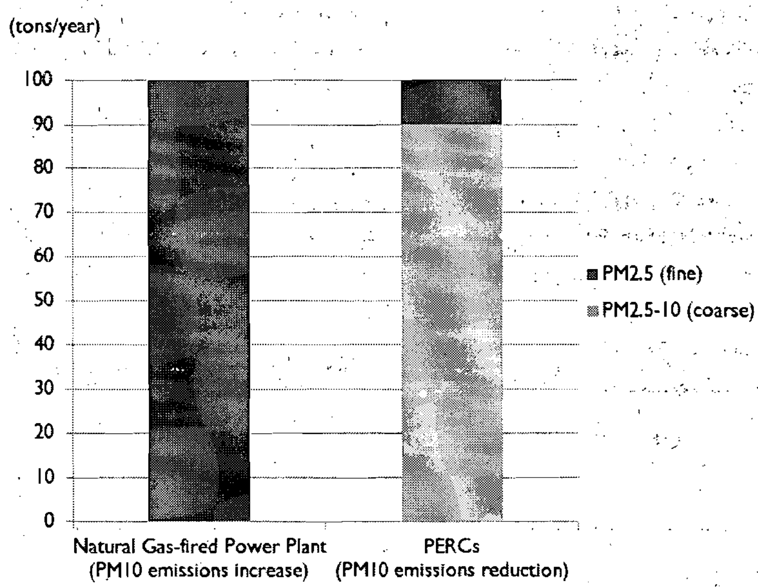


Figure 2:
Comparison of $PM_{2.5}$ and $PM_{2.5\text{-}10}$ size fractions in PM_{10} combustion emissions increase from a natural gas-fired power plant and PM_{10} entrained road dust emissions reduction from PERCs

As discussed in the previous comment, 99.8% of the PM_{10} combustion emissions from the natural gas-fired power plant turbines are fine particulate matter, *i.e.* equal to or smaller than 2.5 micrometers. The PM_{10} emissions reductions from paving an unpaved road consist of 10 percent $PM_{2.5}$ and 90 percent coarser particles with a diameter between 2.5 and 10 micrometers. Thus, when offsetting, for example, 100 tons/year of PM_{10} combustion emissions with PERCs, 99.8 tons/year of $PM_{2.5}$ emissions would be offset with 9.98 tons/year of entrained road dust $PM_{2.5}$ and 89.82 tons/year of $PM_{2.5\text{-}10}$. Thus, the proposed offset scheme would result in a net increase of 89.8 ton/yr of PM2.5, the fraction of particulate matter that poses the most significant health risk.

Thus, while there would be no net increase of PM_{10} emissions within the District, as intended by the provisions for offsets (because PM_{10} emissions increases from the power plant would be offset by a PM_{10} emission reduction achieved through paving an unpaved road), the mass quantity of $PM_{2.5}$ emissions, *i.e.* the fine particulate fraction of PM_{10}, in the District would increase and the concentration of $PM_{2.5}$ in ambient air would rise.

Further, if based on the methodology in MDAQMD's Rule 1406, generation of PERCs from paving unpaved roads and use of offsets for stationary sources would be permitted anywhere within the boundaries of the AVAQMD, irrespective of the location of the Project in the northeastern part of the City. Since the PHPP would be in the northern portion of the City, emissions of PM_{10} and $PM_{2.5}$ would increase in this area. Yet, paving of roads could occur anywhere within the AVAQMD, therefore not necessarily resulting in emission reductions near the source.

Finally, the AVAQMD is located immediately west of the southwest (Victor Valley) portion of the MDAQMD, which has been designated non-attainment for the State $PM_{2.5}$ standard.[23] Thus, emissions in the AVAQMD could be transported into the MDAQMD and contribute to increased $PM_{2.5}$ concentrations, which would impede the MDAQMD's attainment of the state ambient air quality standards.

These potentially significant impacts on air quality must be evaluated and, if found significant, mitigated as required by CEQA.

I.D Entrained Road Dust and Particulate Matter Emissions from Combustion Sources Experience Different Atmospheric Transport and Distribution

Entrained road dust and particulate matter experience very different transport and distribution in the atmosphere.

Emissions from the Project's natural gas-fired turbines, duct burners, auxiliary boiler would be emitted from a tall stack at a high velocity and temperature, whereas entrained road dust emissions would be emitted as area sources near the road surface.

Local and regional transport of this emitted particulate matter is dependent on a number of factors, including particle size, emissions height, wind speed, humidity, and atmospheric stability. Dry deposition, or gravitational settling of particles in the atmosphere, is highly dependent on the particle size. The larger particles do not remain suspended and tend to settle out relatively quickly, in a matter of minutes to hours. With the exception of dust storm events, coarse particles are transported over only a short distance on the order of less than one to tens of miles. In contrast, smaller particles settle out slowly and are regionally distributed. Ultrafine particles quickly coagulate into fine particles, which have an atmospheric half-life of days to weeks and are transported over hundreds to thousands of miles from the source.[24] As discussed above, most (90%) of the entrained road dust is composed of coarser particles. Therefore, most

---

[23] Mojave Desert Air Quality Management District, List and Implementation Schedule for District Measures to Reduce PM Pursuant to Health & Safety Code §39614(d), Adopted June 27, 2005, p. 3.

[24] U.S. Environmental Protection Agency, Air Quality Criteria for Particulate Matter, Volume I of II, October 2004, EPA/600/P-99/002aF, Table 2-2, p. 2-52; http://oaspub.epa.gov/eims/eimscomm.getfile?p_download_id=435945.

of the entrained road dust particulate matter stays in the air for a relatively short period of time and typically spreads only a short distance from the roads. Conversely, combustion emissions from stationary sources are composed almost exclusively of fine particles, mostly ultrafine particles smaller than 0.1 micrometer. In addition to the longer settling time for fine particulate matter, the long-distance distribution of fine particles is aided by their emission from tall stacks with high exit velocities. As a result, $PM_{2.5}$ concentrations in ambient air would increase throughout the District.

I.E PERCs Are Not Contemporaneous with Combustion Emissions

Many stationary sources generate continuous year-round emissions with little seasonal variability. In contrast, emission reductions due to road paving exhibit seasonal variations depending on the moisture content of the road. On days with precipitation, emissions from unpaved roads are low and the difference between an unpaved and paved road is therefore negligible. The calculations of PERCs take the effects of precipitation into account but only on an annual average basis. Therefore, road paving credits are ineffective in a seasonal mitigation scheme because of road surface moisture that limits their effectiveness during the rainy season.

The NSR provisions of the federal Clean Air Act do not prohibit the use of such non-contemporaneous offsets, presumably, because most stationary sources have continuous emissions with little variability and traditional offsets are generated by reducing emissions from such stationary sources. However, several air districts in California recognize the problem of non-contemporaneous offsets and issue emission reduction credits on a quarterly basis; the AVAQMD is not one of them. CEQA, on the other hand, requires continuous compliance, including compliance with daily emissions limits so that short-term ambient air quality standards are not exceeded. On rainy days, the stationary sources would continue to emit particulate matter yet PERCs would be ineffectual on those days, resulting in a temporary net increase of particulate matter emissions in the District which would affect short-term ambient air quality.

I.F Road Paving May Increase Traffic and Particulate Matter Emissions

Paved roads are likely to attract more traffic than the previously unpaved roads; traffic speeds would increase, entrained road dust would increase with the number of vehicles on the road and their possibly increasing weight as more trucks would use the road. Paved roads may also attract development, which would drastically change the vehicle pattern and weight distribution. Thus, the actual reduction in PM10 emissions would be lower than assumed in the PERC calculations.

I.G Construction Emissions of Criteria Air Pollutants Associated with Road Paving Are Significant

The methodology to calculate PERCs based on the MDAQMD's Rule 1406 (after which the AVAQMD would model its PERCs) simply determines entrained road dust from vehicle travel before and after paving of an unpaved road. The methodology fails to account for emissions associated with the paving of existing unpaved roads and with the periodic maintenance of the paved road. Emissions during the construction phase of road paving include asphalt fumes, fugitive dust, and combustion emissions from vehicles and construction equipment. These emissions are considerable, may result in significant impacts, and should be subtracted from the PERCs that would be generated.

