AIR POLLUTION CONTROL DISTRICT

IMPERIAL COUNTY 2018 REDESIGNATION REQUEST AND MAINTENANCE PLAN FOR PARTICULATE MATTER LESS THAN 10 MICRONS IN DIAMETER

Adopted October 23, 2018

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2018 IMPERIAL COUNTY
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Abbreviations and Acronyms

AVTD	Average Vehicle Trips per Day
BACM	Best Available Control Measure
BACT	Best Available Control Technology
CAA	Federal Clean Air Act
CARB	California Air Resources Board
CEPAM	California Emissions Projection Analysis Model
CMP	Conservation Management Practice (agriculture)
DM	*de minimis*
ICAPCD	Imperial County Air Pollution Control District
ICPWD	Imperial County Public Works Department
IID	Imperial Irrigation District
NAA	nonattainment area
NAAQS	National Ambient Air Quality Standards
NEAP	Natural Events Action Plan
PM	particulate matter
PM_{10}	particulate matter less than 10 microns in aerodynamic diameter
$PM_{2.5}$	particulate matter less than 2.5 microns in aerodynamic diameter
RACM	Reasonably Available Control Measure
RFP	Reasonable Future Progress
RTP	Regional Transportation Plan
SCAG	Southern California Association of Governments
SCS	Sustainable Communities Strategy
SIP	State Implementation Plan
SSI	Size Selective Inlet
TPA	Regional Transportation Planning Agency
tpd	tons per day
USEPA	United States Environmental Protection Agency
VDT	Vehicle Daily Trips
VDE	Visible Dust Emissions
WESTAR	Western States Air Resources Council
WRAP	Western Regional Air Partnership
$\mu g/m^3$	microgram per cubic meter
μm	micron or micrometer

1 Introduction

On behalf of the Imperial County Air Pollution Control District (ICAPCD or "District"), this document brings together the data and discussion necessary to revise the previous State Implementation Plan submittal ("Plan" or "SIP submittal") for particulate matter less than 10 microns in aerodynamic diameter (PM_{10}) and requests redesignation of the Imperial Valley Planning Area as attainment. Particulate matter less than 2.5 microns in aerodynamic diameter ($PM_{2.5}$), which is a size subset of PM_{10}, has its own federal standards and separate SIPs will address $PM_{2.5}$ Clean Air Act (CAA) requirements. This Plan includes all required elements in CAA Section 107(d)(3)(E) for a redesignation request and maintenance plan needed by the United States Environmental Protection Agency (USEPA) to approve a redesignation. This chapter provides an overview of particulate matter as an air pollutant, a brief description of the Imperial County area, and a discussion of the purpose and regulatory background associated with this document.

1.1 Purpose

The Imperial Valley Planning Area is currently designated as a Serious nonattainment area for the 24-hour PM_{10} National Ambient Air Quality Standard (NAAQS). Under the CAA, an area can be redesignated as attainment if, among other requirements, the USEPA determines that the NAAQS has been attained. The 24-hour PM_{10} NAAQS allows for one exceedance of the 24-hour average PM_{10} standard (150[1] micrograms per cubic meter [$\mu g/m^3$]) per year averaged over a three consecutive calendar year period, excluding exceptional events, measured at each monitoring site within an area based on quality-assured air quality monitoring data.

A review of the quality-assured PM_{10} monitoring data from 2014 through 2016 shows that, when excluding exceptional events, the Imperial Valley Planning Area did not violate the federal 24-hour PM_{10} standard. During this period, elevated PM_{10} events associated with high wind driven dust storms were flagged and documented in accordance with the USEPA's Exceptional Events regulation (40 CFR § 50.14).[2] Upon concurrence from the USEPA, these events will be excluded from NAAQS determination and a clean data finding will be sought. A clean data finding does not constitute a redesignation to attainment under the CAA. Accordingly, the purpose of this document is to request redesignation of the Imperial Valley Planning Area as attainment for PM_{10} and to submit the requisite maintenance plan and other required actions to qualify for such redesignation by the USEPA.

1.2 Particulate Matter Air Pollution

Particulate matter (PM) is a general term used to describe a complex group of airborne solid, liquid, or semi-volatile materials of various size and composition. Primary PM is emitted directly into the atmosphere from both human activities (including agricultural operations, industrial processes, construction and demolition activities, and entrainment of road dust into the air) and non-anthropogenic activities (such as windblown dust and ash resulting from forest fires). Secondary PM is formed in the atmosphere from predominantly gaseous combustion by-product

1 Per USEPA data handling procedures, an exceedance is a measurement over 154.9 $\mu g/m^3$, since a reading of 154.9 $\mu g/m^3$ would round down to 150 $\mu g/m^3$.

2 Treatment of air quality monitoring data influenced by exceptional events, 40 CFR § 50.14

precursors, such as sulfur and nitrogen oxides (SO_X and NO_X), and volatile organic compounds (VOCs). The relative proportion of primary and secondary PM in a given geographic area can vary widely depending upon such factors as the mix of sources in the area, the mix of PM precursors, and meteorology. In addition, PM and its precursors can be transported hundreds or thousands of miles while suspended in the atmosphere.[3] Consequently, ambient PM in an area may be the combination of primary and secondary particles that result from the emissions of local and remote sources.

Federal and state regulators have established both PM_{10} and $PM_{2.5}$ as separate criteria pollutants based, in part, on how the human body reacts to the different sized particulate and the composition of the different size fractions. Figure 1-1 shows the relative sizes of PM_{10} and $PM_{2.5}$, as well as how far they travel into the human body.

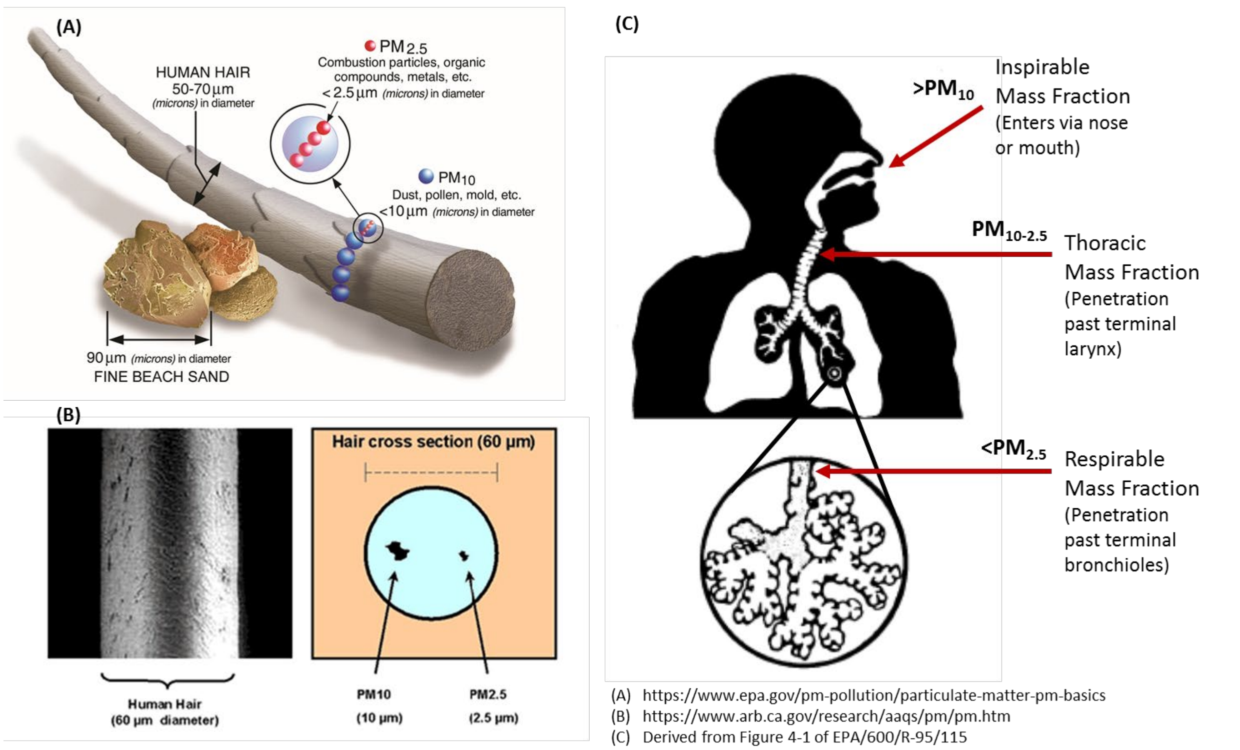
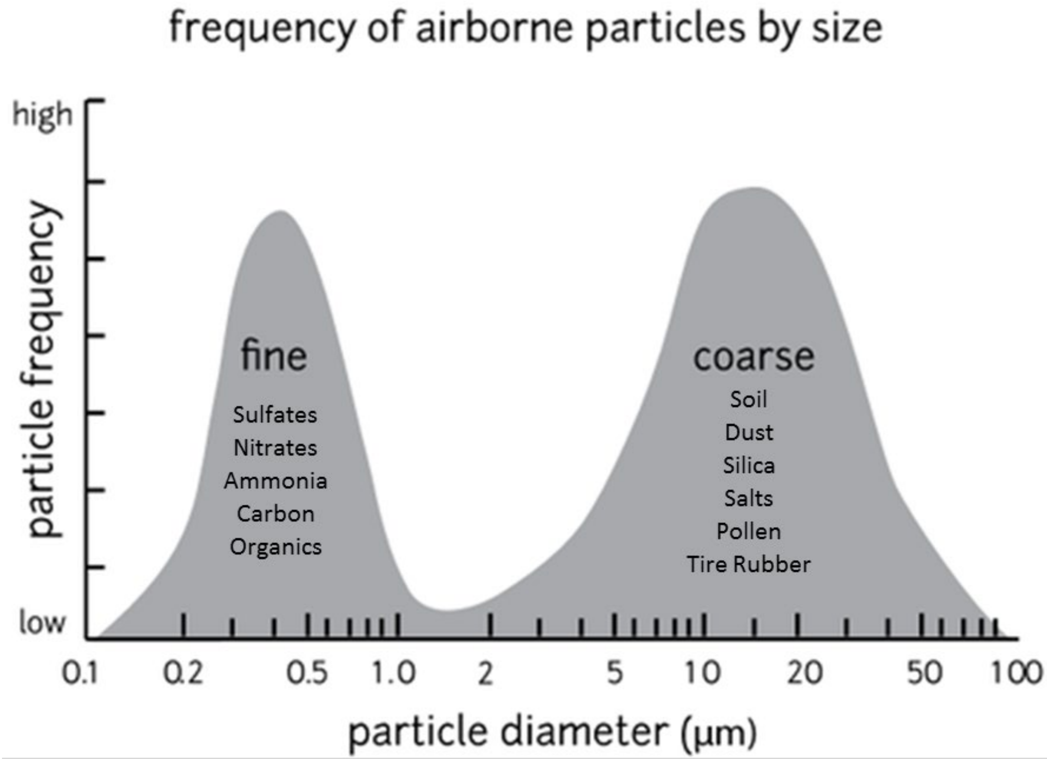


Figure 1-1. $PM_{2.5}$ and PM_{10} Relative Sizes and Health Impact Pathways

PM_{10} and $PM_{2.5}$ are based on the size of the particulates; however, they also have different components. Although PM_{10} includes all "fine" $PM_{2.5}$-sized particulates, it also includes "coarse" primary particulates such as dust generated from activities (e.g., construction, mining, etc.) and entrained from soil surfaces by the wind. Figure 1-2 is a general schematic of the components in

[3] National Research Council. 2010. *Global Sources of Local Pollution: An Assessment of Long-Range Transport of Key Air Pollutants to and from the United States*. Washington, DC: The National Academies Press. Available at: https://doi.org/10.17226/12743. Accessed: June 2018.

fine and coarse PM; the relative contribution depends on how the different sources are represented in a given area.



Derived from https://publiclab.org/wiki/revisions/pm/25078

Figure 1-2. Properties and Sources of $PM_{2.5}$ and PM_{10}

Ammonium nitrate and ammonium sulfate are formed by NO_X and SO_X (generally from combustion) and ammonia (from fertilizers, manures, wastewater treatment, etc.). Combustion also produces primary (or elemental) carbon and many organic aerosols. Note that the relative contribution of fine and coarse material is dependent on the location, sources, and meteorology.

For PM_{10}, the overwhelming majority of airborne PM in the Imperial Valley Planning Area is primary PM. The major source of primary PM is fugitive windblown dust, with other contributions from entrained road dust, farming, and construction activities. During the 2014 through 2016 monitoring period, all elevated PM_{10} events were directly tied to high wind driven dust storms in which precursor emissions played an insignificant role. In addition, on days favoring the build-up of local PM_{10} precursor emissions (i.e. low wind days) ambient PM_{10} concentrations remained below the NAAQS. CARB evaluated the role that precursor emissions play in the overall ambient PM levels in Imperial County in a study that involved comparing PM_{10} and $PM_{2.5}$ concentration and speciation data from 2007 through 2016. Specifically, five dates with complete concentration and matching speciation data were selected and the data analyzed. CARB's goal was to estimate on each day what percentage of the measured PM_{10}'s mass was contributed by SO_X, NO_X, NH_3, and VOCs. CARB determined that each of these precursors contributed to about 2% or less of the total PM_{10} as an average across the five selected days.

Comparing these percentages to a precursor significance threshold level developed for the $PM_{2.5}$ 24-hr standard, CARB concluded that the contribution of each precursor can be considered insignificant for the purposes of this redesignation request and maintenance plan. A more detailed summary of the precursor analysis conducted by CARB is provided in Appendix A.

As discussed previously, particle size is a critical characteristic of PM that primarily determines the location of PM deposition along the respiratory system (and associated health effects) as well as the degradation of visibility through light scattering. In the United States, federal and state agencies have established two types of PM air quality standards, reported in Table 1-1 below. PM_{10} corresponds to the fraction of PM no greater than 10 microns or micrometers (µm) in aerodynamic diameter, while $PM_{2.5}$ refers to the subset of PM_{10} of aerodynamic diameter smaller than 2.5 µm, which is commonly called fine particulate matter. The California state standards are presented for comparative purposes, but are otherwise outside the scope of this document.

Table 1-1. National and State Ambient Air Quality Standards for Particulate Matter

Pollutant	Averaging Time	California Standards	National Standards
Respirable Particulate Matter (PM_{10})	Annual	20 µg/m^3	--
	24-hour	50 µg/m^3	150 µg/m^3
Fine Particulate Matter ($PM_{2.5}$)	Annual	12 µg/m^3	12 µg/m^3
	24-hour	--	35 µg/m^3

PM air pollution has undesirable and detrimental environmental effects. PM affects vegetation, both directly (e.g., deposition of nitrates and sulfates may cause direct foliar damage) and indirectly (e.g., coating of plants upon gravitational settling reduces light absorption). PM also accumulates to form regional haze, which reduces visibility due to scattering of light. Agencies concerned with haze include the National Park Service, the U.S. Forest Service, the Western Regional Air Partnership (WRAP), and the Western States Air Resources Council (WESTAR).

PM_{10} is respirable, with fine and ultrafine particles reaching the alveoli deep in the lungs, and larger particles depositing principally in the nose and throat area. PM_{10} deposition in the lungs results in irritation that triggers a range of inflammation responses, such as mucus secretion and bronchoconstriction, and exacerbates pulmonary dysfunctions, such as asthma, emphysema, and chronic bronchitis. Sufficiently small particles may penetrate into the bloodstream and impact functions such as blood coagulation, cardiac autonomic control, and mobilization of inflammatory cells from the bone marrow. Individuals susceptible to higher health risks from exposure to PM_{10} airborne pollution include children, the elderly, smokers, and people of all ages with low pulmonary/cardiovascular function. For these individuals in particular, adverse health effects of PM_{10} pollution include coughing, wheezing, shortness of breath, phlegm, bronchitis, and aggravation of lung or heart disease, leading to increased risks of hospitalization and mortality from asthma attacks and heart attacks.[4]

1.3 Imperial County

1.3.1 Geography, Population, and Land Use

Imperial County extends over 4,284 square miles[5] in the southeastern corner of California. It is bordered on the south by Mexico, on the east by Arizona, on the west by the Coyote and Fish Creek Mountains (which are in San Diego County), and on the north by Riverside County. The Salton Trough runs approximately northwest to southeast through the center of the County and extends into Mexico. The elevation in Imperial County ranges from about 230 feet below sea level at the Salton Sea in the north to more than 2,800 feet on the mountain summits to the west.

Imperial County's population is about 190,600[6] and its principal industries are farming and retail trade. Most of the population, farming, and retail trade exist in a band of land that, on average, comprises less than one-fourth the width of the County, stretching from the south shore of the Salton Sea to the Mexican border. The road network is densest within this strip, as shown in Figure 1-3. The rest of Imperial County is the Salton Sea and mostly dry, barren desert areas with little or no human population.

Imperial County's agricultural industry was valued at $2.06 billion in 2016. Vegetable and melon crops led the County tally, grossing more than $1 billion, followed by livestock which grossed $468 million. More than 100 types of crops and commodities are grown in Imperial County, and in 2016, it ranked among the top ten out of all 58 counties in California for gross value of agricultural production.[7] Approximately half a million acres of land were harvested in Imperial County in 2014 and this amount has remained fairly constant over the past decade. During the high season, approximately 25 percent of Imperial County's labor force work in the agricultural sector. Additionally, Imperial County has more acreage and production of alfalfa than any other county in the United States. It is also a major producer of lettuce, feedlot beef, melons, carrots, Sudan grass hay, onions, and numerous other commodities.

4 Additional details regarding the adverse health effects of PM can be found in the San Joaquin Valley 2006 PM_{10} Plan (Chapter 1, Section 1.5). Available at: http://www.valleyair.org/Air_Quality_Plans/06PM10.htm. Accessed: June 2018.

5 Official website of Imperial County. Available at: http://www.co.imperial.ca.us/. Accessed: June 2018.

6 State of California Department of Finance. Population Estimates. Available at: http://www.dof.ca.gov/Forecasting/Demographics/Estimates/. Accessed: June 2018.

7 Agricultural Impact Associates. Economic Contributions of Imperial County Agriculture. Crop Report PLUS Series. December 2017. Available at: http://www.co.imperial.ca.us/ag/docs/spc/2016_Imperial_County_Crop_Report_Plus.pdf Accessed: June 2018.

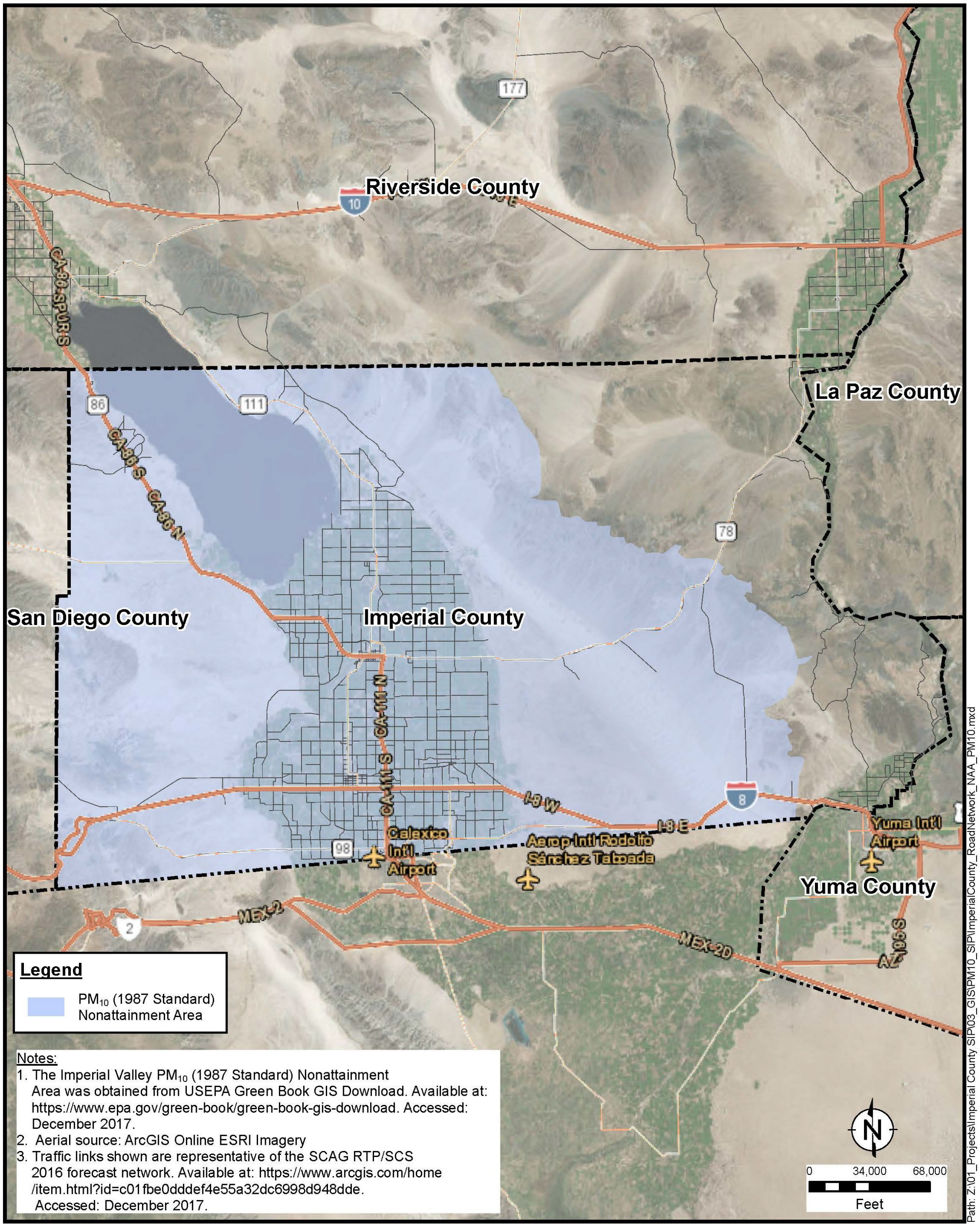


Figure 1-3. Road map of Imperial County

1.3.2 Climate and Meteorology

Climatic conditions in Imperial County are governed by the large-scale sinking and warming of air in the semi-permanent tropical high pressure center of the Pacific Ocean. The high pressure ridge blocks out most mid-latitude storms except in winter when it is weakest and farthest south. The coastal mountains prevent the intrusion of any cool, damp air found in California coastal environs. Because of the barrier and weakened storms, Imperial County experiences clear skies, extremely hot summers, mild winters, and little rainfall. The sun shines, on the average, more in Imperial County than anywhere else in the United States.

Winters are mild and dry with daily average temperatures ranging between 65 and 75ºF (18-24ºC). During winter months it is not uncommon to record maximum temperatures of up to 80ºF. Summers are extremely hot with daily average temperatures ranging between 104 and 115ºF (40-46ºC). It is not uncommon to record maximum temperatures of 120ºF during summer months.

The flat terrain of the valley and the strong temperature differentials created by intense solar heating, produce moderate winds and deep thermal convection. The combination of subsiding air, protective mountains, and distance from the ocean all combine to severely limit precipitation. Rainfall is highly variable with precipitation from a single heavy storm able to exceed the entire annual total during a later drought condition. The average annual rainfall is just over three inches (7.5 centimeters) with most of it occurring in late summer or mid-winter.

Humidity is low throughout the year, ranging from an average of 28 percent in summer to 52 percent in winter. The large daily oscillation of temperature produces a corresponding large variation in the relative humidity. Nocturnal humidity rises to 50 to 60 percent, but drops to about 10 percent during the day.

The wind in Imperial County follows two general patterns. Wind statistics indicate prevailing winds are from the west-northwest through southwest; a secondary flow maximum from the southeast is also evident. The prevailing winds from the west and northwest occur seasonally from fall through spring and are known to be from the Los Angeles area. Occasionally, Imperial County experiences periods of extremely high wind speeds. Wind speeds can exceed 31 miles per hour (mph) and this occurs most frequently during the months of April and May. However, speeds of less than 6.8 mph account for more than one-half of the observed wind measurements.

1.3.3 Atmospheric Stability and Dispersion

Air pollutant concentrations are primarily determined by the amount of pollutant emissions in an area and the degree to which these pollutants are dispersed in the atmosphere. The stability of the atmosphere is one of the key factors affecting pollutant dispersion. Atmospheric stability regulates the amount of vertical and horizontal air exchange, or mixing, that can occur within a given air basin. Restricted mixing and low wind speeds are generally associated with a high degree of stability in the atmosphere. These conditions are characteristic of temperature inversions.

In the atmosphere, air temperatures normally decrease as altitude increases. At varying distances above the Earth's surface, however, a reversal of this gradient can occur. This condition, termed an “inversion”, is simply a warm layer of air above a layer of cooler air, and it has the effect of limiting the vertical dispersion of pollutants. The height of the inversion determines the size of the mixing volume trapped below. Inversion strength or intensity is measured by the thickness of the layer and the difference in temperature between the base and the top of the inversion. The strength of the inversion determines how easily it can be broken by winds or solar heating.

Imperial County experiences surface inversions almost every day of the year. Due to strong surface heating, these inversions are usually broken allowing pollutants to be more easily dispersed. Weak surface inversions are caused by radiative cooling of air in contact with the cold surface of the Earth at night. In valleys and low lying areas, this condition is intensified by the addition of cold air flowing down slope from the hills and pooling on the valley floor.

However, in some circumstances the presence of the Pacific high pressure cell can cause the air to warm to a temperature higher than the air below. This highly stable atmospheric condition, termed a subsidence inversion can act as a nearly impenetrable lid to the vertical mixing of pollutants. The strength of these inversions makes them difficult to disrupt. Consequently, they can persist for one or more days, causing air stagnation and the build-up of pollutants—a condition that frequently occurs across the southern border of Imperial County in the densely populated city of Mexicali, Mexico. In the past these elevated pollution levels have been observed to impact ambient air quality in the nearby city of Calexico, Imperial County.

1.4 Regulation VIII and Imperial County 2009 PM_{10} SIP

1.4.1 Background

In response to the opinion of the U.S. Court of Appeals for the Ninth Circuit in *Sierra Club* v. *United States Environmental Protection Agency, et al.*, in August 2004 the USEPA found that the Imperial Valley Planning Area had failed to attain the NAAQS by the Moderate area PM_{10} attainment date of December 31, 1994, and as a result reclassified the area from a Moderate to a Serious PM_{10} nonattainment area.[8] Also in August 2004, the USEPA proposed a rule to find that the Imperial Valley Planning Area had failed to attain the annual and 24-hour PM_{10} standards by the Serious area deadline of December 31, 2001.[9] The USEPA finalized the rule on December 11, 2007,[10] citing as the basis for the rule that six Imperial County monitoring stations were in violation of the 24-hour standard during 1999 to 2001. The USEPA's final rule action required the state to submit to the USEPA by December 11, 2008 (within one year of the rule's publication in the Federal Register) an air quality plan that demonstrates that the County will attain the PM_{10} standard as expeditiously as practicable.

In response to this rule action, ICAPCD developed the *2009 Imperial County State Implementation Plan for Particulate Matter Less than 10 Microns in Aerodynamic Diameter*[11]

[8] United States Environmental Protection Agency. 2004. *Finding of Failure to Attain and Reclassification to Serious Nonattainment; Imperial Valley Planning Area; California; Particulate Matter of 10 Microns or Less; Final Rule.* Federal Register. Vol. 69. No. 154. August 11, 2004. p. 48792.

[9] United States Environmental Protection Agency. 2004. *Finding of Failure to Attain; Imperial Valley Planning Area; California; Particulate Matter of 10 Microns or Less; Proposed Rule*. Federal Register. Vol. 69. No. 154. August 11, 2004. p. 48835.

[10] United States Environmental Protection Agency. 2007. *Finding of Failure to Attain; California – Imperial Valley Nonattainment Area; PM-10. Final Rule.* Federal Register. Vol. 72. No. 237. December 11, 2007. p. 70222.

[11] Imperial County Air Pollution Control District. 2009. 2009 Imperial County State Implementation Plan for Particulate Matter Less Than 10 Microns in Aerodynamic Diameter. August 11. Available at: http://www.co.imperial.ca.us/airpollution/attainment%20plans/final%20ic%202009%20pm10%20sip%20document.pdf. Accessed: June 2018.

("2009 PM_{10} SIP") which included the required sections of an air quality assessment, emission inventory, District control strategy (including Best Available Control Measures [BACM] and Best Available Control Technology [BACT]), and transportation conformity budgets. For the first main required section, the air quality assessment, an evaluation of the air quality data from 2006 to 2008 was performed in order to determine the peak concentrations around which the control strategy was to be designed. It was found that during this period, there were five days with ambient air PM_{10} concentration measurements that exceeded the 24-hour NAAQS.[12] After extensive technical analysis, the District concluded that each of these exceedances was caused by either transport of pollutants from Mexico or natural high wind events. In the case of exceedances caused by international transport, the CAA contains a specific provision to address them. It establishes that although these exceedances are still considered violations of the standard, the state is not required to develop an attainment strategy addressing the pollution that causes them. For exceedances caused by wind events, there is an applicable provision in the Exceptional Events Rule adopted by the USEPA in 2007 and revised in 2016.[13] This rule recognizes that there are certain naturally occurring, uncontrollable events that can result in exceedances of federal air quality standards, and that appropriately documented events can be excluded from consideration of a region's attainment status.

Given these circumstances, the Imperial Valley Planning Area was considered to have met the federal PM_{10} standard "but-for" international emissions and hence, no attainment demonstration was required. Additionally, the requirements for reasonable further progress (RFP), a five percent yearly reduction in emissions, and contingency measures were not applicable since their sole purpose is to bring an area into attainment of the standard. Nevertheless, the District did address contingency measures in the 2009 PM_{10} SIP in order to provide additional assurance that PM_{10} levels would remain below the standard into the future.

The next major requirement for the 2009 SIP was the emission inventory. This section provided an estimate of the amounts of PM_{10} emissions coming from specific sources. To perform this analysis, the District chose 2005 as the baseline year, from which future emission estimates were calculated based on factors such as growth trends and reductions from rules and regulations. The results of the analysis showed that the greatest sources of PM_{10} emissions in the Imperial Valley Planning Area from 2006 to 2010 were from fugitive dust. More specifically, area-wide dust sources and windblown dust were responsible for the vast majority of the emissions, together comprising approximately 97 percent of PM_{10} emissions for all of Imperial County in 2006. Estimates for 2007 to 2010 were similar.

The conclusions reached based on the emission inventory provided the basis for the next major requirement: the District control strategy. Since the CAA requires Serious nonattainment areas to implement BACM for all area sources considered to be significant contributors to violations of the federal standard, a strategy was created to address them. It was found that there were only two significant area source categories in the emission inventory: agricultural tilling and unpaved

[12] Imperial County was only implementing one-in-six day monitoring at this time; therefore, five measured exceedances would have been interpreted as 30 "expected" exceedances under Appendix K to 40 CFR Part 50.

[13] United States Environmental Protection Agency. 2016. *Treatment of Data Influenced by Exceptional Events; Final rule; notification to states with areas subject to mitigation requirements; final guidance.* Federal Register. Vol. 81. No. 191. October 3, 2016. p. 68216.

road dust. Although these were the only two source categories requiring BACM, in 2005 the District developed a set of fugitive dust rules to address multiple different sources. Collectively, these rules are known as Regulation VIII. In total, the six source categories covered by Regulation VIII are construction and earthmoving activities, bulk materials, carry-out and track-out, open areas, paved and unpaved roads, and agricultural conservation management practices, with the last two specifically addressing the significant area sources identified in the emission inventory. By 2006, the rules were submitted to the USEPA, but no action was taken until February 2010, at which time the USEPA proposed only a partial approval of the rules.[14] The USEPA also identified several rule components which they believed required additional analysis in order to demonstrate BACM-level equivalence.

In response to the partial approval/disapproval of the rules and SIP submission, the District and the California Department of Parks and Recreation challenged the USEPA's decision and related actions on proposed exceptional events.[15] These challenges were overseen by the U.S. Court of Appeals for the Ninth Circuit, which ultimately suggested that the parties engage in a discussion to determine if the dispute could be resolved through a settlement agreement.

1.4.2 Settlement Agreement

On February 17, 2012, the U.S. Court of Appeals issued an Order that directed the parties in litigation to undergo mediation. Eventually a Settlement Agreement was reached, the details of which were published in the Federal Register on August 21, 2012.[16] Several specific stipulations were put forth by the agreement (provided as Appendix B), which ICAPCD and the USEPA were required to adhere to for a speedy approval and subsequent promulgation of the revised rules. First, the proposed agreement required that the District revise Regulation VIII and submit it to the District Governing Board within ninety days of the execution of the settlement. Additionally, the revisions were to be substantially the same as those laid out within the Settlement Agreement, and meet all local, state, and federal administrative requirements before they could be incorporated into the revised SIP. Second, the Settlement Agreement required that once the District Governing Board adopted the rules, the District had fourteen days to submit them to the California Air Resources Board (CARB) for expedited submittal to the USEPA to be incorporated into the California SIP. Third, it was required that the USEPA sign for publication in the Federal Register a proposal to take action on the submission within sixty days of the submittal by CARB. As long as the revised Regulation VIII was substantially the same as set forth in the Settlement Agreement, the USEPA had to propose full approval of the submission.

Fourth, once the USEPA approved the submission, they also had to make a statement that their preliminary determination was that the revised Regulation VIII constituted "reasonable control" of the sources covered by it, "for the purpose of evaluating whether the exceedance of the PM_{10}

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[14] United States Environmental Protection Agency. 2010. *Revisions to the California State Implementation Plan, Imperial County Air Pollution Control District; Final rule.* Federal Register. Vol. 75. No. 130. July 8, 2010. p. 39366.

[15] See *Imperial County Air Pollution Control District v. EPA,* No. 10-72709 (9th Cir.) and *California Department of Parks and Recreation v. EPA*, No. 10-72729 (9th Cir.).

[16] United States Environmental Protection Agency. 2012. *Proposed Settlement Agreement, Clean Air Act Citizen Suit; Notice of Proposed Settlement Agreement; Request for Public Comment.* Federal Register. Vol. 77. No. 162. August 21, 2012. p. 50506.

NAAQS is an 'exceptional event' including reasonable and appropriate control measures on significant contributing anthropogenic sources." It is important to note that this statement only applied to the exceedance of the PM_{10} NAAQS and no other pollutant standards. In addition, events that differ significantly from those discussed during mediation in terms of meteorology, sources, or conditions were excluded. Fifth, the USEPA was to make a determination to defer imposition of any previously assigned sanctions pursuant to the Administrative Procedure Act, 5 U.S.C. 553(d)(1), pending public comments on the proposed action. Sixth, the USEPA was to take final action on the Regulation VIII submission within sixty days of the public comments. Then, the USEPA was required to deliver the notice of final rulemaking promptly to the Office of Federal Register for final review and publication.

Along with these six major requirements, the Settlement Agreement also included a set of provisions to detail the consequences if either the District or the USEPA failed to adhere to the terms of the agreement. However, both parties executed their ends of the agreement in a timely manner, and the provisions did not need to be enforced. On October 16, 2012, the rule revisions in the Settlement Agreement were adopted by ICAPCD and submitted to the USEPA soon after on November 7, 2012. Finally, on January 7, 2013,[17] the USEPA proposed to approve the revisions to Regulation VIII and opened it for public comment. After thirty days, the USEPA finalized both the approval of the revisions and a temporary termination of previously imposed highway funding sanctions.

1.5 Document Organization

The District is requesting redesignation of the Imperial Valley Planning Area from Serious nonattainment to attainment of the PM_{10} NAAQS under CAA Section 107(d)(3)(E) protocol.

Section 107(d)(3)(E) of the CAA requires the USEPA administrator to make five findings prior to granting a request for redesignation:

1. The USEPA has determined that the NAAQS has been attained.
2. The applicable implementation plan has been fully approved by the USEPA under Section 110(k).
3. The USEPA has determined that the improvement in air quality is due to permanent and enforceable reductions in emissions.
4. The State has met all applicable requirements for the area under Section 110 and Part D.
5. The USEPA has fully approved a maintenance plan, including a contingency plan, for the area under Section 175A.

As will be described in the following Chapter, PM_{10} air quality in the Imperial Valley Planning Area, excluding exceptional events, did not violate the NAAQS from 2014 through 2016. Therefore, Chapter 2 provides information on the required monitoring network and confirmation that the 2014-2016 24-hour PM_{10} concentration data shows attainment of the NAAQS. Chapter 3 describes the PM_{10} Control Strategy, including adopted Regulation VIII fugitive dust

[17] United States Environmental Protection Agency. 2013. *Revisions to the California State Implementation Plan, Imperial County Air Pollution Control District; Proposed rule.* Federal Register. Vol. 78. No. 4. January 7, 2013. p. 922.

rules, that has led to permanent and enforceable emissions reduction in the area and that USEPA approved as BACM for significant sources in 2013 (see Section 1.4 for a summary of the previous 2009 PM_{10} SIP submittal, subsequent Settlement Agreement with the USEPA, and USEPA's approval of Imperial County's fugitive dust rules as BACM for significant sources). Chapter 4 addresses the applicable requirements for a maintenance plan and CAA Section 110 and Part D, including emission inventories, continuous monitoring requirements, and contingency provisions. Chapter 5 discusses issues related to the contraction of the Salton Sea and federal, state, and local programs to stabilize the playa as it becomes exposed. Chapter 6 is the formal redesignation request. Together these chapters directly address and satisfy the requirements of CAA Section 107. Chapter 6 also includes a checklist of all these satisfied requirements.

2 PM_{10} Air Quality

2.1 Overview

As briefly described in the previous section of this document, PM_{10} air quality in the Imperial Valley Planning Area, excluding exceptional events, did not violate the NAAQS from 2014 through 2016. This Chapter describes a monitoring network that is consistent with CAA Section 110 and Part D requirements and demonstrates that the 2014-2016 24-hour PM_{10} concentration data shows attainment of the NAAQS. According to USEPA guidance, a demonstration of attainment of the PM_{10} standard must rely on three complete, consecutive calendar years of quality-assured air quality monitoring data collected in accordance with 40 CFR Part 50, Appendix J. The NAAQS allows for one exceedance of the 24-hour PM_{10} standard per year averaged over a three consecutive calendar year period.

2.2 Imperial County Air Monitoring Network

During the 2014-2016 time period, ICAPCD operated filter-based, size-selective inlet (SSI) PM_{10} monitors at five stations located in the populated areas of the County (see Figure 2-1): Calexico-Ethel, El Centro, Brawley, Westmorland, and Niland.[18, 19] These stations form a monitoring network oriented south to north from the United States-Mexico border. These SSI monitors meet federal performance criteria and historically had been the sole source of official data for long-term air quality planning and attainment demonstrations. Beginning in 2013, data collected by collocated Beta Attenuation Mass (BAM) monitors at the Brawley and Niland stations were deemed suitable for submission to the USEPA Air Quality System (AQS) and subsequent regulatory compliance evaluations. Similar data became available at the Westmorland and El Centro stations beginning in the third quarter of 2015 and at the Calexico-Ethel station in the first quarter of 2016. Detailed information regarding these monitors is provided below.

Calexico-Ethel - The Calexico-Ethel monitoring station was installed in 1994 and is operated and maintained by CARB. Located above sea level, it has an absolute location of latitude 32° 40’ 34” and longitude 115° 28’ 59”. Its relative location is 1029 Belcher Street within the property boundary on the southeast corner of the Calexico High School football field parking lot. To the north is located an athletic sports field used for football, baseball, and track. The monitoring station is surrounded by a suburban neighborhood directly to the south, southeast, and southwest and is approximately 0.75 miles (1.2 kilometers) directly north of the international border crossing. The site currently records measurements for ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), $PM_{2.5}$, PM_{10}, lead (Pb), and toxics.

El Centro - The El Centro monitoring station was installed in 1986. Located above sea level, its absolute location is latitude 32° 47’ 32” and longitude 115°33’ 47”. Its relative location is 150

[18] The Calexico-Grant station was permanently decommissioned after July 2007.

[19] The minimum number of monitors required by USEPA regulations (40 CFR Part 58, Appendix D) for the purpose of PM_{10} air quality monitoring in an area is based on the population of the area and on the nature of the PM_{10} air quality in the area. For the Imperial County area, the five PM_{10} monitors currently operated by CARB and ICAPCD are well in excess of the 1-2 monitors needed to satisfy the federal minimum requirements (CARB. 2015. Annual Monitoring Network Report for Twenty-five Districts in California. Volume I. June. Available at: http://www.co.imperial.ca.us/AirPollution/Monitoring/2015%20Annual%20Network%20Plan_Volume%201.pdf. Accessed: June 2018.).

South 9th Street on the roof of the ICAPCD building. The monitoring station is surrounded by governmental and commercial buildings. It is the first monitoring site north of the city of Calexico, continuing the south to north monitoring network for Imperial County. The El Centro monitoring station is classified as urban with large agricultural areas to the east and west of the city's boundaries. This site records measurements for O_3, CO, NO_2, $PM_{2.5}$, and PM_{10}.

Brawley - The current Brawley monitoring station, which was installed in 2003 as a new station, replaced the old one which was installed in 1982. It is located below sea level and has an absolute location of latitude 32° 58' 42" and longitude 115° 32' 21". Its relative location is 220 Main Street atop the Imperial County courthouse in the middle of the city of Brawley, surrounded by commercial buildings. Like other cities within Imperial County, Brawley is surrounded by agricultural lands to the east, north, and west. The Brawley station is the third northernmost station within the Imperial County monitoring network. This site records measurements for $PM_{2.5}$ and PM_{10}.

Westmorland - The Westmorland monitoring station was installed in 1994. Located below sea level, its absolute location is latitude 33° 1' 57" and longitude 115° 37' 25". Its relative location is 570 Cook Street in Westmorland. The site is the second northernmost station within the Imperial County monitoring network. It lies west of the Brawley monitor, but southwest of the Niland monitor. Residential and agricultural areas lie within 10 meters and 400 meters of the site. The site originally monitored both O_3 and PM_{10} concentrations; however, in November 2012, the station experienced an electrical fire and the O_3 monitor was placed out of commission.

Niland - The Niland monitoring station was installed in 1996. Located below sea level, its absolute location is latitude 33° 12' 49" and longitude 115° 32' 43". Its relative location is 7711 English Road. It is adjacent to English Road which is an unpaved and lightly traveled road (approximately 100 vehicles per day). The monitoring site is surrounded by agricultural land to the south, southwest, and southeast. A single residence exists to the west of the station, across English Road. The monitoring station is southeast of Riverside County and the Salton Sea and is the most northerly site within the Imperial County monitoring network. The site records measurements for O_3 and PM_{10}.

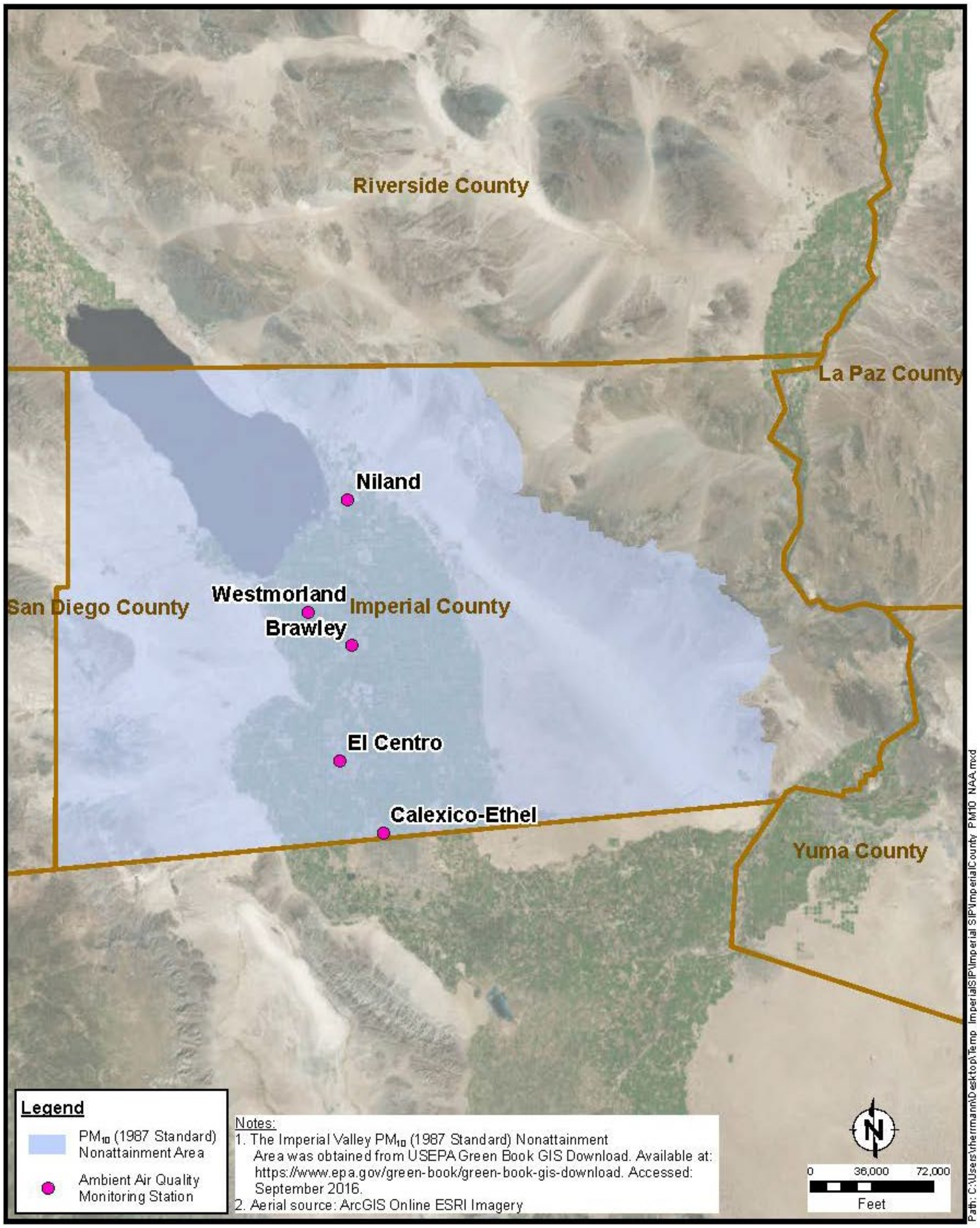


Figure 2-1. Locations of Imperial County PM_{10} monitoring stations

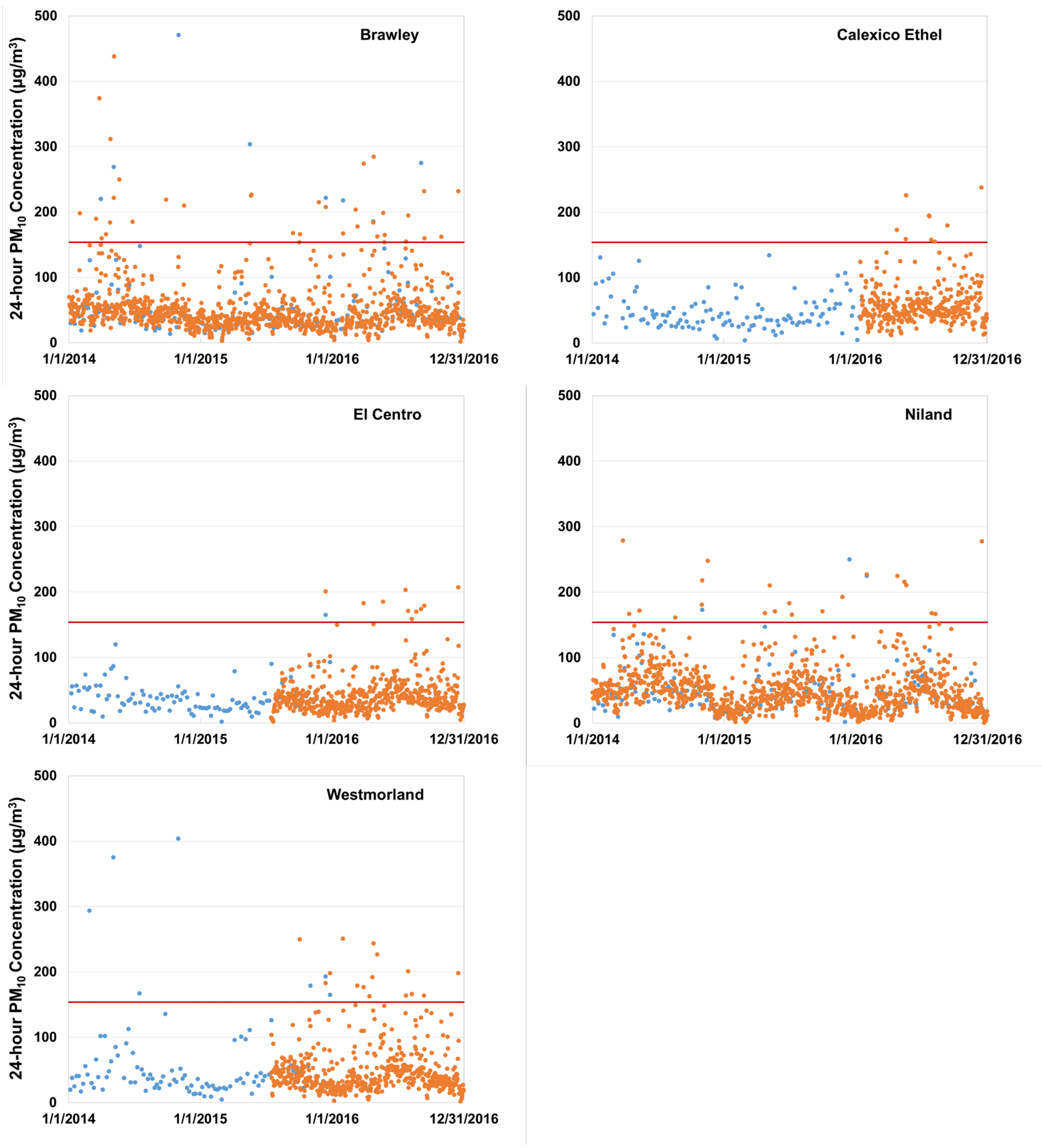
2.3 Ambient Air Quality Data (2014-2016)

SSI and BAM monitor measurements acquired during 2014-2016 are plotted by station in Figure 2-2 and tabulated in Appendix C, Table C-1.[20] The plots reveal that the overwhelming

[20] Table C-2 in Appendix C presents data completeness information by monitor parameter occurrence code and year.

majority of 24-hour ambient PM_{10} concentration measurements are well below the 150 μg/m^3 NAAQS: only three to nine percent of measurements at those stations were above 100 μg/m^3 during 2014-2016, and only 21 to 48 percent were above 50 μg/m^3.

