Bay Area Air Quality Management District
375 Beale Street
San Francisco, CA 94105

Rule Development Workshop Report
Particulate Matter

Draft New Regulation 6: General Provisions, Definitions and Test Methods
Technical Review and Evaluation of Potential Emission Reductions

Draft Amendments to Regulation 6, Rule 1: General Requirements
Draft New Regulation 6, Rule 6, Prohibition of Trackout
Draft New Regulation 6, Rule 7: Roofing Asphalt
Draft New Regulation 6, Rule 8: Bulk Material Storage and Handling

2010 Clean Air Plan, and
Stationary Source Measure SSM 6

WORKSHOP REPORT
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Table of Contents

I. INTRODUCTION AND SUMMARY 5

II. BACKGROUND 7

A. Introduction to Particulate Matter 7

B. Bay Area PM Emissions and PM Formation 8

Primary PM Emissions 8

Secondary PM Emissions 9

Aligning Emissions with Ambient Air Monitoring Results 9

Seasonal Impacts 10

C. PM Health Effects 11

D. Other Impacts of PM 13

E. Bay Area’s Attainment Status of PM Air Quality Standards 13

F. Measuring PM Emissions 15

Particulate Matter Test Methods 15

Measuring Opacity 17

Observing Visible Dust Plumes 17

III. REGULATORY FRAMEWORK 17

A. Overview Current of BAAQMD PM Regulations 18

Interplay with State and Federal PM Requirements 19

IV. TECHNICAL REVIEW 20

A. Air District PM Emissions Inventory 20

B. Review of Bay Area Stationary Sources for PM Reductions 21

PM from Combustion 21

PM from Wide Variety of Stationary Sources 22

Opportunities for PM Emissions Reductions 22

PM Emissions from Combustion 24

PM Emissions from Industrial Stacks and Vents 25

Control of Fugitive Dust 26

Control of Trackout onto Paved Roads 30

Control of Asphalt 33

V. NEW DRAFT REGULATION 6 34

A. General Provisions 34

B. Definitions 34

C. Test Methods 35

VI. EMISSION REDUCTION BENEFITS & COMPLIANCE COSTS 35

A. Emission Reductions Expected 35

B. Costs of Controls 35

C. Other Impacts that may require Resources 35

VII. RULE DEVELOPMENT AND PUBLIC CONSULTATION PROCESS 35

A. Rule Development Process 35

B. Public Outreach and Consultation 36

C. Review of Potential Environmental Impacts Under CEQA 38

D. Review of Potential Economic and Job Impacts with a Socio-Economic Analysis 38

VIII. REFERENCES.. 40

IX. APPENDICES.. 41

APPENDIX A-1: 2011 PARTICULATE EMISSIONS INVENTORY - TONS PER DAY.. 41

APPENDIX A-2: SIGNIFICANT PM EMISSIONS SOURCE CATEGORIES...... 43

APPENDIX A-3: ANALYSIS OF POTENTIAL PM CONTROLS ON AFFECTED FACILITIES 52

Basic Refining Processes 52

Chemical Manufacturing 52

Other Food and Agricultural Processes 53

Asphaltic Concrete Plants.. 54

Roofing Asphalt.. 55

Concrete Batching 55

Glass & Related Products Manufacturing... 55

Stone, Sand & Gravel 56

Landfills and Other Waste Management 57

Other Industrial & Commercial Processes.. 58

Bay Area Rapid Transit Car Cleaning Facilities 59

Smaller Sources 59

Construction Operations (Residential, Commercial, Institutional, Industrial, and Roads) 59

Entrained Road Dust.. 61

Bulk Material Storage and Handling, Including Coke and Coal Operations 63

APPENDIX A-4: APPLICABLE FEDERAL STANDARDS.................................... 64

APPENDIX A-5: EXAMPLES OF CONTROL MEASURES / BEST MANAGEMENT PRACTICES FOR DUST CONTROL.............................. 66

APPENDIX A-6: TEST METHODS FOR DETERMINING SOIL STABILIZATION.. 82

I. INTRODUCTION AND SUMMARY

The Bay Area Air Quality Management District (Air District) is proposing revisions to Regulation 6, Rule 1: General Requirements, the Air District's general particulate matter emissions limitation rule, and a new over-arching regulation for Particulate Matter, Regulation 6: General Provisions, Definitions and Test Methods (Reg 6). The new Regulation 6 is proposed to provide general provisions, definitions and test methods that apply to existing Regulation 6 rules and any other source-specific rules as they are developed in the future. This Workshop Report provides background information on new Regulation 6 and a brief summary of the rationale for updating Regulation 6, Rule 1 (Rule 6-1). A separate Workshop Report (Appendix B) has been developed to provide the information supporting the draft amendments to Rule 6-1. The two draft rules and two workshop reports are intended to provide the public with information on both the new Regulation 6 and draft amendments to Rule 6-1 in advance of public workshops the Air District will hold in early 2017.

The draft amendments to Rule 6-1 address a commitment by the Air District's Board of Directors to review Regulation 6, Rule 1: General Requirements, identified as Stationary Source Measure SSM-6 in the Air District's 2010 Clean Air Plan. Since the 2010 Clean Air Plan, Air District staff further committed to taking steps to address the Bay Area's particulate matter challenges in a November 2012 report entitled *Understanding Particulate Matter: Protecting Public Health in the San Francisco Bay Area*. These draft amendments to Regulation 6, Rule 1 are the first of many steps needed to reduce particulate matter emissions and improve public health.

Background work and analysis was done during the development of potential amendments to Rule 6-1, and is intended to provide the foundation for the Air District's efforts to reduce public exposure to unhealthy levels of particulate matter. Small particles cause or contribute to a wide variety of serious health problems, including asthma, bronchitis, cardio-vascular diseases, and cancer. The Air District has committed to reduce particulate matter levels to achieve significant health benefits. Staff expects that additional, source-specific rulemaking will build upon this foundation.

Staff identified three additional opportunities to reduce particulate emissions, and has developed the following draft new rules:

- Regulation 6, Rule 6: Prohibition of Trackout
  - prohibit trackout of dirt and other solids onto adjacent roadways, and prevention of road dust that comes from vehicles subsequently driving over the dirt and solids.
- Regulation 6, Rule 7: Roofing Asphalt
  - control asphalt fumes that are both odorous and condense to form tiny particles in the air.
- Regulation 6, Rule 8: Bulk Material Storage and Handling
  - control of dust from bulk material storage and handling.

Similarly, separate Workshop Reports (Appendix C, D, & E) have been developed for each of these draft new rules to provide supporting information. The draft rules and workshop reports are intended to provide the public with information on each new rule and draft amendments to Rule 6-1 in advance of public workshops the Air District will hold in early

2017.

Staff is proposing a new Regulation 6: General Provisions, Definitions and Test Methods to provide administrative, monitoring and recordkeeping requirements; definitions; and test methods that apply to all Regulation 6, Particulate Matter regulations. Draft new Reg 6 includes the following:

- General provisions regarding administrative requirements, monitoring and recordkeeping.
- Definitions that apply to all particulate matter rules. This approach standardizes the definitions and provides a single reference location for these definitions. Definitions can be compromised when located in several source specific rules, where version control is difficult.
- Source test methods that apply to all or most individual particulate matter rules. Similarly, this approach standardizes test methods and provides a single reference location for these test methods.

Staff proposes draft amendments to Rule 6-1 because its particulate standards have not been updated in decades; other air districts in California have more stringent standards, and amendments are needed to ensure the Bay Area standards are health-protective. Control technology is available that facilities can use to comply at a reasonable cost; and the revised standards will obtain $PM_{2.5}$ reductions that will help the Air District achieve its health-based $PM_{2.5}$ goals.

This Workshop Report describes the analysis of all of the various particulate matter sources to determine where there may be opportunity for significant emission reductions. Following this introduction and summary, Section II provides background information on particulate matter and the challenges it presents in the Bay Area. Section III describes the regulatory framework for the existing Air District rules, state requirements and federal laws that affect particulate matter emissions. Section IV provides a technical review of the sources of particulate matter in the Bay Area and the technologies available to control these sources of particulate matter emissions. This background establishes the basis for the amendments to Rule 6-1, and for each of the draft new rules. Section V provides a discussion of draft new Regulation 6. Section VI provides a discussion of the expected air quality benefits, and compliance costs. Section VII outlines the public outreach process that the Air District is undertaking in developing the draft new rule, including further information on how interested members of the public can get involved. Similar workshop reports are found in the Appendix for the draft amendments to Rule 6-1, and the three additional new draft rules.

The Air District invites all interested members of the public to review the draft new regulation and this Workshop Report, and to attend one of the public workshops in early 2017. Air District staff will discuss the drafts at the workshops, request feedback and input from the public, and will continue to accept written feedback for two weeks after the last workshop. Air District staff may revise the drafts based on the input received, and will present final proposals to the Air District's Board of Directors for consideration. For further information in advance of the public workshop, please contact Guy Gimlen, Principal Air Quality Engineer, (415) 749-4734, ggimlen@baaqmd.gov.

II. BACKGROUND

This section provides background information regarding airborne particulate matter and associated concerns with public health. The following discussion summarizes and applies information provided in four Air District source documents:

- Bay Area 2010 Clean Air Plan (see Appendix A of the Plan),
- Health Impact Analysis of Fine Particulate Matter in the San Francisco Bay Area, published in September 2011,
- Understanding Particulate Matter: Protecting Public Health in the San Francisco Bay Area, published in November 2012; and
- Sources of Bay Area Fine Particles: 2010 Update and Trends, published in December 2012.

A. Introduction to Particulate Matter

Particulate Matter (PM) encompasses a diverse assortment of tiny airborne particles of different sizes, physical states, chemical compositions, and toxicity. Individual particles can vary in terms of their behavior in the atmosphere and the length of time they remain suspended in the air. PM can originate from a variety of anthropogenic stationary and mobile sources, as well as from natural sources. Typically, PM consists of a mixture of microscopic solid particles and minute liquid droplets known as aerosols that condense at atmospheric temperatures. PM can be emitted directly to the atmosphere (referred to as direct PM or primary PM), or formed in the atmosphere through reactions between other pollutants (referred to as indirect or secondary PM). Primary PM includes soot and liquid aerosols from a wide variety of sources, including cars, trucks, buses, industrial facilities, power plants, cooking and burning wood. Primary PM also includes dust from construction sites, tilled fields, paved and unpaved roads, landfills and rock quarries. Secondary PM may be formed when various pollutants from burning fuels such as sulfur oxides (SO_X) and nitrogen oxides (NO_X) react with volatile organic compounds (VOC) and ammonia in the presence of sunlight and water vapor. PM includes carbon and various metallic elements; compounds such as nitrates, organics, and sulfates; and complex mixtures such as diesel exhaust, wood smoke, and soil. Dust from roads, quarries and construction sites are generally larger, coarser particles, whereas combustion soot and secondary PM tend to be very fine particles. Unlike the other criteria pollutants, which are individual chemical compounds, particulate matter is the total weight of all particles in the air.

PM is often characterized based on particle size using the following terminology:

- **Total Suspended Particulate (TSP)**, which includes all sizes of airborne particles.
- **PM_{10}**, which is the fraction of the total particles in the atmosphere that are 10 microns or smaller in diameter (one micron or micrometer equals one-millionth [10^{-6}] of a meter). This includes $PM_{2.5}$ (described next).
- **$PM_{2.5}$**, which is the fraction of total particles that are 2.5 microns or smaller in diameter, and is sometimes referred to as “fine” PM. This includes ultrafine PM (described next).
- **Ultrafine PM**, which consists of particles smaller than 0.1 micron in diameter.

Larger particles weigh the most, so large particles represent the largest fraction in terms of weight, whereas the smaller particles are more numerous and have more surface area in aggregate but usually contribute less toward the total mass of PM_{10}. Ultrafine PM is estimated to account for roughly 90% of the total number of particles but usually represent much less of a percentage of the mass.

When the 1970 Clean Air Act was adopted, regulatory efforts to address PM focused primarily on Total Suspended Particulate (TSP), the generic name for all particles of any size. Regulation 6, Particulate Matter; Rule 1: General Requirements was developed at that time. Subsequently, scientific evidence pointed to smaller particles as posing the most serious health consequences. Therefore, in 1987, EPA replaced its TSP clean air standard with a PM_{10} clean air standard – one that regulated particles less than 10 microns in diameter. In 1997, EPA augmented its PM_{10} standard with a $PM_{2.5}$ clean air standard focused on particles less than 2.5 microns in diameter.

B. Bay Area PM Emissions and PM Formation

PM chemistry and formation is complex and variable. PM concentrations vary considerably both in composition and spatial distribution and on a day-to-day basis as well as from season to season.

<u>Primary PM Emissions</u>

Direct $PM_{2.5}$ emissions in the Bay Area are produced by a wide variety of sources, both human and natural, but dominated by a few. About half of Bay Area $PM_{2.5}$ is directly emitted from combustion, i.e., burning fossil fuels, wood and other vegetative matter; or cooking. This directly emitted $PM_{2.5}$ is mostly composed of organic carbon compounds and soot containing pure carbon, as well as gases that form liquid aerosols as they cool, known as condensable PM.

Combustion of fossil fuels in all types of engines produces direct emissions of PM. In addition, motor vehicles also: i) cause re-entrainment of dust on and along the side of roads as they drive, ii) create particles known as road dust by abrading road materials such as concrete and asphalt pavement, and iii) create tiny particles from tire and brake pad wear. Combustion of fossil fuels also creates NO_x and SO_x which can react with other air pollutants to form secondary PM.

Diesel engines emit a complex mixture of air pollutants, with a major fraction consisting of $PM_{2.5}$. Diesel emissions account for roughly one-sixth of total emissions of carbonaceous $PM_{2.5}$ in the Bay Area. Because exposure to diesel PM is linked to a wide range of negative health effects, as described below, reducing emissions of diesel PM from heavy-duty engines is a priority for the California Air Resources Board (CARB) and the Air District. Diesel PM emissions from heavy-duty vehicles have already declined substantially over the past decade, and they are expected to continue decreasing significantly over the next decade in response to recent CARB Diesel Risk Reduction Program regulations and Air District regulations.

Geological dust, which includes construction dust and windblown dust, accounts for a relatively modest fraction of $PM_{2.5}$ (5 - 10%), but a very large portion of PM_{10} (50 - 60%). Sea salt from the ocean contributes another 10% on an annual basis.

<u>Condensable PM Emissions</u>

Condensable particulates are a subset of directly emitted, primary particulate matter. Condensable PM leaves the hot engine exhaust or industrial stack in gaseous form, and then condenses to form liquid aerosols or solid particles after mixing with cooler ambient air. The amount of condensable PM is an unknown for many industrial sources, because methods to accurately quantify condensable PM have only recently been developed.

Secondary PM Emissions

In addition to directly emitted PM, emissions of PM precursors such as sulfur dioxide, NO_X, ammonia, and volatile hydrocarbons contribute to atmospheric chemical reactions that form secondary PM. Ammonia reacts with sulfur dioxide (SO_2) to form ammonium sulfate. Combustion of fossil fuels produces NO_X, which combines with ammonia in the atmosphere to form ammonium nitrate. Volatile organic compounds can also form particles through a number of complex chemical mechanisms in the atmosphere. These secondary PM compounds constitute approximately one-third of the Bay Area $PM_{2.5}$ on an annual basis, and approximately 40 – 45% of Bay Area $PM_{2.5}$ during winter peak periods.[1] Secondary PM formation of ammonium sulfate is relatively low (averaging 1-2 $\mu g/m^3$), but it does account for approximately 10% of total $PM_{2.5}$ on an annual average basis.

Even though primary (direct) PM and secondary PM are defined in terms of the processes and sources that produce PM, most individual particles in the atmosphere are in fact a combination of both primary and secondary PM. An individual particle typically begins as a core or nucleus of carbonaceous material, often containing trace metals. These primary (directly emitted) particles are geologic dust or originate from incomplete combustion of fossil fuels or biomass. Layers of organic and inorganic compounds then condense or deposit onto the particle, causing it to grow in size. These layers are largely comprised of secondary material that is not emitted directly. As a particle grows larger, gravity eventually causes it to be deposited onto a surface.

Aligning Emissions with Ambient Air Monitoring Results

Determining the relative contributions of various sources of direct emissions and $PM_{2.5}$ precursors to the total is very complex. An estimate of the relative contribution from various sources is based on the emissions inventory data combined with results of chemical mass balance (CMB) analysis[2] of the material gathered by the ambient air monitors. In analyzing PM sources, there may be discrepancies between the estimated PM emissions inventory and ambient PM concentrations estimated from CMB analysis. For example, the emissions inventory lists road dust, construction dust, and windblown dust as significant sources, whereas chemical mass balance analysis shows such dust to be a very small portion of $PM_{2.5}$, particularly during winter when $PM_{2.5}$ levels are at their highest. A likely explanation is that humidity is generally higher during the winter rainy season, so geologic

[1] Understanding Particulate Matter: Protecting Public Health in the San Francisco Bay Area, November 2012, page 72.

[2] Chemical mass balance (CMB) analysis is a methodology in which a computer model is used to apportion ambient $PM_{2.5}$ collected on filters over 24-hour periods at monitoring sites around the Bay Area to a set of source categories. Each filter was analyzed for a range of chemical species. The same species were measured in special studies of emissions from various sources, such as motor vehicles and wood burning. The CMB model finds the mix of these source measurements that best matches the ambient sample, chemical species by chemical species.

dust is less likely to become airborne during winter. An additional influence is that fugitive dust does not necessarily stay airborne over extended distances. Larger $PM_{2.5}$ particles – i.e. those nearly 2.5 microns in diameter tend to settle out relatively quickly, whereas smaller particles – those less than 1 micron in diameter including combustion related $PM_{2.5}$ – can stay airborne much longer.

Seasonal Impacts

The Air District has found that $PM_{2.5}$ levels that occur on a given day are strongly influenced by the prevailing weather.

Cool weather is especially conducive to the formation of ammonium nitrate. Ammonium nitrate is a significant source of secondary $PM_{2.5}$ in winter months, contributing approximately 10 – 20% of total $PM_{2.5}$ near the coast, and 40 – 50% of total $PM_{2.5}$ inland. This semi-volatile $PM_{2.5}$ component is stable in solid form only during the cool winter months.

The relationship between the weather and $PM_{2.5}$ levels has been analyzed using a statistical technique known as cluster analysis to find groups of days exhibiting similar conditions. Cluster analysis was applied to 10 years of measurements to determine winter weather patterns associated with elevated Bay Area $PM_{2.5}$ levels. Cluster analysis found that a single weather pattern accounted for most elevated 24-hour $PM_{2.5}$ episodes in the Bay Area. $PM_{2.5}$ exceedances in the Bay Area usually occurred after 2-4 consecutive days of $PM_{2.5}$ buildup under a high-pressure system. High $PM_{2.5}$ episodes are typically regional in scale, affecting multiple Bay Area locations, but can also be highly localized depending on proximity of a source, meteorology and other factors. These conditions occur when a high-pressure system moves over Central California in winter months, resulting in sunny days and clear, cold nights with little wind. The lower levels of solar radiation (sunlight) in the winter lead to strong temperature inversions. These inversions are conducive to the buildup of PM in ambient air near ground level, especially $PM_{2.5}$ and ultrafine particles, which can remain airborne for a number of days.

Winter is also when the most residential wood burning occurs. The CMB analysis shows that both fossil fuels and biomass (primarily wood) combustion sources are large $PM_{2.5}$ contributors in all seasons. The biomass combustion's contribution to peak 24-hour $PM_{2.5}$ levels is about 3-4 times higher in winter than the other seasons, as confirmed by isotopic carbon (^{14}C) analysis, reflecting increased levels of wood burning during the winter season. In the Bay Area, wood smoke is the largest source of airborne $PM_{2.5}$ during winter elevated 24-hour PM episodes.

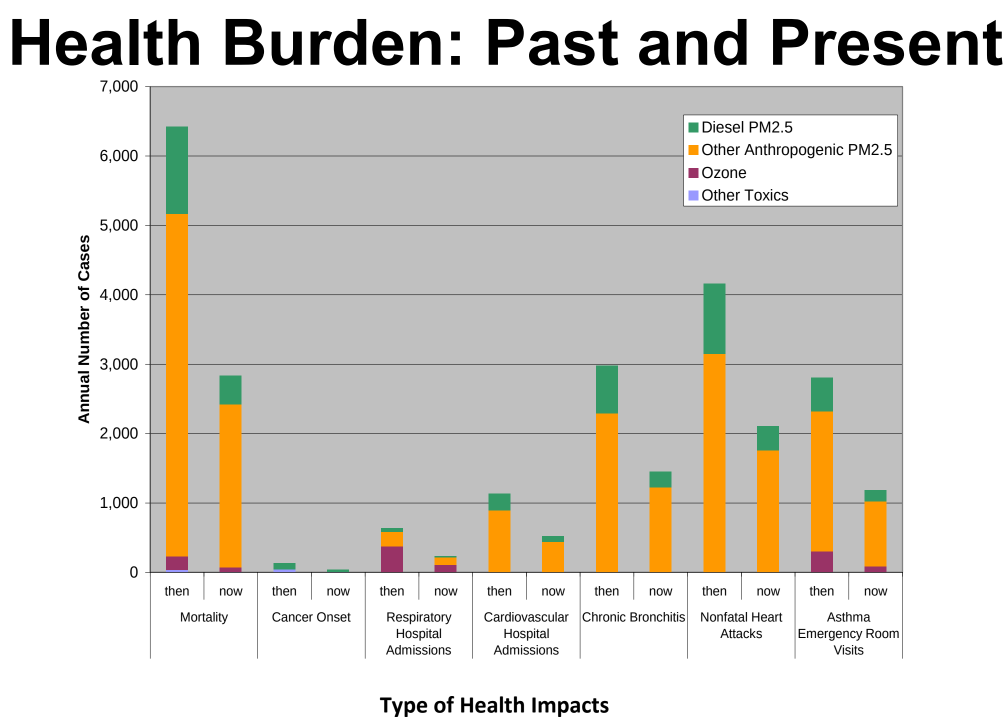
During winter months, the Bay Area may also be impacted by PM from the Central Valley. High-pressure systems over Central California are highly conducive to the build-up of $PM_{2.5}$ in the Central Valley. As dense cold air converges on the Central Valley floor, which increases air pressure, air flows westward through the Carquinez Strait and into the Bay Area, thereby transporting $PM_{2.5}$ from the Central Valley to the Bay Area. When $PM_{2.5}$ from the Central Valley combines with $PM_{2.5}$ emitted or formed within the Bay Area, elevated PM levels in the Bay Area can occur, especially in the eastern parts of the region closest to the Central Valley.

C. PM Health Effects

Because exposure to ambient PM has long been understood as a health hazard,[3] PM was designated as one of the criteria pollutants in the original 1970 federal Clean Air Act. Concerns about PM were initially based on its respiratory health effects, such as aggravating asthma, bronchitis, and emphysema. However, in recent years, many epidemiological studies have linked PM exposure to a much wider range of negative health effects, including cardiovascular effects such as atherosclerosis (hardening of the arteries), ischemic strokes (caused by obstruction of the blood supply to the brain), and heart attacks. Studies also indicate that exposure to PM may be related to other health effects, including reduction in cognitive function, autism, and increased risk of diabetes. Infants and children, the elderly, and persons with heart and lung disease are most sensitive to the effects of PM.

Analysis by Air District staff found that $PM_{2.5}$ is the most significant air pollution health hazard in the Bay Area, particularly in terms of premature mortality.[4] Studies have concluded that reducing PM emissions can reduce mortality and increase average life span.[5] Figure II-1 shows the assessment of air pollution impacts on key health indicators in the Bay Area related to exposure to emissions of PM, ozone and toxics. The graph presents information for "now" (based on 2008 data) compared to several decades ago (1970's for ozone, late 1980's for toxics and PM).

Figure II-1: Assessment of Bay Area Health Burden from PM & Other Air Pollutants



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[3] The London fogs of the early 1950s that killed thousands of people were primarily caused by PM from coal, which led to the banning of coal burning within the city.
[4] See Appendix A in the Bay Area 2010 Clean Air Plan.
[5] For example, a recent study of nationwide scope found that reducing fine PM results in significant and measurable improvements in human health and life expectancy. Pope, C. Arden III et al. "Fine Particulate Air Pollution and Life Expectancy in the United States." New England Journal of Medicine, January 22, 2009. Volume 360:376-386. No. 4.

Although the epidemiological evidence that shows strong correlation between elevated PM levels and public health effects is very well documented, scientists are still working to understand the precise biological mechanisms through which PM damages our health. A recent study by researchers at the University of Michigan suggests that PM may harm our bodies by a combination of 1) increasing blood pressure and 2) triggering a response causing inflammation that can stiffen and damage blood vessels.[6]

The smaller the particle, the more easily it can evade the body's filtration system, penetrate deep into the lungs and enter the bloodstream. Research in recent years suggests that both $PM_{2.5}$ and "ultrafine" particles (those less than 0.1 microns) may actually pose the most serious threat to public health.[7] Because of their small size, $PM_{2.5}$ and ultrafine particles account for a relatively small fraction of total PM mass; however, they comprise the vast majority of particles by number. In addition, small particles have a much higher surface area per mass than larger particles; therefore, they can act as carriers for other agents such as trace metals and organic compounds that collect on their surface. Again, internal combustion engines, whether powered by gasoline, diesel, or natural gas, are a major source of $PM_{2.5}$ and ultrafine PM. Studies in Southern California have found elevated counts of ultrafine particles near freeways. Numerous studies have shown increased incidence of respiratory and cardiovascular disease near heavily traveled roadways.

Public health officials and regulatory agencies, including the California Air Resources Board (CARB), have expressed particular concern about population exposure to PM from diesel engines. Diesel PM endangers public health not only as a component of $PM_{2.5}$, but also as a carcinogenic Toxic Air Contaminant (TAC). Analysis of toxic air contaminants in the Bay Area for the Air District's Community Air Risk Evaluation (CARE) program identified diesel PM as the TAC responsible for the majority of cancer risk from air pollution in the Bay Area. It should be noted, however, that the mortality risk from diesel PM primarily relates to its role as a component of $PM_{2.5}$, rather than as a carcinogenic TAC.

Significant progress has been made to enhance our technical understanding of PM, including improved monitoring and enhanced modeling capabilities. However, because the shift in focus toward PM is relatively recent, efforts to analyze and control PM still lag behind pollutants such as ozone, ozone precursors, and carbon monoxide. Research on the health impacts of $PM_{2.5}$ and ultrafine particles is still evolving, and no ambient air quality standards for ultrafine PM have yet been established. Existing state and national PM standards are based on mass (weight) concentrations in the air, rather than the number of airborne particles.

Silica is the primary component of sand, and concerns about silica are beginning to emerge as a potentially hazardous material-similar to asbestos in many ways. As more information develops regarding silica, depending on the health hazard posed, further regulation will likely be required. Staff will monitor the situation and will update the regulation to

[6] See Robert Brook et al. "Insights into the Mechanism and Mediators of the Effects of Air Pollution Exposure on Blood Pressure and Vascular Function in Healthy Humans" Hypertension: Journal of the American Heart Association, July 29, 2009.

[7] See Chapter 11 (Ultrafine Particles) in the 2007 South Coast Air Quality Management Plan.

incorporate the best controls as the science improves.

A study of particle suspension in the air has shown that larger particles (larger than PM_{10}) fall back to the earth quickly (typically within 100 - 200 feet), and smaller particles ($PM_{2.5}$) tend to dissipate in the surrounding air. Measurements of diesel and other ultrafine PM from vehicles on the freeways indicate that particulates tend to reach background concentrations about 250 meters away from the freeway.[8] [9]

The chemical and physical properties of PM vary greatly with time, region, meteorology, and source, thus complicating the assessment of health and welfare effects. One of the challenges in devising strategies to reduce PM is that scientists are still working to determine the relative risk associated with the many types, sources and sizes of particles that comprise PM. Better information in this regard will help prioritize our efforts to achieve the greatest benefit in reducing health risks associated with PM. Nevertheless, our best knowledge to date suggests that fine particles themselves are harmful, irrespective of composition, and reduction of $PM_{2.5}$ concentrations result in significant health benefits.

D. Other Impacts of PM

PM emissions also have impacts on the climate. PM aerosols can help to reduce the full effect of global warming by scattering sunlight. Conversely, black carbon or soot, a component of PM emitted by diesel engines and by wood or biomass combustion, absorbs sunlight and thus contributes to global warming. Because airborne particles can have both cooling and heating effects, it is difficult to determine the net impact of $PM_{2.5}$ on climate. However, there is consensus that we need to decrease emissions of black carbon to protect the climate.[10]

Particulate matter, especially larger particles (TSP and PM_{10}) can constitute significant nuisances and are a source of public complaints, particularly about dust. Dust can also exacerbate a wide variety of respiratory issues. PM is a prime cause of regional haze, which is a more general quality of life issue.

E. Bay Area's Attainment Status of PM Air Quality Standards

The U.S. Environmental Protection Agency and California Air Resources Board have adopted health-based standards for PM_{10} and $PM_{2.5}$. The federal standards are referred to as the National Ambient Air Quality Standards (NAAQS), and the California standards are referred to as the California Ambient Air Quality Standards (CAAQS) and are designed to protect public health. Both sets of standards are set as concentrations of particles (either 10 microns or smaller, or 2.5 microns or smaller) in the ambient air, using units of micrograms per cubic meter ($\mu g/m^3$). The California's standards are generally more stringent and are the most health-protective in the nation, providing additional protection for the most sensitive groups of people.

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[8] Improving Air Quality and Health in Bay Area Communities, Community Air Risk Evaluation Program Retrospective and Path Forward (2004 – 2014), April 2014, page 76.

[9] Zhu, Y.F., W.C. Hinds, S. Kim, S Shen, C. Sioutas, 2002. Study of ultrafine particles near a major highway with heavy-duty diesel traffic. Atmospheric Environment, 36, 4323-4335. doi:10.1016/S1352-2310(02)00354-0.

[10] US EPA Report to Congress on Black Carbon, March 2012

Both the national and California standards are reviewed periodically to evaluate whether developments in public health and medical research suggest that the standards should be made even more stringent. To date, researchers have not been able to identify a clear threshold below which there are no adverse health effects from exposure to $PM_{2.5}$. This suggests that $PM_{2.5}$ standards may be further reduced in the future.

EPA and the Air Resources Board classify each region in the state as to whether or not it is "attaining" each NAAQS and CAAQS. A summary of the Bay Area's attainment status with respect to each national standard is as follows:

National Air Quality Standards	**Limit**	**Design Value**	**Attainment Status**
National 24 hour $PM_{2.5}$ standard (3-year average of 98th percentiles)	35 µg/m^3 [a]	30	Non-attainment [b]
National Annual $PM_{2.5}$ standard (3 year average)	12 µg/m^3	11.4	Attainment
National 24 hour PM_{10} standard	150 µg/m^3 [c]	58	Unclassified

[a] US EPA tightened the national 24-hour $PM_{2.5}$ standard from 65 to 35 µg/m^3 in 2006. The designation of the Bay Area as non-attainment for the 24-hr national $PM_{2.5}$ standard became effective on December 14, 2009.

[b] On January 9, 2013, U.S. EPA issued a Clean Data Finding for the 2006 24-hour $PM_{2.5}$ National Ambient Air Quality Standard based on air monitoring data, published in the Federal Register, Vol. 78, Page 1760 (78 FR 1760). However, the Bay Area AQMD has not yet submitted a redesignation request to EPA. The Bay Area will continue to be designated as non-attainment until such time as the District submits a redesignation request and maintenance plan to EPA, and EPA approves the request.

[c] The national 24-hour PM_{10} standard allows one exceedance per year over 3 years with every-day sampling. Because PM_{10} is sampled on a 1 in 6-day schedule, this means that, in practice, ANY exceedance would violate the standard.

As explained in the table's note b, the U.S. EPA has issued a Clean Data Finding for the 2006 24-hour $PM_{2.5}$ standard based on air monitoring data, so the Air District is very near attainment for each of the national particulate matter standards. The air monitoring data indicator for attainment of national standards is known as the "Design Value." The Design Value for the 24-hour $PM_{2.5}$ standard is the most recent 3-year average, and for 2011 through 2015 those averages ranged from 26 to 31 µg/m^3, well under the standard of 35 µg/m^3. The Bay Area is in attainment with the national annual $PM_{2.5}$ standard. The Bay Area is currently unclassified for the national 24 hour PM_{10} standard, but monitoring data indicates that ambient concentrations in the region are well below the standard.

A summary of the Bay Area's attainment status with respect to each California standard is as follows:

Air Quality Standard	**Limit**	**Designation Value**	**Attainment Status**
California Annual $PM_{2.5}$ standard (maximum of most recent 3 years)	12 µg/m^3	12	Non-attainment [d]
California 24 hour PM_{10} standard	50 µg/m^3	58	Non-attainment
California Annual PM_{10} standard	20 µg/m^3	22	Non-attainment

[d] Monitoring data shows that the Bay Area now complies with the State annual $PM_{2.5}$ standard. However, because the region has not yet been redesignated as attainment for the State annual $PM_{2.5}$ standard by CARB, the Bay Area is shown as non-attainment for this standard.

The Air District is in compliance with the California annual $PM_{2.5}$ standard of 12 µg/m^3. The air monitoring data indicator for attainment of the California standards is known as the "Designation Value", and at three highest different air monitoring locations in the Bay Area (Napa, San Pablo, and San Jose) for 2013, 2014 and 2015 that value is 12 µg/m^3.

The Air District is not in attainment with the California 24 hour PM_{10} standard of 50 µg/m^3. The air monitoring data for the State 24 hour PM_{10} standard are:

1. The number of days that are estimated to exceed the standard,
2. The high of the 24-hour average, and
3. The 24 hour Expected Peak Day Concentration (EPDC).

Compliance with the 24 hour PM_{10} standard is determined as follows:

- An Expected Peak Day Concentration (EPDC) is computed based on the available 24-hour data from each monitoring site,
- The EPDC is an estimate of the 24 hour PM_{10} concentration that would be exceeded once per year on average,
- Each site's Designation Value is the highest measured PM_{10} concentration below the EPDC, and
- If the Designation Value exceeds 50 µg/m^3 the site does not meet the standard.

The Bay Area does not meet the 50 µg/m^3 standard in most air monitoring locations.

The Air District is not in attainment with the California Annual PM_{10} standard of 20 µg/m^3. The air monitoring data for the annual PM_{10} standard are:

1. The annual average, and
2. The highest of the most recent three years of the annual average.

Compliance with the annual PM_{10} standard, each monitoring location must be at or below 20 µg/m^3 for each of the most recent three years. San Jose averaged 22.2 µg/m^3 during 2013, 20.0 µg/m^3 during 2014, and 20.8 µg/m^3 during 2015.

The Bay Area is not yet in compliance with California PM_{10} clean air standards.

F. Measuring PM Emissions

Particulate Matter Test Methods

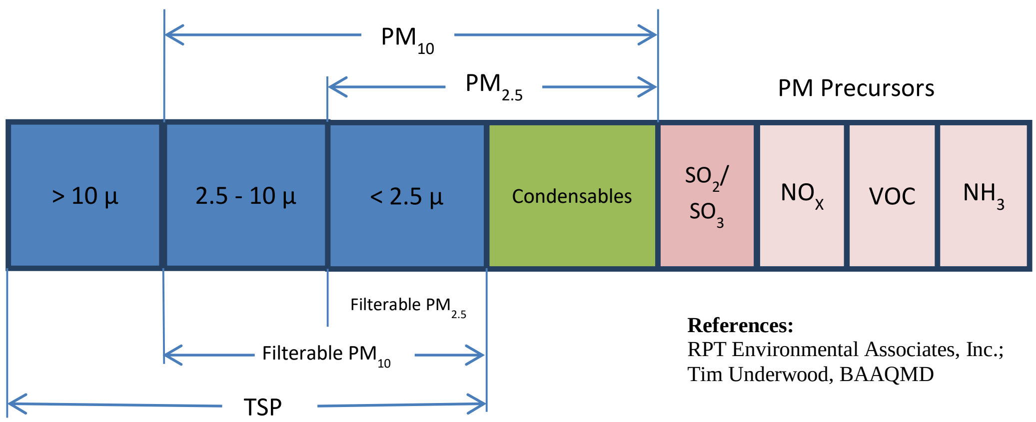
Test methods used to characterize and quantify PM emissions have evolved over time.

PM regulatory efforts initially focused on TSP, and EPA's original test method, EPA Test Method 5, was designed to measure TSP. EPA Test Method 5 measures the solid particles in a sample stream with a filter that is designed to collect 99.5% of all particles larger than 0.3 microns. The solid particles captured in the sample probe and on the filter are known as "filterable" PM. The Air District has its own testing procedures, which are set forth in the Air District's Manual of Procedures (MOP). The MOP Source Test Method ST-15 has been used to quantify PM emissions from permitted stationary sources in the Air District, and was in use prior to development of EPA Test Method 5. MOP Source Test Method ST-15 is similar to EPA Method 5. It collects solid matter on an in-stack filter that is designed to capture 99.5% of particles 0.3 micron and larger, i.e. all the filterable particles known as Total Suspended Particles. The MOP Source Test Method ST-15 reports emissions results for Total Suspended Particles (TSP) in units of +/- 0.002 grains/standard dry cubic feet, and in pounds per hour.

When the PM_{10} clean air standard replaced the TSP standard in 1987, EPA developed a revised test method to measure PM_{10}. The revision incorporated addition of a cyclone that separated large particles from the PM_{10}. The revised test methodology is called EPA Test Method 201/201A.

When $PM_{2.5}$ requirements were added in 1997, Test Method 201/201A was further refined to differentiate PM_{10} from $PM_{2.5}$ by using an additional cyclone to segregate the particles larger than 2.5 microns from those smaller. After filtration, both test methods cool the sample stream to capture any liquid aerosols and solid particles that condense. The liquids and solids captured after cooling are known as "condensable" PM and were sometimes referred to as "back half" PM emissions. Condensable PM is measured by EPA Test Method 202. All condensable PM is considered $PM_{2.5}$, since it is formed after passing through a 0.3 micron filter. The condensable particles can also be separated into organic and inorganic condensable particulates. There is no standardized test method yet for ultrafine PM.

The following diagram shows the many forms of Particulate Matter, and test methods needed to differentiate each. Regulation 6 defines these terms and test methods. Amendments to Rule 6-1 will cite the specific test methods required for compliance.



Total Suspended Particles (TSP): Particulate matter identified as filterable particulate matter (also known as front half particulate matter) using EPA Test Method 5.

PM_{10}: Particulate matter with an aerodynamic diameter equal to 10 microns or less, including both filterable and condensable particles.

$PM_{2.5}$: Particulate matter with an aerodynamic diameter equal to 2.5 microns or less, including both filterable and condensable particles.

Filterable PM_{10}: Particulate matter with an aerodynamic diameter equal to 10 microns or less that can be filtered out of a gas stream at its normal operating temperature. These liquid and/or solid particles are identified using EPA Test Method 201A.

Filterable $PM_{2.5}$: Particulate matter with an aerodynamic diameter equal to 2.5 microns or less that can be filtered out of a gas stream at its normal operating temperature. These liquid and/or solid particles are identified using EPA Test Method 201A.

Condensable PM: Liquid droplets that coalesce, or gaseous emissions that condense to form liquid or solid particles. These liquid and/or solid particles are identified as condensable organic or condensable inorganic particulate matter using EPA Test Method 202.

A significant amount of source testing has taken place on the Bay Area's largest stationary sources. Mid-sized stationary sources in the Bay Area have source tests done based on a recurring test schedule, and smaller stationary sources have source tests done upon request. As test methods changed over the years, the historical source test results have been a mix of TSP, PM_{10} and $PM_{2.5}$ information, sometimes clearly identified as "filterable" and "condensable" PM, and sometimes not clearly identified. Quality of the Air District PM data will improve with use of consistent source test methods.

Measuring Opacity

Opacity is a measurement of the degree to which particulates in an exhaust stream or dust plume obscures the ability of an observer to see through the exhaust stream or dust plume. Opacity can also be measured by a beam of light's ability to pass through the exhaust stream without being reflected by any particles in the exhaust stream. As such, opacity is a surrogate for the much more complicated and time intensive source testing (mass-based measurements) of PM emissions. Regulation 6, Rule 1: General Requirements, Regulation 6, Rule 3: Wood-burning Devices, and Regulation 12, Rule 4: Sandblasting all refer to the opacity test method cited in the MOP, based on EPA Test Method 9. This opacity test method requires a person to be trained and certified to view and "read" the degree to which the emissions obscure the observer's view, and report the result using percent opacity, or the Ringelmann scale from 0 – 5, representing 20% increments of reduced opacity. EPA Method 5 defines the observer's positioning requirements in relation to the emission (with the sun at the observer's back), and requires the observer to view, read and record the opacity once every 15 seconds for the duration of an observation period. Opacity limits are typically defined as "no more than 20% opacity (or Ringelmann 1) for no more than a cumulative three minutes (which would be 12 readings at 15 second intervals) in any sixty minute observation period."

EPA has recently certified an alternate method, based on an American Society for Testing and Materials (ASTM) procedure to measure opacity by using a digital camera and calculating the opacity based on the digital picture of the emissions compared to the background. The Air District is working with this technology to determine what role it will play in the future.

Observing Visible Dust Plumes

Fugitive dust can also be regulated by defining requirements that limit "visible emissions," in terms of whether dust or a dust plume is visible or not. EPA Test Method 22 uses the same requirements for observer positioning as EPA Method 9, and assesses whether the emission is visible (or not) once every 15 seconds for the duration of an observation period.

III. REGULATORY FRAMEWORK

In evaluating areas with the potential to achieve additional PM emission reductions, Air

District staff reviewed the existing framework of regulations that address PM emissions sources. The Air District's efforts to further address the health impacts from PM in the ambient air will be implemented on the foundation of these existing regulations. The discussion below describes the current regulatory framework addressing PM emissions, including a review of the Air District's existing PM regulations and how they interplay with state and federal law.

A. Overview Current of BAAQMD PM Regulations

The Air District has long been concerned about particulate matter. Regulation 6 was adopted in 1973, as have several regulations that address PM, including Regulation 5, Open Burning. However, on-going research and developments in medical science and public health have identified small particulates as having the greatest health impact. PM regulations that began addressing Total Suspended Particles (TSP) have subsequently focused on PM_{10} and $PM_{2.5}$, and have become more stringent as the health impact of fine particles becomes more clear. The Air District's lack of attainment with the California Ambient Air Quality Standards requires that we take strong regulatory action to address PM.

There are currently eleven Air District rules directly addressing PM emissions:

- **Regulation 2, Permits, Rule 2: New Source Review** – This rule requires new and modified sources of specified "criteria" pollutants, including PM, to implement the "Best Available Control Technology" to limit emissions. The "Best Available Control Technology" standard is a technology-forcing requirement that requires sources to install the latest state-of-the-art emissions control technology.
- **Regulation 5, Open Burning** – This rule prohibits open fires within the San Francisco Bay Area, with certain important exceptions.
- **Regulation 6, Particulate Matter, Rule 1: General Requirements** – This rule contains the Air District's general limitations on particulate matter emissions, and is the rule for which the Air District is currently proposing amendments. This rule is described in more detail in the next section.
- **Regulation 6, Particulate Matter, Rule 2: Commercial Cooking Equipment** – This rule limits the PM_{10} emissions from charbroilers used in restaurants.
- **Regulation 6, Particulate Matter, Rule 3: Wood Burning Devices** – This rule prohibits wood burning during wintertime "Spare the Air" alerts.
- **Regulation 6, Particulate Matter, Rule 4: Metal Recycling and Shredding Operations** – This rule requires metal recyclers to develop and implement site-specific emissions control plans approved by the Air District.
- **Regulation 6, Particulate Matter, Rule 5: Particulate Emissions from Refinery Fluidized Catalytic Cracking Units** – This rule establishes a limit of 10 ppmvd ammonia from FCC's, or requires the refinery to conduct operational testing and source tests to establish enforceable ammonia emission limits that minimizes total $PM_{2.5}$ emissions.
- **Regulation 9, Inorganic Gaseous Pollutants, Rule 13: Nitrogen Oxides, Particulate Matter, and Toxic Air Contaminants from Portland Cement**

Manufacturing – This rule requires that TSP emissions (EPA Test Method 5) are less than 0.04 pounds per ton of clinker produced from the kiln, and less than 0.04 pounds per ton of clinker produced from the clinker cooler. In addition, emissions from any miscellaneous operations or emission point must meet opacity limits of no more than 10% for no more than cumulative 3 minutes in any hour observation period. Each facility must also implement a wide variety of Fugitive Dust Mitigation Control Measures.