Fugitive dust emissions during road paving for city and county roads result predominantly from site preparation work which may include scraping, grading, loading, digging, compacting, light-duty vehicle travel, and other operations. Fugitive dust PM_{10} emissions from road construction have been roughly estimated at 15.4 tons per mile ("tons/mile") assuming a typical project duration of 18 months.[25,26] This emission factor is assumed to include the effects of routine dust suppression measures such as watering with a dust control effectiveness of 50%.[27] Thus, construction emissions generated during paving would exceed the AVAQMD's CEQA significance threshold for PM_{10} emissions of 15 tons/year. Assuming a smaller project with a project duration of only one month, paving of one mile of unpaved road would result in daily PM_{10} emissions of 85.8 pounds per day ("lb/day")[28], exceeding the AVAQMD's daily CEQA significance threshold for PM_{10} of 82 lb/day. In addition trucks and construction worker commuter vehicles to and from the construction site would generate additional entrained road dust emissions. Thus, fugitive dust PM_{10} emissions associated with road paving would result in a significant impact on air quality on both a daily and an annual basis during the year the road is paved. These emissions cannot be further mitigated because the calculation already includes the effects of dust suppression measures. Therefore, construction emissions of PM_{10} must be subtracted from the amount of PERCs available as offsets.

The use of asphalt for paving of roads also results in considerable emissions of volatile organic compounds ("VOCs")[29] at the asphalt plant and at the construction site.

---

[25] (7.8 acres/mile) × (18 months) × (0.11 ton PM10/acre-month) = **15.4 ton/mile**

[26] California Air Resources Board, Emissions Inventory Methodologies, Section 7.8, Road Construction Dust, updated August 1997; http://www.arb.ca.gov/ei/areasrc/fullpdf/full7-8.pdf, accessed July 18, 2010.

[27] *Ibid.*

[28] (7.8 acres/mile) × (1 month) × (0.11 ton PM10/acre-month) = **0.86 ton/mile**;
(0.86 ton/mile) × (1 mile) / (20 working days/month) × (2,000 lb/ton) = **85.8 lb/day**

[29] The term VOC is used interchangeably in this report with the term reactive organic gases ("ROG").

Emissions from asphalt paving occur when asphalt mixtures are applied and as they cure. Emissions of VOCs from asphalt paving have been estimated at 9.2 pounds per barrel ("lb/barrel") applied for emulsified asphalt, 88 lb/barrel applied for cutback asphalt, and 0.9 lb/barrel applied for hot-mix asphalt.[30,31] It takes between 7 and 17 tons of asphalt to pave a mile of road. Assuming the use of hot-mix asphalt, the most commonly type of asphalt, a typical density for hot-mix asphalt of 9 pounds per gallon ("lb/gallon")[32], and the CARB-recommended default factor of 10 tons of asphalt per mile, paving of one mile of road results in VOC emissions of about 48 pounds.[33] The use of even small amounts of cut-back would considerably increase this emissions estimate. For example, using just one percent of cutback would more than double these emissions.[34] These estimates also do not include VOC emissions at the asphalt plant, which are considerable.[35]

Construction equipment and vehicles used to transport asphalt from the asphalt plant, road base from aggregate processing plants, and workers to the construction site would generate exhaust emissions from combustion of diesel and gasoline. Particularly emissions of the ozone precursors nitrogen oxides ("NOx") and VOCs have the potential to exceed the AVAQMD's daily CEQA significance thresholds for these pollutants and further exacerbate the District's state and federal ozone non-attainment status.

Emissions from construction and from maintenance of paved roads must therefore be evaluated and adequately mitigated.

---

[30] Asphalt surfaces and pavements are composed of compacted aggregate and an asphalt binder in the form of either asphalt cement (residue from distillation of crude oils, or liquefied asphalts). To be used for pavement, asphalt cement, which is semisolid, must be heated prior to mixing with aggregate. The resulting hot mix asphalt concrete is generally applied in thicknesses of 2 to 6 inches. Liquefied asphalts are either asphalt cutbacks (asphalt cement thinned with volatile petroleum distillates such as naphtha, kerosene, etc.) or asphalt emulsions (nonflammable liquids produced by combining asphalt and water with an emulsifying agent, such as soap). Liquefied asphalts are used in tack and seal operations, in priming roadbeds for hot mix application, and for paving operations up to several inches thick.

[31] California Air Resources Board, Asphalt Paving and Roofing; http://arbis.arb.ca.gov/ei/areasrc/ccosmeth/att_c_asphalt.doc, accessed July 18, 2010.

[32] *Ibid.* (Asphalt densities of vary between 7 to 9 lb per gallon, with hot-mix asphalts at the heavier end of the scale.)

[33] (10 ton asphalt/mile) × (2,000 lb/ton) / (9 lb/gallon asphalt) / (42 gallons/barrel) × (0.9 lb VOC/barrel asphalt) = **47.6 lb VOC/mile**

[34] (10 ton asphalt/mile) × (2,000 lb/ton) / (9 lb/gallon asphalt) / (42 gallons/barrel) × (88 lb VOC/barrel asphalt) × 0.01 = **59.9 lb VOC/mile**

[35] California Air Resources Board, Asphalt Paving and Roofing; http://arbis.arb.ca.gov/ei/areasrc/ccosmeth/att_c_asphalt.doc, accessed July 18, 2010.

II. Methodology Used to Estimate PERCs Is Flawed

The methodology set forth in MDAQMD's Rule 1406 to calculate PERCs from paving unpaved roads has numerous conceptual and technical problems, some of which are discussed below. The inherent uncertainties and severe methodological flaws in the MDAQMD's Rule 1406 may lead to artificially inflated PERCs, which, in turn, would result in significant adverse impacts on the District's air quality by increasing actual PM_{10} emissions. (*See* Comments II.A through II.D.)

II.A Overview of MDAQMD's Rule 1406 Methodology to Calculate PERCs

For ease of reference for the subsequent comments, the following section briefly summarizes the methodology to calculate PERCs as set forth in the MDAQMD's Rule 1406. Calculation of PERCs as the difference in PM_{10} emissions, in tons/year, from a road in unpaved condition and the emissions from the road after it is paved in paved condition involves the following five steps:

1. Calculation of PM_{10} emission factors for unpaved roads ("$E_{unpaved}$")[36] and paved roads ("E_{paved}")[37] in pounds per vehicle mile traveled ("lb/VMT") based on two equations derived from the U.S. EPA's *Compilation of Air Pollutant Emission Factors* ("AP-42"), Sections 13.2.2 for unpaved roads and 13.2.1 for paved roads, respectively:

   a. $$E_{unpaved} = 1.8\frac{\left(\frac{s}{12}\right)^{1}\left(\frac{S}{30}\right)^{0.5}}{\left(\frac{M}{0.5}\right)^{0.2}}$$

   where
   s = surface material silt content (in percent)
   S = mean vehicle speed (in mph)
   M = average moisture content (in percent)

   b. $$E_{paved} = 0.016\left(\frac{sL}{2}\right)^{0.65}\left(\frac{W}{3}\right)^{1.5}$$

   where
   sL = silt loading (in g/m²)
   W = average vehicle weight (in tons)

2. Calculation of the annual vehicle miles traveled ("VMT") for each unpaved road segment by multiplying the time-weighted average of the two traffic

[36] Proposed Rule 1406, Section (F)(1), pp. 1406-10 – 1406-11; Rule 1406 abbreviates this parameter as E_u.