Figure 2-2. Time series plots of 24-hour PM_{10}



Time-series plots of 24-hour PM_{10} ambient air concentration in Imperial County during 2014-2016. Blue-colored measurements are from 1-in-6 day monitors, while orange-colored measurements are from daily monitors. Tabulated results are provided in Appendix C, Table C-1.

2.3.1 Exceptional Events

The USEPA promulgated a Natural Events Policy (NEP) in 1996, allowing exclusion of "PM_{10} air quality data…attributable to uncontrollable natural events from the decisions regarding an area's nonattainment status."[21] This policy enabled local air districts to exclude from the decisions regarding an area's attainment status documented high ambient PM_{10} air quality data that were caused by uncontrollable natural events such as (i) volcanic, seismic activity, (ii) wild land fires, and/or (iii) high wind episodes.[22] The NEP has been incorporated into and superseded by the 2007 Exceptional Event Rule, discussed below.

As of May 21, 2007, states petitioning the USEPA to exclude any air quality monitoring data from regulatory determinations related to compliance with the NAAQS must comply with the USEPA's updated Exceptional Event policy.[23] The rule defines an Exceptional Event as one that "affects air quality, is not reasonably controllable or preventable, is caused by a natural event or by human activity that is unlikely to recur at a particular location, and is determined by the USEPA to be an exceptional event." A clear causal relationship must be established between a measured exceedance of a NAAQS and an exceptional event in order to exclude the exceedance from regulatory determination of an area's attainment status. In September of 2016, the Exceptional Events Rule was updated[24] in order to increase the efficiency of the process by which these events are demonstrated and reviewed. One specific change to the rule was a revision of its language to more closely align with that of the CAA. This included removing the "but for" criterion and adding the "affects air quality" and "historical fluctuations" criteria. Other changes to the rule include clarifying the analyses, content, and organization for demonstrations of exceptional events, requiring that the air agency send an initial notification to USEPA of a potential exceptional event demonstration, and removing specific exceptional event-related deadlines, among others. The final action of approving the revisions to the rule supersedes both the 2007 Exceptional Events Rule and the 2013 Interim Exceptional Events Implementation Guidance.

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[21] United States Environmental Protection Agency. 1996. Areas Affected by PM-10 Natural Events. Memorandum from Mary D. Nichols to USEPA Division Directors. June 6. Available at: https://www3.epa.gov/ttn/naaqs/aqmguide/collection/cp2/19960530_nichols_pm10_natural_events.pdf. Accessed: June 2018.

[22] As a requirement for data flagging and data exclusion from NAAQS compliance determination, the NEP required states to develop area-specific Natural Events Action Plans (NEAPs) designed to protect public health through public education, public notification, and efforts to minimize emissions from contributing anthropogenic sources during natural events. The ICAPCD satisfied this requirement by collaborating with local governments and stakeholders to develop the Imperial County NEAP document in 2005. The Imperial County NEAP, which dealt specifically with natural events caused by high winds and wildland fires, was adopted by the ICAPCD Board of Directors on August 9, 2005. The Imperial County NEAP development process involved the development of BACM measures to satisfy the requirements of controlling and abating wind-generated dust from anthropogenic sources.

[23] United States Environmental Protection Agency. 2007. *Treatment of Data Influenced by Exceptional Events; Final Rule*. Federal Register. Vol. 72. No. 55. March 22, 2007. p. 13560.

[24] United States Environmental Protection Agency. 2016. *Treatment of Data Influenced by Exceptional Events; Final Rule.* Federal Register. Vol. 81. No. 191. October 3, 2016. p. 68216.

2.3.2 Exceedances of the 24-Hour PM_{10} NAAQS (2014-2016)

In the 2014 to 2016 time period, Imperial County experienced 58 days with PM_{10} concentrations in excess of the 24-hour NAAQS. As shown in Table 2-1, all of these exceedances were due to Exceptional Events. These events were primarily caused by gusty westerly winds brought on by low pressure systems. A smaller fraction of the events were the result of monsoonal fronts passing through the region. Additional details regarding these events are provided in Appendix D. These events were documented, publicly noticed, and are being submitted to the USEPA in separate submittals. In contrast to the variation in the number of high readings over these three years, we note that Imperial County emissions (and related underlying activity) did not change appreciably over this period.

Table 2-1. Expected Exceedances of 24-hour PM_{10} NAAQS at Imperial County Air Quality Monitoring Stations from 2014 to 2016

Station Name	POC [1]	Expected Exceedances [2,3], including Exceptional Events			Expected Exceedances [2,3], excluding Exceptional Events		
		2014	2015	2016	2014	2015	2016
Brawley	1	21	13	18	0	0	0
	3	13	6	21	0	0	0
Calexico-Ethel	1	0	0	0	0	0	0
	3	--	--	9	--	--	0
El Centro	2	0	6 [4]	--	0	0	--
	4	--	1	10	--	0	0
Niland	1	6	6	6	0	0	0
	3	7	7	9	0	0	0
Westmorland	1	25	31	--	0	0	--
	3	--	3	18	--	0	0

Notes:

[1] Parameter Occurrence Codes (POCs) 1 and 2 represent 1-in-6 day monitoring, whereas POCs 3 and 4 represent continuous, daily monitoring.

[2] Expected exceedance data is observed exceedance data adjusted to account for exceedances measured at monitors with incomplete data or those sampling less frequently than daily.

[3] "--" indicates monitor not in service or data not reported.

[4] A potential discrepancy with how this value is reported within AQS is being resolved by USEPA Region IX.

2.4 Section 110 and Part D Requirements – Monitoring and Analysis

CAA Section 110 contains the general requirements for SIPs and Part D specifies additional requirements applicable to nonattainment areas. Both Section 110 and Part D describe the elements of a SIP and include, among other things, a monitoring network and air quality analysis. These two requirements have been adequately addressed in this Chapter.

With the submittal of this redesignation request and maintenance plan, Imperial County meets all SIP requirements applicable to the area under Section 110 and Part D, as required by CAA Section 107(d)(3)(E), and requests that approval action on these items occurs simultaneously with this redesignation request. Refer to the checklist in Chapter 6 for a summary of how all applicable requirements have been addressed.

3 Control Strategies - Permanent and Enforceable Emission Reductions

Reclassification of the Imperial Valley Planning Area to Serious nonattainment in 2004 prompted the ICAPCD to begin the development of revised Regulation VIII fugitive dust control rules at the BACM level. This process was initiated ahead of SIP development[25] to accelerate BACM implementation and to meet the requirements and schedule of the District's National Events Action Plan (NEAP) (approved in August 2005). In March 2004, the ICAPCD began a review and assessment of BACM in other areas. Rule development, initiated at a stakeholder meeting in October 2004, was conducted in a public process that involved a local Technical Advisory Committee[26] as well as state and federal air agencies.[27] The process resulted in the adoption in November 2005 of revised Regulation VIII fugitive dust control measures, which form the core of the Imperial County PM_{10} control strategy.[28] Provisions in these rules went into effect in January 2006.[29]

The control strategy consists of <u>rules adopted in 2005 and 2012</u> that have been determined by the USEPA as meeting BACM-level stringency for sources previously identified as significant. An updated significant source analysis shows that no new emission sources would qualify as significant that weren't identified previously. Therefore, no new control measures are being proposed with this Plan.

After its initial review of the newly updated Regulation VIII in February 2010, the USEPA proposed only a partial approval of the rules. The District challenged this decision, and the dispute led to litigation within the U.S. Court of Appeals, and ultimately to a Settlement Agreement. The terms of the Settlement Agreement included agreed-upon revisions to the rules and a schedule for resubmittal to and approval by the USEPA. A more thorough description of the Settlement Agreement is provided in Section 1.4.2. Both ICAPCD and the USEPA adhered to the terms of the Settlement Agreement and the revised rules were ultimately approved by the USEPA in early 2013 and determined to meet BACM-level stringency for significant sources of PM_{10}, a requirement for Serious nonattainment areas under the CAA. Ultimately, four out of the seven Regulation VIII rules were amended including Rules 800, 804, 805, and 806. The changes to these rules included more specific definitions of agricultural dust management practices, opacity, and stabilization requirements for

[25] The USEPA did not take final action regarding nonattainment of the Imperial Valley Planning Area until December 2007.

[26] Including representatives from the Coalition of Labor and Business, the Farm Bureau, the Bureau of Land Management, Border Patrol, the Imperial Irrigation District (IID), the Imperial County Public Works Department (ICPWD), as well as farmers and private industry stakeholders.

[27] Meetings with the CARB and the USEPA were held on March 23, 2005 and on August 10, 2005. Informal comments were also submitted by the California Department of Transportation.

[28] Note that additional controls of PM_{10} emissions in Imperial County are outlined in ICAPCD Rule 420 (beef feedlots) and Rule 701 (agricultural burning). These rules, which were most recently updated in October 2006 and August 2002, respectively, are SIP approved.

[29] The only exception was that control of county unpaved roads under Rule 805 was phased over a 10-year period.

high-traffic agricultural roads and more detailed requirements for land managers to control dust from off-highway vehicle (OHV) areas. More recently, in April 2016, Rule 804 was updated to accommodate the changing conditions and potential future emissions at the Salton Sea. More on the amendments to Rule 804 is provided below.

An update to Imperial County's significant source analysis shows that no new PM_{10} emission sources would qualify as significant that haven't been identified previously as such (see Appendix E for details). This finding implies that all significant sources of PM_{10} in Imperial County are currently being controlled to BACM-level stringency. Therefore, no new control measures are being proposed with this Plan.

The section below provides a summary of the current Regulation VIII fugitive dust rules. Only a brief description of the control measures of the Regulation VIII rules are presented in this section; the complete rules are provided in Appendix F.

3.1 Regulation VIII Rules

3.1.1 Rule 800: General Requirements for Control of Fine Particulate Matter

Purpose and Requirements: The purpose of Regulation VIII is to reduce the amount of PM_{10} entrained in the ambient air as a result of anthropogenic fugitive dust sources generated from within Imperial County. The rules of Regulation VIII require that landholders and other responsible parties take specific actions in order to prevent, reduce, or mitigate PM_{10} emissions. The rules apply to human activities or human-caused conditions capable of generating fugitive dust. The purpose of Rule 800 specifically is to define all the relevant terms that appear throughout the regulation, such as what constitutes "fugitive dust", the characteristics of "open areas", and the requirements for labeling a surface as "stabilized." Also included in this rule are a compliance schedule, descriptions of exempt activities, and the test methods for determining if responsible parties are in compliance with the rules' requirements.

Rule Revisions: Rule 800 was revised as part of the Settlement Agreement to both edit and add new definitions to the list of defined terms. Terms that were added or revised include "Disturbed Surface Area", "Off-Road Event and/or Competitions", "Off-Highway Vehicle" (changed from "Off-Road Vehicle"), and "Recreational Off-Highway Vehicle Use Area". An important update to the compliance schedule added a requirement that any person who owns or operates a Recreational OHV Use Area must draft and submit a dust control plan. Before the revision, only the Bureau of Land Management or United States Border Patrol were required to do so. Additionally, updates to the rule require that a public agency must meet and confer with ICAPCD before they can designate a property as a "New Recreational OHV Use Area." The rule includes descriptions of all the necessary steps required to do this.

3.1.2 Rule 801: Construction and Earthmoving Activities

*Purpose and Requirements***.** The purpose of Rule 801 is to reduce the amount of PM_{10} that is emitted into the air as a result of construction and other earthmoving activities, such as land clearing, excavating, land leveling, grading, demolishing, etc. All persons who own or operate a construction site or who perform any earthmoving activities are required to limit visible dust emissions (VDE) to 20 percent opacity by complying with the following measures:

- Phase work to minimize the amount of disturbed surface area at one time;

- Apply water or chemical stabilization;
- Construct and maintain wind barriers around the activity site;
- Restrict vehicular access to the area by fencing or signage;
- Mitigate track out/carry out of Bulk Materials[30] at the site in compliance with Rule 803; and
- Transport Bulk Material to, from, and around the site in compliance with Rule 802.

Dust Control Plan. Owners or operators of construction/earthmoving sites greater than or equal to 10 acres for residential developments and greater than or equal to 5 acres for non-residential development are required to provide written notification to the ICAPCD 10 days prior to the commencement of activities, and to develop a dust control plan. The plan is expected to document the type and location of the project, the expected start and completion dates of the dust generating activities, the total area of land surface to be disturbed, the actual and potential sources of fugitive dust emissions on the site (including the location of Bulk Material handling and storage areas, paved and unpaved roads, entrances and exits where track out/carry out may occur, etc.), and all the fugitive dust control measures to be implemented before, during, and after any dust-generating activity.

3.1.3 Rule 802: Bulk Materials

Purpose and Requirements. The purpose of Rule 802 is to reduce the amount of PM_{10} that is emitted into the air as a result of outdoor handling, storage, and transport of Bulk Material. The rule requires implementation of the following controls in order to limit VDE to 20 percent opacity:

- For Bulk Material handling (e.g. stacking, loading, unloading, conveying, etc.), control measures include spraying with water, applying and maintaining chemical stabilization, and protecting from wind erosion by sheltering or enclosing;
- For Bulk Material storage, control measures include confinement of the material using a physical barrier (e.g. covering with tarps, plastic, etc.) and confinement by applying water or other chemical/organic stabilizers/suppressants;
- For Bulk Material transport/hauling, control measures include complete covering or enclosing of all haul truck loads, proper selection and maintenance of the cargo compartments of haul trucks to ensure no spillage or loss of Bulk Materials from holes or openings in the compartment's floor, side, or tailgate, and adequate cleaning of the cargo compartment of all haul trucks at the delivery site after removal of Bulk Material.

3.1.4 Rule 803: Carry-Out and Track-Out

*Purpose and Requirements***.** The purpose of Rule 803 is to reduce the amount of PM_{10} that is entrained in the ambient air as a result of Track-Out and Carry-Out[31] occurring on paved public roads. The rule requires mitigation of the deposition of Bulk Material by tracking out/carrying out onto a paved road surface by implementation of the following controls:

[30] Bulk Material is any organic and/or inorganic material consisting of or containing particulate matter with greater than or equal to 5 percent silt content, including materials such as earth, rock, silt, sediment, sand, gravel, soil, fill, aggregate, dirt, mud, or debris.

[31] Track-out/carry out refers to any Bulk Material that adhere to and agglomerate on the exterior surfaces of motor vehicles and/or equipment (including tires) that may then fall onto the pavement.

- Any Bulk Material tracked out or carried out onto a paved road is to be cleaned up at the end of the workday (or immediately if within an urban area and Track-Out or Carry-Out extends a cumulative distance of greater than or equal to 50 feet);
- All sites with access to a paved road and with greater than or equal to 150 Average Vehicle Trips per Day[32] (AVTD) are to (i) install one or more Track-Out prevention devices and (ii) apply and maintain paving, chemical stabilization, or gravel for a distance of greater than or equal to 50 consecutive feet, at access points where unpaved roads adjoin paved roads.

3.1.5 Rule 804: Open Areas

Purpose and Requirements. The purpose of Rule 804 is to reduce the amount of PM_{10} that is emitted from non-agricultural[33] open areas, such as vacant portions of residential or commercial lots. The rule applies to any open area of greater than or equal to 0.5 acres within urban areas, or greater than or equal to 3 acres within rural areas, that contain greater than or equal to 1,000 square feet of disturbed surface area. Rule 804 requires all persons who own or otherwise have jurisdiction over an open area to prevent vehicle use in the open area by posting “No Trespassing” signs or installing physical barriers to prevent trespassing. In addition, surface stabilization is required in open areas to limit VDE to 20 percent opacity by (i) applying water or dust suppressant(s) to all unvegetated areas, (ii) establishing vegetation on all previously disturbed areas, (iii) paving, applying and maintaining gravel, or applying and maintaining chemical stabilizers/suppressants, and/or (iv) by applying alternative BACM, so long as the alternative BACM has been tested and approved by ICAPCD.

Rule Revisions. Rule 804 was revised as a result of the Settlement Agreement to include an exemption for recreational OHV use areas on public lands which are already subject to Rule 800. The 2016 revisions to Rule 804 included a fourth option for controlling dust in open areas by adding language which allows for the development and approval of new types of BACM or “alternative” BACM. This amendment was strategically proposed as a contingency measure for controlling dust on unstabilized playa exposed as the Salton Sea recedes. A more detailed explanation of the Rule 804 revisions and the Salton Sea is found in Chapter 5.

3.1.6 Rule 805: Paved and Unpaved Roads

*Purpose and Requirements***.** The purpose of Rule 805 is to reduce the amount of PM_{10} that is windblown or entrained from new or modified paved roads, from unpaved traffic areas and all non-farm[34] unpaved roads, or from road construction or road modification projects in Imperial County. The rule requirements are the following:

- For unpaved haul/access roads, unpaved traffic areas larger than 1 acre and with greater than or equal to 75 AVTD, unpaved roads with greater than or equal to 50 AVTD, and canal roads with greater than or equal to 20 AVTD, VDE must be limited to 20 percent opacity by applying at least one of the stabilization methods described below;

[32] Or ≥20 AVTD by vehicles with three or more axles.

[33] Emissions from agricultural open areas are controlled by regulations outlined in Rule 806.

[34] Emissions from agricultural unpaved roads are controlled by regulations outlined in Rule 806.

- Parties responsible for the use of canal roads with greater than or equal to 20 AVTD are further required to implement one of a number of additional measures that include maintenance of canal bank surfaces, conversion of open canals to pipeline, installation of remote-control delivery gates to eliminate manual gate operation by maintenance personnel in vehicles along canal banks, or lining of canals to eliminate maintenance associated with the control of silt or weed;
- Construction of new unpaved roads is prohibited within any area with a population greater than or equal to 500, except for temporary activity and if the road is stabilized to limit VDE to 20 percent opacity;
- New or modified paved roads must be constructed with curbing adjacent to the travel lanes, or with shoulders of width two to six feet (depending on the frequency of road usage) that are either paved or that meet the conditions of a stabilized surface.

Stabilization Methods. BACMs for fugitive PM_{10} dust emitted from unpaved roads include stabilization of the unpaved surfaces by (i) paving, (ii) applying chemical stabilization as directed by the product manufacturer, (iii) applying and maintaining gravel, recrushed/recycled asphalt, or other material of low silt content (less than five percent) to a depth of three or more inches, or (iv) wetting by applying water one or more times daily.

Rule Implementation. Rule 805 requires each city or county agency with primary responsibility for any existing unpaved road to provide to the ICAPCD (by March 31, 2006) a compliance plan and a compliance schedule demonstrating implementation of Rule 805 to all unpaved roads within its jurisdiction at an incremental rate of no less than 10 percent per fiscal year during the time period of 2006-2015. General compliance with Rule 805 is required past 2015. The plan identifies the control measures selected for each unpaved road segment, and report of yearly progress is to be made to the APCD by July 31 of each year through 2015.

Rule Revisions. Rule 805 was revised as a result of the Settlement Agreement to include an exemption for recreational OHV use areas on public lands which are already subject to Rule 800. Additionally, a requirement for existing unpaved public roads was edited to mandate that the portions of road being stabilized each year are new, so that all roads were to be stabilized by 2015. This was done to prevent re-stabilization of the same length of roadway multiple times. Another update in this rule added a requirement that a list of all mitigated roads be supplied to ICAPCD and that these public roads must comply with the requirements of a stabilized unpaved road, as defined in the BACM section of Rule 805.

3.1.7 Rule 806: Conservation Management Practices

*Purpose and Requirements***.** The purpose of Rule 806 (effective since January 1, 2006) is to reduce the amount of PM_{10} emitted from agricultural operations in Imperial County. The rule requires all owners or operators of Agricultural Operation Sites of greater than or equal to 40 acres to implement in each Agricultural Parcel at least one Conservation Management Practice (CMP, described below) for each of the following categories: (i) land preparation and cultivation, (ii) harvest activities, (iii) unpaved roads, (iv) unpaved traffic areas, (v) cropland-other CMPs, and (vi) windblown dust control CMPs. Owners and operators are required to prepare, for each Agricultural Operation Site, a CMP Plan that must be made available to the ICAPCD upon request within 72 hours of notice.

Conservation Management Practices for Fugitive Dust (PM_{10}). One or more of a number of listed CMPs must be implemented to satisfy the requirements of Rule 806. Owners or operators of Agricultural Operation Sites may develop and implement alternative CMPs, provided that the achieved PM_{10} emission reductions are at least equivalent to those obtained from CMPs listed for the applicable operation. An alternative CMP must receive approval by the ICAPCD after review of its technical merit before it may be included in a CMP Plan. A subset of the allowed CMPs is reported below for each category covered by Rule 806; a comprehensive listing of the practices is available on the ICAPCD webpage.[35]

- For the control of PM_{10} emissions from land preparation and cultivation, owners or operators may implement alternate tilling, non-tillage, or chemical tillage, chemigation/fertigation, covering of crops, land fallowing, mulching, or night farming;
- For the control of PM_{10} emissions from harvesting, owners or operators may implement green chopping, hand harvesting, night harvesting, pre-harvesting soil preparation, no-burning, or equipment changes/technological improvements;
- For the control of PM_{10} emissions from unpaved roads and unpaved traffic areas, owners or operators may implement graveling, paving, restricted access, speed limits, track-out control, or wind barriers.
- For the control of PM_{10} emissions from cropland-others, owners or operators may implement alternate tilling, mulching, organic practices, reduced tilling, and other CMPs in this category.
- For the control of windblown dust, the owner or operator must minimize the time that newly tilled soil is smooth when preparing a field for planting. This should be done by leaving the field surface with larger clods until immediately before bedding and planting the field. For fields that are in between crops or permanently fallow, at least one other CMP must be implemented, and options include surface roughening, creating wind barriers, managing crop residues, and other practices.

Rule Revisions. Rule 806 was revised as a result of the Settlement Agreement to include additional specifications on how certain agricultural activities are to be conducted in order to limit fugitive dust emissions. These activities include grinding prunings and orchard removals instead of burning them, surface roughening, planting rows of vegetation perpendicular to the direction of wind to create barriers, and many more. These new CMPs were added to existing categories of PM_{10} emission sources, as well as to two new ones: those deemed as "cropland-other" and those specific to windblown dust.

3.2 Record of Control Implementation

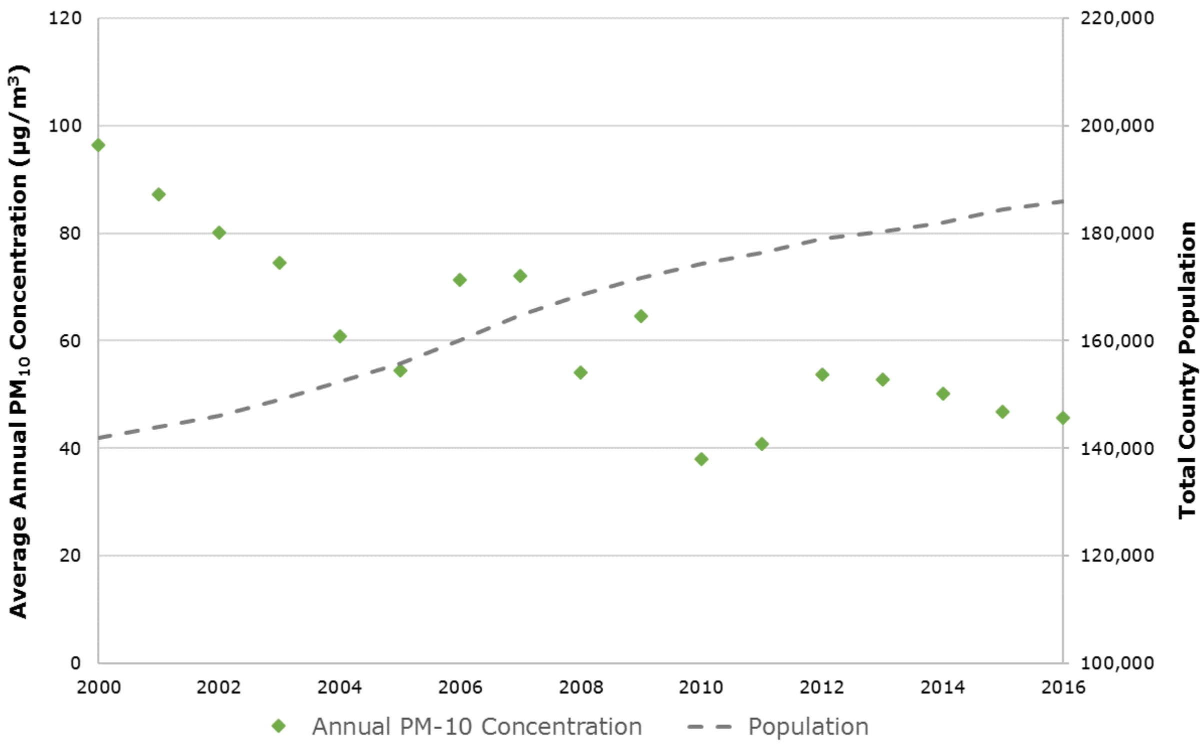
Any person subject to the requirements of any one of the Regulation VIII rules is required to compile and retain records that provide evidence of control measure application (i.e., receipts and/or purchase records). The records are expected to document the type of treatment or control measure, extent of coverage, frequency of application, and date applied. Records must be kept for at least two years and be made available to ICAPCD upon request.

[35] Available at: http://www.co.imperial.ca.us/AirPollution/index.asp?fileinc=compag. Accessed: June 2018.

3.3 Permanent and Enforceable Emission Reductions

The USEPA eliminated an annual PM_{10} NAAQS in 2006,[36] though it is instructive to track annual PM_{10} values in order to observe trends. As shown in Figure 3-1, implementation of the Regulation VIII fugitive dust rules has led to a continual decline in annual average PM_{10} concentrations in Imperial County despite a steady increase in population.

Figure 3-1. Annual Average PM_{10} Concentration and Population in Imperial County from 2000 to 2016



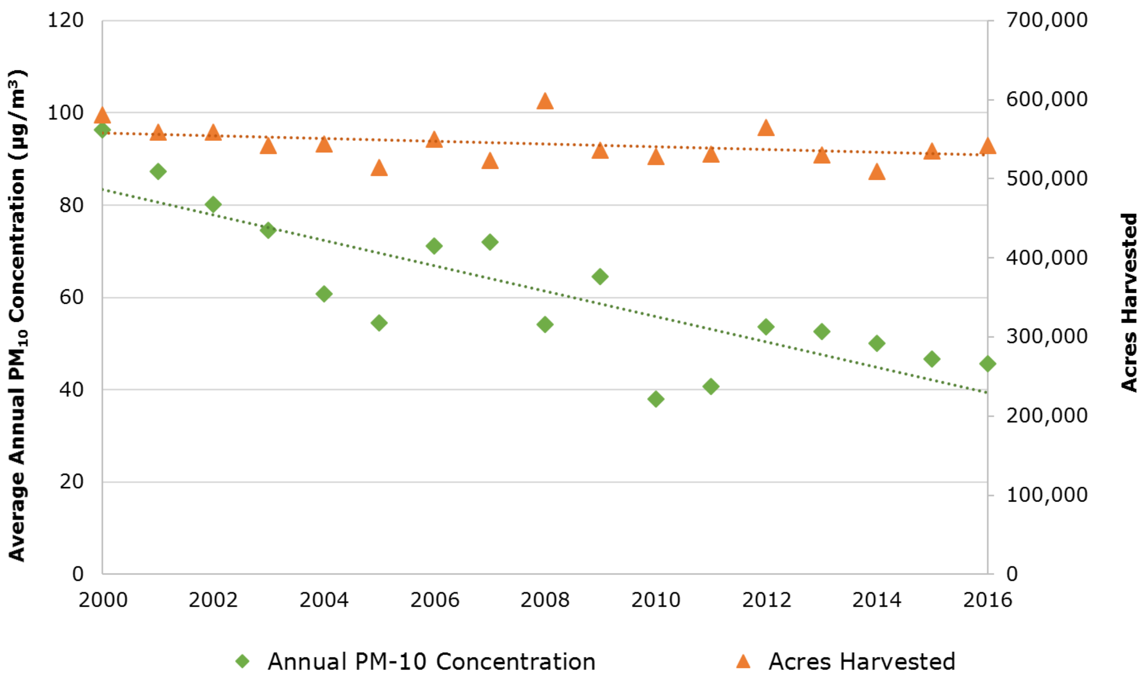
The data in the above plot was provided by CARB. The annual average PM_{10} concentrations depicted in the plot represent the highest values measured at all Imperial County monitoring stations in each calendar year. Exceptional events have been excluded from the data sets.

The decrease in average annual PM_{10} concentration in Imperial County that is shown in Figure 3-1 is the result of the permanent, enforceable reductions that have been achieved due to implementation of the aforementioned rules. Since 2000, the average annual PM_{10} concentration in Imperial County, when exceptional events are excluded, has fallen from 96 $\mu g/m^3$ to 46 $\mu g/m^3$ in 2016. This represents an approximate 52 percent decrease in the general PM_{10} levels in Imperial County over that period. When exceptional events are included, the reduction is still substantial with an approximate 39 percent decrease over the 16-year period. It is technically possible for reductions of this magnitude to be attributed to other factors, such as a reduction in economic activity or unusually favorable meteorological conditions, but this is not

[36] Prior to its revocation, the annual PM_{10} NAAQS was 50 $\mu g/m^3$.

the case for Imperial County. In fact, these reductions have occurred despite a relatively small change in agricultural activity (as measured by total acres harvested), which can be used as a proxy for the local economy overall since agriculture is the largest industry in Imperial County.[37] Figure 3-2 displays the same PM_{10} concentration data shown in Figure 3-1, but also includes data from the annual Imperial County Agricultural Crop and Livestock Reports.[38]

Figure 3-2. Annual Average PM_{10} Concentration and Acres Harvested in Imperial County from 2000 to 2016



As the crop data show, the amount of agricultural activity in Imperial County has remained fairly constant since 2000. The number of acres harvested decreased by only 1.5 percent when comparing the numbers for 2016 and 2000. As a result, the relatively large decrease in average PM_{10} levels is likely attributable to other factors, such as the revisions to the Regulation VIII rules in the early 2000s and the subsequent effect on the Imperial County PM_{10} emission inventory.[39]

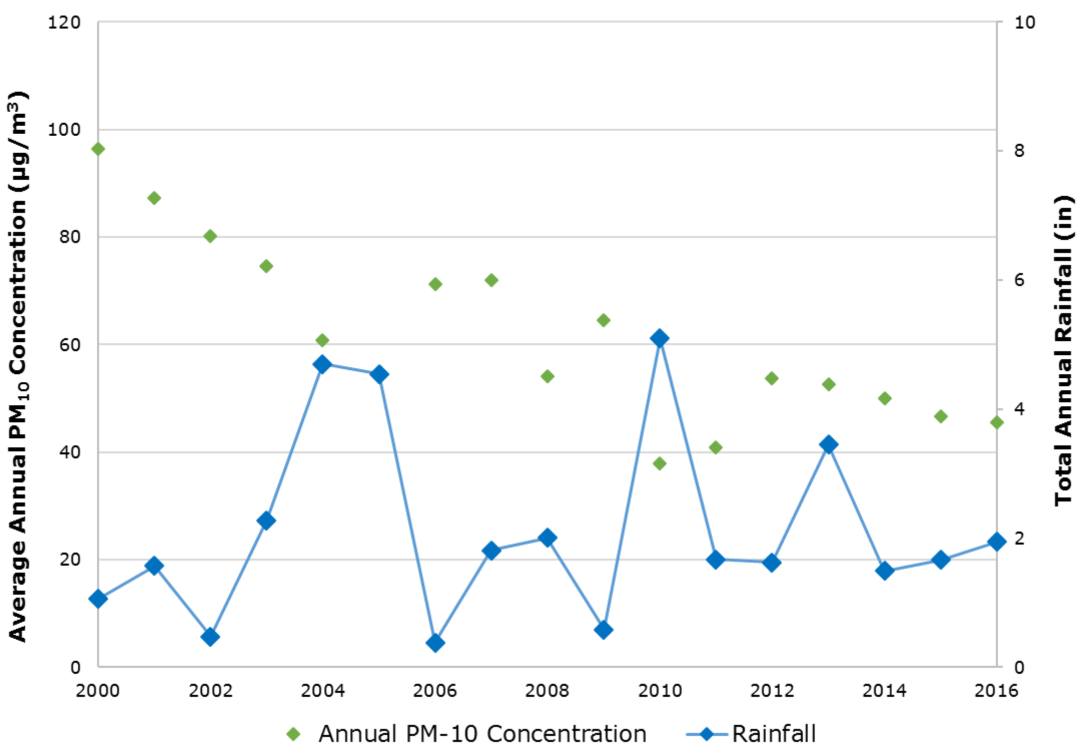
[37] El Centro Chamber of Commerce and Visitors Bureau. *Community*. Available at: https://web.archive.org/web/20101103174411/http://elcentrochamber.org/the-city-of-el-centro/community/. Accessed: June 2018.

[38] Total harvested acres. Data obtained from Imperial County annual Agricultural Crop and Livestock Reports, 2000-2016. Available at http://www.co.imperial.ca.us/ag/?page=iccr. Accessed: August 2018.

[39] According to CARB's Comprehensive Emissions Projection Analysis Model (CEPAM), total Imperial County PM_{10} emissions decreased by approximately 11 percent between 2000 and 2016. CARB's CEPAM is available at: https://www.arb.ca.gov/app/emsinv/fcemssumcat/fcemssumcat2016.php. Accessed: August 2018.

Another factor that can affect fugitive dust emissions (and as a result, ambient levels of PM_{10}) is rainfall. Outdoor surfaces with higher levels of moisture tend to emit less fugitive dust compared to drier surfaces of the same type. Thus, rain acts as a type of control for fugitive dust emissions, and enough rainfall can contribute to decreased PM_{10} levels. Figure 3-3 was created to aide in visualization of the relationship between ambient PM_{10} and precipitation. It displays the same PM_{10} concentration data shown in Figure 3-1 with annual rainfall data overlaid.[40]

Figure 3-3. Annual Average PM_{10} Concentration and Rainfall from 2000 to 2016



The data in the plot shows the average of the total rainfall in each year for all National Centers for Environmental Information Monitoring Stations in Imperial County with data available for the given year. The sharp increases in rainfall in 2004, 2005, and 2010 correlate with relative decreases in the annual average PM_{10} concentrations (excluding exceptional events), suggesting that the increased rainfall may have had an effect. However, it is important to note that while 2004 and 2005 were two of the top three rainiest years in the plotted period, they do not represent the lowest levels of ambient PM_{10}. Every year from 2010 to 2016 had the same or lower average PM_{10} concentrations (excluding exceptional events) than 2004 or 2005, despite also having lower amounts of rain. This illustrates that the observed reductions in the annual average PM_{10} concentrations in the most recent years are not attributable to favorable meteorology, but instead are the result of the permanent, enforceable reductions in PM_{10} emissions from sources where the District has focused control efforts.

[40] Data queried from the National Oceanic and Atmospheric Administration's National Centers for Environmental Information for Imperial, County. Available at: https://www.ncdc.noaa.gov/cdo-web/. Accessed: June 2018.

3.4 Section 110 and Part D Requirements – Control Strategy and Enforcement

CAA Section 110 contains the general requirements for SIPs and Part D specifies additional requirements applicable to nonattainment areas. Both Section 110 and Part D describe the elements of a SIP and include, among other things, enforcement mechanisms, and regulations which have been adopted by the state to attain or maintain the NAAQS. In its rulemakings on the Imperial County 2009 PM_{10} SIP and the subsequent Regulation VIII rule revisions, the USEPA ultimately confirmed that PM_{10} sources previously identified as significant were controlled to BACM-level stringency through Imperial County's rulebook.[41, 42] An update to Imperial County's significant source analysis shows that no new PM_{10} emission sources would qualify as significant that haven't been identified previously as such (see Appendix E for details). This finding implies that all significant sources of PM_{10} in Imperial County are currently being controlled to BACM-level stringency. Therefore, no new control measures are being proposed with this Plan.

With the submittal of this redesignation request and maintenance plan, Imperial County meets all SIP requirements applicable to the area under Section 110 and Part D, as required by CAA Section 107(d)(3)(E), and requests that approval action on these items occurs simultaneously with this redesignation request. Refer to the checklist in Chapter 6 for a summary of how all applicable requirements have been addressed.

[41] United States Environmental Protection Agency. 2010. *Revisions to the California State Implementation Plan, Imperial County Air Pollution Control District; Final rule.* Federal Register. Vol. 75. No. 130. July 8, 2010. p. 39366.

[42] United States Environmental Protection Agency. 2013. *Revisions to the California State Implementation Plan, Imperial County Air Pollution Control District; Final rule.* Federal Register. Vol. 78. No. 77. April 22, 2013. p. 23677.

4 Maintenance Plan

Section 107(d)(3)(E) of the CAA specifies that for an area to be redesignated as attainment, the USEPA must approve a maintenance plan that meets the requirements of Section 175A. The purpose of the maintenance plan is to provide for the maintenance of the 24-hour PM_{10} NAAQS for at least ten years after the redesignation (not ten years after the redesignation submittal). CAA Section 107(d)(3)(D) allows the USEPA Administrator up to 18 months from receipt of a complete submittal to process a redesignation request. To accommodate the USEPA's review time, this maintenance plan covers the period of the USEPA's approval (2018 to 2020) through the following ten years and features a maintenance demonstration, commitment to a future monitoring network, verification of continued attainment, a contingency plan, and provisions for contingency plan implementation.

Section 4.0 provides the proposed Imperial County PM_{10} Maintenance Plan. Section 4.1 presents the PM_{10} emission inventories for the attainment year (2016) and the period covered by this maintenance plan (2018-2030), as well as the transportation conformity budgets, all updated to include the latest planning assumptions. The maintenance plan also provides a commitment to maintain a future PM_{10} monitoring network in the Imperial Valley Planning Area to verify continued attainment of the NAAQS (Sections 4.2 and 4.3). Finally, Section 4.4 presents a contingency plan that addresses potential future air quality issues. The Imperial Valley PM_{10} Maintenance Plan defined in Section 4.0 of this document meets the criteria specified in CAA Sections 107 and 175A and upon approval by USEPA will complete the five criteria required for granting the Imperial County's request for redesignation to attainment of the PM_{10} NAAQS.

4.1 Maintenance Demonstration

According to USEPA guidance,[43] a maintenance plan may demonstrate future maintenance of the NAAQS by either showing that future emissions will not exceed the level of the attainment inventory or by modeling to show that the future mix of sources and emissions rates will not cause a violation of the NAAQS. The District has chosen the first approach to demonstrate future maintenance of the NAAQS.

4.1.1 Emissions Inventories

The inventories supporting this Plan were developed from CARB's California Emissions Projection Analysis Model (CEPAM), Version 1.05. Appendix G provides a full overview of the emission inventory development process. Appendix H presents comprehensive emission inventories for PM_{10} (including filterable and condensable components) as well as PM_{10} precursors.

Table 4-1 presents the PM_{10} emissions inventory for Imperial County for the attainment year, 2016, which shows average total daily emissions of approximately 284.17 tons PM_{10} per day. Consistent with the 2009 PM_{10} SIP, area-wide dust sources and windblown dust are responsible

[43] United States Environmental Protection Agency. 1992. Procedures for Processing Requests to Redesignate Areas to Attainment. Memorandum from John Calcagni to USEPA Regional Directors. September 4. Available at: https://www.epa.gov/sites/production/files/2016-03/documents/calcagni_memo_-_procedures_for_processing_requests_to_redesignate_areas_to_attainment_090492.pdf. Accessed: June 2018.

for the vast majority of PM_{10} emissions in the County. Table 4-2 presents the PM_{10} emission inventory for Imperial County for the period covered by this maintenance plan, 2018 through 2030. As can be seen, the overall inventory is projected to remain fairly constant throughout the 2018-2030 maintenance period, only increasing 0.6 percent from 2016 to 2030. These modest increases are primarily due to the paved road dust, mineral processes, and construction and demolition emissions categories—sources that currently do not qualify as significant (as shown in Appendix E) and whose impact on the 24-hour PM_{10} NAAQS is generally *de minimis*.

As discussed previously, the 24-hour PM_{10} NAAQS is exceeded in Imperial County only under high wind conditions where fugitive dust from outlying desert and mountain areas becomes entrained. During these events, the temporary influx of particulate matter to the County increases 24-hour average concentrations much more than an equivalent increase of emissions of 0.6 percent. When exceptional events are excluded from the 2014-2016 design value calculation, as is provided for in the Exceptional Events Rule, the resulting design value for Imperial County, 149 $\mu g/m^3$, is approximately 3.8 percent less than the standard.[44] With this headroom, the slight increase in emissions from these sources would not be expected to cause an exceedance of the NAAQS.

[44] This is when assuming a standard value of 154.9 $\mu g/m^3$, since USEPA data handling procedures would round this value down to 150 $\mu g/m^3$, a value not above the standard.

Table 4-1. PM_{10} Attainment Inventory for Imperial County, 2016 (tons per day)

Category[1]	2016
Electric Utilities	0.09
Manufacturing and Industrial	0.03
Food and Agricultural Processing	0.01
Service and Commercial	0.07
Food and Agriculture	0.30
Mineral Processes	3.67
Other (Industrial Processes)	0.01
Residential Fuel Combustion	0.05
Farming Operations	8.48
Construction and Demolition	3.02
Paved Road Dust	1.16
Unpaved Road Dust	51.88
Fugitive Windblown Dust	212.52
Managed Burning and Disposal	1.30
Cooking	0.08
On-road Mobile	0.43
Other Mobile	1.07
TOTAL	**284.17**

Notes:

[1] Sources with emissions less than 0.005 tons/day have been omitted from the table.

Abbreviations: BLM – Bureau of Land Management

Table 4-2. PM_{10} Future Year Inventory for Imperial County, 2018-2030 (tons per day)													
Category	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Electric Utilities	0.09	0.09	0.09	0.09	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Manufacturing and Industrial	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Food and Agricultural Processing	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Service and Commercial	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.07	0.08	0.08
Food and Agriculture	0.31	0.32	0.32	0.33	0.33	0.34	0.34	0.35	0.35	0.36	0.36	0.37	0.37
Mineral Processes	3.95	4.08	4.22	4.35	4.48	4.61	4.75	4.89	5.03	5.17	5.32	5.47	5.62
Other (Industrial Processes)	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Residential Fuel Combustion	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Farming Operations	8.37	8.31	8.25	8.22	8.20	8.17	8.14	8.11	8.09	8.06	8.03	8.00	7.98
Construction and Demolition	3.29	3.40	3.51	3.59	3.66	3.71	3.76	3.82	3.90	3.98	4.06	4.14	4.22
Paved Road Dust	1.27	1.24	1.28	1.30	1.38	1.35	1.39	1.43	1.40	1.42	1.45	1.47	1.50
Unpaved Road Dust	51.85	51.84	51.83	51.82	50.22	50.21	50.20	50.20	50.19	50.18	50.18	50.17	50.16
Fugitive Windblown Dust	212.51	212.50	212.50	212.49	212.49	212.48	212.48	212.47	212.47	212.46	212.46	212.45	212.45
Managed Burning and Disposal	1.27	1.26	1.25	1.24	1.23	1.23	1.22	1.22	1.21	1.20	1.20	1.19	1.19
Cooking	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.10	0.10	0.10	0.10	0.10	0.10
On-road Mobile	0.44	0.43	0.44	0.44	0.46	0.45	0.46	0.48	0.47	0.48	0.49	0.50	0.51
Other Mobile	1.05	1.05	1.04	1.04	1.04	1.55	1.55	1.55	1.56	1.57	1.57	1.58	1.59
TOTAL	**284.65**	**284.77**	**284.99**	**285.19**	**283.84**	**284.44**	**284.66**	**284.88**	**285.02**	**285.24**	**285.48**	**285.71**	**285.96**

Notes:

[1] Sources with emissions less than 0.005 tons/day have been omitted from the table.