- **Regulation 10: Standards of Performance for New Stationary Sources** – This rule incorporates the United States Environmental Protection Agency's requirements for New Source Performance Standards (NSPS) by reference into the Air District's regulations.
- **Regulation 12, Miscellaneous Standards of Performance, Rule 4: Sand Blasting** – This rule requires sand blasting operations to meet stack opacity limits of no more than 20% for no more than cumulative 3 minutes in any hour observation period.
- **Regulation 12, Rule 13: Foundry and Forging Operations** – This rule requires foundry and forging operations to develop and implement site specific emissions control plans approved by the Air District.

The Air District has adopted and updated these rules periodically over time.

Interplay with State and Federal PM Requirements

Almost all California Air Resources Board PM-related regulations are directed at mobile sources – primarily diesel engines. With respect to stationary sources, state law authorizes local air districts to adopt PM regulations and leaves the ultimate decision of how best to regulate stationary source PM emissions to each district's Board of Directors. California air pollution control laws set standards for several specific source categories, such as pile-driving hammers, sandblasting operations, and portable diesel equipment in order to ensure statewide consistency, and state law provides guidelines for the local air districts to regulate agricultural burning.

Federal law also leaves the primary role in regulating PM emissions from stationary sources to local agencies. The United States Environmental Protection Agency has adopted regulations to limit criteria pollutants from new and modified sources known as New Source Performance Standards (NSPS), as well as regulations aimed at the toxic air quality impacts known as National Emissions Standards for Hazardous Air Pollutants (NESHAP). The federal NSPS and NESHAP encompass a wide variety of specific stationary source categories, as listed in Appendix 4. The federal regulations delegate responsibility to enforce these requirements to the local air quality agencies. The Air District has incorporated the NSPS by reference into Air District regulations in Regulation 10; and it enforces the NESHAP by incorporating the NESHAP standards into Air District permit conditions for affected sources, which are enforceable by the Air District under the California Health & Safety Code. Beyond these requirements, the Federal Clean Air Act also authorizes local districts to adopt additional, more stringent requirements as needed to achieve the National Ambient Air Quality Standards.

IV. TECHNICAL REVIEW

This Section provides a summary of the technical review that Air District staff has undertaken to review and identify the initial opportunities to reduce PM emissions. Air District staff first reviewed the PM emissions inventory to identify source categories with the potential for significant PM emissions reductions, and where the Air District has regulatory authority to address these sources. Staff then evaluated control technologies that could be applied to reduce emissions in the various significant emissions categories.

A. Air District PM Emissions Inventory

A summary of the 2011 Emissions Inventory is shown below in Table IV-1.

Table IV-1: 2011 Particulate Emissions Inventory - tons per day

Source Categories	TSP	PM_{10}	$PM_{2.5}$
Petroleum Refining	**0.38**	**0.27**	**0.16**
Other Industrial / Commercial Processes			
Chemical Manufacturing	0.43	0.39	0.38
Cooking	2.81	2.81	1.80
Other Food and Agricultural Processes	0.63	0.44	0.26
Metallurgical Foundries & Forging	0.98	0.61	0.46
Metal Recycling and Shredding	0.14	0.10	0.07
Wood Products Manufacturing	0.15	0.10	0.06
Cement Manufacturing	0.12	0.11	0.08
Asphalt Concrete Plants	0.55	0.22	0.18
Concrete Batching	1.21	1.11	0.75
Glass & Related Products	0.71	0.69	0.68
Stone, Sand & Gravel	0.86	0.43	0.06
Sand Blasting	0.35	0.17	0.01
Landfills	6.35	1.56	0.22
Waste Management - other	0.35	0.34	0.32
Other Industrial / Commercial	1.07	0.75	0.45
Subtotal	**16.71**	**9.83**	**5.78**
Combustion – Stationary Sources			
Domestic Combustion - space heating	0.70	0.70	0.70
Domestic Combustion - water heating	0.47	0.47	0.47
Wood Stoves	2.59	2.42	2.33
Fireplaces	8.88	8.31	8.00
Gas Turbines	0.89	0.88	0.88
Petroleum Refinery Combustion	2.51	2.51	2.45
Landfill Flares	0.11	0.11	0.11
Other Natural Gas Combustion	1.41	1.41	1.41
Planned Fires (prunings, crops, weeds, etc.)	0.32	0.29	0.27
Subtotal	**17.88**	**17.10**	**16.62**
Off-Road Mobile Sources	**5.83**	**5.76**	**5.66**
On-Road Motor Vehicles	**12.70**	**12.51**	**6.69**
Construction	**23.44**	**11.47**	**1.14**
Farming	**3.48**	**1.58**	**0.23**
Accidental Fires	**1.39**	**1.25**	**1.20**
Entrained Road Dust	**59.42**	**28.05**	**4.00**
Animal Waste	**19.05**	**9.17**	**1.05**
Wind Blown Dust	**10.40**	**5.25**	**1.03**
Tobacco Smoke & Miscellaneous	**3.52**	**3.39**	**2.75**
Total	**174.20**	**105.63**	**46.31**

Complete details of the 2011 Emissions Inventory for PM are shown in Appendix A-1. Complete analysis of the emission inventory is available in Appendix A-2.

B. Review of Bay Area Stationary Sources for PM Reductions

PM from Combustion

Combustion of various fuels from stationary sources is the single largest category of PM emissions. Rule 6-3 is very effectively addressing PM from fireplaces and woodstoves. However, the remaining sources are difficult to control.

The control technology used for natural gas combustion sources to minimize direct emissions of PM is "good combustion practice," which means ensuring that combustion is as complete as possible. Normally good combustion practice is indicated by low CO concentration in the outlet stream, since low CO concentrations are an indication of complete combustion. Natural gas is by far the cleanest burning fuel because it usually has a very consistent heating content, and is relatively easy to mix the fuel and air as needed for clean combustion. PM from combustion for space heating and hot water is dependent on the design of the furnace, boiler or water heater. In general, this equipment is very efficient, and burns cleanly. The reason the PM emissions are high from this equipment is that a large volume of natural gas is burned in these devices for heating across the entire Bay Area.

PM emissions from gas turbines, and electrical power generating stations are significant because they are large combustion sources, and most burn natural gas. Gas turbines generally have CO emissions limits in their operating permit to ensure complete combustion. Rule 9-11 limits NOx from electrical power boilers, and includes a CO emission limit to ensure complete combustion.

PM emissions from refinery combustion is significant, because refineries are large combustion sources, and they burn refinery process gas. Refinery process gas does not burn as cleanly as natural gas because it is a variable mixture of fuels from various refining processes. Rule 9-10 limits NOx from refinery combustion, and includes a CO emission limit for all refinery process heaters to ensure complete combustion.

Liquid fuels like jet fuel, diesel and fuel oil produce much higher PM emissions. Solid fuels like petroleum coke (and coal, however no coal is burned the Bay Area) create the highest PM emissions. Most industrial sources in the Bay Area burn natural gas, and refineries burn refinery fuel gas.

Although it is less common, several types of sources such as foundries and calciners use incinerators or thermal oxidizers for particulate control. Incinerator efficiencies can range from 25% to 99%, depending on the source and abatement device.

As mentioned above, diesel truck exhaust is a significant source of $PM_{2.5}$ in the Bay Area. CARB is phasing in clean burning diesel fuel requirements, which also apply to non-emergency stationary diesel engines. Clean burning diesel fuel coupled with diesel particulate filters can reduce diesel $PM_{2.5}$ by 85%.

Table IV-2 shows the Source Categories that are considered significant sources of PM, and are stationary sources (either point sources or area sources) where the Air District has jurisdiction to regulate the emissions. There are two broad areas where emission reductions may be achieved: i) industrial emissions from materials processing, and ii) fugitive dust from a variety of sources such as construction sites, disturbed surfaces and road dust.

Table IV-2: Stationary Source Categories considered for Rule 6-1 amendments

Source Category	TSP tpd	PM_{10} tpd	$PM_{2.5}$ tpd
Petroleum Refinery Processing[e]	0.38	0.27	0.16
Chemical Manufacturing	0.43	0.39	0.38
Other Food and Agricultural Processes	0.63	0.44	0.26
Wood Products Manufacturing	0.15	0.10	0.06
Asphaltic Concrete Plants	0.55	0.22	0.18
Concrete Batching	1.21	1.11	0.75
Glass & Related Products	0.71	0.69	0.68
Stone, Sand & Gravel	0.86	0.43	0.06
Landfills	6.35	1.56	0.22
Waste Management – other	0.35	0.34	0.32
Other Industrial / Commercial	1.07	0.75	0.45
Construction – 5 source categories	23.44	11.47	1.14
Entrained Road Dust – 6 source categories	59.42	28.05	4.00
Total:	95.55	45.82	8.66

[e]-excluding combustion at refineries

Twenty two stationary source categories were identified, consisting of 2,455 permitted stationary sources with particulate matter emissions. These sources were screened to focus on the largest of these facilities, 55 of which emit more than 90 lb/day of particulates. These 55 large sources represent slightly more than 2.2% of the permitted sources and approximately 85% of the total emissions.

Staff visited each of these 55 facilities to assess the current conditions, and understand what the potential impact would be if PM control requirements were placed on these operations. Some of these 55 facilities have PM emissions industrial stacks and vents and could be affected by the more stringent TSP concentration and mass emissions limits. Some of these source categories are sources of fugitive dust so more stringent visible emissions limits may have an impact. Background information and potential for reduced PM emissions are summarized for each of these sources below. These assessments provide the basis for estimated PM emissions reductions, and estimated costs for these facilities to comply with potential PM controls.

Opportunities for PM Emissions Reductions

Industrial Stacks and Vents

Most industrial stacks and vents have permit limits based on Best Available Control Technology (BACT) at the time the facilities were installed or modified, but a few do not. New general requirements from amendments to Rule 6-1 will affect the facilities that do not have stringent permit conditions. Amendments to Rule 6-1 are proposed separately, and included with its own workshop report as Appendix B.

Bulk Materials, Construction Sites, and Disturbed Surface Areas
Bulk material stockpiles, construction projects and disturbed surfaces are susceptible to wind erosion, and can be significant sources of fugitive dust. While fugitive dust is a significant source of PM emissions, the particle size of the dust depends on the specific material. Dust from gypsum is almost 90% PM_{10}, and approximately 50% $PM_{2.5}$. Most typical geologic dust is about half (50%) larger than 10 microns, and only about 5% is smaller than 2.5 microns. Most grains used for flour and animal feed are only 30% PM_{10}, and about 1% $PM_{2.5}$. Fugitive dust can cause haze and quality of life issues, and is a moderate contributor to the $PM_{2.5}$ concerns about health impacts. Analysis of data collected by Air District particulate matter monitors indicates that geological material comprises a small part (less than 10 percent) of the PM_{10} and $PM_{2.5}$ in the atmosphere. This is likely due to the fact that these kinds of particles tend to settle out of the air fairly quickly. In addition, sources of fugitive dust are many, varied, and spread widely across the Bay Area.

While preventing and controlling fugitive dust is helpful in reducing area haze and PM_{10} levels, it is less effective at reducing $PM_{2.5}$ - the particles with greatest health impact. Most of the practical fugitive dust control strategies use water to wet the dusty areas. Given the severe drought situation in California, staff believes the concerns about the lack of water currently outweighs the need for general fugitive dust controls at this time. Staff proposes to focus on the highest impact sources while minimizing water consumption.

Trackout
Staff also recommends a new rule to prohibit trackout of mud and dirt onto adjacent highways, where subsequent traffic can pulverize the dirt into silt, and turbulence from the vehicle entrains the silt into the air. This material is one source of road dust, and can readily be controlled.

Trackout is a concern at bulk material storage sites, construction sites, and disturbed surface areas including landfills. As mentioned above, water is often used to control dust. Mud can form at these locations, and accumulate on the bottoms of vehicles and vehicle tires. When vehicles leave the work site, they can track mud out onto a public roadway. Over the next 300 - 500 feet of the road, the mud falls off the vehicles and tires. As the mud dries, the dirt remains on the paved road where subsequent traffic can pulverize the dirt into silt, and the turbulence from the passing vehicles entrains the silt into the air. This mud/residual dirt is called trackout. Trackout can be a significant source of $PM_{2.5}$, and can be controlled cost effectively by knocking or washing the mud off the vehicles before they leave the facility. This draft new rule is proposed separately, and included with its own workshop report as Appendix C.

Paving and Roofing Asphalt Operations
PM emissions from both paving asphalt and roofing asphalt are odorous, as well as estimated to be 95% $PM_{2.5}$. Asphalt is applied at high temperatures (250 - 325°F) for paving asphalt, and even higher temperatures (375 - 475°F) for roofing asphalt. Asphalt emits odors, and some of the asphalt appears to volatize and then subsequently condense into very small liquid aerosols or solids that take the form of smoke. This is commonly known in the asphalt industry as “blue smoke”, and asphalt fumes from both paving and roofing asphalt are associated with eye, nose and throat irritation. Roofing asphalt is applied at very

high temperatures (400 – 500°F), and there is typically significant smoke and fumes that come from both the heater/storage unit (known as an asphalt kettle), and during application of the hot asphalt on the roof. The smoke is vaporized asphalt that forms odorous liquid aerosols and solid particles ($PM_{2.5}$) when exposed to cooler air. Data conflicts regarding whether these fumes are toxic or not. Staff recommends a new rule to control "blue smoke" from roofing asphalt. This draft new rule is proposed separately, and included with its own workshop report as Appendix D.

Bulk Material Storage and Handling

As cited above, wind erosion at bulk material storage and handling facilities can create significant dust, particularly when handling fine solids like gypsum, or even gravel and sand from rock quarries. In addition, the Air District has received numerous complaints about coke dust and coal dust. Coke and coal stockpiles and loading/unloading are unique in that fugitive dust from these products is black and highly visible, compared to geologic dust.

Coke and coal handling facilities were not among the sites that staff first visited during assessment of the 55 most significant sources. Staff subsequently visited each coke and coal handling facility, and recommends a new draft rule to control dust from bulk material storage and handling operations, including coke and coal. This draft new rule is proposed separately, and included with its own workshop report as Appendix E.

C. Control Technologies

As noted above, particulate emissions come from two general types of stationary sources. The first type of source involves processing of various solid materials that are contained inside equipment and ducts, so the subsequent emissions are typically emitted through a stack or vent. The second type of source is more general in nature: dust coming from stockpiles of bulk materials, activities during construction projects and from vehicle traffic on unpaved roadways and disturbed surface areas. The control technologies available to address these two broad areas of PM emissions are discussed below.

PM Emissions from Combustion

The control technology used for natural gas combustion sources to minimize direct emissions of PM is "good combustion practice," which means ensuring that combustion is as complete as possible. Normally good combustion practice is indicated by low CO concentration in the outlet stream, since low CO concentrations are an indication of complete combustion. Natural gas is by far the cleanest burning fuel because it is relatively easy to mix the fuel and air needed for clean combustion. Most industrial sources in the Bay Area burn natural gas, and refineries burn refinery fuel gas.

PM emissions from combustion are significant, and difficult to control. Significant research has been conducted to control NO_x while ensuring "complete combustion" by limiting CO emissions. These technologies have been successfully applied to almost all natural gas and refinery fuel gas sources. The Air District has rules in place to limit both NO_x and CO emissions. Staff has no recommendations to reduce PM emissions from combustion during this rule-making, but is developing rules as described in the Air District-wide Combustion Strategy included in the 2017 Clean Air Plan. This combustion strategy will focus on improving energy efficiency to reduce the total fuel burned, and analyze specific sources where stack dimensions can be modified to reduce localized impact on neighbors.

Liquid fuels like jet fuel, diesel and fuel oil produce much higher PM emissions, but are also difficult to control. CARB is phasing in clean burning diesel fuel requirements, which also apply to non-emergency stationary diesel engines. Clean burning diesel fuel coupled with diesel particulate filters can reduce diesel $PM_{2.5}$ by 85%.

Solid fuels like petroleum coke (and coal, but no coal is burned the Bay Area) create the highest PM emissions. Although it is less common, several types of sources such as foundries and calciners use incinerators or thermal oxidizers for particulate control. Incinerator efficiencies can range from 25% to 99%, depending on the source and abatement device. Combustion of solid fuels is rare, and must be analyzed on a case by case basis.

PM Emissions from Industrial Stacks and Vents

Solid materials are generally moved through an industrial production process with conveyor belts and/or elevators. Particulates can be contained within equipment, or with shrouding or ducts surrounding the conveyors. The equipment or ducts are kept under a slight vacuum by drawing air into the equipment through ducts with the suction of an induced draft fan. This slight vacuum keeps the solids from leaking into the surrounding area. The discharge from the fan is routed through a control device, to a stack or vent piping. Three types of control equipment are typically used to abate particulate emissions from stack or vents at industrial facilities:

- Wet mechanical scrubbers and/or cyclones,
- Baghouses, or
- Electrostatic precipitators

If the process is compatible, water is often injected into the suction produced by the induced draft fan to serve as a wet mechanical scrubber (generally known as a roto-clone). If the process is not compatible with water, a cyclone is installed on the discharge of the fan to control the particulate matter emissions. Wet mechanical scrubbers and cyclones are most effective on large particulates. Table IV-2 (below) shows that neither device is very effective at controlling small particles less than 2.5 microns.

Baghouses and Electro-Static Precipitators (ESP's) are far more effective at controlling small particles less than 2.5 microns. Baghouses use bags made of cloth, or various plastics to filter out particles. The particles collect on the outside surface of the filter cloth, where the particles themselves can establish a filter-cake that serves to filter out additional particulates in the effluent stream. The baghouse is designed to periodically shake or backflow the process stream to remove the filtered particles, collecting these particles for disposal or recycling back into the production process. ESP's are most effective on particles that are susceptible to accepting a positive electrical charge from exposure to high voltage electrodes. Once charged, these particles are then electrically attracted to grounded plates inside the ESP. Similar to the baghouse; the ESP is designed to periodically shake the grounded plates to remove the filtered particles. Table IV-2 indicates that baghouses and ESP's are far more effective at controlling small particles less than 2.5 microns than cyclones or wet scrubbers.

Table IV-2: Particle Size versus Percent Abatement Efficiency[11]

Particle Size	Cyclones	Wet Scrubber	Baghouses	ESP's
< PM_{10}	80%	82% - 95%	94% - 99%	94% - 99%
< $PM_{2.5}$	50%	50% - 92%	93% - 99%	90% - 99%

Cyclones and baghouses, or wet mechanical scrubbers and ESP's can be used in tandem to achieve Best Available Control Technology. The first stage (cyclone or wet scrubber) removes the bulk of the larger particulate matter, and the second stage (baghouse or ESP) removes most of the remaining smaller particles. These systems have demonstrated particulate matter removal to levels of 0.001 - 0.002 grains/dry standard cubic foot. The abatement efficiencies shown in Table IV-2 are based on EPA's analysis of coal and biomass combustion. These control technologies are not appropriate for all of the Bay Area's diverse source types, especially for combustion of liquid and solid fuels, and will be discussed below.

Wet scrubbers and wet electrostatic precipitators are the only technologies that address condensable PM, because wet scrubbers and ESP's cool the effluent stream with water. As discussed previously, condensable PM starts as a gas, then condenses around a nucleus (typically a solid particle) as it cools in the atmosphere, and remains a liquid aerosol in the ambient air. Cyclones, baghouses, and dry ESP's typically operate at high temperatures, so condensable PM is not controlled because the effluent remains in a gaseous state. It may be possible to improve abatement efficiencies by cooling the gases before they enter the abatement devices. Cooling techniques may be considered in the future as a possible control strategy.

Review of EPA's BACT/LAER and ARB's BACT Clearinghouse

EPA provides a searchable database of current knowledge for Reasonably Available Control Technologies (RACT), Best Available Control Technologies (BACT), and Lowest Achievable Emission Rates (LAER). Use of BACT results in the lowest feasible emissions for a particular source and is required of significant new permitted sources under Air District Regulation 2, Rule 2: New Source Review. LAER is a summary of installed technology that achieves the lowest emissions in practice. CARB provides a similar database called the BACT Clearinghouse. Staff searched both of these databases to identify PM_{10} and $PM_{2.5}$ BACT controls for particulate matter sources in other air districts and other states. ARB's BACT Clearinghouse currently has no references for $PM_{2.5}$. EPA's BACT/LAER Clearinghouse provides information for both PM_{10} and $PM_{2.5}$. The EPA's BACT/LAER Clearinghouse search results provide examples of industry specific controls, and indicates the most effective controls were the same for both PM_{10} and $PM_{2.5}$, although the allowable emission rates for each were different. There were no additional technologies identified specifically for $PM_{2.5}$ and no mention of controls for condensable $PM_{2.5}$.

Control of Fugitive Dust

Prevention of wind erosion is the primary control method used for most fugitive dust. Dust can be generated by a wide variety of human activities, including disturbing natural surface areas where wind can subsequently create windblown dust. Entrained dust from vehicle

[11] EPA Control Techniques Document for Fine Particulate Matter dated 10/1998.

traffic on both paved and unpaved surfaces can also be significant.

Current Controls – Rule 6-1 and Storm Water Requirements
The Air District currently does not have any regulations that directly target fugitive dust, other than the general opacity limits. Section 6-1-301 establishes a Ringelmann No. 1 emission limit, and Section 6-1-302 establishes a 20% opacity limit for no more than three minutes in any 60-minute observation period. These provisions do not necessarily prohibit all fugitive dust emissions of concern. Moreover, the average worker at a site that may generate fugitive dust emissions, such as construction sites or bulk materials storage sites, does not readily understand opacity requirements based on the Ringelmann scale. An observer must be rigorously trained and become certified to measure dust plume opacity using the Ringelmann scale, and although Air District inspectors receive such training and certification, few workers in the field do. If workers in the field cannot determine when the dust is excessive, they are unlikely to take any corrective actions. For these reasons, the Air District's current PM regulations do not adequately address fugitive dust emissions.

Many construction sites and other sites where earth-disturbing activities are undertaken are subject to storm water runoff prevention requirements under CEQA and Regional Water Quality Control Board storm water discharge permits. These authorities normally require affected sites to develop Storm Water Pollution Prevention Plans (SWPPP) that utilize Best Management Practices (BMP's) to limit dirt, mud and silt in water runoff into downstream waterways. Some of these SWPPP BMP's also target control of fugitive dust. SWPPP requirements are enforced through a State General Construction Storm Water Permit system that applies to most storm water discharges associated with construction activity. The State General Construction Storm Water Permit (Water Quality Order 2009-0009-DWQ, amended by 2010-0014-DWQ & 2012-0006-DWQ) requires construction sites to electronically file various compliance documents, including a Storm Water Pollution Prevention Plan (SWPPP), to the State Water Board. The Regional Water Quality Control Boards may also issue General Construction Storm Water Permits. These existing requirements mean that many sites are already implementing control measures necessary to prevent significant fugitive dust emissions.

The SWPPP guidance documents provide several Best Management Practices (BMP's) that may be needed to control soil erosion so that excessive dirt and mud do not enter the storm water system and do not pollute downstream waterways. Several of these BMP's also apply to wind erosion, and apply to control of trackout, spills, and soil erosion onto public paved roads. A certified SWPPP inspector must monitor implementation of the required BMP's to ensure the plan is implemented effectively. A certified SWPPP preparer must identify site specific BMPs needed to ensure water effluent from a construction site is acceptable. The SWPPP does not require firm pH (acidity) or turbidity limits because each construction site is unique. However, each SWPPP does identify contingency action levels if storm water quality exceeds limits included in the plan.

The BMP's that are applicable to fugitive dust control include the following categories:

- Erosion Control
- Sediment Control
- Trackout Control
- Non-Storm Water Management
- Waste Management Materials

Any draft requirements for control of fugitive dust or trackout should be consistent with the SWPPP requirements.

Significant resources exist to help with development and implementation of SWPPP's, including details on BMP's. Examples are:
http://www.dot.ca.gov/hq/construc/stormwater/caltrans_guidance_manual-rev1.pdf
http://www.dot.ca.gov/hq/construc/stormwater/BMP_Field_Master_FullSize_Final-Jan03.pdf
http://www.dot.ca.gov/hq/construc/stormwater/documents/SWPPP_Prep_ManualJune2011.pdf
The best information is available from the California Storm water Quality Association, for a nominal subscription price: https://www.casqa.org/resources/bmp-handbooks.

Control Measures
Prevention of wind erosion usually takes one of five approaches:
- Minimize the surface area being disturbed at any given time.
- Apply dust suppression measures when needed.
- Establish wind breaks, and limit work on windy days.
- Limit traffic on disturbed surface, and limit vehicle speeds.
- Prevent dirt, mud, and solids spills; and clean up any spills that have the potential to create dust immediately.

Control measures by necessity are different in areas where active dust generating operations are underway, as opposed to inactive areas. Dust control measures in active areas include:
- Pre-watering, and keeping disturbed surfaces damp during earth moving operations.

- Keeping dusty materials damp, especially when processing these materials.

Water fog and water mist systems are more effective at wetting dust particles, because the fog and mist droplets are about the same size (10 – 50 microns) as the dust particles.

- Providing wind barriers or enclosing dusty material handling and storage areas.

- Keeping storage piles covered.
- Limiting vehicle traffic to paved or stabilized surfaces.
- Limiting vehicle speeds.
- Preventing dirt, mud and other solids from being tracked out or spilled onto paved roadways.
- Preventing erosion of dirt or mud onto paved roadways.

Dust control in inactive areas includes:

- Using wind erosion controls, like trees or bushes, wood or rock walls, earthen banks, or permanent wind breaks.
- Appling chemical dust suppressants that will form a crust on the disturbed surface by absorbing moisture from the air.
- Growing vegetative ground cover. Even if the vegetation dries up during the dry season, the plant root systems will prevent wind from eroding the soil

As mentioned above, control of wind erosion is currently required for construction projects larger than one acre of disturbed surface area by the State Water Quality Board. They have requirements to develop a SWPPP that follows BMP's to limit dirt, mud and silt in water runoff into downstream waterways. Dust control is also addressed directly by some of these SWPPP BMP's, with a menu of options for dust prevention.

Control of Trackout onto Paved Roads

Facilities that use water to control dust can create a problem with mud that sticks to vehicles and vehicles' tires, then carrying the mud out onto an adjoining paved roadway. Any dirt that accumulates on a paved roadway can and will be pulverized into fine particles by passing vehicle tires, and entrained into the air by the turbulence from passing vehicles.

Most facilities have a truck "grizzly" bar or a rumble strip to prevent trackout onto the public roadways. Rumble strips are typically a series of pipes or bars on 6" centers used to shake the vehicle, and dislodge any mud from the vehicle. In addition, these bars or pipes flex the vehicle's tires, and dislodge mud from between the tire treads before it leaves the property.

A critical, and often overlooked element of ensuring a grizzly or rumble strip is effective is to keep the area under the rumble strip clear of accumulated mud. When this area below fills with mud, the rumble strip is no longer is able to remove mud from the vehicle or tires.

In addition, some facilities use a truck wash station designed to clean mud from the tires and under-carriage of the vehicle. Others have long paved roads prior to reaching the public traveled roadways that are either washed down or kept clean with street sweepers.

There are typically three ways to mitigate road dust:

- Support vegetation on median strips and next to road shoulders to minimize wind erosion,
- Water flush,
- Mechanically sweep or vacuum sweep.

The vegetation strategy is best when built into the design of highways and freeways. Water flushing is effective, but creates the concern of flushing silt into the groundwater. Street sweeping is often the most practical, and has the advantage of removing trash, litter and various other debris from the roadways. However, mechanical sweepers often create as much dust as they prevent. Some sweeper designs include a water spray ahead of the sweeper to control dust, but that often just wets the silt and allows it to cling to the road or gutter surface, rather than being swept up. Vacuum sweepers are far more effective at collecting and removing road dust. Street sweepers are now available equipped with air jets to blow silt from the cracks in the street, coupled with high capacity vacuum systems to prevent creation of a dust cloud during the sweeping operation, and high efficiency air filters on the discharge of the vacuum systems to capture more than 80% of PM_{10}. However, even these most effective street sweepers must be operated within strict design guidelines to achieve 80% cleanup efficiency. Street sweepers are typically designed to operate at speeds of less than 5 mph. However, it is common to see street sweepers operating at 10 – 25 mph, particularly on freeways. At speeds greater than 10 mph, street sweeping can aggravate road dust problems by re-entraining road dust rather than recovering it.

There is a similar situation where spills from passing vehicles leave solid materials on the roadway that can be pulverized and entrained into the air. This material is called carryout, and controls include ensuring the vehicle does not leak either solids, or liquids containing solids, and covers for the material so that solids are not blown out of the top of the vehicle at higher speeds. California Motor Vehicle Code, Section 3.3.6 currently has requirements needed to control spills and carryout.

Control of Asphalt

Control of Paving Asphalt

Paving asphalt is a mixture of asphaltic cement (liquid asphalt from a refinery) combined with gravel to give it strength. Paving asphalt may be applied hot (300 – 350°F), or can be applied at cooler temperatures if solvents or water emulsions are used to keep the asphalt pliable and workable at the lower temperature. When paving asphalt is transferred from a storage bin into a delivery truck (known as load-out), a small portion of the hot asphalt vaporizes, creating smoke and fumes. The smoke is vaporized asphalt that forms odorous liquid aerosols and solid particles ($PM_{2.5}$) when exposed to cooler air. This smoke usually creates a haze that is blue in color, so it is called "blue smoke". Blue smoke can be captured and controlled by drawing the aerosols with an induced draft fan through ducts into a filtration system. These blue smoke systems are currently in place in at least two asphalt plants and being installed in a third asphalt plant in the Bay Area.

Control of Chip Seal Paving Asphalt

Chip seal paving is a technique for lightly traveled roads where existing pavement with cracks can be repaired by spraying hot asphalt onto the cracked pavement so the asphalt will fill the cracks, then spreading light gravel on the asphalt and pressure rolling the gravel smooth. Chip seal asphalt is like paving asphalt, normally applied hot (300 – 350°F). Since this asphalt is sprayed, it can produce a large quantity of blue smoke. Blue smoke abatement is also available for chip seal spray systems. A portable module with an induced draft fan, ductwork, and suction hoods are positioned next to the chip seal spray nozzles, and is quite effective at capturing and controlling the blue smoke aerosols.

Control of Roofing Asphalt

Control of roofing asphalt is very simple and relatively easy. Asphalt manufacturers have developed a polymer that can be added to the asphalt to create "low-fuming" roofing asphalt. This polymer floats on the surface of the asphalt to prevent asphalt vaporization, and significantly reduces fumes from the asphalt kettle. This polymer is estimated to reduce asphalt fumes and odors by 60 – 80%. This control method does not help reduce emissions during application of the hot asphalt on the roof. This control method however, does not help reduce emissions during application of the hot asphalt on the roof. This product, known as low-fuming roofing asphalt, appears to be an improvement in worker exposure to fumes as well as providing a reduction in PM emissions and odors.

Other best management practices for roofing asphalt kettles include kettle siting to minimize impact on people, temperature control of the asphalt in the kettle, keeping the kettle closed, and having good seals on the edges of the kettle openings. Compliance with these management practices is driven primarily by safety and efficiency, but also supports emission reduction of both PM and odors.

D. Source Specific Bay Area PM Regulations

The Air District currently has a few PM rules that apply broadly to all sources, and several additional rules that apply to specific industries and categories of PM sources. As the Air District moves forward to further control PM emissions, staff will consider each large source category of PM emissions and determine the best approach to control that source category. Such initiatives will be undertaken in separate rulemaking projects. Draft new

Regulation 6: General Provisions, Definitions and Test Methods is proposed to provide the over-arching definitions and test methods for the current regulations and potential future source-specific regulations.

V. NEW DRAFT REGULATION 6

Air District staff proposes a new Regulation 6: General Provisions, Definitions and Test Methods to provide the over-arching general requirements, definitions and test methods for the current regulations and any potential future source-specific regulations. New Regulation 6 is proposed to address three broad categories:

- General provisions that apply to all of the rules regulating particulate matter.
- Definitions that apply to more than one rule.
- Test methods that apply to more than one rule.

This new rule is intended to provide the foundation upon which existing regulations exist and new source specific rules can be developed.

A. General Provisions

The general provisions in new draft Regulation 6 are primarily focused on administrative, monitoring and record keeping requirements.

Administrative requirement 6-401 requires that each person responsible for PM emissions must provide and maintain a means to monitor or observe the emission. This provision is based on Air District experience where a facility may have been exceeding PM emissions limits, and claimed a defense of not being aware of the excessive PM emissions. Each owner / operator must ensure that the facility emissions can be monitored to determine if corrective actions are needed.

The visible emissions limits are typically based on opacity (or equivalent number on the Ringelmann Chart) using EPA Method 9 as the assessment method. Since most facilities do not have a person certified to assess opacity using EPA Method 9, these facilities may simply monitor the emissions to assess whether they are visible or not, or if the appearance of the emissions has changed. Any significant change in visible emissions represents an early indication that corrective actions may be needed.

Monitoring and record keeping requirements apply to all Regulation 6 Rules, and reference provisions in Regulation 1.

B. Definitions

The definitions in Regulation 6 are those that are used in more than one PM regulation. The intent is to provide the definition once, where any future amendments to the definition can be made in one location. In addition, there are many forms of PM, so as specific rules focus on PM_{10}, $PM_{2.5}$, condensable PM, or PM precursors, the definitions are found in a common location.

C. Test Methods

The test methods defined in Regulation 6 are those that are used in more than one PM regulation. The intent is to provide the definition once, where any future amendments to the definition can be made. In addition, as the many other forms of PM are regulated, the specific test methods for PM_{10}, $PM_{2.5}$, condensable PM, or PM precursors can be added.

Sampling, instrumentation and assessment of visible emissions / opacity are based on specific procedures cited in the Manual of Procedures. Assessment of opacity is conducted in accordance with Modified EPA Method 9 or equivalent as provided by the Manual of Procedures, Volume, 1, Part 1.

VI. EMISSION REDUCTION BENEFITS & COMPLIANCE COSTS

This section of the Workshop Report summarizes the emission reduction benefits that would result from the draft amendments and the costs involved. New draft Reg. 6 is a foundational regulation, to provide the basis for future industry and source specific future regulations. As a result, no emissions reductions are expected from implementation of this rule.

A. Emission Reductions Expected

No emission reductions expected from this new draft Reg. 6.

B. Costs of Controls

No controls are required from new draft Reg. 6, so no costs are incurred. Future administrative costs are expected to be reduced with general provision, definitions, and test methods located in one regulation, rather than being repeated in several regulations creating the resulting concern of consistency between the regulations.

C. Other Impacts that may require Resources

No other impacts are anticipated from new draft Reg. 6.

VII. RULE DEVELOPMENT AND PUBLIC CONSULTATION PROCESS

A. Rule Development Process

The Air District's 2010 Clean Air Plan addresses PM, including PM's significant health impacts, and was approved on September 15, 2010. The 2010 Clean Air Plan included Stationary Source Measure SSM 6: General Particulate Matter Emission Limitation. In addition to developing draft amendments to Rule 6-1 to satisfy SSM 6, Staff has reviewed the entire inventory of PM emissions, and identified source categories where PM (particularly $PM_{2.5}$) emissions are significant, the Air District has authority, and potential for substantial PM reductions are available.

New draft Regulation 6 will provide the foundational regulation for current PM rules, and potential future source specific rules. New draft Regulation 6 rule language, and this accompanying workshop report are the next step in the rule development process. Staff anticipates that new draft Regulation 6, and draft amendments to Rule 6-1 will be considered together at workshops, and at a Public Hearing. Other new source specific draft rules and associated workshop reports will also be considered at the same workshops. It not yet clear whether these other new source specific proposed rules will be considered together at a Public Hearing.

Staff anticipates that the CEQA Analysis will be conducted as if the new draft Regulation 6, draft amendments to Rule 6-1, and the other new source specific draft rules are all one project, so that the cumulative impact of these proposals can be considered. The Socio-Economic Analysis for each project will be done separately.

Staff based the draft amendments to Rule 6-1 on the 2011 emissions inventory. Staff identified the source categories to be considered during review of potential amendments, and identified the largest sources in each category. Staff selected 55 of the largest permitted stationary sources, and visited each one to more fully understand each facility’s business, each unique emissions source and discuss potential control techniques available to reduce PM emissions. In addition, concerns about the lack of information regarding particle size distribution, possible sources of condensable particulate matter, and potential secondary particulate matter formation were discussed. Staff used the information from these visits to develop the draft amendments, and to estimate the emission reductions that could be achieved by implementing these draft rule changes.

B. Public Outreach and Consultation

In analyzing the inventory of PM emissions and source categories where PM (particularly $PM_{2.5}$) emissions are significant, where the Air District has authority, and the potential for substantial PM reductions, staff consulted with the following interested and affected parties:

Businesses	Governmental Agencies
Morton Salt - Newark	CALTRANS District 4 - Oakland
Cargill – Newark	Bay Area Regional Water Quality Board - Oakland
Criterion Catalysts - Pittsburg	North Coast Regional Water Quality Board – Santa Rosa
CertainTeed Gypsum – Napa	Bay Area Rapid Transit – Richmond Maintenance Yard
Maxwell House – San Leandro	Alameda County
C & H Sugar – Crockett	Contra Costa County
Con Agra – Oakland	Marin County
CEMEX – Oakland	Napa County
CEMEX – Clayton	Santa Clara County
Strategic Materials – San Leandro	San Francisco City & County

Dutra Materials – San Rafael	San Mateo County
Superior Supplies – Santa Rosa	Solano County
Granite Rock – Redwood City	Sonoma County
Hanson Aggregates – Clayton	City of Hayward
Bodean / Mark West Quarry – Santa Rosa	City of Napa
PABCO Gypsum – Redwood City	City of Oakland
Georgia Pacific Gypsum - Antioch	City of San Jose
Syar - Napa	City of San Rafael
Syar – Santa Rosa	City of Santa Rosa
Syar - Vallejo	
Soiland Quarry - Cotati	
Langley Hill Quarry - Woodside	
Granite Construction – Santa Clara	
Granite Construction – San Jose	
Willowbrook Feeds – Petaluma	
Hunt & Behrens – Petaluma	
Owens-Corning – Santa Clara	
Owens-Brockway - Oakland	
Waste Management – San Leandro	
Zanker Road Material Processing – San Jose	**Industry Associations**
Waste Management - Altamont	Association of Building Contractors
Redwood Landfill	Associated Roofing Contractors of the Bay Area Counties
Guadalupe Landfill	California Asphalt Pavement Association
Ox Mountain Landfill – Half Moon Bay	Construction Industry Air Quality Coalition
Clover Flat / Upper Valley Resources	Northern California Engineering Contractors
Potrero Hills Landfill	
Stavin	
McGuire & Hester Construction - Oakland	
Ghilotti Bros. Construction – San Rafael	
Universal Building Services - Richmond	
Statewide Sweeping – Milpitas	
Levin Richmond Terminal	
Lehigh Cement	
Phillips 66 Coker	
Phillips 66 Coke Calciner	
Shell Coker	
Tesoro Coker	
Valero Fluid Coker	
APS West	
Carbon Inc.	

These discussions led to review of the Storm Water Pollution Prevention Plan (SWPPP)

Best Management Practices, and the suggestion that any draft requirements should be consistent with SWPPP requirements.

Public Workshops are the next step in the rulemaking process. Air District staff will review the new Regulation 6 general provisions, definitions and test methods, and draft amendments to Rule 6-1 with affected parties to solicit input and identify any potential issues and concerns. The Air District will use the public's input, along with further investigation and analysis by staff to develop the final new Regulation 6 and draft amendments to 6-1, and present them to the Air District's Board of Directors for approval.

C. Review of Potential Environmental Impacts Under CEQA

The Air District contracts with an independent consultant to conduct a California Environmental Quality Act (CEQA) analysis of potential environmental impacts of the new Regulation 6, and draft amendments to Rule 6-1. The consultant will make an initial assessment of any environmental impacts based on the new Regulation 6 and draft amendments to Rule 6-1, and this workshop report.

Similarly, a CEQA analysis will be conducted on the other new source specific draft rules. Staff anticipates that the CEQA analysis will be combined to review all impacts of the new draft Regulation 6, draft amendments to Rule 6-1, and the other new source specific draft rules together all as one project, so that the cumulative impact of these proposals can be considered.

After staff receives additional input during the workshop process, a final proposal and staff report will be used to finalize the CEQA analysis. The CEQA analysis will be included in the final proposal, posted for public review and comment at least 30 days before the Public Hearing. At the Public Hearing, the Air District Board of Directors will consider the final proposal, and public input before taking any action on the new Regulation 6, or amendments to Rule 6-1.

D. Review of Potential Economic and Job Impacts with a Socio-Economic Analysis

The Air District contracts with an independent consultant to conduct a Socio-Economic Analysis of potential economic impacts from the definitions and test methods in new Regulation 6, and the draft amendments to Rule 6-1. The consultant will make an initial assessment of any economic impacts based on the new Regulation 6 and draft amendments to Rule 6-1, and this workshop report.

Unlike the CEQA analysis, staff anticipates independent Socio-Economic Analyses will be made on each of the other new source specific draft rules. The economic impacts on different industries differ, so will be analyzed separately. There is probably no overlap between Rule 6-7: Roofing Asphalt Operations and any of the other source specific rules, so those economic impacts may be evaluated independently. There may be overlap between Rule 6-6: Prohibition of Trackout, and Rule 6-8: Bulk Material Storage and Handling Operations so those economic impacts may be evaluated together.

After staff receives additional input during the workshop process, a final draft proposal and staff report will be used to finalize the Socio-Economic Analysis. The Socio-Economic

Analysis will be included in the final proposal, posted for public review and comment at least 30 days before the Public Hearing. At the Public Hearing, the Air District Board of Directors will consider the final proposal, and public input before taking any action on the new Regulation 6 and amendments to Rule 6-1.