[37] Proposed Rule 1406, Section (F)(2), p. 1406-11; Rule 1406 abbreviates this parameter as E_p.

counts on each road segment by the length of the respective road segment:[38]
VMT = (# vehicles/year on road segment) × (length of road segment)

3. Calculation of PM_{10} emissions from the road in the unpaved condition and the emissions from the road in the paved condition (in ton/year) by multiplying the PM_{10} emission factors for the unpaved road and paved road (in lb/VMT), respectively, with the annual VMT for the road segment (in VMT/year)[39]:

$$PM_{10}\ emissions_{unpaved} = E_{unpaved} \times \frac{VMT}{2{,}000\ lb/ton}$$
$$PM_{10}\ emissions_{paved} = E_{paved} \times \frac{VMT}{2{,}000\ lb/ton}$$

4. Calculation of PERCs as the difference, in tons per year, between the emissions from the road in the unpaved condition and the emissions from the road in the paved condition:[40]
PERCs = $PM_{10}\ emissions_{unpaved} - PM_{10}\ emissions_{paved}$

Comment II.B below discusses the inherently problematic use of these equations for the purpose of establishing PERCs; Comment II.C demonstrates that this methodology for determining PERCs is flawed because it fails to account for a number of variables influencing traffic on the respective road. Comment II.E summarizes the criticisms that have been raised in the scientific community regarding the AP-42 equations, and Comment II.D addresses the inherent uncertainty in several of the parameters used in these equations.

II.B AP-42 Equations Were Not Developed for the Purpose of Generating Road Paving Emission Reduction Credits

The problem with the approach laid out by the MDAQMD in its proposed Rule 1406 is that the equations contained in AP-42 were never meant to be used in this fashion. The equations for paved and unpaved roads were developed using entirely different experimental procedures at different sites and times and can therefore not be used to determine the difference in entrained road dust emissions that would result from paving an unpaved road.

To make this sort of calculation, a controlled study would have to be conducted at a single site: first measuring emissions from the unpaved road, paving the same road and then measuring the emissions again, controlling everything but the paving, *i.e.*,

---

[38] Proposed Rule 1406, Section (C)(2)(a)(iii), pp. 1406-5 – 1406-6; Rule 1406 fails to provide instruction for calculating the "time-weighted average of the two separate traffic counts."

[39] Proposed Rule 1406 omits instructions for the conversion of lb/year to ton/year.

[40] Proposed Rule 1406, Section (C)(3)(a)(iv), p. 1406-6.

having the same vehicle fleet travel the respective road at the same speed, under the same atmospheric conditions. In contrast, in the AP-42 experiments, none of the important variables (location, vehicle fleet weight, speed, atmospheric conditions, etc.) were controlled or comparable between the two sets of experiments used to derive the paved and unpaved road dust equations.

In addition, there is also the issue of error propagation and the use of default values such as, for example, silt loading and silt content, moisture content, mean vehicle speed, or mean vehicle weight. The U.S. EPA clearly recommends that the use of any default values would result in downgrading the quality rating of the equation used to determine emissions from paved an unpaved roads. Thus, the more default values are used, the less reliable the calculated emission factors becomes.

II.C Methodology Fails to Adjust Short-Duration Traffic Counts for Seasonal Variability, Traffic Count Equipment Variability, and Future Growth of Traffic on Paved Road

The methodology for calculating the annual vehicle miles traveled on the unpaved road relies on the "time-weighted average daily traffic count on each road segment."[41] To determine the average daily traffic count, MDAQMD Rule 1406 Subsection (C)(2)(a) requires that two separate 48-hour traffic counts for each road segment be conducted, one on non-holiday weekdays and the other on a non-holiday weekend. MDAQMD Rule 1406 contains no other requirements to adjust these traffic counts to compensate for temporal variations in vehicle travel.

Roads, including unpaved roads, sustain a variety of vehicular traffic and traffic counts vary considerably depending on the season, day-of-week, geographical location, and the type of equipment used to conduct the traffic count. To address the temporal variability in traffic patterns, short-duration traffic counts such as those proposed in Rule 1406 must be adjusted to estimate the annual average daily travel ("AADT") by compensating for seasonal influence, weekly variation and other variables which may be present. The Federal Highway Administration summarizes:

> "Short duration volume counts usually require a number of adjustments in order to convert a daily traffic volume "raw" count into an estimate of AADT [annual average daily traffic]. The specific set of adjustments needed is a function of the equipment used to collect the count and the duration of the count itself. **Almost all short duration counts require adjustments to reduce the effects of temporal bias, if those short duration counts will be used to estimate AADT.**"[42]

---

[41] Proposed Rule 1406, Section (C)(2)(a), pp. 1406-5 – 1406-6.

[42] Federal Highway Administration, Traffic Monitoring Guide, Section 3, Traffic Volume Monitoring, Chapter 3: Traffic Volume Data Collection Design, Adjustments to Short Duration Volume Counts,

MDAQMD Rule 1406 at one point contained a requirement to adjust the "average daily traffic count" by "daily and monthly seasonal adjustment factors" to be obtained from the most recent Highway Performance Monitoring System data provided by the California Department of Transportation. However, later amendments to MDAQMD Rule 1406 simply removed these requirements "due to a lack of adjustment factors for roads eligible for paving."[43] This is not acceptable as it has the effect of rendering the "time-weighted average daily traffic count" highly unreliable and consequently, the quantity of PERCs calculated based on these traffic counts untrustworthy.

In addition, to the daily and seasonal (monthly) adjustment factors, the determination of the AADT must take into account the applicable axle-correction factor, which depends on the type of equipment used for the traffic count. The Federal Highway Administration explains:

> "Equipment that detects vehicles directly (such as inductance loops or vehicle classification counters), do not require axle adjustment. However, the preponderance of data collection equipment dependent on pneumatic tubes actually counts axles rather than vehicles. To represent vehicles, counts taken by axle counting equipment require adjustment by axle correction factors. In general, the higher the percentage of multi-axle vehicles on a road, the more significant the need for axle correction factors.
>
> Axle correction factors can be applied at either the point or system level. That is, axle correction factors can be developed either from specific vehicle classification counts at specific locations, or from a combination of vehicle classification counts averaged together to represent an entire system of roads.
>
> Because truck percentages (and consequently axle correction factors) change dramatically from road to road, even within functional classes and HPMS strata, this Guide recommends that axle correction factors be developed for specific roads, from vehicle classification counts taken on that road whenever possible. Where possible, the axle correction factor applied to an axle count should come from a classification count performed nearby, on that same road, and from a vehicle classification count that was taken during the same approximate period as the volume count. For roads where these adjustment factors are not available, a "system wide" factor is recommended. The "system wide" factor should be computed by averaging all of the axle correction factors computed in the vehicle

---

May 2001, **emphasis** retained; http://www.fhwa.dot.gov/ohim/tmguide/tmg3.htm#a313, accessed July 18, 2010.

[43] Proposed Rule 1406, Section (C)(2)(iii), p. 1406-6.

classification count sample within a functional classification of roads. Where State highway agencies have developed a "truck route" classification system, this classification system may be substituted for the functional class strata."

Finally, the methodology set forth in MDAQMD Rule 1406 uses the vehicle miles traveled determined on the unpaved road to calculate emissions from the paved road. This fails to account not only for the fact that more vehicles will likely use this road than in its unpaved condition but also for the potential future population growth in the region that would result in increased traffic over the coming decades. Increasing vehicle miles traveled on the road would decrease the actual emission reductions available through road paving. Therefore, the "real" amount of PERCs available will decrease over time, which is not accounted for in Rule 1406. The average annual vehicle miles traveled can be adjusted by the region's applicable growth factor determined according to procedures laid out by the Federal Highway Administration.[44] Because Rule 1406 does not require that vehicle miles traveled be adjusted for population growth it overestimates the amount of future emission reductions.

Clearly, the procedure laid out in MDAQMD Rule 1406 is inadequate and will not result in a representative estimate of vehicle miles traveled on the road in question. The absence of adjustment factors in the California Department of Transportation's Highway Performance Monitoring System is no excuse to use a non-representative procedure. Instead, the AVAQMD should consult with the California Department of Transportation or the Federal Highway Administration to determine how District-specific adjustment factors for unpaved roads can be developed.

II.D Uncertainties Inherent in Source-characteristic Correction Parameters for Calculating PM10 Emission Factors for Paved and Unpaved Roads Result in Uncertainty in Calculating the Quantity of PERCs

As summarized in Comment II.A above as the first numbered item, the calculations of PM_{10} emissions factors for unpaved (1.a) and paved roads (1.b) set forth in Rule 1406 rely on equations derived from U.S. EPA's *Compilation of Air Pollutant Emission Factors*. In addition to a number of empirical constants, these equations rely on several source-characteristic correction parameters, *i.e.* factors that are specific to the roads that are to be paved and regional conditions and characteristics. Entrained PM_{10} emissions from publicly accessible unpaved roads have been found to be correlated with the surface material silt[45] content ("s") and the mean vehicle speed ("S") and inversely correlated with the surface material moisture content ("M"); entrained PM_{10}

[44] U.S. Department of Transportation, Federal Highway Administration, Office of Highway Policy Information, Traffic Monitoring Guide, May 1, 2001; http://www.fhwa.dot.gov/ohim/tmguide/index.htm, accessed July 18, 2010.