Abbreviations:

BLM – Bureau of Land Management

As discussed previously and analyzed in Appendix A, CARB has concluded that PM_{10} precursor contributions can be considered insignificant for the purposes of this redesignation request and maintenance plan. Furthermore, as shown in Figure 4-1 and Table 4-3, emissions of main PM_{10} precursors are expected to decrease between the attainment year (2016) and the end of the maintenance period (2030). As a result, PM_{10} precursors are not expected to negatively impact maintenance of the PM_{10} NAAQS during the maintenance period.

Figure 4-1. PM_{10} Precursor Emissions for Imperial County, 2016-2030

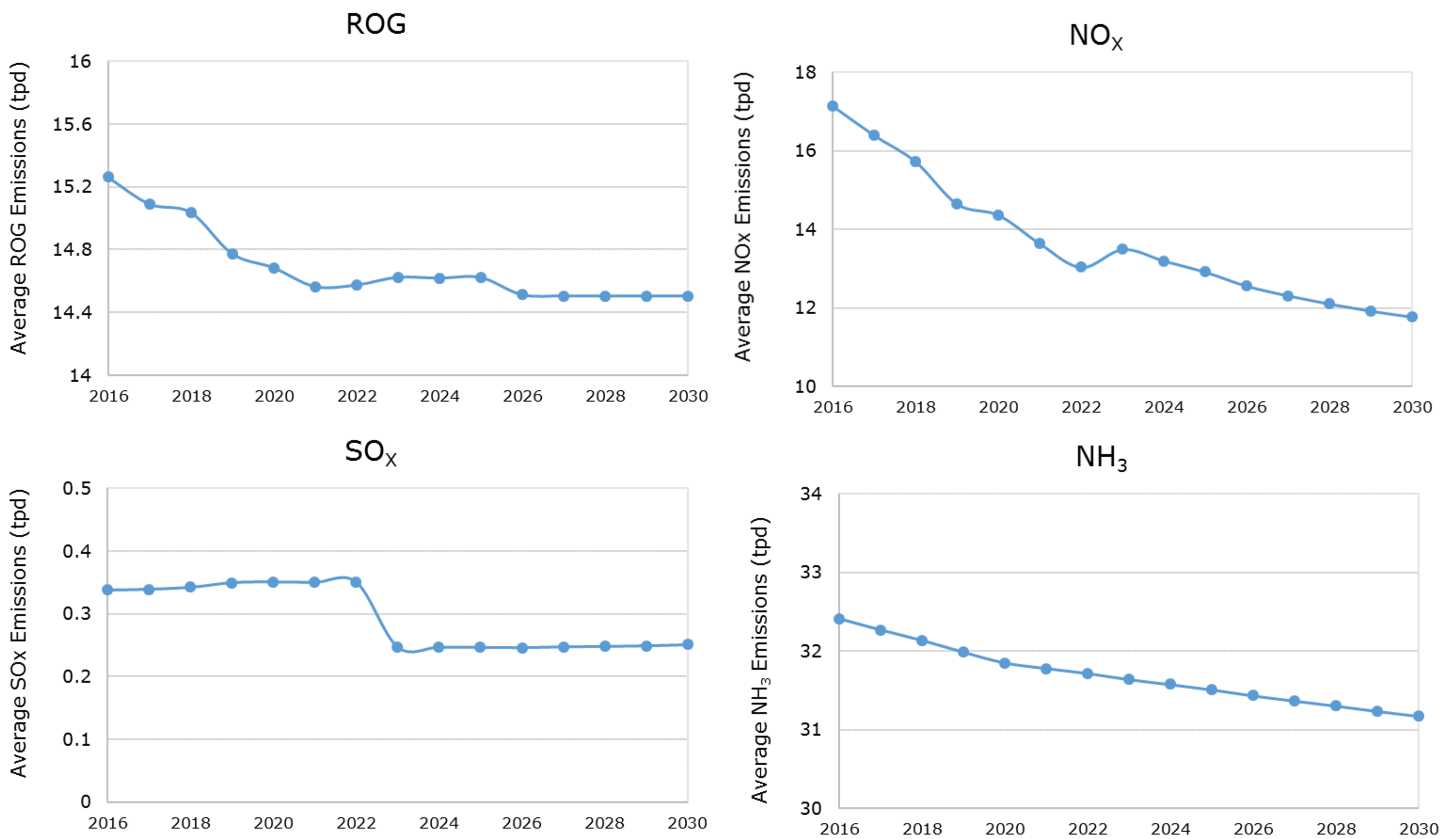


Table 4-3. PM_{10} Precursor Emission Totals for Imperial County, 2016 and 2030								
	ROG Emissions (tpd)		**NO_X Emissions (tpd)**		**SO_X Emissions (tpd)**		**NH_3 Emissions (tpd)**	
	2016	**2030**	**2016**	**2030**	**2016**	**2030**	**2016**	**2030**
	15.26	14.51	17.14	11.77	0.34	0.25	32.41	31.17
% Change from 2016 to 2030	**-5.0%**		**-31.4%**		**-25.8%**		**-3.8%**	

4.1.2 Transportation Conformity

Section 176(c) of the CAA establishes transportation conformity requirements that are intended to ensure that transportation activities do not interfere with air quality progress.[45] The CAA requires that transportation plans, programs, and projects that obtain federal funds or approvals *conform to* applicable SIPs before being approved by a Metropolitan Planning Organization (MPO). Conformity to a SIP means that proposed activities must not:

1) Cause or contribute to any new violation of any standard,
2) Increase the frequency or severity of any existing violation of any standard in any area, or
3) Delay timely attainment of any standard or any required interim emission reductions or other milestones in any area.

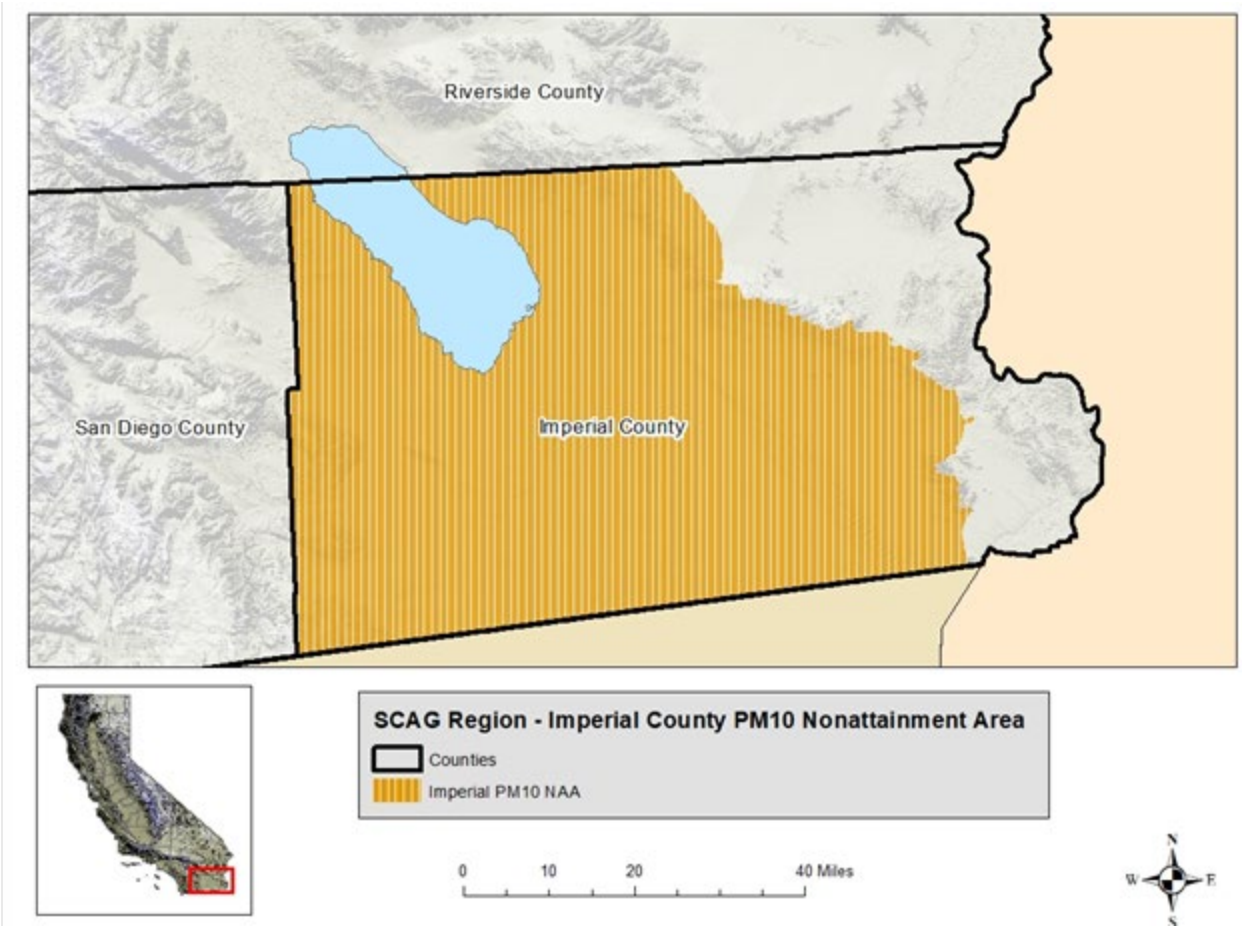
A SIP analyzes the region's total emissions inventory from all sources for purposes of demonstrating RFP, attainment, or maintenance. The portion of the total emissions inventory from on-road highway and transit vehicles in these analyses becomes the "motor vehicle emissions budget." Motor vehicle emission budgets are defined in the transportation conformity regulation[46] as the "portion of the total allowable emissions defined in [a SIP] for a certain date for the purpose of meeting reasonable further progress milestones or demonstrating attainment or maintenance of the NAAQS…[that is] allocated to highway and transit vehicle use and emissions." For conformity purposes, the motor vehicle emissions budget for PM_{10} includes, in addition to vehicular exhaust, tire, and brake wear emissions, re-entrained dust from travel on paved and unpaved roads (71 FR 12498), as well as emissions from road construction if found significant (§ 93.122(e)(2)). Motor vehicle emissions budgets are the mechanism for ensuring that transportation planning activities conform to the SIP. Budgets are set for each criteria pollutant or its precursors, for all RFP base and attainment years. Subsequent transportation plans and programs produced by transportation planning agencies are required to conform to the SIP by demonstrating that the emissions from the proposed plan, program, or project do not exceed the budget levels established in the applicable SIP.

The Imperial County transportation conformity budget is derived from projected PM_{10} emissions within the Southern California Association of Governments (SCAG) Imperial County PM_{10} nonattainment area (Imperial County PM_{10} NAA). Although this area differs from the Imperial County area as shown in Figure 4-2, it captures the overwhelming majority (95%) of transportation emissions generated within Imperial County.

[45] Federal transportation conformity regulations are found in 40 CFR Part 51, subpart T, and in 40 CFR Part 93, subpart A, Conformity to State or Federal Implementation Plans of Transportation Plans, Programs, and Projects Developed, Funded or Approved Under Title 23 U.S.C. of the Federal Transit Laws.

[46] 40 CFR Part 93, Subpart A, §93.101—Definitions. Available at: http://law.justia.com/us/cfr/title40/40-20.0.1.1.7.1.1.2.html. Accessed: November 2016.

Figure 4-2. Imperial County PM_{10} Nonattainment Area as represented in SCAG Model



4.1.2.1 PM_{10} Emission Category and Precursor Requirements for Conformity

Guidance on the motor vehicle emission categories and precursors that must be considered in transportation conformity determinations is found in the transportation conformity regulation and final rules implementing amendments to the regulation.

Direct PM_{10} Emissions

Section 93.102(b)(1) of the Conformity Regulation indicates that directly emitted PM_{10} motor vehicle emissions from the tailpipe, brake wear, and tire wear must be considered in conformity determinations.

Re-Entrained Paved and Unpaved Road Dust PM_{10} Emissions

The March 10, 2006, Final Rule amending the transportation conformity regulation to establish criteria for project-level $PM_{2.5}$ and PM_{10} conformity determinations (71 FR 12498) indicates road dust must be included in regional conformity determinations: "EPA has intended for road dust emissions to be included in all conformity analyses of direct PM_{10} emissions."

Transportation-Related Construction Dust PM_{10} Emissions

Section 93.122(f) of the Conformity Regulation requires regional conformity determinations to include fugitive dust PM_{10} emissions from highway and transit construction activities if these sources are deemed significant contributors to the PM_{10} problem.

4.1.2.2 Assessment of Significance

To facilitate the assessment of significance of sources of mobile PM_{10} dust sources, Table 4-4 lists the mobile PM_{10} dust source categories in the Imperial County PM_{10} NAA and the corresponding percent contribution when compared to the entire PM_{10} emission inventory for the region. Please see Appendix G for a detailed description of the methodology used to estimate emissions found in Table 4-4.

Re-Entrained Paved and Unpaved Road Dust PM_{10} Emissions

As indicated in Table 4-4, re-entrained paved road dust accounts for less than one percent of the region's total direct PM_{10} emissions inventory in the budget years (0.4% in 2016 and 0.5% in 2030), while unpaved road dust accounts for less than seven percent (6.5% in 2016 and 5.9% in 2030). The March 10, 2006, Final Rule amending the transportation conformity regulation to establish criteria for project-level $PM_{2.5}$ and PM_{10} conformity determinations (71 FR 12498) indicates road dust must be included in regional conformity determinations: "EPA has intended for road dust emissions to be included in all conformity analyses of direct PM_{10} emissions." Consequently, this plan makes a finding that PM_{10} emissions from transportation-related paved and unpaved road dust are significant.

Transportation-Related Construction Dust PM_{10} Emissions

As indicated in Table 4-4, road construction dust is less than one percent (0.2% in 2016 and 0.3% in 2030) of the region's total direct PM_{10} emissions inventory in the budget years. Consequently, this plan makes a finding that PM_{10} emissions from transportation-related construction dust are insignificant.

Table 4-4. Annual Average Mobile PM_{10} Dust Categories Contribution to Total PM_{10} Emissions (Tons per Annual Day)

Source Category	2016	Percent of PM_{10} Inventory[b]	Significant?	2030	Percent of PM_{10} Inventory[b]	Significant?
Vehicular Exhaust, Tire, and Brake Wear	0.4	0.2%	Yes	0.5	0.2%	Yes
Re-Entrained Paved Road Dust (Total)	1.2	0.4%	Yes	1.5	0.5%	Yes
Re-Entrained Unpaved Road Dust (City and County Roads)	18.4	6.5%	Yes	16.8	5.9%	Yes
Road Construction Dust	0.6	0.2%	No	0.8	0.3%	No
Total[a]	20.5	NA	NA	19.6	NA	NA

[a] Values from CEPAM v1.05 may not add up due to rounding.
[b] Total PM_{10} emissions in the Imperial County PM_{10} NAA are 284.2 tons per annual day in 2016 and 286.0 tons per annual day in 2030.
Source: CEPAM 1.05 and EMFAC2014

The projected PM_{10} transportation emission inventory for the 2030 horizon year reveals that PM_{10} emissions from road construction; vehicular exhaust, tire wear, and brake wear; and re-entrained paved road dust emissions are projected to increase steadily at a slow rate relative to

2016 year, while re-entrained unpaved road dust emissions are projected to decrease and then remain constant. The Imperial County motor vehicle emissions budgets (i.e., the transportation conformity budgets) reported in Table 4-5 were chosen here to be equal to the projected levels of emissions from the contributing source categories.

4.1.2.3 PM_{10} Conformity Budgets

Conformity budgets must be set for the attainment year for each NAAQS as well as the last year of the maintenance plan. The year 2016 represents a year in attainment and 2030 is the last year of the maintenance plan. The transportation conformity budgets developed for this plan include more recent travel activity projections provided by the SCAG. This travel activity is consistent with SCAG's Final 2016-2040 Regional Transportation Plan/Sustainable Communities Strategy (2016 RTP/SCS).

Average daily emissions are used in the plan consistent with how the PM_{10} standard is measured. Consequently, conformity budgets were calculated in EMFAC2014 using annual average daily emissions for the analysis years listed above. Please see Appendix G for a detailed description of the methodology used to estimate emissions found in Table 4-5.

The transportation conformity budgets in Table 4-5, which were established in consultation with SCAG, the Federal Highway Administration, ICAPCD, CARB, and USEPA satisfy the requirements established in 40 CFR Part 93, Section 118(e)(4). The budgets apply as a "ceiling" or limit on transportation emissions in Imperial County in the year for which they are defined and for all subsequent years until another year for which a different budget is defined (or until a SIP revision modifies the budget).

The motor vehicle emission budgets, presented in the last row in Table 4-5, have been prepared consistent with the on-road emissions inventory by rounding the values to the nearest integer using conventional rounding.

Table 4-5. Annual Average Transportation Conformity Budgets for the Imperial County PM_{10} NAA (Tons per Annual Day)

Source Category	2016	2030
Vehicular Exhaust, Tire, and Brake Wear	0.4	0.5
Re-Entrained Paved Road Dust (Total)	1.2	1.5
Re-Entrained Unpaved Road Dust (City and County Roads)	18.4	16.8
Total[a]	20.0	18.8
Motor Vehicle Emission Budget[b]	**20**	**19**

[a] Values from CEPAM v1.05 may not add up due to rounding.
[b] Motor Vehicle Emission Budgets calculated with EMFAC2014 are rounded up to the nearest tpd.
Source: CEPAM 1.05 and EMFAC2014

4.2 Future Monitoring Network

USEPA guidance[47] states that once an area has been redesignated, the state should continue to operate an appropriate air quality monitoring network in accordance with 40 CFR Part 58 to verify the attainment status of the area. More specifically, daily PM_{10} sampling is required in the area reporting the peak PM_{10} concentration. As discussed in Section 2.2, the District and CARB presently operate SSI and BAM monitors at the Calexico-Ethel, El Centro, Brawley, Westmorland, and Niland air quality monitoring stations. The District in conjunction with CARB will assure the on-going quality of the measured data by performing the operational procedures for data collection including routine calibrations, pre-run and post-run test procedures, and routine service checks. An annual review of the District's entire air quality monitoring network is required by federal regulations to determine if the network is effectively meeting the objectives of the monitoring program. Recently, this responsibility has been taken on by CARB with their annual monitoring network report.[48] If relocation or a closure is recommended in the annual network review, reports are submitted to the USEPA to document compliance with siting criteria. The data collection procedures already in place, in conjunction with the annual review program, will ensure that future PM_{10} ambient concentrations are monitored in the Imperial Valley Planning Area. The District is committed to continue monitoring in the Imperial Valley Planning Area in accordance with 40 CFR Part 58 to verify the attainment status of the area.

4.3 Verification of Continued Attainment

USEPA guidance[49] requires the District to indicate how it will track the progress of its maintenance plan over time. Two options suggested by the guidance include 1) periodic updates to the emissions inventory and 2) periodic review of the inputs and assumptions used for the emission inventory and subsequent updates to the inventory if those inputs or assumptions have significantly changed. The emissions inventory for Imperial County is currently maintained as part of a broader statewide inventory effort led by CARB, as CARB is required to inventory sources of air pollution within California under various state and federal laws.[50] As part of this effort, CARB works with local air districts to create and maintain inventory data. Since portions of the statewide inventory are updated with varying regularity, the District is committing to the second of the two above options to verify continued attainment, that is, the District will review the inputs and assumptions used for the emission inventory on an annual basis. If the District finds that these inputs have changed significantly, the District will solicit

[47] United States Environmental Protection Agency. 1992. Procedures for Processing Requests to Redesignate Areas to Attainment. Memorandum from John Calcagni to USEPA Regional Directors. September 4. Available at: https://www.epa.gov/sites/production/files/2016-03/documents/calcagni_memo_-_procedures_for_processing_requests_to_redesignate_areas_to_attainment_090492.pdf. Accessed: June 2018.

[48] California Air Resources Board. 2015. Annual Monitoring Network Report for Twenty-five Districts in California. June. Available at: http://www.co.imperial.ca.us/AirPollution/Monitoring/2015%20Annual%20Network%20Plan_Volume%201.pdf. Accessed: June 2018.

[49] United States Environmental Protection Agency. 1992. Procedures for Processing Requests to Redesignate Areas to Attainment. Memorandum from John Calcagni to USEPA Regional Directors. September 4. Available at: https://www.epa.gov/sites/production/files/2016-03/documents/calcagni_memo_-_procedures_for_processing_requests_to_redesignate_areas_to_attainment_090492.pdf. Accessed: June 2018.

[50] California Air Resources Board. 2013. Needs and Legal Requirements for the Emission Inventory. Available at: https://www.arb.ca.gov/ei/drei/maintain/legalrequirements.pdf. Accessed: June 2018.

CARB to update the existing inventory and will evaluate the revised inventory against the inventories presented in this maintenance plan.

In addition to the verification actions listed above, the District will assess on a regular basis the PM_{10} air quality data collected from its future monitoring network. Specifically, the PM_{10} 24-hour average concentrations will be compared directly with the PM_{10} NAAQS and will be continually assessed for potential impacts by exceptional events.

4.4 Contingency Plan

CAA Section 175A(d) requires maintenance plans to identify contingency provisions to offset any unexpected increases in emissions and ensure maintenance of the NAAQS. Per the 1992 USEPA guidance[51] regarding contingency plans for areas seeking redesignation, the following are required elements for contingency:

- Clearly identified control measures;
- A schedule and procedure for adoption and implementation of the measures;
- A defined time limit by which the state must take action; and
- An established action level that triggers the contingency measures.

4.4.1 Contingency Plan Trigger

Contingency provisions are traditionally held in reserve and are implemented only if air quality deteriorates beyond a specific level. In general, exceedances or violations of the NAAQS are acceptable triggers for contingency plan implementation. Imperial County, however, often experiences exceedances of the PM_{10} NAAQS[52] caused by high wind dust events, despite the implementation of reasonable controls. To address Imperial's unique circumstances and to ensure appropriate implementation of the contingency plan, the District has developed a process for determining when the trigger for implementation of the continency plan has occurred.

Under this contingency plan trigger process, implementation of the contingency plan will be required when the number of exceedances recorded at a monitor averaged over three consecutive years, is greater than 1.05. The contingency plan trigger process, however, allows certain exceedances to be excluded from this calculation. This aspect of the process is intended to distinguish between exceedances that are not within the District's control, and therefore need not be considered in determining whether the contingency plan has been triggered, and those that are within the District's control, and therefore should be considered.

The process would exclude exceedances from the contingency plan trigger calculation in conjunction with the process for Initial Notification of Potential Exceptional Event (Initial Notification) set forth in 40 CFR 50.14(c)(2). At the conclusion of each quarter, the District will

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[51] United States Environmental Protection Agency. 1992. Procedures for Processing Requests to Redesignate Areas to Attainment. Memorandum from John Calcagni to USEPA Regional Directors. September 4. Available at: https://www.epa.gov/sites/production/files/2016-03/documents/calcagni_memo_-_procedures_for_processing_requests_to_redesignate_areas_to_attainment_090492.pdf. Accessed: June 2018.

[52] 40 CFR Part 50, Appendix K defines an exceedance to mean a daily value that is above the level of the 24-hour standard after rounding to the nearest 10 $\mu g/m^3$.

have 60 days to prepare and submit to CARB a list of exceedances that occurred during the previous quarter, designating those proposed as potential exceptional event exceedances, flagging the data, and providing an initial event description in AQS. The District will also include a copy of previously submitted Initial Notification data and an update on exceedances that occurred in the previous 12 quarters that describes the status of the CARB and USEPA reviews of those events. Once submitted to CARB, CARB will have 60 days to review, during which time they may request additional readily available information from the District. Following CARB's review, CARB will forward the information to USEPA.

In addition to the Initial Notification data, for those exceedances the District believes should be excluded from the contingency plan trigger calculation, the District and/or CARB will provide additional information as an appendix summary table to the Initial Notification as follows:

Analysis/Product	**Criteria**
Hourly and 24-hour average PM_{10} concentrations from following areas: - Imperial County - Coachella Valley - Yuma	Exceedances at multiple monitors in the specified areas (i.e. >2 exceedances/day)
NOAA LCD hourly observation tables - Imperial Co Airport - El Centro NAF - Upwind sites	Wind speed $\geq$ 25 mph consistent w/ increase in hourly PM_{10}
NOAA LCD hourly observation tables - Imperial Co Airport - El Centro NAF - Upwind sites	Reduced visibility < 10 miles consistent w/ increase in hourly PM_{10}
NWS wind/dust advisories or warnings for following areas: - Imperial County - San Diego Mountains - San Diego Deserts - Coachella Valley - Yuma	Issuance of advisory or warning in the specified forecast areas consistent w/ increase in hourly PM_{10}
Summaries of dust complaints and/or notice of violations	No dust complaints are received, or dust complaints do not involve anthropogenic source(s) located upwind of an exceeding monitor.

If any of these five criteria are not met, or if other available data contradict the assessment, the District and/or CARB will include additional information and analysis in the appendix to the quarterly report to support exclusion of the data from determinations of whether the contingency plan has been triggered. The District will confer with USEPA to determine the type of information needed to determine the cause of the exceedance prior to submittal of the quarterly report. This additional information might include:

- a detailed analysis of upwind wind speed and direction;
- PM_{10} and/or $PM_{2.5}$ concentrations from non-regulatory monitors in the area;
- HYSPLIT back-trajectory analysis;
- satellite image or remote sensing analysis;
- an evaluation of upwind source area (including further evaluation of dust complaints/NOVs or known contributing anthropogenic sources);
- PM speciation or PM_{10}/$PM_{2.5}$ ratio analysis; and/or
- other event specific analysis needed to appropriately determine cause of exceedance.

USEPA will review the quarterly reports submitted by CARB and the District. USEPA will notify the District if submitted documentation is insufficient to support exclusion from the contingency plan trigger calculation, and will include such exceedances in calculating the trigger for the contingency plan. If the contingency plan is triggered, the District will begin implementation as described in the next section. If the District and/or CARB subsequently provide additional information to USEPA such that the criteria for exclusion from the contingency plan trigger calculation are satisfied, USEPA will notify the District that the contingency plan trigger will be adjusted. If the resulting value is less than 1.05, implementation of the contingency plan can be halted unless triggered in a subsequent quarter. Figure 4-3 provides a visual depiction of the timeline of events for this proposed process.

4.4.2 Contingency Provisions

If USEPA determines that contingency provisions have been triggered in Imperial County, the District would have 18 months from the USEPA notification date to evaluate the cause of the exceedance and to take the appropriate action. This process would consist of first analyzing the exceedances that caused the violation to determine its possible causes. Based on the potential sources causing the increase in ambient PM_{10}, certain measures would be examined to determine if there exist emission reductions not already used for demonstrating maintenance.

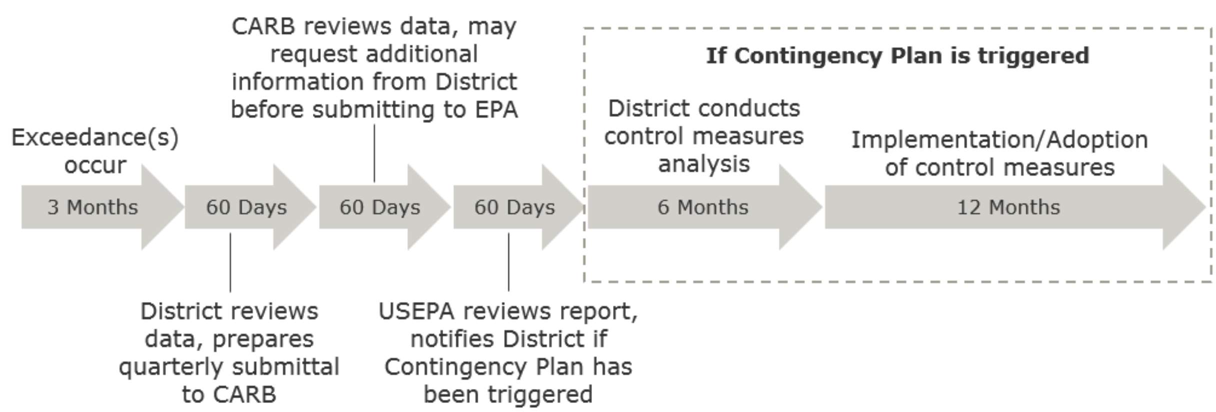
To initiate this process, ICAPCD will first consult with community and local industry members to determine if any voluntary or incentive-based control measures could be implemented to achieve reductions in PM_{10} emissions. If these measures do not adequately address the causes of the exceedances, then the District will look to its collection of fugitive dust rules (ICAPCD Rules 800-806 or collectively, Regulation VIII), or other rules, as appropriate, for measures that can be improved or expanded to achieve additional PM_{10} emissions reductions. For example, if it were determined that non-exceptional event exceedances could be attributed to windblown dust (a known significant source of PM_{10} in the Imperial Valley Planning Area), then a contingency control measure based on revisions to Rule 804 (Open Areas) could be implemented. Table 4-6 includes a summary of potential sources that could contribute to exceedances and the ICAPCD rules that would be explored as options for control through improvement or expansion of applicability. The examples provided are specific to sources of fugitive dust, as it accounts for the majority of PM_{10} emissions in Imperial County.

Table 4-6. Example Emission Sources and Corresponding Rules to Improve/Expand Applicability for Additional Control

Emission Source	ICAPCD Rule
Construction and Earthmoving Activities	801
Bulk Materials	802
Carry-out and Track-out	803
Open Areas	804
Paved and Unpaved Roads	805
Agricultural Operations	806

The District will aim to complete its analysis of the exceedances and available contingency measures within six months of USEPA's notification that contingency was triggered. This will then be followed by a 12-month period during which the contingency measures will be adopted and implemented. Figure 4-3 displays this timeline, including the events leading up to implementation.

Figure 4-3. Timeline of Events Leading to Implementation of Contingency Measures



4.4.3 Contingency Plan Implementation

The District is committed to maintaining its regular review of the ambient PM_{10} monitoring data to assess continued maintenance of the 24-hour standard. If the Contingency Plan Trigger is reached (i.e., a potential violation of the 24-hour PM_{10} NAAQS, consistent with 40 CFR Part 50 Appendix K, Section 2.3(c) following an initial review of exceedances through the Initial Notification of an Exceptional Event Process described above), the District commits to initiating the contingency provisions described above, including identifying measures, either through expanding existing rules or utilizing measures from outside the rulebook to achieve the necessary reductions within 18 months of USEPA's notification. Consistent with CAA Section 175A(b), the District also commits to submitting a second maintenance plan eight years after formal redesignation by USEPA to show maintenance for at least the next 10-year period.

5 Salton Sea Considerations

Located in the northwest corner of Imperial County, the Salton Sea lies in the bed of an ancient lake that has been repeatedly desiccated and reformed by flooding within the Lower Colorado Basin. The current Sea was formed by a break in the bank of a canal carrying water from the Colorado River to the Imperial Valley in 1905. The water level of the Sea has been sustained since then by agricultural drainage waters flowing from lands under cultivation in the Coachella and Imperial Valleys. In 2002, a water transfer agreement was executed by the Imperial Irrigation District (IID), the Coachella Valley Water District (CVWD), and urban water agencies in Southern California that arranges for the transfer of agricultural water to urban areas for domestic use. This and related agreements, collectively referred to as the Quantification Settlement Agreement (QSA), will significantly reduce drainage flows to the Salton Sea after 2017, the year until which IID must maintain existing salinity levels in the Sea by supplying mitigation water.

The Salton Sea will continue to shrink, especially as drainage flows from local agricultural use are significantly reduced in 2017 and beyond. Stabilizing the parts of the playa expected to be emissive as they are exposed will minimize dust. The State's Salton Sea Management Program (SSMP) and Phase I Plan and IID's Salton Sea Air Quality Management Program (SS AQM Program) are designed to proactively provide reasonable controls as the playa is exposed. 2016 Amendments to ICAPCD Rule 804 allow establishment of alternate BACM on exposed playa that is not stabilized; this provides an adopted contingency mechanism for any emissive playa that is not stabilized as it is exposed.

An increase in salinity levels in the Salton Sea threatens both fish and waterfowl habitat values. Under legislation enacted in 2003, the Secretary of Resources in consultation with the Department of Water Resources, appropriate air agencies, and other relevant agencies was required to undertake a restoration study to determine a preferred alternative for the restoration of the Salton Sea ecosystem and the permanent protection of wildlife dependent on that ecosystem. In June 2007, a final Programmatic Environmental Impact Report[53] that analyzed each of eight alternative restoration options was certified and a preferred alternative was recommended to the state legislature. Under all of the alternatives studied, a portion of the Sea bed would be exposed. These exposed areas could become sources of windblown dust, depending on the granularity of the exposed soils and the behavior of salt crystals on the soil surface.

The control of windblown dust from exposed sea bed or playa has benefitted dramatically from control efforts tested in a similar environment at Owens Lake, California. Owens Lake was completely desiccated in the 1920s by the diversion of all incoming flows to an aqueduct

[53] California Department of Water Resources, *et. al*. 2007. Salton Sea Ecosystem Restoration Program. Final Programmatic Environmental Impact Report. Available at: https://www.water.ca.gov/Programs/Integrated-Regional-Water-Management/Salton-Sea-Unit. Accessed: June 2018.

constructed by the Los Angeles Department of Water and Power. Due to the highest PM_{10} concentrations recorded in the United States from windblown dust, the Owens Lake region has been subject to federal CAA nonattainment planning requirements since 1991. Under the most recently approved PM_{10} attainment plan, almost 45 square miles of lakebed surface are being treated with gravel cover, shallow flooding, and managed vegetation BACM. The plan also calls for controls on an additional 3.62 square miles by December 31, 2017, and recognizes modifications to existing BACM, including “reduced thickness gravel”, “brine shallow flooding”, and “tillage with BACM backup.”[54]

Differences in soil and wind conditions between Owens Lake and the Salton Sea suggest that windblown dust issues may be less of a problem at the Salton Sea than experienced at Owens Lake. Salts at Owens Lake are dominated by sodium carbonate, which tends to fracture easily into very fine particles, while sodium chloride, which is harder and less vulnerable to abrasion, constitutes the majority of the salt at the Salton Sea. Additionally, peak wind speeds and the number of hours per year with wind speeds above recognized windblown dust generation thresholds are substantially higher at Owens Lake than at the Salton Sea. On the basis of these two conditions, worse case PM_{10} windblown emission rates—and resultant ambient PM_{10} concentrations—are expected to be lower at the Salton Sea than are recorded at Owens Lake.

Several state statutes and water use permits provide significant authority to ICAPCD and CARB to control windblown PM_{10} emissions from the Salton Sea. Section 2081.7 of the California Fish and Game Code makes the state Department of Water Resources responsible for any environmental impacts related to the use or transfer of water from the Imperial Valley to out-of-basin users that would cause declines in Salton Sea levels or increases in salinity. The California State Water Resources Control Board permit that authorizes transfer of agricultural water to urban water districts[55] requires IID to comply with all PM_{10} ICAPCD rules, including Rule 804. This rule requires the owner of undeveloped property[56] to use BACM to maintain stabilized soil surfaces and to prevent the emission of visible dust in concentrations greater than those which produce 20 percent or more opacity. Rule 804 was recently amended to accommodate the changing conditions at the Salton Sea. Details regarding the changes are provided in Section 5.3.

In May 2015, Governor Brown of California established the Salton Sea Task Force with the objective of preserving two aspects of the environment that are affected by the water levels of the Sea: the area’s ecosystem and its air quality. This is made possible by managing the various sources of water inflow to the Sea in order to maintain its salinity and area of exposed playa, both of which are most heavily influenced by changes in the Sea’s volume. The Salton

[54] Ramboll Environ. 2016. Great Basin Unified Air Pollution Control District 2016 Owens Valley Planning Area PM_{10} State Implementation Plan. April. Available at: https://www.gbuapcd.org/District/AirQualityPlans/OwensValley/. Accessed: June 2018.

[55] Order WRO 2002-0013, In the Matter of Imperial Irrigation District’s (IID) and San Diego County Water Authority’s (SDCWA) Amended Joint Petition for Approval of a Long-Term Transfer of Conserved Water From IID to SDCWA and To Change The Point of Diversion, Place of Use, and Purpose of Use Under Permit 7643 Issued on Application 7482 of IID, State Water Resources Control Board, December 20, 2002.

[56] 0.5 acres or more in urban areas or 3.0 acres or more in rural areas, and contains at least 1000 square feet of disturbed surface areas.

Sea Task Force has committed to developing a plan that consists of clearly defined and measurable goals. Its main short-term goal is to create between 9,000 and 12,000 acres of habitat and dust suppression projects. Later on, the medium-term plan is to expand these projects to cover an area of 18,000 to 25,000 acres. Achieving these goals will require effort from various regulatory agencies and other groups. At the initiation of the task force, Governor Brown appointed members to it from the Natural Resources Agency, the California Environmental Protection Agency, the State Water Resources Control Board, CARB, and the California Energy Commission. Additional oversight from the Colorado River Regional Water Board, ICAPCD, and South Coast Air Quality Management District (SCAQMD) will be provided alongside the work from these groups in order to monitor and assess progress and ensure that the goals are met in a timely manner.

The objectives of the Salton Sea Task Force will be implemented through the Salton Sea Management Program (SSMP). Moving forward the SSMP, in March 2017 the task force released a draft technical memorandum titled, "Phase I: Ten-Year Plan". This document outlines the first 10-year phase of the SSMP and also addresses the development of additional management measures that will be implemented in later phases. In November 2017, certain provisions of the Phase I Plan, specifically the acreages to be controlled on an annual basis, were incorporated into water order WRO 2002-0013.[57] Additional details regarding the Phase I Plan are provided in Section 5.1.

Representatives from ICAPCD serve on the Air Quality Committee of the SSMP and with fellow committee members are tasked with coordinating with agencies and existing mitigation programs to develop a comprehensive air quality program for the SSMP. One such existing mitigation program is the IID's Salton Sea Air Quality Mitigation Program (SS AQM Program). In July 2016, IID released a document outlining the SS AQM Program and IID's approach to addressing air quality mitigation requirements associated with the QSA.[58] Details regarding the SS AQM Program are provided in Section 5.2.

The requirements to control PM_{10} emissions from exposed playa surfaces incorporated into state law and water transfer permits will mitigate potential impacts on air quality from implementation of the QSA.

5.1 Salton Sea Management Program - Phase I: 10 Year Plan

In March 2017, the State of California (through the Salton Sea Task Force) published a draft of a document entitled "Phase 1: 10 Year Plan" (provided as Appendix I). This technical memorandum outlines the first phase of the SSMP and serves as a guide for state and federal actions towards developing projects designed to minimize environmental and human health impacts resulting from water level reductions at the Salton Sea. A major component of this plan is to expedite both the construction of wildlife habitats and the suppression of fugitive dust at the Sea, specifically at areas where playa is exposed or will be exposed in the near future due to

[57] One can find additional information about these revisions here: http://www.waterboards.ca.gov/waterrights/water_issues/programs/salton_sea/. Accessed: June 2018.

[58] Formation Environmental, LLC. *et al*. 2016. Salton Sea Air Quality Mitigation Program. Prepared for Imperial Irrigation District. July. Available at: http://www.iid.com/Home/ShowDocument?id=11827. Accessed: June 2018.

decreasing water levels. The 10 year plan lays out specific goals for the acreage of playa to be covered by these types of projects annually between 2019 and 2029. The locations for habitat development projects will be selected based on landscape characteristics, such as water and soil availability, compatibility within the overall habitat already present, and degree of soil emissivity. The locations for dust suppression projects will be determined in coordination with the Imperial Irrigation District's SS AQM Program, as well as ICAPCD, CARB, and SCAQMD. Collaborative efforts among these groups will ensure that the projects implemented to achieve the acreage goals are compatible with the interests of all parties involved and feasible within established budgets. The projects will be conducted through the existing Water Transfer Joint Powers Authority budget process.

For areas deemed amenable to dust suppression projects, the SSMP will include an air quality component modeled after the SS AQM Program, focusing on the portions of it that deal with researching and monitoring at the Sea to determine particular dust suppression needs in order to identify and implement potential solutions for them. The current vision for the SSMP includes both water-dependent and waterless methods for dust suppression, though continuous monitoring and evaluation will take place to determine which techniques to use for specific areas. The Phase I Plan includes a breakdown of cost estimates to go along with the acreage goals for the dust suppression and habitat development projects. Overall, construction is proposed to cover 29,800 of the 48,300 acres of newly exposed playa by 2029. For Phase I, the projects will be implemented in areas on the north and south ends of the lake, with efforts to focus on exposed playa that have demonstrated emissivity. The estimated cost of these Phase I projects is $303 million.

5.2 Salton Sea Air Quality Mitigation Program

In order to determine if and when new control measures at the Salton Sea should be implemented, conditions there must be monitored. Based on these observations, an effective dust control strategy can be developed to address the specific emission source areas. With this approach in mind, IID created the SS AQM Program, the most comprehensive Salton Sea air quality mitigation program established to date (provided as Appendix J). As mentioned previously, as part of the Salton Sea Task Force the SSMP and the Air Quality Committee are tasked with integrating existing mitigation programs into an overarching air quality program for the Salton Sea. Therefore, this program is relevant to the future of air quality in Imperial County.

The SS AQM Program contains three distinct components which identify, prioritize, and guide implementation of various dust control measures for use on the exposed playa at the Salton Sea. The first component consists of an annual PM_{10} Emissions Inventory and Monitoring Program, which includes goals of mapping the current and projected exposed playa, monitoring its surface characteristics, and measuring its emission potential. Accomplishing these goals each year leads to the report of the annual inventory monitoring results. This information is then used to prioritize the playa dust source areas for control. From this, the second major component of the program can be executed: the dust control strategy. This includes developing and testing different dust control measures which have been tailored to the specific climate and soil conditions at the Salton Sea. These test results are then considered along with Salton Sea restoration projects, renewable energy and habitat projects, and agricultural and other land use projects in order to develop the Annual Proactive Dust Control Plan. These plans are completed within the first quarter of every year by IID, in collaboration with Imperial County and ICAPCD.

Finally, the third component of the SS AQM Program is the implementation of the Annual Proactive Dust Control Plan. The IID takes into account the details of the plan, along with any potential regulatory orders from ICAPCD or SCAQMD, in order to reach a final board action. Once the plan is implemented, the dust control performance is monitored and, if necessary, the measures are enhanced to achieve a more stabilized surface. The performance of the dust control measures is partially evaluated through ambient air monitoring. Since February 2010, six monitoring stations surrounding the Salton Sea have measured and recorded particulate matter concentrations in the ambient air. All six stations measure $PM_{2.5}$ and PM_{10} over five-minute and one-hour averaging periods. The data generated by these monitoring stations are used to produce the annual emissions inventories,[59] assemble dust control plans, and evaluate the performances of said plans and thus, represent an important aspect of the SS AQM Program.

It is important to note that the SS AQM Program does not alter or replace any of the Salton Sea air quality monitoring and mitigation requirements previously set forth. Rather, it expands upon them by providing additional contingency measures specific to newly exposed playa around the Sea. Those playa which are exposed as a direct result of water transfers under the QSA are subject to the air quality monitoring and mitigation requirements described within the QSA, and IID is specifically tasked with controlling the related dust. To ensure that this occurs, ICAPCD has the ability to issue regulatory orders to IID and other culpable entities if dust control measures on the Salton Sea playa are inadequate. On top of this, all other federal, state, and local rules and regulations pertaining to air quality still apply. Included among these is the previously mentioned Rule 804. This rule involves the control of fugitive dust sources from disturbed open areas, which by definition, includes emissive Salton Sea playa.

5.3 2016 Rule 804 Amendments

Rule 804 requires the owner of undeveloped property[60] to use BACM to maintain stabilized soil surfaces and to prevent the emission of visible dust in concentrations greater than those which produce 20 percent or more opacity. Recognizing the possibility that previously established BACM might not be efficient or effective at controlling dust on future exposed playa at the Salton Sea, ICAPCD proposed a strategic amendment to Rule 804, which became effective on April 12, 2016. Prior to the amendment, Rule 804 limited the available BACM to the following controls: apply water or dust suppressants to all unvegetated areas; establish vegetation on all previously disturbed areas; and pave, apply, and maintain gravel or chemical stabilizers or suppressants.[6] The amendment added language to allow for "Alternative BACM" to be permissible. In order for Alternative BACM to be approved, the amendment stipulates that a technical evaluation must be submitted to ICAPCD and an ICAPCD-witnessed field test must take place and demonstrate that the proposed Alternative BACM achieves PM_{10} emission reductions equivalent to the previously established BACM. In addition, the Alternative BACM

[59] The results from the 2016/2017 monitoring year are available online at: https://www.iid.com/water/library/qsa-water-transfer/mitigation-implementation/air-quality-mitigation. Accessed: June 2018.

[60] 0.5 acres or more in urban areas or 3.0 acres or more in rural areas, and contains at least 1000 square feet of disturbed surface areas.

must achieve the stabilized surface and opacity requirements of the rule.[61] Once these conditions have been met, an Alternative BACM can be approved and used for Rule 804 compliance. This amendment allows for the testing and potential use of “new” dust control measures which might be better suited than the current BACM for addressing the changing conditions at the Salton Sea. In this sense, the amendment to Rule 804 is a proactive contingency measure.

[61] Imperial County Air Pollution Control District. 2016. Rule 804: Open Areas. Revised April 12, 2016. Available at: http://www.arb.ca.gov/DRDB/IMP/CURHTML/R804.PDF. Accessed: June 2018.

6 Redesignation Request and Summary Checklist

The District is requesting redesignation of the Imperial Valley Planning Area from Serious nonattainment to attainment of the PM_{10} NAAQS under CAA Section 107(d)(3)(E) protocol.

Section 107(d)(3)(E) of the CAA requires the USEPA administrator to make five findings prior to granting a request for redesignation:

1. The USEPA has determined that the NAAQS has been attained.
2. The applicable implementation plan has been fully approved by the USEPA under Section 110(k).
3. The USEPA has determined that the improvement in air quality is due to permanent and enforceable reductions in emissions.
4. The State has met all applicable requirements for the area under Section 110 and Part D.
5. The USEPA has fully approved a maintenance plan, including a contingency plan, for the area under Section 175A.

As described in Chapter 2 of this document, PM_{10} air quality in the Imperial Valley Planning Area, excluding exceptional events, did not violate the NAAQS from 2014 through 2016. Specifically, Section 2.3 provides the confirmation that the 2014-2016 24-hour PM_{10} concentration data has attained the NAAQS. Section 1.4 characterizes the Imperial County 2009 PM_{10} SIP and subsequent Settlement Agreement with the USEPA and provides reference to the USEPA's approval of Imperial County's fugitive dust rules as BACM for significant sources. With the full execution of the provisions in the Settlement Agreement, Imperial County satisfied its requirements under CAA Section 110(k). In accordance with USEPA guidance, Imperial County requests that approval action on outstanding SIP elements occurs simultaneously with this redesignation request. Chapter 3 discusses how Imperial County's BACM fugitive dust rules have led to permanent and enforceable emissions reduction in the area. Sections 2.4 and 3.4 address the applicable requirements under CAA Section 110 and Part D and Chapter 4 presents the District's maintenance plan. Together these sections directly address and satisfy the requirements of CAA Section 107.