VIII. REFERENCES

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3. BAAQMD Regulation 6, Rule 2: Commercial Cooking Equipment
4. BAAQMD Regulation 6, Rule 3: Wood Burning Devices
5. BAAQMD Regulation 12, Rule 4: Sandblasting
6. BAAQMD Board Resolution 1390
7. BAAQMD Advisory Council, Ultrafine Particles: Ambient Monitoring and Field Studies presentation, 2/8/2012
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9. BAAQMD Advisory Council, Concentrations of Ultrafine Particles and Related Air Pollutants on and Near Roadways and Other Urban Microenvironments presentation, Eric Fujita, Desert Research Institute, Reno, NV, 2/8/2012
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17. South Coast Air Quality Management District, Rules 401, 403, 403-1, 404, 405, 444, 445, 1105-1, 1112-1, 1133-1, 1137, 1155, 1156, 1157, 1158, 1186, 1186-1
18. San Joaquin Valley Air Pollution Control District, Rules 4101, 4103, 4106, 4201, 4202, 4203, 4303, 4901, 8011, 8021, 8031, 8041, 8051, 8061, 8071, 8081
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20. San Joaquin Valley Air Pollution Control District, Draft Staff Report – Appendix C, Cost Effectiveness Analysis of Regulation VIII (Fugitive PM_{10} Prohibitions), 9/27/2001
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22. Maricopa County, Arizona Regulation III, Rule 310: Fugitive Dust from Dust-Generating Operations
23. Maricopa County, Arizona Quick Reference Dust Control Guide
24. Northeast States for Coordinated Air Use Management, Assessment of Control Technology Options for BART-Eligible Sources, March, 2005
25. California Water Resources Control Board, Construction Storm Water Program, http://www.waterboards.ca.gov/water_issues/programs/stormwater/construction.shtml
26. 2009-0009-DWQ Construction general permit *(effective July 1, 2010)*
27. California Storm Water Quality Association, Storm water Best Management Practice Handbook Portal: Construction

IX. APPENDICES

Appendix A: New Regulation 6

Appendix A-1: 2011 Particulate Emissions Inventory[12] - tons per day

Source Categories	TSP	PM_{10}	$PM_{2.5}$
Petroleum Refining **Subtotal**	**0.38**	**0.27**	**0.16**
Other Industrial / Commercial Processes			
Chemical Manufacturing	0.43	0.39	0.38
Cooking	2.81	2.81	1.80
Other Food and Agricultural Processes	0.63	0.44	0.26
Metallurgical Foundries & Forging	0.98	0.61	0.46
Metal Recycling and Shredding	0.14	0.10	0.07
Wood Products Manufacturing	0.15	0.10	0.06
Cement Manufacturing	0.12	0.11	0.08
Asphalt Concrete Plants	0.55	0.22	0.18
Concrete Batching	1.21	1.11	0.75
Glass & Related Products	0.71	0.69	0.68
Stone, Sand & Gravel	0.86	0.43	0.06
Sand Blasting	0.35	0.17	0.01
Landfills	6.35	1.56	0.22
Waste Management - other	0.35	0.34	0.32
Other Industrial / Commercial	1.07	0.75	0.45
Subtotal	**16.71**	**9.83**	**5.78**
Combustion – Stationary Sources			
Domestic Combustion - space heating	0.70	0.70	0.70
Domestic Combustion - water heating	0.47	0.47	0.47
Wood Stoves	2.59	2.42	2.33
Fireplaces	8.88	8.31	8.00
Gas Turbines	0.89	0.88	0.88
Petroleum Refinery Combustion	2.51	2.51	2.45
Landfill Flares	0.11	0.11	0.11
Other Natural Gas Combustion	1.41	1.41	1.41
Planned Fires (prunings, crops, weeds, etc.)	0.32	0.29	0.27
Subtotal	**17.88**	**17.10**	**16.62**
Off-Road Mobile Sources			
Lawn & Garden Equipment - Gasoline	0.21	0.21	0.21
Refrigeration Units - Diesel	0.19	0.18	0.17
Agricultural Equipment - Diesel	0.33	0.32	0.31
Construction & Mining Equipment - Gasoline	0.11	0.11	0.11
Construction & Mining Equipment - Diesel	0.59	0.56	0.55
Industrial Equipment - Diesel	0.10	0.10	0.09
Light Commercial Equipment - Gasoline	0.34	0.34	0.34
Light Commercial Equipment - Diesel	0.34	0.32	0.31
Locomotive Operations - Diesel	0.20	0.20	0.19
Ships In Transit - Diesel	0.29	0.29	0.28
Ships In Transit – Fuel Oil	0.73	0.73	0.71
Commercial Harbor Craft	0.75	0.75	0.75
Recreational Boats - Gasoline	1.39	1.39	1.38
Commercial Aircraft	0.12	0.12	0.12
General Aviation Aircraft	0.14	0.14	0.14
Subtotal	**5.83**	**5.76**	**5.66**
On-Road Motor Vehicles			

[12] Base Year 2011 Bay Area Emissions Inventory, August 2013

Light Duty Passenger Vehicles - Exhaust	0.29	0.28	0.26
Light Duty Passenger Vehicles - Tire Wear	0.83	0.83	0.21
Light Duty Passenger Vehicles - Brake Wear	3.88	3.81	1.63
Light Duty Trucks I - Exhaust	0.09	0.09	0.08
Light Duty Trucks I - Tire Wear	0.10	0.10	0.02
Light Duty Trucks I - Brake Wear	0.45	0.44	0.19
Light Duty Trucks II - Exhaust	0.10	0.09	0.09
Light Duty Trucks II - Tire Wear	0.27	0.27	0.07
Light Duty Trucks II - Brake Wear	1.27	1.24	0.53
Medium Duty Trucks - Exhaust	0.09	0.08	0.08
Medium Duty Trucks - Tire Wear	0.20	0.20	0.05
Medium Duty Trucks - Brake Wear	0.94	0.92	0.40
Light Heavy Duty Trucks I - Exhaust	0.13	0.13	0.12
Light Heavy Duty Trucks I - Brake Wear	0.34	0.34	0.15
Medium Heavy Duty Trucks - Exhaust	0.67	0.67	0.62
Medium Heavy Duty Trucks – Brake Wear	0.31	0.30	0.13
Heavy Heavy Duty Trucks - Exhaust	1.60	1.60	1.47
Heavy Heavy Duty Trucks – Tire Wear	0.13	0.13	0.03
Heavy Heavy Duty Trucks – Brake Wear	0.23	0.22	0.09
Urban Buses - Exhaust	0.19	0.19	0.17
Urban Buses – Brake Wear	0.50	0.49	0.21
Other Buses - Exhaust	0.09	0.09	0.09
Subtotal	**12.70**	**12.51**	**6.69**
Miscellaneous			
Construction Operations - Residential	5.09	2.49	0.25
Construction Operations - Commercial	4.99	2.44	0.24
Construction Operations - Institutional	5.02	2.46	0.25
Construction Operations - Industrial	2.34	1.14	0.11
Construction Operations - Roads	6.00	2.94	0.29
Subtotal	**23.44**	**11.47**	**1.14**
Farming Operations - Land Preparation	2.27	1.03	0.15
Farming Operations - Harvest	1.21	0.55	0.08
Subtotal	**3.48**	**1.58**	**0.23**
Accidental Fires - structural	0.21	0.21	0.19
Accidental Fires - all vegetation	1.18	1.04	1.01
Subtotal	**1.39**	**1.25**	**1.20**
Entrained Road Dust – Paved Freeways	12.81	5.86	0.88
Entrained Road Dust – Paved Major Roads	15.49	7.08	1.06
Entrained Road Dust – Paved Collectors	3.13	1.43	0.21
Entrained Road Dust – Paved Local Streets	21.50	9.83	1.47
Entrained Road Dust – Unpaved Forest/Park Roads	5.95	3.53	0.35
Entrained Road Dust – Unpaved Farm Roads	0.54	0.32	0.03
Subtotal	**59.42**	**28.05**	**4.00**
Animal Waste - Dairy Cattle	1.07	0.52	0.06
Animal Waste - Range Cattle	1.80	0.87	0.10
Animal Waste - Broilers	5.05	2.43	0.28
Animal Waste - Layers	3.76	1.81	0.21
Animal Waste - Turkeys	2.43	1.17	0.13
Animal Waste - Sheep	0.92	0.44	0.05
Animal Waste - Horses	0.21	0.10	0.01
Animal Waste - Other	3.81	1.83	0.21
Subtotal	**19.05**	**9.17**	**1.05**
Wind Blown Dust - Agricultural Land	9.81	4.90	0.98
Wind Blown Dust - Other	0.59	0.35	0.05
Subtotal	**10.40**	**5.25**	**1.03**
Cigarette/Tobacco Smoking	0.61	0.54	0.52
Various other minor PM sources	2.91	2.85	2.23
Total	**174.20**	**105.63**	**46.31**

Note: Source categories shown with more than 0.10 tpd TSP emissions. Resulting sub-totals are slightly less than total PM emissions inventory.

Appendix A-2: Significant PM Emissions Source Categories

A. Air District PM Emissions Inventory

The first step in developing the draft amendments was to identify PM source categories with the potential for significant emission reductions. Staff used the Air District's 2011 Emissions Inventory as the basis for this review. The 2011 Emissions Inventory provides a comprehensive estimate of the total amount of PM emitted within the Bay Area, sub-divided into estimates of Total Suspended Particulates (TSP), PM_{10}, and $PM_{2.5}$. The total estimated 2011 emissions are as follows:

TSP:	174 tons per day (tpd)
PM_{10}:	106 tpd
$PM_{2.5}$:	46 tpd

The Emissions Inventory breaks down the Bay Area's total PM emissions into multiple source categories. Staff reviewed each source category where PM emissions were estimated to exceed 0.1 tons per day. The contribution of each major grouping of source categories to total emissions of TSP, PM_{10}, and $PM_{2.5}$ are shown in Figures A-2.1 through 2.3 below. These figures provide a graphic illustration of the contribution of each "Summary Category," or grouping of related source categories, to the region's PM emissions inventory.

Figure A-2.1: 2011 Emissions Inventory – TSP Summary Categories

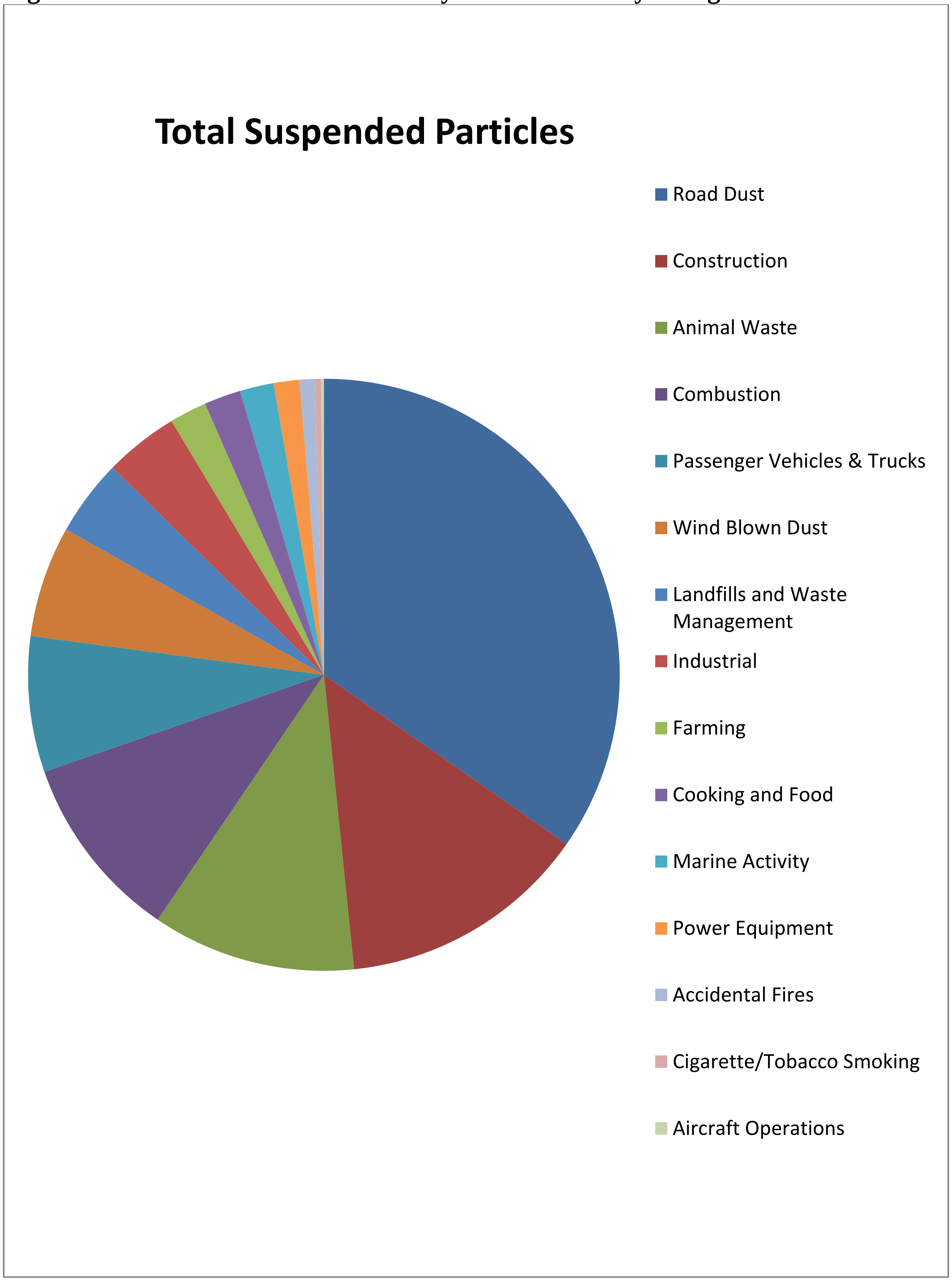
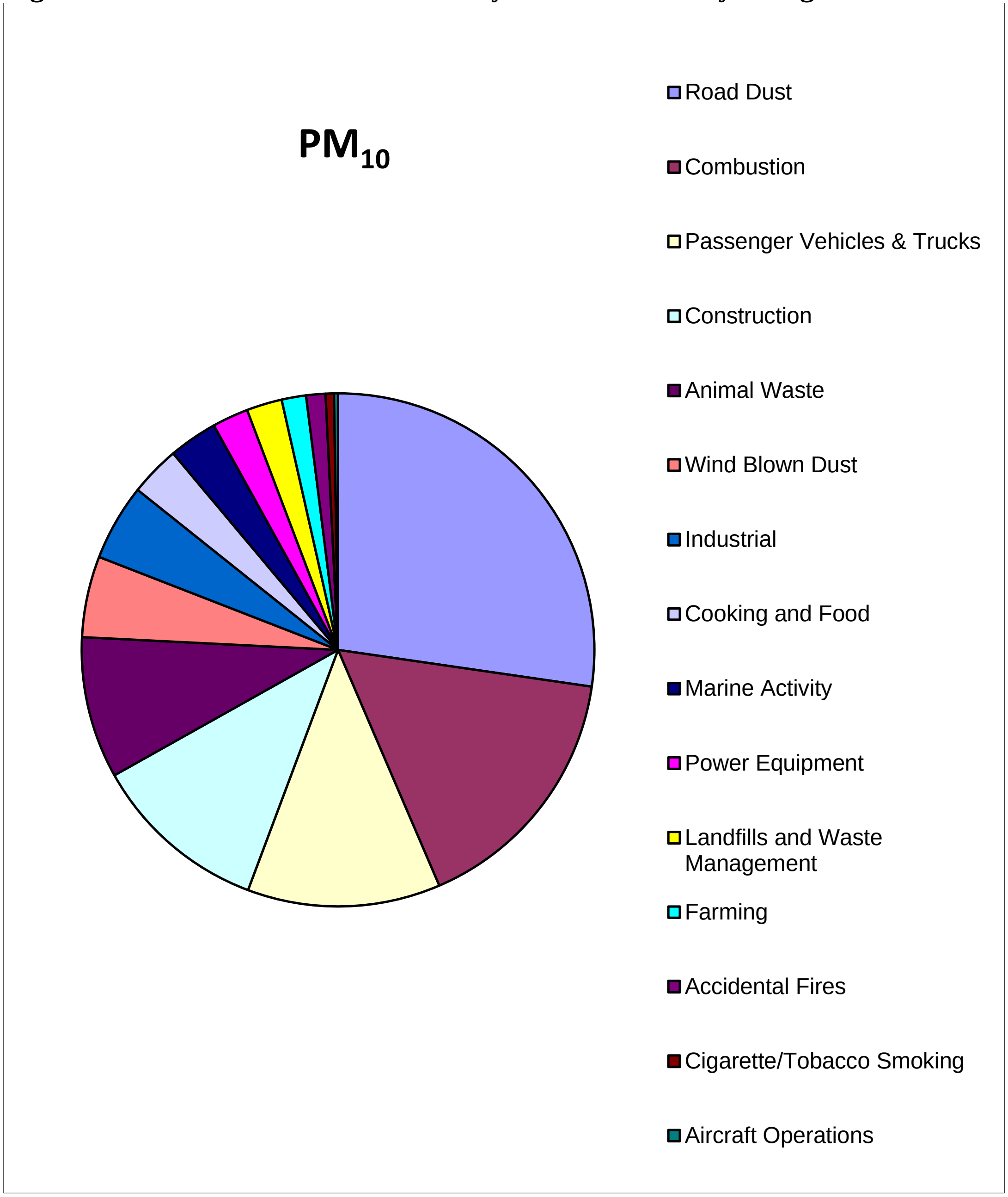


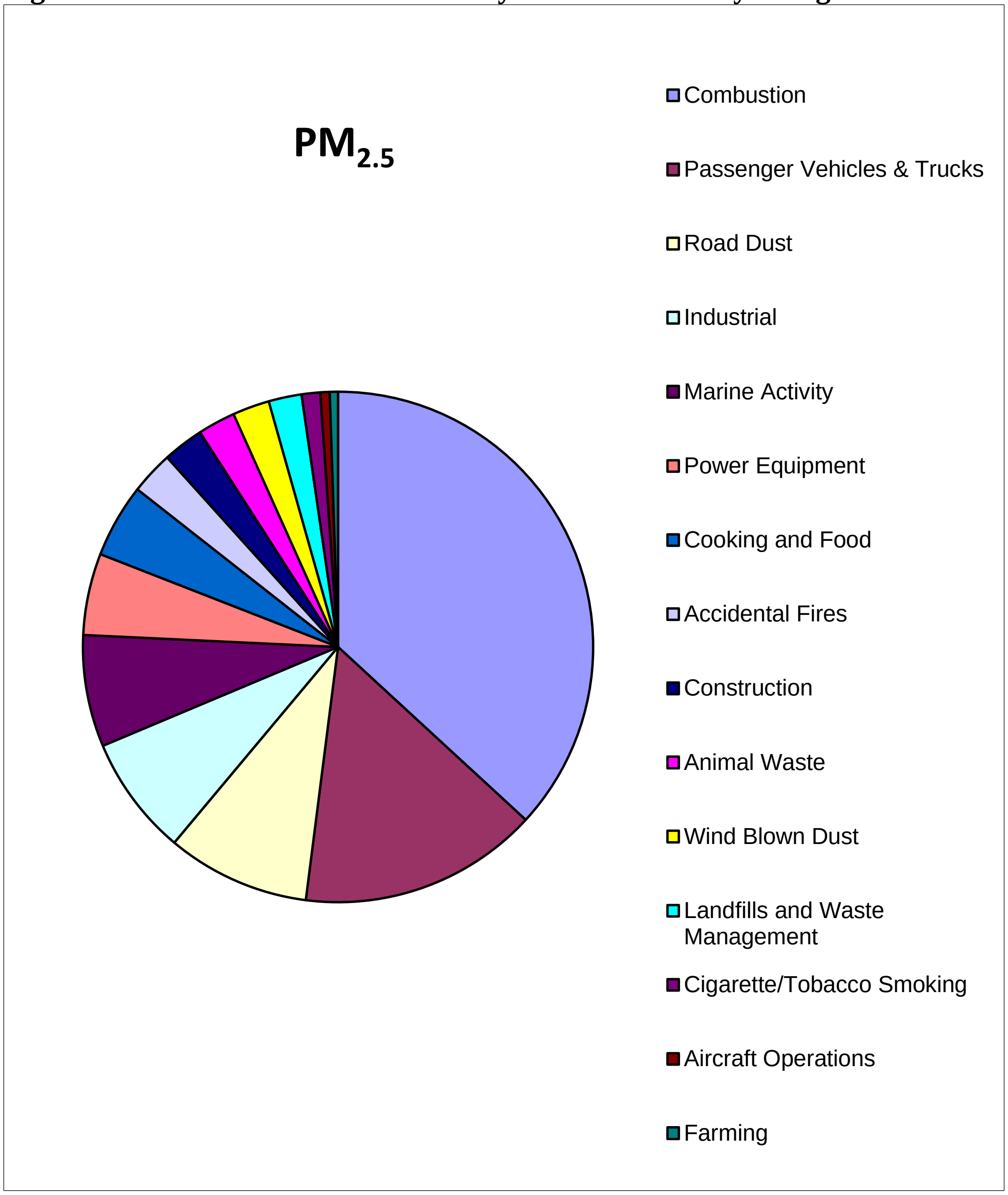
Figure A-2.2: 2011 Emissions Inventory – PM_{10} Summary Categories



As these figures show, the conclusions for TSP (Figure A-2.1) and PM_{10} (Figure A-2.2) are similar - the most significant Summary Categories of emissions are the same six categories:

Summary Category	**% of Total TSP**	**% of Total PM_{10}**
Road Dust	34.7	27.3
Combustion of fuel from various sources	10.2	16.2
Passenger Vehicles & Trucks	7.4	12.2
Construction	13.7	11.2
Animal Waste	11.1	8.9
Wind Blown Dust	6.1	5.1

Figure A-2.3: 2011 Emissions Inventory – $PM_{2.5}$ Summary Categories



The conclusions for $PM_{2.5}$ are somewhat different. The first three most significant $PM_{2.5}$ Summary Categories are the same as those for TSP and PM_{10}:

Summary Category	**% of Total $PM_{2.5}$**
Combustion of fuel from various sources	36.8
Passenger Vehicles & Trucks	15.2
Road Dust	9.1

However, the next three most significant $PM_{2.5}$ Summary Categories are:

Summary Category	**% of Total $PM_{2.5}$**
Industrial sources	7.6
Marine Activity	7.1
Power Equipment	5.2

B. PM Emissions from Combustion

As discussed above in describing PM controls, there are very few effective ways to control PM from natural gas or refinery fuel gas combustion. CARB has developed requirements for control of diesel fuel combustion. Control of jet fuel combustion is outside the authority of the Air District, since no gas turbines in the district currently burn liquid fuels. Control of PM from combustion of solid fuels (specifically petroleum coke) require site-specific analysis.

C. Identification of Source Categories with Potential for Significant PM Reductions

The purpose of draft rule amendments to Rule 6-1 is to significantly reduce PM_{10} and $PM_{2.5}$ emissions. The 2011 Emissions Inventory has been used as the basis for this analysis, and each source category with emissions of greater than 0.10 ton per day for TSP, PM_{10}, or $PM_{2.5}$ was considered. There are eighty eight (88) source categories that capture 95 – 98% of total estimated PM emissions, and represent all significant emissions where reductions may be feasible.

Each of the 88 source categories are shown in Appendix 1. Draft amendments to Rule 6-1 are proposed for each source category where a significant quantity of emissions (especially $PM_{2.5}$) is emitted and where potential control can yield significant PM reductions. Several source categories are excluded from this rule development project based on the following criteria:

- There is a current rule in place for the source category, or other recent rule amendments that are not yet fully implemented; or
- Other rulemaking is currently underway or included in the 2010 Clean Air Plan; or
- The source category is outside of Air District jurisdiction; or
- No control methods are currently available that can have significant impact on emissions from the source category.

Future rulemaking to reduce PM emissions will reconsider all of these categories to identify the sources with greatest opportunity for improvement. Future PM rules will most likely be focused on specific source categories and specific sources, with specific control techniques and specific emission limits.

Twenty two of the eighty eight source categories are being considered for possible control and emissions reductions. These categories include 43% of the total estimated PM_{10} emissions, and 19% of the total estimated $PM_{2.5}$ emissions. The largest of these categories are Construction Dust and Entrained Road Dust. Proposals to control Construction Dust and Entrained Road Dust (summarized as Fugitive Dust) were considered when developing the potential draft amendments for Rule 6-1.

Table A-2.1: Source Categories considered for Rule 6-1 amendments

Source Category	PM_{10}	$PM_{2.5}$
Petroleum Refinery Processing[e]	0.27 tpd	0.16 tpd
Chemical Manufacturing	0.39	0.38
Other Food and Agricultural Processes	0.44	0.26
Wood Products Manufacturing	0.10	0.06
Asphaltic Concrete Plants	0.22	0.18

Concrete Batching	1.11	0.75
Glass & Related Products	0.69	0.68
Stone, Sand & Gravel	0.43	0.06
Landfills	1.56	0.22
Waste Management – other	0.34	0.32
Other Industrial / Commercial	0.75	0.45
Construction – 5 source categories	11.47	1.14
Entrained Road Dust – 6 source categories	28.05	4.00
Total:	45.82	8.66

[e] excluding refinery combustion

D. Source Categories Not Being Considered for Additional Regulatory Requirements

Of the 88 source categories identified in the 2011 Emissions Inventory with PM emissions of over 0.10 ton per day, only 22 are being considered for additional emissions controls. The other 66 were excluded from consideration for various reasons, as discussed below.

Six source categories have rules in place, or recent rule amendments (including state Air Toxic Control Measures) that are not yet fully implemented. These six categories are not currently being considered for potential amendments to Rule 6-1. Three of these source categories are significant sources of both PM_{10} and $PM_{2.5}$ emissions: cooking, wood stoves and fireplaces collectively represent 22% of the PM_{10} and 41% of the $PM_{2.5}$ emissions. The other three source categories have much lower emissions.

Table A-2.2: Source Categories with existing or partially implemented rules

Source Category	PM_{10}	$PM_{2.5}$
• Cooking	2.81 tpd	1.80 tpd
• Sand Blasting	0.17	0.01
• Domestic Combustion – water heating	0.47	0.47
• Wood Stoves	2.42	2.33
• Fireplaces	8.31	8.00
• Gas Turbines	0.88	0.88
Total	15.06	13.49

Eight categories are not being considered for potential amendments to Rule 6-1 because they are addressed by new rules that have recently been approved, or are included in the stationary source measure in the 2010 Clean Air Plan. Some of these sources are currently regulated and the other sources are the subject of Further Study Measures currently included in the 2010 Clean Air Plan. Petroleum Refinery Combustion is also a significant source of PM. Regulation 9, Rule 10 was recently amended to address these sources' NO_X emissions, and include a provision for CO monitoring as an indicator for complete combustion. Additional research is needed to better control PM emissions from refinery process gas combustion. These eight source categories represent 5% of the PM_{10} and 9% of the $PM_{2.5}$ emissions.

Table A-2.3: Source Categories with new rules recently approved, or included in the 2010 CAP

Source Category	PM_{10}	$PM_{2.5}$
• Metallurgical Foundries and Forging	0.61 tpd	0.46 tpd
• Metal Recycling and Shredding	0.10	0.07
• Cement Manufacturing	0.11	0.08
• Domestic Combustion – space heating	0.70	0.70
• Petroleum Refinery Combustion	2.51	2.45
• Planned Fires (prunings, crops, weeds)	0.29	0.27
• Animal Waste - Dairy Cattle	0.52	0.06
• Animal Waste - Range Cattle	0.87	0.10
Total	5.71	4.19

Thirty eight source categories are not within the jurisdiction of the Air District, so are not being considered for potential amendments to Rule 6-1. These 38 source categories represent 18% of the PM_{10} and 28% of the $PM_{2.5}$ emissions.

Table A-2.4: Source Categories outside the jurisdiction of the Air District

Source Category	PM_{10}	$PM_{2.5}$
• Lawn & Garden Equipment	0.21 tpd	0.21 tpd
• Refrigeration Units - Diesel	0.18	0.17
• Agricultural Equipment - Diesel	0.32	0.31
• Construction & Mining Equipment – Gasoline	0.11	0.11
• Construction & Mining Equipment - Diesel	0.56	0.55
• Industrial Equipment - Diesel	0.10	0.09
• Light Commercial Equipment - Gasoline	0.34	0.34
• Light Commercial Equipment - Diesel	0.32	0.31
• Locomotive Operations – Diesel	0.20	0.19
• Ships in Transit – Diesel	0.29	0.28
• Ships in Transit – Fuel Oil	0.73	0.71
• Commercial Harbor Craft	0.75	0.75
• Recreational Boats – Gasoline	1.39	1.38
• Commercial Aircraft	0.12	0.12
• General Aviation Aircraft	0.14	0.14
• Light Duty Passenger Vehicles - Exhaust	0.28	0.26
• Light Duty Passenger Vehicles – Tire Wear	0.83	0.21
• Light Duty Passenger Vehicles – Brake Wear	3.81	1.63
• Light Duty Trucks I - Exhaust	0.09	0.08
• Light Duty Trucks I – Tire Wear	0.10	0.02
• Light Duty Trucks I – Brake Wear	0.44	0.19
• Light Duty Trucks II - Exhaust	0.09	0.09
• Light Duty Trucks II – Tire Wear	0.27	0.07
• Light Duty Trucks II – Brake Wear	1.24	0.53
• Medium Duty Trucks - Exhaust	0.08	0.08
• Medium Duty Trucks – Tire Wear	0.20	0.05

• Medium Duty Trucks – Brake Wear	0.92	0.40
• Light Heavy Duty Trucks I - Exhaust	0.13	0.12
• Light Heavy Duty Trucks I – Brake Wear	0.34	0.15
• Medium Heavy Duty Trucks - Exhaust	0.67	0.62
• Medium Heavy Duty Trucks – Brake Wear	0.30	0.13
• Heavy Heavy Duty Trucks - Exhaust	1.60	1.47
• Heavy Heavy Duty Trucks – Tire Wear	0.13	0.03
• Heavy Heavy Duty Trucks – Brake Wear	0.22	0.09
• Urban Buses – Exhaust	0.19	0.17
• Urban Buses – Brake Wear	0.49	0.21
• Other Buses – Exhaust	0.09	0.09
• Cigarette/Tobacco Smoking	0.54	0.52
Total	18.81	12.87

Staff proposes omitting fourteen source categories from consideration for possible control and emission reductions. Staff is not considering these source categories based on:

i) their current emissions are relatively small,
ii) current rulemaking will provide a basis for future work (regarding control of PM from dairy cattle / range cattle on other types of animals),
iii) additional study is needed to address farming operations, or
iv) control techniques are not currently available to address these categories.

These 14 source categories represent 17% of the total PM_{10} and 11% of the total $PM_{2.5}$ emissions.

Table A-2.5 – Source Categories with relatively small PM emissions, without practical controls, or where current work will help develop future control strategies

Source Category	PM_{10}	$PM_{2.5}$
• Landfill Flares	0.11 tpd	0.11 tpd
• Other Natural Gas Combustion	1.41	1.41
• Farming Operations – Land Preparation	1.03	0.15
• Farming Operations – Harvest	0.55	0.08
• Accidental Fires – structural	0.21	0.19
• Accidental Fires – all vegetation	1.04	1.01
• Animal Waste – Broilers	2.43	0.28
• Animal Waste – Layers	1.81	0.21
• Animal Waste – Turkeys	1.17	0.13
• Animal Waste – Sheep	0.44	0.05
• Animal Waste – Horses	0.10	0.01
• Animal Waste – Other	1.83	0.21
• Wind Blown Dust – Agricultural Land	4.90	0.98
• Wind Blown Dust – Other	0.35	0.05
Total	17.38	4.87

Combustion sources of all types are a cumulative large source of particulates, yet each individual source is a relatively small source of particulate matter. Combustion is a large contributor to the generation of fine PM. Particulates emissions from diesel and fuel oil combustion are common and readily visible. Combustion of natural gas can create ultrafine

PM in addition to the small amounts of larger PM. Gas turbines that burn natural gas have been source tested often, and most of the time very little PM is found due to the large volume of exhaust flow. Emission rates of $PM_{2.5}$ can be significant even when the PM concentration is very dilute. Source test results for these sources indicate PM emissions are 0.0006 grains PM_{10}/dscf or lower. The control technology used for this type of source is “good combustion practice,” which means ensuring that combustion is as complete as possible. Low CO concentrations in flue gas are an indication of complete combustion. There are no practical controls to reduce particulates beyond “good combustion practice” available for these stationary sources. The 2017 Clean Air Plan stationary source control measure entitled “combustion strategy” will review all sources of combustion with the intent of identifying efficiency measures that will reduce the amount of fuel consumed, and will also consider impact on neighbors.

Appendix A-3: Analysis of Potential PM Controls on Affected Facilities

A. Source Categories Identified for Potential Emission Reductions Through PM Controls

Twenty two source categories were reviewed as initial steps to reduce PM emissions. In those 22 source categories there are 2455 permitted stationary sources with particulate matter emissions. These sources were screened to focus on the largest of these facilities, 55 of which have more than 90 lb/day of particulate emissions. These 55 large sources represent slightly more than 2.2% of the permitted sources and approximately 85% of the total emissions from these categories.

Facilities in some of these 22 source categories may be affected by the more stringent TSP concentration and mass emissions limits. Staff visited each of these 55 facilities to assess the current situation, and understand what impact PM controls would have on these operations. Background information and potential for reduced PM emissions are discussed for each of these categories below. These assessments provide the basis for estimated PM emissions reductions, and estimated costs for these facilities to comply with the draft amendments.

Basic Refining Processes

Four of the large sources of PM are refinery fluid catalytic cracking (FCC) units. Flue gas from the regenerator contains catalyst dust, and is controlled with cyclones and electrostatic precipitators (ESP) to limit particulate emissions. These refining processes and the associated control equipment are very sophisticated, and they currently achieve relatively low emissions of filterable PM (typical filterable PM concentrations range from 0.001 – 0.01 grains of PM/dry standard cubic foot).

These sources also contain condensable PM and ammonia, which is a PM precursor. Regulation 6, Rule 5: Particulate Emissions from Refinery Fluidized Catalytic Cracking Units was recently adopted to address the ammonia emissions and optimize ammonia levels in the effluent to minimize particulate emissions from the ESP's.

These facilities are already equipped with Best Available Control Technology for the solid (filterable) particulates. Implementation of Rule 6-5 will address the condensable particulates. No other general or source specific regulations are recommended at this time.

Chemical Manufacturing

One of the large sources of PM in the Bay Area is a petroleum coke calciner. Particulate emissions come from the transportation and storage of green coke, the calcining process, and storage and transportation of the calcined coke product. The primary opportunity for improvement appears to be control of fugitive dust from the storage and handling of the calcined coke product. Regulation 9, Rule 14: Petroleum Coke Calcining Operations was recently adopted to address significant SO_2 emissions, which is a PM precursor. A draft new regulation to address bulk material storage and handling, including coke and coal will reduce emissions from this facility.

One of the large sources of PM is a facility that manufactures catalysts used in oil refining. These catalysts are made from alumina powder that is shipped in by rail. The manufacturing facility is contained within buildings, and has baghouses on the process drying streams and on the ventilation from each of the buildings. There does not appear to be significant opportunity for additional cost effective emission reductions at this time.

Other Food and Agricultural Processes

Two large facilities make salt. Salt dust is contained by ducting surrounding the solids handling systems, and wet mechanical scrubbers (known as roto-clones) are used to control salt emissions. There are several baghouses and one water scrubber used as control devices as well. Wet mechanical scrubbers have relatively poor control effectiveness, but since salt particles are absorbed by the body, these particles may not create the same health impacts as other fine particulates. Staff recommends an exemption from more stringent PM requirements for salt manufacturing.

One large facility is a sugar refinery. Their solids handling processes are abated with wet mechanical scrubbers, and baghouses. One system uses char to absorb color bodies from the raw sugar, and is abated with a baghouse. There does not appear to be significant opportunity for additional cost effective emission reductions at this time. Similar to salt, the sugar particles may not have the same health impacts as other fine particulates. Staff recommends an exemption from more stringent PM requirements for sugar manufacturing.

One of the large sources is a flour mill. The facility currently produces 1,000,000 lbs. of flour per year, and is in the process of expanding production. They have an extensive system of baghouses and are upgrading the baghouses involved in the expansion as required by Regulation 2, Rule 2. The expanded facilities must meet Best Available Control Technology (BACT) requirements. The facilities current emission limits are 0.02 gr/dscf, and new permit requirements for the expansion will reduce emission limits to the 0.002 – 0.004 gr/dscf range. Staff recommends no further analysis of flour manufacturing at this time, as there does not appear to be significant opportunity for additional cost effective emission reductions.

One large facility is a coffee roaster. There are many cyclone and baghouse combinations for bean and ground coffee handling. The coffee roasting is abated for NO_X and hydrocarbons, but is not abated for PM. There have been several source tests conducted on the coffee roasters – indicating PM emissions are 0.012 gr/dscf totaling approximately 0.2 lb/hr, with an additional 0.014 gr/dscf of condensable PM (also ~ 0.2 lb/hr). Staff recommends no further analysis of coffee roasting at this time, as there does not appear to be significant opportunity for additional cost effective emission reductions.

Two large facilities produce livestock feed from various grains. One facility has baghouses to control the grain conveyors and elevators, and the hammer-mill for grinding the grain. The other facility has cyclones to control these types of sources. The cyclones at the second facility are quite old, and estimated to be only 65% efficient. Since these cyclones are much less efficient than baghouses, this facility may be an area of opportunity for improvement. However, secondary abatement is seldom cost effective since more than half of the PM emissions are already removed by the cyclones. The grain unloading areas in both facilities are uncontrolled, although the dusting is relatively minor and occurs only during interim periods when the grain initially falls from the truck into the pit. Compliance testing requirements in draft amendments to Rule 6-1 will identify if further controls are needed for either of these facilities.

Asphaltic Concrete Plants

Five of the large facilities produce asphaltic concrete for road paving. The process for handling and drying aggregate for use in asphalt is controlled, including NO_x controls for the drier and a baghouse to control PM from the drier, handling and storage systems. The area of opportunity for asphaltic concrete facilities is where significant clouds of "blue smoke" occur each time a batch of asphalt mix is delivered from the storage bin into a delivery truck (called load-out). This smoke appears to be vaporized and possibly partially oxidized asphalt. The asphaltic concrete mixture for Warm Mix asphalt is kept at 235 – 275°F in storage, and is hot enough to create this "blue smoke" plume when dropped from the storage vessel into the truck. The asphaltic concrete mixture for Hot Mix asphalt is kept at 300 – 325°F in storage, and makes significantly more "blue smoke." The volume of the plume can be minimized by reducing the free-fall distance into the truck and possibly using a delivery chute.

The California Department of Transportation (CALTRANS) at times requires paving with "rubberized" asphalt. This rubberized asphaltic concrete includes crumb rubber from recycled tires. Rubberized asphaltic concrete is applied at temperatures from 325 – 375°F. These higher temperatures can cause sulfur in the crumb rubber to evolve as hydrogen sulfide (H_2S), an odorous chemical (smells like rotten eggs). In addition, the resulting asphalt mix is in the 300 – 325°F range, and creates significant quantities of "blue smoke."

"Blue smoke" abatement is installed on two of the five large facilities, and currently being added to a third facility. These systems include an enclosure around the truck-loading ramp, and use an induced draft fan to draw air surrounding the loading zone into an abatement device. This control system is estimated to capture 90% of the "blue smoke", and routes it to a filtration system that is estimated to recover 85% of the vaporized oil. While this appears to be an area of opportunity for asphalt concrete mix plants, the existing blue smoke abatement systems collect very little material. The blue smoke is deceiving – although it appears to be a significant volume of smoke, there are very few pounds of particles collected. Some blue smoke abatement systems only require cleaning monthly. Based on existing examples of blue smoke abatement, it does not appear to be cost effective to require installation of this equipment at these facilities to remove the minor amounts of $PM_{2.5}$ at this time.

An additional concern is that this blue smoke can occur a second time when the truck delivers its load of asphaltic concrete to the paver at the jobsite. The cloud of blue smoke at the jobsite is usually much smaller because the asphaltic concrete is generally delivered by sliding the asphalt mix from the dump truck into the paver in a slower and more controlled manner. There does not appear to be a feasible method to control blue smoke at the paving jobsite.

Blue smoke also occurs when an asphaltic surface treatment (generally known as chip-seal paving) is used to seal cracks on an existing paved road, or when layered with fine aggregate to form a roadway that normally sees very low volume of motor vehicle traffic. Blue smoke occurs when hot liquid asphalt is sprayed on an existing paved roadway or aggregate. The cloud of blue smoke at the jobsite can be significant when the hot liquid asphalt includes recycled rubber. Abatement is currently available – a portable modular system similar to the blue smoke abatement systems used at asphalt plants. These systems include an enclosure around the liquid asphalt spray nozzles, and an induced draft fan to draw significant quantities of air surrounding the spray zone into an abatement device. This approach is estimated to capture 85% of the "blue smoke," and routes it to a filtration system that is estimated to recover 85% of the vaporized oil. This also appears to be an area of opportunity to reduce PM emissions, but the amount of asphalt recovered is very small, so staff does not recommend blue smoke abatement at this time.

Additional analysis of possible toxic impacts of blue smoke will be considered in future Health Risk Assessments of these facilities.

Roofing Asphalt

Roofing asphalt is an area with potential for cost effective emission reductions. Roofing asphalt is typically heated to 450 – 500°F in small heating units called asphalt kettles, and pumped to the roof. Smoke and odors can emanate from the kettle (particularly if the asphalt is overheated), and from the asphalt as it is spread on the roof. Smoke and odors also occur when the kettle is opened to add additional asphalt. Roofing asphalt can now be blended with a polymer that forms a skim-layer on the surface of the hot liquid asphalt in the kettle, and has been shown to reduce smoke and odors by up to 80%. This product, known as low-fuming roofing asphalt, appears to be an improvement in worker exposure to fumes, as well as a reduction in PM emissions and odors.

A draft new regulation to address roofing asphalt will is being proposed and the accompanying workshop report is included in this report as Appendix D.

Concrete Batching

Two of the large facilities are concrete batch mix plants. The cement and aggregate flow through a cylindrical chute into the receiving hopper on a delivery truck. An induced draft fan is often used to draw air surrounding the loading zone into an abatement device. This approach is estimated to capture 90% of the cement and aggregate dust, and routes it to a baghouse that is estimated to recover 99% of the dust. Plastic flexible shrouds are often positioned around all four sides of the delivery chute to protect the delivery from the wind. Water is often sprayed on the outside of the shrouds to control any dust that may escape the induced draft fan suction during the delivery. Staff recommends no further analysis of concrete batching operations at this time, as there does not appear to be significant opportunity for additional cost effective emission reductions.

Glass & Related Products Manufacturing

One large facility is a glass recycling facility, that receives glass, sorts it into specific colors and types, and then delivers it to glass manufacturing facilities. Glass comes in via trucks and rail cars. The glass is dumped into piles, scooped up with a large front-end loader, and fed into a hopper / crusher / screening process. Plastic bottles and aluminum cans are removed by hand. A magnet is used to remove trash metals. Water sprays are used for abatement of the conveyors. Baghouses are used for abatement of the recycled glass loaded into trucks for delivery. Occasionally recycled glass is loaded directly into trucks using a large front-end loader. There does not seem to be a significant area of opportunity for additional cost effective emission reductions at this time because there is relatively little dust coming from the transportation and storage of the broken glass.

One facility manufactures fiberglass for insulation. Delivery trucks drop recycled glass into a hopper where it is conveyed to a storage silo. The entire recycled glass supply operation is abated with an induced draft fan and baghouse. Glass is melted with a "cold top" electric arc furnace. There appears to be very little PM emissions from this furnace. Molten glass is then spun into fiberglass abated by large induced draft fan and cyclones. Source test information finds the PM emissions from these sources range from 0.01 – 0.04 grains/dry standard cubic foot, and 2 – 8 lbs/hr from each of 4 parallel fiberglass spinning heads. This spinning process seems to be a source of very fine (0.1 – 1.0 microns) particulates. The facility's corporate engineering group believes the $PM_{2.5}$ comes from volatilization of the molten glass during the spinning process. They have installed electrostatic precipitators (ESP's) at other corporate locations, and find them to be only 50 – 80% effective. Their cyclones could be upgraded to include baghouses or an ESP, but control efficiency is uncertain until particle size distributions are more clearly defined. The fiberglass is then coated with a binder, and this binder is a large source of PM emissions. A recent source test measured about 450 lbs. of PM_{10} per day (including condensable PM). However, this facility is in the process of converting to a different binder, so modification of their permit will drive any improvements needed to achieve BACT controls on the binder coating system. The fiberglass is cooled, formed into mats, and cut into finished sizes, all abated with induced draft fans, cyclones and high efficiency air filters. Source-specific rule making will be needed to address the very fine particulate matter coming from the fiberglass spinning process.

One facility manufactures glass containers, however this facility is no longer a concern because it has recently shut down operations.

Stone, Sand & Gravel

Nine of the large facilities are rock quarries. In general, staff observed that those quarries that made efforts to control dust did a good job of preventing significant dust plumes. On the other hand, those quarries that made little or no effort to control dust had visible dust plumes from crushers, conveyors, stockpiles, and from vehicles on the unpaved roads.

The source and quality of rock from a quarry can vary significantly, so the final products and uses vary as well. However, most quarries have a similar production process: blasting, scooping up the rock with large front-end loaders, crushing the rock, transporting the rock via conveyors, screening the rock into various sizes, additional crushing if necessary, and conveying the various sized rock products to storage piles. Blasting at a quarry creates a significant plume of dust. If the wind is still, this dust can linger for quite some time. If the wind is strong, the wind can carry this dust off-site, and create a nuisance for neighbors. No pre-watering or other methods appear to be practical to prevent or control dust from blasting. Some quarries have a water wash facility to rinse dirt and sand from the various aggregate products.

Most quarries use water sprays as their only dust mitigation strategy. They spray water on the crushers and conveyors, and on the product stockpiles to control dust. Water fog and water misting systems are much more effective because they produce small water droplets that contact the small dust particles more effectively. Some water sprays appeared to be effective, while others needed additional spray nozzles or more regular maintenance of the existing spray nozzles. Almost all quarries load the finished product into trucks with a front-end loader. Loading the finished products into trucks can be a significant source of dust, depending on the time and care used in depositing the rock or aggregate into the truck. Those operators that drop the entire load into a truck quickly from a height of 2 - 3 feet create a significant dust plume. Those that slowly and gently slide the load of rock into the truck from a height of no more than 1-2 feet create a much more modest dust plume. A separate rulemaking for controlling fugitive dust from quarries and other facilities that store and handle bulk materials is being proposed and the accompanying workshop report is included in this report as Appendix E.