[45] Particles smaller than 75 micrometers in diameter.

emissions from paved roads vary with the road surface silt loading ("sL")[46] and the average weight of the vehicles traveling the road ("W"). Because some of these source-characteristic correction parameters are highly variable, it is crucial that the values chosen for these parameters to calculate PM_{10} emissions to generate PERCs accurately reflect local conditions.

The following graph illustrates conceptually how the range of source-characteristic correction parameters used to calculate PM_{10} emission factors for unpaved and paved roads affect the quantity of PERCs calculated according to the protocol set forth in Rule 1406.

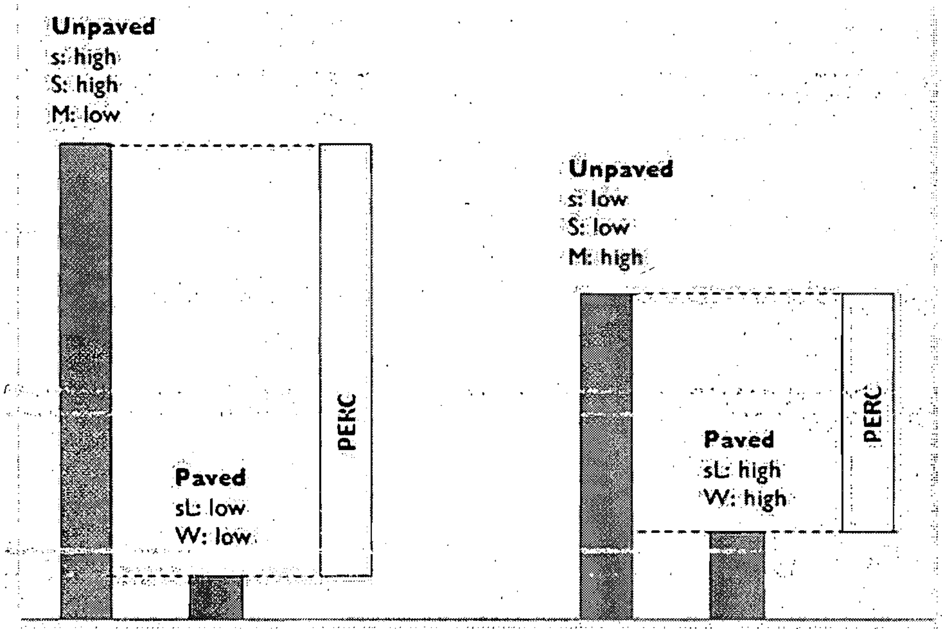


Figure 3: Effects of source-characteristic parameters (s, S, M, sL, and W) for calculating PM_{10} emission factors from unpaved and paved roads on quantity of PERCs calculated according to Rule 1406

Figure 1 illustrates conceptually how PERCs are calculated by determining the difference between PM_{10} emissions from unpaved and paved roads. The left portion of Figure 3 illustrates conceptually how choosing high values for the silt content (s) and mean vehicle speed (S) and low values for the moisture content (M), silt loading (sL) and average vehicle weight (W) would result in high calculated emissions from an unpaved road, low calculated emissions from the same road after paving, and, therefore, in a large quantity of PERCs calculated as the difference between the emissions from the road before and after paving. The right side of Figure 3 illustrates the opposite, *i.e.* the more conservative assumptions for the source-characteristic

[46] Weight of silt per unit area; here in grams per square meter.

parameters, specifically how a low silt content and mean vehicle speed and a high moisture content, silt loading, and average vehicle weight would result in lower calculated emissions from the unpaved road, higher emissions from the road after paving, and therefore, a smaller quantity of PERCs calculated as the difference between the emissions from the road before and after paving. (Calculations of entrained road dust emissions from vehicle travel on unpaved roads are considerably affected by the range of source-characteristic correction parameters (s, S, and M) whereas emissions from paved roads are affected to a lesser extent by the variability of silt loading (sL) and average vehicle weight (W).

This example illustrates conceptually that in case the values for these source-characteristic correction factors are poorly chosen, *i.e.* not representative for the actual conditions of a specific road being paved to generate PERCs, the calculated PERCs could potentially be severely over- or underestimated. Overestimating PERCs would result in increases of PM_{10} emissions within the District because actual PM_{10} emissions from stationary sources would be offset with PERCs that only exist on paper. While most of the source-specific correction parameters chosen for MDAQMD Rule 1406 are reasonably conservative, the proposed silt content default values for unpaved gravel and non-gravel roads do not accurately reflect conditions of unpaved roads in the AVAQMD (nor the MDAQMD). This may lead to substantial overestimates of PERCs which would result in significant adverse impacts on the air quality in the AVAQMD.

Silt Content on Unpaved Roads

The PM_{10} emission factor for unpaved roads ($E_{unpaved}$) is linearly correlated with the silt content (s) of the road surface material. (*See* Equation 1.a in Comment I above.) MDAQDMD Rule 1406 provides the applicant for PERCs with two options for selecting an appropriate value for the silt content: a) experimentally determining the actual silt content with U.S. EPA test methods, or b) using a default silt content ("s") value of 11.0% for non-gravel roads or 6.2% for gravel roads.[47] The MDAQMD's staff report for Rule 1406 does not address how these default values were determined or whether these values are reasonably conservative.

The default values for silt content in MDAQMD's Rule 1406 are likely not going to be representative for the specific unpaved road segments in the AVAQMD selected for purposes of generating PERCs. Surface silt content on public unpaved roads has been determined to range widely between 1.8 and 35 percent.[48] The U.S. EPA specifically warns that "the ranges of silt content vary over two orders of magnitude. Therefore, the use of data from this table can potentially introduce considerable error.

[47] Proposed Rule 1406, Section (F)(1), pp. 1406-10 – 1406-11.

[48] U.S. Environmental Protection Agency, Compilation of Air Pollutant Emission Factors, Section 13.2.2 Unpaved Roads, November 2006, Table 13.2.2-2, p. 13.2.2-5.

Use of this data is strongly discouraged when it is feasible to obtain locally gathered data. Since the silt content of a rural dirt road will vary with geographic location, it should be measured for use in projecting emissions."[49] For the Blythe Energy Project II, which sought to offset PM_{10} emissions with emission reduction credits generated by road paving, the MDAQMD experimentally determined the surface soil silt content for three roads varying from 5 to 12 percent.[50] These results illustrate the variability of silt content and the need for actual measurements rather than default factors. The MDAQMD provided no discussion whatsoever why Rule 1406 does not require to experimentally determine the silt content rather than providing the option of a default value.

The knowledge of the road-specific silt content on unpaved road is critical because the value of the silt content has a large impact on the PM_{10} emission factor and therefore on the amount of PERCs calculated. Inset Table 1 summarizes the quantities of PERCs generated from the hypothetical paving of an unpaved road segment 1 mile in length with an average traffic count of 750 vehicles per day with the silt content of the unpaved road varying from 5 to 12 percent and otherwise using all other default values as proposed by Rule 1406.

Table 1: PM_{10} emission factors and PERCs calculated for 1 mile unpaved road with an average traffic count of 750 vehicles per day

Silt Content	$E_{unpaved}$ (lb/VMT)	PERCs (tons/year)
5%	0.533	72.4
6%	0.640	87.0
7%	0.746	101.6
8%	0.853	116.2
9%	0.960	130.8
10%	1.066	145.4
11%	1.173	160.0
12%	1.279	174.6

[49] U.S. Environmental Protection Agency, Compilation of Air Pollutant Emission Factors, Section 13.2.2 Unpaved Roads, November 2006; p. 13.2.2-1; *emphasis* added.