A checklist of requirements pertinent to this 2018 Redesignation Request and Maintenance Plan (as outlined both in CAA Section 107(d)(3)(E) and in the September 4, 1992 USEPA memorandum[62] regarding procedures for processing requests to redesignate areas to attainment) is presented in Table 6-1. In addition, because Imperial County is requesting approval action on outstanding SIP elements under CAA Section 110 and Part D as part of this redesignation request, those items have been included in Table 6-1 as well. Note that because Imperial County is shown in this document to have attained the 24-hour PM_{10} NAAQS, based on 2014-2016 monitoring data, RFP and milestone requirements are unnecessary, and specifically the five percent yearly emission reductions requirement does not apply to future years. As

[62] United States Environmental Protection Agency. 1992. Procedures for Processing Requests to Redesignate Areas to Attainment. Memorandum from John Calcagni to USEPA Regional Directors. September 4. Available at: https://www.epa.gov/sites/production/files/2016-03/documents/calcagni_memo_-_procedures_for_processing_requests_to_redesignate_areas_to_attainment_090492.pdf. Accessed: June 2018.

documented in Table 6-1, all remaining requirements applicable to this 2018 Redesignation Request and Maintenance Plan have been successfully addressed.

Table 6-1. Plan Checklist

Plan Components	Required Elements	Document Reference	Comments
Redesignation Request	Attainment of the NAAQS; CAA Sec. 107(d)(3)(E)(i)	Section 2.3	Pending USEPA review and approval of exceptional event documentation
	USEPA approval of State Implementation Plan; CAA Sec. 107(d)(3)(E)(ii)	Sections 2.4 and 3.4	Pending as part of this submittal; see Section 110 and Part D portion of this table.
	Air quality improvements due to permanent and enforceable emissions reductions; CAA Sec. 107(d)(3)(E)(iii)	Section 3.3	Included.
	USEPA approval of a maintenance plan and contingency plan; CAA Sec. 107(d)(3)(E)(iv)	Chapter 4	Pending as part of this submittal.
	Section 110 and Part D requirements have been met; CAA Sec. 107(d)(3)(E)(v)	Sections 2.4 and 3.4	Pending as part of this submittal; see Section 110 and Part D portion of this table.
Maintenance Plan	Attainment Inventory; CAA Sec. 175A(a) and (USEPA, 1992)	Section 4.1.1	Included; emissions inventory for attainment year (2016)
	Maintenance Demonstration; CAA Sec. 175A(a) and (USEPA, 1992)	Section 4.1	Included; future year emissions inventories (2018-2030) provided in support of maintenance demonstration.
	Future Monitoring Network, featuring daily PM_{10} monitoring; CAA Sec. 175A(a) and (USEPA, 1992)	Section 4.2	Commitment established
	Verification of Continued Attainment; CAA Sec. 175A(a) and (USEPA, 1992)	Section 4.3	Commitment established
	Contingency Plan; CAA Sec. 175A(d) and (USEPA, 1992)	Section 4.4	Included

Table 6-1. Plan Checklist

Plan Components	Required Elements	Document Reference	Comments
Section 110 and Part D Requirements	Emissions Inventory; CAA Sec. 172(c)(3)	Section 4.1.1 and Appendix H	Included.
	A plan that enables attainment of the PM_{10} federal air quality standard; CAA Sec. 189(b)(1)(A)	Chapters 2 and 3	This plan demonstrates that Imperial County attained the PM_{10} NAAQS, based on 2014-2016 monitoring data. Attainment was due, in part, to ICAPCD's adoption and subsequent implementation of Regulation VIII fugitive dust rules, which have been declared by USEPA as BACM for significant sources of PM_{10}.
	Annual reductions in PM_{10} or PM_{10} precursor emissions that are of no less than 5 percent until attainment; CAA Sec. 189(d)	Does not apply	Imperial County is shown in this document to have already attained the PM_{10} NAAQS. Therefore, this provision is not applicable to future years.
	BACM and BACT for significant sources and major stationary sources of PM_{10}, to be implemented no later than 4 years after reclassification of the area as serious; CAA Sec. 189(b)(1)(B)	Sections 1.4.1, 1.4.2, Chapter 3, and Appendix E	Reclassification of Imperial County to Serious nonattainment for PM_{10} occurred on August 2004. ICAPCD's Regulation VIII fugitive dust rules have been declared by USEPA as BACM for significant sources. A revised significance source analysis was included in this Plan and shows that no new emission sources would qualify as significant.
	Transportation conformity and motor vehicle emission budgets in accord with the plan; CAA Sec. 176	Section 4.1.2	Included.
	RFP and quantitative milestones; CAA Sec. 172(c)(2) and Sec. 189(c)	Does not apply	These requirements are not applicable in the present plan since Imperial County is already in attainment, based on 2014-2016 monitoring data.
	Contingency measures; CAA Sec. 172(c)(9)	Section 4.4	Included.

7 References

Agricultural Impact Associates. Economic Contributions of Imperial County Agriculture. Crop Report PLUS Series. December 2017. Available at: http://www.co.imperial.ca.us/ag/docs/spc/2016_Imperial_County_Crop_Report_Plus.pdf. Accessed: June 2018.

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Appendix A
PM_{10} Precursor Analysis for Imperial County

Appendix B
Executed Settlement Agreement

Appendix C
2014-2016 Monitoring Data for Imperial County

Appendix D
2014-2016 Documented Exceptional Events for Imperial County

Appendix E

Best Available Control Measures Analysis for the 2018 Imperial County Redesignation Request and Maintenance Plan for PM_{10}

Appendix F
Regulation VIII Fugitive Dust Rules

Appendix G
Emission Inventory Documentation

Appendix H
PM_{10} and PM_{10} Precursor Emission Inventories

Appendix I
Salton Sea Management Program Phase I: 10-year Plan (March 2017)

Appendix J
Salton Sea Air Quality Mitigation Program
(July 2016)

Appendix A. Precursor Analysis

In addition to direct emissions, particulate matter is formed when gases are transformed into particles through chemical reactions in the atmosphere. We refer to these gases as precursors. Sulfur oxides (SO_x), nitrogen oxides (NO_x), volatile organic compounds (VOC) and ammonia (NH_3) all contribute to the formation of particulate matter. For this analysis, we evaluated their contribution to the formation of PM_{10}.

PM_{10} contains coarse particles (larger than 2.5 µm in diameter), and fine particles (2.5 µm in diameter or smaller). The fine particles ($PM_{2.5}$) consist primarily of nitrate, sulfate, and elemental and organic carbon. Coarse particles usually contain earth crustal materials and fugitive dust produced by the break-up of larger solid particles. This can include wind-blown dust from agricultural processes, uncovered soil, and unpaved roads, as well as re-entrained road dust.

For this analysis, staff considered all available PM_{10} and $PM_{2.5}$ mass and speciation data. Because PM_{10} and $PM_{2.5}$ speciation data is only recorded once every 6 days, it is important to analyze more data points to evaluate whether PM_{10} precursors play a significant role to the PM_{10} exceedances in Imperial County. In order to assure that the most data points are considered, Staff reviewed the last ten years of data, from 1/1/2007 through 12/31/2016, to identify days with matching PM_{10} mass data and PM_{10} and $PM_{2.5}$ speciation data. In order to maximize the number of days with parallel PM_{10} mass and PM_{10} and $PM_{2.5}$ speciation data, we considered days with concentrations greater than 95 percent of the PM_{10} standard (>143 µg/m^3). For days near or over the PM_{10} standard that also coincided with a PM_{10} and $PM_{2.5}$ speciation sample day, Staff identified five days with PM_{10} concentrations ranging from 144 µg/m^3 to 305 µg/m^3 (Table 1).

Table 1. High PM_{10} days between 1/1/2007 and 12/31/2016 with matching PM_{10} and $PM_{2.5}$ speciation data

	Mass (µg/m^3)		**Measured or Estimated PM_{10} Contribution (µg/m^3)**				**Estimated Precursor Contribution (µg/m^3)**			
Date	**PM_{10}**	**$PM_{2.5}$**	**NO_3**	**SO_4**	**NH_4**	**Carbon**	**NO_X**	**SO_X**	**NH_3**	**VOC**
6/5/07	282	30	2.9	4.6	2.6	14.4	3.7	4.6	5.5	7.2
10/21/07	144	15	1.1	3.2	1.5	3.8	1.4	3.2	2.6	1.9
7/18/09	147.9	25	2.1	3.7	2.0	8.2	2.7	3.7	4.1	4.1
9/4/09	265.8	27	1.9	6.5	3.0	5.5	2.5	6.5	4.9	2.8
8/13/12	305.3	23	3.8	4.4	2.8	8.6	4.9	4.4	6.6	4.3
Average	229	24	2.4	4.5	2.4	8.1	3.0	4.5	4.7	4.1
Percent Contribution of the Average Precursor Contribution to the Average PM_{10} Mass							1.3	2.0	2.1	1.8

PM_{10} nitrate and PM_{10} sulfate in Table 1 represent measured concentrations. PM_{10} ammonium represents the calculated value based on the amount needed to fully neutralize all measured nitrate and sulfate. PM_{10} carbon data are not measured at Calexico. Since most of the PM_{10} carbon is in the fine fraction, we used $PM_{2.5}$ carbon estimate as a surrogate for the PM_{10} carbon. We estimated $PM_{2.5}$ carbon as a difference between measured $PM_{2.5}$ mass and the sum of ammonium nitrate, ammonium sulfate, geological material, and elemental species concentrations.

The paragraphs that follow examine each precursor.

Sulfur Oxides - SO_x

Since sulfate can exist in the atmosphere in the form of sulfuric acid if it's not neutralized by ammonia, the SO_x contribution is evaluated by estimating sulfate contribution to the elevated PM_{10} concentrations. On average, sulfate contributes 4.5 μg/m^3 or 2 percent of PM_{10} mass.

Nitrogen Oxides - NO_x

Since NO_x contributes directly to ammonium nitrate formation, its impact on the PM_{10} design value was evaluated by summing all measured nitrate plus ammonium needed to fully neutralize measured nitrate. On average, the two components together contribute 3 μg/m^3 or 1.3 percent to the PM_{10} mass.

Ammonia – NH3

Since in the absence of ammonia, nitrate would only exist as a gas, ammonia contribution to the elevated PM10 concentrations is represented by all measured ammonium plus all measured nitrate ion. On average, the two components together contribute 4.7 μg/m^3 or 2.1 percent to the PM_{10} mass.

Volatile Organic Compounds - VOC

There are two routes by which VOCs can contribute to ambient PM_{10}. The first is through various chemical reactions leading to the formation of Secondary Organic Aerosols (SOAs). The second is through photochemical reactions that create oxidants such as ozone and hydroxyl radicals, which in turn oxidize NO_X emissions leading to the formation of particulate ammonium nitrate. As noted above, ammonium nitrate is not a significant component of $PM_{2.5}$. Therefore, the impact of VOC emissions on the PM_{10} design value through nitrate formation is also insignificant and our analysis will be limited to the impact of VOC emissions on SOA formation. Between January 2015 and February 2016 CARB contracted with Professor Schauer's group at the University of Wisconsin, Madison (UWM), to conduct a yearlong organic molecular marker study in the San Joaquin Valley. We used these data to estimate SOA contribution to the measured carbon concentrations. The estimated contribution ranged from 17 percent to 45 percent depending on the site and averaging time (annual, exceedance, or winter average). In order to consider a worst-case scenario, we assumed that 50 percent of organic matter is due to SOAs. Applying this assumption to measured concentrations, we estimated that VOCs contribute 4.1 $\mu g/m^3$ or 1.8 percent of PM_{10} mass. This value represents the highest possible SOA concentration.

In order to evaluate the appropriateness of this estimate, we used the organic aerosol tracer tool located at the Western Regional Air Partnership (WRAP) Technical Support System (TSS) website (http://vista.cira.colostate.edu/tss/). This tool allows us to investigate the contribution of primary and secondary anthropogenic and biogenic sources on modeled carbon at Class I areas. Annual average biogenic and anthropogenic SOA concentrations at the Joshua Tree National Park, the closest Class I area monitor to Calexico, were estimated to be about 0.58 and 0.09 $\mu g/m^3$, respectively for the 2002-2004 baseline. Therefore, our estimate of 4.1 $\mu g/m^3$ is reasonable and conservative.

Whether a $PM_{2.5}$ precursor is significant for the 24-hour $PM_{2.5}$ standard is determined by evaluating if a precursor contributes 1.3 $\mu g/m^3$ or more to the 24-hour $PM_{2.5}$ standard of 35 $\mu g/m^3$ (or approximately 3.7%). Taking into consideration that the level of the 24-hr PM_{10} standard is much higher than the level of the $PM_{2.5}$ standard (150 $\mu g/m^3$ vs. 35 $\mu g/m^3$), the threshold level for PM_{10} is presumed to be higher than for $PM_{2.5}$. As shown in Table 1, since on average each precursor is found to contribute less than 2.1% to the PM_{10} concentrations, their contribution is considered insignificant.

We also considered whether precursor contribution would be higher for PM_{10} design values over the 229 $\mu g/m^3$ average estimated in Table 2. Figures 1 and 2 illustrate relationships between $PM_{2.5}$ and PM_{10} in Imperial Valley. It is evident from the charts that elevated $PM_{2.5}$ concentrations, in general, correspond to PM_{10} concentrations below the level of the standard. When PM_{10} levels exceed the 24-hour standard of 150 $\mu g/m^3$, $PM_{2.5}$ contributes a small percent of the PM_{10} mass. This suggests that high PM_{10} levels are driven by fugitive dust and secondary PM_{10} components are not expected to increase with PM_{10} mass increasing beyond the level of PM_{10} standard.

Figure 1. Relationship between PM_{10} and $PM_{2.5}$ at Calexico, 2007 -2016

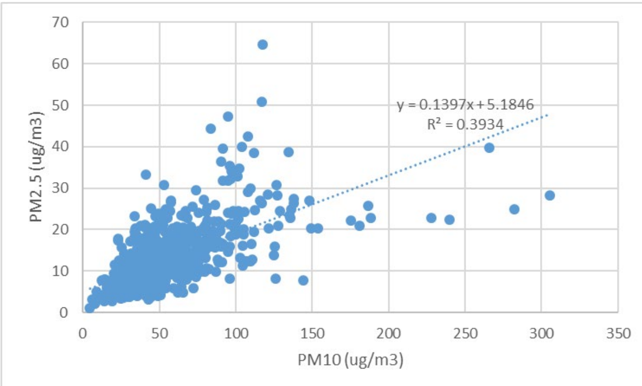
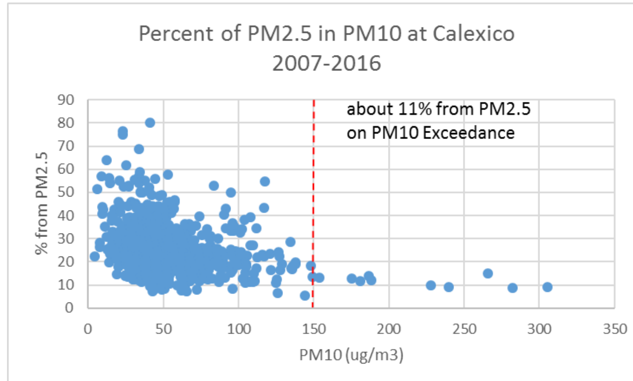


Figure 2. Percent of $PM_{2.5}$ in PM_{10} at Calexico, 2007-2016



Elevated PM_{10} concentrations in Imperial County are dominated by primary PM_{10} emissions from wind-blown dust rather than by secondarily formed PM_{10}. This precursor contribution analysis demonstrates that secondary formation is negligible compared with directly emitted PM_{10}. Reductions in emissions of PM_{10} precursors would not be effective in reducing PM_{10} concentrations and would lead to insignificant air quality changes. We conclude that precursor controls do not need to be included in the evaluation of potential control measures.

SETTLEMENT AGREEMENT

WHEREAS, on August 11, 2004, the United States Environmental Protection Agency ("EPA") reclassified the Imperial Valley Planning Area ("Imperial Valley") as a "serious" nonattainment area for coarse particulate matter ("PM10") national ambient air quality standards ("NAAQS") under the Clean Air Act, 69 Fed. Reg. 48,792 (Aug. 11, 2004), triggering the Clean Air Act requirement in 42 U.S.C. § 7513a(b)(1)(B) that the State of California submit to EPA within four years a state implementation plan containing provisions for the implementation of best available control measures ("BACM") for the control of PM10;

WHEREAS, in 2005 the Imperial County Air Pollution Control District ("Air District") adopted Rules 800 through 806 (known as "Regulation VIII") intended to limit emissions of PM10 within Imperial County;

WHEREAS, in 2006 the California Air Resources Board submitted the 2005 version of Regulation VIII to EPA as a revision to the state implementation plan;

WHEREAS, on July 8, 2010, EPA published a final rule in the Federal Register approving in part and disapproving in part the 2005 version of Regulation VIII, *see* 75 Fed. Reg. 39,366 (July 8, 2010) ("Final Rule");

WHEREAS, the Air District filed a petition for review of the Final Rule in the United States Court of Appeals for the Ninth Circuit (Case No. 10-72709);

WHEREAS, the California Department of Parks and Recreation ("Parks") filed a petition for review of the Final Rule in the United States Court of Appeals for the Ninth Circuit (Case No. 10-72729);

WHEREAS, the petitions for review were consolidated (referred to hereinafter as "the Existing Litigation");

WHEREAS, briefing on the Existing Litigation has concluded and oral argument was held on February 15, 2012;

WHEREAS, on February 17, 2012 the United States Court of Appeals for the Ninth Circuit issued an Order (Docket No. 83) that referred the Existing Litigation to mediation, vacated submission of the Existing Litigation to the Court until further order, and noted that in the event that mediation efforts fail, the panel will finalize a disposition of the Existing Litigation without further briefing or argument from the parties;

WHEREAS, the Air District, Parks (hereinafter referred to together as "Petitioners"), and EPA (collectively, "the Parties") have a mutual interest in ensuring that the Air District's Regulation VIII satisfies the Clean Air Act's requirements for best available control measures for the control of PM10 air pollution, 42 U.S.C. § 7513a(b)(1)(B);

WHEREAS, EPA's determination of whether an exceedance of the PM10 NAAQS is an "exceptional event" within the meaning of section 319 of the Act, 42 U.S.C. § 7619, and EPA's regulations at 40 C.F.R. §§50.1 and 50.14 requires that EPA consider, among other criteria, whether the exceedance was "reasonably controllable or preventable" and EPA's consideration of this factor, evaluates, among other criteria, whether "reasonably available reasonable and appropriate measures" are in place to control anthropogenic PM10 sources and to abate or minimize the exposure of the public associated with the exceptional event (hereinafter referred to as "reasonable control");

WHEREAS, the Air District intends to prepare and transmit to the California Air Resources Board for submittal to EPA a revision to the state implementation plan as required by Clean Air Act section 189(d), 42 U.S.C. § 7513a(d);

WHEREAS, in order to avoid the uncertainty, delay, and costs associated with continued litigation, the Air District, Parks, and EPA wish to implement this Settlement Agreement;

NOW THEREFORE, the Parties agree as follows:

1. The parties to this Settlement Agreement ("Agreement") are the Petitioners and EPA. Nothing in this Agreement shall be construed to make any other person or entity not executing this Agreement a third-party beneficiary to this Agreement.

2. This Agreement applies to, is binding upon, and inures to the benefit of the Petitioners (and their successors, assigns, and designees) and EPA.

3. This Agreement shall not constitute an admission or evidence of any fact, wrongdoing, misconduct, or liability on the part of the Parties, their officers, or any person affiliated with them.

4. Within fourteen days (14) after this Agreement is finalized pursuant to Paragraph 22 of this Agreement, the Parties shall file a motion and proposed order (attached hereto as Attachment A) in the Ninth Circuit Court of Appeals requesting that the case continue to be withheld from submission to the panel pending completion of, and subject to, the terms of this Agreement.

5. Any deadline stated herein that falls on a Saturday, a Sunday, or a legal holiday shall be extended to the next day which is not one of the aforementioned days.

6. Within 90 days after this Agreement is executed by all Parties, but before finalization pursuant to Paragraph 22 of this Agreement, the Air District shall submit to its Governing Board revisions to the Regulation VIII rules that are substantially the same in substance as set forth in Attachment B to this Agreement, and supporting documentation (including off-highway vehicle BACM demonstration).

7. Within fourteen (14) days of the Governing Board's adoption of the revised Regulation VIII rules, the Air District shall submit the revised Regulation VIII rules and supporting documentation (including off-highway vehicle BACM demonstration) to the California Air Resources Board and request expedited submittal to EPA for incorporation into the California state implementation plan.

8. Within sixty (60) days of the California Air Resources Board's submittal of the revised Regulation VIII rules and supporting documentation (including off-highway vehicle BACM demonstration) to EPA as a revision to the California state implementation plan, the EPA Region 9 Regional Administrator will sign for publication in the Federal Register a notice of proposed rulemaking that proposes taking action on the submittal pursuant to Clean Air Act section 110(k), 42 U.S.C. § 7410(k). If the rules are substantially the same in substance as set forth in Attachment B to this Agreement, the notice to be signed by the Regional Administrator shall propose full approval of the submittal pursuant to Clean Air Act sections 110(k) and 189(b)(1)(B), 42 U.S.C. §§ 7410(k), 7513a(b)(1)(B). EPA shall include in the notice of proposed rulemaking a statement that EPA's preliminary view is that the revised Regulation VIII rules constitute "reasonable control" of the sources covered by Regulation VIII for the purpose of evaluating whether an exceedance of the PM10 NAAQS is an "exceptional event" including reasonable and appropriate control measures on significant contributing anthropogenic sources. This statement does not extend to exceedances of NAAQS other than the PM10 NAAQS, or to events that differ significantly in terms of meteorology, sources, or conditions from the events that are at issue in the Existing Litigation. Once signed, EPA shall promptly deliver the notice of proposed rulemaking to the Office of Federal Register for review and publication.

9. If the Regional Administrator proposes full approval of the submittal referenced in Paragraph 8, then concurrently with signature of the notice in Paragraph 8, the Regional Administrator shall sign for publication in the Federal Register a notice making an interim final determination to defer imposition of sanctions pursuant to the Administrative Procedure Act, 5 U.S.C. § 553(d)(1). However, as is standard for such determinations, EPA may lift the deferral of sanctions if EPA receives significant and substantive public comments that change its assessment described in the determination and the proposed approval of the revised Regulation VIII rules.

10. Within sixty (60) days of the close of public comment on EPA's proposed rule referenced in Paragraph 8 of this Agreement, the EPA Region 9 Regional Administrator will sign for publication in the Federal Register a notice of final rulemaking taking action pursuant to Clean Air Act section 110(k), 42 U.S.C. § 7410(k). Once signed, EPA shall promptly deliver the notice of final rulemaking to the Office of Federal Register for review and publication.

11. Within ninety (90) days after publication in the Federal Register of EPA's notice of final rulemaking on a section 189(d) plan for the Imperial Valley PM10 serious nonattainment area, the Petitioners shall act to terminate the Existing Litigation by filing motions to dismiss their petitions with prejudice pursuant to Fed. R. App. Pro. 42, with each party to bear its own costs and attorneys' fees.

12. If EPA does not comply with any requirement of Paragraphs 8 through 10 of this Agreement, or if the final action required by Paragraph 10 does not finalize approval of the revised Regulation VIII rules, then the Air District and Parks may at their election, move to request that the Ninth Circuit Court of Appeals submit the Existing Litigation to the panel and proceed to a decision on the Existing Litigation. The Parties agree that this Paragraph 12

constitutes the Petitioners' sole remedy under this Agreement if EPA does not comply with any requirement of Paragraphs 8 through 10.

13. If EPA takes any final action to require the State of California, on behalf of the Air District, to submit any plan required under Clean Air Act section 189(d), 42 U.S.C. § 7513a(d), prior to the dismissal described in Paragraph 11 of this Agreement, then the Air District may at its election, move to request that the Ninth Circuit Court of Appeals submit the Existing Litigation to the panel and proceed to a decision on the Existing Litigation. The Parties agree that this Paragraph 13 constitutes the Petitioners' sole remedy under this Agreement if EPA takes any final action to require a section 189(d) plan from the State of California on behalf of Imperial County.

14. If the California Air Resources Board does not submit the revised Regulation VIII rule submission to EPA within sixty (60) days after receiving it, then any of the Parties may at their election move to request that the Ninth Circuit Court of Appeals submit the Existing Litigation to the panel and proceed to a decision on the Existing Litigation.

15. In any event, no later than four years after the implementation date(s) within Imperial County for the revised Regulation VIII rules, the Petitioners shall act to terminate the Existing Litigation by filing motions to dismiss their petitions with prejudice pursuant to Fed. R. App. Pro. 42, with each party to bear its own costs and attorneys' fees.

16. This Agreement constitutes a full and final resolution of all matters related to the Existing Litigation, subject to the rights of the Parties to terminate this Agreement as referenced herein. Petitioners agree to release, discharge, and covenant not to assert (by way of the commencement of an action, the joinder of EPA in an existing action or in any other fashion) any and all claims, causes of action, suits or demands of any kind whatsoever in law or equity which

they may have had, or may now or hereafter have, against the United States based upon matters related to the Existing Litigation.

17. If EPA's final action taken pursuant to Paragraph 10 of this Agreement is full approval, then Petitioners shall not bring a legal challenge to such action. Nothing in this Agreement shall preclude Petitioners from bringing a legal challenge to a final action taken pursuant to Paragraph 10 of this Agreement, other than full approval.

18. Nothing in this Agreement shall be construed to limit or modify the discretion accorded to EPA by the Clean Air Act, or by general principles of administrative law, nor shall it in any way be deemed to limit EPA's discretion in adopting any final rule.

19. Nothing in this Agreement shall be construed to limit or modify EPA's discretion to alter, amend, or revise any regulations, guidance, or interpretation EPA may issue in accordance with or on matters related to this Agreement from time to time or to promulgate or issue superseding regulations, guidance, or interpretations, or to limit any right that the Petitioners may have to seek judicial review in a subsequent case of any such action by EPA.

20. The Parties agree that they do not waive or limit any defense relating to the Existing Litigation if the Ninth Circuit Court of Appeals submits the Existing Litigation to the panel and the panel proceeds to a decision. EPA specifically reserves the right to argue that the Existing Litigation is moot in the event that any request to the Ninth Circuit Court of Appeals to submit the Existing Litigation to the panel occurs after EPA's final rulemaking referenced in Paragraph 10 of this Agreement and such final rulemaking is a full approval of the revised Regulation VIII rules.

21. No provision of this Agreement shall be interpreted as or constitute a commitment or requirement that EPA obligate or pay funds in contravention of the Anti-Deficiency Act, 31

U.S.C. § 1341, or take actions in contravention of the Administrative Procedure Act, 5 U.S.C. §§ 551-559, 701-706, the Clean Air Act, or any other law or regulation, either substantive or procedural.

22. The Parties agree and acknowledge that before this Agreement is final, EPA must provide notice in the Federal Register and an opportunity for comment pursuant to Clean Air Act § 113(g), 42 U.S.C. § 7413(g). After this Agreement has undergone an opportunity for notice and comment, the Administrator and/or the Attorney General, as appropriate, shall promptly consider any such written comments in determining whether to withdraw or withhold consent to this Agreement, in accordance with section 113(g) of the Clean Air Act. If the federal government elects to withdraw or withhold consent to this Agreement, Petitioners shall have the right to withdraw from this Agreement. This Agreement shall become final on the date that EPA provides written notice of such finality to Petitioners.

23. The Parties may modify any deadline or other term of this agreement by written stipulation.

24. Any notices required or provided for by this Agreement shall be in writing, and shall be deemed effective (i) upon receipt if sent by U.S. Post or (ii) upon the date sent if sent by overnight delivery, facsimile, or email. In addition, to be effective, any such notice must be sent to the following:

For the Air District:

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email: christenson.kara@epa.gov

or such other person as any party may subsequently identify in writing to the other parties.

25. The various terms, paragraphs, and sections contained herein shall be deemed separable and severable. If any provision of this Agreement is deemed invalid or unenforceable, the balance of the Agreement shall remain in full force and effect.

26. It is hereby expressly understood and agreed that this Agreement was jointly drafted by Petitioners and EPA. Accordingly, the Parties hereby agree that any and all rules of construction to the effect that ambiguity is construed against the drafting Party shall be inapplicable in any dispute concerning the terms, meaning, or interpretation of this Agreement.

27. Each undersigned representative of the Parties to this Agreement certifies that he or she is fully authorized by the party to enter into and execute the terms and conditions of this Agreement, and to legally bind such party to this Agreement.

28. This Agreement may be executed in any number of counterpart originals, each of which shall be deemed to constitute an original agreement, and all of which shall constitute one agreement. The execution of one counterpart by any party shall have the same force and effect as if that party had signed all other counterparts.

FOR THE AIR DISTRICT:

Date: __________

____
MICHAEL W. KELLEY
Chairman of the Board
Imperial County Air Pollution Control District

FOR PARKS:

Date: __________

____
RUTH COLEMAN
Director
California Department of Parks and Recreation

FOR EPA:

Date: 7/27/2012

Christina L. Richmond
CHRISTINA L. RICHMOND, Trial Attorney
Environmental Defense Section
Environment and Natural Resources Division
United States Department of Justice

FOR THE AIR DISTRICT:

Date: 7/17/12

Michael W. Kelley

MICHAEL W. KELLEY
Chairman of the Board
Imperial County Air Pollution Control District

FOR PARKS:

Date: __________

____
RUTH COLEMAN
Director
California Department of Parks and Recreation

FOR EPA:

Date: __________

____
CHRISTINA L. RICHMOND, Trial Attorney
Environmental Defense Section
Environment and Natural Resources Division
United States Department of Justice

FOR THE AIR DISTRICT:

Date: __________

MICHAEL W. KELLEY
Chairman of the Board
Imperial County Air Pollution Control District

FOR PARKS:

Date: 7/25/12

~~RUTH COLEMAN~~ Janelle Beland
~~Director~~ Acting Director
California Department of Parks and Recreation

FOR EPA:

Date: __________

CHRISTINA L. RICHMOND, Trial Attorney
Environmental Defense Section
Environment and Natural Resources Division
United States Department of Justice

Table C-1. 2014-2016 Monitoring Data for Imperial County

Imperial County 2018 PM_{10} Plan

Date	PM_{10} Concentration (µg/m^3)									
	Calexico - Ethel		Brawley		El Centro		Westmorland		Niland	
	POC 1	POC 3	POC 1	POC 3	POC 2	POC 4	POC 1	POC 3	POC 1	POC 3
Station ID	60250005	60250005	60250007	60250007	60251003	60251003	60254003	60254003	60254004	60254004
1/1/2014	--	--	--	70	--	--	--	--	--	47
1/2/2014	--	--	--	58	--	--	--	--	--	38
1/3/2014	--	--	--	56	--	--	--	--	--	66
1/4/2014	--	--	--	55	--	--	--	--	--	47
1/5/2014	44	--	30	46	--	--	20	--	22	38
1/6/2014	--	--	--	34	--	--	--	--	--	40
1/7/2014	--	--	--	51	--	--	--	--	--	43
1/8/2014	--	--	--	65	45	--	--	--	--	41
1/9/2014	--	--	--	56	--	--	--	--	--	50
1/10/2014	--	--	--	54	--	--	--	--	--	65
1/11/2014	91	--	46	61	56	--	38	--	44	62
1/12/2014	--	--	--	70	--	--	--	--	--	49
1/13/2014	--	--	--	43	--	--	--	--	--	38
1/14/2014	--	--	--	32	--	--	--	--	--	48
1/15/2014	--	--	--	35	--	--	--	--	--	34
1/16/2014	--	--	--	42	--	--	--	--	--	41
1/17/2014	54	--	29	39	24	--	25	--	30	41
1/18/2014	--	--	--	45	--	--	--	--	--	51
1/19/2014	--	--	--	59	--	--	--	--	--	49
1/20/2014	--	--	--	54	--	--	--	--	--	42
1/21/2014	--	--	--	54	--	--	--	--	--	45
1/22/2014	--	--	--	55	--	--	--	--	--	47
1/23/2014	131	--	--	79	57	--	41	--	--	43
1/24/2014	--	--	--	53	--	--	--	--	--	60
1/25/2014	--	--	--	43	--	--	--	--	--	57
1/26/2014	--	--	--	48	--	--	--	--	--	49
1/27/2014	--	--	--	66	--	--	--	--	--	51
1/28/2014	--	--	--	53	--	--	--	--	--	44
1/29/2014	94	--	40	54	49	--	41	--	27	51
1/30/2014	--	--	--	111	--	--	--	--	--	89
1/31/2014	--	--	--	198	--	--	--	--	--	86
2/1/2014	--	--	--	31	--	--	--	--	--	36
2/2/2014	--	--	--	29	--	--	--	--	--	35
2/3/2014	--	--	--	32	--	--	--	--	--	61
2/4/2014	30	--	19	29	21	--	17	--	19	34
2/5/2014	--	--	--	42	--	--	--	--	--	46
2/6/2014	--	--	--	56	--	--	--	--	--	47
2/7/2014	--	--	--	29	--	--	--	--	--	35
2/8/2014	--	--	--	60	--	--	--	--	--	58
2/9/2014	--	--	--	46	--	--	--	--	--	47
2/10/2014	41	--	35	50	--	--	29	--	30	45
2/11/2014	--	--	--	34	--	--	--	--	--	29
2/12/2014	--	--	--	52	--	--	--	--	--	39
2/13/2014	--	--	--	65	54	--	--	--	--	56
2/14/2014	--	--	--	82	--	--	--	--	--	50
2/15/2014	--	--	--	--	--	--	--	--	--	62
2/16/2014	99	--	58	82	74	--	56	--	--	58
2/17/2014	--	--	--	61	--	--	--	--	--	62
2/18/2014	--	--	--	67	--	--	--	--	--	50
2/19/2014	--	--	--	73	--	--	--	--	--	66
2/20/2014	--	--	--	64	--	--	--	--	--	38

Table C-1. 2014-2016 Monitoring Data for Imperial County
Imperial County 2018 PM_{10} Plan

Date	PM_{10} Concentration (µg/m^3)									
	Calexico - Ethel		Brawley		El Centro		Westmorland		Niland	
	POC 1	POC 3	POC 1	POC 3	POC 2	POC 4	POC 1	POC 3	POC 1	POC 3
Station ID	**60250005**	**60250005**	**60250007**	**60250007**	**60251003**	**60251003**	**60254003**	**60254003**	**60254004**	**60254004**
2/21/2014	--	--	--	60	--	--	--	--	--	50
2/22/2014	71	--	53	73	51	--	43	--	44	58
2/23/2014	--	--	--	59	--	--	--	--	--	59
2/24/2014	--	--	--	74	--	--	--	--	--	59
2/25/2014	--	--	--	67	--	--	--	--	--	58
2/26/2014	--	--	--	71	--	--	--	--	--	44
2/27/2014	--	--	--	39	--	--	--	--	--	38
2/28/2014	106	--	126	149	54	--	294	--	135	144
3/1/2014	--	--	--	39	--	--	--	--	--	47
3/2/2014	--	--	--	19	--	--	--	--	--	17
3/3/2014	--	--	--	27	--	--	--	--	--	19
3/4/2014	--	--	--	33	--	--	--	--	--	26
3/5/2014	--	--	--	35	--	--	--	--	--	28
3/6/2014	--	--	41	60	18	--	30	--	39	58
3/7/2014	--	--	--	73	--	--	--	--	--	46
3/8/2014	--	--	--	39	--	--	--	--	--	22
3/9/2014	--	--	--	30	--	--	--	--	--	15
3/10/2014	--	--	--	36	--	--	--	--	--	58
3/11/2014	--	--	--	55	--	--	--	--	--	44
3/12/2014	--	--	26	35	17	--	23	--	10	19
3/13/2014	--	--	--	48	--	--	--	--	--	60
3/14/2014	--	--	--	51	--	--	--	--	--	39
3/15/2014	--	--	--	49	--	--	--	--	--	39
3/16/2014	--	--	--	44	--	--	--	--	--	48
3/17/2014	--	--	--	190	--	--	--	--	--	87
3/18/2014	--	--	77	113	57	--	66	--	53	80
3/19/2014	--	--	--	55	--	--	--	--	--	29
3/20/2014	--	--	--	40	--	--	--	--	--	46
3/21/2014	--	--	--	53	--	--	--	--	--	52
3/22/2014	--	--	--	59	--	--	--	--	--	69
3/23/2014	--	--	--	59	--	--	--	--	--	51
3/24/2014	--	--	47	69	42	--	39	--	35	50
3/25/2014	--	--	--	137	--	--	--	--	--	127
3/26/2014	--	--	--	374	--	--	--	--	--	279
3/27/2014	38	--	--	94	--	--	--	--	--	115
3/28/2014	--	--	--	51	--	--	--	--	--	52
3/29/2014	--	--	--	57	--	--	--	--	--	49
3/30/2014	64	--	220	150	57	--	102	--	84	80
3/31/2014	--	--	--	106	--	--	--	--	--	102
4/1/2014	--	--	--	160	--	--	--	--	--	101
4/2/2014	--	--	--	137	--	--	--	--	--	38
4/3/2014	--	--	--	30	--	--	--	--	--	39
4/4/2014	--	--	--	50	--	--	--	--	--	53
4/5/2014	24	--	49	35	10	--	20	--	29	48
4/6/2014	--	--	--	28	--	--	--	--	--	30
4/7/2014	--	--	--	42	--	--	--	--	--	42
4/8/2014	--	--	--	46	--	--	--	--	--	53
4/9/2014	--	--	--	58	--	--	--	--	--	53
4/10/2014	--	--	--	56	--	--	--	--	--	87
4/11/2014	54	--	53	62	74	--	102	--	--	74
4/12/2014	--	--	--	103	--	--	--	--	--	167

Table C-1. 2014-2016 Monitoring Data for Imperial County
Imperial County 2018 PM_{10} Plan

Date	PM_{10} Concentration (µg/m³)									
	Calexico - Ethel		Brawley		El Centro		Westmorland		Niland	
	POC 1	POC 3	POC 1	POC 3	POC 2	POC 4	POC 1	POC 3	POC 1	POC 3
Station ID	60250005	60250005	60250007	60250007	60251003	60251003	60254003	60254003	60254004	60254004
4/13/2014	--	--	--	166	--	--	--	--	--	130
4/14/2014	--	--	--	58	--	--	--	--	--	66
4/15/2014	--	--	--	50	--	--	--	--	--	66
4/16/2014	--	--	--	57	--	--	--	--	54	73
4/17/2014	42	--	38	52	36	--	39	--	--	59
4/18/2014	--	--	--	47	--	--	--	--	--	57
4/19/2014	--	--	--	38	--	--	--	--	--	60
4/20/2014	--	--	--	36	--	--	--	--	--	44
4/21/2014	--	--	--	51	--	--	--	--	--	64
4/22/2014	--	--	--	131	--	--	--	--	--	134
4/23/2014	43	--	53	81	42	--	48	--	57	75
4/24/2014	--	--	--	75	--	--	--	--	--	73
4/25/2014	--	--	--	184	--	--	--	--	--	--
4/26/2014	--	--	--	312	--	--	--	--	--	149
4/27/2014	--	--	--	23	--	--	--	--	--	54
4/28/2014	--	--	--	47	--	--	--	--	--	53
4/29/2014	79	--	89	141	83	--	63	--	48	82
4/30/2014	--	--	--	58	--	--	--	--	--	75
5/1/2014	--	--	--	39	--	--	--	--	--	32
5/2/2014	--	--	--	37	--	--	--	--	--	37
5/3/2014	--	--	--	46	--	--	--	--	--	62
5/4/2014	--	--	--	55	--	--	--	--	--	74
5/5/2014	86	--	269	222	87	--	375	--	121	100
5/6/2014	--	--	--	438	--	--	--	--	--	--
5/7/2014	--	--	--	54	--	--	--	--	--	72
5/8/2014	--	--	--	40	--	--	--	--	--	69
5/9/2014	--	--	--	50	--	--	--	--	--	72
5/10/2014	--	--	--	104	--	--	--	--	--	--
5/11/2014	126	--	127	135	120	--	85	--	103	172
5/12/2014	--	--	--	50	--	--	--	--	--	29
5/13/2014	--	--	--	59	--	--	--	--	--	33
5/14/2014	--	--	--	45	--	--	--	--	--	61
5/15/2014	--	--	--	53	--	--	--	--	--	64
5/16/2014	--	--	--	78	--	--	--	--	--	65
5/17/2014	35	--	81	113	41	--	72	--	92	110
5/18/2014	--	--	--	100	--	--	--	--	--	106
5/19/2014	--	--	--	130	--	--	--	--	--	95
5/20/2014	--	--	--	250	--	--	--	--	--	122
5/21/2014	--	--	--	36	--	--	--	--	--	32
5/22/2014	--	--	--	56	--	--	--	--	--	42
5/23/2014	36	--	30	34	18	--	--	--	136	44
5/24/2014	--	--	--	58	--	--	--	--	--	62
5/25/2014	--	--	--	41	--	--	--	--	--	39
5/26/2014	--	--	--	51	--	--	--	--	--	72
5/27/2014	--	--	--	48	--	--	--	--	--	72
5/28/2014	--	--	--	48	--	--	--	--	--	72
5/29/2014	54	--	37	61	30	--	--	--	47	79
5/30/2014	--	--	--	48	--	--	--	--	--	71
5/31/2014	--	--	--	69	--	--	--	--	--	51
6/1/2014	--	--	--	29	--	--	--	--	--	42
6/2/2014	--	--	--	127	--	--	--	--	--	--

Table C-1. 2014-2016 Monitoring Data for Imperial County
Imperial County 2018 PM_{10} Plan

Date	PM_{10} Concentration ($\mu g/m^3$)									
	Calexico - Ethel		Brawley		El Centro		Westmorland		Niland	
	POC 1	POC 3	POC 1	POC 3	POC 2	POC 4	POC 1	POC 3	POC 1	POC 3
Station ID	60250005	60250005	60250007	60250007	60251003	60251003	60254003	60254003	60254004	60254004
6/3/2014	--	--	--	45	--	--	--	--	--	42
6/4/2014	30	--	34	35	28	--	38	--	33	59
6/5/2014	--	--	--	59	--	--	--	--	--	82
6/6/2014	--	--	--	108	--	--	--	--	--	133
6/7/2014	--	--	--	38	--	--	--	--	--	95
6/8/2014	--	--	--	62	--	--	--	--	--	78
6/9/2014	--	--	--	88	--	--	--	--	--	90
6/10/2014	--	--	--	116	69	--	91	--	94	135
6/11/2014	--	--	--	73	--	--	--	--	--	103
6/12/2014	--	--	--	62	--	--	--	--	--	89
6/13/2014	--	--	--	97	--	--	--	--	--	99
6/14/2014	--	--	64	81	--	--	--	--	--	85
6/15/2014	--	--	--	61	--	--	--	--	--	100
6/16/2014	--	--	--	83	34	--	113	--	46	61
6/17/2014	49	--	88	92	--	--	--	--	--	122
6/18/2014	--	--	--	34	--	--	--	--	--	55
6/19/2014	43	--	--	57	--	--	--	--	--	71
6/20/2014	--	--	--	62	--	--	--	--	--	87
6/21/2014	--	--	--	54	--	--	--	--	--	74
6/22/2014	39	--	45	48	37	--	31	--	37	49
6/23/2014	--	--	--	45	--	--	--	--	--	61
6/24/2014	--	--	--	62	--	--	--	--	--	64
6/25/2014	--	--	--	53	--	--	--	--	--	84
6/26/2014	--	--	--	185	--	--	--	--	--	130
6/27/2014	--	--	--	96	--	--	--	--	--	100
6/28/2014	44	--	58	64	44	--	76	--	66	88
6/29/2014	--	--	--	46	--	--	--	--	--	65
6/30/2014	--	--	--	54	--	--	--	--	--	60
7/1/2014	--	--	--	60	--	--	--	--	--	71
7/2/2014	--	--	--	68	--	--	--	--	--	77
7/3/2014	--	--	--	116	--	--	--	--	--	120
7/4/2014	24	--	32	37	30	--	31	--	34	48
7/5/2014	--	--	--	40	--	--	--	--	--	64
7/6/2014	--	--	--	48	--	--	--	--	--	89
7/7/2014	--	--	--	54	--	--	--	--	--	83
7/8/2014	--	--	--	62	--	--	--	--	--	75
7/9/2014	--	--	--	63	--	--	--	--	--	82
7/10/2014	27	--	40	44	--	--	54	--	--	46
7/11/2014	--	--	--	53	--	--	--	--	--	83
7/12/2014	--	--	--	34	--	--	--	--	--	49
7/13/2014	--	--	--	64	--	--	--	--	--	69
7/14/2014	--	--	--	44	--	--	--	--	--	56
7/15/2014	--	--	--	47	--	--	--	--	--	48
7/16/2014	43	--	148	63	--	--	167	--	116	142
7/17/2014	--	--	--	66	--	--	--	--	--	101
7/18/2014	--	--	--	40	31	--	--	--	--	89
7/19/2014	--	--	--	45	--	--	--	--	--	51
7/20/2014	--	--	--	28	--	--	--	--	--	37
7/21/2014	--	--	--	34	--	--	--	--	--	50
7/22/2014	33	--	39	46	--	--	51	--	52	61
7/23/2014	--	--	--	51	--	--	--	--	--	52

Table C-1. 2014-2016 Monitoring Data for Imperial County
Imperial County 2018 PM_{10} Plan