Truck traffic on unpaved roads within a quarry can also be a significant source of PM emissions. Most quarries spray water on their unpaved roadways to prevent dust. However, water on unpaved roads can create mud that adheres to the truck tires and truck body, resulting in mud deposits on the paved roads at the exits from these quarries. This mud is known as “trackout” because the trucks and truck tires “track out” mud onto the paved roads. Most quarries have a set of widely spaced bars (known as “grizzlies) near the quarry exit that are designed to knock mud off the trucks, and flex the tire treads to be sure no mud adheres to the tire treads, thus preventing “trackout” onto the public roadway. These grizzly bar systems must also have a place to collect the mud, and the mud must be removed regularly to prevent it from building up to the point where it renders the system ineffective. Some quarries have truck wash stations to clean the trucks and wash mud from the tires before they leave the facility. Trackout can become a significant fugitive dust problem when allowed onto the public roads adjacent to the quarry. The mud can dry into fine silt and local traffic can entrain (and re-entrain) the silt into a localized dust plume. A separate rulemaking for prohibition of trackout will require about one-third of all quarries to improve control of trackout. The draft new rule and workshop report are attached as Appendix C.

Landfills and Other Waste Management

Twelve landfills in the Bay Area are large sources of PM. Similar to quarries, staff observed that the landfills that made efforts to control dust did a good job of preventing significant dust plumes. On the other hand, those landfills that made little or no effort to control dust had visible dust plumes from vehicles on the unpaved roads.

Landfill particulate matter emissions parallel the emissions from construction sites and rock quarries. In addition, landfills may have a variety of other operations including tire recycling; paper, wood, plastic and glass recycling; and green waste recycling. Minor sources of dust are:

- dumping of municipal waste, and construction/demolition debris;
- cuts made in other parts of the landfill to provide cover soil;
- transfer and sorting of recyclables;
- recycling of concrete; and
- recycling and chipping wood.

Most landfills currently have stringent permit conditions in place to control PM emissions. The vast majority of dust at a landfill comes from vehicle traffic. All roads and the area next to the active fill site are normally kept wet to minimize fugitive dust. Landfill sites often use their own leachate as the water source for keeping the roads and active fill site wet. This leachate can have odor issues at times, but it seldom seems to create an odor problem when used to wet the landfill gravel and dirt roads. Landfills also have issues with “trackout” of mud that can accumulate on trucks from the wet gravel and dirt roads. Most landfills have a truck grizzly bar / rumble strip facilities to prevent trackout onto the public roadways. Some facilities have truck wash stations, and others have long paved roads that they either wash down or attempt to keep clean with street sweepers. The primary opportunity for cost effective emissions reductions appears to be more disciplined prevention of trackout onto public roads.

In addition, five other locations in the category of “other” waste management appear to be large sources of PM emissions. These are waste transfer stations, where waste is segregated into various recyclables: green waste, plastic, paper, wood, metals, tires, and concrete for example. Again, PM emissions come primarily from handling of the waste as it is separated into the various recycle streams, and from truck traffic in and out of the facility. Water spray from permanent spray nozzles, or manually from a fire hose is used to wet the waste before it is transferred to a conveyor belt for sorting. Fresh water or reclaimed water is normally used for these water sprays. Water fog or water mist systems are far more effective and use less water. Water sprays appear to be effective, and no significant PM emission reductions are expected. Water is used to control road dust on paved roads and any gravel roads at each facility. Trackout is generally less of a problem at waste transfer stations because most of the roadways are paved. Staff recommends no further analysis of other waste management operations at this time, as there does not appear to be significant opportunity for additional cost effective emission reductions.

Other Industrial & Commercial Processes

There are three gypsum related facilities in the Bay Area. Gypsum is used in fertilizer, cement manufacturing, and is the primary component of wallboard. Gypsum is a soft, powdered mineral salt that is mined and transported as a dry material, and dust from gypsum is approximately 90% PM_{10}, and nearly 50% $PM_{2.5}$.

One of the facilities receives gypsum, conveys it to a large storage pile, and loads it into trucks as supply to a cement manufacturing facility. This facility has a baghouse on the receiving system, and water sprays on the conveyor system. The primary area of opportunity for cost effective emission reductions is fugitive dust from traffic in the area, particularly with a large skip loader used to load gypsum into the product delivery trucks. A second facility receives gypsum, conveys it to a large storage pile, and manufactures wallboard. This facility has baghouses on the gypsum receiving and storage facility, on the crushed gypsum and conveyor to the wallboard plant, and on the gypsum calcining operation within the plant. The area of opportunity for emission reduction is concentrated on fugitive dust from a recycled gypsum storage pile and the truck traffic within the facility. These two gypsum facilities will be affected by the draft rule for bulk material storage and handling.

A third facility manufactures the paper tape used to join and smooth out the interface between two sections of wallboard. This facility generates PM from the mechanical process used to texturize the paper tape so the wallboard joint compound will adhere to the paper tape. This facility has a cyclone to capture the paper dust created by texturizing the paper tape. A baghouse can provide more effective control than a cyclone, so there is an opportunity for reducing emissions by adding a baghouse to the discharge from the cyclone. The discharge of the cyclone appears clear with little residue on the discharge ducts, so no additional controls may be warranted. There are no source tests on this emission point, so the compliance testing required in the draft amendments to Rule 6-1 will determine whether this facility needs to install better control equipment.

Bay Area Rapid Transit Car Cleaning Facilities

Bay Area Rapid Transit (BART) has four maintenance yards that each have BART car cleaning facilities. Particulate matter from rail wear, electric motor wear, and brake pad wear accumulate under the BART cars, and can be emitted to the air during the cleaning process. These cleaning facilities are enclosed, and abated with wet mechanical scrubbers (roto-clones) that seem to work pretty effectively – there is no tell-tale dust or stain on the discharge of the scrubbers. However, emissions from each of these wet scrubbers are currently estimated to be more than 200 lb/day, so staff believes PM control can be improved by adding a baghouse or a wet electrostatic precipitator to the discharge of each wet mechanical scrubber. The amendments to Rule 6-1 include both emissions weight and concentration limits that will cause BART to upgrade controls on these sources.

BART also has a rail-grinding car that is designed to smooth out the system’s rails. This rail-grinding car has an induced draft fan to capture rail dust, and a baghouse to control the discharge of the fan. It appears to work effectively, and does not appear to have much potential for cost effective emission reductions.

Smaller Sources

The remaining 2,400 permitted stationary sources emit significantly less than 90 pounds per day. They collectively account for the remaining 15% of the total emissions of the 22 source categories that are being considered for this first phase of PM emission reductions. They represent an array of sources similar to the larger stationary sources - just lower in emissions. Staff will work with these smaller sources during the workshop phase of the rule development process to discover any unique specific issues that may be raised by these smaller sources.

Construction Operations (Residential, Commercial, Institutional, Industrial, and Roads)

Construction is a large source of fugitive dust, and provides a significant opportunity for emission reductions. Construction dust is currently limited by the visible emission standard in Rule 6-1; and Air District Rule 11-14, Asbestos-Containing Serpentine and the California Air Resources Board Air Toxic Control Measures limit construction operations involving naturally occurring asbestos (known as serpentine rock) for Surfacing Applications and for Construction, Grading, Quarrying, and Surface Mining Operations. Construction dust is also limited by the Regional Water Quality Control Board requirements for Storm Water Pollution Prevention Plans (SWPPP). SWPPP's are required for any construction site over 1 acre.

PM emissions from construction operations are separated into five different categories in the emission inventory, as follows:

Source Category	TSP	PM_{10}	$PM_{2.5}$
Residential	5.09 tpd	2.49 tpd	0.25 tpd
Commercial	4.99	2.44	0.24
Institutional	5.02	2.46	0.25
Industrial	2.34	1.14	0.11
Roads	6.00	2.94	0.29
Total:	23.44	11.47	1.14

CARB guidelines indicate typical dust from construction and other disturbed surfaces is ~ 49% PM_{10}, and only ~ 5% $PM_{2.5}$. Staff is not proposing any draft amendments for Rule 6-1, or any new rules to general control fugitive dust at this time. Instead, staff proposes to focus on trackout that creates road dust, and the potential for subsequent vehicle traffic to pulverize the trackout into silt and $PM_{2.5}$.

As mentioned previously, the State Regional Water Quality Control Board requires Storm Water Pollution Prevention Plans for large construction projects, and provides a variety of Best Management Practices to control silt in water runoff, wind erosion, and trackout onto paved roads. SWPPP Best Management Practices summarized in Appendix A-5A of this workshop report.

Appendix A-5B of this workshop report provides a summary of wind erosion and fugitive dust control methodologies, divided into various categories of potential dust generating activities. These categories are:

1. Bulk Materials – Onsite Handling / Processing Operations
   - Conveying
   - Crushing
   - Screening
   - Stockpiles
2. Bulk Materials – Onsite Hauling / Transporting
   - Loading
   - Unloading
   - Stacking
   - Hauling
   - Transporting
3. Bulk Materials – Offsite Hauling / Transporting
   - Crossing or using paved roads accessible to the Public
4. Concrete and Demolition Work

- Clearing concrete forms
- Mechanical and manual demolition

5. Disturbed Surface Areas
6. Earth-moving Activities
   - Earth cutting and filling,
   - Drilling,
   - Grading,
   - Leveling,
   - Clearing and/or grubbing,
   - Excavating,
   - Trenching,
   - Landscaping,
   - Road shoulder maintenance
   - Soil mulching
   - Landfill operations,
   - Weed abatement by discing or blading.
7. Open Area and Vacant Land
8. Stabilization Requirements
9. Trackout, Carryout, & Spillage, Erosion Requirements
10. Traffic in Unpaved Work Sites
11. Unpaved Parking Areas, Staging Areas, Material Storage Areas, and Unpaved Access Roads and Haul Roads
12. Other Potential Dust Generating Operations / Control Measures

The SWPPP BMP's and these fugitive dust control methodologies are provided here as a reference for the future when a new rule(s) for control of fugitive dust is developed.

Entrained Road Dust

Road dust is divided into six categories based on the estimated emissions from each type of road: Paved Freeways; Paved Major Roads; Paved Collectors; Paved Local Streets; Unpaved Forest/Park Roads; and Unpaved Farm Roads. Each road type accumulates dust from four primary sources:

- Erosion in the form of dirt and debris that blows from the side of the road onto the road by gusts of wind, or that is washed onto the roadway during heavy rains, floods, or irrigation system malfunctions;
- Dirt or other bulk materials that may blow out of a truck, or may leak or spill from a truck as it travels down the road (known as carryout);
- Dirt or mud that adheres to a vehicle's tires or undercarriage which then dries and falls onto the roadway (known as trackout); and
- Particles from the road surface itself that can be eroded by vehicle traffic. These particles are very small when eroded from a paved or concrete road.

Two other sources of particulate can accumulate near roadways - particles from tire wear and brake pad wear. However, they are considered separate categories in the emissions inventory. Staff has no recommendations on how to address either tire wear nor break pad wear.

Any dirt that accumulates on a roadway can be pulverized into fine particles by vehicle tires, and entrained into the air by the turbulence from passing vehicles. Any larger particles (larger than PM_{10}) fall back to the earth quickly (typically within a 100 - 200 feet), while the smaller particles ($PM_{2.5}$) either fall back to earth more slowly or become dissipated with the surrounding air. A study of near freeway particulate measurements indicates diesel and other ultra-fine PM from freeways tend to reach background concentrations about 250 meters away from the freeway.[13] [14]

Entrained Road Dust is identified as six different categories in the emission inventory, as follows:

Source Category	TSP	PM_{10}	$PM_{2.5}$
Paved Freeways	12.81 tpd	5.86 tpd	0.88 tpd
Paved Major Roads	15.49	7.08	1.06
Paved Collectors	3.13	1.43	0.21
Paved Local Streets	21.50	9.83	1.47
Unpaved Forest/Park Roads	5.95	3.53	0.35
Unpaved Farm Roads	0.54	0.32	0.03
Total:	59.42	28.05	4.00

CARB estimates of particle size distribution vary with the type of roadway. Paved road dust is estimated to be 46% PM_{10}, and 7% $PM_{2.5}$, with the remainder being particles larger than 10 microns. Unpaved road dust is estimated to be 59% PM_{10}, and 6% $PM_{2.5}$, with the remainder being particles larger than 10 microns.

Entrained road dust from paved roads can be limited by requiring prevention of trackout, carryout, and erosion onto paved roads. Dust and silt are not usually found in the travel lanes, but rather accumulate along the sides of the roads (either in gutters or road shoulders) and on median strips. In some air districts the various Public Works Departments have paved road shoulders and median strips, but that approach has the disadvantage of creating impermeable surfaces, which can aggravate concerns about water runoff into nearby storm drains and silt deposition into groundwater. A better solution is to provide low-silt gravel or vegetation along road shoulders and median strips to reduce the impact of air turbulence.

There are typically three ways to mitigate road dust:

- Support vegetation on median strips and next to road shoulders to minimize wind erosion
- Water flush
- Mechanical sweeping or Vacuum sweeping

The vegetation strategy is best when built into the design of highways and freeways. Water flushing is effective, but creates the concern of flushing silt into the groundwater. Street sweeping is often the most practical, and has the advantage of removing trash, litter and other debris from the roadway. However, mechanical sweepers often create as much dust

[13] Improving Air Quality and Health in Bay Area Communities, Community Air Risk Evaluation Program Retrospective and Path Forward (2004 – 2014), April 2014, page 76.

[14] Zhu, Y.F., W.C. Hinds, S. Kim, S Shen, C. Sioutas, 2002. Study of ultrafine particles near a major highway with heavy-duty diesel traffic. Atmospheric Environment, 36, 4323-4335. doi:10.1016/S1352-2310(02)00354-0.

as they prevent, as discussed in Section IV B.

Entrained road dust from unpaved city, county, forest, park, and farm roads with very light traffic are much more difficult to address. Control of PM emissions from unpaved roads is simple, through paving, covering the road with low silt gravel, or covering with a petroleum road emulsion. However, since unpaved roads are so widely distributed around the Air District's nine counties, only on rare occasions is there enough traffic to create significant entrained road dust and only then is control of unpaved road dust likely to be cost effective.

Bulk Material Storage and Handling, Including Coke and Coal Operations

Bulk material storage and handling are significant sources of PM emissions, and have also been a source of public complaints. Bulk materials are unpackaged solids less than 2 inches in length or diameter, such as soil, sand, gravel, aggregate, construction materials, coke and coal. Wind erosion from storage and handling of these materials can contribute to fine particulate matter pollution when bulk material dust gets carried into the atmosphere by the wind or by being handled in the open air. Coke and coal are particularly troublesome because the dust is black. Coke or coal dust is far more visible than typical geologic dust, and black residue on people's cars, windows and patio furniture is especially annoying. Black coke and coal dust also absorb sunlight, so they have a greater impact on climate change than most typical dust sources.

The Air District has approximately 120 facilities that store and handle bulk materials, 10 of which handle petroleum coke, and three facilities that store and handle coal. Approximately 40 of these facilities already have controls for fugitive dust, mostly water sprays. Wind breaks are a very effective method to control wind erosion that initiates fugitive dust plumes, particularly when bulk materials are actively conveyed from one place to another. Costs for wind screens and improvements to watering systems are relatively minor. Neighbor complaints are expected to be reduced significantly. A separate rulemaking for controlling fugitive dust from bulk material storage and handling sites is proposed and the draft new rule and workshop report are attached as Appendix E.

Appendix A-4: Applicable Federal Standards

The United States Environmental Protection Agency has adopted the following New Source Performance Standards (NSPS) and National Emission Standards for Hazardous Air Pollutants (NESHAP) that address PM emissions:

Federal New Source Performance Standards (40 C.F.R. Part 60)

Source Category	Subpart and Section	Description
All	Subpart A, § 60.11	General Provisions
Sulfuric Acid Production Units	Subpart Cd, § 60.31d	Emissions Guidelines and Compliance Times
Fossil-Fuel-Fired Steam Generators	Subpart D, § 60.42	Standards of Performance
Electric Utility Steam Generating Units	Subpart Da, § 60.42Da	Standards of Performance
Industrial-Commercial-Institutional Steam Generating Units	Subpart Db; §§ 60.43b & 60.48b	Standards of Performance
Small Industrial-Commercial-Institutional Steam Generating Units	Subpart Dc, § 60.43c	Standards of Performance
Incinerators	Subpart E, § 60.52	Standards of Performance
Large Municipal Waste Combustors	Subpart Eb, § 60.55b	Standards of Performance
Standards of Performance for Hospital/Medical/Infectious Waste Incinerators	Subpart Ec, § 60.52c	Standards of Performance
Sulfuric Acid Plants	Subpart H, § 60.83	Standards of Performance
Hot Mix Asphalt Facilities	Subpart I, § 60.92	Standards of Performance
Petroleum Refineries	Subpart J, § 60.102; Subpart Ja, § 60.102a & § 60.105a	Standards of Performance
Secondary Lead Smelters	Subpart L, § 60.122	Standards of Performance
Secondary Brass and Bronze Production Plants	Subpart M, § 60.132	Standards of Performance
Primary Emissions from Basic Oxygen Process Furnaces Constructed after June 11, 1973	Subpart N, § 60.142	Standards of Performance
Secondary Emissions from Basic Oxygen Process Steelmaking Facilities Constructed after January 20, 1983	Subpart Na, § 60.142a	Standards of Performance
Sewage Treatment Plants	Subpart O, § 60.152	Standards of Performance
Glass Manufacturing Plants	Subpart CC, § 60.292	Standards of Performance
Grain Elevators	Subpart DD, § 60.302	Standards of Performance
Lime Manufacturing	Subpart HH, § 60.342	Standards of Performance
Metallic Mineral Processing Plants	Subpart LL, § 60.382	Standards of Performance
Phosphate Rock Plants	Subpart NN, § 60.402	Standards of Performance
Ammonium Sulfate Manufacture	Subpart PP, § 60.442	Standards of Performance
Asphalt Processing and Asphalt Roofing Manufacture	Subpart UU, § 60.472	Standards of Performance
New Residential Wood Heaters	Subpart AAA, § 60.532	Standards of Performance
Nonmetallic Mineral Processing Plants	Subpart OOO, § 60.672	Standards of Performance
Wool Fiberglass Insulation Manufacturing Plants	Subpart PPP, § 60.682	Standards of Performance
Calciners and Dryers in Mineral Industries;	Subpart UUU, § 60.732	Standards of Performance
Municipal Solid Waste Landfills	Subpart WWW, § 60.752	Standards of Performance

Federal National Emission Standards for Hazardous Air Pollutants (NESHAP) (40 C.F.R. Part 63)

Source Category	Subpart and Section	Description
Petroleum Refineries	Subpart CC, § 63.642	National Emission Standards for Hazardous Air Pollutants
Mineral Wool Production	Subpart DDD, § 63.1178	National Emission Standards for Hazardous Air Pollutants
Hazardous Waste Combustors; Incinerators, Cement Kilns & Lightweight Aggregate Kilns (Interim Standards)	Subpart EEE, § 63.1203, § 63.1205, § 63.1219, § 63.1221	National Emission Standards for Hazardous Air Pollutants
Wool Fiberglass Manufacturing	Subpart NNN, § 63.1382	National Emission Standards for Hazardous Air Pollutants
Petroleum Refineries: Catalytic Cracking Units, Catalytic Reforming Units, and Sulfur Recovery Units, and Bypass Lines	Subpart UUU, § 63.1564, § 63.1565, § 63.1566, § 63.1567, § 63.1568, § 63.1569, § 63.1570	National Emission Standards for Hazardous Air Pollutants
Lime Manufacturing Plants	Subpart AAAAA, § 63.7090	National Emission Standards for Hazardous Air Pollutants
Industrial, Commercial, and Institutional Boilers and Process Heaters	Subpart DDDDD, § 63.7500	National Emission Standards for Hazardous Air Pollutants
Brick and Structural Clay Products Manufacturing	Subpart JJJJJ, § 63.8405	National Emission Standards for Hazardous Air Pollutants
Clay Ceramics Manufacturing Emission Limitations and Work Practice Standards	Subpart KKKKK, § 63.8555	National Emission Standards for Hazardous Air Pollutants
Asphalt Processing and Asphalt Roofing Manufacturing Emission Limitations	Subpart LLLLL, § 63.8684	National Emission Standards for Hazardous Air Pollutants
Refractory Products Manufacturing Emission Limitations and Work Practice Standards	Subpart SSSSS, § 63.9788	National Emission Standards for Hazardous Air Pollutants
Secondary Nonferrous Metals Processing Area Sources Standards, Compliance, and Monitoring Requirements	Subpart TTTTTT, § 63.114655	National Emission Standards for Hazardous Air Pollutants
Asphalt Processing and Asphalt Roofing Manufacturing Standards and Compliance Requirements	Subpart AAAAAAA, § 63.11561	National Emission Standards for Hazardous Air Pollutants
Chemical Preparations Industry Standards and Compliance Requirements	Subpart BBBBBBB, § 6311581	National Emission Standards for Hazardous Air Pollutants
Prepared Feeds Manufacturing Standards, Monitoring, and Compliance Requirements	Subpart DDDDDDD, § 63.11621	National Emission Standards for Hazardous Air Pollutants

APPENDIX A-5: Examples of Control Measures / Best Management Practices for Dust Control

Fugitive Dust Control Measure: A technique, practice, equipment or procedure used to prevent, minimize or mitigate the generation, emissions, entrainment, suspension, and/or airborne transport of fugitive dust. For the purposes of this rule, Storm Water Pollution Prevention Plan (SWPPP) Best Management Practices (BMP), and other dust prevention techniques used to meet CEQA mitigation requirements or local ordinances are considered control measures. Control measures also include:

1 Application of water and dust suppressants;
2 Application of low-silt gravel, asphaltic emulsion, and vegetative or synthetic cover;
3 Physical restriction of fugitive dust, soil erosion and motive forces of fugitive dust (wind and water), including curbing, paving, wind breaks, chutes, shrouds, enclosures, buildings; and
4 Work practice standards including restricting vehicle speeds, controlling drops of bulk materials, using wash down pads, and keeping cargo beds in good repair and covered.

Appendix A-5A

Applicable Storm Water Pollution Prevention Plan – Relevant Best Management Practices

Source Category	Best Management Practices
Erosion Control	EC-1 Scheduling EC-2 Preservation of Existing Vegetation EC-3 Hydraulic Mulch EC-4 Hydroseeding EC-5 Soil Binders EC-6 Straw Mulch EC-7 Geotextiles & Mats EC-8 Wood Mulching EC-15 Soil Preparation / Roughening EC-16 Non-Vegetative Stabilization
Sediment Control	SE-7 Street Sweeping and Vacuuming
Wind Erosion Control	WE-1 Wind Erosion Control
Tracking Control	TC-1 Stabilized Construction Entrance/Exit TC-2 Stabilized Construction Roadway TC-3 Entrance/Outlet Tire Wash
Non-Storm water Management	NS-3 Paving and Grinding Operations NS-13 Concrete Finishing NS-16 Temporary Batch Plants
Waste Management & Materials	WM-1 Material Delivery and Storage WM-2 Material Use WM-3 Stockpile Management WM-4 Spill Prevention and Control WM-5 Solid Waste Management WM-8 Concrete Waste Management

Appendix A-5B

Example Control Measures / Best Management Practices

Source Category	**Control Measure**	**Guidance**	**Records**
1.0 Bulk Materials – Onsite Handling / Processing Operations	**During Active Operations**		
• Conveying • Crushing • Screening • Stockpiles	1.1 Stabilize material before, during, and after conveying, crushing, or screening to prevent visible dust plumes.	1.1.1 Stabilize bulk material with water mist/fog or spray, or chemical/organic dust suppressant.	1.1.1 Establish records indicating stabilization methods and actions for each potential dust source.
	1.2 Use water misting/fogging systems or water sprays, to mitigate fine dust.		1.2.1 Monitor and log key operating parameters of abatement systems.
	1.3 Stabilize material on stockpiles with any indication of windblown visible dust emissions.	1.3.1 Maintain stockpiles to avoid steep sides or faces.	1.3.1 Monitor and record visible dust emissions observations.
	1.4 Use water spray trucks or water spray systems as necessary. Water truck / water spray system must cover entire stockpile.		1.4.1 Monitor and record visible dust emissions observations.
	1.5 Assess operational status of water misting/fog/spray abatement systems regularly and record status.		1.5.1 Monitor and log key operating parameters of abatement systems.
	1.6 Limit stockpiles within 100 yards of an occupied building to less than 8 feet in height.		1.6.1 Monitor and record visible dust emissions observations.
	1.7 Stabilize areas surrounding material stockpiles and conduct housekeeping to ensure materials remain consolidated in storage areas and away from vehicle travel paths.	1.7.1 Stabilize surrounding areas with water, silt free gravel, or dust suppressant.	1.7.1 Monitor and log housekeeping actions, and any cleanup necessary.
	1.8 Incorporate wind breaks, enclosures, or area covers as needed.	1.8.1 Wind barrier with no more than 50% porosity upwind of stockpiles and processing facilities. Height of the wind barrier equals the height of the pile. Distance of the barrier from the pile no more than twice the height of the pile.	
	1.9 Use transfer chutes and shrouds to mitigate dusting from the energy of solids handling and solids falling into and out of delivery trucks, and into processing equipment and onto conveyor belts.		1.9.1 Monitor and record visible dust emissions observations.

	1.10 Record stabilization methods, actions and results.	1.10.1 Document stabilization status in records.	1.10.1 Monitor and log key operating parameters of abatement systems.
	1.11 Clean up any spilled materials that could create dust plumes with wet vacuum or HEPA filter equipped vacuum system.		1.11.1 Record any cleanup necessary.
	1.12 If wind gusts exceed 25 mph, apply water to the stockpile a minimum of twice per hour, or install temporary coverings.		1.12.1 Document wind gusts, and contingency actions taken.
	1.13 Consider water wash of bulk materials to remove PM less than 10 microns.		
	During Periods of Inactive Operations		
	1.14 When not loading, unloading or stacking operations: cover, or stabilize stockpile and maintain soil crust.	1.14.1 Maintain soil crust.	1.14.1 Document stabilization actions for inactive sources.
	1.15 If stockpiles are inactive for more than 14 days, cover with tarp/plastic/other suitable material.	1.15.1 Cover with tarp, plastic or other suitable material and anchor adequately to prevent wind erosion.	
2.0 Bulk Materials – Onsite Hauling / Transporting	**During Active Operations**		
• Loading • Unloading • Stacking • Hauling • Transporting	2.1 Pre-water material prior to loading.	2.1.1 Stabilize bulk material with water or chemical/organic dust suppressant.	2.1.1 Record stabilization methods and actions for each potential dust source.
	2.2 Stabilize material while loading, unloading, and stacking to prevent visible dust plumes.		2.2.1 Monitor and log key operating parameters of abatement systems.
	2.3 Use water misting/fogging systems or water sprays to mitigate fine dust.		2.3.1 Monitor and record visible dust emissions observations.
	2.4 Use water spray trucks or water spray systems as necessary. Water truck / water spray system must cover entire stockpile.		2.4.1 Monitor and log key operating parameters of abatement systems.
	2.5 Assess operational status of water misting/fogging/spray abatement systems regularly, and record status.		2.5.1 Monitor and log key operating parameters of

			abatement systems.
	2.6 Add or remove material from the downwind portion of the stockpile.	2.6.1 Maintain stockpiles to avoid steep sides or faces	
	2.7 Conduct housekeeping to ensure bulk materials remain consolidated onto stockpiles, and remain away from vehicle travel paths.		2.7.1 Monitor and log housekeeping actions, and any cleanup necessary.
	2.8 Incorporate wind breaks, enclosures, or area covers as needed		
	2.9 Use transfer chutes and shrouds to mitigate dusting from the energy of solids handling and solids falling into and out of delivery trucks, and into processing equipment and onto conveyor belts.		
	2.10 Fully enclose or shroud conveyors.		
	2.11 Inspect cargo compartments for holes and other openings to prevent spillage.	2.11.1 Check belly-dump truck seals regularly. 2.11.2 Remove any trapped rocks to prevent spillage	2.11.1 Document leak check inspections, and any corrections or cleanup necessary.
	2.12 Empty loader bucket slowly and minimize drop height from loader bucket to prevent dust plumes		
	2.13 Ensure minimum of 6 inches freeboard in haul truck.		2.13.1 Monitor and record freeboard.
	2.14 Maintain highest point of bulk material below the edges of the cargo container;		2.13.1 Monitor and record material height.
	2.15 Ensure empty cargo compartments are clean, or covered with a tarp or other suitable closure;	2.15.2 Use tarps or other suitable enclosures on haul truck.	
	2.16 If trucks are also used for offsite hauling, ensure they comply with California DMV Vehicle Code Section 23114.		
	2.17 Limit vehicle traffic to established haul routes and parking lots by installing traffic barriers as necessary;		2.17.1 Document traffic control actions.
	2.18 Conduct vehicle traffic counts to determine daily vehicle traffic (DVT).	2.18.1 Traffic control reduces stabilization requirements.	2.18.1 Document actual DVT.
	2.19 When Daily Vehicle Traffic (DVT) exceeds 75, or AADVT exceeds 50, or DVT exceeds 25 from vehicles with 3 or more axles, stabilize unpaved roads or unpaved traffic areas.	2.19.1 Stabilize by watering, uniform layer of low silt gravel, chemical dust suppressant, vegetative materials, paving, road mix, or other method demonstrated to be effective and approved by the	

		APCO.	
	2.20 Limit vehicle speed to no more than 15 mph.		2.20.1 Document speed limit control actions.
	2.21 Record stabilization methods, actions and results.		2.21.1 Monitor and log key operating parameters of abatement systems.
	2.22 Clean up any spilled materials that could create dust plumes with wet vacuum or HEPA filter equipped vacuum system.		2.22.1 Record any cleanup necessary.
	2.23 If wind gusts exceed 25 mph, discontinue truck loading operations, and stop all vehicle traffic or cover all haul vehicles.		2.23.1 Document wind gusts, and contingency actions taken.
3.0 Bulk Materials – Offsite Hauling /	**<u>During Active Operations</u>**		
Transporting, crossing or using paved roads and paved areas accessible to the Public	3.1 Stabilize material or cover cargo compartment before hauling to prevent visible dust plumes.	3.1.1 Stabilize bulk material with water or chemical/organic dust suppressant. 3.1.2 Use tarps or other suitable enclosures on haul trucks.	3.1.1 Record stabilization methods and actions for each potential dust source.
	3.2 Record stabilization methods and actions.		
	3.3 Inspect cargo compartments for holes and other openings to prevent spillage.	3.3.1 Check belly-dump truck seals regularly. 3.3.2 Remove any trapped rocks to prevent spillage.	3.3.1 Document leak check inspections, and any cleanup necessary.
	3.4 Ensure minimum of 6 inches freeboard in haul truck.		3.4.1 Monitor and record freeboard.
	3.5 Maintain highest point of bulk material below the edges of the cargo container.		
	3.6 Ensure empty cargo compartments are clean, or covered with a tarp or other suitable closure.		3.6.1 Monitor and log compartment cleanliness, covers.
	3.7 Limit vehicle traffic to established haul routes and parking lots by installing traffic barriers as necessary.	3.7.1 Traffic control reduces stabilization requirements.	3.7.1 Document traffic control actions.
	3.8 Comply with California DMV Vehicle Code Section 23114.		
	3.9 Conduct vehicle traffic counts to determine daily vehicle traffic (DVT).		3.9.1 Document actual DVT.
	3.10 Where Daily Vehicle Traffic (DVT) exceeds 75, or AADVT exceeds 50, or DVT exceeds 25 from vehicles with 3	3.10.1 Stabilize by watering, uniform layer of low silt gravel,	

	or more axles, stabilize unpaved roads or unpaved traffic areas.	chemical dust suppressant, vegetative materials, paving, road mix, or other method demonstrated to be effective and approved by the APCO.	
	3.11 Limit vehicle speed to no more than 15 mph.		3.11.1 Document vehicle speed control actions.
	3.12 Record stabilization methods, actions and results.		3.12.1 Monitor and record visible dust emissions observations.
	3.13 Clean up any spilled materials that could create dust plumes with wet vacuum or HEPA filter equipped vacuum system.		3.13.1 Document leak check inspections, and any cleanup necessary.
	3.14 If wind gusts exceed 25 mph, stop all vehicle traffic or cover all haul vehicles.		3.14.1 Document wind gusts, and contingency actions taken.
	3.15 Prevent trackout onto paved public roads, per Section 9.0.		
4.0 Concrete & Demolition Work	**<u>Clearing Concrete Forms</u>**		
• Clearing concrete forms • Demolition – mechanical & manual	4.1 Use sweeping and water spray to clear forms.	4.1.1 Do not use high pressure air to clear forms.	4.1.1 Record cleanup methods and actions for concrete forms.
	4.2 Use vacuum system equipped with HEPA filtration to clear forms.		
	<u>Demolition</u>		
	4.3 Divide demolition activities into phases to minimize the amount of demolition debris exposed at any one time.		
	4.4 Stabilize building exterior surfaces and other wind erodible surfaces.		4.4.1 Monitor and record visible dust emissions observations.
	4.5 Apply sufficient water fog or mist during demolition to prevent visible dust plumes.	4.5.1 Stabilize demolished material with water or chemical/organic dust suppressant.	4.5.1 Record stabilization methods and actions for each potential dust source.
	4.6 Stabilize surface soil where support equipment and vehicles will operate.		4.6.1 Monitor and record visible dust emissions observations.
	4.7 Stabilize loose soil and demolition debris within 100 ft. of demolition work site.		4.7.1 Monitor and record visible dust emissions observations.

	4.8 If a wind gust occurs (wind speed exceeds 25 mph), discontinue demolition.		4.8.1 Document wind gusts, and contingency actions taken.
	4.9 Apply water mist or fog, or dust suppressant after demolition to establish a crust and prevent wind erosion.	4.9.1 Stabilize demolished material with water or chemical/organic dust suppressant.	4.9.1 Monitor and record soil crust observations.
5.0 Disturbed Surface Areas	**Preparation Activity**		
	5.1 Divide creation of disturbed surfaces areas into phases to minimize the disturbed surface areas exposed at any one time.		
	5.2 Maintain live perennial vegetation where possible.		
	5.3 Pre-water surface areas to depths of planned cuts or land shaping, allowing time for penetration.		
	During Active Operations		
	5.4 Stabilize disturbed surface areas as they are being created.	5.4.1 Stabilize disturbed surfaces with water or chemical/organic dust suppressant.	5.4.1 Record stabilization methods and actions for each potential dust source.
	5.5 Stabilize disturbed soil throughout the construction site and between structures to prevent visible dust plumes.	5.5.1 Apply suitable dust suppressant to create a soil crust.	5.5.1 Monitor and record soil crust observations.
	5.6 Limit vehicular traffic on disturbed soil to the extent possible.		
	5.7 Incorporate furrows, compacting, wind breaks, enclosures, or area covers as needed to reduce wind soil erosion.	5.7.1 Construct wind barriers with no more than 50% porosity to control windblown fugitive dust. The distance from wind barrier to the disturbed area should be no more than twice the height of the wind barrier. Each 1 foot of wind barrier height will typically protect 8 – 10 feet of disturbed surface. 5.7.2 When interior block walls are planned, install as early as possible.	5.7.1 Record prevention measures and actions for erosion control.
	5.8 Utilize work practices and/or structural provisions to prevent wind and water soil erosion onto paved areas accessible to the public.		5.8.1 Record prevention measures and actions for erosion control.
	5.9 Stabilize disturbed surface areas upon completion; on the last day of active operations prior to a weekend or holiday, or if inactive for more than 14 days.		5.9.1 Monitor and record soil crust observations.
	5.10 Record stabilization methods and actions as required.	5.10.1 Maintain soil moisture content at least 12% as measured by	5.10.1 Monitor and record visible dust emissions

		ASTM D2216-05. For areas where optimum moisture content for compaction is less than 12%, maintain at least 70% of optimum soil moisture content.	observations.
	5.11 If wind gusts exceed 25 mph, apply water a minimum of every 8 hours. If there is any evidence of wind driven fugitive dust, increase watering frequency to a minimum of every 6 hours.		5.11.1 Document wind gusts, and contingency actions taken.
	<u>During Periods of Inactivity</u>		
	5.13 When dust generating operation is inactive for 30 days or more: i. Pave, apply low silt gravel, or apply a suitable dust suppressant; or ii. Establish sufficient vegetative ground cover; and iii. Restrict vehicle access to the area through the use of fences, ditches, vegetation, berms, or other suitable barriers; iv. Restore area as described in Section 15.15.		5.13.1 Monitor and record soil crust observations.
	5.14 If work site is a Large Operation, apply requirements in 5.13 after 21 days.		5.14.1 Document timeliness of soil stabilization.
	5.15 Re-establish ground cover as soon as reasonably possible, but no longer than 90 days, in sufficient quantity and density to expose less than 30% of unstabilized ground. Use aggregates, berms, or wind screens in combination with seeding and watering, chemical stabilizers and ground cover such that in total, these actions apply to all the disturbed surface areas.		5.15.1 Document completion of soil stabilization.
6.0 Earth-moving activities	**<u>Preparation Activity</u>**		
Use of any equipment for any activity where soil is being disturbed, moved or uncovered that may generate fugitive dust emissions, and shall include but not limited to the following:	6.1 Phase work schedule to reduce the amount of disturbed surface area at any one time; and to allow for more effective interim watering and stabilization to minimize potential dust generation.	6.1.1 Grade each project phase separately, timed to coincide with construction. 6.1.2 Apply interim watering and stabilization to minimize potential for dust generation.	
• Earth cutting and filling, • Drilling, • Grading,	6.2 Pre-apply water and allow time for penetration to stabilize soil prior to earth-moving activities.	6.2.1 Apply mist/fog, water sprays, or chemical/dust suppressant to stabilize soil and backfill material.	6.2.1 Document stabilization methods and actions for each potential dust source.

• Leveling, • Clearing and/or grubbing, • Excavating, • Trenching, • Landscaping, • Road shoulder maintenance • Soil mulching • Landfill operations, • Weed abatement by discing or blading.			
	6.3 Maintain live perennial vegetation where possible.		
	<u>During Active Operations</u>		
	6.4 Dedicate water truck or high capacity water fog to work site.	6.4.1 Or dedicate water mist/fog equipment to work site and backfilling equipment.	
	6.5 Pre-water and maintain surface soils in stable condition where vehicles and support equipment operate.	6.5.1 Apply water or chemical dust suppressant to unpaved vehicle equipment traffic areas sufficient to limit visible dust emissions.	6.5.1 Monitor and record visible dust emissions observations.
	6.6 Pre-apply water to depth of proposed cuts; and allow time for penetration to stabilize soil prior to cutting, or trenching. For deep trenching, trench in 18 inches increments, then re-apply water.		6.6.1 Record prevention measures and actions.
	6.7 Apply water or chemical/organic dust suppressant in sufficient quantities to prevent visible dust.	6.7.1 Stabilize soil with water or chemical/organic dust suppressant.	6.7.1 Monitor and record soil crust observations.
	6.8 Re-apply water as necessary to maintain soils in a damp condition.		
	6.9 Stabilize cut and fill material during trenching and handling.		
	6.10 Stabilize cut and fill material when not actively handling.		
	6.11 Empty loader bucket slowly and minimize drop height from loader bucket to prevent dust plumes.		
	6.12 Stabilize soil during and immediately after clearing and grubbing activities;		6.12.1 Monitor and record soil crust observations.
	6.13 Record stabilization methods and actions as required.		
	6.14 Construct furrows, use compaction, or erect 3-5 foot high wind barriers or three-side barriers with no more than 50% porosity upwind of earthmoving activities to limit the impact	6.14.1 Construct wind barriers with no more than 50% porosity to control windblown fugitive dust.	

	of the wind.	The distance from wind barrier to the disturbed area should be no more than twice the height of the wind barrier. Each 1 foot of wind barrier height will typically protect 8 – 10 feet of disturbed surface. In instances where backfill material is piled, the wind barrier height should be equal to or greater than the height of the pile, and the distance from wind barrier to the pile should be no more than twice the height of the pile.	
	6.15 Wash mud and soil from equipment at completion of each task.		
	6.16 Restrict vehicles access and traffic during periods of inactivity to the extent possible.		6.16.1 Monitor and document traffic controls.
	6.17 Stabilize soils once earth-moving activities are complete.		
	6.18 Utilize work practices and/or structural provisions to prevent wind and water soil erosion onto paved areas accessible to the public.		6.18.1 Document actions taken to prevent trackout and erosion.
	6.19 Stabilize sloping surfaces using seeding and soil binders until vegetation or ground cover can effectively stabilize the slopes.		
	6.20 If wind gusts exceed 25 mph, discontinue/cease cut and fill operations, trenching, clearing and grubbing, road shoulder maintenance, and weed abatement operations.		6.20.1 Document wind gusts, and contingency actions taken.
	<u>During Periods of Inactive Operations</u>		
	6.22 Restrict access to vehicle traffic during periods of inactivity to the extent possible.		
	6.23 If area remains inactive for 14 days or more, apply water or chemical dust suppressant to create a stabilized surface.		6.23.1 Monitor and record soil crust observations.
	6.24 Apply chemical dust suppressants and/or low silt gravel to maintain a stabilized surface after completing road shoulder maintenance.	6.24.1 Installation of curbing and/or paving of road shoulders can reduce recurring maintenance costs. 6.24.2 Use of chemical dust suppressants can inhibit vegetation growth and reduce future road shoulder weed abatement and	6.24.1 Document timeliness of soil stabilization.

		maintenance costs.	
7.0 Open Area and Vacant land	7.1 Apply water or chemical/organic dust suppressant in sufficient quantities to prevent visible dust plumes.	7.1.1 Stabilize open areas with water or chemical/organic dust suppressant.	7.1.1 Document stabilization methods and actions for each potential dust source.
	7.2 Stabilize sloping surfaces using seeding and soil binders until vegetation or ground cover can effectively stabilize the open area.		7.2.1 Document stabilization methods and actions for sloping surfaces and open areas.
	7.3 Install barriers, curbs, fences, gates, posts, signs, shrubs, trees or other effective control measures to prevent motor vehicle traffic and off-road vehicle traffic on vacant land.		
8.0 Stabilization Requirements	**<u>Unpaved roads, parking lots and material storage area:</u>**		
	8.1 Stabilize for a centerline distance of at least 100 feet and a width of at least 20 feet to the point of intersection with any paved area accessible to the public.	8.1.1 Stabilizers must stand up to vehicle traffic.	8.1.1 Document stabilization methods and actions for each potential dust source.
	8.2 Cover with at least 3 inches base of gravel with less than 5% silt content. Ensure that unpaved road base silt loading remains less than 8% silt content, or less than 0.33 oz./ft^2.		8.2.1 Silt content is measured by ASTM Method C136-06. Silt is characterized as material less than 75 microns and can pass through a No. 200 sieve.
	8.3 Stabilize with petroleum emulsion.		
	8.4 Pave.		
	8.5 Keep adequately wetted.		
	8.6 Prevent trackout onto paved roads accessible to the public, per Section 9.0		
	<u>Disturbed Surface Area</u>		
	8.7 Stabilize with one of the following: i. Water; ii. Chemical stabilizers; iii. A synthetic cover; iv. Planted vegetative cover; v. Other equivalent methods or techniques.	8.7.1 Stabilize until permanent structure, or vegetation is in place.	8.7.1 Monitor and record soil stability observations.
	8.8 The owner/operator of any disturbed surface area on which no dust generating operation is occurring (a work site that is under construction, or temporarily or permanently inactive) shall be considered stabilized by meeting at least one of the	8.8.1 Sample and test stabilization as needed to ensure no visible dust emissions.	8.8.1 Document soil stability observations.

	following requirements: i. Maintain a visible soil crust. Crust is measured by test method cited in Appendix 6; ii. Maintain a wind erosion threshold friction velocity (TFV) for the area (corrected for non-erodible elements) of 100 cm/second or higher, as cited in Appendix 6; iii. Maintain at least 50% of the surface area in flat vegetative cover (i.e. rooted vegetation or unattached vegetative debris lying on the surface with a predominant horizontal orientation and not subject to movement by wind); iv. Maintain at least 30% of the surface area in standing vegetative cover (i.e. rooted vegetation with a predominant vertical orientation); v. Maintain at least 10% of the surface area in standing vegetative cover (i.e. rooted vegetation with a predominant vertical orientation), and where the threshold friction velocity (TFV) for the area (corrected for non-erodible elements) is 43 cm/second or higher; vi. Maintain at least 10% of the surface area in non-erodible elements such as rocks, stones, or hard-packed clumps of soil; or vii. Comply with an alternate test method, upon written approval from the APCO.		
	8.9 Should a disturbed surface area contain more than one type of visibly distinguishable stabilization, the owner/operator shall test each representative surface separately for stability using the appropriate test methods described in Section 8.7, and aggregate the results to determine compliance with the stability requirements.		8.9.1 Document soil stability observations and aggregate results.