[50] Alan De Salvio, Mojave Desert Air Quality Management District, Letter to Gerardo Rios, U.S. Environmental Protection Agency Region IX, Re: Blythe Energy Project II and Requested USEPA Approval, District Company No.: 1437, District Facility No.: 2472, January 5, 2006, p. 4: "Road Surface Silt Content (use for unpaved road). This value was determined experimentally for the road while unpaved. Surface soil samples were gathered on January 21, 2002 and analyzed using AP-42 Appendix C (ASTM D 422) to determine silt content." and p. 6: silt contents for Lost Lake Road ("LL"), Hidden Valley Road ("HV"), and Roadrunner Avenue ("RR"), first row of values in Table "Net PM_{10} ERC Issuance Calculation (subtracting paved road emissions); http://snipurl.com/4kvsk or http://www.energy.ca.gov/sitingcases/blythe2/documents/intervenors/2006-01-10_MOJAVE_COMM_AQ.PDF.

Table 1 demonstrates that a difference of only 1 percent in silt content leads to a difference in calculated PERCs of 14.6 tons/year. (Sample calculations for 5 percent and 6.2 percent silt content are provided in attached Table A-1; for 11 percent and 12 percent silt content in attached Table A-2.) This example illustrates how a small difference in silt content results in a substantial difference in the quantity of PERCs when calculated using the default values in Rule 1406 and illustrates that a site-specific silt content is crucial for determining reasonably accurate PERCs. There is a very real potential that the use of the MDAQMD's default factors may considerably overestimate the amount of actual PM_{10} emission reductions generated by paving roads. This inherent uncertainty renders PERCs calculated according to Rule 1406 unenforceable and not permissible for CEQA purposes.

II.E MDAQMD Rule 1406 Is Not Based on Current Information

The U.S. EPA has recently proposed a revised equation for estimating entrained road dust emissions from paved roads.[51] This revision was made as a result of the addition of emissions tests at seven locations. (Four of these test locations involved vehicles traveling at lower speeds than the prior data base.)[52] The equations contained in the November 2006 and proposed June 2006 AP-42 sections for paved roads are shown below:

November 2006: $E = k \times (sL/2)^{0.65} \times (W/3)^{1.5}$

June 2010: $E = k \times (sL/2)^{0.98} \times (W/3)^{0.53} \times (S/30)^{0.16}$

where S = average speed (in mph) of the vehicles traveling on the road

The newer equation accounts for the vehicle speed on the road whereas the older equation does not. Further, the exponents for silt loading (sL) and weight (W) have changed.

Finally, the MDAQMD's Rule 1406 uses a value of 0.016 pounds per vehicle mile traveled ("lb/VMT") for the PM10 particle size multiplier k. The newly adjusted value for the PM10 particle size multiplier k in the June 2010 AP-42 document is 0.015.

---

[51] *See* U.S. Environmental Protection Agency, AP 42, Fifth Edition, Volume I, Chapter 13: Miscellaneous Sources, 13.2.1 Paved Roads; http://www.epa.gov/ttn/chief/ap42/ch13/index.html.

[52] *Ibid*, Explanation of Proposed Revisions; http://www.epa.gov/ttn/chief/ap42/ch13/draft/proposed_revision_paved_roads.pdf.

II.F Critique of AP-42 Equations for Estimating Entrained Road Dust Emissions from Paved and Unpaved Roads

The emission equations used in Rule 1406 to determine the amount of PERCs generated from paving unpaved roads were determined by multiple linear regressions from various field studies in which particulate emissions from roads were measured together with variables that affect these emissions. The equations are empirical models that lack a mechanistic foundation. They are not based on fundamental scientific and engineering principles, but rather on statistical relationships. The U.S. EPA's investigations indicate that the uncertainty in estimated emissions is large.[53]

Literature surveys indicate a large uncertainty concerning the particulate matter emissions from vehicle travel on roads by dust re-suspension and abrasion. Numerous experts have weighed in on the lack of a decent model. For example, one expert group has called into question the performance of these models as unsuitable. In fact, a detailed study of the paved road equation by the University of California concluded that "[t]here is no reason to believe that the purely empirical AP-42 model for paved road emissions provides credible estimates of the "mean" emission factor." The study concluded that the AP-42 equation for paved roads "is not likely to provide adequate estimates of PM_{10} emissions from paved roads."[54]

Other studies have concluded similarly. One study concluded with respect to the paved road equation that "[c]onsidering the uncertainties associated with this equation, great care is required in utilizing this model in control programs. In fact, site-specific experimental information would be more desirable than the surrogate measurements found in the EPA study, for SIP development."[55] Another critique of the paved and unpaved road equations concluded that the "published emission factors, especially those for paved roads currently used in EPA models, are subject to large uncertainties, and should be refined if they are to be used as the basis for implementing control strategies to reduce ambient PM_{10}."[56] Hence, numerous studies have concluded based on careful field studies that the equations used by MDAQMD Rule 1406 are not appropriate for purposes of calculating accurate emissions, and, by extension, for determining emission reductions credits for paving unpaved roads.

---

[53] *See, e.g.*, U.S. Environmental Protection Agency, Emissions Factor Uncertainty Assessment Report, February 2007; http://snipurl.com/4j9t8 or http://www.epa.gov/ttn/chief/efpac/documents/ef_uncertainty_assess_draft0207s.pdf.

[54] A. Venkatram, A Critique of Empirical Emission Factor Models: A Case Study of the AP-42 Model for Estimating PM10 Emissions from Paved Roads, Atmospheric Environment, v. 34, pp. 1-11, 2000.

[55] R. Kantamaneni *et al.*, The Measurement of Roadway PM10 Emission Rates Using Atmospheric Tracer Ratio Techniques, Atmospheric Environment, v. 30, 1996, at 4222.

[56] C.S. Claiborn, A. Mitra, G. Adams, L. Bamesberger, G. Allwine, R. Kantamaneni, B. Lamb, and H. Westberg, Evaluation of PM10 Emission Rates from Paved and Unpaved Roads Using Tracer Techniques, Atmospheric Environment, v. 29, 1995, pp. 1075-1089.

Emissions calculated from a generic statistically based equation may be suitable for an area-wide inventory, but not for source-specific actual emissions because, as the U.S. EPA remarked, the AP-42 emission factors "essentially represent an average of a range of emission rates, approximately half of the subject sources will have emission rates greater than the emission factor and the other half will have emission rates less than the factor."[57] Thus, if half of the road segments have higher baseline emissions from unpaved roads than calculated, PERCs would be overestimated. Source-specific tests "can determine the actual pollutant contribution from an existing source better than can emission factors."[58] As discussed in the following comments, MDAQMD Rule 1406 does not require determination of source-specific baseline emissions from unpaved roads even though such measurements are feasible and routinely performed. In addition to using a generic equation instead of actual measurements, MDAQMD Rule 1406 further corrupts the calculation of PERCs by only requiring generic and unrepresentative default values for variables used in the calculations. These calculations do not yield "actual" emissions, which must be used to determine the emissions baseline from the unpaved road and to reliably determine the quantity of PERCs that would be available through paving. They would therefore be equally unreliable for the AVAQMD.

III. Generation of PERCs Would Result in Adverse Impacts on Biological Resources

Paving dirt or gravel roads may result in a number of adverse direct and indirect impacts on biological resources. Direct impacts include mortality during road construction and increased frequency of roadkill from vehicle travel on paved roads. In contrast, many indirect effects of roads are cumulative and involve changes in community structure and ecological processes. These indirect impacts include spread of invasive plant species; air, water, soil, and noise pollution; soil disturbance and erosion; and increase of roadway pollutants and associated habitat loss, degradation and fragmentation; alteration of wildlife movement; and changes in wildlife populations. These effects should therefore be investigated in a CEQA review.

III.A Paving Roads Would Result in Direct Mortality during Construction

Paving of unpaved roads in the District would involve improvement of the existing sub-base including removal of gravel surface layers, widening of the road footprint, and heightening of the road base. Any vegetation along the unimproved road

[57] U.S. Environmental Protection Agency, Introduction to AP-42, Volume 1, Fifth Edition, p. 2; http://www.epa.gov/ttn/chief/ap42/c00s00.pdf, accessed July 18, 2010.