Date	PM_{10} Concentration (µg/m^3)									
	Calexico - Ethel		Brawley		El Centro		Westmorland		Niland	
	POC 1	POC 3	POC 1	POC 3	POC 2	POC 4	POC 1	POC 3	POC 1	POC 3
Station ID	60250005	60250005	60250007	60250007	60251003	60251003	60254003	60254003	60254004	60254004
7/24/2014	--	--	--	59	49	--	--	--	--	--
7/25/2014	--	--	--	90	--	--	--	--	--	--
7/26/2014	--	--	--	49	--	--	--	--	--	--
7/27/2014	--	--	--	103	--	--	--	--	--	--
7/28/2014	42	--	42	46	43	--	43	--	--	--
7/29/2014	--	--	--	53	--	--	--	--	--	--
7/30/2014	--	--	--	58	--	--	--	--	56	91
7/31/2014	--	--	--	64	--	--	--	--	--	95
8/1/2014	--	--	--	70	--	--	--	--	--	89
8/2/2014	--	--	--	45	--	--	--	--	--	50
8/3/2014	47	--	21	28	17	--	18	--	20	31
8/4/2014	--	--	--	25	--	--	--	--	--	43
8/5/2014	--	--	--	28	--	--	--	--	--	46
8/6/2014	--	--	--	49	--	--	--	--	--	108
8/7/2014	--	--	--	69	--	--	--	--	--	64
8/8/2014	--	--	--	49	--	--	--	--	--	52
8/9/2014	26	--	--	53	28	--	36	--	47	61
8/10/2014	--	--	--	34	--	--	--	--	--	40
8/11/2014	--	--	--	43	--	--	--	--	--	63
8/12/2014	--	--	--	63	--	--	--	--	--	102
8/13/2014	--	--	--	59	--	--	--	--	--	59
8/14/2014	--	--	--	40	--	--	--	--	--	61
8/15/2014	54	--	47	63	41	--	43	--	69	90
8/16/2014	--	--	--	39	--	--	--	--	--	58
8/17/2014	--	--	--	32	--	--	--	--	--	50
8/18/2014	--	--	--	102	--	--	--	--	--	161
8/19/2014	--	--	--	97	--	--	--	--	--	80
8/20/2014	--	--	--	63	--	--	--	--	--	53
8/21/2014	25	--	--	36	23	--	37	--	49	54
8/22/2014	--	--	--	29	--	--	--	--	--	30
8/23/2014	--	--	--	23	--	--	--	--	--	24
8/24/2014	--	--	--	25	--	--	--	--	--	29
8/25/2014	--	--	--	41	--	--	--	--	--	26
8/26/2014	--	--	--	41	--	--	--	--	--	45
8/27/2014	30	--	19	34	19	--	23	--	25	32
8/28/2014	--	--	--	45	--	--	--	--	--	38
8/29/2014	--	--	--	40	--	--	--	--	--	42
8/30/2014	--	--	--	41	--	--	--	--	--	75
8/31/2014	--	--	--	48	--	--	--	--	--	91
9/1/2014	--	--	--	32	--	--	--	--	--	79
9/2/2014	35	--	24	34	38	--	28	--	46	60
9/3/2014	--	--	--	44	--	--	--	--	--	59
9/4/2014	--	--	--	48	--	--	--	--	--	64
9/5/2014	--	--	--	53	--	--	--	--	--	59
9/6/2014	--	--	--	37	--	--	--	--	--	52
9/7/2014	--	--	--	26	--	--	--	--	--	27
9/8/2014	24	--	22	35	22	--	22	--	25	35
9/9/2014	--	--	--	42	--	--	--	--	--	39
9/10/2014	--	--	--	34	--	--	--	--	--	41
9/11/2014	--	--	--	44	--	--	--	--	--	49
9/12/2014	--	--	--	48	--	--	--	--	--	32

Table C-1. 2014-2016 Monitoring Data for Imperial County
Imperial County 2018 PM_{10} Plan

Date	PM_{10} Concentration (µg/m^3)									
	Calexico - Ethel		Brawley		El Centro		Westmorland		Niland	
	POC 1	POC 3	POC 1	POC 3	POC 2	POC 4	POC 1	POC 3	POC 1	POC 3
Station ID	60250005	60250005	60250007	60250007	60251003	60251003	60254003	60254003	60254004	60254004
9/13/2014	--	--	--	54	--	--	--	--	--	69
9/14/2014	45	--	--	41	44	--	32	--	31	42
9/15/2014	--	--	--	65	--	--	--	--	--	63
9/16/2014	--	--	--	37	--	--	--	--	--	49
9/17/2014	--	--	--	33	--	--	--	--	--	33
9/18/2014	--	--	--	73	--	--	--	--	--	104
9/19/2014	--	--	--	40	--	--	--	--	--	83
9/20/2014	33	--	35	51	36	--	40	--	50	64
9/21/2014	--	--	--	43	--	--	--	--	--	38
9/22/2014	--	--	--	52	--	--	--	--	--	61
9/23/2014	--	--	--	53	--	--	--	--	--	63
9/24/2014	--	--	--	44	--	--	--	--	--	66
9/25/2014	--	--	--	56	--	--	--	--	--	66
9/26/2014	25	--	55	68	--	--	136	--	--	130
9/27/2014	--	--	--	219	--	--	--	--	--	--
9/28/2014	--	--	--	41	--	--	--	--	--	37
9/29/2014	--	--	--	43	--	--	--	--	--	37
9/30/2014	--	--	--	45	--	--	--	--	61	75
10/1/2014	--	--	--	51	--	--	--	--	--	59
10/2/2014	--	--	47	67	40	--	--	--	28	63
10/3/2014	--	--	--	40	--	--	--	--	--	37
10/4/2014	56	--	--	42	--	--	--	--	--	42
10/5/2014	--	--	--	40	--	--	--	--	--	45
10/6/2014	--	--	--	53	--	--	--	--	--	70
10/7/2014	--	--	--	33	--	--	--	--	--	82
10/8/2014	23	--	14	20	19	--	27	--	40	49
10/9/2014	--	--	--	33	--	--	--	--	--	56
10/10/2014	--	--	--	44	--	--	--	--	--	46
10/11/2014	--	--	--	34	--	--	--	--	--	41
10/12/2014	--	--	--	32	--	--	--	--	--	42
10/13/2014	--	--	--	51	--	--	--	--	--	48
10/14/2014	60	--	47	59	42	--	49	--	59	82
10/15/2014	--	--	--	56	--	--	--	--	--	76
10/16/2014	--	--	--	56	--	--	--	--	--	61
10/17/2014	--	--	--	46	--	--	--	--	--	87
10/18/2014	--	--	--	55	--	--	--	--	--	79
10/19/2014	--	--	--	35	--	--	--	--	--	62
10/20/2014	32	--	38	53	32	--	35	--	45	60
10/21/2014	--	--	--	60	--	--	--	--	--	70
10/22/2014	--	--	--	58	--	--	--	--	--	66
10/23/2014	--	--	--	60	--	--	--	--	--	55
10/24/2014	--	--	--	76	--	--	--	--	--	65
10/25/2014	--	--	--	48	--	--	--	--	--	52
10/26/2014	21	--	24	32	--	--	32	--	29	42
10/27/2014	--	--	--	47	--	--	--	--	--	55
10/28/2014	--	--	--	65	40	--	--	--	--	52
10/29/2014	--	--	--	57	--	--	--	--	--	49
10/30/2014	--	--	--	54	--	--	--	--	--	64
10/31/2014	--	--	--	116	--	--	--	--	--	181
11/1/2014	--	--	471	131	56	--	404	--	173	218
11/2/2014	--	--	--	24	--	--	--	--	--	22

Table C-1. 2014-2016 Monitoring Data for Imperial County
Imperial County 2018 PM_{10} Plan

Date	PM_{10} Concentration (µg/m^3)									
	Calexico - Ethel		Brawley		El Centro		Westmorland		Niland	
	POC 1	POC 3	POC 1	POC 3	POC 2	POC 4	POC 1	POC 3	POC 1	POC 3
Station ID	60250005	60250005	60250007	60250007	60251003	60251003	60254003	60254003	60254004	60254004
11/3/2014	--	--	--	36	--	--	--	--	--	27
11/4/2014	33	--	--	46	--	--	--	--	--	25
11/5/2014	--	--	--	31	--	--	--	--	--	28
11/6/2014	--	--	--	43	--	--	--	--	--	24
11/7/2014	63	--	43	46	35	--	52	--	54	56
11/8/2014	--	--	--	52	--	--	--	--	--	86
11/9/2014	--	--	--	42	--	--	--	--	--	44
11/10/2014	--	--	--	42	--	--	--	--	--	72
11/11/2014	--	--	--	45	--	--	--	--	--	55
11/12/2014	--	--	--	67	--	--	--	--	--	69
11/13/2014	49	--	42	54	45	--	37	--	35	45
11/14/2014	--	--	--	47	--	--	--	--	--	63
11/15/2014	--	--	--	89	--	--	--	--	--	60
11/16/2014	--	--	--	210	--	--	--	--	--	248
11/17/2014	--	--	--	36	--	--	--	--	--	52
11/18/2014	--	--	--	48	--	--	--	--	--	72
11/19/2014	85	--	42	54	48	--	42	--	40	44
11/20/2014	--	--	--	60	--	--	--	--	--	58
11/21/2014	--	--	--	20	--	--	--	--	--	21
11/22/2014	--	--	--	27	--	--	--	--	--	53
11/23/2014	--	--	--	42	--	--	--	--	--	40
11/24/2014	--	--	--	27	--	--	--	--	--	23
11/25/2014	51	--	--	34	39	--	23	--	28	33
11/26/2014	--	--	--	40	--	--	--	--	--	44
11/27/2014	--	--	--	34	--	--	--	--	--	29
11/28/2014	--	--	--	50	--	--	--	--	--	56
11/29/2014	--	--	--	66	--	--	--	--	--	55
11/30/2014	--	--	--	30	--	--	--	--	--	36
12/1/2014	37	--	19	22	20	--	17	--	22	28
12/2/2014	--	--	--	41	--	--	--	--	--	57
12/3/2014	--	--	--	15	--	--	--	--	--	--
12/4/2014	--	--	--	24	--	--	--	--	--	--
12/5/2014	--	--	--	37	--	--	--	--	--	28
12/6/2014	--	--	--	23	--	--	--	--	--	20
12/7/2014	11	--	--	14	14	--	26	--	8	11
12/8/2014	--	--	--	33	--	--	--	--	--	17
12/9/2014	--	--	--	26	--	--	--	--	--	11
12/10/2014	--	--	--	29	--	--	--	--	--	16
12/11/2014	--	--	--	36	--	--	--	--	--	29
12/12/2014	--	--	--	14	--	--	--	--	--	14
12/13/2014	7	--	--	15	11	--	13	--	8	7
12/14/2014	--	--	--	11	--	--	--	--	--	8
12/15/2014	--	--	--	24	--	--	--	--	--	12
12/16/2014	--	--	--	25	--	--	--	--	--	19
12/17/2014	--	--	--	18	--	--	--	--	--	15
12/18/2014	--	--	--	34	--	--	--	--	--	17
12/19/2014	40	--	--	37	25	--	14	--	9	11
12/20/2014	--	--	--	32	--	--	--	--	--	11
12/21/2014	--	--	--	32	--	--	--	--	--	21
12/22/2014	--	--	--	38	--	--	--	--	--	25
12/23/2014	--	--	--	33	--	--	--	--	--	17

Table C-1. 2014-2016 Monitoring Data for Imperial County
Imperial County 2018 PM_{10} Plan

Date	PM_{10} Concentration (µg/m^3)									
	Calexico - Ethel		Brawley		El Centro		Westmorland		Niland	
	POC 1	POC 3	POC 1	POC 3	POC 2	POC 4	POC 1	POC 3	POC 1	POC 3
Station ID	**60250005**	**60250005**	**60250007**	**60250007**	**60251003**	**60251003**	**60254003**	**60254003**	**60254004**	**60254004**
12/24/2014	--	--	--	24	--	--	--	--	--	18
12/25/2014	45	--	35	45	44	--	36	--	--	36
12/26/2014	--	--	--	16	--	--	--	--	--	22
12/27/2014	--	--	--	16	--	--	--	--	--	23
12/28/2014	--	--	--	21	--	--	--	--	--	14
12/29/2014	--	--	--	31	--	--	--	--	--	23
12/30/2014	--	--	--	40	--	--	--	--	--	30
12/31/2014	28	--	--	32	24	--	14	--	17	25
1/1/2015	--	--	--	50	--	--	--	--	--	22
1/2/2015	--	--	--	40	--	--	--	--	--	35
1/3/2015	--	--	--	61	--	--	--	--	--	54
1/4/2015	--	--	--	51	--	--	--	--	--	43
1/5/2015	--	--	--	44	--	--	--	--	--	24
1/6/2015	32	--	29	31	23	--	24	--	17	20
1/7/2015	--	--	--	38	--	--	--	--	--	19
1/8/2015	--	--	--	41	--	--	--	--	--	22
1/9/2015	--	--	--	49	--	--	--	--	--	35
1/10/2015	--	--	--	38	--	--	--	--	--	44
1/11/2015	--	--	--	19	--	--	--	--	--	26
1/12/2015	46	--	15	17	23	--	10	--	10	14
1/13/2015	--	--	--	18	--	--	--	--	--	11
1/14/2015	--	--	--	19	--	--	--	--	--	7
1/15/2015	--	--	--	24	--	--	--	--	--	12
1/16/2015	--	--	--	25	--	--	--	--	--	22
1/17/2015	--	--	--	27	--	--	--	--	--	15
1/18/2015	34	--	26	27	22	--	29	--	18	18
1/19/2015	--	--	--	35	--	--	--	--	--	21
1/20/2015	--	--	--	36	--	--	--	--	--	43
1/21/2015	--	--	--	24	--	--	--	--	--	31
1/22/2015	--	--	--	33	--	--	--	--	--	38
1/23/2015	--	--	--	38	--	--	--	--	--	47
1/24/2015	27	--	20	22	24	--	25	--	--	69
1/25/2015	--	--	--	13	--	--	--	--	--	19
1/26/2015	--	--	--	8	--	--	--	--	--	11
1/27/2015	--	--	--	16	--	--	--	--	--	7
1/28/2015	--	--	--	23	--	--	--	--	13	13
1/29/2015	--	--	--	26	--	--	--	--	--	19
1/30/2015	--	--	13	15	11	--	9	--	7	9
1/31/2015	--	--	--	10	--	--	--	--	--	5
2/1/2015	--	--	--	8	--	--	--	--	--	2
2/2/2015	--	--	--	24	--	--	--	--	--	8
2/3/2015	89	--	--	37	--	--	--	--	--	17
2/4/2015	--	--	--	41	--	--	--	--	--	27
2/5/2015	69	--	37	47	42	--	26	--	21	24
2/6/2015	--	--	--	45	--	--	--	--	--	31
2/7/2015	--	--	--	36	--	--	--	--	--	27
2/8/2015	--	--	--	31	--	--	--	--	--	28
2/9/2015	--	--	--	35	--	--	--	--	--	15
2/10/2015	--	--	--	25	--	--	--	--	--	--
2/11/2015	25	--	20	23	23	--	21	--	26	25
2/12/2015	--	--	--	23	--	--	--	--	--	13

Table C-1. 2014-2016 Monitoring Data for Imperial County
Imperial County 2018 PM_{10} Plan

Date	PM_{10} Concentration (µg/m^3)									
	Calexico - Ethel		Brawley		El Centro		Westmorland		Niland	
	POC 1	POC 3	POC 1	POC 3	POC 2	POC 4	POC 1	POC 3	POC 1	POC 3
Station ID	60250005	60250005	60250007	60250007	60251003	60251003	60254003	60254003	60254004	60254004
2/13/2015	--	--	--	40	--	--	--	--	--	22
2/14/2015	--	--	--	40	--	--	--	--	--	22
2/15/2015	--	--	--	34	--	--	--	--	--	21
2/16/2015	--	--	--	23	--	--	--	--	--	23
2/17/2015	--	--	26	30	24	--	20	--	14	17
2/18/2015	--	--	--	41	--	--	--	--	--	25
2/19/2015	85	--	--	58	--	--	--	--	--	37
2/20/2015	--	--	--	60	--	--	--	--	--	42
2/21/2015	--	--	--	109	--	--	--	--	--	124
2/22/2015	--	--	--	85	--	--	--	--	--	88
2/23/2015	29	--	23	26	21	--	22	--	7	7
2/24/2015	--	--	--	28	--	--	--	--	--	21
2/25/2015	--	--	--	38	--	--	--	--	--	22
2/26/2015	--	--	--	53	--	--	--	--	--	33
2/27/2015	--	--	--	117	--	--	--	--	--	102
2/28/2015	--	--	--	43	--	--	--	--	--	62
3/1/2015	4	--	4	3	2	--	5	--	6	6
3/2/2015	--	--	--	8	--	--	--	--	--	2
3/3/2015	--	--	--	26	--	--	--	--	--	3
3/4/2015	--	--	--	13	--	--	--	--	--	5
3/5/2015	--	--	--	18	--	--	--	--	--	4
3/6/2015	--	--	--	19	--	--	--	--	--	6
3/7/2015	39	--	25	24	19	--	23	--	18	18
3/8/2015	--	--	--	24	--	--	--	--	--	26
3/9/2015	--	--	--	41	--	--	--	--	--	28
3/10/2015	--	--	--	32	--	--	--	--	--	25
3/11/2015	--	--	--	33	--	--	--	--	--	26
3/12/2015	--	--	--	28	--	--	--	--	--	20
3/13/2015	20	--	22	27	18	--	21	--	11	9
3/14/2015	--	--	--	26	--	--	--	--	--	22
3/15/2015	--	--	--	41	--	--	--	--	--	38
3/16/2015	--	--	--	36	--	--	--	--	--	32
3/17/2015	--	--	--	33	--	--	--	--	--	47
3/18/2015	--	--	--	31	--	--	--	--	--	39
3/19/2015	26	--	16	17	19	--	--	--	35	22
3/20/2015	--	--	--	22	--	--	--	--	--	17
3/21/2015	--	--	--	61	--	--	--	--	--	47
3/22/2015	--	--	--	31	--	--	--	--	--	47
3/23/2015	--	--	--	35	--	--	--	--	--	57
3/24/2015	--	--	--	64	--	--	--	--	--	120
3/25/2015	27	--	28	33	21	--	25	--	27	36
3/26/2015	--	--	--	24	--	--	--	--	--	26
3/27/2015	--	--	--	29	--	--	--	--	--	52
3/28/2015	--	--	--	25	--	--	--	--	--	49
3/29/2015	--	--	--	21	--	--	--	--	--	34
3/30/2015	--	--	--	38	--	--	--	--	--	38
3/31/2015	39	--	40	45	35	--	--	--	64	81
4/1/2015	--	--	--	61	--	--	--	--	--	66
4/2/2015	--	--	--	47	--	--	--	--	--	50
4/3/2015	--	--	--	36	--	--	--	--	--	29
4/4/2015	--	--	--	35	--	--	--	--	--	49

Table C-1. 2014-2016 Monitoring Data for Imperial County
Imperial County 2018 PM_{10} Plan

Date	PM_{10} Concentration (µg/m³)									
	Calexico - Ethel		Brawley		El Centro		Westmorland		Niland	
	POC 1	POC 3	POC 1	POC 3	POC 2	POC 4	POC 1	POC 3	POC 1	POC 3
Station ID	**60250005**	**60250005**	**60250007**	**60250007**	**60251003**	**60251003**	**60254003**	**60254003**	**60254004**	**60254004**
4/5/2015	--	--	--	52	--	--	--	--	--	97
4/6/2015	59	--	77	99	79	--	96	--	72	100
4/7/2015	--	--	--	107	--	--	--	--	--	65
4/8/2015	--	--	--	28	--	--	--	--	--	12
4/9/2015	--	--	--	22	--	--	--	--	--	23
4/10/2015	--	--	--	33	--	--	--	--	--	49
4/11/2015	--	--	--	34	--	--	--	--	--	39
4/12/2015	40	--	27	31	30	--	34	--	27	33
4/13/2015	--	--	--	36	--	--	--	--	--	40
4/14/2015	--	--	--	38	--	--	--	--	--	63
4/15/2015	--	--	--	109	--	--	--	--	--	122
4/16/2015	--	--	--	32	--	--	--	--	--	42
4/17/2015	--	--	--	30	--	--	--	--	--	34
4/18/2015	52	--	31	36	31	--	--	--	36	48
4/19/2015	--	--	--	38	--	--	--	--	--	43
4/20/2015	--	--	--	46	--	--	--	--	--	54
4/21/2015	--	--	--	67	--	--	--	--	--	47
4/22/2015	--	--	--	34	--	--	37	--	--	48
4/23/2015	--	--	--	35	--	--	--	--	--	36
4/24/2015	22	--	91	109	23	--	101	--	147	168
4/25/2015	--	--	--	101	--	--	--	--	--	113
4/26/2015	--	--	--	25	--	--	--	--	--	11
4/27/2015	--	--	--	20	--	--	--	--	--	37
4/28/2015	--	--	--	28	--	--	--	--	--	20
4/29/2015	--	--	--	37	--	--	--	--	--	34
4/30/2015	--	--	31	30	26	--	30	--	39	42
5/1/2015	--	--	--	38	--	--	--	--	--	42
5/2/2015	35	--	--	36	--	--	--	--	--	30
5/3/2015	--	--	--	44	--	--	--	--	--	39
5/4/2015	--	--	--	42	--	--	--	--	--	62
5/5/2015	--	--	--	40	--	--	--	--	--	38
5/6/2015	--	--	61	73	29	--	97	--	90	117
5/7/2015	134	--	--	127	--	--	--	--	--	210
5/8/2015	--	--	--	33	--	--	--	--	--	21
5/9/2015	--	--	--	15	--	--	--	--	--	23
5/10/2015	--	--	--	23	--	--	--	--	--	27
5/11/2015	--	--	--	32	--	--	--	--	--	37
5/12/2015	35	--	27	29	24	--	44	--	51	59
5/13/2015	--	--	--	44	--	--	--	--	--	43
5/14/2015	--	--	--	75	--	--	--	--	--	105
5/15/2015	--	--	--	6	--	--	--	--	--	12
5/16/2015	--	--	--	14	--	--	--	--	--	10
5/17/2015	--	--	--	21	--	--	--	--	--	23
5/18/2015	18	--	304	152	17	--	111	--	39	74
5/19/2015	--	--	--	31	--	--	--	--	--	51
5/20/2015	--	--	--	41	--	--	--	--	--	60
5/21/2015	--	--	--	225	--	--	--	--	--	171
5/22/2015	--	--	--	227	--	--	--	--	--	122
5/23/2015	--	--	--	17	--	--	--	--	--	40
5/24/2015	12	--	15	--	10	--	14	--	23	25
5/25/2015	--	--	--	--	--	--	--	--	--	32

Table C-1. 2014-2016 Monitoring Data for Imperial County
Imperial County 2018 PM_{10} Plan

Date	PM_{10} Concentration ($\mu g/m^3$)									
	Calexico - Ethel		Brawley		El Centro		Westmorland		Niland	
	POC 1	POC 3	POC 1	POC 3	POC 2	POC 4	POC 1	POC 3	POC 1	POC 3
Station ID	**60250005**	**60250005**	**60250007**	**60250007**	**60251003**	**60251003**	**60254003**	**60254003**	**60254004**	**60254004**
5/26/2015	--	--	--	--	--	--	--	--	--	34
5/27/2015	--	--	--	43	--	--	--	--	--	46
5/28/2015	--	--	--	33	--	--	--	--	--	41
5/29/2015	--	--	--	37	--	--	--	--	--	62
5/30/2015	34	--	31	31	38	--	32	--	29	30
5/31/2015	--	--	--	29	--	--	--	--	--	58
6/1/2015	--	--	--	45	--	--	--	--	--	76
6/2/2015	27	--	--	59	--	--	--	--	--	60
6/3/2015	--	--	--	39	--	--	--	--	--	53
6/4/2015	--	--	--	34	--	--	--	--	--	45
6/5/2015	--	--	39	47	16	--	40	--	30	33
6/6/2015	--	--	--	29	--	--	--	--	--	56
6/7/2015	--	--	--	44	--	--	--	--	--	36
6/8/2015	--	--	--	53	--	--	--	--	--	58
6/9/2015	--	--	--	36	--	--	--	--	--	29
6/10/2015	--	--	--	21	--	--	--	--	--	27
6/11/2015	16	--	22	26	15	--	26	--	22	24
6/12/2015	--	--	--	36	--	--	--	--	--	42
6/13/2015	--	--	--	37	--	--	--	--	--	48
6/14/2015	--	--	--	36	--	--	--	--	--	31
6/15/2015	--	--	--	48	--	--	--	--	--	45
6/16/2015	--	--	--	53	--	--	--	--	--	49
6/17/2015	37	--	--	51	32	--	45	--	50	54
6/18/2015	--	--	--	61	--	--	--	--	--	60
6/19/2015	--	--	--	36	--	--	--	--	--	45
6/20/2015	--	--	47	58	--	--	--	--	--	49
6/21/2015	--	--	--	44	--	--	--	--	--	37
6/22/2015	--	--	--	49	--	--	--	--	--	57
6/23/2015	35	--	37	42	30	--	34	--	41	44
6/24/2015	--	--	--	61	--	--	--	--	--	78
6/25/2015	--	--	--	66	--	--	--	--	--	60
6/26/2015	--	--	--	61	--	--	--	--	--	54
6/27/2015	--	--	--	45	--	--	--	--	--	39
6/28/2015	--	--	--	40	--	--	--	--	--	33
6/29/2015	42	--	--	49	45	--	41	--	66	66
6/30/2015	--	--	--	88	--	--	--	--	--	183
7/1/2015	--	--	--	40	--	--	--	--	--	52
7/2/2015	--	--	--	40	--	--	--	--	--	37
7/3/2015	--	--	--	27	--	--	--	--	--	48
7/4/2015	--	--	--	58	--	--	--	--	--	86
7/5/2015	38	--	--	42	34	--	--	--	33	46
7/6/2015	--	--	--	39	--	--	--	--	--	65
7/7/2015	--	--	--	55	--	--	--	--	--	90
7/8/2015	--	--	--	128	--	--	--	--	--	166
7/9/2015	--	--	--	79	--	--	--	--	--	105
7/10/2015	--	--	--	28	--	--	--	--	--	48
7/11/2015	31	--	37	39	34	--	43	--	42	49
7/12/2015	--	--	--	25	--	--	--	--	--	43
7/13/2015	--	--	--	43	--	--	--	--	--	78
7/14/2015	--	--	--	41	--	--	--	--	--	71
7/15/2015	--	--	--	41	--	--	--	--	--	63

Table C-1. 2014-2016 Monitoring Data for Imperial County
Imperial County 2018 PM_{10} Plan

Date	PM_{10} Concentration (µg/m^3)									
	Calexico - Ethel		Brawley		El Centro		Westmorland		Niland	
	POC 1	POC 3	POC 1	POC 3	POC 2	POC 4	POC 1	POC 3	POC 1	POC 3
Station ID	60250005	60250005	60250007	60250007	60251003	60251003	60254003	60254003	60254004	60254004
7/16/2015	--	--	--	40	--	8	--	45	--	76
7/17/2015	84	--	101	115	90	8	126	104	109	132
7/18/2015	--	--	--	29	--	6	--	38	--	24
7/19/2015	--	--	--	17	--	5	--	14	--	18
7/20/2015	--	--	--	14	--	5	--	11	--	12
7/21/2015	--	--	--	34	--	5	--	48	--	68
7/22/2015	--	--	--	52	--	2	--	90	--	58
7/23/2015	28	--	23	26	--	17	--	33	45	46
7/24/2015	--	--	--	34	--	20	--	26	--	33
7/25/2015	--	--	--	27	--	24	--	27	--	30
7/26/2015	--	--	--	51	--	28	--	52	--	79
7/27/2015	--	--	--	38	--	26	--	27	--	43
7/28/2015	--	--	--	36	--	38	--	46	--	53
7/29/2015	32	--	34	38	37	43	--	29	30	33
7/30/2015	--	--	--	38	--	44	--	56	--	74
7/31/2015	--	--	--	49	--	34	--	62	--	28
8/1/2015	--	--	--	30	--	35	52	53	--	60
8/2/2015	--	--	--	24	--	18	--	33	--	29
8/3/2015	--	--	--	37	--	40	--	46	--	39
8/4/2015	44	--	43	45	39	41	50	49	75	72
8/5/2015	--	--	--	51	--	49	--	47	--	54
8/6/2015	--	--	--	51	--	42	--	50	--	96
8/7/2015	--	--	--	79	--	30	--	43	--	76
8/8/2015	--	--	--	30	--	27	--	29	--	29
8/9/2015	--	--	--	26	--	24	--	26	--	35
8/10/2015	31	--	36	37	39	42	40	40	47	46
8/11/2015	--	--	--	43	--	44	--	44	--	45
8/12/2015	--	--	--	43	--	42	--	41	--	41
8/13/2015	--	--	--	40	--	43	--	49	--	88
8/14/2015	--	--	--	38	--	41	--	40	--	80
8/15/2015	--	--	--	34	--	31	--	30	--	54
8/16/2015	62	--	55	62	61	76	50	69	52	61
8/17/2015	--	--	--	67	--	66	--	58	--	97
8/18/2015	--	--	--	52	--	48	--	59	--	113
8/19/2015	--	--	--	41	--	35	--	47	--	79
8/20/2015	--	--	--	62	--	56	--	52	--	68
8/21/2015	--	--	--	72	--	64	--	67	--	74
8/22/2015	34	--	32	36	33	39	33	35	47	40
8/23/2015	--	--	--	29	--	38	--	32	--	33
8/24/2015	--	--	--	34	--	38	--	38	--	52
8/25/2015	--	--	--	60	--	67	--	63	--	45
8/26/2015	--	--	--	26	--	35	--	30	--	38
8/27/2015	--	--	--	37	--	32	--	31	--	66
8/28/2015	33	--	30	31	30	33	32	29	64	65
8/29/2015	--	--	--	32	--	27	--	30	--	49
8/30/2015	--	--	--	27	--	32	--	29	--	46
8/31/2015	--	--	--	33	--	31	--	40	--	111
9/1/2015	--	--	--	51	--	45	--	52	--	106
9/2/2015	--	--	--	37	--	33	--	47	--	111
9/3/2015	44	--	38	40	35	41	52	63	70	69
9/4/2015	--	--	--	46	--	39	--	54	--	70

Table C-1. 2014-2016 Monitoring Data for Imperial County
Imperial County 2018 PM_{10} Plan

Date	PM_{10} Concentration (µg/m^3)									
	Calexico - Ethel		Brawley		El Centro		Westmorland		Niland	
	POC 1	POC 3	POC 1	POC 3	POC 2	POC 4	POC 1	POC 3	POC 1	POC 3
Station ID	60250005	60250005	60250007	60250007	60251003	60251003	60254003	60254003	60254004	60254004
9/5/2015	--	--	--	35	--	37	--	42	--	65
9/6/2015	--	--	--	22	--	22	--	22	--	43
9/7/2015	--	--	--	23	--	24	--	31	--	40
9/8/2015	--	--	--	--	--	64	--	70	--	128
9/9/2015	62	--	52	58	70	81	57	67	61	79
9/10/2015	--	--	--	34	--	40	--	36	--	42
9/11/2015	--	--	--	48	--	45	--	43	--	43
9/12/2015	--	--	--	32	--	29	--	37	--	40
9/13/2015	--	--	--	67	--	82	--	55	--	90
9/14/2015	--	--	--	168	--	63	--	119	--	117
9/15/2015	55	--	52	67	42	51	49	55	41	90
9/16/2015	--	--	--	36	--	18	--	26	--	7
9/17/2015	--	--	--	65	--	35	--	55	--	31
9/18/2015	--	--	--	48	--	38	--	60	--	39
9/19/2015	--	--	--	36	--	40	--	63	--	39
9/20/2015	--	--	--	25	--	24	--	32	--	25
9/21/2015	28	--	30	34	30	39	--	37	59	66
9/22/2015	--	--	--	30	--	32	--	23	--	22
9/23/2015	--	--	--	41	--	48	45	42	--	37
9/24/2015	--	--	--	47	--	44	--	50	--	51
9/25/2015	--	--	--	55	--	52	--	54	--	70
9/26/2015	--	--	--	46	--	42	--	53	--	54
9/27/2015	41	--	27	29	27	30	32	36	30	33
9/28/2015	--	--	--	32	--	34	--	33	--	56
9/29/2015	--	--	--	32	--	45	--	37	--	48
9/30/2015	--	--	--	50	--	46	--	48	--	69
10/1/2015	--	--	--	154	--	86	--	97	--	171
10/2/2015	--	--	--	43	--	34	--	45	--	43
10/3/2015	45	--	29	32	25	27	43	41	67	61
10/4/2015	--	--	--	166	--	45	--	250	--	110
10/5/2015	--	--	--	20	--	20	--	22	--	8
10/6/2015	--	--	--	22	--	20	--	20	--	17
10/7/2015	--	--	--	36	--	26	--	73	--	21
10/8/2015	--	--	--	36	--	28	--	48	--	48
10/9/2015	65	--	36	32	38	37	53	62	67	67
10/10/2015	--	--	--	29	--	43	--	42	--	43
10/11/2015	--	--	--	29	--	33	--	53	--	34
10/12/2015	--	--	--	43	--	50	--	57	--	38
10/13/2015	--	--	--	42	--	41	--	53	--	38
10/14/2015	--	--	--	44	--	33	--	47	--	41
10/15/2015	31	--	25	28	14	22	23	32	23	28
10/16/2015	--	--	--	14	--	15	--	10	--	5
10/17/2015	--	--	--	14	--	14	--	18	--	10
10/18/2015	--	--	--	27	--	23	--	68	--	55
10/19/2015	--	--	--	18	--	15	--	55	--	14
10/20/2015	--	--	--	24	--	21	--	37	--	19
10/21/2015	52	--	24	24	41	45	26	26	48	26
10/22/2015	--	--	--	27	--	42	--	32	--	82
10/23/2015	--	--	--	33	--	29	--	75	--	40
10/24/2015	--	--	--	27	--	21	--	26	--	33
10/25/2015	--	--	--	26	--	--	--	33	--	35

Table C-1. 2014-2016 Monitoring Data for Imperial County
Imperial County 2018 PM_{10} Plan

Date	PM_{10} Concentration (µg/m^3)									
	Calexico - Ethel		Brawley		El Centro		Westmorland		Niland	
	POC 1	POC 3	POC 1	POC 3	POC 2	POC 4	POC 1	POC 3	POC 1	POC 3
Station ID	60250005	60250005	60250007	60250007	60251003	60251003	60254003	60254003	60254004	60254004
10/26/2015	--	--	--	30	--	33	--	38	--	28
10/27/2015	80	--	42	40	45	47	56	59	60	41
10/28/2015	--	--	--	68	--	47	--	69	--	69
10/29/2015	--	--	--	34	--	30	--	50	--	34
10/30/2015	--	--	--	80	--	104	--	127	--	47
10/31/2015	--	--	--	26	--	24	--	34	--	35
11/1/2015	--	--	--	43	--	55	--	39	--	41
11/2/2015	--	--	--	128	88	90	179	117	39	131
11/3/2015	--	--	--	66	--	36	--	74	--	43
11/4/2015	53	--	--	23	--	24	--	23	--	17
11/5/2015	--	--	23	24	--	20	--	32	--	18
11/6/2015	--	--	--	29	--	21	--	23	--	16
11/7/2015	--	--	--	20	--	18	--	28	--	19
11/8/2015	60	--	23	21	24	24	27	30	21	16
11/9/2015	--	--	--	60	--	71	--	53	--	88
11/10/2015	--	--	--	141	--	32	--	84	--	24
11/11/2015	--	--	--	21	--	15	--	28	--	25
11/12/2015	--	--	--	25	--	16	--	28	--	26
11/13/2015	--	--	--	34	--	24	--	28	--	43
11/14/2015	103	--	37	36	35	37	30	26	81	72
11/15/2015	--	--	--	85	--	45	--	66	--	73
11/16/2015	--	--	--	119	--	48	--	138	--	66
11/17/2015	--	--	--	38	--	37	--	39	--	33
11/18/2015	--	--	--	46	--	48	--	41	--	36
11/19/2015	--	--	--	35	--	39	--	34	--	30
11/20/2015	60	--	31	34	37	41	38	38	44	44
11/21/2015	--	--	--	26	--	26	--	30	--	29
11/22/2015	--	--	--	17	--	15	--	18	--	14
11/23/2015	--	--	--	50	--	51	--	40	--	42
11/24/2015	--	--	--	101	--	86	--	90	--	102
11/25/2015	--	--	--	215	--	93	--	139	--	193
11/26/2015	15	--	18	18	11	12	16	14	28	21
11/27/2015	--	--	--	14	--	11	--	11	--	15
11/28/2015	--	--	--	22	--	18	--	19	--	15
11/29/2015	--	--	--	19	--	18	--	14	--	14
11/30/2015	--	--	--	25	--	16	--	23	--	12
12/1/2015	--	--	--	26	--	18	--	21	--	17
12/2/2015	--	--	32	30	27	26	28	25	2	20
12/3/2015	--	--	--	27	--	33	--	23	--	15
12/4/2015	107	--	--	34	--	55	--	28	--	51
12/5/2015	--	--	--	28	--	20	--	23	--	20
12/6/2015	--	--	--	16	--	14	--	18	--	24
12/7/2015	--	--	--	34	--	33	--	27	--	30
12/8/2015	91	--	39	39	37	37	33	32	46	47
12/9/2015	--	--	--	53	--	56	--	50	--	42
12/10/2015	--	--	--	77	--	95	--	81	--	49
12/11/2015	--	--	--	84	--	79	--	82	--	89
12/12/2015	--	--	--	18	--	15	--	17	--	20
12/13/2015	--	--	--	48	--	23	--	44	--	53
12/14/2015	--	--	222	208	165	201	193	183	250	33
12/15/2015	--	--	--	19	--	18	--	27	--	26

Table C-1. 2014-2016 Monitoring Data for Imperial County
Imperial County 2018 PM_{10} Plan

Date	PM_{10} Concentration (µg/m^3)									
	Calexico - Ethel		Brawley		El Centro		Westmorland		Niland	
	POC 1	POC 3	POC 1	POC 3	POC 2	POC 4	POC 1	POC 3	POC 1	POC 3
Station ID	60250005	60250005	60250007	60250007	60251003	60251003	60254003	60254003	60254004	60254004
12/16/2015	--	--	--	22	--	22	--	25	--	19
12/17/2015	--	--	--	31	--	32	--	30	--	15
12/18/2015	81	--	--	27	--	25	--	24	--	16
12/19/2015	--	--	--	24	--	29	--	30	--	39
12/20/2015	--	--	19	18	12	11	14	13	12	10
12/21/2015	--	--	--	26	--	30	--	26	--	16
12/22/2015	42	--	--	89	--	45	--	127	--	40
12/23/2015	--	--	--	30	--	17	--	50	--	24
12/24/2015	--	--	--	62	--	33	--	30	--	26
12/25/2015	--	--	--	72	--	71	--	80	--	21
12/26/2015	55	--	101	132	93	102	165	198	73	132
12/27/2015	--	--	--	16	--	22	--	18	--	26
12/28/2015	--	--	--	32	--	30	--	34	--	23
12/29/2015	--	--	--	10	--	26	--	23	--	12
12/30/2015	--	--	--	30	--	41	--	62	--	29
12/31/2015	--	--	--	26	--	31	--	29	--	18
1/1/2016	--	--	25	23	--	29	--	13	21	16
1/2/2016	--	--	--	45	--	34	--	52	--	41
1/3/2016	--	--	--	44	--	22	--	31	--	46
1/4/2016	--	--	--	23	--	30	--	25	--	17
1/5/2016	22	--	--	20	--	26	--	20	--	12
1/6/2016	--	--	--	9	--	9	--	18	--	16
1/7/2016	5	--	6	4	--	4	--	3	4	2
1/8/2016	--	--	--	21	--	21	--	13	--	7
1/9/2016	--	--	--	23	--	24	--	18	--	9
1/10/2016	--	--	--	22	--	27	--	23	--	10
1/11/2016	--	--	--	19	--	18	--	13	--	4
1/12/2016	--	--	--	19	--	15	--	12	--	3
1/13/2016	40	--	34	29	--	31	--	19	11	9
1/14/2016	--	--	--	--	--	45	--	25	--	9
1/15/2016	--	124	--	--	--	150	--	60	--	28
1/16/2016	--	37	--	--	--	26	--	23	--	23
1/17/2016	--	40	--	--	--	22	--	18	--	14
1/18/2016	--	103	--	--	--	46	--	28	--	19
1/19/2016	66	71	35	--	--	47	--	30	19	18
1/20/2016	--	58	--	--	--	28	--	18	--	12
1/21/2016	--	58	--	--	--	23	--	22	--	8
1/22/2016	--	65	--	--	--	25	--	21	--	6
1/23/2016	--	43	--	--	--	25	--	20	--	17
1/24/2016	--	46	--	--	--	14	--	12	--	9
1/25/2016	--	49	21	--	--	23	--	14	11	11
1/26/2016	--	45	--	--	--	19	--	14	--	10
1/27/2016	--	46	--	--	--	23	--	20	--	20
1/28/2016	--	52	--	34	--	31	--	24	--	11
1/29/2016	--	85	--	38	--	45	--	33	--	23
1/30/2016	--	95	--	72	--	80	--	66	--	64
1/31/2016	--	93	218	167	--	48	--	251	225	227
2/1/2016	--	48	--	135	--	40	--	141	--	55
2/2/2016	--	43	--	22	--	27	--	26	--	11
2/3/2016	--	42	--	21	--	24	--	19	--	9
2/4/2016	--	31	--	20	--	15	--	18	--	8

Table C-1. 2014-2016 Monitoring Data for Imperial County
Imperial County 2018 PM_{10} Plan

Date	PM_{10} Concentration (µg/m^3)									
	Calexico - Ethel		Brawley		El Centro		Westmorland		Niland	
	POC 1	POC 3	POC 1	POC 3	POC 2	POC 4	POC 1	POC 3	POC 1	POC 3
Station ID	60250005	60250005	60250007	60250007	60251003	60251003	60254003	60254003	60254004	60254004
2/5/2016	--	33	--	19	--	17	--	16	--	15
2/6/2016	--	17	18	15	--	9	--	11	13	8
2/7/2016	--	27	--	13	--	10	--	11	--	9
2/8/2016	--	23	--	23	--	20	--	21	--	10
2/9/2016	--	44	--	27	--	21	--	23	--	17
2/10/2016	--	44	--	35	--	26	--	31	--	18
2/11/2016	--	63	--	33	--	28	--	24	--	17
2/12/2016	--	66	42	39	--	32	--	40	18	15
2/13/2016	--	42	--	35	--	34	--	32	--	26
2/14/2016	--	24	--	30	--	18	--	25	--	19
2/15/2016	--	27	--	25	--	19	--	23	--	14
2/16/2016	--	66	--	30	--	34	--	32	--	15
2/17/2016	--	97	--	88	--	58	--	117	--	67
2/18/2016	--	76	52	56	--	42	--	48	20	23
2/19/2016	--	39	--	26	--	25	--	19	--	11
2/20/2016	--	51	--	27	--	34	--	20	--	12
2/21/2016	--	33	--	23	--	19	--	21	--	15
2/22/2016	--	77	--	51	--	42	--	47	--	34
2/23/2016	--	62	--	35	--	37	--	42	--	21
2/24/2016	--	44	32	28	--	23	--	26	17	14
2/25/2016	--	59	--	34	--	24	--	46	--	14
2/26/2016	--	73	--	33	--	30	--	40	--	17
2/27/2016	--	85	--	39	--	45	--	31	--	25
2/28/2016	--	91	--	48	--	46	--	34	--	44
2/29/2016	--	124	--	52	--	71	--	51	--	53
3/1/2016	--	115	64	72	--	83	--	77	48	52
3/2/2016	--	89	--	55	--	51	--	45	--	43
3/3/2016	--	69	--	47	--	40	--	40	--	46
3/4/2016	--	54	--	70	--	38	--	86	--	69
3/5/2016	--	58	--	51	--	47	--	68	--	56
3/6/2016	--	64	--	204	--	86	--	149	--	124
3/7/2016	--	42	72	45	--	26	--	32	38	41
3/8/2016	--	18	--	12	--	16	--	11	--	8
3/9/2016	--	28	--	24	--	11	--	31	--	15
3/10/2016	--	48	--	30	--	24	--	25	--	20
3/11/2016	--	89	--	178	--	47	--	179	--	140
3/12/2016	--	31	--	63	--	15	--	31	--	46
3/13/2016	--	32	44	45	--	26	--	37	48	54
3/14/2016	--	23	--	40	--	20	--	41	--	37
3/15/2016	--	57	--	41	--	32	--	39	--	24
3/16/2016	--	52	--	40	--	30	--	40	--	43
3/17/2016	--	52	--	38	--	34	--	27	--	56
3/18/2016	--	65	--	42	--	51	--	38	--	72
3/19/2016	--	60	28	31	--	43	--	29	45	45
3/20/2016	--	41	--	25	--	20	--	20	--	40
3/21/2016	--	76	--	65	--	50	--	55	--	117
3/22/2016	--	109	--	142	--	46	--	110	--	116
3/23/2016	--	37	--	30	--	23	--	32	--	33
3/24/2016	--	51	--	25	--	19	--	18	--	19
3/25/2016	--	43	33	32	--	25	--	32	45	40
3/26/2016	--	54	--	48	--	49	--	29	--	27

Table C-1. 2014-2016 Monitoring Data for Imperial County
Imperial County 2018 PM_{10} Plan

Date	PM_{10} Concentration (µg/m^3)									
	Calexico - Ethel		Brawley		El Centro		Westmorland		Niland	
	POC 1	POC 3	POC 1	POC 3	POC 2	POC 4	POC 1	POC 3	POC 1	POC 3
Station ID	**60250005**	**60250005**	**60250007**	**60250007**	**60251003**	**60251003**	**60254003**	**60254003**	**60254004**	**60254004**
3/27/2016	--	39	--	27	--	30	--	24	--	27
3/28/2016	--	138	--	274	--	183	--	177	--	--
3/29/2016	--	58	--	104	--	40	--	110	--	79
3/30/2016	--	19	--	16	--	12	--	21	--	12
3/31/2016	--	29	26	26	--	13	--	29	22	25
4/1/2016	--	44	--	23	--	22	--	28	--	32
4/2/2016	--	58	--	31	--	44	--	29	--	31
4/3/2016	--	35	--	23	--	22	--	24	--	30
4/4/2016	--	42	--	34	--	32	--	41	--	44
4/5/2016	--	75	--	47	--	43	--	39	--	47
4/6/2016	--	65	55	57	--	40	--	54	47	54
4/7/2016	--	37	--	57	--	17	--	76	--	45
4/8/2016	--	13	--	8	--	7	--	8	--	5
4/9/2016	--	13	--	11	--	9	--	18	--	11
4/10/2016	--	12	--	4	--	10	--	5	--	5
4/11/2016	--	18	--	10	--	13	--	8	--	9
4/12/2016	--	19	11	13	--	11	--	9	8	8
4/13/2016	--	39	--	30	--	25	--	21	--	33
4/14/2016	--	61	--	113	--	48	--	163	--	118
4/15/2016	--	53	--	84	--	55	--	89	--	75
4/16/2016	--	31	--	34	--	18	--	26	--	14
4/17/2016	--	36	--	24	--	30	--	18	--	29
4/18/2016	--	47	30	27	--	21	--	22	20	21
4/19/2016	--	58	--	33	--	33	--	35	--	35
4/20/2016	--	48	--	34	--	35	--	32	--	42
4/21/2016	--	55	--	38	--	49	--	44	--	44
4/22/2016	--	87	--	134	--	85	--	192	--	115
4/23/2016	--	43	--	62	--	63	--	33	--	32
4/24/2016	--	65	186	184	--	48	--	141	96	126
4/25/2016	--	173	--	285	--	151	--	244	--	225
4/26/2016	--	47	--	28	--	34	--	29	--	25
4/27/2016	--	99	--	141	--	68	--	75	--	136
4/28/2016	--	69	--	75	--	53	--	128	--	63
4/29/2016	--	35	--	44	--	23	--	36	--	43
4/30/2016	--	45	44	42	--	38	--	72	25	31
5/1/2016	--	24	--	13	--	20	--	17	--	12
5/2/2016	--	35	--	38	--	59	--	30	--	22
5/3/2016	--	41	--	37	--	28	--	20	--	19
5/4/2016	--	45	--	41	--	42	--	53	--	50
5/5/2016	--	125	--	163	--	85	--	227	--	135
5/6/2016	--	18	25	23	--	11	--	30	12	13
5/7/2016	--	16	--	7	--	10	--	16	--	24
5/8/2016	--	15	--	10	--	8	--	24	--	15
5/9/2016	--	32	--	22	--	22	--	23	--	35
5/10/2016	--	34	--	26	--	32	--	26	--	43
5/11/2016	--	45	--	30	--	40	--	35	--	28
5/12/2016	--	44	35	35	--	45	--	41	37	41
5/13/2016	--	49	--	31	--	42	--	34	--	29
5/14/2016	--	50	--	77	--	45	--	84	--	123
5/15/2016	--	57	--	59	--	67	--	100	--	216
5/16/2016	--	40	--	59	--	44	--	103	--	90