9.0 Trackout, Carryout & Spillage, Erosion Requirements	9.1 Any owner/operator or agency with jurisdiction over unpaved areas with access to public paved roads shall prevent trackout, carryout, spillage and erosion onto these paved public roads.		9.1.1 Document monitoring of prevention processes, results, and corrective actions taken.
	9.2 Each owner/operator or agency shall monitor public paved roads adjacent to their unpaved areas to ensure no visible roadway dust accumulates on such public paved roads.	9.2.1 Monitor at least twice each workday to ensure prevention of dirt on public roadways.	9.2.1 Document monitoring of adjacent paved roads, results, and corrective

			actions taken.
	9.3 Each owner/operator or agency whose unpaved area is the source of visible roadway dust on public paved roads shall clean the public paved road.		9.3.1 Document any cleanup actions taken, and timeline for completion.
	Trackout Control		
	9.4 All vehicles and equipment owned or operated by a facility shall pass through trackout control device prior to exiting the facility onto public paved roads;	9.4.1 Route traffic to ensure all vehicles pass through trackout control.	
	9.5 Install, maintain and use a trackout control device that prevents and controls trackout by removing particulate matter from tires and the exterior surfaces of haul trucks and motor vehicles that exit the work site onto public paved roads.		
	9.6 Owner/operator shall prevent trackout by implementing at least one of the following: i. Pave at least 100 feet and a width of at least 20 feet to the point of intersection with the paved area accessible to the public. ii. Install a 100 feet long X 20 feet wide gravel pad comprised of at least 3 inches base of gravel with less than 5% silt content. Ensure that unpaved road base silt loading remains less than 8% silt content, or less than 0.33 oz./ft^2. iii. Install a grizzly/rumble grate that consists of raised dividers (rails, pipes, or grates) a minimum of three inches tall, six inches apart, and 20 feet long to create vibration that shakes particulate matter off the entire circumference of each wheel as the vehicle passes over the grizzly or rumble grate. iv. Install a wheel wash system at each exit onto paved areas accessible to the public.	9.6.1 Monitor paved public road to ensure no trackout or visible roadway dust. 9.6.2 Monitor critical parameters of trackout control to ensure proper operation.	9.6.1 Document monitoring and results of trackout control.
	Prevention of Carryout and Spillage		
	9.7 When loading haul vehicles, maintain at least 6 inches of freeboard.	9.7.1 Monitor loading periodically for freeboard.	9.7.1 Document checks for prevention of carryout and spillage.
	9.8 Maintain highest point of bulk material below the edges of the cargo container.	9.8.1 Monitor loading periodically for overfill.	
	9.9 Inspect cargo compartment for leaks or compromised seals to prevent spillage.	9.9.1 Monitor for potential leaks.	
	9.10 Ensure empty cargo compartments are clean, or covered with a tarp or other suitable closure.	9.10.1 Monitor for cleanliness, and adequate cover.	

	9.11 Comply with California DMV Vehicle Code Section 23114.		
	Prevention of Erosion		
	9.12 Monitor perimeter of facility, particularly near any paved areas accessible to the public to ensure no wind or water erosion deposits mud, dirt or visible road dust onto paved roads.	9.12.1 Monitor for erosion, and any visible road dust.	9.12.1 Document prevention of erosion and road dust.
	9.13 Utilize work practices and/or structural provisions to prevent wind and water soil erosion onto paved areas accessible to the public.		
	Cleanup of Trackout		
	9.14 Removal of any visible trackout, carryout or any visible roadway dust from any source on a paved public road shall be accomplished using wet sweeping (rotary brush or wet broom) with sufficient water, including but not limited to kick broom, steel bristle broom, Teflon broom, or a HEPA filter equipped vacuum device at the speed recommended by the manufacturer.	9.14.1 Cleanup any mud or visible roadway dust as required.	9.14.1 Document discovery of mud, dirt, or visible roadway dust, and timeliness of cleanup.
	9.15 Operate a PM_{10}-efficient street sweeper that has pickup efficiency of at least 80%, and equipped with rotary brush or wet broom with sufficient water, including but not limited to kick broom, steel bristle broom, Teflon broom, vacuum, at the speed recommended by the manufacturer.		
	9.16 Flush with water if curbs or gutters are not present and where the use of water will not result in residue remaining as further source of trackout, or result in adverse impact on storm water drainage systems.		
	9.17 Manually sweep up or vacuum up deposits with a vacuum equipped with a HEPA filter.		
	9.18 Use of blower devices or dry rotary brushes or brooms for removal from paved public roads is expressly prohibited. The removal of trackout from paved public roads does not exempt an owner/operator from obtaining state or local agency permits which may be required.		
	Cleanup Timeliness		
	9.19 Each owner/operator or agency whose operations or unpaved area is the source of visible roadway dust on public paved roads shall clean up trackout, spillage, and/or erosion from paved areas accessible to the public as required.		
10.0 Traffic in construction sites and on unpaved roads	10.1 Limit vehicle speed to less than 15 mph.		

and other unpaved surfaces			
	10.2 Post speed limit signs that meet State Department of Transportation standards at each unpaved road entrance and post at least every ¼ mile, with signs readable in both directions of travel.		
	10.3 Require construction traffic to use established haul routes. Use barriers to ensure vehicles use only established parking areas and haul routes.		
	10.4 Establish vehicle speed enforcement process that includes the following: • Customers or visitors found to be travelling in excess of the posted speed limit: 1) issue verbal warning; then 2) facility access to be limited; then 3) facility access to be denied. • Employees found to be travelling in excess of the posted speed limit: 1) issue verbal warning; then 2) progressive discipline up to and including termination. • Contractors and subcontractors found to be travelling in excess of the posted speed limit: 1) issue verbal warning; then 2) site removal and future facility access denied.	10.4.1 Monitor vehicle traffic speeds periodically.	10.4.1 Maintain records demonstrating compliance with the vehicle speed enforcement process.
11.0 Unpaved parking areas, staging areas, and material storage areas; and unpaved access road and haul roads.	11.1 Limit number and size of unpaved areas.		
	11.2 Limit number and size of entrances and exits to unpaved areas.		
	11.3 Stabilize unpaved roads, parking, staging, and material storage areas during use to prevent visible dust plumes.	11.3.1 With water, chemical dust suppressant, vegetative materials, paving, road mix, or low silt gravel, or other method demonstrated to be effective and approved by the APCO.	11.3.1 Document stabilization of unpaved roads, and other unpaved areas. 11.3.2 Monitor and document visible dust plumes from unpaved roads and unpaved areas.
	11.4 Consider paving.		

	11.5 Apply material with low silt content (i.e. asphalt, concrete, recycled road base, or gravel to a minimum depth of 3 inches.		
	11.6 Limit vehicle access to unpaved access roads and haul routes, parking areas, staging areas, and material storage areas with barriers.	11.6.1 Reduces stabilization requirements.	
	11.7 Limit vehicles trips to less than 20 per day.	11.7.1 Document daily vehicle trips past busiest locations, at least twice annually.	11.7.1 Document annual vehicle daily trip monitoring, and results.
	11.8 Limit vehicles speeds to less than 15 mph.		11.9 Document how vehicle speed limits are managed.
	11.10 If wind gusts exceed 25 mph, stop all vehicle traffic or apply water every 15 minutes during active operations.		11.10.1 Document actions taken during wind gusts.
	11.11 In areas not used for more than 14 days, stabilize exposed soil to prevent visible dust plumes.		
	11.12 Stabilize parking, staging, and material storage areas at project completion.	11.12.1 Soil stabilization, uniform layer of low silt gravel, or paving.	11.12.1 Document stabilization and test results.
12.0 Other Control Measures	12.1 Any other control measure approved by the APCO and U.S. EPA as equivalent to the methods described in this table.		

Appendix A-6: Test Methods for Determining Soil Stabilization

Determination of Adequately Wetted: Field determination of "adequately wetted" shall be as follows:

- Sample at least one quart of solids from the top three inches of a road, bare area or surface of a stockpile.
- The sample shall be poured out from a height of four (4) feet onto a clean hard surface. The material shall be considered to be adequately wetted if there is no observable dust emitted when the material hits the hard surface.

Determination of Soil Moisture Content: Soil moisture content requirements shall be determined as follows:

- Apply water to maintain soil moisture content at a minimum of 12% as determined by ASTM Method D2216-05 or other equivalent method approved by the APCO.
- For areas that have an optimum moisture content for compaction of less than 12%, as determined by ASTM Method D1557-02e1 or other equivalent method approved by the APCO, maintain at least 70% of the optimum soil moisture content..

Determination of Surface Crusting: Measurement of the stability of surface crusting on horizontal surfaces shall be conducted in accordance with the following test method (reference - San Joaquin Valley Air Pollution Control District (SJVAPCD) Regulation 8011, Appendix B, Section 2):

- Where a visible crust exists, drop a steel ball with a diameter of 15.9 millimeters (0.625 inches) and a mass ranging from 16 to 17 grams from a distance of 30 centimeters (one foot) directly above (at a 90 degree angle perpendicular to) the ground surface. If blow sand (thin deposits of loose grains covering less than 50 percent of the surface that have not originated from the surface being tested) is present, clear the blow sand from the surfaces to be tested before dropping the steel ball.
- A sufficient crust is determined to exist if, when the ball is dropped according to Section 6-5-613.1, the ball does not sink into the surface so that it is partially or fully surrounded by loose grains and, upon removing the ball, the surface on which it was dropped has not been pulverized so that loose grains are visible.
- Drop the ball three times each in three representative test areas within a survey area measuring 1 foot by 1 foot that represents a random portion of the surface being evaluated. The test area shall be deemed to have passed if at least two of the three times the ball was dropped; the results met the criteria in Section 6-5-613.2. If all three test areas pass, the area shall be deemed to be "sufficiently crusted".

Determination of Threshold Friction Velocity (TFV): For disturbed surface areas that are not crusted or partially covered with vegetation, determine threshold friction velocity (TFV) in accordance with the following test method (reference - San Joaquin Valley Air Pollution Control District (SJVAPCD) Regulation 8011, Appendix B, Section 4):

- Obtain and stack a set of sieves with the following openings: 4 millimeters (mm), 2 mm, 1 mm, 0.5 mm, and 0.25 mm or obtain and stack a set of standard/commonly available sieves. Place the sieves in order according to size openings, beginning with the largest size opening at the top. Place a collector pan underneath the bottom (0.25 mm) sieve. Collect a sample of loose surface material from an area at least 30 cm by 30 cm in size to a depth of approximately 1 cm using a brush and dustpan or other similar device. Only collect soil samples from dry surfaces (i.e. when the surface is not damp to the touch). Remove any rocks larger than 1 cm in diameter from the sample. Pour the sample into the top sieve (4 mm opening) and cover the sieve/collector pan unit with a lid. Minimize escape of particles into the air when transferring surface soil into the sieve/collector pan unit. Move the covered sieve/collector pan unit by hand using a broad, circular arm motion in the horizontal plane. Complete twenty circular arm movements, ten clockwise and ten counterclockwise, at a speed just necessary to achieve some relative horizontal motion between the sieves and the particles. Remove the lid from the sieve/collector pan unit and disassemble each sieve separately beginning with the largest sieve. As each sieve is removed, examine it for loose particles. If loose particles have not been sifted to the finest sieve through which they can pass, reassemble and cover the sieve/collector pan unit and gently rotate it an additional ten times. After disassembling the sieve/collector pan unit, slightly tilt and gently tap each sieve and the collector pan so that material aligns along one side. In doing so, minimize escape of particles into the air. Line up the sieves and collector pan in a row and visibly inspect the relative quantities of catch in order to determine which sieve (or whether the collector pan) contains the greatest volume of material. If a visual determination of relative volumes of catch among sieves is difficult, use a graduated cylinder to measure the volume.

- Estimate TFV for the sieve catch with the greatest volume using Table 1 of this appendix, which provides a correlation between sieve opening size and TFV.

Table 1. Determination of Threshold Friction Velocity

Tyler Sieve No.	ASTM 11 Sieve No.	Opening (mm)	TFV (cm/s)
5	5	4	135
9	10	2	100
16	18	1	76
32	35	0.5	58
60	60	0.25	43
Collector Pan	---	--	30

- Collect at least three soil samples which represent random portions of the overall conditions of the site, repeat the above TFV test method for each sample and average the resulting TFVs together to determine the TFV uncorrected for non-erodible elements. Non-erodible elements are distinct elements, in the random portion of the overall conditions of the site, that are larger than 1 cm in diameter, remain firmly in place during a wind gust, and inhibit soil loss by protecting disturbed surface from the shear stress of the wind. Non-erodible elements include stones and bulk surface material but do not include flat or standing vegetation. For surfaces with non-erodible elements, determine corrections to the TFV by identifying the fraction of the survey area, as viewed from directly overhead, that is occupied by non-erodible elements using the following procedure. For a more detailed description of this procedure, see Section 6 (Test Methods for Stabilization-Rock Test Method) of this appendix. Select a survey area of 1 meter by 1 meter that represents a random portion of the overall conditions of the site. Where many non-erodible elements lie within the survey area, separate the non-erodible elements into groups according to size. For each group, calculate the overhead area for the non-erodible elements according to the following equations:

Average Dimensions = (Average Length) x (Average Width) Eq. 1

Overhead Area = (Average Dimensions) x (Number of Elements) Eq. 2

Total Overhead Area = Eq. 3
Overhead Area of Group 1 + Overhead Area of Group 2 (etc.)

Total Frontal Area = Eq. 4
Total Overhead Area/2

Percent Cover Of Non-Erodible Elements = Eq. 5
(Total Frontal Area/Survey Area) x 100

Note: Ensure consistent units of measurement (e.g., square meters or square inches when calculating percent cover).

Repeat this procedure on an additional two distinct survey areas that represent a random portion of the overall conditions of the site and average the results. Use Table 2 of this appendix to identify the correction factor for the percent cover of non-erodible elements. Multiply the TFV by the corresponding correction factor to calculate the TFV corrected for non-erodible elements.

Table 2. Correction Factors for Threshold Friction Velocity

Percent Cover of Non-Erodible Elements	Correction Factor
Greater than or equal to 10%	+ 5
Greater than or equal to 5% and less than 10%	+ 3
Less than 5% and greater than or equal to 1%	+ 2
Less than 1%	None

Determination of Flat Vegetative Cover: For disturbed surface areas with partial vegetative cover, determine the proportion of flat vegetative cover according to the test method in San Joaquin Valley Air Pollution Control District (SJVAPCD) Regulation 8011, Appendix B, Section 5.

Determination of Standing Vegetative Cover: For disturbed surface areas with partial vegetative cover, determine the proportion of standing vegetative cover according to the test method in San Joaquin Valley Air Pollution Control District (SJVAPCD) Regulation 8011, Appendix B, Section 6.

Determination of Non-erodible Elements Cover: For disturbed surface areas with partial rock and other non-erodible elements cover, determine the proportion of non-erodibles according to the Rock Test method in San Joaquin Valley Air Pollution Control District (SJVAPCD) Regulation 8011, Appendix B, Section 7.

Appendix B: Amendments to Rule 6-1 Workshop Report

Bay Area Air Quality Management District
375 Beale Street
San Francisco, CA 94105

Particulate Matter
Rule Development Workshop Report

Draft Amendments to Regulation 6, Particulate Matter;
Rule 1: General Requirements

2010 Clean Air Plan
Stationary Source Measure SSM 6

WORKSHOP REPORT
January 2017

Guy Gimlen
Principal Air Quality Engineer

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Table of Contents

I. INTRODUCTION AND SUMMARY ... 88

II. BACKGROUND ... 89

III. REGULATORY FRAMEWORK ... 89

IV. TECHNICAL REVIEW ... 89

V. DRAFT AMENDMENTS TO REGULATION 6, RULE 1 ... 89

A. Current Provisions of Rule 6-1: General Limitations 89

General TSP Emissions Limitations ... 89

Opacity Limits ... 90

Prohibition on Fallout of Visible Particles ... 90

SO_3 and H_2SO_4 Limits for Sulfuric Acid Plants and Sulfur Recovery Units 91

B. Draft Amendments to Rule 6-1 91

General Exemptions 91

Effective Date ... 92

Definitions ... 92

Update Total Suspended Particles Limits for General Sources ... 92

Retain Provisions Limiting Visible Particles ... 96

Specify Explicit Compliance Test Requirements ... 96

Clarify Test Methods ... 96

C. Other Implementation and Enforcement Improvements 97

VI. EMISSION REDUCTION BENEFITS & COMPLIANCE COSTS ... 98

A. Emission Reductions Expected 98

B. Costs for Controls 99

TSP Limits ... 99

Source Test Costs ... 99

C. Other Impacts That May Require Resources 99

VII. RULE DEVELOPMENT AND PUBLIC CONSULTATION PROCESS ... 99

A. Rule Development Process 99

B. Public Outreach and Consultation 100

C. Review of Potential Environmental Impacts under CEQA 102

D. Review of Economic and Job Impacts with a Socio-Economic Analysis 102

VIII. REFERENCES ... 103

I. INTRODUCTION AND SUMMARY

The Bay Area Air Quality Management District (Air District) is drafting revisions to Regulation 6, Rule 1: General Requirements (Rule 6-1), the Air District's general particulate matter emissions limitation rule. This Workshop Report has been developed to provide the information supporting the draft amendments to Rule 6-1 and is intended to provide the public with information on draft amendments to Rule 6-1 in advance of public workshops the Air District will hold in 2017.

The draft amendments to Rule 6-1 are part of a rule-making process to address a commitment by the Air District's Board of Directors to review Regulation 6, Rule 1, identified as Stationary Source Measure SSM-6 in the Air District's 2010 Clean Air Plan. Since the 2010 Clean Air Plan, Air District staff further committed to taking steps to address the Bay Area's particulate matter challenges in a November 2012 report entitled *Understanding Particulate Matter: Protecting Public Health in the San Francisco Bay Area*. These draft amendments to Regulation 6, Rule 1 begin to fulfill these important commitments to reduce particulate matter emissions and improve public health.

Staff proposes amendments to Rule 6-1 because particulate standards have not been updated in decades; other air districts in California have more stringent standards, and amendments are needed to ensure the Bay Area standards are health-protective. Control technology is available that facilities can use to comply at a reasonable cost; and the revised standards will obtain $PM_{2.5}$ reductions that will help us achieve our health-based $PM_{2.5}$ goals.

This Workshop Report describes the review that staff has undertaken to analyze the various source categories addressed by Rule 6-1, General Requirements and determine where there may be significant emission reductions. Following this introduction and summary, Section II, Background; Section III, Regulatory Framework; and Section IV, Technical Review each refer to the parallel sections in the Regulation 6 workshop report. Section V provides a comprehensive discussion of draft amendments to Rule 6-1. Section VI provides a discussion of the expected air quality benefits, and compliance costs. Section VII outlines the public outreach process that the Air District is undertaking in developing the draft amendments, including further information on how interested members of the public can get involved.

The Air District invites all interested members of the public to review the draft amendments and this Workshop Report, and to attend one of the public workshops in early 2017. Air District staff will discuss the draft amendments at the workshops and request feedback and input from the public, and will continue to accept written feedback for two weeks after the last workshop. Air District staff may revise the draft based on the feedback and input received, and will present a final proposal to the Air District's Board of Directors for consideration. For further information in advance of the public workshop, please contact Guy Gimlen, Principal Air Quality Engineer, (415) 749-4734, ggimlen@baaqmd.gov.

II. BACKGROUND

Refer to the Background section of the workshop report for new draft Regulation 6.

III. REGULATORY FRAMEWORK

Refer to the Regulatory Framework section of the workshop report for new draft Regulation 6.

IV. TECHNICAL REVIEW

Refer to the Technical Review section of the workshop report for new draft Regulation 6.

V. DRAFT AMENDMENTS TO REGULATION 6, RULE 1

A. Current Provisions of Rule 6-1: General Limitations

General TSP Emissions Limitations

Currently, Rule 6-1 imposes the following general TSP emissions limits:

- Section 6-1-310 sets a limit on the **concentration of TSP** in a source's exhaust. TSP concentration must be less than 343 milligrams per dry standard cubic meter (mg/dscm), or 0.15 grains per dry standard cubic foot (gr/dscf). This requirement is applicable to all sources subject to Rule 6-1. There are also specific provisions for correcting the measured TSP emissions concentrations for incineration and salvage operations, gas-fired pathological waste incinerators, and heat transfer operations.
- Section 6-1-311 sets a limit on the **total weight of TSP** in a source's exhaust, using a sliding scale based on the source's "process weight rate." The specific limit for a particular source is based on the amount of material it processes (the process weight rate[1]), where larger sources are allowed more TSP emissions up to a maximum limit of 40 pounds per hour (lbs/hr). The specific formula used to determine the TSP emissions limit for a given process weight rate is set forth in Section 6-1-311, along with a table of emissions limits that correspond to various typical process weight rate levels. Section 6-1-311 also includes a provision exempting fuel-fired indirect heat exchangers (typical boilers and process heaters) from the TSP mass limits.

The current TSP emissions limits in Rule 6-1 have become significantly outdated. As a result, most facilities within the Bay Area are actually achieving PM emissions rates well below what is required by Sections 6-1-310 and 6-1-311. This outcome has been driven in part by the "Best Available Control Technology" (BACT) requirement in the Air District New Source Review permitting regulations (Regulation 2-2). BACT requires facilities to install the most effective emission control technology when a new source is installed or an existing source is modified, even if that level of control is not required by Rule 6-1. As a result, the controls required by BACT have evolved far ahead of the requirements in Rule 6-1, and for many facilities, the permit conditions established by BACT set the PM emissions standards for that facility.

In addition, the Air District's current TSP limits in Sections 6-1-310 and 6-1-311 now lag well

[1] "Process weight" is defined as the total weight of all material introduced into an operation; excluding: (i) liquids and gases used solely as fuels, (ii) air that is not consumed as a reactant, and (iii) combustion air. A source's "process weight rate" is the rate at which such materials are introduced into the operation.

behind similar rules in other urban air districts in the state. Rule 6-1's PM concentration limit is 0.15 gr/dscf, whereas the limit is 0.10 gr/dscf or lower in several other air districts. The South Coast air district, for example, imposes a limit of 0.01 gr/dscf for exhaust flows exceeding 70,000 cubic meters per minute (~ 2.5 million standard cubic feet per minute). Current Rule 6-1 limits on total mass of PM emissions are also less restrictive than those in the South Coast, San Joaquin Valley, and Sacramento air districts. These considerations were the basis for the Air District's commitment in SSM 6 to revisit the general PM limitations in Rule 6-1 and impose requirements that reduce emissions.

This rule amendment project addresses the General Requirements in Rule 6-1. In addition, the Air District's has been developing rules that apply to specific sources, categories of sources, or specific industries. This approach is consistent with those of other California air districts. As the Air District moves forward to further control PM emissions, staff will consider the largest source categories of PM emissions and determine the best approach to control each source category. Such initiatives will be undertaken in separate rulemaking. Draft new Regulation 6: General Provisions, Definitions and Test Methods is proposed to provide the over-arching requirements, definitions and test methods for the current regulations and for potential future source-specific regulations.

Opacity Limits

Rule 6-1 sets a primary opacity limit of 20% opacity for any source of emissions (equivalent to No. 1 on the Ringelmann scale) for no more than cumulative 3 minutes in any 60-minute observation period. The rule also allows up to 40% opacity (equivalent to No. 2 on the Ringelmann scale) in certain specified instances. These requirements are in Sections 6-1-301 through 6-1-304 and Section 6-1-306.

Unlike the general TSP emissions limitations discussed above, these opacity limits continue to reflect the regulatory state of the art. Requirements for visible emissions are very similar throughout California's air districts. Most districts' visible emissions regulations are based on the Ringelmann scale or a specific opacity limit. Opacity limits are often based on a "not to exceed" limit of three or four minutes in any 60-minute period. Visible emissions can also be limited to remain within the source's property boundaries. All of these regulatory approaches are consistent with the Air District's current opacity provisions in Rule 6-1. Rule 6-1's opacity limits were not identified for revision in SSM 6, and Air District staff have not found any reason to amend them. The draft amendments therefore retain the opacity limits in essentially the same form, although the draft includes revisions to make the requirements more clear and straightforward.

Prohibition on Fallout of Visible Particles

Section 6-1-305 prohibits the emission of visible particles that are large enough to be visible as individual particles at the source, if they fall onto adjacent property "in sufficient numbers to cause annoyance to any other person." Staff proposes retaining this provision. There is also a prohibition of "incandescent" particles (i.e., glowing embers) falling onto adjacent property. This provision is a relic from the era when incinerators, known as "burn barrels" were commonly used to burn trash, and often emitted embers and other large, visible soot particles that caused fallout problems. While this seldom occurs today, staff proposes to retain this provision because burning embers do occasionally fall on neighboring property.

SO_3 and H_2SO_4 Limits for Sulfuric Acid Plants and Sulfur Recovery Units

Sections 6-1-320 and 6-1-330 set SO_3 and H_2SO_4 emission limits for sulfuric acid manufacturing plans and sulfur recovery units that use sulfur-containing material as a principal raw material. For sulfuric acid manufacturing plants, the limit is 92 mg/dscm (0.04 gr/dscf) of SO_3 converted to and quantified as 100% H_2SO_4. For sulfur recovery units, the limit is 183 mg/dscm (0.08 gr/dscf) of SO_3 converted to and quantified as 100% H_2SO_4. SO_3 and H_2SO_4 emission limits are also set in Regulation 12, Rule 6: Acid Mist from Sulfuric Acid Plants at 0.3 lbs H_2SO_4/ton of acid produced. These limits are not being revised at this time because another rule-making project is being considered to review both SO_2 and SO_3 emissions limits from sulfuric acid plants and sulfur plants.

B. Draft Amendments to Rule 6-1

Air District staff proposes draft amendments to Rule 6-1 in three broad categories:

- Update the current particulate matter emissions limits for general sources of PM emissions (including both concentration limits and mass emissions limits) to reflect the most stringent emissions levels achievable.
- Clarify the testing requirements to measure PM emissions and determine compliance with the rule.
- Specify the source test methods used for compliance testing.

This Section discusses all of the draft amendments in detail. The purpose of these draft amendments is to reduce particulate matter emissions; to clarify applicability of the rule; to improve enforceability of the rule; to clearly define testing requirements and specific test methods used to determine compliance with the rule; and, to begin to fulfill the commitments the Air District has made in Stationary Source Measure 6 in the 2010 Clean Air Plan.

General Exemptions

Staff proposes adding exemptions to Rule 6-1 for sources that are currently regulated under other existing regulations where the requirements are more stringent, or at least as stringent with additional special provisions required. These include sandblasting (Regulation 12, Rule 4), open fires (Regulation 5), wood burning devices (Regulation 6, Rule 3), and Portland Cement Manufacturing (Regulation 9, Rule 13).

Staff proposes a limited exemption from the new more stringent TSP concentration and weight limits for commercial cooking equipment (Regulation 6, Rule 2), for salt and sugar operations, and for combustion in fuel-fired indirect heat exchangers (typical boilers and process furnaces). Emissions limits for commercial cooking are established in pounds of PM_{10} per 1000 pounds of meat cooked. Staff is proposing a limited exemption for food grade and pharmaceutical grade salt and sugar manufacturing facilities. Particles of salt and sugar represent a unique exception to the public health concerns regarding PM. Although $PM_{2.5}$ from salt and sugar manufacturing contributes to overall PM emissions, these fine particles of sugar or salt simply absorb into wet lung tissue. No employee Personnel Protective Limits exist for either salt or sugar particles. Staff proposes to exempt product grade salt and sugar particulates from the more stringent draft particulate matter concentration and weight emissions limits in Sections 6-1-310.2 and 6-1-311.2. Staff proposes to continue the existing exemption for fuel-fired indirect heat exchangers because PM from this equipment is related to combustion efficiency and controls are not readily available.

Note that exemptions are not provided for Metal Recycling and Shredding Operations (Regulation

6, Rule 4), and Foundry and Forging Operations (Regulation 12, Rule 13) because the opacity limits in Rule 6-1 continue to apply to these operations.

Effective Date

Staff proposes the revised TSP emissions limits become effective 24 months after adoption of the amendments to Rule 6-1. This provides two years for all affected entities to budget, design, construct and operate any additional control technologies necessary to ensure compliance. The existing TSP limits in the current rule will be in effect pending this future effective date.

Definitions

The draft amendments also include a number of new definitions, as well as some revisions to existing definitions. Staff believes future PM regulations will likely be source specific requirements, so many definitions will apply to several rules. Staff proposes new Regulation 6: General Provisions, Definitions and Test Methods to provide the overarching information applicable to all Particulate Matter regulations. Other draft revisions to the definitions clarify how some of the existing requirements apply, for example by defining opacity, Ringelmann chart, and standard conditions.

Update Total Suspended Particles Limits for General Sources

Sections 6-1-310 and 6-1-311 currently establish limits on the concentration of TSP in source's exhaust and the total mass of TSP emitted, respectively. The draft amendments to Rule 6-1 update the rule within its current structure: a general particulate matter rule that limits Total Suspended Particulates emissions from a wide variety of sources. In spite of the greater concern about the health impacts from $PM_{2.5}$ and other fine particulates, this rule continues to establish (more) stringent TSP limits for two reasons:

- Reduction in TSP will result in reductions in both PM_{10} and $PM_{2.5}$ emissions. These reductions will vary by source type, since different sources have differing particle size distribution profiles. As examples:
  - Emissions from calcining gypsum are 88% PM_{10}, 49% of which is $PM_{2.5}$.
  - Emissions from coffee roasting are 62% PM_{10}, 61% of which is $PM_{2.5}$.
  - Emissions from woodworking operations are 40% PM_{10}, 28% of which is $PM_{2.5}$.
  - Emissions from grain handling operations are 29% PM_{10}, 1% of which is $PM_{2.5}$.
- The current emissions standards that apply generally to all particulate matter sources are TSP concentration and TSP weight emissions limits. As the examples above indicate, extensive research and testing on many different types of particulate matter sources would be necessary to establish parallel PM_{10} or $PM_{2.5}$ concentration and weight limits for the wide variety of sources covered by Rule 6-1.
- Source specific rule-making is a better approach to establish appropriate PM_{10} or $PM_{2.5}$ concentration and weight limits for each source category.

The draft amendments reduce the existing limits to reflect emissions from the most effective emission control technology.

TSP Concentration Limit

The current TSP concentration limit in Section 6-1-310 is 343 milligrams per dry standard cubic meter (mg/dscm), or 0.15 grains per dry standard cubic foot (gr/dscf). Effective two years after rule adoption, the draft amendments reduce this limit using a sliding scale based on the size of the source as measured by the volume of exhaust. The proposed new limits range from 343 mg/m^3 for the smallest sources to 23.0 mg/m^3 for the largest sources. The draft limit is defined by the following table, derived from the most stringent TSP limits currently in place in California:

Table 6-1-310.2: Process Volume vs. Allowable TSP Concentrations

Exhaust Gas Volume		TSP Concentration Limit	
dsm^3/min	**dscf/min**	**mg/dsm^3**	**gr/dscf**
50 or less	1,766 or less	343	0.150
>50 – 75	>1,766 - 2,649	298	0.130
>75 – 100	>2,469 - 3,531	268	0.117
>100 – 150	>3,531 - 5,297	230	0.101
>150 – 200	>5,297 - 7,063	207	0.0903
>200 – 300	>7,063 - 10,594	178	0.0776
>300 – 400	>10,594 - 14,126	159	0.0697
>400 – 500	>14,126 - 17,657	147	0.0641
>500 – 750	>17,657 - 26,486	126	0.0551
>750 - 1,000	>26,486 - 35,315	113	0.0495
>1,000 - 1,500	>35,315 - 52,972	97.3	0.0425
>1,500 - 2,000	>52,972 - 70,629	87.3	0.0382
>2,000 - 3,000	>70,629 - 105,944	75.1	0.0328
>3,000 - 4,000	>105,944 - 141,259	67.4	0.0295
>4,000 - 5,000	>141,259 - 176,573	62.0	0.0271
>5,000 - 7,500	>176,573 - 264,860	53.3	0.0233
>7,500 - 10,000	>264,860 - 353,147	47.8	0.0209
>10,000 - 15,000	>353,147 - 529,720	41.1	0.0180
>15,000 - 20,000	>529,720 - 706,293	36.9	0.0161
>20,000 - 30,000	>706,293 - 1,059,440	31.7	0.0139
>30,000 - 40,000	>1,059,440 - 1,412,587	28.5	0.0124
>40,000 - 50,000	>1,412,587 - 1,765,733	26.2	0.0115
>50,000 - 70,000	>1,765,733 - 2,472,027	23.1	0.0101
>70,000	>2,472,027	23.0	0.0100

These draft limits are set forth in new section 6-1-310.2. The draft revision would become effective 24 months after approval.

The draft new limits would not apply to small sources (defined as Potential to Emit either TSP or PM_{10} at less than 1000 kg per year, ~ 6 pounds per day). Potential to Emit is defined in Regulation 2-1-217. Sources with PM emissions less than 1000 kg per year can be controlled with water sprays, cyclones, or baghouses, but such controls do not appear to be justified because the cost of equipment and operating costs are relatively high for the small particulate matter emissions reductions. The existing 343 mg/dscm standard will be retained in Section 6-1-310.1, and sources below the 2.7 kg/day threshold will continue to be subject to that standard.

TSP Weight Limit

The current limit on total mass of TSP emissions in Section 6-1-311 is based on a source's process weight rate P (the rate at which materials are processed in the source), specified by Section 6-1-311, Table 1. This table relied on a formula to interpolate between the entries in the table. Rather than continue this obtuse approach, Table 1 has been replaced with an equivalent Table 6-1-311.1. Table 6-1-311.1 provides emission limits for a wide range of process weight rates, as shown below:

Table 6-1-311.1: Process Weight Rate vs. Allowable TSP Emission Limits

Process Weight Rate		**TSP Emission Limit**	
kg/hour	**lb/hour**	**kg/hour**	**lb/hour**
250 or less	551 or less	0.81	1.78
>250 - 300	>551 - 661	0.91	2.02
>300 - 400	>661 - 882	1.11	2.45
>400 -500	>882 - 1,102	1.29	2.84
>500 - 600	>1,102 - 1,323	1.45	3.21
>600 - 700	>1,323 - 1,543	1.61	3.56
>700 – 800	>1,323 – 1,764	1.76	3.89
>800 – 900	>1,764 – 1,984	1.91	4.21
>900 – 1,000	>1,984 – 2,205	2.05	4.52
>1,000 - 1,200	>2,205 – 2,646	2.31	5.11
>1,200 - 1,400	2,646 – 3,086	2.56	5.66
>1,400 - 1,600	3,086 – 3,257	2.80	6.19
>1,600 - 1,800	3,257 – 3,968	3.03	6.70
>1,800 – 2,000	>3,968 – 4,409	3.26	7.19
>2,000 – 2,500	>4,409 – 5,512	3.78	8.35
>2,500 –3,000	>5,512 – 6,614	4.27	9.43
>3,000 – 3,500	>6,614 – 7,716	4.74	10.5
>3,500 – 4,000	>7,716 – 8,818	5.18	11.4
>4,000 - 4,500	>8,818 – 9,921	5.61	12.4
>4,500 - 5,000	>9,921 - 11,023	6.02	13.3
>5,000 – 6,000	>11,023 - 13,228	6.80	15.0
>6,000 - 7,000	>13,228 - 15,432	7.54	16.6
>7,000 -8,000	>15,432 – 17,637	8.24	18.2
>8,000 – 9,000	>17,637 – 19,842	8.92	19.7
>9,000 - 10,000	>19,842 – 22,046	9.57	21.1
>10,000 – 12,000	>22,046 - 26,455	10.8	23.9
>12,000 - 14,000	>26,455 - 30,865	12.0	26.5
>14,000 - 16,000	>30,865 - 35,274	13.1	29.0
>16,000 - 18,000	>35,274 – 39,683	14.2	31.3
>18000 - 20,000	>39,683 - 44,092	15.2	33.6
>20,000 - 22,000	>44,092 – 48,502	16.2	35.9
>22,000 - 24,000	>48,502 – 52,911	17.2	38.0
>24,000 - 25,000	>52,911 – 55,116	17.7	39.1
>25,000 - 26,000	>55,116 – 57,320	18.1	40.0
>26,000	>57,320	18.1	40.0

Effective 24 months after rule adoption, the draft amendments would adopt a more stringent mass emission limits. These draft limits are set forth in new section 6-1-311.2. As with the draft new concentration limits, these draft TSP mass emissions limits would not apply to small sources with TSP or PM_{10} Potential to Emit emissions less than 1000 kg per year (~6 pounds per day). The existing limits would remain, and continue to apply to small sources. The draft mass emissions limits are shown below, derived from the most stringent TSP limits currently in place in California:

Table 6-1-311.2: Process Weight vs. Allowable TSP Weight Limits

Process Weight Rate		TSP Emissions Limit	
kg/hour	**lb/hour**	**kg/hour**	**lb/hour**
100 or less	220 or less	0.45	0.99
>100 - 150	>220 - 331	0.59	1.29
>150 - 200	>331 - 441	0.70	1.55
>200 - 300	>441 - 661	0.90	1.98
>300 - 400	>661 - 882	1.06	2.34
>400 -500	>882 - 1,102	1.21	2.67
>500 - 750	>1,102 - 1,653	1.52	3.34
>750 – 1,000	>1,653 - 2,205	1.78	3.92
>1,000 – 1,500	>2,205 - 3,307	2.21	4.86
>1,500 - 2,000	>3,307 - 4,409	2.56	5.65
>2,000 - 3,000	>4,409 - 6,614	3.15	6.95
>3,000 - 4,000	>6,614 - 8,818	3.64	8.02
>4,000 - 5,000	>8,818 - 11,023	4.06	8.95
>5,000 - 7,500	>11,023 - 16,535	4.96	10.9
>7,500 - 10,000	>16,535 - 22,046	5.44	12.0
>10,000 - 15,000	>22,046 - 33,069	6.00	13.2
>15000 - 20,000	>33,069 - 44,092	6.40	14.1
>20,000 - 30,000	>44,092 - 66,139	7.04	15.5
>30,000 - 40,000	>66,139 - 88,185	7.53	16.6
>40,000 - 50,000	>88,185 - 110,231	7.93	17.5
>50,000 - 75,000	>110,231 - 165,347	8.71	19.2
>75,000 - 100,000	>165,347 - 220,462	9.33	20.6
>100,000 - 150,000	>220,462 - 330,693	10.3	22.6
>150,000 - 200,000	>330,693 - 440,925	11.0	24.2
>200,000 - 300,000	>440,925 - 661,387	12.1	26.6
>300,000 - 400,000	>661,387 - 881,849	12.9	28.5
>400,000 - 500,000	>881,849 - 1,102,312	13.6	29.9
>500,000	>1,102,312	13.6	30.0

<u>Basis for Revised Limits</u>

These draft new limits are reasonable and appropriate. Current limits have not been revised in more than 30 years and are significantly outdated. Emissions control technologies are available to achieve these limits and, therefore, the draft limits reflect the current state of technological improvements. In addition, other California air districts have adopted similarly stringent TSP emissions limits. The South Coast, San Joaquin Valley, and Sacramento districts all have TSP mass emissions limits that are as stringent as the revised mass limits the Air District is proposing, and the South Coast also has TSP concentration limits as stringent as the revised concentration limits the Air District is proposing. The experience of these other districts further support that the draft new limits are feasible and appropriate. The Air District also reviewed the state of available control technologies to determine whether it would be feasible to impose even more stringent standards than those in place in other air districts. While there are specific control technologies for specific industries that represent Best Available Control Technology, the draft limits represent Best Available Retrofit Control Technology (BARCT) for a wide variety of PM sources.

Retain Provisions Limiting Visible Particles

Section 6-1-305 prohibits the emission of visible particles that are large enough to be visible as individual particles at the source, if they fall onto adjacent property "in sufficient numbers to cause annoyance to any other person" and a prohibition of "incandescent" particles (i.e., glowing embers) falling onto adjacent property. This provision is a relic from the era when incinerators, known as "burn barrels" were commonly used to burn trash, and often emitted embers and other large, visible soot particles. While this seldom occurs today, other sources of fugitive particulate emissions do occasionally fall on neighboring property. Staff proposes to retain these provisions as general requirements to prohibit visible particles or burning embers from falling onto neighboring property.

Specify Explicit Compliance Test Requirements

Effective one year after rule adoption, staff proposes explicit compliance testing requirements for sources subject to the TSP emissions limits in Sections 6-1-310 and 6-1-311, and for the SO_3 and H_2SO_4 emissions limits in Sections 6-1-320 and 6-1-330. The current rule does not explicitly require compliance testing. Instead, testing to ensure that sources comply with these requirements is implemented through permit conditions. The draft amendments would add explicit testing requirements to ensure that sources are being tested, and to ensure that compliance testing requirements are being applied consistently across the entire Bay Area. Proposed compliance testing frequency is based on each source's Potential to Emit TSP, PM_{10}, or SO_3 (as H_2SO_4) emissions. Staff proposes compliance source test frequency as follows:

- Annual compliance test required for TSP, PM_{10}, or SO_3 (as H_2SO_4) sources greater than 16,000 kg per year (about 96 lbs per day).
- Biennial compliance test required for TSP, PM_{10}, or SO_3 (as H_2SO_4) sources greater than 8,000 but less than 16,000 kg per year (48 – 96 lbs per day).
- A compliance test every five years required for TSP, PM_{10}, or SO_3 (as H_2SO_4) sources greater than 2,000 but less than 8,000 kg per year (12 – 48 lbs per day).
- No source tests required for TSP, PM_{10}, or SO_3 (as H_2SO_4) sources less than 2,000 kg per year (12 lbs per day).

Staff proposes no source testing requirements for small sources, and would also allow the APCO to waive these testing requirements (or extend testing frequencies) in appropriate circumstances.

Clarify Test Methods

Staff is clarifying the specific test methods to be used to determine compliance with the emissions limits in the rule. Rule 6-1 currently refers to the Air District Manual of Procedures, but it does not explicitly state what procedures are to be used for determining compliance. The draft revisions make the required test methods explicit.

Total Suspended Particulate Measurements

The draft amendments clarify EPA Test Method 5 as the source test method for measuring TSP. Manual of Procedures Source Test 15 for Particulate Matter was created before EPA Test Method 5 was finalized. Now that EPA PM test methods are more sophisticated and designed to test for the many forms of PM, citing the specific EPA test methods, or an APCO-approved equivalent is more appropriate.

SO_3 and H_2SO_4 Measurements

Compliance with the SO_3 and H_2SO_4 emissions limits in Sections 6-1-320 and 6-1-330 is measured using Air District Source Test Method ST-20, EPA Method 8, or an APCO-approved equivalent.

Visible Emissions

Draft new Section 6-601 specifies the test method for determining whether emissions are visible, or the cumulative amount of time an emission is visible during a specified observation period. EPA Method 22 is a standardized test method in which any observer determines whether an emission is visible, or not. Method 22 specifies the position from which the observer must view the emission, how to assess visibility at 15 second intervals for a specified observation period, and how to aggregate the time the emission may exceed the visibility limits.

Opacity Measurements

Draft new Section 6-602 specifies the test method for determining the opacity of emissions, or use of an opacity sensing instrument. EPA Method 9 is a standardized test method in which a trained observer compares the opacity of a smoke or dust plume to a chart known as the Ringelmann scale to determine how dark (opaque) it is. Method 9 specifies the position from which the observer must view the plume, how to assess the opacity at 15 second intervals for a specified observation period, and how to aggregate the time the plume may exceed the opacity or Ringelmann scale limits.

Opacity Sensors: Some sources are equipped with opacity sensors that measure the percentage opacity of the emissions plume. Such sensors may be used to measure opacity.

Approved Alternate Test Method - Digital Cameras: A technique has been developed to use digital camera images and image processing to assess obscured visibility when compared to the background. The EPA has adopted it as an alternate method to EPA Test Method 9. This alternate method (EPA ALT-082) is based on ASTM D7520-09 test method. While this alternate method is not specifically included in the rule language, the Air District has the option to use this technology in the future. Note, however, that significant work is required to develop inspection test methods and train the Air District area inspectors in the use and limitations of this alternate method.