[58] *Ibid*, p. 3.

would be removed as well as any organisms living in that vegetation or the unimproved road shoulders. These activities will often result in the loss of sessile or slow-moving organisms in the path of the road.

A number of animals live in or adjacent to road shoulder berms of unimproved roads in the District. These include the Western burrowing owl (*Athene cunicularia hypgugea*), a state and federal species of concern. Burrowing owls do not dig their own burrows but prefer to adopt vacant tortoise, kit fox, ground squirrel, or other rodent dens or burrows, frequently found in unimproved road shoulders or adjacent vegetation. Burrowing owls are very susceptible to burrow disturbance, particularly during their breeding season from the beginning of February through end of August. Similarly, the desert tortoise (*Gopherus agassizii*), listed as threatened under the federal and state Endangered Species Acts, frequently constructs burrows along the elevated berms of unpaved roads because the topography mimics that formed along the banks of desert washes, a preferred site for burrow construction.[59] Many other species may also be adversely affected during the construction phase, including the Mojave ground squirrel (*Spermophilus mohavensis*), listed as threatened under the California Endangered Species Act.

The MDAQMD's Rule 1406 contains no requirements that road paving contractors conduct burrowing owl, desert tortoise, or Mojave ground squirrel surveys prior to disturbing unpaved road shoulders. The MDAQMD's Rule 1406 also does not contain any seasonal restrictions or mitigation measures to minimize impacts on burrowing owl, desert tortoise, or ground squirrel populations. Thus, it is likely that construction activities associated with paving roads would impact active burrows of these species and result in direct mortality of individuals. This is a significant impact that should be mitigated to the extent feasible. Pre-construction surveys should be required following accepted protocols, *e.g.*, the *Burrowing Owl Survey Protocol and Mitigation Guidelines* [60] and the *Field Survey Protocol for Desert Tortoise*[61]. During construction, operators of heavy equipment should be accompanied by a qualified biologist to minimize mortalities. Mitigation measures such as relocating impacted animals and securing suitable habitat elsewhere should be required and implemented according to accepted guidelines. Adverse impacts on these species can also be minimized by imposing seasonal restrictions to road paving with late fall and winter, *i.e.* outside of the breeding season for these species, being the best time for these activities.

---

[59] Luckenbach R.A., Ecology and Management of the Desert Tortoise (*Gopherus agassizii*) in California. In: Bury R.B. (Ed.), North American Tortoises: Conservation and Ecology, Washington, D.C., U.S. Fish and Wildlife Service Wildlife Research Report 12, pp. 1-39.

[60] California Burrowing Owl Consortium, Burrowing Owl Survey Protocol and Mitigation Guidelines, 2001.

[61] U.S. Fish and Wildlife Service, Field Survey Protocol for Any Non-federal Action that May Occur Within the Range of the Desert Tortoise, January 2002.

III.B Paving Would Lead to Increased Incidents of Roadkill

Animals are attracted to paved roads for a variety of reasons, often to their demise. Dark pavement absorbs radiant heat and releases it at night, creating a "heat island" around roads. This can attract heat-seeking species such as birds and snakes to roads, increasing their mortality by vehicle collision. Paving an unpaved road can elevate the road to higher service levels and may divert traffic from nearby unpaved roads. The increased volume of traffic on the newly paved section of the road would result in increased incidents of wildlife mortality. Further, paving typically increases traffic speed on this section of the road. Traveling at greater speeds reduces the ability of the driver to see animals on the road or on the shoulders, resulting in increased incidents of road kill. Unpaved roads, particularly when "unimproved," are typically less dangerous for wildlife.

Roadkill is the greatest directly human-caused source of wildlife mortality throughout the U.S. with more than a million vertebrates every day. In the Mojave Desert, the slow-moving desert tortoise is particularly at risk for collisions with fast-moving vehicles. Vehicle collisions are also the leading cause of mortality in mountain lions (*Puma concolor*)[62] and burrowing owls.

Roads can be designed to minimize impacts with the addition of specialized undercrossing to accommodate wildlife wanting to get from one side to the other. Caltrans has established standard designs that allow for the passage of various animal sizes. When properly used, these designs will decrease the amount of roadkill.[63] The MDAQMD's Rule 1406 does not contain any design requirements for road paving to minimize roadkill.

III.C Paving Unpaved Roads Would Increase Habitat Fragmentation and Alteration

Not all animals are attracted to roads. Some species associate roads with negative experiences and are reluctant to cross the barrier presented by roads; other species are physically unable to cross road embankments. For these species, a road effectively cuts the population in half. A network of roads fragments the population further. The remaining small populations are then vulnerable to problems associated with rarity: genetic deterioration from inbreeding and random drift in gene frequencies, environmental catastrophes, fluctuations in habitat conditions, and demographic

---

[62] Dickson B.G., Jenness J.S., and Beier P., Influence of Vegetation, Topography, and Roads on Cougar Movement in Southern California, Journal of Wildlife Management, Vo. 69, No. 1, January 2005, pp. 264-276.

[63] Chuck Morton, Caltrans, Presentation at UC Davis, Road Ecology, Integrating Transportation and the Natural Environment, The Roads' Footprint. TTP 289A/B, April 12, 2007.

stochasticity (*i.e.*, chance variation in age and sex ratios). Thus, roads contribute to what many conservation biologists consider the major threat to biological diversity: habitat fragmentation. Such fragmentation may be especially ominous in the face of rapid climate change. If organisms are prevented from migrating to track shifting climatic conditions, and cannot adapt quickly enough because of limited genetic variation, then extinction is inevitable.

In general, adding a road to the landscape automatically fragments the habitat. The road becomes a physical barrier to many of the natural processes, such as drainage, wildlife movement, that are present on the landscape. The road will create a "break" in the plant landscape that may separate populations of plants and animals and may affect reproductive success. Fragmentation may also allow predators to hunt and thrive along the new edge habitats.[64]

Paving unpaved roads would increase habitat fragmentation for at least some species in the Mojave Desert. For example, studies have shown that dirt roads facilitate movement of mountain lions through their habitat but traveling mountain lions avoid 2-lane paved roads.[65] Thus, paving roads could lead to further habitat fragmentation and associated increased population pressure for mountain lions. Embankments of paved roads are also typically steeper than those of unpaved roads, which for many species, including desert tortoises, increase the difficulty to crossing these roads and, as a result, may lead to habitat fragmentation and the above-discussed associated consequences. As mentioned before, roads can be designed with the addition of specialized undercrossing to accommodate wildlife crossings, which would minimize habitat fragmentation. The MDAQMD's Rule 1406 contains no provisions to require undercrossings to minimize habitat fragmentation pressure on desert wildlife populations.

In addition to habitat fragmentation, habitat along the roads would also be permanently altered. During construction, impacts on habitat from road paving include soil compaction, soil excavation, stripping and stockpiling of topsoil, drying out of topsoil, and vegetation removal. Long-term impacts from paving to the roadside environment would result in changes in the immediate microclimate due to changes in stormwater runoff patterns such as flooding or drainage effects, increased paved area, higher temperatures, and drier conditions along roads. Microclimates along paved roads have been observed to change between 30 and 120 feet from the road surface. The presence of a paved road may cause wildlife to shift home ranges, and alter their movement pattern, reproductive behavior, escape response and physiological state.

---

[64] *Ibid.*

[65] Dickson B.G., Jenness J.S., and Beier P., Influence of Vegetation, Topography, and Roads on Cougar Movement in Southern California, Journal of Wildlife Management, Vol. 69, No. 1, January 2005, pp. 264-276.

When roads act as barriers to movement, they also bar gene flow where individuals are reluctant to cross for breeding.

For example, animals rely on hearing to avoid predators, obtain food, and communicate. Desert animals, in particular, require a very acute sense of hearing to survive. Noise pollution and vibration from roads, initially from construction equipment and later from increased and faster traffic, can degrade wildlife habitat and impair biodiversity. Most frequently, noise pollution leads wildlife to avoid roads, but it has also been shown to change reproductive behavior and other patterns of activity. Animals respond to noise pollution by altering activity patterns, and with an increase in heart rate and production of stress hormones. Exposure to chronic noise has been shown to lead to hearing loss in some species, thereby reducing their ability to avoid predators and obtain food.[66] Sometimes animals become habituated to increased noise levels, and apparently resume normal activity. But birds and other wildlife that communicate by auditory signals may be at a disadvantage near roads.