Table C-1. 2014-2016 Monitoring Data for Imperial County
Imperial County 2018 PM_{10} Plan

Date	PM_{10} Concentration (µg/m^3)									
	Calexico - Ethel		Brawley		El Centro		Westmorland		Niland	
	POC 1	POC 3	POC 1	POC 3	POC 2	POC 4	POC 1	POC 3	POC 1	POC 3
Station ID	**60250005**	**60250005**	**60250007**	**60250007**	**60251003**	**60251003**	**60254003**	**60254003**	**60254004**	**60254004**
5/17/2016	--	55	--	43	--	44	--	55	--	55
5/18/2016	--	44	18	20	--	31	--	17	30	25
5/19/2016	--	50	--	95	--	34	--	90	--	66
5/20/2016	--	159	--	--	--	74	--	--	--	211
5/21/2016	--	226	--	199	--	185	--	93	--	113
5/22/2016	--	46	--	47	--	20	--	53	--	53
5/23/2016	--	35	--	81	--	44	--	105	--	77
5/24/2016	--	67	144	154	--	50	--	148	74	103
5/25/2016	--	78	--	165	--	--	--	119	--	76
5/26/2016	--	33	--	26	--	--	--	38	--	38
5/27/2016	--	47	--	39	--	38	--	34	--	46
5/28/2016	--	43	--	39	--	48	--	37	--	45
5/29/2016	--	35	--	27	--	30	--	26	--	33
5/30/2016	--	41	30	30	--	38	--	30	31	34
5/31/2016	--	57	--	46	--	66	--	51	--	54
6/1/2016	--	59	--	51	--	51	--	44	--	58
6/2/2016	--	67	--	50	--	57	--	42	--	61
6/3/2016	--	55	--	37	--	43	--	38	--	38
6/4/2016	--	34	--	70	--	35	--	55	--	38
6/5/2016	--	36	108	121	--	38	--	64	79	96
6/6/2016	--	49	--	58	--	38	--	42	--	55
6/7/2016	--	56	--	48	--	56	--	49	--	70
6/8/2016	--	63	--	56	--	61	--	55	--	51
6/9/2016	--	60	--	48	--	55	--	50	--	51
6/10/2016	--	59	--	56	--	59	--	56	--	56
6/11/2016	--	62	58	65	--	64	--	68	63	78
6/12/2016	--	32	--	66	--	31	--	82	--	50
6/13/2016	--	44	--	22	--	24	--	32	--	32
6/14/2016	--	51	--	49	--	46	--	57	--	72
6/15/2016	--	124	--	106	--	68	--	112	--	105
6/16/2016	--	51	--	33	--	39	--	55	--	51
6/17/2016	--	63	38	40	--	45	--	55	29	35
6/18/2016	--	43	--	50	--	28	--	50	--	24
6/19/2016	--	22	--	23	--	20	--	26	--	18
6/20/2016	--	75	--	76	--	79	--	69	--	72
6/21/2016	--	62	--	69	--	77	--	67	--	79
6/22/2016	--	66	--	101	--	66	--	65	--	98
6/23/2016	--	76	51	58	--	71	--	55	58	67
6/24/2016	--	67	--	53	--	64	--	53	--	50
6/25/2016	--	59	--	49	--	53	--	47	--	44
6/26/2016	--	54	--	51	--	55	--	49	--	46
6/27/2016	--	55	--	52	--	47	--	48	--	50
6/28/2016	--	64	--	58	--	57	--	65	--	81
6/29/2016	--	84	65	73	--	80	--	74	70	92
6/30/2016	--	64	--	59	--	53	--	55	--	64
7/1/2016	--	41	--	44	--	40	--	42	--	49
7/2/2016	--	61	--	51	--	55	--	48	--	50
7/3/2016	--	51	--	37	--	38	--	33	--	54
7/4/2016	--	40	--	67	--	33	--	95	--	68
7/5/2016	--	62	80	89	--	50	--	85	73	85
7/6/2016	--	77	--	64	--	66	--	83	--	93

Table C-1. 2014-2016 Monitoring Data for Imperial County

Imperial County 2018 PM_{10} Plan

Date	PM_{10} Concentration (µg/m^3)									
	Calexico - Ethel		Brawley		El Centro		Westmorland		Niland	
	POC 1	POC 3	POC 1	POC 3	POC 2	POC 4	POC 1	POC 3	POC 1	POC 3
Station ID	**60250005**	**60250005**	**60250007**	**60250007**	**60251003**	**60251003**	**60254003**	**60254003**	**60254004**	**60254004**
7/7/2016	--	61	--	39	--	40	--	40	--	56
7/8/2016	--	49	--	42	--	38	--	42	--	64
7/9/2016	--	60	--	63	--	52	--	49	--	50
7/10/2016	--	66	--	117	--	39	--	66	--	116
7/11/2016	--	48	48	54	--	60	--	76	48	54
7/12/2016	--	60	--	33	--	43	--	45	--	76
7/13/2016	--	66	--	51	--	55	--	45	--	50
7/14/2016	--	55	--	48	--	43	--	51	--	58
7/15/2016	--	67	--	59	--	59	--	57	--	70
7/16/2016	--	68	--	56	--	59	--	48	--	65
7/17/2016	--	75	61	68	--	65	--	72	53	68
7/18/2016	--	62	--	45	--	38	--	48	--	51
7/19/2016	--	47	--	52	--	45	--	58	--	47
7/20/2016	--	46	--	44	--	44	--	51	--	54
7/21/2016	--	50	--	39	--	38	--	34	--	48
7/22/2016	--	63	--	56	--	60	--	57	--	55
7/23/2016	--	195	129	144	--	203	--	137	111	147
7/24/2016	--	194	--	155	--	126	--	164	--	131
7/25/2016	--	49	--	40	--	42	--	37	--	37
7/26/2016	--	47	--	50	--	50	--	50	--	66
7/27/2016	--	43	--	46	--	37	--	49	--	46
7/28/2016	--	61	--	48	--	51	--	55	--	65
7/29/2016	--	69	92	87	--	66	--	54	82	79
7/30/2016	--	158	--	195	--	171	--	201	--	168
7/31/2016	--	33	--	27	--	31	--	23	--	31
8/1/2016	--	37	--	34	--	33	--	30	--	42
8/2/2016	--	35	--	44	--	35	--	38	--	43
8/3/2016	--	37	--	42	--	36	--	50	--	44
8/4/2016	--	40	39	36	--	39	--	38	48	50
8/5/2016	--	43	--	48	--	46	--	55	--	58
8/6/2016	--	47	--	39	--	40	--	37	--	44
8/7/2016	--	36	--	33	--	31	--	56	--	48
8/8/2016	--	84	--	62	--	94	--	74	--	75
8/9/2016	--	155	--	141	--	159	--	166	--	167
8/10/2016	--	--	43	40	--	40	--	44	38	44
8/11/2016	--	43	--	27	--	30	--	27	--	31
8/12/2016	--	46	--	27	--	34	--	31	--	26
8/13/2016	--	53	--	36	--	38	--	44	--	34
8/14/2016	--	49	--	34	--	33	--	32	--	40
8/15/2016	--	48	--	33	--	33	--	37	--	38
8/16/2016	--	51	38	35	--	47	--	45	39	39
8/17/2016	--	94	--	82	--	99	--	99	--	105
8/18/2016	--	55	--	63	--	50	--	86	--	60
8/19/2016	--	114	--	119	--	105	--	126	--	151
8/20/2016	--	89	--	84	--	89	--	82	--	93
8/21/2016	--	138	--	113	--	170	--	118	--	76
8/22/2016	--	42	58	66	--	33	--	75	57	69
8/23/2016	--	46	--	42	--	46	--	48	--	70
8/24/2016	--	58	--	46	--	60	--	49	--	56
8/25/2016	--	77	--	68	--	73	--	75	--	73
8/26/2016	--	53	--	42	--	44	--	40	--	46

Table C-1. 2014-2016 Monitoring Data for Imperial County
Imperial County 2018 PM_{10} Plan

Date	PM_{10} Concentration (µg/m^3)									
	Calexico - Ethel		Brawley		El Centro		Westmorland		Niland	
	POC 1	POC 3	POC 1	POC 3	POC 2	POC 4	POC 1	POC 3	POC 1	POC 3
Station ID	**60250005**	**60250005**	**60250007**	**60250007**	**60251003**	**60251003**	**60254003**	**60254003**	**60254004**	**60254004**
8/27/2016	--	34	--	45	--	39	--	41	--	30
8/28/2016	--	41	24	23	--	30	--	21	27	25
8/29/2016	--	54	--	48	--	36	--	44	--	32
8/30/2016	--	62	--	55	--	47	--	52	--	60
8/31/2016	--	63	--	62	--	72	--	68	--	83
9/1/2016	--	52	--	53	--	52	--	49	--	95
9/2/2016	--	44	--	52	--	40	--	44	--	64
9/3/2016	--	97	275	119	--	174	--	130	--	97
9/4/2016	--	69	--	81	--	39	--	72	--	73
9/5/2016	--	33	--	44	--	28	--	52	--	43
9/6/2016	--	65	--	49	--	54	--	54	--	49
9/7/2016	--	52	--	47	--	49	--	46	--	41
9/8/2016	--	41	--	36	--	40	--	35	--	30
9/9/2016	--	51	37	33	--	38	--	37	33	32
9/10/2016	--	49	--	39	--	31	--	34	--	38
9/11/2016	--	31	--	56	--	27	--	53	--	42
9/12/2016	--	82	--	232	--	106	--	164	--	75
9/13/2016	--	180	--	160	--	179	--	82	--	93
9/14/2016	--	42	--	28	--	29	--	25	--	17
9/15/2016	--	48	36	33	--	32	--	28	27	24
9/16/2016	--	66	--	55	--	49	--	65	--	40
9/17/2016	--	49	--	48	--	37	--	43	--	39
9/18/2016	--	45	--	33	--	26	--	27	--	25
9/19/2016	--	129	--	99	--	110	--	141	--	104
9/20/2016	--	20	--	12	--	12	--	11	--	9
9/21/2016	--	19	10	9	--	10	--	7	8	6
9/22/2016	--	82	--	89	--	82	--	102	--	144
9/23/2016	--	71	--	52	--	50	--	41	--	54
9/24/2016	--	27	--	30	--	20	--	25	--	15
9/25/2016	--	30	--	37	--	30	--	21	--	12
9/26/2016	--	54	--	54	--	56	--	45	--	36
9/27/2016	--	39	40	40	--	46	--	33	35	36
9/28/2016	--	47	--	30	--	37	--	25	--	24
9/29/2016	--	53	--	28	--	36	--	49	--	48
9/30/2016	--	46	--	28	--	24	--	32	--	37
10/1/2016	--	33	--	24	--	27	--	28	--	26
10/2/2016	--	119	--	86	--	67	--	137	--	84
10/3/2016	--	55	79	95	--	57	--	76	--	60
10/4/2016	--	41	--	35	--	30	--	31	--	41
10/5/2016	--	51	--	--	--	33	--	39	29	30
10/6/2016	--	48	--	44	--	33	--	37	--	30
10/7/2016	--	62	--	33	--	28	--	26	--	29
10/8/2016	--	39	--	30	--	27	--	27	--	24
10/9/2016	--	40	32	30	--	31	--	32	26	23
10/10/2016	--	54	--	40	--	58	--	43	--	41
10/11/2016	--	56	--	37	--	37	--	43	--	30
10/12/2016	--	74	--	43	--	53	--	45	--	50
10/13/2016	--	78	--	50	--	47	--	44	--	45
10/14/2016	--	90	--	67	--	55	--	60	--	57
10/15/2016	--	54	38	38	--	43	--	39	34	36
10/16/2016	--	51	--	26	--	28	--	25	--	38

Table C-1. 2014-2016 Monitoring Data for Imperial County
Imperial County 2018 PM_{10} Plan

Date	PM_{10} Concentration (µg/m^3)									
	Calexico - Ethel		Brawley		El Centro		Westmorland		Niland	
	POC 1	POC 3	POC 1	POC 3	POC 2	POC 4	POC 1	POC 3	POC 1	POC 3
Station ID	**60250005**	**60250005**	**60250007**	**60250007**	**60251003**	**60251003**	**60254003**	**60254003**	**60254004**	**60254004**
10/17/2016	--	44	--	44	--	20	--	41	--	38
10/18/2016	--	51	--	41	--	32	--	36	--	26
10/19/2016	--	59	--	43	--	35	--	28	--	21
10/20/2016	--	63	--	33	--	35	--	32	--	20
10/21/2016	--	76	48	45	--	44	--	38	31	30
10/22/2016	--	101	--	61	--	70	--	56	--	50
10/23/2016	--	45	--	29	--	38	--	30	--	34
10/24/2016	--	83	--	36	--	47	--	29	--	26
10/25/2016	--	29	--	21	--	19	--	17	--	10
10/26/2016	--	38	--	30	--	24	--	20	--	16
10/27/2016	--	51	29	27	--	31	--	35	17	13
10/28/2016	--	115	--	49	--	65	--	40	--	30
10/29/2016	--	64	--	39	--	38	--	33	--	23
10/30/2016	--	62	--	162	--	79	--	124	--	58
10/31/2016	--	48	--	23	--	23	--	28	--	16
11/1/2016	--	33	--	38	--	25	--	39	--	32
11/2/2016	--	46	36	30	--	23	--	20	33	10
11/3/2016	--	103	--	68	--	91	--	39	--	34
11/4/2016	--	133	--	107	--	82	--	103	--	68
11/5/2016	--	78	--	39	--	29	--	32	--	28
11/6/2016	--	69	--	27	--	28	--	24	--	22
11/7/2016	--	61	--	47	--	39	--	35	--	30
11/8/2016	--	54	33	33	--	30	--	25	24	22
11/9/2016	--	63	--	37	--	34	--	36	--	17
11/10/2016	--	61	--	46	--	39	--	73	--	21
11/11/2016	--	45	--	41	--	45	--	41	--	23
11/12/2016	--	40	--	38	--	30	--	28	--	37
11/13/2016	--	--	--	32	--	22	--	30	--	27
11/14/2016	--	--	39	35	--	32	--	37	--	17
11/15/2016	--	85	--	55	--	67	--	52	--	32
11/16/2016	--	136	--	105	--	128	--	101	76	57
11/17/2016	--	70	--	85	--	59	--	83	--	60
11/18/2016	--	67	--	35	--	29	--	31	--	16
11/19/2016	--	67	--	31	--	26	--	31	--	19
11/20/2016	--	98	37	36	--	51	--	37	30	32
11/21/2016	--	31	--	13	--	21	--	26	--	11
11/22/2016	--	28	--	20	--	19	--	15	--	12
11/23/2016	--	31	--	23	--	23	--	20	--	12
11/24/2016	--	21	--	20	--	26	--	16	--	9
11/25/2016	--	32	--	36	--	28	--	31	--	20
11/26/2016	--	92	88	98	--	53	--	135	65	91
11/27/2016	--	70	--	43	--	21	--	30	--	11
11/28/2016	--	31	--	39	--	39	--	30	--	39
11/29/2016	--	50	--	29	--	27	--	27	--	15
11/30/2016	--	58	--	31	--	33	--	19	--	11
12/1/2016	--	76	--	34	--	36	--	25	--	10
12/2/2016	--	50	39	47	--	49	--	51	20	24
12/3/2016	--	51	--	30	--	37	--	37	--	15
12/4/2016	--	55	--	15	--	24	--	12	--	14
12/5/2016	--	104	--	48	--	73	--	40	--	17
12/6/2016	--	93	--	58	--	57	--	54	--	45

Table C-1. 2014-2016 Monitoring Data for Imperial County
Imperial County 2018 PM_{10} Plan

Date	PM_{10} Concentration (µg/m^3)									
	Calexico - Ethel		Brawley		El Centro		Westmorland		Niland	
	POC 1	POC 3	POC 1	POC 3	POC 2	POC 4	POC 1	POC 3	POC 1	POC 3
Station ID	**60250005**	**60250005**	**60250007**	**60250007**	**60251003**	**60251003**	**60254003**	**60254003**	**60254004**	**60254004**
12/7/2016	--	52	--	40	--	33	--	39	--	32
12/8/2016	--	54	38	35	--	38	--	27	18	15
12/9/2016	--	65	--	41	--	40	--	32	--	23
12/10/2016	--	87	--	46	--	45	--	38	--	36
12/11/2016	--	87	--	53	--	57	--	44	--	33
12/12/2016	--	76	--	42	--	56	--	33	--	34
12/13/2016	--	91	--	53	--	56	--	43	--	29
12/14/2016	--	69	42	41	--	46	--	36	24	21
12/15/2016	--	93	--	61	--	69	--	67	--	37
12/16/2016	--	238	--	232	--	207	--	198	--	278
12/17/2016	--	102	--	77	--	118	--	95	--	22
12/18/2016	--	25	--	21	--	14	--	14	--	16
12/19/2016	--	28	--	25	--	27	--	22	--	8
12/20/2016	--	38	38	27	--	27	--	25	19	18
12/21/2016	--	31	--	18	--	23	--	20	--	13
12/22/2016	--	13	--	2	--	5	--	2	--	1
12/23/2016	--	27	--	12	--	24	--	16	--	6
12/24/2016	--	14	--	11	--	15	--	14	--	12
12/25/2016	--	24	--	8	--	11	--	6	--	4
12/26/2016	--	15	15	12	--	10	--	8	--	4
12/27/2016	--	38	--	20	--	18	--	12	--	5
12/28/2016	--	34	--	28	--	21	--	19	12	8
12/29/2016	--	43	--	35	--	27	--	27	--	13
12/30/2016	--	44	--	27	--	25	--	20	--	18
12/31/2016	--	38	--	18	--	28	--	18	--	12

Notes:
Data obtained from United States Environmental Protection Agency Outdoor Air Quality Data. Available at: https://www.epa.gov/outdoor-air-quality-data/download-daily-data. Accessed: October 2017.

Abbreviations:
POC - parameter occurrence code

Table C-2. 2014-2016 Monitoring Data Completeness

Imperial County 2018 PM_{10} Plan

Year	Monitoring Frequency	AQS Site ID	Name	POC	% Complete
2014	Continuous	60250007	Brawley-Main Street	3	99
2014	Continuous	60254004	Niland-English Road	3	96
2014	Intermittent	60250005	Calexico-Ethel Street	1	95
2014	Intermittent	60250007	Brawley-Main Street	1	86
2014	Intermittent	60251003	El Centro-9th Street	2	98
2014	Intermittent	60254003	Westmorland North	1	96
2014	Intermittent	60254004	Niland-English Road	1	93
2015	Continuous	60250007	Brawley-Main Street	3	98
2015	Continuous	60251003	El Centro-9th Street	4	91
2015	Continuous	60254003	Westmorland North	3	91
2015	Continuous	60254004	Niland-English Road	3	99
2015	Intermittent	60250005	Calexico-Ethel Street	1	98
2015	Intermittent	60250007	Brawley-Main Street	1	96
2015	Intermittent	60251003	El Centro-9th Street	2	98
2015	Intermittent	60254003	Westmorland North	1	93
2015	Intermittent	60254004	Niland-English Road	1	100
2016	Continuous	60250005	Calexico-Ethel Street	3	99
2016	Continuous	60250007	Brawley-Main Street	3	95
2016	Continuous	60251003	El Centro-9th Street	4	99
2016	Continuous	60254003	Westmorland North	3	99
2016	Continuous	60254004	Niland-English Road	3	100
2016	Intermittent	60250005	Calexico-Ethel Street	1	100
2016	Intermittent	60250007	Brawley-Main Street	1	100
2016	Intermittent	60254004	Niland-English Road	1	98

Notes:
1. Continuous monitoring refers to the collection of measurements once per day. Intermittent monitoring refers to the collection of measurements once every six days.
2. Data compiled from USEPA AMP600 certification reports.

Abbreviations:

AQS - Air Quality System

POC - parameter occurrence code

USEPA - United States Environmental Protection Agency

Monitoring Site	AQS No.	POC	Date	PM_{10} Concentration ($\mu g/m^3$)	Documentation Status	Event Description
Brawley	06-025-0007	3	01/31/2014	198	Submitted to CARB	Predominantly west-southwest winds with gusts as high as 38 mph.
Westmorland	06-025-4003	1	02/28/2014	294	Submitted to CARB	Predominantly south southwest with gusts as high as 41 mph.
Brawley	06-025-0007	3	03/17/2014	190	Submitted to CARB	Predominantly southwest winds with gusts as high as 31 mph.
Brawley	06-025-0007	3	03/26/2014	374	Submitted to CARB	Predominantly west winds with gusts as high as 43 mph.
Niland	06-025-4004	3	03/26/2014	279		
Brawley	06-025-0007	1	03/30/2014	220	Submitted to CARB	Predominantly west southwest winds with gusts as high as 36 mph.
Brawley	06-025-0007	3	04/01/2014	160		Predominantly west southwest winds with gusts as high as 34 mph.
Niland	06-025-4004	3	04/12/2014	167	Submitted to CARB	Predominantly west winds with gusts as high as 25 mph.
Brawley	06-025-0007	3	04/13/2014	166		
Brawley	06-025-0007	3	04/25/2014	184	Submitted to CARB	Predominantly west southwest winds with gusts as high as 42 mph.
Brawley	06-025-0007	3	04/26/2014	312		Predominantly west winds with gusts as high as 40 mph.
Brawley	06-025-0007	1	05/05/2014	269	Submitted to CARB	Predominantly west southwest winds with gusts as high as 40 mph.
Westmorland	06-025-4003	1	05/05/2014	375		Predominantly west southwest winds with gusts as high as 40 mph.
Brawley	06-025-0007	3	05/05/2014	222		Predominantly west southwest winds with gusts as high as 40 mph.
Brawley	06-025-0007	3	05/06/2014	438		Predominantly west winds with gusts as high as 51 mph.
Niland	06-025-4004	3	05/11/2014	172	Submitted to CARB	Predominantly west winds with gusts as high as 25 mph.
Brawley	06-025-0007	3	05/20/2014	250	Submitted to CARB	Predominantly west southwest winds with gusts as high as 38 mph.
Brawley	06-025-0007	3	06/26/2014	185	Submitted to CARB	Predominantly west southwest winds with gusts as high as 36 mph.
Westmorland	06-025-4003	1	07/16/2014	167	Submitted to CARB	Predominantly west southwest winds with gusts as high as 30 mph.
Niland	06-025-4004	3	08/18/2014	161	Submitted to CARB	Predominantly southeast winds with gusts as high as 41 mph.
Brawley	06-025-0007	3	09/27/2014	219	Submitted to CARB	Predominantly west southwest winds with gusts as high as 39 mph.
Niland	06-025-4004	3	10/31/2014	181	Submitted to CARB	Predominantly west southwest winds with gusts as high as 23 mph.
Brawley	06-025-0007	1	11/01/2014	471		Predominantly west southwest winds with gusts as high as 40 mph.
Westmorland	06-025-4003	1	11/01/2014	404		Predominantly west southwest winds with gusts as high as 40 mph.
Niland	06-025-4004	1	11/01/2014	173		Predominantly west southwest winds with gusts as high as 40 mph.
Niland	06-025-4004	3	11/01/2014	218		Predominantly west southwest winds with gusts as high as 40 mph.
Brawley	06-025-0007	3	11/16/2014	210	Submitted to CARB	Predominantly south southwest winds with gusts as high as 34 mph.
Niland	06-025-4004	3	11/16/2014	248		
Niland	06-025-4004	3	04/24/2015	168	Submitted to CARB	According to the weather briefing issued by the National Weather Service on April 24, 2015 unsettled weather occurred within the southeast desert region of California affecting Imperial County. As a result of the unsettled weather the NWS issued a “Wind Advisory” indicating that elevated winds were expected for April 24, 2015. West wind 10 to 20mph in the morning increasing to 20 to 30mph in the afternoon. Gusts up to 40mph in the afternoon. Affected areas include Southeast California including El Centro, Plaster City, Blythe, Desert Center, Joshua Tree National Park and additional locations along the Interstate 8 and 10 corridors.
Niland	06-025-4004	3	05/07/2015	210	Submitted to CARB	According to the National Weather Service Zone forecast and Wind Advisory, Sustained west southwest winds 25 to 30mph with strong gusts 40 to 45mph. Strong gusts were expected to create hazardous crosswinds and potentially reduce visibilities due to blowing dust. Affected areas include Southeast California including El Centro, Plaster City, Blythe, Desert Center, Joshua Tree National Park and additional locations along the Interstate 8 and 10 corridors.
Brawley	06-025-0007	1	05/18/2015	304	Submitted to CARB	According to the National Weather Service Zone forecast west winds 5 to 25mph throughout the day with evening gusts up to 30mph. Affected areas include Southeast California including Brawley, Calexico, El Centro, Glamis, Imperial and the Salton Sea.
Brawley	06-025-0007	3	05/21/2015	225	Submitted to CARB	According to the National Weather Service issued wind advisory west winds 15 to 25mph with gusts up to 40mph were expected in the afternoon. Affected areas included cities of Brawley, Calexico, El Centro, Glamis, Imperial and the Salton Sea
Niland	06-025-4004	3	05/21/2015	171		
Brawley	06-025-0007	3	05/22/2015	227		
Niland	06-025-4004	3	06/30/2015	183	Submitted to CARB	According to NOAA's National Climatic Centers an early-season monsoon pattern set up across the southwest U.S., bringing several days of enhanced mid-level moisture from the southeast. A disturbance moving through Baja on the 30th produced an active day of thunderstorms over southern California, reaching all the way to the coast with prolific lightning and rainfall for several areas. Lightning sparked a few small fires near Poway and La Mesa. The National Weather Service issued a weather briefing for the Arizona Desert area.

Monitoring Site	AQS No.	POC	Date	PM_{10} Concentration ($\mu g/m^3$)	Documentation Status	Event Description
Niland	06-025-4004	3	07/08/2015	166	Submitted to CARB	According to NOAA's National Climatic Centers an unseasonable upper level low moving in from the Pacific helped trigger thunderstorms over eastern California and adjacent areas of western Nevada. Isolated severe weather and flash flooding occurred. The National Weather Service zone forecast indicated west winds 10 to 15mph becoming southwest 15 to 25mph in the afternoon with gusts up to 35mph
Brawley	06-025-0007	3	09/14/2015	168	Submitted to CARB	According to a High Wind Advisory issued for the Coachella Valley - a low pressure system from the Gulf of Alaska produced periods of strong and gusty west winds to the Coachella Valley and Riverside county mountains. Area west winds from 20 to 30mph with gusts to 45mphs were predicted. The area identified in the wind advisory included the San Diego County Deserts along the desert mountain slopes an into the adjacent desert areas which border the Imperial County Deserts.
Niland	06-025-4004	3	10/01/2015	171	Submitted to CARB	According to a High Wind Advisory issued for both Imperial County and the Coachella Valley - a low pressure system from the Gulf of Alaska produced periods of strong and gusty west winds to the Imperial and Coachella Valleys and Riverside county mountains. Area west winds from 20 to 30mph with gusts to 45mphs were predicted. The issued wind advisory identified Imperial County, including the cities of Brawley, Calexico, El Centro, Glamis, Imperial and the Salton Sea.
Westmorland	06-025-4003	3	10/04/2015	250	Submitted to CARB	According to zone forecast issued by the National Weather Service conditions were breezy with southwest winds 10 to 15mph becoming west 15 to 25 in the afternoon. Imperial County including Brawley, Calexico, El Centro, Glamis, Imperial and the Salton Sea
Brawley	06-025-0007	3	10/04/2015	166		
Westmorland	06-025-4003	1	11/02/2015	179	Submitted to CARB	The National Weather Service in Phoenix issued a wind advisory for west winds at 30 to 40mph with occasional gust around 50 affecting Imperial County including El Centro, Imperial and the Salton Sea
Niland	06-025-4004	3	11/25/2015	193	Submitted to CARB	The National Weather Service in Phoenix and San Diego synopsis indicated that a chilly Pacific weather system (low pressure system) would be moving into the desert southwest bringing cooler temperatures, breezy conditions, more cloud cover and a slight chance for light mountain showers. The low pressure system over the great basin and southwest states brought cooler weather and a few periods of mainly light showers through Friday with gusty west winds in the mountains and deserts
Brawley	06-025-0007	3	11/25/2015	215		
Brawley	06-025-0007	1	12/14/2015	222	Submitted to CARB	The NWS issued high wind warnings for the San Diego mountain and desert areas while only issuing a Freeze alert for Imperial County. “Low pressure aloft will slowly move east today and result in a continued weakening of the winds,” according to the weather service. “The low pressure system will leave behind a cold air mass which will result in areas of frost tonight in the valleys as temperatures fall to 30 to 35 degrees in many locations. Peak wind gusts recorded between Sunday evening and Monday morning were 59 mph in Borrego Springs; 55 mph in Boulevard and Ocotillo Wells; 50 mph in In-Koh-Pah. Gusts of less than 45 mph were noted in numerous other areas.
El Centro	06-025-1003	2	12/14/2015	165		
Westmorland	06-025-4003	1	12/14/2015	193		
Niland	06-025-4004	1	12/14/2015	250		
Westmorland	06-025-4003	3	12/14/2015	183		
Brawley	06-025-0007	3	12/14/2015	208		
El Centro	06-025-1003	4	12/14/2015	201		
Westmorland	06-025-4003	1	12/26/2015	165	Submitted to CARB	The NWS issued high wind warnings for the San Diego mountain and desert areas while only issuing a Freeze alert for Imperial County. “Low pressure aloft will slowly move east today and result in a continued weakening of the winds,” according to the weather service. “The low pressure system will leave behind a cold air mass which will result in areas of frost tonight in the valleys as temperatures fall to 30 to 35 degrees in many locations. Peak wind gusts recorded between Sunday evening and Monday morning were 59 mph in Borrego Springs; 55 mph in Boulevard and Ocotillo Wells; 50 mph in In-Koh-Pah. Gusts of less than 45 mph were noted in numerous other areas.
Westmorland	06-025-4003	3	12/26/2015	198		
Brawley	06-025-0007	1	01/31/2016	218	Submitted to CARB	The NWS issued a Wind Advisory for a wide portion of southeast CA for warning of winds up to 35 mph and gusts up to 50 mph. Blowing dust was also expected.
Niland	06-025-4004	1	01/31/2016	225		
Brawley	06-025-0007	3	01/31/2016	236		
Niland	06-025-4004	3	01/31/2016	259		
Westmorland	06-025-4003	3	01/31/2016	344		
Brawley	06-025-0007	3	02/01/2016	207		
Brawley	06-025-0007	3	03/06/2016	237	Submitted to CARB	The NWS issued a Blowing Dust Advisory for southeast CA and the Yuma, Arizona area. West winds of 20 to 30 mph were expected with gusts up to 40 to 45 mph. Visibility was expected to drop below one mile.
Westmorland	06-025-4003	3	03/06/2016	220		
Brawley	06-025-0007	3	03/11/2016	178	Submitted to CARB	The NWS issued a Wind Advisory for southeast CA and western Arizona. Strong southwest winds of 30 mph with frequent gusts up to 45 mph were expected, along with occasional dense blowing dust.
Westmorland	06-025-4003	3	03/11/2016	179		

Monitoring Site	AQS No.	POC	Date	PM_{10} Concentration ($\mu g/m^3$)	Documentation Status	Event Description
Brawley	06-025-0007	3	03/28/2016	334	Submitted to CARB	The NWS issued a Wind Advisory for southeast CA and western Arizona. Strong southwest winds of 30 mph with frequent gusts up to 45 mph were expected, along with occasional dense blowing dust.
Niland	06-025-4004	3	03/28/2016	333		
Westmorland	06-025-4003	3	03/28/2016	465		
El Centro	06-026-1003	4	03/28/2016	284		
Brawley	06-025-0007	3	04/14/2016	228	Submitted to CARB	According to the NWS San Diego office, a trough of low pressure moving inland across southern California generated west winds with gusts in excess of 60 mph across the mountains and deserts of San Diego County. A High Wind Warning was issued, advising of west to northwest winds up to 35 mph, with gusts up to 60 mph. Strong winds were expected along desert sloes west of Imperial County, with the potential of limited visibility below three miles due to blowing dust.
Westmorland	06-025-4003	3	04/14/2016	163		
Brawley	06-025-0007	3	04/22/2016	242	Submitted to CARB	West to southwest winds up to 30 mph with gusts over 35 mph. A Wind Advisory was issued along with warnings of possible blowing dust for portions of southeast California.
Westmorland	06-025-4003	3	04/22/2016	192		
Brawley	06-025-0007	1	04/24/2016	186	Submitted to CARB	Westerly winds over 30 mph with gusts up to 45 mph. The NWS issued a Wind Advisory for southeast California for winds 25-35 mph with gusts to 45 mph. Gusts up to 55 mph along with blowing dust and sand were expected along corridors like Interstate 8.
Brawley	06-025-0007	3	04/24/2016	218		
Westmorland	06-025-4003	3	04/24/2016	177		
Brawley	06-025-0007	3	04/25/2016	285		
Calexico	06-025-0005	3	04/25/2016	173		
Niland	06-025-4004	3	04/25/2016	225		
Westmorland	06-025-4003	3	04/25/2016	244		
Brawley	06-025-0007	3	05/05/2016	163	Submitted to CARB	The NWS issued a Blowing Dust Advisory for Imperial County with emphasis on the western portion. West winds of 25 to 30 mph were expected, with gusts up to 40 mph. Blowing dust was expected to limit visibility to one mile.
Niland	06-025-4004	3	05/05/2016	171		
Westmorland	06-025-4003	3	05/05/2016	227		
Niland	06-025-4004	3	05/15/2016	216	Submitted to CARB	A strong onshore flow brought gusty west winds over southern California. The NWS San Diego office issued a Wind Advisory for areas including the deserts of San Diego County west of Imperial County. West winds of 20 to 30 mph were expected with gusts up to 50 mph. Visibility was expected to be reduced due to blowing dust and sand.
Brawley	06-025-0007	3	05/20/2016	283	Submitted to CARB	A strong upper low moving inland over northern California created gusty winds over southeast California. The post frontal gradient over the southern California terrain brought strong downslope mountain waves to Imperial County. A Wind Advisory was issued May 20 for a wide area of southeast California including Imperial County. Southwest winds of 20 to 30 mph were expected, with gusts up to 40 mph. Dangerous cross-winds and dense patches of blowing dust.
Calexico	06-025-0005	3	05/20/2016	159		
Niland	06-025-4004	3	05/20/2016	309		
Westmorland	06-025-4003	3	05/20/2016	370		
Brawley	06-025-0007	3	05/21/2016	199		
Calexico	06-025-0005	3	05/21/2016	226		
El Centro	06-026-1003	4	05/21/2016	252		
Brawley	06-025-0007	3	05/25/2016	165	Submitted to CARB	West winds over 30 mph with gusts over 40 mph. Advisories were issued for wind and blowing dust in the mountains and deserts of southeastern California.
Calexico	06-025-0005	3	07/23/2016	195	Submitted to CARB	Southeast monsoonal winds with winds up to 20 mph.
El Centro	06-026-1003	4	07/23/2016	203		
Brawley	06-025-0007	3	07/24/2016	155		
Calexico	06-025-0005	3	07/24/2016	194		
Westmorland	06-025-4003	3	07/24/2016	164		
El Centro	06-026-1003	4	07/24/2016	162		
Brawley	06-025-0007	3	07/30/2016	195	Submitted to CARB	Southeast monsoonal winds up to 25 mph with gusts over 35 mph. The NWS issued a Dust Storm Warning for Imperial County and the eastern deserts of Riverside County.
Calexico	06-025-0005	3	07/30/2016	158		
Niland	06-025-4004	3	07/30/2016	206		
Westmorland	06-025-4003	3	07/30/2016	201		
El Centro	06-026-1003	4	07/30/2016	205		
Calexico	06-025-0005	3	08/09/2016	155	Submitted to CARB	Southern gulf surge monsoonal winds up to 25 mph. Possibility of suspended dust reducing visibility.
Niland	06-025-4004	3	08/09/2016	167		
Westmorland	06-025-4003	3	08/09/2016	166		
El Centro	06-026-1003	4	08/09/2016	159		

Appendix D. 2014-2016 Documented Exceptional Events for Imperial County

Imperial County 2018 PM_{10} Plan

Monitoring Site	AQS No.	POC	Date	PM_{10} Concentration ($\mu g/m^3$)	Documentation Status	Event Description
Brawley	06-025-0007	3	08/19/2016	155	Submitted to CARB	Southern gulf surge monsoonal winds up to 25 mph. Possibility of suspended dust reducing visibility.
Westmorland	06-025-4003	3	08/19/2016	164		Southern gulf surge monsoonal winds up to 25 mph. Possibility of suspended dust reducing visibility.
El Centro	06-026-1003	4	08/21/2016	170		Monsoonal winds mostly from the southeast. The NWS issued a Blowing Dust Advisory for western Arizona.
Brawley	06-025-0007	1	09/03/2016	275	Submitted to CARB	Fall-like Pacific storm moved into the western states. West to southwest winds up to 25 mph forecasted.
Westmorland	06-025-4003	3	09/03/2016	202		
El Centro	06-026-1003	4	09/03/2016	174		
Brawley	06-025-0007	3	09/12/2016	232	Submitted to CARB	A weather disturbance moving through the region generated west to southwest up to 28 mph with gusts of 33 mph at El Centro NAF. Smoke Text Product identified blowing dust over portions of southern California and southern Arizona.
Westmorland	06-025-4003	3	09/12/2016	164		
Brawley	06-025-0007	3	09/13/2016	160		
Calexico	06-025-0005	3	09/13/2016	180		
El Centro	06-026-1003	4	09/13/2016	179		
Westmorland	06-025-4003	3	09/19/2016	176	Submitted to CARB	A weather system moving through the region generated west to southwest up over 25mph.
Brawley	06-025-0007	3	10/30/2016	162	Submitted to CARB	A vigorous trough dropped through southern California, generating southwest winds of 10 to 20 mph with gusts up to 30 mph.
Brawley	06-025-0007	3	12/16/2016	645	Submitted to CARB	A strong Pacific low pressure system and accompanying cold front moved through the region, generating gusty winds across southeast California and western Arizona. A Wind Advisory was issued for southeast California, with expected west to southwest winds of 20 to 35/40 mph and gusts exceeding 40/50 mph. Patches of blowing dust throughout the region were expected.
Calexico	06-025-0005	3	12/16/2016	238		
Niland	06-025-4004	3	12/16/2016	529		
Westmorland	06-025-4003	3	12/16/2016	733		
El Centro	06-026-1003	4	12/16/2016	207		

Notes:

Adjacent, color-blocked rows indicate multiple concentration measurements impacted by a singular exceptional event.

Abbreviations:

AQS - Air Quality System
CA - California
mph - miles per hour
NAF - Naval Air Facility
NOAA - National Oceanic and Atmospheric Administration
NWS - National Weather Service
PM_{10} - particulate matter less than 10 microns in aerodynamic diameter
POC - parameter occurrence code
$\mu g/m^3$ - micrograms per cubic meter
U.S. - United States

**BEST AVAILABLE CONTROL MEASURES ANALYSIS
FOR THE 2018 IMPERIAL COUNTY
REDESIGNATION REQUEST AND MAINTENANCE PLAN FOR PARTICULATE MATTER
LESS THAN 10 MICRONS IN DIAMETER**

Prepared for

Imperial County Air Pollution Control District
150 South 9th Street
El Centro, CA. 92243-2801

Prepared by

Ramboll US Corporation
350 S Grand Avenue, Suite 2800
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Contents

FIGURES

TABLES

Abbreviations and Acronyms

BACM	Best Available Control Measure
BACT	Best Available Control Technology
CAA	Clean Air Act
CARB	California Air Resources Board
CEMS	continuous emissions monitoring system
GE	General Electric
ICAPCD	Imperial County Air Pollution Control District
mph	miles per hour
MW	megawatts
NOx	nitrogen oxides
PM_{10}	Particulate Matter Less than 10 Microns in Diameter
SCR	selective catalytic reduction
SIP	State Implementation Plan
$\mu g/m_3$	micrograms per cubic meter
USG	United States Gypsum

1. INTRODUCTION

1.1 PM_{10} State Implementation Plan

The *Imperial County 2018 Redesignation Request and Maintenance Plan for Particulate Matter Less than 10 Microns in Diameter (PM_{10})* ("Plan") compiles the data and discussion necessary to revise the previous State Implementation Plan submittal for PM_{10} and requests redesignation as attainment for the Imperial Valley Planning Area. This appendix provides an overview of the analysis that was conducted to determine that the control strategies currently implemented in Imperial County meet the Clean Air Act (CAA) requirement of controlling significant sources of PM_{10} to Best Available Control Measure (BACM) or Best Available Control Technology (BACT) standards. In particular, this appendix features a revision to Imperial County's previous PM_{10} significant source analysis and demonstrates that no new emission source categories qualify as significant. In addition, this appendix discusses the current major stationary sources of PM_{10} in Imperial County and how they are controlled to BACT-level stringency.

1.2 Background

CAA Section 189(b) requires areas designated as Serious nonattainment for PM_{10} to implement BACM/BACT for the control of PM_{10}. BACM/BACT is a label describing practices that allow for the maximum degree of emission reduction considering technical and economic feasibility and environmental impacts of the control. While the BACM/BACT requirement can also apply to sources of PM_{10} precursors, ambient PM_{10} in Imperial County is overwhelmingly primary PM_{10}, with little or no contribution from secondary aerosols. This observation is supported by a technical analysis performed by the California Air Resources Board (CARB) and included as Appendix A to this Plan. As a result, BACM/BACT for sources of PM_{10} precursors are not addressed under this Plan.

USEPA guidance for State Implementation Plans for Serious PM_{10} nonattainment areas[1] instructs that BACM standards are required for all source categories except those that "the State [can] demonstrate [do] not contribute significantly to nonattainment of the NAAQS." A source category is presumed to contribute significantly to a violation of the PM_{10} NAAQS if its PM_{10} impact exceeds 5 micrograms per cubic meter ($\mu g/m^3$). Analyses of the PM_{10} sources and controls in place in Imperial County have been conducted by the Imperial County Air Pollution Control District (ICAPCD or "District") in the past. This was first done in 2005 and resulted in the development of a set of fugitive dust rules, collectively known as Regulation VIII. That analysis had identified the following four sources as significant and requiring BACM: **windblown dust from open areas**, **entrained and windblown dust from unpaved roads**, **windblown dust from non-pasture agricultural lands**, and **tilling dust from agricultural operations.**

In 2008 and 2009, to support its *2009 Imperial County State Implementation Plan for Particulate Matter Less than 10 Microns in Aerodynamic Diameter* ("2009 PM_{10} SIP"),[2] the District revised its analysis of significant sources to reflect a 2005 base year inventory and 2006-2008 ambient data. That analysis identified only **entrained dust from unpaved roads** and **tilling dust from agricultural operations** as significant sources of PM_{10}. The USEPA disagreed with certain

[1] United States Environmental Protection Agency. 1994. *State Implementation Plans for Serious PM-10 Nonattainment Areas, and Attainment Date Waivers for PM-10 Nonattainment Areas Generally; Addendum to the General Preamble for the Implementation of Title I of the Clean Air Act Amendments of 1990.* Federal Register. Vol. 59. No. 157. August 16, 1994. p. 41998.

[2] Imperial County Air Pollution Control District. 2009. 2009 Imperial County State Implementation Plan for Particulate Matter Less Than 10 Microns in Aerodynamic Diameter. August 11. Available at: http://www.co.imperial.ca.us/airpollution/attainment%20plans/final%20ic%202009%20pm10%20sip%20document.pdf. Accessed: July 2018.

portions of that analysis, particularly the exclusion of certain high-wind exceedance days, and determined that **windblown dust from unpaved roads**, **windblown dust from open areas**, and **windblown dust from non-pasture agricultural lands** would also qualify as significant sources requiring BACM.[3] Ultimately, in 2010 the USEPA published a rule issuing limited approval and limited disapproval of Imperial County's Regulation VIII rules, citing certain BACM-related deficiencies in the rule set.[4]

In response to the limited approval/disapproval of the rules and related SIP submission, the District and the California Department of Parks and Recreation challenged the USEPA's decision in the U.S. Court of Appeals for the Ninth Circuit. Ultimately, the dispute was resolved through mediation and a Settlement Agreement (see Section 1.4.2 of the main text of the Plan for additional information). In 2013, the USEPA published a rule[5] finalizing approval of Imperial County's Regulation VIII rules, acknowledging that they satisfy BACM requirements for sources previously identified as significant for PM_{10}. Table 1-1 below presents a summary of these source categories and the most relevant Regulation VIII rule(s) that govern them.

Table 1-1. Source Categories Previously Identified as Significant for PM_{10} and Most Applicable Regulation VIII Rule(s)

Source Category	Applicable Regulation VIII Rule
Windblown Dust from Open Areas	Rule 800, Rule 804
Entrained Dust from Unpaved Roads	Rule 805
Windblown Dust from Unpaved Roads	Rule 805
Windblown Dust from Non-Pasture Agricultural Lands	Rule 806
Tilling Dust from Agricultural Operations	Rule 806

[3] United States Environmental Protection Agency. 2010. Technical Support Document for EPA's Notice of Proposed Rulemaking on Revisions to the California State Implementation Plan as Submitted by the State of California for the Imperial County Air Pollution Control District. EPA's Analysis of Imperial County Air Pollution Control District's Regulation VIII – Fugitive Dust Rules 800-806. February.

[4] United States Environmental Protection Agency. 2010. *Revisions to the California State Implementation Plan, Imperial County Air Pollution Control District; Final rule.* Federal Register. Vol. 75. No. 130. July 8, 2010. p. 39366.

[5] United States Environmental Protection Agency. 2013. *Revisions to the California State Implementation Plan, Imperial County Air Pollution Control District; Final rule.* Federal Register. Vol. 78. No. 77. April 22, 2013. p. 23677.

2. DETERMINATION OF SIGNIFICANT SOURCES OF PM_{10}

As discussed above, analyses have been conducted in the past to determine significant sources of PM_{10} in Imperial County. Those analyses were conducted using the most recent emission inventory and monitoring data available at that time. Since several years have passed since the most recent significant source analyses occurred, they are being revisited under this Plan using the most recent emission inventory and monitoring data available.