C. Other Implementation and Enforcement Improvements

The primary areas for implementation and enforcement improvement in Rule 6-1 are focused on providing more specific compliance test requirements and test methods.

VI. EMISSION REDUCTION BENEFITS & COMPLIANCE COSTS

This section of the Workshop Report summarizes the emission reduction benefits that would result from the draft amendments and the costs involved. Table VI-1 summarizes the emissions and emission reductions anticipated from the draft amendments to Rule 6-1.

Table VI-1: Estimated Emissions Reductions from Draft Amendments to Rule 6-1:

Source Categories	**TSP** tons per day	**PM_{10}** tons per day	**$PM_{2.5}$** tons per day
Base Case Emissions: Other Industrial / Commercial Processes	16.71	9.83	5.78
Emission Reductions: Other Industrial / Commercial Processes	0.3	0.3	0.15
Reduction from PM in Target Categories	1.7%	3.0%	2.6%

Current PM emissions estimates from the 2011 Emission Inventory total 174.20 tons per day (tpd) of Total Suspended Particles (TSP), 105.63 tpd PM_{10}, and 46.31 tpd $PM_{2.5}$. The emissions addressed by these draft amendments come from the target category of "Other Industrial / Commercial Processes", as shown in Table VI-1.

A. Emission Reductions Expected

The draft more stringent TSP limits will impact only one large source of PM. As mentioned above, most Bay Area source's PM limits have been established through permit conditions when the source was installed or modified. The general nature of the TSP limits in Rule 6-1 requires that they apply to all PM sources, so they are less restrictive than the permit conditions that may be applied to any specific source. As a result, emission reductions from more stringent TSP limits are expected to reduce TSP emissions by 600 lb/day (110 tons per year or tpy) from the Bay Area Rapid Transit car cleaning facilities (in four different maintenance locations), as described below. All of the reduced emissions are expected to be PM_{10} and approximately half are expected to be $PM_{2.5}$.

Bay Area Rapid Transit (BART) has four maintenance yards that each have BART car cleaning facilities. Emissions from wet scrubbers on each of the enclosed cleaning facilities appear to be more than 220 lb day TSP. Staff believes PM control can be improved by adding a baghouse or a wet electrostatic precipitator to the discharge of each wet mechanical scrubber. Staff estimates the PM emission reductions will be 210 lb/day TSP, 210 lb/day PM_{10}, and 105 lb/day $PM_{2.5}$ five days per week at each of the four maintenance yards.

The draft more stringent TSP limits may also impact two additional facilities: a bottle manufacturing facility in Oakland, and a facility in Santa Rosa that manufactures paper tape used to join and smooth two sections of wallboard. The glass manufacturing facility in Oakland is shut down with no plans to re-open. The current emissions performance from the paper tape manufacturer is estimated, with no supporting source test information available. Additional source tests are needed to determine whether additional controls will be required, and whether those controls would be cost effective. Based on these uncertainties, no emission reductions from these two facilities are included in this summary.

B. Costs for Controls

TSP Limits

Emission reductions from the four BART car cleaning facilities based on more stringent TSP limits are expected to reduce TSP emissions by 600 lb/day (110 tpy), all of the emissions being PM_{10}, and approximately half of the emission reductions being $PM_{2.5}$. Staff estimates each facility will need to install a baghouse or a wet electrostatic precipitator to the discharge of each existing induced draft fan. Capital costs for each new moderately sized baghouse (15,000 standard cubic foot per minute) are estimated to be $315,000,[2] and annual amortized cost plus operating costs are estimated at $95,000 per year. Estimated costs total $1,260,000 capital investment for all four maintenance facilities, with annual amortized capital plus operating costs estimated to be $380,000. Staff estimates TSP and PM_{10} emissions can be reduced by 27.4 tpy (13.7 tpy $PM_{2.5}$) at each cleaning station.

Source Test Costs

Draft amendments to Rule 6-1 explicitly require compliance testing of permitted sources ranging from annually to once every five years, depending on the extent of the emissions. Estimated costs to conduct an appropriate compliance source test is $3,000 – 5,000. Estimated costs to modify sample ports in order to conduct the tests, if necessary, are less than $10,000.

C. Other Impacts That May Require Resources

An exemption for small stationary sources with Potential to Emit either TSP or PM_{10} emissions at less than 1000 kg per year may create additional work for Air District Permit Engineers. Facilities that have permitted sources currently estimated to have emissions less than 2000 kg per year may wish to take advantage of the proposed exemption by challenging the current estimating techniques and/or EPA AP-42 Emission Factors used. Permit engineers may be asked to review the current PM emissions factors, which can take approximately one hour of engineering time for each source.

Air District Meteorology, Measurement, and Rules Division resources will be needed to consult with each permitted source to ensure each source has the proper equipment and access facilities needed to conduct the required source test.

Compliance and Enforcement will need to determine to what extent, and when they may want to implement EPA ALT-082, the digital camera technique used to measure opacity as an alternate to EPA Test Method 9.

VII. RULE DEVELOPMENT AND PUBLIC CONSULTATION PROCESS

A. Rule Development Process

The Air District's 2010 Clean Air Plan addresses PM, including PM's significant health impacts, and was approved on September 15, 2010. The 2010 Clean Air Plan included Stationary Source Measure SSM 6: General Particulate Matter Emission Limitation. Draft amendments to Rule 6-1

[2] EPA Cost Manual, adjusted to 2013 costs by ChemEng Process Construction Index.

have been developed to begin PM emission reductions intended to satisfy SSM 6.

Staff based the draft amendments to Rule 6-1 on the 2011 emissions inventory. Staff identified the source categories to be considered during review of potential amendments, and identified the largest sources in each category. Staff selected 55 of the largest permitted stationary sources, and visited each one to more fully understand each facility's business, each unique emissions source and discuss potential control techniques available to reduce PM emissions. In addition, concerns about the lack of information regarding particle size distribution, possible sources of condensable particulate matter, and potential secondary particulate matter formation were discussed. Staff used the information from these visits to develop the draft amendments, and to estimate the emission reductions that could be achieved by implementing these draft rule changes.

Greater areas of opportunity for potential PM emission reductions were identified in other source categories:

- Track out of mud onto paved roads is a large source of potential $PM_{2.5}$ reductions, and staff is proposing a separate rule with separate workshop report to address trackout. Note: staff has no recommendations for control of road dust from the erosion of roads, tires, or brake pads.
- Smoke and condensed asphalt vapors from roofing asphalt are an odorous source of $PM_{2.5}$, and staff is proposing a separate rule with separate workshop report to address roofing asphalt operations.
- Fugitive dust from a variety of sources (quarries, landfills, construction sites and other disturbed surfaces) is a large source of PM, but only 5 – 10% of typical geologic fugitive dust is $PM_{2.5}$. Most dust control techniques require water and since California is currently in the fourth year of a severe drought, staff is proposing fugitive dust requirements only on bulk material storage and handling operations at this time. The 2017 Clean Air Plan includes a stationary source control measure that will reconsider fugitive dust controls at a later date. Coke and coal storage and handling facilities are a subset of this larger category of sources.
    - Dust from coke and coal operations are not a significant source of potential $PM_{2.5}$ reductions, but the Air District has received numerous complaints regarding black dust on residences and businesses. Staff is proposing requirements to include coke and coal handling operations in the overall bulk material storage and handling requirements.

Public Workshops are the next step in the rulemaking process. Air District staff will review the draft amendments to Rule 6-1 (along with the new Regulation 6 administrative requirements, definitions and test methods) with affected parties to solicit input and identify any potential issues and concerns. The Air District will use the public's input, along with further investigation and analysis by staff to develop the final new Regulation 6 and draft amendments to 6-1, and present them to the Air District's Board of Directors for approval.

B. Public Outreach and Consultation

In developing the proposals to amend Rule 6-1, staff consulted with the following interested and affected parties:

Businesses	Governmental Agencies
Morton Salt - Newark	CALTRANS District 4 - Oakland
Cargill – Newark	Bay Area Regional Water Quality Board - Oakland
Criterion Catalysts - Pittsburg	North Coast Regional Water Quality Board – Santa Rosa
CertainTeed Gypsum – Napa	Bay Area Rapid Transit – Richmond Maintenance Yard
Maxwell House – San Leandro	Alameda County
C & H Sugar – Crockett	Contra Costa County
Con Agra – Oakland	Marin County
CEMEX – Oakland	Napa County
CEMEX – Clayton	Santa Clara County
Strategic Materials – San Leandro	San Francisco City & County
Dutra Materials – San Rafael	San Mateo County
Superior Supplies – Santa Rosa	Solano County
Granite Rock – Redwood City	Sonoma County
Hanson Aggregates – Clayton	City of Hayward
Bodean / Mark West Quarry – Santa Rosa	City of Napa
PABCO Gypsum – Redwood City	City of Oakland
Georgia Pacific Gypsum - Antioch	City of San Jose
Syar - Napa	City of San Rafael
Syar – Santa Rosa	City of Santa Rosa
Syar - Vallejo	
Soiland Quarry - Cotati	
Langley Hill Quarry - Woodside	
Granite Construction – Santa Clara	
Granite Construction – San Jose	
Willowbrook Feeds – Petaluma	
Hunt & Behrens – Petaluma	
Owens-Corning – Santa Clara	
Owens-Brockway - Oakland	
Waste Management – San Leandro	
Zanker Road Material Processing – San Jose	**Industry Associations**
Waste Management - Altamont	Association of Building Contractors
Redwood Landfill	Associated Roofing Contractors of the Bay Area Counties
Guadalupe Landfill	California Asphalt Pavement Association
Ox Mountain Landfill – Half Moon Bay	Construction Industry Air Quality Coalition
Clover Flat / Upper Valley Resources	Northern California Engineering Contractors
Potrero Hills Landfill	
Stavin	
McGuire & Hester Construction - Oakland	
Ghilotti Bros. Construction – San Rafael	

Universal Building Services - Richmond	
Statewide Sweeping – Milpitas	
Levin Richmond Terminal	
Lehigh Cement	
Phillips 66 Coker	
Phillips 66 Coke Calciner	
Shell Coker	
Tesoro Coker	
Valero Fluid Coker	
APS West	
Carbon Inc.	

These discussions led to review of the Storm Water Pollution Prevention Plan (SWPPP) Best Management Practices, and the suggestion that any fugitive dust requirements should be consistent with SWPPP requirements.

C. Review of Potential Environmental Impacts under CEQA

The Air District contracts with an independent consultant to conduct a California Environmental Quality Act (CEQA) analysis of potential environmental impacts from any rule making project. Since review of the entire inventory of possible PM emission reductions is resulting in the proposals for draft amendments to Rule 6-1, and proposals for a new Regulation 6 and three new additional PM rules, the CEQA analysis will be conducted for the entire suite of draft amendments and new draft rules. The consultant will make an initial assessment of any environmental impacts based on the draft amendments to Rule 6-1, the new draft rules, and the accompanying workshop reports.

After staff receives additional input during the workshop process, a final proposal and staff report will be used to finalize the CEQA analysis. The CEQA analysis will be included in the final proposal, posted for public review and comment at least 30 days before the Public Hearing. At the Public Hearing, the Air District Board of Directors will consider the final proposal, and public input before taking any action on the amendments to Rule 6-1 or the new draft Regulation 6.

D. Review of Economic and Job Impacts with a Socio-Economic Analysis

The Air District contracts with an independent consultant to conduct a Socio-Economic Analysis of potential economic impacts from each rule-making project. The consultant will make an initial assessment of any economic impacts based on the draft amendments to Rule 6-1, and on the new draft Regulation 6 and the accompanying workshop reports.

After staff receives additional input during the workshop process, a final draft proposal and staff report will be used to finalize the Socio-Economic Analysis. The Socio-Economic Analysis will be included in the final proposal, posted for public review and comment at least 30 days before the Public Hearing. At the Public Hearing, the Air District Board of Directors will consider the final proposal, and public input before taking any action on the proposed amendments to Rule 6-1 and new proposed Regulation 6.

Note that the new source specific rules Socio-Economic Analysis will be done independently for each source category or industry, because the economic situation for each industry is unique.

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Appendix C: New Rule 6-6 Workshop Report

Bay Area Air Quality Management District

375 Beale Street
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New Regulation 6: Particulate Matter, Rule 6: Prohibition of Trackout

WORKSHOP REPORT
January 2017

Guy Gimlen
Principal Air Quality Engineer

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The following people participated in the Air District workgroup to develop the draft amendments to this rule. Each deserves recognition for their important contributions.

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Greg Solomon – Engineering
Brian Lusher – Engineering
Chuck McClure – Meteorology, Measurement and Rules

Table of Contents

I. INTRODUCTION AND SUMMARY 107

II. BACKGROUND 109

III. REGULATORY FRAMEWORK 109

IV. TECHNICAL REVIEW 109

V. DRAFT NEW REGULATION 6, RULE 6 109

A. Definitions 109

B. Prohibition of Trackout 110

C. Prohibition of Visible Emissions from Trackout 110

D. Cleanup of Trackout 110

E. Opacity Measurements 110

F. Effective Date 111

VI. EMISSION REDUCTION BENEFITS & COMPLIANCE COSTS 111

A. Summary of Estimated Emission Reductions from Entrained Road Dust 111

B. Costs for Controls 111

Trackout Prevention 111

Visible Road Dust Cleanup 112

C. Other Impacts That May Require Resources 113

VII. RULE DEVELOPMENT AND PUBLIC CONSULTATION PROCESS .. 114

A. Rule Development Process 114

B. Public Outreach and Consultation 114

C. Review of Potential Environmental Impacts Under CEQA 116

D. Review of Potential Socio-Economic Impacts 116

VIII. REFERENCES 117

I. INTRODUCTION AND SUMMARY

The Bay Area Air Quality Management District (Air District) is proposing a new regulation to control particulate matter, Regulation 6, Particulate Matter, Rule 6: Prohibition of Trackout (Rule 6-6). This workshop report provides background information on new Rule 6-6 and its rationale. This workshop report is intended to provide members of the public with a description of the new regulation in advance of public workshops the Air District will hold in early 2017.

The Air District is proposing this new Rule 6-6 as part of a suite of proposals aimed at addressing fine particulate pollution. Small particles cause or contribute to a wide variety of serious health problems, including asthma, bronchitis, cardio-vascular diseases, and cancer. The Air District has committed to reducing particulate matter levels to achieve significant health benefits. The new rule will help reduce emissions of particulate matter in the Bay Area in a feasible and cost-effective manner, thereby improving public health and air quality throughout the region. The suite of proposals include (i) amendments to Rule 6-1 to strengthen that rule's particulate matter emissions limits applicable to general industrial operations; (ii) this new Rule 6-6 addressing trackout, (iii) a new Rule 6-7 addressing roofing asphalt operations; (iv) a new Rule 6-8 addressing bulk material handling operations (including coke and coal); and (v) a new Regulation 6 providing definitions, test methods, monitoring requirements, and other administrative provisions that will apply generally to all of the Rules in Regulation 6. More information about these related proposals can be found in the workshop reports for each of the proposals, which are being published concurrently with this report.

The draft new Rule 6-6 focuses on road dust, a large source of fine particulates. Road dust is composed of small particles from erosion of the road's surface and fine particles from vehicles driving over and pulverizing any solid materials that may have been deposited on the road. Tire wear and brake pad wear are also sources of particulates found near roadways. Draft new Rule 6-6 addresses mud and dirt that can be "tracked out" onto a paved road from a construction site, quarry, landfill or other disturbed surface. This material – referred to as "trackout" – contributes to particulate pollution because vehicle traffic on the paved road will pulverize the mud and dirt into smaller particles (known as silt), and turbulence from the vehicles entrain the silt into the air. Draft new Rule 6-6 addresses this problem by prohibiting trackout of mud and dirt onto paved roadways. Prohibition of trackout is intended to control $PM_{2.5}$, particularly around these areas that can impact nearby young and elderly people, or people with breathing issues.

The principal requirements in the draft new Rule 6-6 are:

- <u>Prohibition of Trackout onto Paved Roadways:</u> Any owner/operator of a large bulk material site greater than 1 acre, large construction site greater than 1 acre, or large disturbed surface site greater than 1 acre shall not allow solids from the site to deposit on the adjacent paved road:
  - o Any visible roadway material on the paved roadway or paved roadway shoulder cannot exceed a cumulative 25 linear of feet of tire tracks, or cumulative 25 square feet at any exit from the site during the workday, and
  - o No visible roadway material is allowed on paved roadways or paved roadway shoulder at any exit from the site at the end of the workday.

- <u>Prohibition of Visible Emissions Visible Emissions from Vehicles driving over Trackout:</u> Any owner/operator of a large bulk material site greater than 1 acre, large construction site greater than 1 acre, or large disturbed surface site greater than 1 acre shall not allow significant visible emissions (a dust plume) from vehicles driving over solid materials that have been "tracked out" onto a paved roadway at the exit from the site.

- Cleanup of Trackout: Any owner/operator of a large bulk material site greater than 1 acre, large construction site greater than 1 acre, or large disturbed surface site greater than 1 acre shall not allow significant visible emissions (a dust plume) during cleanup of visible roadway material.

The Air District is publishing the full text of draft new Rule 6-6 along with this workshop report.

Staff considered applying the prohibition of trackout to all bulk material sites, construction sites, and disturbed surface sites. Staff observed during visits to various bulk material sites, construction sites, and disturbed surface sites that only the large facilities used significant water for dust control, so only those sites were susceptible to creating trackout. Smaller facilities tended to rely on housekeeping and sweeping up to control fugitive dust, or when they did use water used the water in only limited areas. Most local towns and counties have an ordinance requiring control of trackout onto paved roads that affects all sources. Therefore, staff proposes to apply this prohibition of trackout to large bulk material sites greater than 1 acre, construction sites greater than 1 acre, and disturbed surface sites greater than 1 acre. This approach will focus Air District Compliance and Enforcement resources on the potential for significant trackout. Cities and counties can continue to monitor and enforce prohibition of trackout at smaller sites.

Staff estimates draft new Rule 6-6 will affect about 150 – 250 large bulk material, large construction and large disturbed surface sites. Staff estimates there are currently an additional 1,000 smaller sites. The large bulk material sites consist of approximately 10 quarries, 10 asphalt plants, and 5 other miscellaneous bulk solids facilities), large construction sites (150 – 200 construction sites at any given time), and large disturbed surface sites (approximately 15 landfills and 10 other unpaved equipment and material storage sites) in the Bay Area. Each of these facilities is currently required to meet a project CEQA requirement, or a Regional Water Quality Control Board requirement to control trackout onto paved roads, but enforcement appears to be spotty. Staff found many locations where significant mud and dirt had been tracked out from the exits of these sites. Staff believes enhanced enforcement by the Air District will improve emissions performance.

Expected emission reductions from draft new Rule 6-6 are 2.69 ton per day (tpd) of TSP, 1.23 tpd of PM_{10}, and 0.18 tpd of $PM_{2.5}$. Costs are expected to be minimal since most sites currently control trackout to some degree. Additional capital equipment may be needed at a few sites, but most improvement will come through management attention to monitoring and controlling trackout.

This workshop report describes the draft new Rule 6-6. Following this introduction and summary, Section II, Background; Section III, Regulatory Framework; and Section IV, Technical Review each refer to the parallel sections in the Regulation 6 workshop report. Section V provides a comprehensive discussion of all of the draft rule proposals. Section VI provides a discussion of the expected air quality benefits, and compliance costs. Section VII outlines the public outreach and involvement process that the Air District is undertaking in developing the draft new rule, including further information on how interested members of the public can get involved.

The Air District invites all interested members of the public to review the draft new regulation and this workshop report, and to attend one of the public workshops planned in early 2017. Air District staff will discuss the draft at the workshops and request feedback and input from the public, and will continue to accept written feedback for two weeks after the last workshop. Air District staff may revise the draft based on the feedback received, and will present a final proposal to the Air District's Board of Directors for consideration. For further information in advance of the public workshop, please contact Guy Gimlen, Principal Air Quality Engineer, (415) 749-4734, ggimlen@baaqmd.gov.

II. BACKGROUND

Refer to the Background section of the workshop report for new draft Regulation 6.

III. REGULATORY FRAMEWORK

Refer to the Regulatory Framework section of the workshop report for new draft Regulation 6.

IV. TECHNICAL REVIEW

Refer to the Technical Review section of the workshop report for new draft Regulation 6.

V. DRAFT NEW REGULATION 6, RULE 6

Air District staff are proposing a new Rule 6-6 that prohibits trackout onto paved roadways and visible fugitive dust emissions associated with such trackout. The principal elements of this proposal are to:

- Prohibit trackout onto paved roads. Limit visible roadway material at any exit from a facility to less than cumulative 25 linear feet or to an area less than cumulative 25 square feet. At the end of the workday, there should be no visible roadway material at any exit from a facility.
- Prohibit significant visible emissions of fugitive dust from vehicle traffic over any trackout. Staff proposes a limit for fugitive dust plumes of 10% opacity (half as dark as Ringelmann 1) for no more than 3 minutes in any 60-minute observation period (5% of the time) for any plumes more than 5 feet long, 5 feet wide, or 5 feet high.
- Cleanup of trackout must be conducted so that any fugitive dust generated meets the visible emissions limits.

This Section discusses all of the draft amendments in each of these areas in detail.

A. Definitions

The definitions in draft new Regulation 6 apply to Rule 6-6.

Bulk material is defined as any unpackaged solid less than 2 inches in diameter or length. A bulk material storage site is any facilities that has stockpiles of bulk materials.

Construction sites are defined as any location where buildings, structures are improvements are being constructed, maintained, altered, remodeled, expanded or demolished. These sites include all contiguous and adjacent areas where related activities can take place.

A disturbed surface site is any land that has been physically moved, uncovered, destabilized, or otherwise modified from its natural conditions, making the surface subject to wind erosion, vehicle traffic or mechanical activities that generate fugitive dust.

Trackout is material that adheres or agglomerates on the exterior of a motor vehicle, then subsequently falls onto a paved roadway or paved shoulder of a paved roadway.

Visible roadway material is any sand, dirt, soil, or other solid particle that is visible on a paved road or shoulder, which can be removed by sweeping.

B. Prohibition of Trackout

Draft Section 6-6-301.1 prohibits an owner / operator of a large bulk material site, large construction site or large disturbed surface site from allowing trackout to accumulate at any facility exit where the visible roadway material is in excess of cumulative 25 linear feet of tire track, or an area in excess of cumulative 25 square feet. Any excess roadway material must be completely cleaned up immediately. All visible roadway material must be cleaned up at the end of the workday.

C. Prohibition of Visible Emissions from Trackout

Draft Section 6-6-301.2 prohibits an owner / operator of a large bulk material site, large construction site or large disturbed surface site from allowing trackout at any facility exit where vehicle traffic over such trackout generates a fugitive dust plume of visible emissions greater than 5 feet high, 5 feet long, or 5 feet wide that exceeds 10% opacity (half as dark as Ringelmann 1) for more than 3 minutes in any 60-minute observation period (5% of the time). Opacity assessment test method is cited in Regulation 6-602 (Manual of Procedures Volume 1, Part 1, which references EPA Test Method 9).

D. Cleanup of Trackout

Draft Section 6-6-302 requires all cleanup of visible roadway material must meet the visible emissions limit cited in Draft Section 6-6-301.2.

E. Opacity Measurements

Draft Regulation 6-602 specifies the test method for determining the opacity of emissions, citing Manual of Procedures Volume 1, Part 1 (which references EPA Test Method 9). The procedure also provides descriptions regarding how to conduct the opacity observations and subsequent opacity calculations for determining opacity using the Cumulative Time Method, the Time Averaged Method, and Intermittent Emissions Method. The Intermittent Emission Method is the method that is appropriate for vehicles traveling over trackout on a paved road, causing visible dust emissions.

EPA Test Method 9: EPA Method 9 is a standardized test method in which a trained observer compares the opacity of a smoke or dust plume to the background, and states the result in terms of percent opacity, or compares it to a chart known as the Ringelmann scale to determine how dark (opaque) it is. Method 9 prescribes assessing the smoke or plume once every 15 seconds during a pre-determined observation period. Method 9 also specifies the position from which the observer must view the plume and how to measure the aggregate time during which the plume exceeds a specified level on the Ringelmann scale.

Opacity Sensors: Some sources (although rarely for fugitive dust) are equipped with opacity sensors that measure the percentage opacity of the emissions plume. Such sensors may be used to measure opacity.

F. Effective Date

Staff proposes the new prohibition of trackout become effective one year after rule approval. This provides more than enough time from adoption to improve facilities, management emphasis and training. All large facilities should already be complying with these requirements through their Storm Water Pollution Prevention Plans.

VI. EMISSION REDUCTION BENEFITS & COMPLIANCE COSTS

This section of the Workshop Report summarizes the emission reduction benefits that would result from the draft new Rule 6-6 and the costs involved.

Table VI-1 summarizes these reductions anticipated from the draft new Rule 6-6, both in absolute terms and as a percentage of PM emissions within the Bay Area.

Table VI-1: Estimated Emissions Reductions from Draft New Rule 6-6:

Source Categories	**TSP** tons per day	**PM_{10}** tons per day	**$PM_{2.5}$** tons per day
Estimated Road Dust Reductions	2.69	1.23	0.18
% Reduction from Local Roads Category	12.5%	12.5%	12.5%
% Reduction from Road Dust Category	4.5%	4.5%	4.5%
% Reduction from Total PM Emissions	1.5%	1.2%	0.4%

A. Summary of Estimated Emission Reductions from Entrained Road Dust

Draft new Rule 6-6 requires large bulk material sites, large construction sites, and large disturbed surface sites to take steps to prevent trackout onto paved roadways, as outlined above. Staff estimates that very little trackout occurs from small bulk material sites, small construction sites, and small disturbed surface sites simply because they are small with very little vehicle traffic in and out, so there is very little potential to create trackout. Staff has estimated emission reductions based on the large sites - more than 1 acre. Trackout prevention is currently required as part of a large facility or large construction site's SWPPP. Staff estimates that 50% of current local road dust comes from trackout. Staff estimates approximately one-third of sites are currently marginal or inadequate in their compliance with trackout requirements. Staff estimates that specific limits on visible emissions from roadway dust, and cleanup requirements will reduce PM emissions from the existing one-third marginal performers by approximately 25%. Twenty-five percent reduction in emissions from 50% of the road dust from local roads will result in emission reductions of 12.5%. Staff estimates a total reduction of 2.69 tpd of TSP, 1.23 tpd PM_{10}, and 0.18 tpd $PM_{2.5}$.

B. Costs for Controls

<u>Trackout Prevention</u>

Trackout at small bulk material sites, construction sites, and disturbed surface sites can be limited by careful use of water to control fugitive dust, and limiting vehicle traffic to paved or stabilized roads. Any trackout that does occur can be cleaned up by a cleanup crew using hand brooms and shovels or dust pans. If small sites are not already doing this to meet the local trackout control ordinance, the costs for this cleanup is very low and can likely be incorporated into the duties of the existing workforce.

Trackout at large sites can be prevented by using a "grizzly" bars or a "rumble grate". A grizzly system can be installed for approximately $10,000, with monthly cleaning required to provide an open catch basin below the grizzly for mud and dirt to fall into, away from the vehicle tires. Most large sites already have a grizzly system or a truck wash station. Annual costs of operating a grizzly system are estimated to be $3,000 per year.[1] Estimated dust prevention from a grizzly system is 6 tpy.[2] Staff estimates that 50% of the dust is PM_{10}, and 10% of the dust is $PM_{2.5}$. Note – grizzly system effectiveness is very dependent on keeping the mud receiving area below the grizzly bars clean. Staff observed several grizzly systems that are no longer effective because the mud receiving catch basins were full. Staff estimates improved grizzly bar systems, or better facilities to remove the mud that is collected will be required at 100 facilities, costing at most $1,000,000 in capital, and $300,000 per year in operating costs.

Truck wash stations are very effective at preventing trackout, and typically cost from $100,000 to 150,000 in capital[3], amortized to $30,000 per year. Water, power, maintenance, and mud cleanout and disposal increase the total costs to about $56,000 per year. These facilities need to have the mud removed weekly, typically removing 800 – 1,000 lbs. of solids. A large facility may need two truck wash stations if they have high vehicle traffic. Staff estimates that few, if any large sites will need to install a truck wash system. However, assuming that 10 sites determine it is more cost effective to use a truck wash rather than a grizzly system, the costs could be $1,500,000 capital, with annual costs totaling $560,000.

Visible Road Dust Cleanup

Construction projects, counties and cities, and facilities handling bulk materials will all need to be prepared to clean up any dirt or other materials that may bypass the grizzly and wash stations, resulting in deposits on adjoining paved roads. More management attention will be required to ensure that their site is not creating trackout, and ensure that all trackout that does occur is cleaned up promptly, and at the end of each workday. Estimated costs are described below.

One option for removing excessive trackout and cleanup of all trackout at the end of each workday is to use a street sweeper. Street sweepers are available in three models: rotary brush models available with water sprays to prevent dust during the sweeping operation; vacuum systems with high efficiency air filters to capture and contain more than 80% of PM_{10}; and regenerative vacuum sweepers that blow air onto the roadway to dislodge dirt and silt out of cracks in the road before vacuuming. Conventional street sweepers are estimated to cost $250,000, although they do a very poor job of capturing and controlling visible road dust and will probably not meet the visible dust requirements of the draft new Rule 6-6. Regenerative PM_{10} efficient street sweepers are estimated to cost $450,000. Amortized cost is approximately $80,000 per year, plus an additional $150,000 per year for an operator, fuel and maintenance. Sites that are effective at preventing trackout will not need a regenerative PM_{10} efficient street sweeper.

A simpler option is to send a worker to sweep up the area at the end of the day. Estimated cost for cleanup of 50 square feet of excessive trackout or spills is $75 (one worker for 1 hour, plus hand

[1] CASQA TC-1 fact sheet: $2400 installation and maintenance costs per entrance/exit

[2] Based on 500 lbs. solids removal per week, all potentially converted to silt by vehicle traffic, and 50% of silt entrained into the air as fugitive dust.

[3] $125,000 installed cost at PG&E Power Station cleanup at Hunter's Point

tools) each workday, totaling $15,000 per year (typically 200 dry workdays each year). Most large facilities already conduct cleanup at the end of each workday (or should to meet the requirements of the SWPPP). Staff estimates no more than an incremental 10% of these costs will actually accrue when management and workers are committed to preventing and cleaning up trackout. Staff estimates large facilities with effective truck wash systems will not have to do any cleanup. Staff estimates that 200 facilities with effective grizzly systems will have to do minor cleanup at the end of each dry workday, with total incremental costs for these facilities equal to 10% X $3,000,000 = $300,000 annual costs.

Total costs for implementation of draft new Rule 6-6 are estimated to be $2,500,000 capital, and $1,160,000 annual operating costs to achieve emission reductions of 2.69 tpd TSP, 1.23 tpd PM_{10}, and 0.16 tpd $PM_{2.5}$. Assuming 200 dry days per year here in the Bay Area, expected emission reductions are 246 tpy of PM_{10}, and 36 tpy of $PM_{2.5}$.

C. Other Impacts That May Require Resources

Compliance & Enforcement inspectors will now need to monitor large bulk material sites, large construction sites and large disturbed surface sites for trackout, and will need to respond to citizen complaints of localized fugitive dust from trackout. Compliance & Enforcement does not currently plan to proactively monitor and visit construction sites, but will be aware of any localized fugitive dust plumes that emanate from trackout, and will investigate as needed.

VII. RULE DEVELOPMENT AND PUBLIC CONSULTATION PROCESS

A. Rule Development Process

The rule development process for draft new Rule 6-6 began with the Air District's 2010 Clean Air Plan, which addressed PM and PM's significant health impacts (among other air quality concerns). The 2010 Clean Air Plan included Stationary Source Measure SSM 6, which committed the Air District to strengthening its general PM emissions limits in Regulation 6 Particulate Matter, Rule 1: General Requirements. The Air District is proposing revisions to those regulations to begin to fulfill this commitment as provided in the draft amendments to Rule 6-1 that are being circulated concurrently with this proposal. Since the 2010 Clean Air Plan, Air District staff further committed to taking steps to address the Bay Area's particulate matter challenges in a November 2012 report entitled *Understanding Particulate Matter: Protecting Public Health in the San Francisco Bay Area*. These commitments to address particulate matter challenges led Air District staff to review additional opportunities for significant reductions in particulate matter emissions. Staff identified fugitive dust from quarries, landfills, construction sites and other disturbed surfaces, from bulk material storage sites, and from road dust as significant areas of potential improvement (along with the other areas being addressed in the other new rules being proposed at this time).

To evaluate what meaningful particulate matter emission reductions could be achieved from these sources, Staff considered fugitive dust requirements based on similar rules currently in place in South Coast and San Joaquin Valley, and in Maricopa County, Arizona. Staff reviewed dust control methods identified by the EPA, CARB, and other air districts in California, Arizona, and Nevada. However, most of the control techniques evaluated require liberal use of water to wet open areas to control wind erosion. Since fugitive dust is mostly larger than $PM_{2.5}$, and since California is currently in the fourth year of a severe drought, staff is not proposing fugitive dust requirements at this time.

Staff is proposing to address fugitive dust emissions from trackout in draft new Rule 6-6 because trackout onto paved roads is a unique source of fugitive dust. Visible roadway material on a paved road is ultimately pulverized to silt by vehicles driving over it, and the silt is much more susceptible to wind erosion than typical dirt. In addition, this silt is subject to turbulence from vehicle driving by at 25 – 45 mph, much higher than typical wind speeds. Control of this source of fugitive dust does not increase use of water, and is consistent with trackout control requirements that already exist in current Storm Water Pollution Prevention Plans for large bulk material sites, large construction projects, and large disturbed surface sites. Staff has no recommendations for control of road dust from the erosion of roads, tires, or brake pads.

B. Public Outreach and Consultation

In developing the proposals for draft new Rule 6-6, staff consulted with the following interested and affected parties:

Businesses	**Governmental Agencies**
Morton Salt - Newark	CALTRANS District 4 - Oakland
Cargill – Newark	Bay Area Regional Water Quality Board - Oakland
Criterion Catalysts - Pittsburg	North Coast Regional Water Quality Board – Santa Rosa

CertainTeed Gypsum – Napa	Bay Area Rapid Transit – Richmond Maintenance Yard
Maxwell House – San Leandro	Alameda County
C & H Sugar – Crockett	Contra Costa County
Con Agra – Oakland	Marin County
CEMEX – Oakland	Napa County
CEMEX – Clayton	Santa Clara County
Strategic Materials – San Leandro	San Francisco City & County
Dutra Materials – San Rafael	San Mateo County
Superior Supplies – Santa Rosa	Solano County
Granite Rock – Redwood City	Sonoma County
Hanson Aggregates – Clayton	City of Hayward
Bodean / Mark West Quarry – Santa Rosa	City of Napa
PABCO Gypsum – Redwood City	City of Oakland
Georgia Pacific Gypsum - Antioch	City of San Jose
Syar - Napa	City of San Rafael
Syar – Santa Rosa	City of Santa Rosa
Syar - Vallejo	
Soiland Quarry - Cotati	
Langley Hill Quarry - Woodside	
Granite Construction – Santa Clara	
Granite Construction – San Jose	
Willowbrook Feeds – Petaluma	
Hunt & Behrens – Petaluma	
Owens-Corning – Santa Clara	
Owens-Brockway - Oakland	
Waste Management – San Leandro	
Zanker Road Material Processing – San Jose	**Industry Associations**
Waste Management - Altamont	Association of Building Contractors
Redwood Landfill	Associated Roofing Contractors of the Bay Area Counties
Guadalupe Landfill	California Asphalt Pavement Association
Ox Mountain Landfill – Half Moon Bay	Construction Industry Air Quality Coalition
Clover Flat / Upper Valley Resources	Northern California Engineering Contractors
Potrero Hills Landfill	
Stavin	
McGuire & Hester Construction - Oakland	
Ghilotti Bros. Construction – San Rafael	
Universal Building Services - Richmond	
Statewide Sweeping – Milpitas	
Levin Richmond Terminal	
Lehigh Cement	
Phillips 66 Coker	
Phillips 66 Coke Calciner	
Shell Coker	
Tesoro Coker	

Valero Fluid Coker	
APS West	
Carbon Inc.	

These discussions led to review of the Storm Water Pollution Prevention Plan (SWPPP) Best Management Practices, and the draft new Rule 6-6 is consistent with SWPPP requirements for large sources.

Public Workshops are the next step in the rulemaking process. Air District staff will review the draft new Rule 6-6 with affected parties to solicit input and identify any potential issues and concerns. The Air District will use the public's input, along with further investigation and analysis by staff to develop the final new proposed Rule 6-6, and present to the Air District's Board of Directors for approval.

C. Review of Potential Environmental Impacts Under CEQA

The Air District contracts with an independent consultant to conduct a California Environmental Quality Act (CEQA) analysis of potential environmental impacts from any rule making projects. Since review of the entire inventory of possible PM emission reductions is resulting in the proposal for draft amendments to Rule 6-1, draft new Regulation 6, draft new Rule 6-6, and proposals for two new additional PM rules, the CEQA analysis will be conducted for the entire suite of proposed draft amendments and new rules. The consultant will make an initial assessment of any environmental impacts based on the draft amendments to Rule 6-1, draft new Regulation 6, draft new Rule 6-6, the two additional draft new rules, and the accompanying workshop reports.

After staff receives additional input during the workshop process, a final proposal and staff report will be used to finalize the CEQA analysis. The CEQA analysis will be included in the final proposal, posted for public review and comment at least 30 days before the Public Hearing. At the Public Hearing, the Air District Board of Directors will consider the final proposal and public input before taking any action on the proposed new Rule 6-6.

D. Review of Potential Socio-Economic Impacts

The Air District contracts with an independent consultant to conduct a Socio-Economic Analysis of potential economic impacts from the draft new Rule 6-6. The consultant will make an initial assessment of any economic impacts based on the draft new Rule 6-6, and this workshop report. Note that for draft new Rule 6-6 the Socio-Economic Analysis will be done independently for each source category or industry, because the economic situation for each industry is unique.

After staff receives additional input during the workshop process, a final proposal and staff report will be used to finalize the Socio-Economic Analysis. The Socio-Economic Analysis will be included in the final proposal, posted for public review and comment at least 30 days before the Public Hearing. At the Public Hearing, the Air District Board of Directors will consider the final proposal and public input before taking any action on the proposed new Rule 6-6.

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Appendix D: New Rule 6-7 Workshop Report

Bay Area Air Quality Management District

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New Regulation 6: Particulate Matter, Rule 7: Roofing Asphalt

WORKSHOP REPORT
January 2017

Guy Gimlen
Principal Air Quality Engineer

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The following people participated in the Air District workgroup to develop this draft new rule. Each deserves recognition for their important contributions.

Alexander Crockett, Esq. – Legal
Paul Hibser – Compliance & Enforcement
Ed Giacometti – Compliance & Enforcement
Greg Solomon – Engineering
Chuck McClure – Meteorology, Measurement and Rules

Table of Contents

I. INTRODUCTION AND SUMMARY 121

II. BACKGROUND 122

III. REGULATORY FRAMEWORK 122

IV. TECHNICAL REVIEW 123

A. PM Emissions from Roofing Asphalt 123

Roofing Asphalt Controls 123

V. DRAFT NEW REGULATION 6, RULE 7 124

A. Definitions 124

B. Low Fuming Roofing Asphalt 124

VI. EMISSION REDUCTION BENEFITS & COMPLIANCE COSTS 124

A. Summary of Estimated Emission Reductions from Roofing Asphalt Operations 125

B. Costs for Controls 125

VII. RULE DEVELOPMENT AND PUBLIC CONSULTATION PROCESS .. 126

A. Rule Development Process 126

B. Public Outreach and Consultation 126

C. Review of Potential Environmental Impacts Under CEQA 127

D. Review of Economic and Job Impacts with a Socio-Economic Analysis 128

VIII. REFERENCES 129

IX. APPENDIX 130

I. INTRODUCTION AND SUMMARY

The Bay Area Air Quality Management District (Air District) is proposing a new regulation to control particulate matter, Regulation 6, Particulate Matter, Rule 7: Roofing Asphalt (Rule 6-7). This workshop report provides background information on the draft new Rule 6-7 and its rationale. This workshop report is intended to provide members of the public with description of the new regulation in advance of public workshops the Air District will hold in early 2017.

This draft new Rule 6-7 is being proposed to address the smoke and fumes from roofing asphalt operations, which are odorous and a source of small particulates. The draft new Rule 6-7 addresses the concern of hot vaporized asphalt condensing into liquid aerosols in the form of smoke with a characteristic light blue color when seen in the air (known as “blue smoke”). These solid or liquid aerosol smoke particles are very small, and small particles cause or contribute to a wide variety of serious health problems, including asthma, bronchitis, cardio-vascular diseases, and cancer. The Air District has committed to reduce particulate matter levels to achieve significant health benefits. The new rule will begin reducing emissions of particulate matter in the Bay Area in a feasible and cost-effective manner, thereby improving public health and air quality throughout the region.

The draft new Rule 6-7 addresses smoke and fumes from roofing asphalt operations. Draft new Rule 6-7 establishes a requirement to use only low-fuming asphalt when doing roofing asphalt projects in the Air District. The requirement for draft new Rule 6-7 is:

- **Roofing Asphalt Operation:** Effective one year after rule adoption, any owner/operator of a roofing asphalt operation must use low-fuming asphalt. The only exception is hot rubber coatings used for waterproofing.

The Air District is publishing the full text of draft new Rule 6-7 along with this workshop report.

Ten to fifteen roofing asphalt contractors will be affected by the requirement to use low-fuming roofing asphalt. Low-fuming roofing asphalt is readily available, so emissions reductions, including reduced odors should be achieved quickly. Staff estimates low-fuming roofing asphalt will result in 19 lbs per day (0.01 tpd) $PM_{2.5}$ emissions reductions. Cost for low-fuming asphalt is approximately $1.00 per 100 lb. plug, increasing costs approximately 2%. Total costs will be $100,000 annually.

The Air District is proposing this new Rule 6-7 as part of a suite of proposals aimed at addressing fine particle pollution, which include (i) amendments to Rule 6-1 to strengthen that rule’s particulate matter emissions limits applicable to general industrial operations; (ii) a new Rule 6-6 addressing dust emissions generated by mud and dirt tracked out onto paved roadways from large bulk material sites, large construction sites and other areas with disturbed soil or dirt; (iii) a new Rule 6-8 addressing bulk material storage and handling operations, including petroleum coke and coal; and (iv) a new Regulation 6 providing definitions, monitoring requirements, and other administrative provisions that will apply generally to all of the Rules in Regulation 6. More information about these other related proposals can be found in the workshop reports for each of the proposals, which are being published concurrently with this report.

This workshop report describes the draft new Rule 6-7. Following this introduction and summary, Section II, Background; Section III, Regulatory Framework; and Section IV, Technical Review each refer to the parallel sections in the Regulation 6 workshop report. Appendix D-1 at the end of this report documents a technical review of paving asphalt, and chip seal asphalt for reference. Staff could not find cost effective controls to reduce PM emissions from the paving and chip seal asphalt sources. Section V provides a comprehensive discussion of all of the draft amendments. Section VI provides a discussion of the expected air quality benefits, and compliance costs. Section VII outlines the public outreach and involvement process that the Air District is undertaking in developing the draft new rule, including further information on how interested members of the public can get involved.

The Air District invites all interested members of the public to review the draft new regulation and this workshop report, and to attend one of the public workshops in early 2017. Air District staff will discuss the draft at the workshops and request feedback from the public and all interested parties, and will continue to accept written feedback for two weeks after the last workshop. Air District staff may revise the draft based on the feedback, and will present a final proposal to the Air District's Board of Directors for consideration. For further information in advance of the public workshop, please contact Guy Gimlen, Principal Air Quality Engineer, (415) 749-4734, ggimlen@baaqmd.gov.

II. BACKGROUND

Refer to the Background section of the workshop report for new draft Regulation 6.

III. REGULATORY FRAMEWORK

Refer to the Regulatory Framework section of the workshop report for new draft Regulation 6.

In addition, this section further describes the current regulatory framework addressing PM emissions from asphalt operations. The only Air District regulation that currently applies to these activities is the Air District's public nuisance rule in Regulation 1, and the general opacity limit in Rule 6-1, which addresses all plumes and stack vents. The general opacity limit in Rule 6-1 is no more than 20% opacity (Ringelmann No. 1) for no more than 3 minutes in any 60 minute observation period. This limit does not necessarily prohibit all particulate emissions of concern. There are also a number of other Air District and federal regulatory provisions addressing asphalt generally, but none of these regulations addressed the specific activities that would be covered by the draft new Rule 6-7.