III.D Paving Unpaved Roads Increases Spread of Invasive Plant Species

Paving roads has been found to increase the spread of invasive non-native and opportunistic native plant species. Vehicles carry and distribute seeds on their tires and undercarriages. The establishment of invasive species along roads is promoted by changing habitat by altering conditions; stressing or removing native species during road improvement; and allowing easier movement by wild or human vectors.

The new edge habitats created by paving roads are often unsuitable for native species, but attractive to invasive, non-native species or opportunistic native species from where they can spread into open areas.[67] In general, plant productivity is greater along paved than dirt roads. A study analyzing roads with varying degrees of improvement in a desert ecosystem found that each step of road improvement converted an increasing area of natural habitat to roadside habitat, from which non-native weeds spread into adjacent natural ecosystems. Non-native cheatgrass, for instance, was three times more abundant in verges beside paved roads than in those bordering four-wheel-drive tracks. Verges along improved roads were also wider — about 3 feet on each side of a four-wheel-drive track versus 23 feet on a paved road.[68]

---

[66] Noise Pollution Clearinghouse, Noise Effects on Wildlife, Fact Sheet.

[67] Chuck Morton, Caltrans, Presentation at UC Davis, Road Ecology, Integrating Transportation and the Natural Environment, The Roads' Footprint, TTP 289A/B, April 12, 2007.

[68] Matthew L. Brooks and Bridget Lair, United States Geological Survey, Ecological Effects of Vehicular Routes in a Desert Ecosystem, March 2, 2005;
http://www.dmg.gov/documents/Desert_Road_Ecology_report.pdf.

Non-native or invasive species pose a significant threat to our nation's biological diversity, and are causing substantial economic burdens. Each year, approximately $137 billion nationwide is lost to the effects of invasive plants on agriculture, industry, recreation, and the environment. An estimated 4,600 acres of land are invaded daily by invasive plants. Invasive species impact nearly half the species currently listed as threatened or endangered under the federal Endangered Species Act.

Annual plant invaders already commonly occur on berms along most paved roads in the Mojave Desert and severely threaten ecosystem integrity. Improved roads can act as conduits for the invasion of adjacent ecosystems.[69] Non-native invasive mustards including London Rocket (*Sisymbrium irio*), Sahara mustard (*Brassica tournefortii*), and Indian hedge mustard (*Sisymbrium orientale*) have in the past years been spreading at an alarming rate and are entirely covering many previously sparsely vegetated road sides and desert areas. Native creosote bush is abundant species that opportunistically exploits the increased moisture levels along roadsides. A study investigating productivity and diversity relationships in the Mojave Desert roadside vegetation found that the edge effect of a paved road increases productivity as reflected by standing crop, by approximately 17 times on the basis of the vegetated area alone and 6 times when the area of the bare road surface was included as part of the productive unit. An unpaved road showed only an increase of approximately 6 and 3 times in the respective categories. The increase in vigor has been shown to attract herbivorous insects, so it is conceivable that the herbivorous desert tortoise selects burrows in proximity to high densities of food plants as well.[70]

III.E Paving Roads Would Increase Roadside Pollution

Paved roads typically require considerably increased roadside management compared to unpaved roads. This includes mowing or herbicide application to keep the shoulders of the road clear of vegetation. Chemicals used in the maintenance of roadways contaminate roadside ecosystems. While many state departments of transportation have begun to reduce the use of herbicides and other chemicals, the use of herbicides continues to damage roadside ecosystems. Those chemicals may also promote the invasion of weedy and exotic species, which are resistant to herbicides.

Another source of pollution is direct leaching of poly-aromatic hydrocarbons ("PAHs") from the asphalt road itself. In the past, PAHs in roadside runoff were solely attributed to deposition from car exhaust fumes. However, research from Australia indicates that relatively high concentrations of PAHs can be introduced into soils

---

[69] *Ibid.*

[70] Johnson H.B., Vasek F.C., and Yonkers T., Productivity, Diversity and Stability Relationships in Mojave Desert Roadside Vegetation, Bulletin of the Torrey Botanical Club, Vol. 102, No. 3, 1975, pp. 106-115.

through leaching from asphalt surfaces.[71] PAHs are known to have potential for adverse effects to a large number of animals, including invertebrates, birds, and mammals.

Increased vehicular travel on paved roads would also increase the amount of NOx emissions from exhaust fumes, which has been positively correlated with increased levels of nitrogen in the surrounding soil. Experiments in the Mojave Desert suggest that increased soil nitrogen can promote the growth of non-native annual plants and reduce growth and diversity of native annual plants.[72]

IV. Conclusions

In my opinion, there is a reasonable possibility that the generation and use of PERCs to offset the Project's PM10 emissions would result in significant adverse impacts on the environment. These potential impacts from the proposed mitigation for Project emissions should be analyzed under CEQA before PERCs are generated and used. The CEC maintains that its preliminary staff assessment ("PSA") satisfies CEQA review requirements for the proposed road paving PM10/2.5 offsets."[73] However, the above discussed issues were nowhere discussed in the PSA.

Please feel free to call me at (321) 626-6885 or e-mail at phyllisfox@gmail.com if you have any questions about the comments in this letter.

Sincerely,

Phyllis Fox

[71] Sadler R., Delamont C., White P., and Connell D., Contaminants in Soil as a Result of Leaching from Asphalt, Toxicological and Environmental Chemistry, Vol. 68, 1997, pp. 71-81; in: Criley M. and Postelli K., From Gravel to Pavement — The Impacts of Upgrading; The Road-RIPorter, Vol. 5, No. 4, July/August 2000.

[72] Brooks M.L. and Lair B., Ecological Effects of Vehicular Routes in a Desert Ecosystem, United States Geological Service, March 2, 2005.

[73] California Energy Commission, Preliminary Staff Assessment, Volume 2, Palmdale Hybrid Power Project, 08-AFC-9, CEC-700-2010-001-PSA, February 2010, pp. 4.1-30 – 4.1-32; http://www.energy.ca.gov/2010publications/CEC-700-2010-001/CEC-700-2010-001-PSA.PDF

Table A-1: Calculation of PERCs with 5% and 6.2% silt content for gravel road

PM10 Emission Factor for Unpaved Road

$E_{unpaved} = 1.8 \times (s/12)^1 (S/30)^{0.5} / (M/0.5)^{0.2}$		from Rule 1406
$E_{unpaved}$	**0.533 lb/VMT**	
s	5 %	MDAQMD measured lower end of range
S	20 mph	from Rule 1406
M	1 %	from Rule 1406

PM10 Emission Factor for Paved Road

$E_{paved} = 0.016 \times (sL/2)^{0.65} (W/3)^{1.5}$		from Rule 1406
E_{paved}	**0.0039 lb/VMT**	
sL	0.23 g/m^2	from Rule 1406
W	3 ton	from Rule 1406

PM10 Emission Factor for Calculating PERCs (Unpaved - Paved Road)

$(E_{unpaved}) - (E_{paved})$ **0.53 lb/VMT**

PERCs

PERCs = PM10 Emission Factor x AVMT x (365 days/year) / (2,000 lb/ton)

Length of Road (miles)	Average Daily Traffic Count	DVMT	AVMT	PERCs (tons/tear)
1.00	750	750	273,750	**72.4**

PM10 Emission Factor for Unpaved Road

$E_{unpaved} = 1.8 \times (s/12)^1 (S/30)^{0.5} / (M/0.5)^{0.2}$		from Rule 1406
$E_{unpaved}$	**0.661 lb/VMT**	
s	6.2 %	Rule 1406 default for gravel road
S	20 mph	from Rule 1406
M	1 %	from Rule 1406

PM10 Emission Factor for Paved Road

$E_{paved} = 0.016 \times (sL/2)^{0.65} (W/3)^{1.5}$		from Rule 1406
E_{paved}	**0.0039 lb/VMT**	
sL	0.23 g/m^2	from Rule 1406
W	3 ton	from Rule 1406

PM10 Emission Factor for Calculating PERCs (Unpaved - Paved Road)