2.1 De Minimis Criterion

As a criterion for classification of PM_{10} sources into significant or *de minimis* categories, USEPA guidance states that "a source category….will be presumed to contribute significantly to a violation of the 24-hour NAAQS if its PM_{10} impact at the location of the expected violation would exceed 5 µg/m^3." [6] This language unambiguously implies that this test should be applied, for any violation, to every source category using information specific to the day of the violation. The implementation of the criterion for any specific violation requires a day-specific decomposition of the air quality impacts into fractional contributions from all relevant source categories (i.e., a day-specific emission inventory). This type of information can be difficult to obtain without comprehensive air dispersion modeling. Therefore, this analysis utilizes a more practical, alternative approach that involves evaluating the fractional contribution of sources in Imperial County's average annual daily emission inventory and then performing a sensitivity analysis to determine if variations in the inventory would alter the conclusions of the analysis.

From 2014 to 2016, Imperial County experienced 58 days where PM_{10} concentrations were greater than the 24-hour PM_{10} NAAQS. However, all of the exceedances on these days have been identified by the District as Exceptional Events and are currently going through USEPA's review process for affirmation. Therefore, the 5 µg/m^3 criterion was compared against a hypothetical "near-exceedance" concentration of 154 µg/m^3 to establish the fractional cut-off point (5 µg/m^3/154 µg/m^3 = 3.25%) above which Imperial County source categories would qualify as significant.

2.2 Average Annual Daily Emission Inventory Comparison

Table 2-1 presents the average annual daily PM_{10} emissions inventory for Imperial County for the attainment year, 2016. This table is organized by emission source category and features the percent contribution of each category. When compared against the established fractional cut-off point of 3.25%, three categories qualify as significant. These include **windblown dust from open areas – others** (which includes unpaved roads)**, windblown dust from non-pasture agricultural lands,** and **entrained dust from unpaved roads** (specifically city/county and canal roads). All three of these categories have been previously identified by the District as significant sources of PM_{10} and are currently controlled by rules approved by the USEPA as BACM for these source categories.[7] The following section presents a sensitivity analysis and demonstrates how variations in the inventory would not alter the conclusions of this analysis.

[6] United States Environmental Protection Agency. 1994. *State Implementation Plans for Serious PM-10 Nonattainment Areas, and Attainment Date Waivers for PM-10 Nonattainment Areas Generally; Addendum to the General Preamble for the Implementation of Title I of the Clean Air Act Amendments of 1990.* Federal Register. Vol. 59. No. 157. August 16, 1994. p. 41998.

[7] Windblown dust from open areas is regulated under ICAPCD Rule 804: Open Areas. Windblown dust from non-pasture agricultural lands is regulated under ICAPCD Rule 806: Conservation Management Practices. Entrained dust from unpaved roads is regulated under ICAPCD Rule 805: Paved and Unpaved Roadways.

Table 2-1. Imperial County 2016 Average Annual Daily PM_{10} Emission Inventory

Inventory Category	PM_{10} Emissions[1] (tpd)	Percent of Total[2]
Electrical Utilities	0.09	0.03%
Cogeneration	0.00	0.00%
Manufacturing and Industrial	0.04	0.01%
Service and Commercial	0.07	0.03%
Fuel Combustion	0.00	0.00%
Industrial Processes		
Mineral Processes	3.67	1.29%
Food/Agriculture	0.31	0.11%
Residential Fuel Combustion	0.05	0.02%
Farming		
Tilling	4.87	1.71%
Harvest	0.99	0.35%
Cattle	2.62	0.92%
Construction[3]	3.02	1.06%
Paved Road Dust	1.16	0.41%
Entrained Unpaved Road Dust		
City/County	18.38	6.47%
Canal	30.74	10.82%
BLM/USFS	1.39	0.49%
Farm	1.37	0.48%
Fires	0.00	0.00%
Waste Burning	1.30	0.46%
Cooking	0.08	0.03%
On-Road Mobile	0.43	0.15%
Other Mobile	1.07	0.38%
Windblown Dust		
Open Areas - Urban	0.00	0.00%
Open Areas - Others	199.96	70.37%
Non-Pasture Agricultural Lands	10.77	3.79%
Pasture	1.79	0.63%
TOTAL:	**284.17**	**100.0%**

Notes:
[1] 2016 inventory data was queried from the California Air Resources Board's California Emissions Project Analysis Model, Version 1.05; however, some emissions have been recategorized to better align with past Imperial County significant source analyses.
[2] Highlighting indicates that the value exceeds the *de minimis* level for a near-exceedance day (3.25%; 5 µg/m^3 / 154 µg/m^3).

3. SIGNIFICANT SOURCE SENSITIVITY ANALYSIS

As discussed previously, from 2014 to 2016 all measured exceedances of the 24-hour PM_{10} NAAQS in Imperial County were identified as Exceptional Events. These events were primarily caused by gusty westerly winds brought on by low pressure systems. A smaller fraction of the events can be attributed to monsoonal fronts passing through the region. For most of these events, one would expect that the fractional contribution of windblown dust to ambient PM_{10} levels to be greater compared to its average annual daily contribution. As a result, this sensitivity analysis focuses on the potential scenario of an exceedance occurring on a low-wind day, when the fractional contribution of windblown dust would be less than its daily average.

3.1 Low-Wind Day Emission Inventory Comparison

Table 3-1 presents the average annual daily PM_{10} emissions inventory for Imperial County for the attainment year, 2016; however, the percent contribution of each source category has been calculated for varying levels of windblown dust to assess how changes in the contribution of PM_{10} from windblown dust would affect the significance determination of other categories. It was found that if windblown dust were reduced to just 25% of its average annual daily contribution to the inventory, then one additional category, **tilling dust from agricultural operations**, would get added to the list of sources contributing more than 3.25% of the total emissions for that day. However, at 50% windblown dust, this category drops back below the fractional cut-off point, leaving only **entrained dust from unpaved roads** (specifically city/county and canal roads) as the only non-windblown dust source category above the cut-off point.

If the windblown dust category were completely excluded from the inventory (i.e., reduced to 0% contribution), several other source categories would rise above the 3.25% cut-off value. However, a review of the PM_{10} concentration data and collocated wind speed data from 2014 to 2016 shows that it’s unlikely that this theoretical “no-wind” day would result in an exceedance of the 24-hour PM_{10} NAAQS. This scenario is further analyzed in the following section.

Table 3-1. Imperial County 2016 Average Annual Daily PM_{10} Emission Inventory – Windblown Dust Sensitivity Analysis

Inventory Category	PM_{10} Emissions[1] (tpd)	Percent of Total When Windblown Dust Category Equals X% of its 2016 Inventory Value[2]				
		0%	25%	50%	75%	100%
Electrical Utilities	0.09	0.13%	0.07%	0.05%	0.04%	0.03%
Cogeneration	0.00	0.00%	0.00%	0.00%	0.00%	0.00%
Manufacturing and Industrial	0.04	0.06%	0.03%	0.02%	0.02%	0.01%
Service and Commercial	0.07	0.10%	0.06%	0.04%	0.03%	0.03%
Fuel Combustion	0.00	0.00%	0.00%	0.00%	0.00%	0.00%
Industrial Processes						
Mineral Processes	3.67	5.12%	2.94%	2.06%	1.59%	1.29%
Food/Agriculture	0.31	0.43%	0.25%	0.17%	0.13%	0.11%
Residential Fuel Combustion	0.05	0.06%	0.04%	0.03%	0.02%	0.02%
Farming						
Tilling	4.87	6.80%	3.90%	2.74%	2.11%	1.71%
Harvest	0.99	1.38%	0.79%	0.56%	0.43%	0.35%
Cattle	2.62	3.66%	2.10%	1.47%	1.13%	0.92%
Construction	3.02	4.21%	2.42%	1.70%	1.31%	1.06%
Paved Road Dust	1.16	1.62%	0.93%	0.65%	0.50%	0.41%
Entrained Unpaved Road Dust						
City/County	18.38	25.65%	14.73%	10.33%	7.96%	6.47%
Canal	30.74	42.90%	24.64%	17.28%	13.31%	10.82%
BLM/USFS	1.39	1.95%	1.12%	0.78%	0.60%	0.49%
Farm	1.37	1.91%	1.10%	0.77%	0.59%	0.48%
Fires	0.00	0.01%	0.00%	0.00%	0.00%	0.00%
Waste Burning	1.30	1.81%	1.04%	0.73%	0.56%	0.46%
Cooking	0.08	0.11%	0.06%	0.04%	0.03%	0.03%
On-Road Mobile	0.43	0.60%	0.35%	0.24%	0.19%	0.15%
Other Mobile	1.07	1.49%	0.85%	0.60%	0.46%	0.38%
Windblown Dust						
Open Areas - Urban	0.00	0.00%	0.00%	0.00%	0.00%	0.00%
Open Areas - Others	199.96	0.00%	40.06%	56.20%	64.91%	70.37%
Non-Pasture Agricultural Lands	10.77	0.00%	2.16%	3.03%	3.50%	3.79%
Pasture	1.79	0.00%	0.36%	0.50%	0.58%	0.63%
TOTAL:	**284.17**					

Notes:
[1] 2016 inventory data was queried from the California Air Resources Board's California Emissions Project Analysis Model, Version 1.05; however, some emissions have been recategorized to better align with past Imperial County significant source analyses.
[2] Highlighting indicates that the value exceeds the *de minimis* level for a near-exceedance day (3.25%; 5 $\mu g/m^3$ / 154 $\mu g/m^3$).

3.2 Example "Low-Wind" Near-Exceedance Day

The 2014 to 2016 PM_{10} monitoring data for Imperial County were reviewed in conjunction with collocated wind speed data to see if there were any days in which a monitor measured a near exceedance on a low- or no-wind day. This analysis was done by creating a scatter plot for each year of data, with the x-axis representing measured 24-hour PM_{10} concentration values from the five Imperial County PM_{10} monitoring stations and the y-axis representing the average hourly wind speed measured each day at the collocated meteorological station (see Figures 3-1 through 3-3).[8] The vertical orange line represents a near-exceedance concentration of 154 µg/m^3. As discussed previously, all measurements above the standard during this period (colored orange in the plots below) have been identified as potential Exceptional Events and are being thoroughly evaluated through the USEPA's review process. Upon concurrence from the USEPA, these data points would be excluded from Imperial County's NAAQS determination.

Out of the three years of data, the 24-hour PM_{10} measurement at the El Centro monitoring station on January 15, 2016 (highlighted green in Figure 3-3) is the closest example of a low-wind near-exceedance day. On that day the average hourly wind speed at the collocated meteorological station was 4.28 miles per hour (mph), which was over 35% less than the next closest low-wind near-exceedance data point. However, a review of the hourly wind speed data from that day (as shown in Figure 3-4), shows that while the average hourly wind speed was relatively low, the day still exhibited periods of elevated wind speed and could not reasonably be categorized as a "no-wind" day. Seeing how this is the closest example to a low-wind near-exceedance scenario, this finding supports the conclusion that it's unlikely that a day with low winds and 0% windblown dust contributions would result in an exceedance of the 24-hour PM_{10} NAAQS at a monitor in Imperial County.

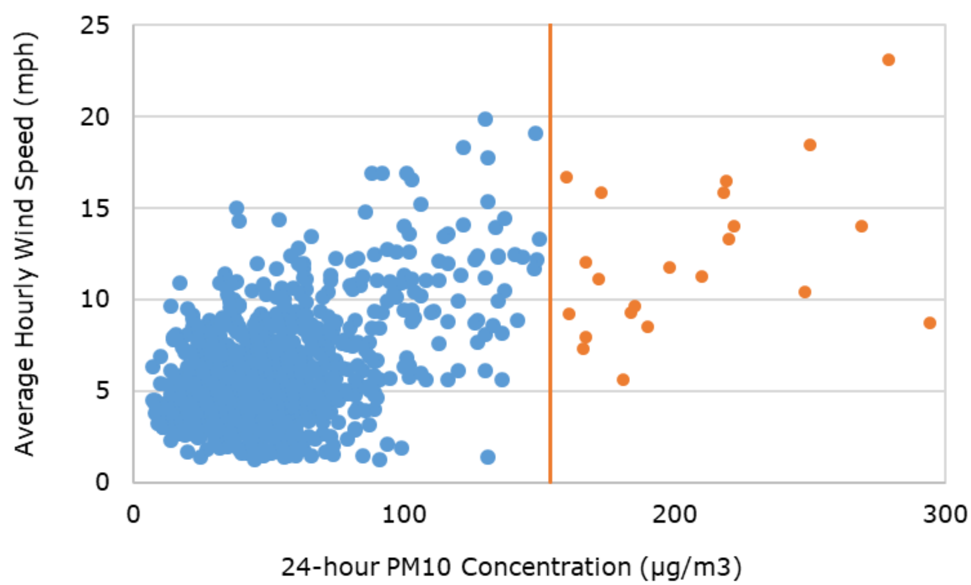


Figure 3-1. 24-hour PM_{10} Concentration vs. Wind Speed in Imperial County, 2014

[8] Except for the Brawley monitor, which does not have collocated wind speed data. For that monitor, wind speed data from the Imperial County Airport was used as a surrogate.

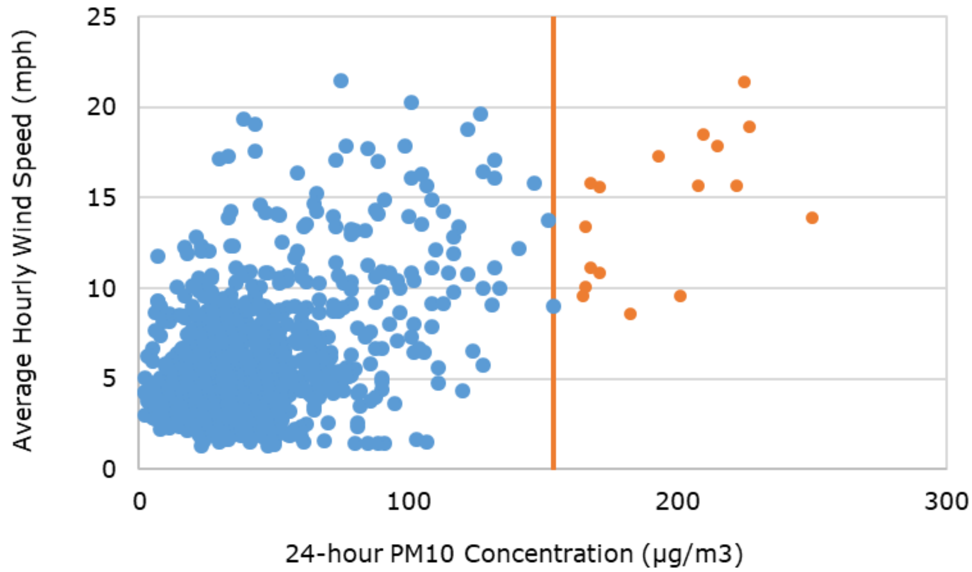


Figure 3-2. 24-hour PM_{10} Concentration vs. Wind Speed in Imperial County, 2015

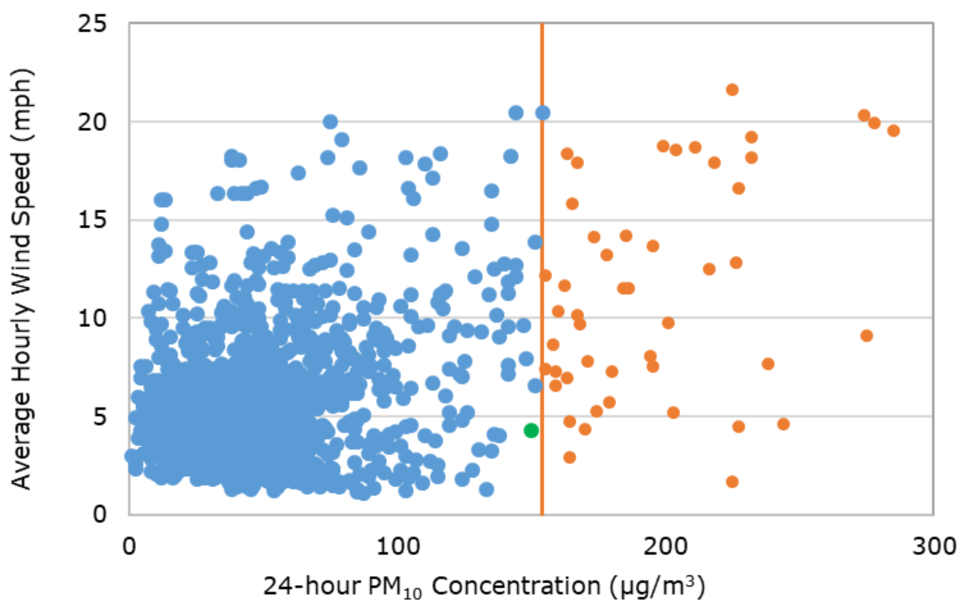


Figure 3-3. 24-hour PM_{10} Concentration vs. Wind Speed in Imperial County, 2016

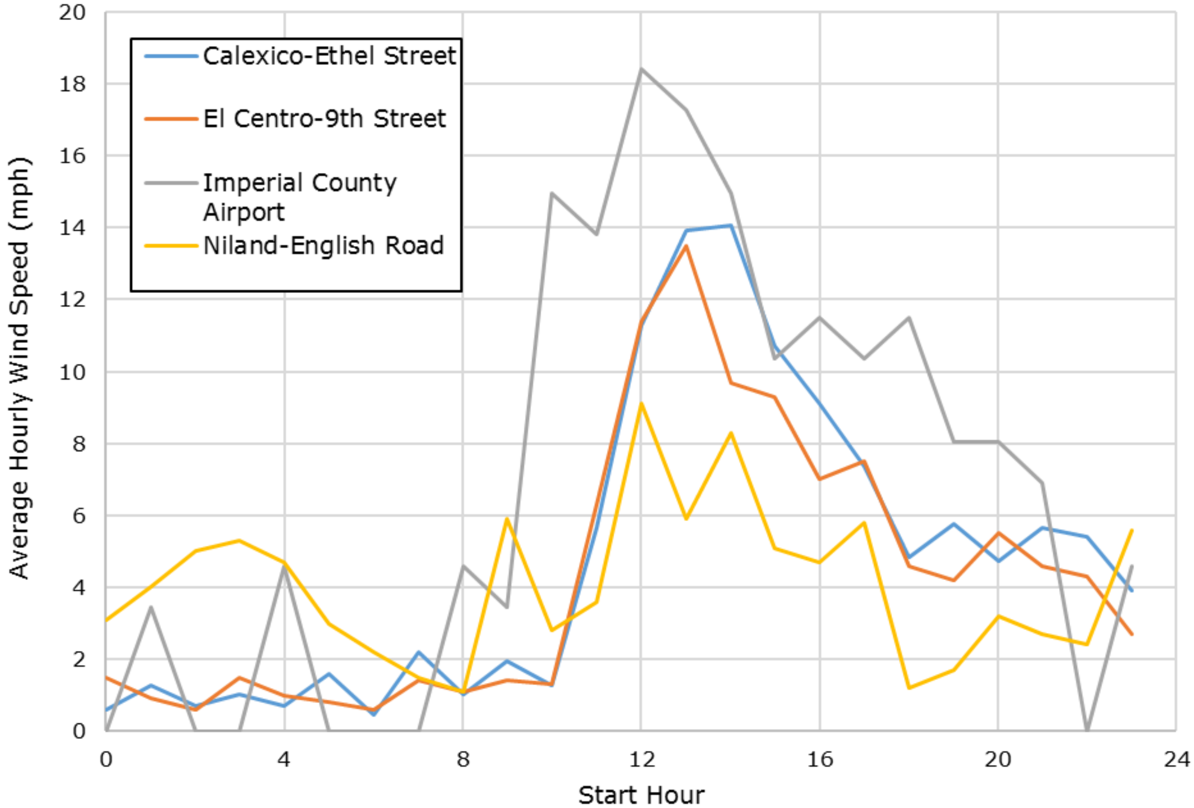


Figure 3-4. Average Hourly Wind Speed in Imperial County on January 15, 2016[9]

[9] The Westmorland data was omitted from this plot as there were only two hours of wind speed data available for this day.

4. BEST AVAILABLE CONTROL TECHNOLOGY ANALYSIS

For Serious PM_{10} nonattainment areas, CAA Section 189(b)(3) defines a major source as "any stationary source or group of stationary sources located within a contiguous area and under common control that emits, or has the potential to emit, at least 70 tons per year of PM_{10}." Imperial County currently has two facilities that qualify as major stationary sources of PM_{10}. These include the Imperial Irrigation District El Centro Generating Station and the United States Gypsum Plaster City facility. As described below, both facilities are controlled to BACT-level stringency.

4.1 Imperial Irrigation District El Centro Generating Station

The Imperial Irrigation District El Centro Generating Station features three main operational units (Units 2-4). Unit 2 is a General Electric (GE) Frame 7EA combined cycle unit (i.e., combustion and steam) capable of generating 115 megawatts (MW), of which the combustion turbine provides 83 MW. Unit 3 features two 48.0 MW Siemens SGT-800 combustion turbines and one condensing steam turbine. Unit 4 is a Riley Stoker Boiler rated at 74 MW.

Unit 2 was repowered with a gas turbine in 1993 and uses selective catalytic reduction (SCR) technology for the control of nitrogen oxides (NOx). The unit is allowed to burn No. 2 diesel as secondary fuel for 720 hours per year. In 2007, a new GEA CDX-080 cooling tower with drift eliminators rated at 0.0005% was installed at Unit 2, which at the time of installation satisfied BACT.

The two combustion turbines at Unit 3 operate solely on natural gas and are equipped with ultra-low NOx combustors and SCR. Unit 3 is equipped with a cooling tower with drift eliminators rated at 0.0005%, which at the time of installation satisfied BACT.

The Riley Boiler at Unit 4 commenced operation in 1968 and is a wall-fired type boiler with six Peabody burners (two rows of three). The boiler burns natural gas as the primary fuel, but is allowed to burn No. 6 fuel oil as secondary fuel. Over the years the Riley Boiler has been modified to meet various District rules. In 2000, an SCR system and a continuous emissions monitoring system (CEMS) were installed to meet NOx emission limits under ICAPCD Rule 400 (Fuel Burning Equipment – Oxides of Nitrogen). In 2013, a new SPX cooling tower with drift eliminators rated at 0.0005% was installed, which at the time satisfied BACT. At the same time, the permit was modified to incorporate ICAPCD rule 400.2 (Boilers, Process Heaters, and Steam Generators) NOx emissions limits.

4.2 United States Gypsum Plaster City Facility

The United States Gypsum (USG) Corporation manufactures gypsum wallboard and related products at its Plaster City facility, which has been in operation since the 1940s. Raw gypsum is mined at the Split Mountain quarry where it undergoes primary crushing and is stored. The ore is eventually transported via rail 20 miles to the Plaster City facility where wallboard and other gypsum products are manufactured. Over the past ten years, the Plaster City facility has undergone nearly a complete equipment modification upgrade. More energy efficient equipment has replaced older, less efficient equipment. Furthermore, each equipment modification has been subject to New Source Review permitting with increased emissions control requirements, including the installation of baghouses at transfer and crushing points. USG has various permitted combustion sources that are all fueled by natural gas, which meets BACT for PM_{10}. The mills have also been retrofitted with dust collectors limited to 0.01 grains per dry standard cubic feet, which also satisfies BACT.

5. CONCLUSION

Concurrent with its submittal of the *Imperial County 2018 Redesignation Request and Maintenance Plan* for PM_{10}, the District evaluated its current control strategy to ensure that all significant sources of PM_{10} are being controlled to BACM/BACT standards. This appendix provides an overview of that analysis and demonstrates, using the 2016 attainment inventory and 2014 to 2016 monitoring data, that all source categories that that have the potential to contribute significantly to a violation of the PM_{10} NAAQS in Imperial County are controlled by rules that have been approved by the USEPA as BACM for those sources. Furthermore, this appendix demonstrates that current major sources of PM_{10} in Imperial County are controlled to BACT-level stringency. Therefore, no new control measures are being proposed with this Plan.

RULE 800 GENERAL REQUIREMENTS FOR CONTROL OF FINE PARTICULATE MATTER (PM-10)

(Adopted 10/10/94; Revised 11/25/96; Revised 11/08/2005; Revised 10/16/2012)

A. General Description

The purpose of this regulation is to reduce the amount of fine Particulate Matter (PM-10) entrained in the ambient air as a result of emissions generated from anthropogenic (man-made) Fugitive Dust (PM-10) sources generated from within Imperial County by requiring actions to prevent, reduce, or mitigate PM-10 emissions. The Rules contained within this Regulation have been developed pursuant to United States Environmental Protection Agency guidance for Serious PM10 Non Attainment Areas.

B. Applicability

The requirements of this rule shall apply to any Active Operation, and/or man-made or man-caused condition or practice capable of generating Fugitive Dust (PM-10) as specified in this Regulation except those determined exempt as defined in Part E of this Rule. The definitions, exemptions, requirements, administrative requirements recordkeeping requirements, and test methods set forth in this rule are applicable to all the rules under Regulation VIII (Fugitive Dust Requirements) of the Rules and Regulations of the Imperial County Air Pollution Control District.

C. Definitions

For the purpose of this Regulation, the following terms are defined:

C.1 ACTIVE OPERATION: Activities capable of generating Fugitive Dust (PM-10), including but not limited to, Earthmoving Activities, Construction activities, Unpaved Roads, Track-Out/Carry-Out, Bulk Material storage and transport, Unpaved Haul/Access Roads.

C.2 AGGREGATE MATERIALS: Consists of sand, Gravel, quarried stone and/or rock fragments that are typically used in Construction. Aggregates may be natural, artificial or recycled.

C.3 ANEMOMETRS: Are devices used to measure wind speed and direction in accordance with manufacturer’s performance standards, maintenance and calibration criteria.

C.4 ANNUAL AVERAGE DAILY VEHICLE TRIPS: annual average 24-hour total of all vehicles counted on a road.

C.5 APCD: The Imperial County Air Pollution Control District.

C.6 APCO: The Imperial County Air Pollution Control Officer.

C.7 AVERAGE VEHICLE TRIPS PER DAY: Means the average number of vehicles that cross a given point surface during a specific 24-hour period as determined by the most recent Institute of Transportation Engineers trip generation manual, tube counts, or observations.

C.8 BLM: The Bureau of Land Management.

C.9 BP: The United States Border Patrol.

C.10 BULK MATERIAL: Earth, rock, Silt, sediment, sand, Gravel, soil, fill, Aggregate, dirt, mud, debris, and other organic and/or inorganic material consisting of or containing Particulate Matter with five percent or greater Silt content. For the purpose of this Regulation, the Silt content level is assumed to be 5 percent or greater, unless the Person responsible for the Active Operation conducts the applicable laboratory tests and demonstrate that the Silt content is less than 5 percent. Active Operations seeking to determine if the Silt content is less than five percent are required to conduct the laboratory analysis in accordance with ASTM method C-136-a (Standard Test Method for Sieve analysis of Fine and Coarse Aggregates), or other equivalent test methods approved by EPA, ARB, and the APCD.

C.11 CANAL BANK: A rise of land on either side of an irrigation canal.

C.12 CHEMICAL STABILIZATION/SUPPRESSION: A means of Fugitive Dust (PM-10) control implemented to mitigate PM-10 emissions by applying petroleum resins, asphaltic emulsions, acrylics, adhesives, or any other materials approved for use by the California Air Resources Board (CARB), U.S. Environmental Protection Agency (U.S. EPA) and/or the APCO.

C.13 CONSTRUCTION: Any on-site mechanical activities preparatory to or related to the building, alteration, rehabilitation, or demolition of an improvement on real property, including, but not limited to, land clearing, excavation related to construction, land leveling, grading, cut and fill grading, and the erection or demolition of any structure. As used in Regulation VIII, a construction site may encompass several contiguous parcels, or may encompass only a portion of one parcel, depending on the relationship of the property boundaries to the actual construction activities.

C.14 DESIGNATED REPRESENTATIVE: The agent for a Person. The Designated Representative shall be responsible for and have the full authority to implement BACM on behalf of the Person.

C.15 DISTURBED SURFACE AREA: An area in which naturally occurring soils, or soils or other materials placed thereon, have been physically moved, uncovered, destabilized, or otherwise modified by grading, land leveling, scraping, cut and fill activities, excavation, bush and timber clearing, or grubbing, and soils on which vehicle traffic and/or equipment operation has occurred. An area is considered to be disturbed until the activity that caused the disturbance has been completed, and the disturbed area meets the stabilized surface conditions specified in this rule, or the area has been paved or otherwise covered by a permanent structure.

C.16 DPR: The California Department of Parks and Recreation.

C.17 EARTHMOVING ACTIVITIES: The use of any equipment for an activity that may generate Fugitive Dust emissions, including, but not limited to, cutting and filling, grading, leveling, excavation, trenching, loading or unloading of Bulk Materials, demolishing, drilling, adding to or removing bulk materials from open storage piles, weed abatement through disking, and back filling.

C.18 FUGITIVE DUST: The Particulate Matter entrained in the ambient air which is caused from man-made and natural activities such as, but not limited to, movement of soil, vehicles, equipment, blasting, and wind. This excludes Particulate Matter emitted directly in the exhaust of motor vehicles or other fuel combustion devices, from portable brazing, soldering, or welding equipment, pile drivers, and stack emissions from stationary sources.

C.19 GRAVEL: Gravel travelways shall have a three (3) inch minimum depth Stabilized Surface. The travelway shall have a relative compaction of not less than 95% as determined by Test Method No. California 216 of State of California, Business and Transportation Agency Department of Transportation, and conforming to the following grading:

Sieve Designation	¾” Maximum Percent Passing
1”	100
¾”	90-100
#4	35-60
#30	10-30
#200	2-9

Reference: California Department of Transportation Standard Specification Section 26/class II Aggregate Base

C.20 HAUL/ACCESS ROAD: Any on-site road used for commercial, industrial, institutional, and/or governmental traffic.

C.21 HAUL TRUCK: Any fully or partially open-bodied licensed motor vehicle used for transporting Bulk Material for industrial or commercial purposes.

C.22 IMPLEMENT OF HUSBANDRY: An unlicensed vehicle which is used exclusively in the conduct of Agricultural Operations. An Implement of Husbandry does not include a vehicle if its existing design is primarily for the transportation of persons or property on a highway, unless specifically designated as such by some other provision of the Vehicle Code of California.

C.23 NON-RESIDENTIAL AREA: Any unpaved vehicle and equipment traffic area operated at any commercial, manufacturing or government sites.

C.24 MODIFIED PAVED ROAD: Any Paved Road that is widened or improved so as to increase traffic capacity. This term does not include road maintenance, repair, chip seal, pavement or roadbed rehabilitation that does not affect roadway geometrics, or surface overlay work.

C.25 OFF-FIELD AGRICULTURAL SOURCE: Any Agricultural Source or activity at an Agricultural Source that falls into one or more of the following categories:

C.25.a Outdoor handling, storage and transport of Bulk Material;

C.25.b Paved Road;

C.25.c Unpaved Road; or

C.25.d Unpaved Traffic Area.

C.26 OFF-ROAD EVENT AND/OR COMPETITIONS: Means any of the following: any organized, sanctioned, or structured use, event or activity on public land in which two hundred and fifty (250) or more contestants compete and either or both of the following elements apply: (i) Participants register, enter, or complete an application for the event; (ii) A predetermined course or area is designated.

C.27 OFF- HIGHWAY VEHICLE(OHV): An off-highway vehicle is a motorized vehicle when operating off a highway, including a two-wheel, three-wheel or four-wheel vehicle, motorcycle, four-wheel drive vehicle, dune buggy, amphibious vehicle, ground effects or air cushion vehicle and any other means of land transportation deriving motive power from a source other than muscle or wind. "Highway" means the entire width between the boundary lines of every way publicly maintained by the federal government, a city, a town or a county if any part of the way is generally open to the use of the public for purposes of vehicular travel, excluding unpaved trails and paths specifically intended for recreational use.

C.28 ON-FIELD AGRICULTURAL SOURCE: Any Agricultural Source or activity at an Agricultural Source that is not an Off-Field Agricultural Source, including (but not limited to) the following:

C.28.a Activities conducted solely for the purpose of preparing land for the growing of crops or the raising of fowl or animals, such as brush or timber clearing, grubbing, scraping, ground excavation, land leveling, grading, turning under stalks, disking, or tilling;

C.28.b Drying or pre-cleaning of agricultural crop material on the field where it was harvested;

C.28.c Handling or storage of agricultural crop material that is baled, cubed, pelletized, or long-stemmed, on the field where it was harvested, and the handling of fowl or animal feed materials at sites where animals or fowl are raised;

C.28.d Disturbances of cultivated land as a result of fallowing, planting, fertilizing or harvesting.

C.29 OPEN AREA: Any of the following described in Subsection C.29.a through C.29.c of this rule. For the purpose of this rule, vacant portions of residential or commercial lots and contiguous parcels that are immediately adjacent to and owned and/or operated by the same individual or entity are considered one open area. An open area does not include any Unpaved Traffic Area as defined in this rule.

C.29.a An un-subdivided or undeveloped land whether or not it is adjoining a developed (or partially developed) residential, industrial, institutional, governmental, or commercial area.

C.29.b A subdivided residential, industrial, institutional, governmental, or commercial lot, which contains no approved or permitted building or structures of a temporary or permanent nature.

C.29.c A partially developed residential, industrial, institutional, governmental, or commercial lot and contiguous lots under common ownership.

C.30 PARTICULATE MATTER: Any material, except uncombined water, which exists in a finely divided form as a liquid or solid at 60 degrees F and one atmosphere pressure.

C.31 PAVED ROADS: An improved street, highway, alley, public way, that is covered by concrete, asphaltic concrete, or asphalt.

C.32 PERSON: Any individual, public or private corporation, partnership, association, firm, trust, estate, municipality, or any other legal entity whatsoever which is recognized by law as the subject of rights and duties, who is responsible for an Active Operation.

C.33 PM-10: Particulate Matter with an aerodynamic diameter smaller than or equal to a nominal 10 microns as measured by the applicable State and Federal reference test methods.

C.34 RECREATIONAL OFF-HIGHWAY VEHICLE (OHV) USE AREA: The entire area of a parcel of land, except for camping and approved buffer areas, that is managed for off-highway vehicle use through the development or designation of off-highway vehicle trails or areas.

C.35 RURAL: Areas not classified as urban constitute “rural.”

C.36 SILT: Any Aggregate Material with a particle size less than 75 micrometers in diameter as measured by a No. 200 sieve as defined in ASTM D-2487 and as tested by ASTM-C-136 or other equivalent test methods approved by EPA, ARB, and the APCD.

C.37 STABILIZED SURFACE: Any disturbed surface area or open bulk storage pile that is resistant to wind blown Fugitive Dust emissions. A surface is considered to be stabilized if it meets at least one of the following conditions specified in this Section and as determined by the test methods specified in Appendix B, Section A, B and D-G tests of this rule:

C.37.a A visible crust; or

C.37.b A threshold friction velocity (TFV) for disturbed surface areas corrected for non-erodible elements of 100 centimeters per second or greater; or

C.37.c A flat vegetative cover of at least 50 percent that is attached or rooted vegetation; or unattached vegetative debris lying on the surface with a predominant horizontal orientation that is not subject to movement by wind; or

C.37.d A standing vegetative cover of at least 30 percent that is attached or rooted vegetation with a predominant vertical orientation; or

C.37.e A standing vegetative cover that is attached or rooted vegetative with a predominant vertical orientation that is at least 10 percent and where the TFV is at least 43 centimeters per second when corrected for non-erodible elements; or

C.37.f A surface that is greater than or equal to 10 percent of non-erodible elements such as rocks, stones, or hard-packed clumps of soil.

C.38 STABILIZED UNPAVED ROAD: Any Unpaved Road or unpaved vehicle/equipment traffic area surface which meets the definition of Stabilized Surface as determined by the test method in Appendix B, Section C of this rule, and where VDE is limited to 20% opacity.

C.39 TACTICAL TRAINING: Training conducted by the U.S. Department of Defense, the U.S. military services, or its allies for combat, combat support, combat service support, tactical or relief operations. Examples include but are not limited to munitions training.

C.40 TEMPORARY UNPAVED ROAD: Any Unpaved Road surface which is created to support a temporary or periodic activity and the use of such road surface is limited to vehicle access for a period of not more than six months during any consecutive three-year period.

C.41 THRESHOLD FRICTION VELOCITY (TFV): The corrected velocity necessary to initiate soil erosion as determined by the test method specified in Appendix B, Section D, of this rule. The lower TFV, the greater the propensity for fine particles to be lifted at relatively low wind speeds.

C.42 TRACK-OUT/CARRY-OUT: Any and all Bulk Materials that adhere to and agglomerate on the exterior surfaces of motor vehicles and/or equipment (including tires) that may then fall onto the pavement.

C.43 TRACK-OUT PREVENTION DEVICE: A Gravel pad, grizzly, wheel wash system, or a paved area, located at the point of intersection of an unpaved area and a Paved Road that prevents or controls Track-Out.

C.44 UNPAVED ROADS: Streets, alley ways, or roadways that are not covered by one of the following: concrete, asphaltic concrete, asphalt, or other similar materials specified by the U.S.EPA, CARB and/or the APCO.

C.45 UNPAVED TRAFFIC AREA: Any nonresidential area that is:

C.45.a Not covered by asphalt, recycled asphalt, asphaltic concrete, concrete, or concrete pavement, and

C.45.b Used for fueling and servicing; shipping, receiving and transfer; or parking or storing equipment, haul trucks, vehicles, and any conveyances.

C.46 URBAN AREA: An area within an incorporated city boundary or within unincorporated areas completely surrounded by an incorporated city.

C.47 VDE: Visible dust emissions. Dust emissions that are visible to an observer.

C.48 VMT: Vehicle miles traveled.

C.49 WIND GUST: Is the maximum instantaneous wind speed as measured by an anemometer.

D. Compliance Schedule

D.1 Existing sources subject to this Regulation shall comply with its requirements no later than 90 days after its adoption date.

D.2 New sources subject to this Regulation shall comply with its requirements prior to initiation of activity.

D.3 BP and any person (including BLM and DPR) who owns or operates a Recreational OHV Use Area on public lands shall each comply with the following compliance schedule:

D.3.a Submit a draft dust control plan addressing all applicable portions of this Regulation including section F.5 and F.7 within three (3) months of the adoption date of this rule, to which the APCO shall respond within 60 days;

D.3.b Submit a final dust control plan addressing all APCO comments within two (2) months after receiving APCO's comments, which the APCO shall transmit to CARB and U.S. EPA for 45-day review and comment;

D.3.c If comments received from CARB or EPA, submit to them and APCO a revised final dust control plan addressing all comments within two (2) months after receiving comments.

D.3.d Implement all final dust control plan elements within six (6) months of submittal; and

D.3.e Submit an updated dust control plan every two calendar years by the procedures described in D.3.a to D.3.d. The updated plans shall be transmitted to the District no later than 90 days after the end of the calendar year and, in addition to information required of the initial plan, shall include a summary of actions taken to prevent or mitigate PM10 emissions during the previous two years.

E. Exemptions

The following activities are exempt from provisions of this Regulation:

E.1 Actions required by the Federal or State Endangered Species Act or any order issued by a court or governmental agency.

E.2 Off-Field Agricultural Sources necessary to minimize or respond to adverse effects on agricultural crops caused during freezing temperatures as declared by the National Weather Service.

E.3 Emergency maintenance of flood control channels and water spreading basins.

E.4 Any emergency operation activities performed to ensure public health and safety. Emergency activities lasting more than 30 days shall be subject to this Regulation, except where compliance would limit the effectiveness of the emergency activity performed to ensure public health and safety.

E.5 Blasting operations permitted by the California Division of Industrial Safety. Other activities performed in conjunction with blasting are not exempt from complying with the provisions of this rule.

E.6 The following military training activities conducted by the Department of Defense: (1) military Tactical Training, (2) maintenance, repair, and removal of targets and munitions associated with military Tactical Training, (3) open areas on active military ranges, including but not limited to designated impact areas, landing zones, and bivouac areas. However, unpaved roads, staging areas, parking lots, and other activities performed in conjunction with military Tactical Training are not exempt from complying with the provisions of this Regulation, as applicable.

F. General Requirements

F.1 Materials used for Chemical Stabilization of soils, including petroleum resins, asphaltic emulsions, acrylics, and adhesives shall not violate State Water Quality Control Board standards for use as a soil stabilizer. Materials accepted by the California Air Resources Board (ARB) and the

United States Environmental Protection Agency (EPA), and which meet State water quality standards, shall be considered acceptable to the ICAPCD.

F.2 Any material prohibited for use as dust Suppressant by EPA, the ARB, or other applicable law, rule, or regulation is also prohibited under Regulation VIII.

F.3 Use of hygroscopic materials may be prohibited by the APCD in areas lacking sufficient atmospheric moisture of soil for such materials to effectively reduce Fugitive Dust emissions. The atmospheric moisture of soil is considered to be sufficient if it meets the application specifications of the hygroscopic product manufacturer. Use of such materials may be approved in conjunction with sufficient wetting of the controlled area.

F.4 Any use of dust Suppressants or gravel pads, and paving materials such as asphalt or concrete for paving, shall comply with other applicable District Rules.

F.5 Recreational OHV Use Area on Public lands Dust Control Plan Requirements

The BLM, DPR, or any other owner or operator of a Recreational OHV Use Area on public lands shall prepare a dust control plan to minimize PM-10 emissions. The dust control plan shall include at a minimum the following:

F.5.a A stipulation that all new authorizations for point and area stationary emission sources obtain all necessary permits and satisfy all applicable SIP provisions, including Regulation VIII specific control measures;

F.5.b A summary of:

F.5.b.1 The total miles of roads in the Recreational OHV Use Area on public lands that are paved, paved with unpaved shoulders, and unpaved roads with 50 or more average vehicle trips per day, including length and level of usage of each such road; the priority for control of road segments based on annual and episodic (e.g. event) usage; the plans for control of PM-10 emissions from these roads;

F.5.b.2 The location and extent (acreage and where feasible, estimate of number of vehicles) of open areas disturbed by legal and illegal Recreational Use, including maps such as those required by California Public Resources Code (PRC) section 5090.34; the priority for control of these open areas based on annual and episodic (e.g. event) usage; the plans for control of PM-10 emissions from these areas;

F.5.c Unpaved Roads and Unpaved Vehicle/Equipment Traffic Area. The dust control plan shall be implemented on all days that traffic exceeds, or is expected to exceed, the number of average daily vehicle trips per day as specified in sections F.5.c.1 and F.5.c.2 of this rule, except where measures are demonstrated by owner/operator to be prohibited by federal or state laws, regulations, or approved plans concerning wilderness preservation and species management and recovery.

F.5.c.1 On each day of an Off-Road Event and/or Competition that 50 average vehicle daily trips per day will occur on an unpaved road segment, the owner/operator shall limit VDE to 20% opacity and comply with the requirements of a stabilized unpaved road by application and/or re-application/maintenance of at least one of the following control measures:

F.5.c.1.1 Watering;
F.5.c.1.2 Uniform layer of washed gravel;
F.5.c.1.3 Paving;
F.5.c.1.4 Restrict access;
F.5.c.1.5 Restrict speed limit at or below 15 mph;
F.5.c.1.6 Chemical/organic dust suppressants;
F.5.c.1.7 Roadmix;
F.5.c.1.8 Any other method(s) that can be demonstrated that effectively limits VDE to 20% opacity and meets the conditions of a stabilized unpaved road.

F.5.c.2 On each day of an Off-Road Event and/or Competition that 50 average vehicle daily trips per day will occur on an unpaved surface area dedicated to any vehicle parking and Unpaved Traffic Area, the owner/operator shall limit VDE to 20% opacity and comply with the requirements of a stabilized unpaved road by application and/or re-application/maintenance of at least one of the following control measures:

F.5.c.2.1 Watering;
F.5.c.2.2 Uniform layer of washed gravel;

F.5.c.2.3 Paving;
F.5.c.2.4 Restricted access below the limit;
F.5.c.2.5 Restrict speed limit at or below 15 mph;
F.5.c.2.6 Chemical/organic dust suppressants;
F.5.c.2.7 Roadmix;
F.5.c.2.8 Any other method(s) that can be demonstrated that effectively limits VDE to 20% opacity and meets the conditions of a stabilized unpaved road.

F.5.d The dust control plan must describe all PM-10 control measures that will be implemented, such as restricted use areas, stabilization of Unpaved Traffic Areas and current Recreation Area Management Plan (RAMP) measures, all applicable soil and habitat conservation requirements, and all monitoring and corrective actions taken to reduce PM10 emissions during Off-Road Events and/or Competitions on public land and include all those measures that are feasible and not prohibited by the laws, regulations and plans described in F.5.c;

F.5.e Use BLM-standard road design and drainage specifications when maintaining existing roads or authorizing road maintenance and new road construction;

F.5.f Include public educational information on reducing PM-10 emissions with agency (e.g., BLM and DPR) open area literature (e.g. identification of restricted areas and/or applicable speed limits) and on related information signs in heavily used areas; and

F.5.g The owner or operator of a recreational OHV use area on public lands shall not permit Off-Road Events and/or Competitions from June 15th to August 15th, unless a specific dust control plan is submitted to and approved by the ICAPCD. The dust control plan shall include specific fugitive dust control measures and demonstrate that all control measures, including the requirements of this rule, can be implemented and enforced.

F.6 Border Patrol (BP) Requirements

The BP shall prepare a dust control plan designed to minimize PM10 emissions from sources under the control of the BP. The dust control plan shall include the following fugitive dust control measures:

F.6.a A stipulation that all new authorizations for point and area stationary emission sources obtain all necessary permits and satisfy all applicable SIP provisions, including Regulation VIII specific control measures;

F.6.b Implement alternatives to tire-dragging that result in fewer PM10 emissions, unless BP demonstrates such alternatives to be inconsistent with the monitoring of immigration across the U.S.-Mexico border;

F.7 New Recreational OHV Use Area(s) on Public Land Requirements

Before a public agency (including BLM and DPR) designates a property as “New Recreational OHV Use Area” (hereafter referred to as “New Recreational OHV Use Area”) for OHV recreation, the agency shall meet and confer with ICAPCD. A “New Recreational OHV Use Area” shall include areas physically undisturbed by OHV usage as of January 1, 2013. After development and approval of an agency’s first Dust Control Plan under Section D.3 of this rule, “New Recreational OHV Use Area also includes areas not described in the previous public agency’s dust control plan.”

F.7.a ICAPCD shall review the public agency’s draft General Plan, Specific Plan, or RAMP and/or related documents for consistency and compliance with the rules and requirements applicable to and/or implementing Imperial County’s plan for attainment and/or maintenance of the 24-hour federal PM-10 standard. During the applicable public comment period, ICAPCD may provide comments on the applicable plan to the public agency related to consistency and compliance with such rules and requirements, and where applicable, describe additional measures necessary for consistency and compliance with such rules and requirements.

F.7.b For any New Recreational OHV Use Area(s) with PM-10 emissions of 70 tons per year or above, the public agency must demonstrate in a federal- and/or state-required environmental assessment that these emissions would not:

F.7.b.1 Cause or contribute to any new violations of any PM-10 NAAQS in the area.

F.7.b.2 Interfere with provisions in the applicable PM-10 SIP for maintenance of the PM-10 NAAQS.