The Air District's regulations include Regulation 12, Rule 3 (Miscellaneous Standards of Performance – Asphalt Air Blowing), which governs when the exhaust from air blown roofing asphalt must be incinerated. EPA requirements for roofing asphalt include the New Source Performance Standard for Asphalt Processing and Asphalt Roofing Manufacture (40 CFR Part 40, Subpart UU, §60.472), which applies to air blowing of the roofing asphalt and roofing asphalt shingle and surface roll roofing manufacturing, and establishes PM emissions limits including 20% opacity. The National Emissions Standards for Hazardous Air Pollutants for Asphalt Processing and Asphalt Roofing Manufacturing (40 CFR Part 63, Subpart LLLLL, §63.8684 and Subpart AAAAAAA, §63.11561) apply to the hazardous air pollutants that may come from air blowing of roofing asphalt. The Air District enforces these federal requirements under its own regulatory enforcement program. These regulations target the manufacturing of the asphalt products, but they do not address emissions that may occur when applying these products: when roofing asphalt is heated before being applied to a roof. These activities are the subject of the proposed Rule 6-7.

IV. TECHNICAL REVIEW

Refer to the Technical Review section of the workshop report for new draft Regulation 6.

B. PM Emissions from Roofing Asphalt

Roofing asphalt is used to seal and protect a flat roof. Roofing asphalt is applied at very high temperatures (400 – 500°F), and there is typically significant smoke and fumes that come from both the heater/storage bin (known as an asphalt kettle) at grade, and during application of the hot asphalt up on the roof. This smoke is vaporized asphalt that forms odorous liquid aerosols when exposed to cooler air, very similar to the blue smoke from paving asphalt and chip seal asphalt. The asphalt kettle usually has a propane burner, and heats solid 100 lb. "plugs" of roofing asphalt up to about 450°F. As the asphalt is used, new plugs are added to the kettle through a hatch on the top of the kettle. The liquid roofing asphalt is usually pumped from the kettle up to the roof, and then carried in buckets to the location on the roof where the asphalt is spread around on the roof with a mop. Smoke and odors also occur from the hot roofing asphalt in the bucket, and while being spread onto the roof.

Figure IV-1: Roofing Asphalt Plugs, and Kettle

Best management practices for roofing asphalt kettles include kettle siting, a method to control the temperature of the asphalt in the kettle, having good seals on the edges of the kettle openings and keeping the kettle closed. These management practices are driven primarily by safety and efficiency, but they also support reduction of both PM and odors.

<u>Roofing Asphalt Controls</u>

Control of roofing asphalt is very simple and relatively easy. Asphalt manufacturers have developed a polymer that can be added to the roofing asphalt that significantly reduces emissions. This polymer forms a skim-layer on the surface of the hot liquid asphalt in the kettle to prevent asphalt vaporization, and acts like a blanket, reducing fumes from the asphalt kettle. This polymer is estimated to reduce asphalt fumes and odors from the kettle by 60 – 80%. This control method however, does not help reduce emissions during application of the hot asphalt on the roof. This product, known as low-fuming roofing asphalt, appears to provide improvements in worker exposure to fumes as well as providing a reduction in PM emissions and odors.

V. DRAFT NEW REGULATION 6, RULE 7

Air District staff proposes draft new Rule 6-7 that establishes requirements for roofing asphalt operations:

- Require roofing asphalt operations to use low-fuming roofing asphalt on all roofing projects in the Air District.

This Section discusses all of the draft new requirements in detail.

A. Definitions

The definitions in draft new Regulation 6 apply to Rule 6-7. In addition, definitions for roofing asphalt and low-fuming roofing asphalt are provided.

B. Low Fuming Roofing Asphalt

Draft Section 6-7-301 requires all roofing asphalt to be low-fuming roofing asphalt, with the exception of hot rubber coatings used for waterproofing.

Staff proposes the new requirement for use of low-fuming roofing asphalt become effective one year after rule adoption. This provides adequate time from adoption for roofing asphalt suppliers and contractors to work off any inventories of conventional roofing asphalt, and prepare to use only low-fuming roofing asphalt.

VI. EMISSION REDUCTION BENEFITS & COMPLIANCE COSTS

This section of the Workshop Report summarizes the emission reduction benefits that would result from the draft new Rule 6-7 and the costs involved. Table VI-1 summarizes the emissions and emission reductions anticipated from the draft Rule 6-7.

Table VI-1: Estimated Emissions Reductions from Draft New Rule 6-7:

Source Categories	TSP tons per day	PM_{10} tons per day	$PM_{2.5}$ tons per day
Roofing Asphalt	0.01	0.01	0.01
Reduction from Category Emissions	**1.8%**	**4.6%**	**5.6%**
Reduction from Total PM Emissions	**0.006%**	**0.009%**	**0.022%**

D. Summary of Estimated Emission Reductions from Roofing Asphalt Operations

Roofing asphalt demand in the Air District is approximately 100,000 tons per year,[1] but the vast majority of that is for asphalt shingle type roofing. Only about 5% of this demand is for Build Up Roofing[2] – where asphalt kettles are used to heat roofing asphalt for application on a rooftop.

Staff estimates PM emissions from a Build Up Roofing asphalt kettle based on EPA AP-42 Emission Factors for asphalt single manufacturing – in a device known as a saturator. The emission factor is 1.2 lb PM per ton of saturated asphalt shingle, and the shingle weight is approximately 40% fiberglass base and 60% roofing asphalt. Staff used an emission factor of 2 lbs PM per ton of roofing asphalt. Based on 5,000 tons per year of Build Up roofing asphalt demand in the Air District, PM emissions from the asphalt kettle are estimated to be 10,000 lbs per year, or 5 tons per year (27 lbs per day). Staff estimates an additional 10,000 lbs per year of PM (or more) is emitted during application of the asphalt onto the roof.

Low-fuming asphalt has been shown to reduce emissions 60 – 80% at the kettle. Staff estimates that low-fuming asphalt will reduce these emissions by 70%, resulting in reduced PM equal to 19 lb/day (3.5 tpy). All Build Up roofing asphalt kettle smoke and fumes are likely all $PM_{2.5}$, since the particles consist of vaporized asphalt that has condensed to an aerosol.

B. Costs for Controls

Low-fuming asphalt costs an additional $1.00[3] above the base of $40 – $45 per 100 lb plug, approximately 2.5% more than conventional roofing asphalt. Total roofing asphalt demand for Built Up Roofing is estimated to be 5,000 tons per year (100,000 - 100 lb plugs), so the cost of requiring the use of low-fuming roofing asphalt in the Air District is estimated to be an incremental $100,000 per year. Estimated emission reductions are 3.5 tpy of $PM_{2.5}$.

[1] U.S. Energy Information Administration, Asphalt and Road Oil Supply and Disposition
[2] William D. Callahan, Executive Director, Associated Roofing Contractors of the Bay Area Counties
[3] Larry Reardon, Enterprise Roofing

VII. RULE DEVELOPMENT AND PUBLIC CONSULTATION PROCESS

A. Rule Development Process

The rule development process for proposed new Rule 6-7 began with the Air District's 2010 Clean Air Plan, which addresses PM and PM's significant health impacts (among other air quality concerns). The 2010 Clean Air Plan included Stationary Source Measure SSM 6, which committed the Air District to strengthening its general PM emissions limits in Regulation 6, Particulate Matter; Rule 1: General Requirements. The Air District is proposing revisions to those regulations to fulfill this commitment as provided in the draft amendments to Rule 6-1 that are being circulated concurrently with this proposal. Since the 2010 Clean Air Plan, Air District staff further committed to taking steps to address the Bay Area's particulate matter challenges in a November 2012 report entitled *Understanding Particulate Matter: Protecting Public Health in the San Francisco Bay Area*. These commitments to address particulate matter challenges led Air District staff to review opportunities for significant reductions in particulate matter emissions. Staff identified control of blue smoke from paving and chip seal operations, and control of smoke/odors from roofing asphalt as areas of potential improvement (along with the other areas being addressed in the other new rules being proposed).

B. Public Outreach and Consultation

In developing the proposals for draft new Rule 6-7, staff consulted with the following interested and affected parties:

Businesses	Governmental Agencies
Morton Salt - Newark	CALTRANS District 4 - Oakland
Cargill – Newark	Bay Area Regional Water Quality Board - Oakland
Criterion Catalysts - Pittsburg	North Coast Regional Water Quality Board – Santa Rosa
CertainTeed Gypsum – Napa	Bay Area Rapid Transit – Richmond Maintenance Yard
Maxwell House – San Leandro	Alameda County
C & H Sugar – Crockett	Contra Costa County
Con Agra – Oakland	Marin County
CEMEX – Oakland	Napa County
CEMEX – Clayton	Santa Clara County
Strategic Materials – San Leandro	San Francisco City & County
Dutra Materials – San Rafael	San Mateo County
Superior Supplies – Santa Rosa	Solano County
Granite Rock – Redwood City	Sonoma County
Hanson Aggregates – Clayton	City of Hayward
Bodean / Mark West Quarry – Santa Rosa	City of Napa
PABCO Gypsum – Redwood City	City of Oakland
Georgia Pacific Gypsum - Antioch	City of San Jose
Syar - Napa	City of San Rafael
Syar – Santa Rosa	City of Santa Rosa
Syar - Vallejo	

Soiland Quarry - Cotati	
Langley Hill Quarry - Woodside	
Granite Construction – Santa Clara	
Granite Construction – San Jose	
Willowbrook Feeds – Petaluma	
Hunt & Behrens – Petaluma	
Owens-Corning – Santa Clara	
Owens-Brockway - Oakland	
Waste Management – San Leandro	
Zanker Road Material Processing – San Jose	**Industry Associations**
Waste Management - Altamont	Association of Building Contractors
Redwood Landfill	Associated Roofing Contractors of the Bay Area Counties
Guadalupe Landfill	California Asphalt Pavement Association
Ox Mountain Landfill – Half Moon Bay	Construction Industry Air Quality Coalition
Clover Flat / Upper Valley Resources	Northern California Engineering Contractors
Potrero Hills Landfill	
Stavin	
McGuire & Hester Construction - Oakland	
Ghilotti Bros. Construction – San Rafael	
Universal Building Services - Richmond	
Statewide Sweeping – Milpitas	
Levin Richmond Terminal	
Lehigh Cement	
Phillips 66 Coker	
Phillips 66 Coke Calciner	
Shell Coker	
Tesoro Coker	
Valero Fluid Coker	
APS West	
Carbon Inc.	

Public workshops are the next step in the rulemaking process. Air District staff will review the draft new Rule 6-7 with affected parties to solicit input and identify any potential issues and concerns. The Air District will use the public's input, along with further investigation and analysis by staff to develop the final proposed new Rule 6-7, and present to the Air District's Board of Directors for approval.

C. Review of Potential Environmental Impacts Under CEQA

The Air District contracts with an independent consultant to conduct a California Environmental Quality Act (CEQA) analysis of potential environmental impacts from any rule making projects. Since review of the entire inventory of possible PM emission reductions is resulting in the proposal for draft amendments to Rule 6-1, draft new Regulation 6, draft new Rule 6-7, and proposals for two new additional PM rules, the CEQA analysis will be conducted for the entire suite of proposed draft amendments and new rules. The consultant will make an initial assessment of any environmental impacts based on the draft amendments to Rule 6-1, draft new Rule 6-7, the two additional draft new rules, and the accompanying workshop reports.

After staff receives additional input during the workshop process, a final proposal and staff report will be used to finalize the CEQA analysis. The CEQA analysis will be included in the final proposal, posted for public review and comment at least 30 days before the Public Hearing. At the Public Hearing, the Air District Board of Directors will consider the final proposal and public input before taking any action on the draft new Rule 6-7.

D. Review of Economic and Job Impacts with a Socio-Economic Analysis

The Air District contracts with an independent consultant to conduct a Socio-Economic Analysis of potential economic impacts from the draft new Rule 6-7. The consultant will make an initial assessment of any economic impacts based on the draft new Rule 6-7, and this workshop report.

After staff receives additional input during the workshop process, a final draft proposal and staff report will be used to finalize the Socio-Economic Analysis. The Socio-Economic Analysis will be included in the final proposal, posted for public review and comment at least 30 days before the Public Hearing. At the Public Hearing, the Air District Board of Directors will consider the final proposal and public input before taking any action on the draft new Rule 6-7.

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IX. APPENDIX

Appendix D-1: Technical Review of Paving and Chip Seal Asphalt

Initial work on asphalt emissions indicated three areas of potential for emission reductions: (i) the load-out of hot asphalt into trucks at the asphalt plant; (ii) the application of chip seal asphalt products onto the road surface at paving operations; and (iii) the melting of roofing asphalt before application of roofing asphalt onto roofs. The mechanical systems needed to control the smoke and fumes from loading hot asphalt, and from application of chip seal asphalt were both found to **not** be cost effective, so are not being proposed during this rule-making project. Roofing asphalt can be controlled easily and cost effectively. This appendix summarizes the information gathered regarding paving asphalt, and chip seal asphalt.

PM Emissions during Truck Load-out at Paving Asphalt Plants

Asphalt Plants produce asphaltic concrete (asphalt for road paving). Most PM emissions from asphalt plants occur from truck traffic in and out of the facility, and from the driers used to prepare aggregate (gravel) before mixing the aggregate with hot asphalt. The Air District has strict permit conditions for paving asphalt plants, limiting NOx and PM from the aggregate driers, and limiting fugitive dust from vehicle traffic. Staff found these typical sources of emissions were well controlled.

When the final hot paving asphalt product is delivered from a large storage silo into a delivery truck, a large cloud of smoke occurs when the paving asphalt is first exposed to the air and deposited in the truck. In the asphalt industry this is commonly known as “blue smoke” because it has a blue ting when viewed in the sunlight. Most of this “blue smoke” is vaporized asphalt (particularly when the asphalt is “hot mix” paving asphalt delivered at more than 300°F), but some of this smoke may also be steam from residual water in the truck, or vapors from a release agent that is often used to coat the bed of the truck to improve the ability of the asphalt to slide out of the truck into the paving equipment at the job site. Toxic air contaminants are estimated for this load-out operation. Further review is needed to ensure that toxicity of “blue smoke” emissions are properly assessed during each asphalt plant Health Risk Assessment.

The asphaltic concrete mixture for Warm Mix asphalt is kept at 235 – 275^{o}F in storage, and is hot enough to create this “blue smoke” plume when loaded out from the storage vessel into the truck. The California Department of Transportation (CALTRANS) at times requires paving with “rubberized” asphalt. This rubberized asphaltic concrete includes crumb rubber from recycled tires. Rubberized asphaltic concrete is applied at temperatures from 325 – 375^{o}F. These higher temperatures can cause sulfur in the crumb rubber to generate hydrogen sulfide (H_2S) vapors, an odorous chemical (smells like rotten eggs). The resulting asphaltic concrete mixture for Hot Mix asphalt is kept at 300 – 325^{o}F in storage, and makes significantly more “blue smoke.” The volume of the plume can be minimized by reducing the free-fall distance into the truck and possibly using a delivery chute, but “blue smoke” is an area of opportunity for emission reductions. Figure D-1.1 shows blue smoke billowing from the truck load-out (without any controls).

Figure D-1.1: Paving Asphalt Load-out with blue smoke emissions

There is also concern about “blue smoke” when the hot mix paving asphalt reaches the jobsite. Very little hot asphalt will vaporize when it rides in the truck from the asphalt plant to the job site because the external surface of the asphalt has cooled. The next step is to slide the asphalt from the dump truck into the paver. Some additional smoking occurs at this step as air is exposed to new hot asphalt. The following step is for the paver to deposit a layer of asphalt onto the road bed. Again, additional smoking occurs at this step because air is being exposed to new hot asphalt. As the asphalt cools while it is compacted, there is only minor additional smoke. Figures D-1.2 and Figure D-1.3 shows paving asphalt operations at the jobsite with typical blue smoke. There does not appear to be any practical way to control the blue smoke at either of these steps in the paving process.

Figure D-1.2: Typical Jobsite Blue Smoke from the paver

Figure D-1.3: Blue smoke from freshly laid pavement

Control of Paving Asphalt

Blue smoke from hot paving asphalt load-out can be abated by a vacuum collection and filtration system to capture and dispose of the particulates. Three paving asphalt plants in the Bay Area currently have such systems. These systems include a wind screen enclosure around the truck-loading ramp, and use a large induced draft fan to draw air surrounding the loading zone into an abatement device. This approach is estimated to capture 80% of the "blue smoke", and routes it to a filtration system that is estimated to recover 95% of the vaporized asphalt. Figure D-1.4 shows an example of a blue smoke abatement system installed on a paving asphalt truck load-out facility.

Figure D-1.4: Blue Smoke Abatement system with filters

PM Emissions during Application of Chip Seal Asphalt to Roadway Surfaces

Chip seal asphalt is used to construct roads in rural areas. Roads built with chip seal asphalt are designed for lighter traffic, and are typically not as costly to build. These roads consist of a layer of aggregate, then chip seal asphalt is sprayed onto the aggregate to create a light-duty pavement. Often sand is spread over the liquid asphalt, and rolled with a heavy roller to compact the pavement. Chip seal asphalt is also used to repair existing paved roads that may have cracks. Liquid asphalt is sprayed over the cracked pavement and allowed to fill the cracks. Blue smoke is emitted in both of these types of projects because the liquid asphalt is hot (225 – 275^{o}F) and since the asphalt is sprayed, the spray droplets have a high surface area exposed so much more of the asphalt is vaporized into the air. Figure D-1.5 shows chip seal asphalt being applied without any controls.

Figure D-1.5: Chip Seal Asphalt Operation

Control of Chip Seal Paving Asphalt

Similarly, "blue smoke" is emitted when spraying hot chip seal asphalt onto an existing paved road with cracks, or onto a bed of aggregate to form a new chip seal paved road. Abatement is currently available – similar to the blue smoke abatement systems available for the asphalt plants. This system includes a portable enclosure pulled along by the truck spraying the chip seal asphalt, surrounding the liquid asphalt spray nozzles, and uses a large induced draft fan to draw significant quantities of air surrounding the spray zone into an abatement device. This approach is estimated to capture 80% of the "blue smoke", and routes it to a filtration system that is estimated to recover 95% of the vaporized oil. Figure D-1.6 shows and example of a vacuum and filtration system working in tandem with the chip seal spray equipment.

Figure D.1.6: Chip Seal Asphalt "blue smoke" controls

Summary of Estimated Emission Reductions from Asphalt Operations

Paving Asphalt Plants

Significant quantities of blue smoke occur when asphalt plants load out hot paving asphalt into delivery trucks. The blue smoke plume is typically about the size of the truck, and lasts for about 5 – 10 seconds before it begins to dissipate. These plumes of blue smoke appear to be large and significant.

However, facilities that have blue smoke abatement systems actually recover very little material and usually need to be cleaned only weekly, or monthly. Emissions factor estimates for blue smoke from paving asphalt load out varied widely:

- EPA AP-42 emissions factor – 0.5 lbs of PM_{10} per thousand tons of paving asphalt
- Justice-Butler Blue Smoke Abatement experience[4] –
  - 7 lbs of PM_{10} per thousand tons of paving asphalt
  - 0.3 lbs of PM_{10} per thousand tons of paving asphalt
  - 0.1 lbs of PM_{10} per thousand tons of paving asphalt
- Syar Industries, Inc. Asphalt Plant Blue Smoke Abatement experience[5] –

[4] Mike Butler, Butler-Justice, Inc., range of asphalt accumulation in Blue Smoke Abatement filters

[5] Toby Goyette, Syar Industries, Inc., range of asphalt accumulation in Blue Smoke Abatement filters

- 2 lbs of PM_{10} per thousand tons of paving asphalt
- 1 lbs of PM_{10} per thousand tons of paving asphalt

Blue smoke emissions may become even larger in the future as CALTRANS specifies more use of rubberized paving asphalt which requires a higher temperature.

The Air District's most recent inventory of PM emissions sources estimates that asphalt plants emit 0.22 tpd of PM_{10} and 0.18 tpd of $PM_{2.5}$ in total from all PM sources at these facilities, including sources such as aggregate driers and fugitive dust from vehicle traffic. These estimates do not include PM emissions of blue smoke from paving asphalt. Paving asphalt demand in the Air District is about 2,000,000 tons each year.[6] Staff estimates PM emissions associated with the blue smoke from asphalt load out ranges from 1 – 2 lbs of PM_{10} per thousand tons of paving asphalt (the middle ground of actual experience with blue smoke abatement), so resulting potential emissions from paving asphalt are estimated to be 2,000 – 4,000 lbs (1 – 2 tons per year). Note that three asphalt plants currently have blue smoke abatement systems in place, so the likely emissions are less: estimated at 0.5 – 1.5 tons per year. All blue smoke emissions are likely $PM_{2.5}$, since the particles consist of vaporized asphalt that has condensed to an aerosol.

Installation of blue smoke abatement vacuum collection and filtration systems can reduce the $PM_{2.5}$ emissions by 75%. Existing blue smoke abatement systems have achieved 80% capture, and 95%+ efficiency in filtration of the condensed asphalt aerosols.[7] Staff anticipates no emission reductions from paving asphalt blue smoke, because blue smoke abatement systems do not appear to be cost effective for the relatively small amount of emissions that can be captured, as described below in the Costs for Controls section.

<u>Chip Seal Asphalt Operations</u>

Significant quantities of blue smoke occur when asphalt contractors spray liquid asphalt for chip seal paving. Chip seal asphalt demand is estimated at about 2,500 tons each year[8] (note the demand is much lower because the weight of aggregate is not included in the chip seal demand measurements). Staff estimates PM emissions associated with the blue smoke from application of chip seal asphalt are 40 – 60 times higher (to account for the lack of aggregate, and increased volatilized asphalt from spraying chip seal asphalt), estimated at 40 - 120 lbs of PM_{10} per thousand tons of chip seal asphalt, resulting in potential emissions from application of chip seal asphalt estimated to be 100 – 300 lbs per year (~0.1 ton per year).

Installation of blue smoke abatement vacuum collection and filtration systems can reduce the $PM_{2.5}$ emissions by 75%. Existing blue smoke abatement systems have achieved 80% capture, and 95%+ efficiency in filtration of the condensed asphalt aerosols.[9] Staff anticipates no emission reductions from chip seal asphalt blue smoke, because blue smoke abatement systems do not appear to be cost effective for the relatively small amount of emissions that can be captured, as described below in the Costs for Controls section. Further review of toxicity from blue smoke is needed during chip seal asphalt operation's Health Risk Assessment.

Costs for Controls

<u>Paving Asphalt Plants</u>

Control of blue smoke from hot paving asphalt plants can be achieved with a permanent blue

[6] U.S. Energy Information Administration, Asphalt and Road Oil Supply and Disposition
[7] Mike Butler, Butler-Justice, Inc., design basis for Blue Smoke Abatement capture and filtration
[8] U.S. Energy Information Administration, Asphalt and Road Oil Supply and Disposition
[9] Mike Butler, Butler-Justice, Inc., design basis for Blue Smoke Abatement capture and filtration

smoke control system and accompanying wind screens installed around the asphalt load-out hopper. This system captures blue smoke with an induced draft fan and the filters the smoke particles for recycle. Estimated cost for this permanent system with wind screens is $300,000 capital[10], resulting in annual amortized cost of $30,000 and operating costs estimated at an additional $15,000 per year. Staff estimates a large asphalt plant (~750,000 tons per year) would capture and recycle 0.5 tons per year of asphalt aerosols. Staff does not recommend a requirement for blue smoke controls because they do not appear to be cost effective. Further review of blue smoke emissions is needed during asphalt plant Health Risk Assessment.

Chip Seal Operations

Control of blue smoke from chip seal operations can be achieved with a portable blue smoke control system that is positioned next to the chip seal spray nozzles, draws the blue smoke with an induced draft fan and filters the smoke particles for recycle. Estimated cost for this portable device is $250,000 capital[11], resulting in annual amortization of $25,000 and operating costs estimated at an additional $10,000 per year. Staff estimates one of these control devices would be needed in the Bay Area to provide the capability to control chip seal operations. Estimated total costs are $35,000 per year, and estimated emission reductions are 0.1 tons per year of $PM_{2.5}$. Staff does not recommend a requirement for blue smoke controls because they do not appear to be cost effective. Further review of blue smoke emissions is needed during chip seal operation Health Risk Assessment.

[10] Mike Butler, Butler-Justice, Inc., Blue Smoke Abatement Systems
[11] Mike Butler, Butler-Justice, Inc., Blue Smoke Abatement Systems

Appendix E: New Rule 6-8 Workshop Report

Bay Area Air Quality Management District

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New Regulation 6: Particulate Matter,
Rule 8: Bulk Material Storage and Handling

WORKSHOP REPORT
January 2017

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Greg Solomon – Engineering
Chuck McClure – Meteorology, Measurement and Rules

Table of Contents

I. INTRODUCTION AND SUMMARY **141**
II. BACKGROUND **142**
III. REGULATORY FRAMEWORK **143**
IV. TECHNICAL REVIEW **143**
A. PM Emissions from Petroleum Coke and Coal 143
B. Wind Screens are Effective Dust Controls 143
C. Judicious Water Use to Control Dust 147
D. Traffic Controls 148
V. DRAFT NEW REGULATION 6, RULE 8 .... **148**
A. Exemptions 149
B. Definitions 149
C. Prohibition of Visible Emissions 149
D. Bulk Material Spills 150
E. Vehicle Traffic in Bulk Material Facilities 150
F. Prevent Trackout 150
G. Prevent Carryout 150
H. Monitoring and Records 151
I. Manual of Procedures 151
VI. EMISSION REDUCTION BENEFITS & COMPLIANCE COSTS **152**
A. Summary of Estimated Emission Reductions 152
B. Costs for Controls 153
C. Summary of Costs for Controls 156
VII. RULE DEVELOPMENT AND PUBLIC CONSULTATION PROCESS .. **157**
A. Rule Development Process 157
B. Public Outreach and Consultation 157
C. CEQA Analysis of Potential Environmental Impacts 159
D. Socio-Economic Analysis of Potential Economic and Job Impacts 159
VIII. REFERENCES **160**
IX. APPENDIX **161**

I. INTRODUCTION AND SUMMARY

The Bay Area Air Quality Management District (Air District) is drafting a new regulation to control particulate matter emissions from bulk material storage and handling operations. The proposal is to create a new Regulation 6, Particulate Matter; Rule 8: Bulk Material Storage and Handling (Rule 6-8). This workshop report provides background information on the draft new Rule 6-8 and its rationale. This workshop report is intended to provide members of the public with description of the new regulation in advance of public workshops the Air District will hold in the early 2017.

The draft new Rule 6-8 will address particulate emissions from storage and handling of significant quantities of bulk materials, including petroleum coke and coal. These emissions present an environmental and public health concern because small dust particles cause or contribute to a wide variety of serious health problems, including asthma, bronchitis, cardio-vascular diseases, and cancer. The Air District has committed to reduce fine particulate matter levels to achieve significant health benefits. Bulk materials are unpackaged solids less than 2 inches in length or diameter, such as soil, sand, gravel, aggregate, construction materials, coke and coal. Wind erosion from storage and handling of these materials can contribute to fine particulate matter pollution when bulk material dust gets carried into the atmosphere by the wind or by being handled in the open air. Coke and coal are particularly troublesome because the dust is black. Coke or coal dust is far more visible than typical geologic dust, and black residue on people's cars, windows and patio furniture is especially annoying. Black coke and coal dust also absorb sunlight, so they have a greater impact on climate change than most typical dust sources.

Currently Regulation 6, Particulate Matter; Rule 1, General Requirements limits visible emissions from all sources to no more than 20% opacity for no more than a cumulative three minutes in any sixty-minute observation period using EPA Test Method 9, or as dark in shade as that designated as Number 1 on the Ringelmann Chart. This requirement continues to apply to all bulk material operations and sources.

The draft new Rule 6-8 addresses fugitive dust from significant bulk material operations that have permits to operate from the Air District, including coke and coal, that produce or use more than 10 tons per year of a bulk material, or store the bulk material in stockpiles more than 3 feet tall or have a footprint of more than 100 square feet. The draft new Rule imposes the following requirements for such facilities:

- No source may create a fugitive dust plume greater than 5 feet long, 5 feet wide, or 5 feet tall that exceeds 10% opacity for more than a cumulative three minutes in any sixty-minute observation period (5% of the time) using EPA Test Method 9, or as dark in shade as that designated as Number ½ on the Ringelmann Chart.
- No source may create a visible fugitive dust plume that carries beyond the property line of the facility.
- Any spill of bulk material more than 6 inches high or covers more than 25 square feet must be cleaned up or stabilized with moisture, a chemical dust suppressant, or a wind screen. Cleanup activities may not exceed the visible fugitive dust plume limitations.
- Physical barriers must be used to prevent bulk material from eroding into the vehicle traffic areas. Vehicle traffic must travel on paved roads, or roads stabilized with moisture, chemical stabilizers or aggregate. Vehicles may not exceed a speed limit of 15 mph.
- The facility must prevent trackout of wet solids onto adjacent paved roadways, as required in new draft Rule 6-6.

- The facility must prevent carryout of leaked or spilled material onto adjacent paved roadways. Any truck loaded by the facility must be inspected before leaving the facility to ensure no leaks or spills occur.

The Air District is publishing the full text of draft new Rule 6-8 along with this workshop report.

This new Rule 6-8 will affect approximately 120 facilities that store and handle bulk materials, 10 of which handle petroleum coke, and three facilities that store and handle coal. Approximately 40 of these facilities already have controls for fugitive dust, mostly water sprays. Wind breaks are a very effective method to control wind erosion that initiates fugitive dust plumes, particularly when bulk materials are actively conveyed from one place to another. Costs for wind screens and improvements to watering systems are relatively minor. Emission reductions are estimated to be 0.37 tons per day of PM_{10}, with approximately 0.03 tpd of emissions being $PM_{2.5}$. Neighbor complaints are expected to be reduced significantly. The new rule will reduce emissions of particulate matter in the Bay Area in a feasible and cost-effective manner, thereby improving public health and reducing nuisance dust deposited on nearby neighbor's property.

The Air District is drafting this new Rule 6-8 as part of a suite of proposals aimed at addressing fine particle pollution, which include (i) amendments to Rule 6-1 to strengthen that rule's particulate matter emissions limits applicable to general industrial operations; (ii) a new Rule 6-6 addressing the trackout of dirt and other dusty materials onto paved roadways; (iii) a new Rule 6-7 addressing roofing asphalt operations; and (iv) a new Regulation 6 providing definitions, test methods, monitoring requirements, and other administrative provisions that will apply generally to all of the Rules in Regulation 6. More information about these other related proposals can be found in the workshop reports for the proposals, which are being published concurrently with this report.

This workshop report describes the draft new Rule 6-8. Following this introduction and summary, Section II, Background; Section III, Regulatory Framework; and Section IV, Technical Review each refer to the parallel sections in the Regulation 6 workshop report. Section V of this Workshop Report provides a comprehensive discussion of the draft amendments. Section VI then provides a discussion of the expected air quality benefits, and compliance costs. Section VII concludes the report with an outline of the public outreach and involvement process that the Air District is undertaking in developing the draft new rule, including further information on how interested members of the public can get involved.

The Air District invites all interested members of the public to review the draft new regulation and this workshop report, and to attend one of the public workshops in early 2017. Air District staff will discuss the draft at the workshops and request feedback and input from the public, and will continue to accept written feedback for two weeks after the last workshop. Air District staff may revise the proposal based on the feedback and input received, and will present a final proposal to the Air District's Board of Directors for consideration. For further information in advance of the public workshop, please contact Guy Gimlen, Principal Air Quality Engineer, (415) 749-4734, ggimlen@baaqmd.gov.

II. BACKGROUND

Refer to the Background section of the workshop report for new draft Regulation 6.

III. REGULATORY FRAMEWORK

Refer to the Regulatory Framework section of the workshop report for new draft Regulation 6.

Prohibition of carryout is addressed in California Vehicle Code §23114. Requirements for prevention of situations that could result in carryout are addressed in draft new Rule 6-8.

IV. TECHNICAL REVIEW

Refer to the Technical Review section of the workshop report for new draft Regulation 6.

C. PM Emissions from Petroleum Coke and Coal

Petroleum coke is a product of the oil refining process, converting residuum (the heavy asphaltic material from crude oil) into lighter gas oils and solid coke. Three of the five Bay Area refineries produce solid coke. The solid coke is formed in a large vessel called a coke drum, and removed from the drum with high pressure water. The solid coke usually falls into a pit, where it is scooped up, crushed to a manageable size, and conveyed to storage on a conveyor belt. Each refinery conveys, loads, and stores coke in stockpiles (either on-site or off-site). The solid coke may be loaded directly onto a truck and transported to a customer. Most petroleum coke is burned for fuel. One refiner produces "fluid" coke, which has the consistency of black sand. One refiner also calcines a portion of their coke to produce a specialty product (called calcined coke).

One cement manufacturer in Cupertino burns petroleum coke as fuel. Coke is transported to this facility by truck, offloaded via conveyor to a storage pile, and the fed into the process stream. Most of the coke produced in the Bay Area is shipped overseas. There are three coke shipping facilities, one located in the Richmond harbor, and two located on the Carquinez Straits. Each of these shipping facilities receives solid coke by truck, off-loads it, conveys and stores it, then loads it onto a ship. The facility in Richmond stores the coke in an open stockpile. The facility in Pittsburg is a state of the art facility, with enclosed off-loading, enclosed conveyors, and enclosed storage. The facility in Benicia is partially enclosed, and handles fluid coke.

The Bay Area has two foundries that use coal as a raw material in the manufacturing process. One is located in Oakland, and one in Union City. Coal is received from out of state by railcar at each facility. One facility off-loads and conveys the coal to open storage, then scoops up coal as needed to supply the manufacturing process. The other off-loads and conveys the coal to a series of silos where the coal is stored until used in the manufacturing process. In both locations, coal dust is a concern when off-loading the railcar into a hopper and conveyor system. Staff observed coal dust coming out of the top of the railcar during unloading, and coal dust surrounding the receipt hopper below the railcar. In addition, the facility that scoops up the coal to feed into the manufacturing processes had issues with coal spills into the vehicle path used to deliver the coal to the process equipment.

D. Wind Screens are Effective Dust Controls

Prevention of wind erosion for bulk materials, including coke and coal, is very similar to that needed for geologic fugitive dust:

- Minimize the surface area being exposed to wind erosion.
- Establish windbreaks, and limit work on windy days.
- Apply dust suppression measures including water fog or mist when needed.

- Limit traffic on surfaces with dusty silt, and limit vehicle speeds.
- Prevent dirt, mud, and solids spills; and clean up any spills that have the potential to create dust immediately.

Staff observed the following areas of opportunity for better bulk material dust control:

- Protect locations where bulk materials are handled from wind erosion:
    - Unloading from a railcar or truck into a hopper that feeds a conveyor,
    - Unloading from a ship (this is seldom done, but uses a clamshell style scoop when it is done),
    - Conveyors are often up in the air and more susceptible to winds,
    - Conveyor transfer points (the transitions from the end of one conveyor onto another conveyor, or crusher or screening device),
    - Stockpiles, and
    - Loading onto trucks, railcars and ships.
- Reduce drop heights at conveyor transfer points, and drop heights onto a stockpiles where the material is exposed to the wind,
- Prevent and cleanup spills that are subject to wind erosion, and
- Prevent bulk materials from migrating into vehicle traffic areas where it can be pulverized into silt, and entrained into the air from the turbulence of the vehicle traffic.

No location had improvements needed in each of the areas above, but every location (except the shipping facility in Pittsburg) had improvements needed in a least two of the areas listed above.

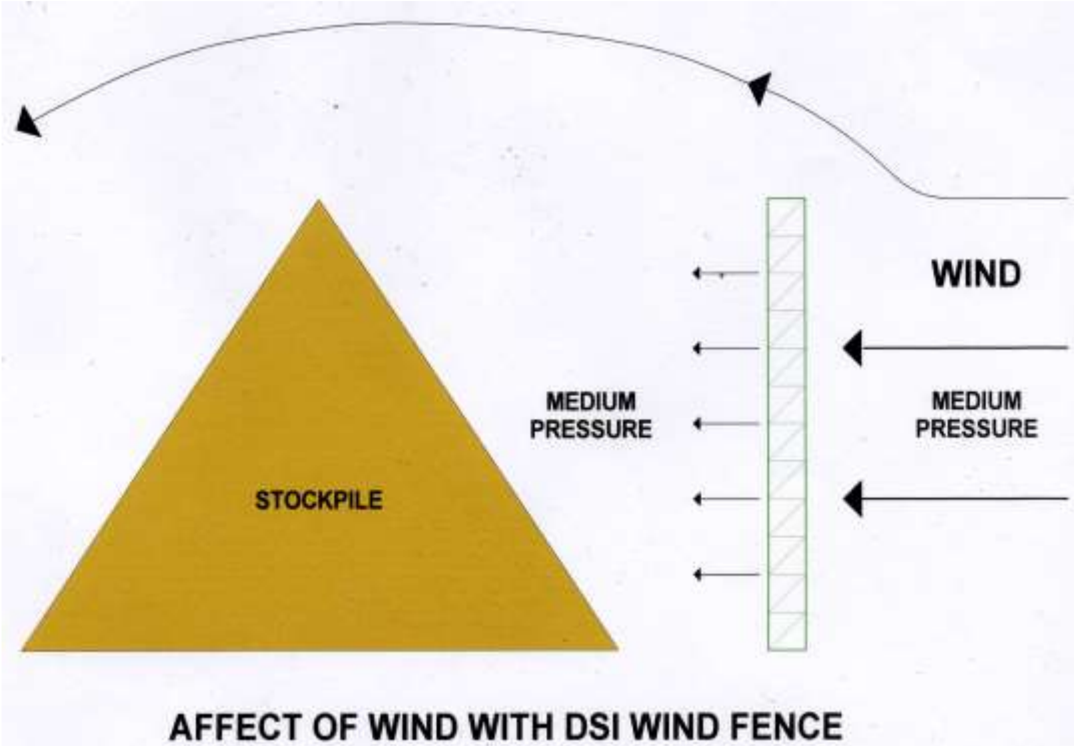
Figure IV-1: Typical Wind Screen - constructed to protect a down-wind stockpile.

Wind barriers are very effective at reducing wind velocity and controlling wind erosion. Research on wind barrier design finds that the most effective designs[1] have 50% porosity, and the height of the windbreak should be as high as the bulk material handling operation or stockpile that it protects. The windbreak should be placed a distance no more than its height upwind from the potentially dusty source. Wind screens are estimated to be 70% effective at reducing fugitive dust.

Figure IV-2 shows the impact a wind barrier has on wind velocity. This example is provided by Dust Solutions, Inc., a company that provides a wide variety of dust solutions, including water misters and wind barriers.

[1] Windbreak Effectiveness for Storage-Pile Fugitive-Dust Control, Billman and Ayra, Department of Marine, Earth and Atmospheric Sciences, North Carolina State University.

Figure IV-2: Wind Barrier – from Dust Solutions, Inc.



Dust controls are similar during active dust generating operations. Dust control measures for active bulk material handling include:

- Provide wind barriers to prevent / minimize wind erosion, or enclose dusty material handling and storage areas.

Figure IV-3: Wind Barrier surrounding a conveyor transfer point

Windbreaks on conveyors can be built or attached to the support structure for the conveyor, with adequate clean-out openings to accommodate conveyor spills. BACT for conveyors includes covers, enclosed transfer points, and catch-pans to catch any small spills from conveyor operation. These catch-pans, however, are often difficult to retrofit onto an existing conveyor because the mechanical structure must be designed for the weight of the catch-pan plus any spills that may collect. Staff is not proposing to require catch-pans on conveyors because of this retrofit problem.

Fugitive dust from wind erosion is estimated based on wind speed above the friction threshold velocity (wind speed required to get the first particle of fugitive dust into the air). Use of a wind screen to reduce wind velocity by 50% in the Bay Area (with average wind speed of about 7 – 9 mph during the dry season) results in estimated fugitive dust reductions of approximately 85%. Staff estimates that a combination of windscreens and judicious use of water fog and misting systems can control more than 90% of fugitive dust. However, since about one-third of bulk material handling facilities already use some combination of wind screens and water sprays, staff estimates enhanced effort to control dust, particularly using wind screens will be 70% effective.

E. Judicious Water Use to Control Dust

In addition to wind screens, judicious use of water is the next most effective way to control dust. Spray water fog and mist as needed to moisten dust particles and prevent dust plumes:

- Use water fog or mist to control dust during active handling operations.

- Spray water fog and mist to keep disturbed surfaces damp during bulk material moving operations.

Inventory guidelines for construction projects indicates water use can control ~50% of fugitive dust generation.

Note the obvious concern about excessive use of water to control fugitive dust emissions, especially in the persistent recurring drought being experienced in California. This concern about water use drives the recommendation to use wind screens as a first approach to dust control, and take advantage of the better effectiveness of water fog and water mist systems, rather than water sprays, water hoses, and water trucks. Fog and mist systems create small water droplets that are more effective at contact with small dust particles. Most estimates of water fog and water mist place them at being 10 – 20 times more effective at reducing fugitive dust per gallon of water. Water fog and mist systems must be protected from the wind by an enclosure or a wind screen, because the fog or mist will be affected by the wind patterns.

Staff recommends using water fog and water mist systems, rather than water spray systems to stabilize disturbed surfaces, and control fugitive dust from active operations. Fog and misting systems are far more effective that water sprays, sprinklers, or water trucks. Fog and mist systems generate ~ 10 - 50-micron water droplets that are near the size of the dust, and are more effective at wetting the dust particle than larger water droplets. In addition, water fog and mist systems use only 5 – 10% as much water as a water spray system to accomplish the same dust control. During this recurring drought in California, staff recommends water fog or mist systems, and recommends converting existing water spray systems to water fog/mist systems. These water fog systems can also be even more effective when a surfactant (typically a soap) is used to help the water contact and adhere to the solid particles of dust more easily.

F. Traffic Controls

In addition,

- Keep storage piles covered.
- Limit vehicle traffic to paved or stabilized surfaces.
- Limit vehicle speeds.
- Prevent erosion of bulk materials onto paved roadways where vehicles can pulverize the solids into fine particles.
- Prevent dirt, mud and other solids from being tracked out or spilled onto paved roadways.

Staff draft proposals for control and prevention of fugitive dust from bulk material handling operations are based on the control methods above and practical suggestions received during facility visits.

V. DRAFT NEW REGULATION 6, RULE 8

Draft new Rule 6-8 sets emission limits and control requirements for bulk material handling operations that have operating permits from the Air District, and produce or use more than 10 tons per year of materials, or store material in stockpiles more than 3 feet high or have a footprint of more than 100 square feet. The principal elements of the draft new Rule are the following:

- Prohibit visible emissions of fugitive dust from significant fugitive dust plumes (larger than 5 feet long, 5 feet wide, or 5 feet high) from bulk material handling operations to no more than 10% opacity (or half as dark in shade as that designated as Number 1 on the Ringelmann Chart) for no more than 3 minutes in any 60 minute observation period (5% of the time).
- Prohibit visible emissions of fugitive dust from leaving the property and affecting neighbors.

- Protect or clean up bulk material spills when they occur so they are not subject to wind erosion.
- Control vehicle traffic in bulk handling facilities to limit speed and prevent dust.
- Prevent trackout of dirt, mud, and bulk materials onto adjacent paved roadways, as required in draft Regulation 6, Rule 6: Prohibition of Trackout.
- Prevent carryout and spills of bulk materials onto paved roadways.
- Monitor each facility for visible emissions, and document results.

This regulation is effective two years after rule adoption. This will give each facility adequate time to budget, design and install and operate controls as needed to meet the requirements of this regulation.

This Section discusses all of the draft amendments in each of these areas in detail.

A. Exemptions

Staff has drafted an exemption for two miscellaneous situations. One is where national, state or local agencies are responding to a natural or civil disaster or emergency situation. In response to a disaster or emergency, dust control is low priority. The second is where blasting operations have been permitted by the California Division of Industrial Safety. It is very difficult to control dust during blasting operations. Staff has observed significant pre-watering of a blast site (for approximately 12 hours), yet there was very little impact on the fugitive dust from the blast. This exemption applies to the blasting operations only. The storage and handling of bulk materials remains subject to the requirements of this rule.