$(E_{unpaved}) - (E_{paved})$ **0.66 lb/VMT**

PERCs

PERCs = PM10 Emission Factor x AVMT x (365 days/year) / (2,000 lb/ton)

Length of Road (miles)	Average Daily Traffic Count	DVMT	AVMT	PERCs (tons/tear)
1.00	750	750	273,750	**89.9**

Difference 17.5 tons/year

Table A-2: Calculation of PERCs with 11% and 12% silt content for non-gravel unpaved road

PM10 Emission Factor for Unpaved Road

$E_{unpaved} = 1.8 \times (s/12)^{1} (S/30)^{0.5} / (M/0.5)^{0.2}$ from Rule 1406

$E_{unpaved}$	**1.173 lb/VMT**	
s	11 %	Rule 1406 default for non-gravel unpaved road
S	20 mph	from Rule 1406
M	1 %	from Rule 1406

PM10 Emission Factor for Paved Road

$E_{paved} = 0.016 \times (sL/2)^{0.65} (W/3)^{1.5}$ from Rule 1406

E_{paved}	**0.0035 lb/VMT**	
sL	0.23 g/m^2	from Rule 1406
W	3 ton	from Rule 1406

PM10 Emission Factor for Calculating PERCs (Unpaved - Paved Road)

($E_{unpaved}$) - (E_{paved}) **1.17 lb/VMT**

PERCs

PERCs = PM10 Emission Factor x AVMT x (365 days/year) / (2,000 lb/ton)

Length of Road (miles)	Average Daily Traffic Count	DVMT	AVMT	PERCs (tons/tear)
1.00	750	750	273,750	**160.1**

PM10 Emission Factor for Unpaved Road

$E_{unpaved} = 1.8 \times (s/12)^{1} (S/30)^{0.5} / (M/0.5)^{0.2}$ from Rule 1406

$E_{unpaved}$	**1.279 lb/VMT**	
s	12 %	MDAQMD measured higher end of range
S	20 mph	from Rule 1406
M	1 %	from Rule 1406

PM10 Emission Factor for Paved Road

$E_{paved} = 0.016 \times (sL/2)^{0.65} (W/3)^{1.5}$ from Rule 1406

E_{paved}	**0.0035 lb/VMT**	
sL	0.23 g/m^2	from Rule 1406
W	3 ton	from Rule 1406

PM10 Emission Factor for Calculating PERCs (Unpaved - Paved Road)

($E_{unpaved}$) - (E_{paved}) **1.28 lb/VMT**

PERCs

PERCs = PM10 Emission Factor x AVMT x (365 days/year) / (2,000 lb/ton)

Length of Road (miles)	Average Daily Traffic Count	DVMT	AVMT	PERCs (tons/tear)
1.00	750	750	273,750	**174.7**

Difference 14.6 tons/year

BEFORE THE ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION OF THE STATE OF CALIFORNIA
1516 NINTH STREET, SACRAMENTO, CA 95814
1-800-822-6228 – WWW.ENERGY.CA.GOV

APPLICATION FOR CERTIFICATION For the *PALMDALE HYBRID POWER PROJECT*

Docket No. 08-AFC-9

PROOF OF SERVICE
(Revised 7/1/2010)

APPLICANT
Thomas M. Barnett
Executive Vice President
Inland Energy, Inc.
3501 Jamboree Road
South Tower, Suite 606
Newport Beach, CA 92660
tbarnett@inlandenergy.com

Antonio D. Penna Jr.
Vice President
Inland Energy
18570 Kamana Road
Apple Valley, CA 92307
tonypenna@inlandenergy.com

Laurie Lile
Assistant City Manager
City of Palmdale
38300 North Sierra Highway, Suite A
Palmdale, CA 93550
llile@cityofpalmdale.org

APPLICANT'S CONSULTANTS
Sara J. Head, QEP
Vice President
AECOM Environment
1220 Avenida Acaso
Camarillo, CA 93012
sara.head@aecom.com

COUNSEL FOR APPLICANT
Michael J. Carroll
Marc Campopiano
Latham & Watkins, LLP
650 Town Center Drive, Ste. 2000
Costa Mesa, CA 92626
michael.carroll@lw.com
marc.campopiano@lw.com

INTERESTED AGENCIES
Ronald E. Cleaves, Lt. Col, USAF
Commander ASC Det 1 Air Force Plant 42
2503 East Avenue P
Palmdale, CA 93550
Ronald.Cleaves@edwards.af.mil

Erinn Wilson
Staff Environmental Scientist
Department of Fish & Game
18627 Brookhurst Street, #559
Fountain Valley, CA 92708
E-mail preferred
ewilson@dfg.ca.gov

Richard W. Booth, Sr. Geologist
Lahontan Regional
Water Quality Control Board
2501 Lake Tahoe Blvd.
South Lake Tahoe, CA 96150-2306
rbooth@waterboards.ca.gov

Rick Buckingham
3310 El Camino Avenue, LL-90
State Water Project
Power & Risk Office
Sacramento, CA 95821
E-mail preferred
rbucking@water.ca.gov

Manuel Alvarez
Southern California Edison
1201 K Street
Sacramento, CA 95814
Manuel.Alvarez@sce.com

***Robert C. Neal, P.E.**
Public Works Director
City of Lancaster
44933 Fern Avenue
Lancaster, CA 93534-2461
rneal@cityoflancasterca.org

California ISO
E-mail Preferred
e-recipient@caiso.com

Robert J. Tucker
Southern California Edison
1 Innovation Drive
Pomona, CA 91768
Robert.Tucker@sce.com

Christian Anderson
Air Quality Engineer
Antelope Valley AQMD
43301 Division St, Suite 206
Lancaster, CA 93535
E-mail preferred
canderson@avaqmd.ca.gov

Keith Roderick
Air Resources Engineer
Energy Section/Stationary Sources
California Air Resources Board
P.O. Box 2815
Sacramento, California 95812
E-mail preferred
kroderic@arb.ca.gov

ENERGY COMMISSION
JEFFREY D. BYRON
Commissioner and Presiding Member
jbyron@energy.state.ca.us

*indicates change

ANTHONY EGGERT
Commissioner and Associate Member
aeggert@energy.state.ca.us

Paul Kramer
Hearing Officer
pkramer@energy.state.ca.us

Kristy Chew
Advisor to Commissioner Byron
E-mail preferred
kchew@energy.state.ca.us

Lorraine White
Advisor to Commissioner Eggert
E-mail preferred
lwhite@energy.state.ca.us

Felicia Miller
Project Manager
fmiller@energy.state.ca.us

Lisa DeCarlo
Staff Counsel
ldecarlo@energy.state.ca.us

Jennifer Jennings
Public Adviser
publicadviser@energy.state.ca.us

*indicates change

DECLARATION OF SERVICE

I, ____________, declare that on, ____________, I served and filed copies of the attached ____, dated ____________. The original document, filed with the Docket Unit, is accompanied by a copy of the most recent Proof of Service list, located on the web page for this project at: **[http://www.energy.ca.gov/sitingcases/palmdale/index.html]**. The document has been sent to both the other parties in this proceeding (as shown on the Proof of Service list) and to the Commission's Docket Unit, in the following manner:

(Check all that Apply)

For service to all other parties:

_____ sent electronically to all email addresses on the Proof of Service list;

_____ by personal delivery;

_____ by delivering on this date, for mailing with the United States Postal Service with first-class postage thereon fully prepaid, to the name and address of the person served, for mailing that same day in the ordinary course of business; that the envelope was sealed and placed for collection and mailing on that date to those addresses **NOT** marked "email preferred."

AND

For filing with the Energy Commission:

___ sending an original paper copy and one electronic copy, mailed and emailed respectively, to the address below (preferred method);

OR

____depositing in the mail an original and 12 paper copies, as follows:

CALIFORNIA ENERGY COMMISSION
Attn: Docket No. 08-AFC-9
1516 Ninth Street, MS-4
Sacramento, CA 95814-5512
docket@energy.state.ca.us

I declare under penalty of perjury that the foregoing is true and correct, that I am employed in the county where this mailing occurred, and that I am over the age of 18 years and not a party to the proceeding.

____