Staff has developed a draft limited exemption for situations where wind gusts exceed 25 mph. Fugitive dust is very difficult to control in high wind situations, so facilities will be exempt from the visible emissions limit. However, the facility must demonstrate to the Air District's satisfaction that they have implemented all feasible control measures to limit fugitive dust. The facility must document the date, time and wind gust speed to be eligible for this exemption. Wind rose data indicates wind gusts greater than 25 mph (~ 10 meters per second) occur less than 1% of the time, mostly during winter storms, but occasionally during April and May of each year.

B. Definitions

The definitions in draft new Regulation 6 apply to Rule 6-8.

Bulk materials are defined as any unpackaged soil, sand, gravel, aggregate, construction material or other unpackaged solids less than 2 inches in length or diameter.

A regulated bulk material site is one subject to a permit to operate issued by the Air District, and that produces, uses or handles more than 10 tons per year of bulk materials, or stores bulk materials in piles higher than 3 feet or with a footprint of more than 100 square feet.

Carryout is defined as any material that spills or leaks from loaded or empty vehicle onto a paved roadway or paved shoulder of a paved roadway.

C. Prohibition of Visible Emissions

Currently, Regulation 6, Rule 1: General Requirements establishes a limit of visible emissions from any source of no more than 20% opacity for no more than 3 minutes in any 60-minute observation period, using EPA Method 9. This requirement will continue to apply to bulk material operations.

Any significant regulated bulk material handling facility must meet a visible emissions limit for any fugitive dust plume greater than 5 feet long, 5 feet wide, or 5 feet high that is no more than 10% opacity for a period or aggregate periods of more than 3 minutes in any 60-minute observation period for any fugitive dust plume. The test method is again EPA Method 9, or half as dark in shade as that designated as Number ½ on the Ringelmann Chart.

Any significant regulated bulk material handling facility must not allow a fugitive dust plume of visible emissions to travel or be carried beyond the property line of the facility.

D. Bulk Material Spills

Any significant regulated bulk material handling facility must protect or cleanup any bulk material spill that is more than 6 inches high or more than 25 square feet. The spill may be protected by a wind screen, adequately wetted or stabilized with a chemical stabilizer, or covered with a temporary cover. Cleanup activities must meet the visible emissions limit.

E. Vehicle Traffic in Bulk Material Facilities

Any significant regulated bulk material handling facility must:

- Establish physical barriers to prevent bulk materials from eroding into the vehicle traffic areas,
- Vehicles must travel only on paved roads, or roads stabilized with moisture, chemical stabilizers, or aggregate,
- Vehicles must not exceed a speed limit of 15 mph.

F. Prevent Trackout

Any significant regulated bulk material handling facility must prevent, monitor and cleanup trackout, as defined in draft Regulation 6, Rule 6.

G. Prevent Carryout

Any significant regulated bulk material handling facility must prevent carryout, defined as any spills or leaks from loaded or empty trucks. Each facility must implement the following controls after loading or unloading is complete, and before the truck leaves the facility:

- Ensure that all truck bulk material compartments are covered in one of the following ways:
  - With a sliding solid cover; or
  - With a slot-top cover that reduces open surface area by at least 50%, provided that this alternative may be used only if the bulk material is either adequately wetted or adequate chemical stabilizer is applied to prevent fugitive dust; or
  - With a continuous tarp that completely covers the compartment; or
  - With an alternate method proven effective and approved by the APCO in writing.
- Ensure that the truck drop gate pin is installed.
- Ensure that there are no solid or liquid leaks from the truck.

- Ensure that there is no loose bulk material adhering to the exterior surfaces of the truck.

H. Monitoring and Records

Any significant regulated bulk material handling facility must conduct the following monitoring, and record the results:

- Monitor any fugitive dust plume visible emissions at least once every 4 hours during working hours, and record the results.
- Maintain all records for at least two years, and make them available to APCO upon request.

I. Manual of Procedures

Draft new Section 6-601 in new Regulation 6 specifies the test method for assessing visible emissions.

Draft new Section 6-602 in new Regulation 6 specifies the test method for assessing opacity of visible emissions.

VI. EMISSION REDUCTION BENEFITS & COMPLIANCE COSTS

This section of the Workshop Report summarizes the emission reduction benefits that would result from the draft new Rule 6-8 and the costs involved. Table VI-1 summarizes the emissions and emission reductions anticipated from the draft Rule 6-8.

Table VI-1: Estimated Emissions Reductions from Draft New Rule 6-8:

Source Categories	TSP tons per day	PM_{10} tons per day	$PM_{2.5}$ tons per day
Current Bulk Material PM Emissions	2.04	1.67	0.15
Estimated Emission Reductions	0.45	0.37	0.03
Reduction from Current Emissions	**22.1%**	**22.2%**	**20.0%**
Reduction from Total PM Emissions	**0.26%**	**0.35%**	**0.06%**

E. Summary of Estimated Emission Reductions

<u>Bulk Material Sources with more than 6 lbs. per day TSP emissions</u>

There are 72 facilities with 134 sources of more than 6 lbs per day of TSP emissions. Forty- four of these sources are already equipped with water spray systems, and the other 90 of these sources do not currently have any dust controls. Staff estimates that the 44 sources may elect to upgrade their existing water sprays to water fog or water mist systems in order to reduce water use, but this will not significantly reduce emissions. Staff estimates that the remaining sources will be controlled with wind screens, transfer point shrouds, and loading/unloading chutes. Some judicious use of water fog and water mist systems may be necessary in locations where it is difficult to fit wind screens or shrouds. Staff expects that less than half of the 90 sources will require supplemental water fog or sprays along with wind screens. In addition, staff estimates that only half of these sources will actually install controls, because the facilities will be able to improve their operations to meet the 10% opacity requirements. Emissions reductions are estimated based on only 45 of the sources will be fitted with emissions control. Staff assumes wind screens/shrouds and loading chutes are 70% effective, resulting in emission reductions of 0.37 tons per day of PM_{10}, and 0.03 tons per day of $PM_{2.5}$.

<u>Bulk Material Sources with 2 – 6 lbs. per day TSP emissions</u>

There are 72 facilities with 123 sources of TSP emissions ranging from 4 to 6 lbs per day (some of these facilities also have sources with greater than 6 lbs. per day of TSP emissions). Forty of these sources are already equipped with water spray systems, and the other 83 of these sources do not currently have any dust controls. Staff estimates that some of the 40 sources with water sprays may be upgraded to water fog or water mist systems to reduce water use, but will not significantly reduce emissions. Staff estimates that the remaining sources will likely not be controlled with wind screens, transfer point shrouds, and loading/unloading chutes. Current emissions of 2 – 6 lbs. per day may be small enough to meet the visible emissions performance objective of 10% opacity without installing additional controls. Staff assumes no additional emissions reductions from these sources.

F. Costs for Controls

A number of different approaches can control fugitive dust from bulk material stockpiles, transfer operations including scooping, crushing, conveying, and loading. The draft new visible emissions limit and requirements for windscreens are expected to reduce fugitive dust by at least 70%. Each of the impacted facilities currently has some of this equipment, so additions or modifications to this equipment should be less costly than installing new equipment.

Costs of Controls for Bulk Material Handling

Wind screens can be used to shield almost any bulk material stockpile, handling equipment, or loading/unloading operations. Wind screens around stockpiles are most effective if they are at least as high as the pile, and extend beyond each edge of the pile. Wind screens can also be used to protect bulk material handling equipment (crushers, conveyors, transfer points, screen, and loading facilities from wind erosion. The following provide the cost estimates for various wind screen equipment:

- Wind Screens for stockpiles
  - 100-foot section of 10-foot high fencing estimated to cost $15 - $40 / foot, or $3,000 capital[2]
  - Slats or nylon mesh to provide proper porosity costs up to $5/foot[3]
  - Estimated costs for construction and foundations equals double the cost of materials
  - Total capital for 100 feet of 10-foot high wind screen is $70 / foot, equaling $7,000 capital, amortized to $1,050 per year
  - Estimated cost for 100-foot section of 20-foot high wind screen is $140 / foot, equaling $14,000 capital, amortized to $2,100 per year
  - Estimated cost for 100-foot section of 30-foot high wind screen is $280 / foot, equaling $28,000 capital, amortized to $4,200 per year
  - Can control erosion down-wind for ~ 8 – 10 times the height of the barrier.
  - Total cost for a 10 feet tall stockpile requires 100 feet of windscreen – with capital costs of $7,000, amortized to $1,575 per year
  - Total cost for a 20 feet tall stockpile requires 200 feet of windscreen – with capital costs of $28,000, amortized to $4,200 per year
  - Total cost for a 30 feet tall stockpile requires 300 feet of windscreen – with capital costs of $84,000, amortized to $12,600 per year
- Wind Screens for conveyors
  - Typical conveyor is about 100-foot long
  - Must erect a wind screen on at least one side (preferably the upwind side) of the conveyor
  - Design check to be sure structural integrity is adequate - $2,000
  - Materials costs for stainless steel wire mesh screen - $1,500[4]

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[2] An 8'-12' tall commercial-grade chain-link fence to enclose a residential tennis or basketball court can cost $15-$40 or more a foot. Production Fence Works in Georgia estimates average cost for an 8' high, 60'x100' fence around a single tennis court with a single walk-in gate at $9,200.

[3] Because of its open weave, a chain-link fence is transparent. To make it more opaque, metal, wood or vinyl privacy slats can be woven into the mesh. The slats can be purchased separately, at a cost of $1-$2 or more per foot of fencing, or a chain link fence with built-in privacy or a fabric screen can cost $6-$40 a foot ($600-$4,000 for 100'; $1,800-$12,000 for 300') depending on the type of materials, whether installation in included, and the height, gauge and mesh of the fence.

[4] http://www.twpinc.com/wire-mesh-material/stainless-steel/16-mesh-t316-stainless-35

  - Additional structural steel to reinforce stainless mesh - $500[5]
  - Labor to install – roughly equal to materials costs - $2,000
  - Total costs - $6,000 capital, amortized to $900 per year
- Wind Screens for conveyor transfer points
  - 4-sided 4ft X 4ft stainless steel mesh for wind screen - $250
  - 4 sided 4ft X 4ft plastic shrouds - $150
  - Structural steel supports - $200
  - Labor to install – roughly equal to materials costs - $600
  - Total cost for each transfer point shroud - $1,200 capital, amortized to $180 per year
- Wind Screens for crushers, screening equipment, and loading/unloading facilities
  - 3-sided 4ft X 10ft stainless steel mesh for wind screen - $500
  - Structural steel supports - $400
  - Labor to install – roughly equal to materials costs - $900
  - Total cost for each transfer point shroud - $1,800 capital, amortized to $270 per year

Loading and unloading bulk materials usually involved a front end loader or a clamshell style scoop. Wind screens are useful during these operations, but additional efforts are needed to control the dust during the drop of material from the front end loader or clamshell. Dropping more slowly helps, but a delivery chute to control the fall of the material is very effective, combined with a shroud around the chute to protect it from wind. The following are the estimated costs for these facilities:

- Portable Solids Transfer Chutes and Shrouds
  - Very similar to wind screen for crushers and screening equipment, but must be portable to adjust to wind direction and loading requirements.
  - Cost of portable loading chute with adjustable base - $10,000, amortized to $1,500 per year.
  - Cost of shroud with portable base to shelter loading/unloading operations - $5,000, amortized to $750 per year.

Two other requirements are included in the draft new rule – control vehicle traffic within the facility, and clean up any spills. The following are the estimated costs for these facilities:

- Truck Traffic Control
  - Signs restricting traffic to certain areas – less than $5,000 capital
  - Speed limit signs – less than $5,000 capital
  - Barriers to prevent erosion of bulk material into traffic lanes – less than $10,000 capital
  - Management time needed to enforce speed limits – normally no incremental costs.
- Bulk Material Spill Cleanup
  - Manual cleanup - $75/hour for worker and hand-tools. 1 hour per day, 200 dry workdays - $15,000 per year
  - Regenerative PM10 efficient street sweeper - $400,000 capital, amortized to $60,000 per year, plus $150,000 per year for fuel and operator.

Capital is amortized based on 7% interest, 15-year life, 1% taxes, 1% insurance, and typical 2%

[5] https://www.onlinemetals.com/merchant.cfm?pid=2&step=4&showunits=inches&id=3&top_cat=1

maintenance costs – resulting in a ~15% annual cost of capital.

Estimated costs of water fog, and water misting systems is as follows:

- Water
  - Cost of water - $4-$7 per 100 cubic feet (758 gallons) equates to approximately $0.01per gallon
  - Water Mist systems (Micro-Cool) is an industrial version of those used to cool Palm Springs open air patios:
    - $15,000 for pump, filters and piping system
    - Plastic tubing to deliver mist to desired locations - $1,000
    - Portable water supply – 1" galvanized piping at $10 per foot[6] - $5,000
    - Amortized capital costs - $3,150 per year
    - Water use ~ 100 gallons per hour – say 60 hours per week, 52 weeks per year = 312,000 gallons per year at a cost of $3,120
    - Total costs to provide mist for a typical conveyor belt system - $6,270 per year
  - Water Fog systems for a stockpile
    - (Dust Boss, or Buffalo Monsoon) are large air blowers with air mist systems surrounding the flow of air:
    - $25,000 for pump, filters and piping system
    - Portable water supply – 1" galvanized piping at $10 per foot - $5,000
    - Amortized capital costs - $4,500 per year
    - Power – 5 HP - use 2 hours per day, 5 days per week, 52 weeks per year = 9,698 kWh = $2,242.50 per year
    - Water use ~ 20 gallons per minute – use 2 hours per day, 5 days per week, 52 weeks per year = 624,000 gallons per year at a cost of $6,240.00 per year
    - Total cost - $12,992.50 per year

For reference, below are estimated costs for the typical watering system currently used at most construction sites, landfills, and bulk material handling facilities:

  - Water Spray systems for a stockpile
    - Similar to golf course sprinkler systems[7]
    - $15,000 for 150 feet of piping, 4 sprinklers, and controller
    - $10,000 for installation and infrastructure
    - Amortized costs - $3,750 per year
    - Water use ~ 10,000 gallons per day – 5 days per week, 52 weeks per year = 2,600,000 gallons per year at a cost of $26,000.00
    - Total cost - $29,7250 per year
  - Firehose for watering specific locations
    - 1 ½" firehose - ~40 gpm[8]
    - Cost of firehose and nozzle - $300
    - Worker to direct the firehose - $25/hour, 2 hours per day, 5 days per week, 52 weeks per year = $13,000

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[6] http://www.discountsteel.com/items/Galvanized_Steel_Pipe.cfm?item_id=172&size_no=11

[7] http://store.rainbird.com/sprinklers.html?impact_inlet=166

[8] http://www.elkhartbrass.com/files/aa/downloads/catalog/catalog-f6-T.pdf

        - Water use ~ 40 gallons per minute – use 2 hours per day, 5 days per week, 52 weeks per year = 1,248,000 gallons per year at a cost of $12,480 per year
        - Total costs - $25,480 per year
    - Water truck for roads and can be used to water stockpiles:
        - Truck - $150,000 amortized to $22,500 per year
        - Truck operator and fuel - $75,000 per year
        - Water – 5,000-gallon truck, 2 deliveries per day to keep roadways stabilized – use 5 days per week, 52 weeks per year = 2,600,000 gallons per year at a cost of $26,000 per year
        - Total costs - $123,500 per year
- Dust Suppressants
    - Costs for surfactants are much higher than water.
    - However, surfactants are assumed competitive with water when the stockpile or disturbed area will be left stabilized for an extended period.

G. Summary of Costs for Controls

This draft new rule will affect 72 facilities, with 134 sources with PM emissions currently estimated to exceed 6 lbs. per day of TSP. Eighteen of these facilities already have water spray abatement in place, so staff assumes each facility will make minor improvements to the existing systems and meet the requirements of this draft new rule. Fifty four of these facilities, with 90 sources may require controls. The sources have a wide range of scale for processing and handling bulk materials. The scope of the controls is directly set by the specific bulk handling operation involved, and the size of the bulk material handling facilities.

This new draft rule may affect another 72 facilities with 123 sources with PM emissions currently estimated to range from 2 – 6 lbs. per day of TSP. However, staff estimates PM emissions less than 6 lbs. per day will not exceed the draft opacity limit.

Appendix 1 is a Table 1-1 that describes each of the 90 sources that will potentially require controls. Emission reduction estimates assume half of these will find ways to meet the opacity limit and other requirements of the rule without having to install significant controls. Staff assumes that only half of the controls shown in Table 5-1 will actually be installed.

Total estimated costs to control 45 sources is $866,000 capital, and $206,000 annual costs. Expected emission reductions are 746.6 lbs per day of PM_{10} (136.3 tons per year).

<u>Cost Effectiveness:</u>
Average cost effectiveness is $1,514 per ton of PM_{10} reduced. 6 lbs. per day of PM_{10}, or 136.3 tons per year. Average cost effectiveness is $206,000 / 136.3 = $1,514 per ton. The poorest cost effectiveness is found for two controls: $13,968 per ton for a water fog system at a quarry operation, and $10,303 per ton for a stockpile windscreen at a second quarry operation. These cost effectiveness levels are within normal acceptable ranges for particulate emission reductions.

<u>Water Use</u>
Five water fog systems are recommended in the table above. Each of these water fog systems is anticipated to use 624,000 gallons per year, totaling 3,120,000 gallons of incremental water use. Thirty-four water mist systems are recommended in the table above. Each of these water mist systems is anticipated to use 312,000 gallons per year, totaling 10,608,000 gallons of incremental

water use. Total incremental water use for the proposed wind screens, and judicious use of water is 13,728,000 gallons per year. Staff assumes all five of these water fog systems are installed to meet the requirements of Rule 6-8.

The CEQA threshold for housing development water use is based on water use needed for 500 dwelling units. Water use is estimated for 225 – 400 gallons per day for each dwelling unit, so the threshold ranges from 41,000,000 – 74,000,000 gallons of water. The proposed particulate controls will use 33% of the CEQA threshold for incremental water use. If twice as many bulk material handling facilities opt to use water rather than wind screens, water use would be no more than 66% of the CEQA water consumption threshold

Typical urban water use is 8 million acre-feet of water per year = equaling 2.6 trillion gallons per year. 13.728 million gallons of proposed water use equals 5.3 millionths of the typical water supply. The threshold of 41 million gallons of water equals about 16 millionths of the typical water supply.

VII. RULE DEVELOPMENT AND PUBLIC CONSULTATION PROCESS

A. Rule Development Process

The rule development process for proposed new Rule 6-8 began with the Air District's 2010 Clean Air Plan, which addressed PM and PM's significant health impacts (among other air quality concerns). The 2010 Clean Air Plan included Stationary Source Measure SSM 6, which committed the Air District to strengthening its general PM emissions limits in Regulation 6-1-310 and 6-1-311. The Air District is proposing revisions to those regulations to fulfill this commitment as provided in the draft amendments to Rule 6-1 that are being circulated concurrently with this proposal.

Since the 2010 Clean Air Plan, Air District staff further committed to taking steps to address the Bay Area's particulate matter challenges in a November 2012 report entitled *Understanding Particulate Matter: Protecting Public Health in the San Francisco Bay Area*. As Air District staff began reviewing large PM emissions source categories for areas with the potential for significant reductions, members of the public began raising complaints about coke dust. Staff investigated coke and coal handling operations in light of these concerns and found that there are cost-effective controls that can reduce fugitive dust emissions from these operations. During the study of coke and coal operations, it became clear that similar particulate reductions were likely with all bulk material handling operations, so the scope of this rule was expanded to all bulk material handling.

B. Public Outreach and Consultation

In developing the proposals for draft new Rule 6-8, staff consulted with the following interested and affected parties:

Businesses	**Governmental Agencies**
Morton Salt - Newark	CALTRANS District 4 - Oakland
Cargill – Newark	Bay Area Regional Water Quality Board - Oakland

Criterion Catalysts - Pittsburg	North Coast Regional Water Quality Board – Santa Rosa
CertainTeed Gypsum – Napa	Bay Area Rapid Transit – Richmond Maintenance Yard
Maxwell House – San Leandro	Alameda County
C & H Sugar – Crockett	Contra Costa County
Con Agra – Oakland	Marin County
CEMEX – Oakland	Napa County
CEMEX – Clayton	Santa Clara County
Strategic Materials – San Leandro	San Francisco City & County
Dutra Materials – San Rafael	San Mateo County
Superior Supplies – Santa Rosa	Solano County
Granite Rock – Redwood City	Sonoma County
Hanson Aggregates – Clayton	City of Hayward
Bodean / Mark West Quarry – Santa Rosa	City of Napa
PABCO Gypsum – Redwood City	City of Oakland
Georgia Pacific Gypsum - Antioch	City of San Jose
Syar - Napa	City of San Rafael
Syar – Santa Rosa	City of Santa Rosa
Syar - Vallejo	
Soiland Quarry - Cotati	
Langley Hill Quarry - Woodside	
Granite Construction – Santa Clara	
Granite Construction – San Jose	
Willowbrook Feeds – Petaluma	
Hunt & Behrens – Petaluma	
Owens-Corning – Santa Clara	
Owens-Brockway - Oakland	
Waste Management – San Leandro	
Zanker Road Material Processing – San Jose	**Industry Associations**
Waste Management - Altamont	Association of Building Contractors
Redwood Landfill	Associated Roofing Contractors of the Bay Area Counties
Guadalupe Landfill	California Asphalt Pavement Association
Ox Mountain Landfill – Half Moon Bay	Construction Industry Air Quality Coalition
Clover Flat / Upper Valley Resources	Northern California Engineering Contractors
Potrero Hills Landfill	
Stavin	
McGuire & Hester Construction - Oakland	
Ghilotti Bros. Construction – San Rafael	
Universal Building Services - Richmond	
Statewide Sweeping – Milpitas	
Levin Richmond Terminal	
Lehigh Cement	
Phillips 66 Coker	
Phillips 66 Coke Calciner	

Shell Coker	
Tesoro Coker	
Valero Fluid Coker	
APS West	
Carbon Inc.	

Public Workshops are the next step in the rulemaking process. Air District staff will review the draft new Rule 6-8 with affected parties to solicit input and identify any potential issues and concerns. The Air District will use the public's input, along with further investigation and analysis by staff to develop the final new Rule 6-8, and present them to the Air District's Board of Directors for approval.

C. CEQA Analysis of Potential Environmental Impacts

The Air District contracts with an independent consultant to conduct a California Environmental Quality Act (CEQA) analysis of potential environmental impacts from any rule making projects. Since review of the entire inventory of possible PM emission reductions is resulting in the proposal for draft amendments to Rule 6-1, draft new Regulation 6, draft new Rule 6-8, and proposals for two new additional PM rules, the CEQA analysis will be conducted for the entire suite of proposed draft amendments and new rules. The consultant will make an initial assessment of any environmental impacts based on the draft amendments to Rule 6-1, draft new Rule 6-8, the two additional draft new rules, and the accompanying workshop reports. Potential water use will be a significant area of focus when analyzing the environmental impacts of this draft new rule.

After staff receives additional input during the workshop process, a final proposal and staff report will be used to finalize the CEQA analysis. The CEQA analysis will be included in the final proposal, posted for public review and comment at least 30 days before the Public Hearing. At the Public Hearing, the Air District Board of Directors will consider the final proposal, and public input before taking any action on the draft new Rule 6-8.

D. Socio-Economic Analysis of Potential Economic and Job Impacts

The Air District contracts with an independent consultant to conduct a Socio-Economic Analysis of potential economic impacts from the draft new Rule 6-8. The consultant will make an initial assessment of any economic impacts based on the draft new Rule 6-8, and this workshop report.

After staff receives additional input during the workshop process, a final draft proposal and staff report will be used to finalize the Socio-Economic Analysis. The Socio-Economic Analysis will be included in the final proposal, posted for public review and comment at least 30 days before the Public Hearing. At the Public Hearing, the Air District Board of Directors will consider the final proposal, and public input before taking any action on the draft new Rule 6-8.

VIII. REFERENCES

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111. BAAQMD Regulation 6, Rule 2: Commercial Cooking Equipment
112. BAAQMD Regulation 6, Rule 3: Wood Burning Devices
113. BAAQMD Regulation 12, Rule 4: Sandblasting
114. BAAQMD Board Resolution 1390
115. BAAQMD Advisory Council, Ultrafine Particles: Ambient Monitoring and Field Studies presentation, 2/8/2012
116. BAAQMD Advisory Council, Ultrafine Particles: Ambient Monitoring and Field Studies presentation, Philip M. Fine, SCAQMD, 2/8/2012
117. BAAQMD Advisory Council, Concentrations of Ultrafine Particles and Related Air Pollutants on and Near Roadways and Other Urban Microenvironments presentation, Eric Fujita, Desert Research Institute, Reno, NV, 2/8/2012
118. EPA Stationary Source Control Techniques Document for Fine Particulate Matter, October 1998
119. EPA Test Methods 5, 5B, 5F, 9, 17, 22
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121. EPA AP42, Fifth Edition, Volume 1, Chapter 13: Miscellaneous Sources, 13.2
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125. South Coast Air Quality Management District, Rules 401, 403, 403-1, 404, 405, 444, 445, 1105-1, 1112-1, 1133-1, 1137, 1155, 1156, 1157, 1158, 1186, 1186-1
126. San Joaquin Valley Air Pollution Control District, Rules 4101, 4103, 4106, 4201, 4202, 4203, 4303, 4901, 8011, 8021, 8031, 8041, 8051, 8061, 8071, 8081
127. San Joaquin Valley Air Pollution Control District, Draft Staff Report, BACM Amendments to Regulation VIII (Fugitive PM_{10} Prohibitions), 9/27/2001
128. San Joaquin Valley Air Pollution Control District, Draft Staff Report – Appendix C, Cost Effectiveness Analysis of Regulation VIII (Fugitive PM_{10} Prohibitions), 9/27/2001
129. Sacramento Air Quality Management District, Rules 401, 403, 404, 405, 406, 407, 409, 417, 421
130. Maricopa County, Arizona Regulation III, Rule 310: Fugitive Dust from Dust-Generating Operations
131. Maricopa County, Arizona Quick Reference Dust Control Guide
132. Northeast States for Coordinated Air Use Management, Assessment of Control Technology Options for BART-Eligible Sources, March, 2005
133. California Water Resources Control Board, Construction Storm Water Program, http://www.waterboards.ca.gov/water_issues/programs/stormwater/construction.shtml
134. 2009-0009-DWQ Construction general permit *(effective July 1, 2010)*
135. California Stormwater Quality Association, Stormwater Best Management Practice Handbook Portal: Construction

IX. APPENDIX

Appendix E-1
Table E-1.1: Estimated Cost of Bulk Material Handling Facilities controls

Facility	Source	Material	PM_{10} Emissions lb per day	Recommended Controls	$ Capital	$ Annualized	Potential PM_{10} Reductions lb per day
Granite Rock	MINERL> Storage, contained, Rock	Stone	11.77311	Wind screen or shroud for storage PLUS Water mist system	$1,800 $21,000	$270 $6,270	8.2
United States Pipe & Foundry	MTGL/SEC> Storage, Slag, 5 days/wk	Slag	9.665754	Wind screen for stock pile	$7,000	$1,050	6.3
Berkeley Asphalt	MINERL> Storage, contained, Gravel/sand	Sand/gravel	7.169912	Wind screen or shroud for storage	$1,800	$270	5.0
Syar Industries, Inc	MINERL> Screening, Gravel/sand	Sand/gravel	6.484362	Wind screen for screener	$3,600	$540	4.5
Syar Industries, Inc	MINERL> Screening, Gravel/sand	Sand/gravel	6.484362	Wind screen for screener	$3,600	$540	4.5
Syar Industries, Inc	MINERL> Screening, Gravel/sand	Sand/gravel	12.96872	Wind screen for screener PLUS Water mist system	$5,400 $21,000	$810 $6,270	9.1
Syar Industries, Inc	MINERL> Screening, Gravel/sand	Sand/gravel	13.15579	Wind screen for screener PLUS Water mist system	$5,400 $21,000	$810 $6,270	9.2
PABCO Gypsum	MINERL> Grinding, Gypsum, 8 tons/hr max	Gypsum	35.47945	Wind screen for grinder PLUS Water mist system	$1,800 $21,000	$270 $6,270	24.8

ConAgra, Inc	FOOD/AG> Shipping & receiving	Wheat - grain	8.569397	Wind screen or shroud for loading/unloading	$3,600	$540	6.0
Granite Rock	MINERL> Storage, contained, Rock	Stone	6.093049	Wind screen or shroud for storage	$3,600	$540	4.3
CEMEX Construction Materials	MINERL> Screening, Rock, 340 tons/hr max	Stone	13.83834	Wind screen for screener PLUS Water mist system	$3,600 $21,000	$540 $6,270	9.7
CEMEX Construction Materials	MINERL> Mining/quarry, stockpiling	Stone	9.557514	Wind screen for stock pile	$84,000	$12,600	6.7
CEMEX Construction Materials	MINERL> Mining/quarry, Rock	Stone	63.44099	Water fog system	$30,000	$13,000	44.4
Hanson Aggregates	MINERL> Storage, open, Rock	Stone	17.75472	Wind screen for stock pile	$84,000	$12,600	12.4
Levin Richmond Terminal	MISC-HDLG> Material handling	Other Materials - other/not spec	6.871506	Wind screen and shroud for handling	$3,000	$450	4.8
Levin Richmond Terminal	MISC-HDLG> Material handling	Other Materials - other/not spec	9.54767	Wind screen and shroud for handling	$3,000	$450	6.7
Levin Richmond Terminal	MINERL> Storage, open, Multi-material	Coke	7.570336	Wind screen for stock pile	$28,000	$4,200	5.3
Levin Richmond Terminal	MISC-HDLG> Material handling	Iron ore	54.36137	Wind screen and shroud for handling PLUS Water mist system	$6,000 $21,000	$900 $6,270	38.1
Levin Richmond Terminal	MISC-HDLG> Material handling	Iron ore	57.9789	Wind screen and shroud for handling PLUS Water mist system	$6,000 $21,000	$900 $6,270	40.6
Levin Richmond Terminal	MINERL> Storage, open, Multi-material	Iron ore	17.39367	Wind screen for stock pile	$28,000	$4,200	12.2
Levin Richmond Terminal	MISC-HDLG> Material handling	Iron ore	60.80411	Wind screen and shroud for handling	$6,000	$900	42.6

Levin Richmond Terminal	MISC-HDLG> Material handling	Coke	10.44925	Wind screen and shroud for handling	$6,000	$900	7.3
Levin Richmond Terminal	MISC-HDLG> Material handling	Coke	10.44925	Wind screen and shroud for handling	$6,000	$900	7.3
Brenntag Pacific	MISC-HDLG> Storage, Potash, 5 days/wk	Potash	9.315069	Wind screen for stock pile	$7,000	$1,050	6.5
Right Away Redy Mix	MINERL> Conveying, Gravel/sand	Sand/gravel	45.55035	Wind screen for conveying and transfer points PLUS Water mist system	$12,000 $21,000	$1,800 $6,270	31.9
Redwood Landfill	MISC-HDLG> Grinding, 80 tons/hr max	Wood - other/not spec	54.79452	Wind screen for grinder PLUS Water mist system	$3,600 $21,000	$540 $6,270	38.4
Superior Supplies	MINERL> Storage, contained, Concrete	Concrete	30.45745	Wind screen or shroud for storage PLUS Water mist system	$1,800 $21,000	$270 $6,270	21.3
Superior Supplies	MINERL> Storage, contained, Concrete	Concrete	30.45745	Wind screen or shroud for storage PLUS Water mist system	$1,800 $21,000	$270 $6,270	21.3
Soiland Co	MINERL> Mining/quarry, stockpiling	Stone	13.39811	Wind screen for stock pile	$28,000	$4,200	9.4
Hunt And Behrens	FOOD/AG> Conveying/transferring	Grains - feed	11.17808	Wind screen for conveying and transfer points	$6,000	$900	7.8
Hunt And Behrens	FOOD/AG> Conveying/transferring	Grains - feed	19.89041	Wind screen for conveying and transfer points PLUS Water mist system	$6,000 $21,000	$900 $6,270	13.9
Hunt And Behrens	FOOD/AG> Conveying/transferring	Grains - feed	21.46849	Wind screen for conveying and transfer points	$6,000	$900	15.0

				PLUS Water mist system	$21,000	$6,270	
Hunt And Behrens	FOOD/AG> Conveying/transferring	Grains - feed	24.49315	Wind screen for conveying and transfer points PLUS Water mist system	$6,000 $21,000	$900 $6,270	17.1
Central Concrete Supply	MINERL> Loading/unloading, Concrete	Concrete	31.55614	Portable shroud and chute for loading/unloading	$15,000	$2,250	22.1
Central Concrete Supply	MINERL> Storage, contained, Gravel/sand	Sand/gravel	25.45191	Wind screen or shroud for storage PLUS Water mist system	$3,600 $21,000	$540 $6,270	17.8
Central Concrete Supply	MINERL> Conveying, Gravel/sand	Sand/gravel	17.5531	Wind screen for conveying and transfer points PLUS Water mist system	$12,000 $21,000	$1,800 $6,270	12.3
Marin Sanitary Service	MISC-HDLG> Material handling	Waste material - other/not spec	26.59671	Wind screen and shroud for handling PLUS Water mist system	$3,000 $21,000	$450 $6,270	18.6
Syar Industries Inc	MINERL> Conveying, Rock, 160 tons/hr max	Stone	21.14268	Wind screen for conveying and transfer points PLUS Water mist system	$6,000 $21,000	$900 $6,270	14.8
Syar Industries Inc	MINERL> Loading, feed/surge/weigh bins	Sand/gravel	96.86276	Wind screen and shroud for loading PLUS Water mist system	$6,000 $21,000	$900 $6,270	67.8
Syar Industries Inc	MINERL> Screening, Gravel/sand	Sand/gravel	7.887342	Wind screen for screener	$1,800	$270	5.5

Syar Industries Inc	MINERL> Screening, Gravel/sand	Sand/gravel	15.77447	Wind screen for screener PLUS Water mist system	$1,800 $21,000	$270 $6,270	11.0
Syar Industries Inc	MINERL> Screening, Gravel/sand	Sand/gravel	28.68077	Wind screen for screener PLUS Water mist system	$3,600 $21,000	$540 $6,270	20.1
City of Berkeley, Dept of Public Works	Misc MINERL, 560 tons/hr max, 7 days/wk	Waste material - other/not spec	35.25658	Water fog system	$30,000	$13,000	24.7
Sugar City Building Materials	Misc MINERL, Gravel/sand	Sand/gravel	6.377373	Wind screen and shroud for handling	$3,000	$450	4.5
CEMEX Construction Materials	MINERL> Storage, contained, Gravel/sand	Sand/gravel	33.8926	Wind screen or shroud for storage PLUS Water mist system	$1,800 $21,000	$270 $6,270	23.7
CEMEX Construction Materials	MINERL> Concrete batching, Concrete	Concrete	158.6552	Wind screen and shroud for handling PLUS Water mist system	$6,000 $21,000	$900 $6,270	111.1
Davis Street SMART	MISC-HDLG> Material handling	Waste material - other/not spec	62.9135	Wind screen and shroud for handling PLUS Water mist system	$6,000 $21,000	$900 $6,270	44.0
CEMEX Construction Materials	MTGL/SEC> Storage, Cement, 5 days/wk	Cement	6.778575	Wind screen and shroud for handling	$3,000	$450	4.7
Langley Hill Quarry	MINERL> Mining/quarry, stockpiling	Stone	28.29265	Wind screen for stock pile	$7,000	$1,050	19.8
Langley Hill Quarry	Misc MINERL, Rock, 200 tons/hr max	Stone	83.2146	Water fog system	$30,000	$13,000	58.2
CEMEX Construction Materials	MINERL> Storage, contained, Gravel/sand	Sand/gravel	29.95704	Wind screen or shroud for storage PLUS	$3,600	$540	21.0

				Water mist system	$21,000	$6,270	
CEMEX Construction Materials	Truck Loadout	Sand/gravel	8.641832	Portable shroud and chute for loading/unloading	$15,000	$2,250	6.0
Oldcastle Precast (Pleasanton)	MINERL> Conveying, Cement	Cement	11.12663	Wind screen for conveying and transfer points	$6,000	$900	7.8
CEMEX Construction Materials	MINERL> Conveying, Gravel/sand	Sand/gravel	7.977463	Wind screen for conveying and transfer points	$6,000	$900	5.6
Hydro Conduit Corporation	Misc MINERL, Gravel/sand, 20 tons/hr max	Sand/gravel	6.575342	Wind screen and shroud for handling	$3,000	$450	4.6
Associated Concrete Co	MINERL> Storage, contained, 35 min/batch	Cement - dry process mfg	29.677	Wind screen or shroud for storage PLUS Water mist system	$1,800 $21,000	$270 $6,270	20.8
Sonoma Compost	MISC-HDLG> Material handling	Fertilizer - other/not spec	12.49315	Wind screen and shroud for handling	$3,000	$450	8.7
Mission Trail Waste Systems	MISC-HDLG> Material handling	Waste material - other/not spec	7.296683	Wind screen and shroud for handling	$3,000	$450	5.1
Vulcan Materials/Calmat Company	MINERL> Storage, contained, Gravel/sand	Sand/gravel	36.8126	Wind screen or shroud for storage PLUS Water mist system	$9,000 $21,000	$1,350 $6,270	25.8
Vulcan Materials/Calmat Company	MINERL> Screening, Rock, 407 tons/hr max	Stone	8.209816	Wind screen for screener	$9,000	$1,350	5.7
RC Ready Mix Co	MINERL> Storage, contained, Cement	Cement	9.145048	Wind screen or shroud for storage	$1,800	$270	6.4
Concrete ReadyMix, Inc	MINERL> Conveying, Concrete	Concrete	11.30652	Wind screen for conveying and transfer points	$6,000	$900	7.9
Willowbrook Feeds	FOOD/AG> Storage, Feed grains, 5 days/wk	Grains - feed	9.169085	Wind screen or shroud for storage	$1,800	$270	6.4

Willowbrook Feeds	FOOD/AG> Conveying/transferring	Grains - feed	9.828615	Wind screen for conveying and transfer points	$6,000	$900	6.9
Willowbrook Feeds	FOOD/AG> Shipping & receiving	Grains - feed	23.69022	Portable shroud and chute for loading/unloading	$15,000	$2,250	16.8
Allied Waste Services of North	MISC-HDLG> Material handling	Waste material - other/not spec	9.453911	Wind screen and shroud for handling	$3,000	$450	6.6
Right Away Redy Mix	MINERL> Storage, contained, Cement	Cement	27.94521	Wind screen or shroud for storage PLUS Water mist system	$1,800 $21,000	$270 $6,270	19.6
Feed Sources, Inc	FOOD/AG> Pressing, Barley, feed	Barley - feed	6.408219	Wind screen for presser	$1,800	$270	4.5
Soiland Co , Inc	MINERL> Mining/quarry, crushing, Rock	Stone	13.54477	Water fog system, wind screen for crusher	$21,800	$8,940	9.5
Quikrete Northern California	MINERL> Loading, feed/surge/weigh bins	Sand/gravel	6.575342	Portable shroud and chute for loading/unloading	$15,000	$2,250	4.6
Quikrete Northern California	MINERL> Loading, feed/surge/weigh bins	Sand/gravel	24.65754	Portable shroud and chute for loading/unloading	$30,000	$4,500	17.3
San Jose Concrete Pipe Co Inc	MINERL> Concrete batching, Gravel/sand	Sand/gravel	6.312876	Wind screen and shroud for handling	$3,000	$450	4.4
CEMEX Construction Materials	MINERL> Conveying, Limestone	Sand/gravel	8.704453	Wind screen for conveying and transfer points	$6,000	$900	6.1
Shell Chemical LP	MISC-HDLG> Material handling	Heterogene ous catalyst	12.66849	Wind screen and shroud for handling	$3,000	$450	8.9
Tyco Electronics Corporation	MISC-HDLG> Mixing, 4.5 min/batch	Other Materials - other/not spec	35.44102	Wind screen for mixer PLUS Water mist system	$1,800 $21,000	$270 $6,270	24.8
Central Concrete Supply , Inc	MINERL> Conveying, Gravel/sand	Sand/gravel	21.82696	Wind screen for conveying and transfer points PLUS	$6,000 $21,000	$900 $6,270	15.3

				Water mist system			
BoDean Company	MINERL> Mining/quarry, stockpiling	Sand/gravel	27.33953	Wind screen for stock pile	$84,000	$12,600	19.1
Tesoro Refining & Marketing Co	MISC-HDLG> Material handling, Coke	Coke	58.21511	Wind screen and shroud for handling PLUS Water mist system	$9,000 $21,000	$1,350 $6,270	40.8
Napa Recycling & Waste Service	MISC-HDLG> Material handling	Waste material - other/not spec	22.66216	Wind screen and shroud for handling PLUS Water mist system	$3,000 $21,000	$450 $6,270	15.9
Recall North America	MISC-HDLG> Material handling, Paper	Paper	34.247	Wind screen and shroud for handling PLUS Water mist system	$3,000 $21,000	$450 $6,270	24.0
CEMEX Pacific Holdings, LLC	MINERL> Loading, feed/surge/weigh bins	Sand/gravel	30.28986	Wind screen for loading bins	$3,600	$540	21.2
CEMEX	Wet Plant Aggregate bin system: 10 bins	Sand/gravel	9.180685	Wind screen for bins	$3,600	$540	6.4
South Bay Recycling, LLC (SBR)	Solid Waste Transfer Station	Waste material - other/not spec	68.13991	Water fog system	$30,000	$13,000	47.7
G3 Minerals, Byron Plant	Coarse Waste Sand Stockpile	Sand/gravel	10.88544	Wind screen for stock pile	$7,000	$1,050	7.6
G3 Minerals, Byron Plant	No. 1 Dryer Feed Bin	Sand/gravel	17.09769	Wind screen for dryer	$3,600	$540	12.0
G3 Minerals, Byron Plant	No. 2 Dryer Feed Bin	Sand/gravel	17.09769	Wind screen for dryer	$3,600	$540	12.0
G3 Minerals, Byron Plant	Quarry Operation	Sand/gravel	7.311354	Water fog system	$30,000	$13,000	5.1
Phillips 66 Carbon Plant	Portable Conveyor	Coke	7.424832	Wind screen for conveying and transfer points	$6,000	$900	5.2

Phillips 66 Carbon Plant	Portable Conveyor	Coke	9.600767	Wind screen for conveying and transfer points	$6,000	$900	6.7
Phillips 66 Carbon Plant	Stockpile Fugitive Emissions; Including All Transfers	Coke	13.00317	Wind screen for stock pile	$84,000	$12,600	9.1
				Totals	$1,722,600	$412,640	1,493.2 #/day

Staff expects only half of these potential control measures to be implemented, and expects to accrue only half of the emission reductions, based on some facilities and sources may be able to achieve the opacity limit currently, or through other minor improvements to their existing operation.

Expected capital investment for control measure to be ~$866,000 capital, with resulting annual operating expenses of $206,000. Emission reductions are estimated to be 746.6 lbs. per day of PM_{10}, or 136.3 tons per year. Average cost effectiveness is $206,000 / 136.3 = $1,514 per ton. The poorest cost effectiveness is found for two controls: $13,968 per ton for a water fog system at a quarry operation, and $10,303 per ton for a stockpile windscreen at a second quarry operation. These cost effectiveness levels are within normal acceptable ranges for particulate emission reductions.

Water Use

Five water fog systems are recommended in the table above. Each of these water fog systems is anticipated to use 624,000 gallons per year, totaling 3,120,000 gallons of incremental water use. Staff assumes all five will be installed.

Thirty four water mist systems are recommended in the table above. Each of these water mist systems is anticipated to use 312,000 gallons per year, totaling 10,608,000 gallons of incremental water use. Staff assumes all 34 will be installed.

Total incremental water use for the proposed wind screens, and judicious use of water is 13,728,000 gallons per year.

The CEQA threshold for housing development water use is based on water use needed for 500 dwelling units. Water use is estimated for 225 – 400 gallons per day for each dwelling unit, so the threshold ranges from 41,000,000 – 74,000,000 gallons of water.

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Typical urban water use is 8 million acre-feet of water per year = equaling 2.6 trillion gallons per year. 13.728 millions gallons of proposed water use equals 5.3 millionths of the typical water supply. The threshold of 41 million gallons of water equals about 16 millionths of the typical water supply.