F.7.b.3 Increase the frequency or severity of any existing violation of PM-10 NAAQS; or

F.7.b.4 Delay timely attainment of the PM-10 NAAQS or any required interim emission reductions or other milestones in any area including, where applicable, emission levels specified in the applicable SIP for purposes of: (i) a demonstration of reasonable further progress; (ii) a demonstration of attainment; or (iii) a maintenance plan.

F.7.c The public agency shall not approve the applicable General Plan, Specific Plan, or RAMP unless and until it has incorporated ICAPCD's comments and recommended mitigation measures or explained why a comment or recommended mitigation measure does not apply or is infeasible. If the public agency does not accept a mitigation measure or comment, the public agency shall consult with ICAPCD to identify an alternative measure or way to address ICAPCD's concern. In any event, all New Recreational OHV Use Areas shall comply with Section F.5 above.

G. Administrative Requirements

G.1 Test Methods

G.1.a Determination of VDE Opacity

Opacity observations to determine compliance with VDE standards shall be conducted in accordance with the test procedures for "Visual Determination of Opacity" as described in Appendix A of this rule. Opacity observations for sources other than unpaved traffic areas (e.g., roads, parking areas) shall be conducted per Section B of Appendix A and shall require 12 readings at 15-second intervals.

G.1.b Determination of Stabilized Surface

Observations to determine compliance with the conditions specified for a stabilized surface, in any inactive disturbed surface area, whether at a work site that is under construction, at a work site that is temporarily or permanently inactive, or on an open area and vacant lot, shall be conducted in accordance with the test methods described in Appendix B of this rule. If a disturbed surface area passes any of the applicable Appendix B-Section A, B and D-G tests, then the surface shall be considered stabilized.

G.1.c Determination of Soil Moisture Content

Soil moisture content shall be determined by using ASTM Method D2216-98 (Standard Test Method for Laboratory Determination of Water [Moisture] Content of Soil and Rock by Mass), or other equivalent test methods approved by the EPA, ARB, and the APCO.

G.1.d Determination of Silt Content for Bulk Materials

Silt content of a Bulk Material shall be determined by ASTM Method C136a (Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates), or other equivalent test methods approved by EPA, ARB, and the APCD.

G.1.e Determination of Silt Content for Unpaved Roads and Unpaved Vehicle/Equipment Traffic Areas

Silt Content for Unpaved Roads and Unpaved Traffic Areas shall be determined by using Section C of Appendix B of this Rule or other equivalent test methods approved by EPA, ARB, and the APCO.

G.1.f Determination of Threshold Friction Velocity (TFV)

TFV shall be determined by using Section D of Appendix B of this Rule or other equivalent test methods approved by EPA, ARB, and the APCO.

H. Record of Control Implementation

Any Person subject to the requirements of this rule shall compile and retain records that provide evidence of control measure application and compliance with this rule (i.e., receipts and/or purchase records). Such Person shall describe, in the records, the type of treatment or control measure, extent of coverage, and date applied. For control measures which require multiple daily applications, recording the frequency of application will fulfill the recordkeeping requirements of this rule (i.e., water being applied three times a day and the date) Records shall be maintained and be readily accessible for two years after the date of each entry and shall be provided to the APCD upon request.

I. Violations

Failure to comply with any provisions of this rule shall constitute a violation of Regulation VIII. Failure to comply with the provisions of an APCO approved dust control plan shall also constitute a violation of this Regulation. Regardless of whether an APCO approved dust control plan is being implemented or not, or whether a Person responsible for an Active Operation(s) is complying with an approved dust control plan, the Person is still subject to the requirements of Regulation VIII at all times.

APPENDIX A
Visual Determination of Opacity

SECTION A Test Method For Unpaved Roads and Unpaved Traffic Areas
SECTION B Test Method For Time-Averaged Regulations

SECTION A TEST METHOD FOR UNPAVED ROADS AND UNPAVED TRAFFIC AREAS

A Opacity Test Method. The purpose of this test method is to estimate the percent opacity of Fugitive Dust plumes caused by vehicle movement on Unpaved Roads and Unpaved Traffic Areas. This method can only be conducted by an individual who has current certification as a qualified observer.

A.1 Step 1: Stand at least 16.5 feet from the fugitive dust source in order to provide a clear view of the emissions with the sun oriented in the 140° sector to the back. Following the above requirements, make opacity observations so that the line of vision is approximately perpendicular to the dust plume and wind direction. If multiple plumes are involved, do not include more than one plume in the line of sight at one time.

A.2 Step 2: Record the Fugitive Dust source location, source type, method of control used, if any, observer's name, certification data and affiliation, and a sketch of the observer's position relative to the Fugitive Dust source. Also, record the time, estimated distance to the Fugitive Dust source location, approximate wind direction, estimated wind speed, description of the sky condition (presence and color of clouds), observer's position to the Fugitive Dust source, and color of the plume and type of background on the visible emission observation form both when opacity readings are initiated and completed.

A.3 Step 3: Make opacity observations, to the extent possible, using a contrasting background that is perpendicular to the line of vision. Make opacity observations approximately 1 meter above the surface from which the plume is generated. Note that the observation is to be made at only one visual point upon generation of a plume, as opposed to visually tracking the entire length of a dust plume as it is created along a surface. Make two observations per vehicle, beginning with the first reading at zero seconds and the second reading at five seconds. The zero-second observation should begin immediately after a plume has been created above the surface involved. Do not look continuously at the plume but, instead, observe the plume briefly at zero seconds and then again at five seconds.

A.4 Step 4: Record the opacity observations to the nearest 5% on an observational record sheet. Each momentary observation recorded represents the average opacity of emissions for a 5-second period. While it is not required by the test method, EPA recommends that the observer estimate the size of the vehicles which generate dust plumes for which readings are taken (e.g. mid-size passenger car or heavy-duty truck.) and take the approximate speeds the vehicles are traveling when the readings are being taken.

A.5 Step 5: Repeat Step 3 (Section A.3. of this appendix) and Step 4 (Section A.4. of this appendix) until you have recorded a total of 12 consecutive opacity readings. This will occur once six vehicles have driven on the source in your line of observation for which you are able to take proper readings. The 12 consecutive readings must be taken within the same period of observation but must not exceed 1 hour. Observations immediately preceding and following interrupted observations can be considered consecutive.

A.6 Step 6: Average the 12 opacity readings together. If the average opacity reading equals 20% or lower, the source is in compliance with the opacity standard described in the applicable rule.

SECTION B TEST METHOD FOR VISUAL DETERMINATION OF OPACITY OF EMISSIONS FROM SOURCES FOR TIME-AVERAGED REGULATIONS

B Applicability. This method is applicable for the determination of the opacity of emissions from sources of visible emissions for time-averaged regulations. A time-averaged regulation is any regulation that requires averaging visible emission data to determine the opacity of visible emissions over a specific time period.

B.1 Principle. The opacity of emissions from sources of visible emissions is determined visually by a qualified observer who has received certification.

B.2 Procedures. A qualified observer who has been certified shall use the following procedures for visually determining the opacity of emissions.

B.2.a Position. Stand at a position at least 5 meters from the Fugitive Dust source n order to provide a clear view of the emissions with the sun oriented in the 140° sector to the back. Consistent as much as possible with maintaining the above requirements, make opacity observations from a position such that the line of sight is approximately perpendicular to the plume and wind direction. The observer may follow the Fugitive Dust plume generated by mobile earthmoving equipment, as long as the sun remains oriented in the 140° sector to the back. As much as possible, if multiple plumes are involved, do not include more than one plume in the line of sight at one time.

B.2.b Field Records. Record the name of the site, Fugitive Dust source type (i.e., pile, material handling (i.e., transfer, loading, sorting)), method of control used, if any, observer's name, certification data and affiliation, and a sketch of the observer's position relative to the Fugitive Dust source. Also, record the time, estimated distance to the Fugitive Dust source location, approximate wind direction, estimated wind speed, description of the sky condition (presence and color of clouds,) observer's position relative to the fugitive dust source, and color of the plume and type of the background on the visible emission observation form when opacity readings are initiated and completed.

B.2.c Observations. Make opacity observations, to the extent possible, using a contrasting background that is perpendicular to the line of sight. For storage piles, make opacity observations approximately 1 meter above the surface from which the plume is generated. For extraction operations and the loading of haul trucks in open-pit mines, make opacity observations approximately one meter above the rim of the pit. The initial observation should begin immediately after a plume has been created above the surface involved. Do not look continuously at the plume, but instead observe the plume momentarily at 15-second intervals. For Fugitive Dust from Earthmoving equipment, make opacity observations approximately 1 meter above the mechanical equipment generating the plume.

B.2.d Recording Observations. Record the opacity observations to the nearest 5% every 15 seconds on an observational record sheet. Each momentary observation recorded represents the average opacity of emissions for a 15-second period. If a multiple plume exists at the time of an observation, do not record an opacity reading. Mark an "x" for that reading. If the equipment generating the plume travels outside of the field of observation, resulting in the inability to maintain the orientation of the sun within the 140° sector or if the equipment ceases operating, mark an "x" for the 15 – second interval reading. Readings identified as "x" shall be considered interrupted readings.

B.2.e Data Reduction For Time-Averaged Regulations. For each set of 12 or 24 consecutive readings, calculate the appropriate average opacity. Sets must consist of consecutive observations, however, readings immediately preceding and following interrupted readings shall be deemed consecutive and in no case shall two sets overlap, resulting in multiple violations.

APPENDIX B
Determination of Stabilization

SECTION A TEST METHODS FOR DETERMINING STABILIZATION

The test methods described in Section B through Section G of this appendix shall be used to determine whether an area has a Stabilized Surface. Should a disturbed area contain more than one type of disturbance, soil, vegetation, or other characteristics, which are visibly distinguishable, test each representative surface separately for stability, in an area that represents a random portion of the overall disturbed conditions of the site, according to the appropriate test methods in Section B through Section G of this appendix, and include or eliminate it from the total size assessment of disturbed surface area(s) depending upon test method results.

SECTION B VISIBLE CRUST DETERMINATION

B.1 Where a visible crust exists, drop a steel ball with a diameter of 15.9 millimeters (0.625 inches) and a mass ranging from 16-17 grams from a distance of 30 centimeters (one foot) directly above (at a 90° angle perpendicular to) the soil surface. If blowsand is present, clear the blowsand from the surfaces on which the visible crust test method is conducted. Blowsand is defined as thin deposits of loose uncombined grains covering less than 50% of a site which have not originated from the representative site surface being tested. If material covers a visible crust, which is not blowsand, apply the test method in Section D of this appendix to the loose material to determine whether the surface is stabilized.

B.2 A sufficient crust is defined under the following conditions: once a ball has been dropped according to section B.1 of this appendix, 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 upon which it fell has not been pulverized, so that loose grains are visible.

B.3 Drop the ball three times within a survey area that measures 1 foot by 1 foot and that represents a random portion of the overall disturbed conditions of the site. The survey area shall be considered to have passed the Visible Crust Determination Test if the results of at least two out of the three times that the ball was dropped, met the criteria in section B.2 of this appendix. Select at least two other survey areas that represent a random portion of the overall disturbed conditions of the site, and repeat this procedure. If the results meet the criteria of section B.2 of this appendix for all of the survey areas tested, then the site shall be considered to have passed the Visible Crust Determination Test and shall be considered sufficiently crusted.

B.4 At any given site, the existence of a sufficient crust covering one portion of the site may not represent the existence or protectiveness of a crust on another portion of the site. Repeat the visible crust test as often as necessary on each random portion of the overall conditions of the site for an accurate assessment.

SECTION C DETERMINATION OF SILT CONTENT FOR UNPAVED ROADS AND UNPAVED VEHICLE/EQUIPMENT TRAFFIC AREAS

The purpose of this test method is to estimate the silt content of the trafficked parts of Unpaved Roads and Unpaved vehicle/equipment Traffic Areas. The higher the Silt content, the more fine dust particles that are released when vehicles travel on Unpaved Roads and Unpaved vehicle/equipment Traffic Areas.

C.1 Equipment:

C.1.a A set of sieves with the following openings: 4 millimeters (mm), 2mm, 1mm, 0.5mm and 0.25 mm, a lid, and collector pan.
C.1.b A small whisk broom or paintbrush with stiff bristles and dustpan 1 ft. in width (the broom/brush should preferably have one, thin row of bristles no longer than 1.5 inches in length.)
C.1.c A spatula without holes.
C.1.d A small scale with half-ounce increments (e.g., postal/package scale.)
C.1.e A shallow, lightweight container (e.g., plastic storage container.)
C.1.f A sturdy cardboard box or other rigid object with a level surface.
C.1.g A basic calculator.
C.1.h Cloth gloves (optional for handling metal sieves on hot, sunny days.)
C.1.i Sealable plastic bags (if sending samples to a laboratory.)
C.1.j A pencil/pen and paper.

C.2 Step 1: Look for a routinely traveled surface, as evidenced by tire tracks. Only collect samples from surfaces that are not damp due to precipitation or dew. This statement is not meant to be a standard in itself for dampness where watering is being used as a control measure. It is only intended to ensure that surface testing is done in a representative manner. Use caution when taking samples to ensure personal safety with respect to passing vehicles. Gently press the edge of a dustpan (1 foot in width) into the surface four times to mark an area that is 1 square foot. Collect a sample of loose surface material into the dustpan, minimizing escape of dust particles. Use a spatula to lift heavier elements such as gravel. Only collect dirt/Gravel to an approximate depth of 3/8 inch or 1 cm in the 1 square foot area. If you reach a hard, underlying subsurface that is <3/8 inch in depth, do not continue collecting the sample by digging into the hard surface. In other words, you are only collecting a surface sample of loose material down to 1 cm. In order to confirm that samples are collected to a 1cm depth, a wooden dowel or other similar narrow object at least one-foot in length can be laid horizontally across the survey area while a metric ruler is held perpendicular to the dowel. (Optional: At this point, you can choose to place the sample collected into a plastic bag or container and take it to an independent laboratory for silt content analysis. A reference to the procedure the laboratory is required to follow is at the end of this section.)

C.3 Step 2: Place a scale on a level surface. Place a lightweight container on the scale. Zero the scale with the weight of the empty container on it. Transfer the entire sample collected in the dustpan to the container, minimizing escape of dust particles. Weigh the sample and record its weight.

C.4 Step 3: Stack a set of sieves in order according to the size openings specified above, beginning with the largest size opening (4mm) at the top. Place a collector pan underneath the bottom (0.25mm) sieve.

C.5 Step 4: Carefully pour the sample into the sieve stack, minimizing escape of dust particles by slowly brushing material into the stack with a whiskbroom or brush. On windy days, use the trunk or door of a vehicle as a wind barrier. Cover the stack with a lid. Lift up the sieve stack and shake it vigorously up and down and sideways for at least 1 minute.

C.6 Step 5: Remove the lid from the stack and disassemble each sieve separately, beginning with the top sieve. As you remove each sieve, examine it to make sure that all of the material has been sifted to the finest sieve through which it can pass (e.g., material in each sieve (besides the top sieve that captures a range of larger elements) should look the same size.) If this is not the case, re-stack the sieves and collector pan, cover the stack with the lid, and shake it again for at least 1 minute. You only need to reassemble the sieve(s) that contain material, which require further sifting.

C.7 Step 6: After disassembling the sieves and collector pan, slowly sweep the material from the collector pan into the empty container originally used to collect and weigh the entire sample. Take care not to minimize escape of dust particles. You do not need to do anything with material captured in the sieves – only the collector pan. Weigh the container with the materials from the collector pan and record its weight.

C.8 Step 7: If the source is an unpaved road, multiply the resulting weight by 0.38. If the source is an Unpaved vehicle/equipment Traffic Area, multiply the resulting weight by 0.55. The resulting number is the estimated silt loading. Then, divide the total weight of the sample you recorded earlier in Step 2 (Section C.4) and multiply by 100 to estimate the percent Silt content.

C.9 Step 8: Select another two routinely traveled portions of the Unpaved Road or Unpaved vehicle/equipment Traffic Area and repeat this test method. Once you have calculated the silt loading and percent silt content of the 3 samples collected, average your results together.

C.10 Step 9: Examine Results. If the average silt loading is less than 0.33 oz/ft^2, the surface is STABLE. If the average silt loading is greater than or equal to 0.33 oz/ft^2, then proceed to examine the average percent Silt content. If the source is an Unpaved Road and the average percent Silt content is 6% or less, the surface is STABLE. If the source is an unpaved parking lot and the average percent Silt content is 8% or less, the surface is STABLE. If your field test results are within 2% of the standard (for example, 4%-8% Silt content on an Unpaved Road) it is recommended that you collect 3 additional samples from the source according to Step 1 (section C.2) and take them to an independent laboratory for Silt content analysis.

C.11 Independent Laboratory Analysis: You may choose to collect samples from the source, according to Step 1 (section C.2) and send them to an independent laboratory for Silt content analysis rather than conduct the sieve field procedure. If so, the test method the laboratory is required to use is: “Procedures For Laboratory Analysis for Surface/Bulk Dust Loading Samples,” (Fifth Edition, Volume 1, Appendix C.2.3 “Silt Analysis,” 1995,) AP-42, Office of Air Quality Planning & Standards, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina.

SECTION D DETERMINATION OF THRESHOLD FRICTION VELOCITY (TFV)

For disturbed surface areas that are not crusted or vegetated, determine threshold friction velocity (TFV) according to the following sieving field procedure (based on a 1952 laboratory procedure published by W.S. Chepil).

D.1 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 (TFV)

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

D.2 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 episode, and inhibit soil loss by consuming Section of 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. 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 = Overhead Area Of Group 1 + Overhead Area of Group 2 (etc)	Eq. 3
Total Frontal Area = Total Overhead Area/2	Eq. 4
Percent Cover of Non-Erodible Elements = (Total Frontal Area/Survey Area) x 100	Eq. 5

Note: Ensure consistent units of measurements (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

SECTION E DETERMINATION OF FLAT VEGETATIVE COVER

Flat vegetation includes attached (rooted) vegetation or unattached vegetative debris lying on the surface with a predominant horizontal orientation that is not subject to movement by wind. Flat vegetation, which is dead but firmly attached, shall be considered equally protective as live vegetation. Stones or other aggregate larger than 1 centimeter in diameter shall be considered protective cover in the course of conduction the line transect test method. Where flat vegetation exists conduct the following line transect test method.

E.1 Line Transect Test Method. Stretch a 100 foot measuring tape across a survey area that represents a random portion of the overall conditions of the site. Firmly anchor both ends of the measuring tape into the surface using a tool such as a screwdriver, with the tape stretched taut and close to the soil surface. If vegetation exists in regular rows, place the tape diagonally (at approximately a 45° angle) away from a parallel or perpendicular position to the vegetated rows. Pinpoint an area the size of a 3/32 inch diameter brazing rod or wooden dowel centered above each 1 foot interval mark along one edge of the tape. Count the number of times that flat vegetation lies directly underneath the pinpointed area at 1 foot intervals. Consistently observe the underlying surface from a 90° angle directly above each pinpoint on one side of the tape. Do not count the underlying surface as vegetated if any portion of the pinpoint extends beyond the edge of the vegetation underneath in any direction. If clumps of vegetation or vegetative debris lie underneath the pinpointed area, count the surface as vegetated, unless bare soil is visible directly below the pinpointed area. When 100 observations have been made, add together the number of times a surface was counted as vegetated. This total represents the percent of flat vegetations cover (e.g., if 35 positive counts were made, then vegetation cover is 35%.) If the survey area that represents a random portion of the overall conditions of the site is too small for 100 observations, make as many observations as possible. Then multiply the count of vegetated surface areas by the appropriate conversion factor to obtain percent cover. For example, if vegetation was counted 20 times within a total of 50 observations, divide 20 by 50 and multiply by 100 to obtain a flat vegetation cover of 40%.

E.2 Conduct the line transect test method, as described in section E.1 of this appendix, an additional two times on areas that represent a random portion of the overall conditions of the site and average results.

SECTION F DETERMINATION OF STANDING VEGETATIVE COVER.

Standing vegetation includes vegetation that is attached (rooted) with a predominant vertical orientation. Standing vegetation, which is dead but firmly rooted, shall be considered equally protective as live vegetation. Conduct the following standing vegetation test method to determine if 30% cover or more exists. If the resulting percent cover is less than 30% but equal to or greater than 10%, then conduct the test in Section D; “Determination Of Threshold Friction Velocity (TFV,) of this appendix in order to determine if the site is stabilized, such that the standing vegetation cover is equal to or greater than 10%, where threshold friction velocity, corrected for non-erodible elements, is equal to or greater than 43cm/second.

F.1 For standing vegetation that consists of large, separate vegetative structures (e.g., shrubs and sagebrush,) select a survey area that represents a random portion of the overall conditions of the site that is the shape of a square with sides equal to at least 10 times the average height of the vegetative structures. For smaller standing vegetation, select a survey area of three feet by three feet.

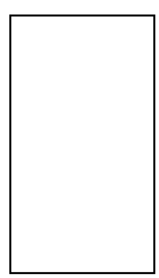
F.2 Count the number of standing vegetative structures within the survey area. Count vegetation, which grows in clumps as a single unit. Where different types of vegetation exist and/or vegetation of different height and width exists, separate the vegetative structures with similar dimensions into groups. Count the number of vegetative structures in each group within the survey area. Select an individual structure within each group that represents the average height and width of the vegetation in the group. If the structure is dense (e.g., when looking at it vertically from base to top there is little or zero open air space within its perimeter,) calculate and record its frontal silhouette area, according to Equation 6 of this appendix. Also, use Equation 6 of this appendix to estimate the average height and width of the vegetation if the survey area is larger than nine square feet. Otherwise, use the procedure in section F.3 of this appendix to calculate the frontal silhouette area. Then calculate the percent cover of standing vegetation according to Equations 7, 8, and 9 of this appendix.

Frontal Silhouette Area = (Average Height) x (Average Width)	Eq. 6
Frontal Silhouette Area Of Group= (Frontal Silhouette Area Of Individual Vegetative Structure) x (Number Of Vegetation Structures Per Group)	Eq. 7
Total Frontal Silhouette Area = Frontal Silhouette Area Of Group 1 + Frontal Silhouette Area Of Group 2 (etc.)	Eq. 8
Percent Cover Of Standing Vegetation = (Total Frontal Silhouette Area/Survey Area) x 100	Eq. 9
Percent Open Space = [(Number Of Circled Gridlines Within The Outlined Area Counted That Are Not Covered By Vegetation/Total Number Of Gridline Intersections Within The Outlined Area) x 100]	Eq.10
Percent Vegetative Density = 100 – Percent Open Space	Eq. 11
Vegetative Density = Percent Vegetative Density/100	Eq. 12
Frontal Silhouette Area = [Max. Height x Max. Width] x [Vegetative Density/.04]o.5	Eq. 13

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

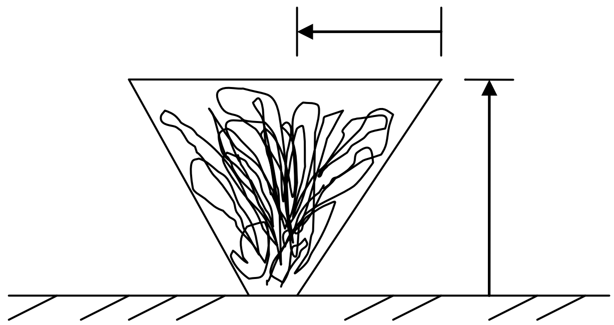
F.3 Vegetative Density Factor. Cut a single, representative piece of vegetation (or consolidated vegetative structure) to within 1cm of surface soil. Using a white paper grid or transparent grid over white paper, lay the vegetation flat on top of the grid (but do not apply pressure to flatten the structure.) Grid boxes of 1 inch or ½ inch squares are sufficient for most vegetation when conducting this procedure. Using a marker or pencil, outline the shape of the vegetation along its outer perimeter, according to Figure B, C, or D of this appendix, as appropriate. (Note: Figure C differs from Figure D primarily in that the width of vegetation in Figure C is narrow at its base and gradually broadens to its tallest height. In Figure D, the width of the vegetation generally becomes narrower from its midpoint to its tallest height.) Remove the vegetation, count and record the total number of gridline intersections within the outlined area, but do not count gridline intersections that connect with the outlined shape. There must be at least 10 gridline intersections within the outlined area and preferably more than 20, otherwise, use smaller grid boxes. Draw small circles (no greater than a 3/32 inch diameter) at each gridline intersection counted within the outlined area. Replace the vegetation on the grid within its outlined shape. From a distance of approximately 2 feet directly above the grid, observe each circled gridline intersection. Count and record the number of circled gridline intersections that are not covered by any piece of the vegetation. To calculate percent vegetative density, use Equations 10 and 11 of this appendix. If percent vegetative density is equal to or greater than 30, use an equation (one of the equations-Equations 16, 17, or 18 of this appendix) that matches the outline used to trace the vegetation (Figure B, C, or D) to calculate its frontal silhouette area. If percent vegetative density is less than 30, use Equations 12 and 13 of this appendix to calculate the frontal silhouette area.

Figure B. Cylinder



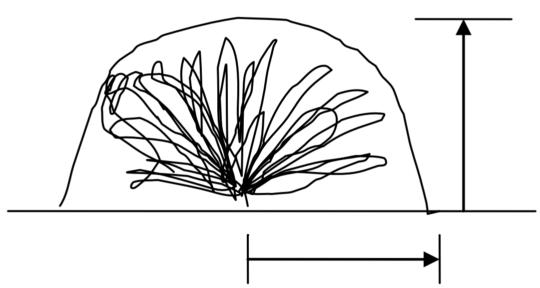
Frontal Silhouette Area = Maximum Height x Maximum Width Eq.16

Figure C. Inverted Cone



Frontal Silhouette Area = Maximum Height x ½ Maximum Width Eq. 17

Figure D. Upper Sphere



Frontal Silhouette Area = (3.14 x Maximum Height x ½ Maximum Width)/2 Eq.18

SECTION G ROCK TEST METHOD

The Rock Test Method, which is similar to Section D, Test Methods For Stabilization-Determination Of Threshold Friction Velocity (TFV) of this appendix, examines the wind-resistance effects of rocks and other non-erodible elements on disturbed surfaces. Non-erodible elements are objects larger than 1 centimeter (cm) in diameter that remain firmly in place even on windy days. Typically, non-erodible elements include rocks, stones, glass fragments, and hardpacked clumps of soil lying on or embedded in the surface. Vegetation does not count as a non-erodible element in this method. The purpose of this test method is to estimate the percent cover of non-erodible elements on a given surface to see whether such elements take up enough space to offer protection against windblown dust. For simplification, the following test method refers to all non-erodible elements as ‘rocks.”

G.1 Select a 1 meter by 1 meter survey area that represents the general rock distribution on the surface. A 1 meter by 1 meter area is slightly greater than a 3 foot by 3 foot area. Mark-off the survey area by tracing a straight, visible line in the dirt along the edge of a measuring tape or by placing short ropes, yard sticks, or other straight objects in a square around the survey area.

G.2 Without moving any of the rocks or other elements, examine the survey area. Since rocks >3/8 inch (1cm) in diameter are of interest, measure the diameter of some of the smaller rocks to get a sense of which rocks need to be considered.

G.3 Mentally group the rocks >3/8 inch (1cm) diameter lying in the survey area into small, medium, and large size categories. Or, if the rocks are all approximately the same size, simply select a rock of average size and typical shape. Without removing any of the rocks from the ground, count the number of rocks in the survey area in each group and write down the resulting number.

G.4 Without removing rocks, select one or two average-size rocks in each group and measure the length and width. Use either metric units or standard units. Using a calculator, multiply the length times the width of the rocks to get the average dimensions of the rocks in each group. Write down the results for each rock group.

G.5 For each rock group, multiply the average dimensions (length times width) by the number of rocks counted in the group. Add the results from each rock group to get the total rock area within the survey area.

G.6 Divide the total rock area, calculated in section G.5 of this appendix, by two (to get frontal area.) Divide the resulting number by the size of the survey area (make sure the units of measurement match,) and multiply by 100 for percent rock cover. For example, the total rock area is 1,400 square centimeters divide 1,400 by 2 to get 700. Divide 700 by 10,000 (the survey area is 1 meter by 1 meter, which is 100 centimeters by 100 centimeters or 10,000 centimeters) and multiply by 100. The result is 7% rock cover. If rock measurements are made in inches, convert the survey area from meters to inches (1 inch = 2.54 centimeters.)

G.7 Select and mark-off two additional survey areas and repeat the procedures described in section G.1 through section G.6 of this appendix. Make sure the additional survey areas also represent the general rock distribution on the site. Average the percent cover results from all three survey areas to estimate the average percent of rock cover.

G.8 If the average rock cover is greater than or equal to 10%, the surface is stable. If the average rock cover is less than 10%, follow the procedures in section G.9 of this appendix.

G.9 If the average rock cover is less than 10%, the surface may or may not be stable. Follow the procedures in Section D.3 Determination Of Threshold Friction Velocity (TFV) of this rule and use the results from the rock test method as a correction (i.e., multiplication) factor. If the rock cover is at least 1%, such rock cover helps to limit windblown dust. However, depending on the soil's ability to release fine dust particles into the air, the percent rock cover may or may not be sufficient enough to stabilize the surface. It is also possible that the soil itself has a high enough TFV to be stable without even accounting for rock cover.

G.10 After completing the procedures described in Section G.9 of this appendix, use Table 2 of this appendix to identify the appropriate correction factor to the TFV, depending on the percent rock cover.

RULE 801 CONSTRUCTION AND EARTHMOVING ACTIVITIES
(Adopted 11/08/2005)

A. Purpose

The purpose of this rule is to reduce the amount of fine Particulate Matter (PM-10) entrained in the ambient air as a result of emissions generated from Construction and other Earthmoving Activities by requiring actions to prevent, reduce, or mitigate PM-10 emissions.

B. Applicability

This rule applies to any Construction and other Earthmoving Activities, including, but not limited to, land clearing, excavation related to construction, land leveling, grading, cut and fill grading, erection or demolition of any structure, cutting and filling, trenching, loading or unloading of bulk materials, demolishing, drilling, adding to or removing bulk of materials from open storage piles, weed abatement through disking, back filling, travel on-site and travel on access roads to and from the site.

C. Definitions

The definition~~s~~ of terms found in Rule 800 (General Requirements for Control of Fine Particulate Matter (PM-10) shall apply to this rule.

D. Exemptions

In addition to the exemptions listed in Rule 800, Section E, the following exemptions are established for this rule:

D.1 Construction or demolition at existing single family residential dwellings.

D.2 The 20% opacity limit of Sections E.1.a and E.2.b shall not apply when Wind Gusts exceed 25 miles per hour, provided that at least one of the following control measures is implemented for each applicable Fugitive Dust source type:

D.2.a Cease dust generating activities for a period of one hour after Wind Gusts last exceed the threshold. If operations cease for the remainder of the day, stabilization measures must be implemented.

D.2.b Apply water or dust Suppressants once per hour.

D.2.c Apply water to maintain 12% soil moisture content.

D.2.d Construct fences 3-5 feet high with 50% or less porosity, and must be done in conjunction with another measure, as above.

E. Requirements

E.1 Construction sites and Earthmoving Activities:

E.1.a All Persons who own or operate a Construction site shall comply with the requirements of Section F.1 so as to limit VDE to 20% opacity and comply with the conditions for a Stabilized Surface when applicable.

E.1.b All Persons who perform any Earthmoving Activities shall comply with the requirements of Section F.1 so as to limit VDE to 20% opacity.

E.1.c All Persons who own or operate a Construction site of 10 acres or more in size for residential developments or 5 acres or more for non-residential developments shall develop a dust control plan. The dust control plan shall be made available to the APCD upon request. The dust control plan shall comply with the requirements of Section F.

E.1.d The owner or operator required to develop a dust control plan shall provide written notification to the APCD within 10 days prior to the commencement of any Construction activities via fax or mail. The requirement to develop a dust control plan shall apply to all such activities conducted for residential and non-residential (e.g., commercial, industrial, or institutional) purposes or conducted by any governmental entity. Regardless of whether a dust control plan is in place or not the owner or operator is still subject to comply with all requirements of the applicable rules under Regulation VIII at all times.

F. Best Available Control Measures for Fugitive Dust (PM-10)

F.1 Construction and Earthmoving Activities shall comply with the following requirements:

F.1.a Pre-Activity:

F.1.a.1 Pre-water site sufficient to limit VDE to 20% opacity, and

F.1.a.2 Phase work to minimize the amount of disturbed surface area at any one time.

F.1.b During Active Operations:

F.1.b.1 Apply water or Chemical Stabilization as directed by product manufacturer to limit VDE to 20% opacity, or

F.1.b.2 Construct and maintain wind barriers sufficient to limit VDE to 20% opacity. If utilizing wind barriers, control measure F.1.b.1 above shall be implemented.

F.1.b.3 Apply water or Chemical Stabilization as directed by product manufacturer to unpaved haul/access roads and Unpaved Traffic Areas sufficient to limit VDE to 20% opacity and meet the conditions of a Stabilized Unpaved Road.

F.1.c Temporary Stabilization During Periods of Inactivity:

F.1.c.1 Restrict vehicular access to the area by fencing or signage; and

F.1.c.2 Apply water or Chemical Stabilization, as directed by product manufacturer, sufficient to comply with the conditions of a Stabilized Surface. If an area having 0.5 acres or more of disturbed surface area remains unused for seven or more days, the area must comply with the conditions for a Stabilized Surface area.

F.1.d Track Out/Carry Out of Bulk Materials at the site shall be mitigated in compliance with Rule 803.

F.1.e Unpaved Roads and Unpaved Traffic Areas at the site shall comply with Rule 805.

F.1.f Bulk Material handling operations at the site shall comply with Rule 802.

F.1.g Material transport of Bulk Material to, from, or around the site shall comply with Rule 802.

F.1.h Haul trucks transporting Bulk Material to, from, or around the site shall comply with Rule 802.

F.2 Dust Control Plan:

F.2.a Retain a copy of the dust control plan at the project site.

F.2.b Comply with the requirements of the approved dust control plan.

F.2.c A dust control plan shall contain all of the following information:

1. Name, address, and phone number of the Person responsible for the preparation, submittal, and implementation of the dust control plan and responsible for the project site.

2. A plot plan which shows the type and location of each project.

3. The total area of land surface to be disturbed, estimated daily throughput volume of earthmoving in cubic yards, and total area in acres of the entire project site.

4. The expected start and completion dates of dust generating and soil disturbance activities to be performed on the site.

5. The actual and potential sources of Fugitive Dust emissions on the site and the location of Bulk Material handling and storage areas, Paved and Unpaved Roads, entrances and exits where Track Out/Carry Out may occur, and Unpaved Traffic Areas.

6. Dust Suppressants to be applied, including: product specifications; manufacturer's usage instructions (method, frequency, and intensity of application); type, number, and capacity of application equipment; and information on environmental impacts and approvals or certifications related to appropriate and safe use for ground application.

7. Specific surface treatment(s) and/or control measures utilized to control Track Out/Carry Out, and sedimentation where unpaved and/or access points join paved public access roads.

8. The dust control plan should describe all Fugitive Dust control measures to be implemented before, during, and after any dust generating activity.

G. Record of Control Implementation

Any Person subject to the requirements of this rule shall compile and retain records that provide evidence of control measure application (i.e., receipts and/or purchase records). Such Person shall describe, in the records, the type of treatment or control measure, extent of coverage, and date applied. For control measures which require multiple daily applications, recording the frequency of application will fulfill the recordkeeping requirements of this rule (i.e., water being applied three times a day and the date) Records shall be maintained and be readily accessible for two years after the date of each entry and shall be provided to the APCD upon request.

H. Violations

Failure to comply with any provisions of this rule shall constitute a violation of Regulation VIII.

RULE 802 BULK MATERIALS
(Adopted 11/08/2005)

A. Purpose

The purpose of this regulation is to reduce the amount of fine Particulate Matter (PM-10) entrained in the ambient air as a result of emissions generated from outdoor handling, storage, and transport of Bulk Material by requiring actions to prevent, reduce, or mitigate PM-10 emissions.

B. Applicability

This rule applies to the outdoor handling, storage, and transport of Bulk Material, including, but not limited to, earth, rock, silt, sediment, sand, gravel, soil, fill, Aggregate Materials, dirt, mud, debris, and other organic and/or inorganic material consisting of or containing Particulate Matter with five percent or greater silt content.

C. Definitions

The definition~~s~~ of terms found in Rule 800 (General Requirements for Control of Fine Particulate Matter (PM-10) shall apply to this rule.

D. Exemptions

In addition to the exemptions listed in Rule 800, Section E, the following exemptions are established for this rule:

D.1 Outdoor storage, transport, or handling of Bulk Materials (including, but not limited to, organic or inorganic fertilizer, grains, seed, soil amendments, and feed) which would be damaged by wetting with water or by the application of Chemical Stabilization/Suppression, provided owners/operators demonstrate to the satisfaction of the APCO that none of the control measures required by this rule can be implemented to limit VDE to 20% opacity or provide a Stabilized Surface, as defined in Rule 800.

D.2 Outdoor storage or handling of any Bulk Material at a single site where no material is actively being added or removed at the end of the workday or overnight and where the total material stored is less than 100 cubic yards.

D.3 Transport of a Bulk Material in an outdoor area for a distance of twelve feet or less with the use of a chute or conveyor device.

D.4 Transport/hauling of Bulk Materials when conducted within the boundaries of a premises, are exempt from the requirements specified in Sections

F.3.a and F.3.d.

E. Requirements

E.1 Bulk Material handling: no Person shall cause, suffer, allow or engage in any Bulk Material handling operation including, but not limited to stacking, loading, unloading, conveying and reclaiming of Bulk Material, for industrial or commercial purposes without complying with one or more of the requirements of Section F.1 so as to limit VDE to 20% opacity.

E.2 Bulk Material storage: no Person shall cause, suffer, allow or engage in any Bulk Material storage, for industrial or commercial purposes without complying with one or more of the requirements of Section F.2 so as to limit VDE to 20% opacity.

E.3 Material transport: no Person shall cause, suffer, allow or otherwise engage in the transportation of Bulk Materials for industrial or commercial purposes, without complying with all of the requirements of Section F.3 so as to limit VDE to 20% opacity.

E.4 Haul Trucks: no Person shall cause, suffer, allow or otherwise engage in the use or operation of any Haul Truck, for industrial or commercial purposes, of transporting or storing Bulk Material without complying with all of the requirements of Section F.3 so as to limit VDE to 20% opacity.

F. Best Available Control Measures for Fugitive Dust (PM-10)

F.1 BULK MATERIAL HANDLING/TRANSFER:

F.1.a Spray with water prior to handling and/or at points of transfer; or.

F.1.b Apply and maintain Chemical Stabilization, or

F.1.c Protect from wind erosion by sheltering or enclosing the operation and transfer line.

F.2 BULK MATERIAL STORAGE

F.2.a When storing Bulk Materials, comply with the conditions for a Stabilized Surface; or

F.2.b Cover Bulk Materials stored outdoors with tarps, plastic, or other suitable material and anchor in such a manner that prevents the cover from being removed by wind action, or

F.2.c Construct and maintain barriers with less than 50% porosity. If utilizing fences or wind barriers, apply water or chemical/organic stabilizers/suppressants, or

F.2.d Utilize a 3-side structure with a height at least equal to the height of the storage pile and with less than 50% porosity.

F.3 MATERIAL TRANSPORT/HAULING:

F.3.a Completely cover or enclose all Haul Truck loads of Bulk Material.

F.3.b Haul Trucks transporting loads of Aggregate Materials shall not be required to cover their loads if the load, where it contacts the side, front, and back of the cargo container area remains six inches from the upper area of the container area, and if the load does not extend, at its peak, above any part of the upper edge of the cargo container area (As defined in Section 23114 of the California Vehicle Code for both public and private roads).

F.3.c The cargo compartment(s) of all Haul Trucks are to be constructed and maintained so that no spillage and loss of Bulk Material can occur from holes or other openings in the cargo compartment's floor, side, and/or tailgate. Seals on any openings used to empty the load including, but not limited to, bottom-dump release gates and tailgates to be properly maintained to prevent the loss of Bulk Material from those areas.

F.3.d The cargo compartment of all Haul Trucks is to be cleaned and/or washed at delivery site after removal of Bulk Material.

G. Record of Control Implementation

Any Person subject to the requirements of this rule shall compile and retain records that provide evidence of control measure application (i.e., receipts and/or purchase records). Such Person shall describe, in the records, the type of treatment or control measure, extent of coverage, and date applied. For control measures which require multiple daily applications, recording the frequency of application will fulfill the recordkeeping requirements of this rule (i.e., water being applied three times a day and the date) Records shall be maintained and be readily accessible for two years after the date of each entry and shall be provided to the APCD upon request.

H. Violations

Failure to comply with any provision~~s~~ of this rule shall constitute a violation of Regulation VIII.

RULE 803 CARRY-OUT AND TRACK-OUT
(Adopted 11/08/2005)

A. Purpose

The purpose of this regulation is to reduce the amount of fine Particulate Matter (PM-10) entrained in the ambient air as a result of emissions generated from Track-Out and Carry-Out by requiring actions to prevent, reduce, or mitigate PM-10 emissions.

B. Applicability

This rule applies to all sites that are subject to Regulation VIII where Track-Out or Carry-Out has occurred or may occur on paved public roads or the paved shoulders of a paved public road.

C. Definitions

The definition~~s~~ of terms found in Rule 800 (General Requirements for Control of Fine Particulate Matter (PM-10) shall apply to this rule.

D. Exemptions:

In addition to the exemptions listed in Rule 800, Section E, the following exemptions are established for this rule:

D.1 Agricultural Operation Sites defined in and subject to Rule 806, Conservation Management Practices, are exempt from the requirements specified in Sections F.1.b and F.1.c.

D.2 Any operation site that operates no more than 10 days within a 90 days period at each location is exempt from the requirements specified in Sections F.1.b and F.1.c.

E. Requirements

E.1 Track Out/Carry Out: any Person who causes the deposition of Bulk Material by tracking out or carrying out onto a Paved Road surface shall comply with the requirements of Section F.1, as specified, to prevent or mitigate such deposition.

F. Best Available Control Measures for Fugitive Dust (PM-10)

F.1 TRACK OUT/CARRY OUT:

F.1.a Clean up any Bulk Material tracked out or carried out onto a Paved

Road on the following time-schedule:

(1) Within urban areas, immediately, when Track-Out or Carry-Out extends a cumulative distance of 50 linear feet or more; and

(2) At the end of the workday, for all other Track-Out or Carry-Out.

F.1.b In addition to F.1.a, all sites with access to a Paved Road and with 150 or more Average Vehicle Trips per Day, or 20 or more Average Vehicle Trips per Day by vehicles with three or more axles shall install one or more Track-Out Prevention Devices or other APCO approved Track-Out control device or wash down system at access points where unpaved traffic surfaces adjoin Paved Roads; or

F.1.c In addition to F.1.a, all sites with access to a Paved Road and with 150 or more Average Vehicle Trips per Day, or 20 or more Average Vehicle Trips per Day by vehicles with three or more axles shall apply and maintain paving, Chemical Stabilization, or at least 3 inch depth of Gravel (using Gravel or other low Silt (<5%) content material), for a distance of 50 or more consecutive feet at access points where Unpaved Roads adjoin Paved Roads.

G. Record of Control Implementation

Any Person subject to the requirements of this rule shall compile and retain records that provide evidence of control measure application (i.e., receipts and/or purchase records). Such Person shall describe, in the records, the type of treatment or control measure, extent of coverage, and date applied. Records shall be maintained and be readily accessible for two years after the date of each entry and shall be provided to the APCD upon request.

H. Violations

Failure to comply with any provisions of this rule shall constitute a violation of Regulation VIII.

RULE 804 OPEN AREAS
(Adopted 11/08/2005; Revised 10/16/2012; 04/12/2016)

A. Purpose

The purpose of this regulation is to reduce the amount of fine Particulate Matter (PM_{10}) entrained in the ambient air as a result of emissions generated from Open Areas by requiring actions to prevent, reduce, or mitigate PM_{10} emissions.

B. Applicability

This rule shall apply to any open area having 0.5 acres or more within urban areas, or 3.0 acres or more within rural areas; and contains at least 1000 square feet of disturbed surface area.

C. Definitions

The definition of terms found in Rule 800 (General Requirements for Control of Fine Particulate Matter (PM_{10}) shall apply to this rule.

D. Exemptions

In addition to the exemptions listed in Rule 800, Section E, the following exemptions are established for this rule:

D.1 Agricultural Operation Sites subject to Rule 806, Conservation Management Practices.

D.2 Recreational OHV Use Areas on public lands subject to Rule 800, General Requirements for Control of Fine Particulate Matter (PM_{10}).

E. Requirements

E.1 Open Areas: all Persons who own or otherwise have jurisdiction over an Open Area shall comply with one or more of the requirements of Section F.1 to comply with the conditions of a Stabilized Surface at all times and limit VDE to 20% opacity.

E.2 Vehicle use in Open Areas: within 30 days following initial discovery of evidence of trespass, a Person who owns or otherwise has jurisdiction over an Open Area shall prevent unauthorized vehicle access by posting "No Trespassing" signs or installing physical barriers such as fences, gates, posts, and/or appropriate barriers to effectively prevent access to the area.

F. Best Available Control Measures for Fugitive Dust (PM_{10})

F.1 OPEN AREAS

Any Combination of BACM and Alternative BACM is permissible.

F.1.a Apply and maintain water or dust suppressant(s) to all unvegetated areas.

F.1.b Establish vegetation on all previously disturbed areas.

F.1.c Pave, apply and maintain Gravel, or apply and maintain Chemical Stabilizers/Suppressants

F.1.d Implement Alternative BACM, approved in accordance with subdivision G.

G. Alternative BACM Approval Process

G.1 The APCD may approve Alternative BACM if:

G.1a Both a technical evaluation submitted to the APCD and APCD-witnessed field test(s) (number and nature of tests determined by APCO) demonstrate that the proposed Alternative BACM achieves PM_{10} emissions reductions equivalent to BACM measures identified at F.1.a, F.1.b, and F.1.c available for the applicable operation and that the dust control method will achieve a STABALIZED SURFACE and meet the 20% opacity requirement; and,

G.2 After the APCD has accepted the Alternative BACM, the proposed Alternative BACM will be submitted to EPA for its approval.

H. Record of Control Implementation

Any Person subject to the requirements of this rule shall compile and retain records that provide evidence of control measure application (i.e., receipts and/or purchase records). Such Person shall describe, in the records, the type of treatment or control measure, extent of coverage, and date applied. For control measures which require multiple daily applications, recording the frequency of application will fulfill the recordkeeping requirements of this rule (i.e., water being applied three times a day and the date) Records shall be maintained and be readily accessible for two years after the date of each entry and shall be provided to the APCD upon request.

I. Violations

Failure to comply with any provisions of this rule shall constitute a violation of Regulation VIII.

RULE 805 PAVED AND UNPAVED ROADS
(Adopted 11/08/2005; Revised 10/16/2012)

A. Purpose

The purpose of this regulation is to reduce the amount of fine Particulate Matter (PM-10) entrained in the ambient air as a result of emissions generated from new or existing public or private Paved or Unpaved Road, road construction project, or road modification project by requiring actions to prevent, reduce, or mitigate PM-10 emissions.

B. Applicability

This rule applies to any new or existing public or private Paved or Unpaved Road, road construction project, or road modification project.

C. Definitions

The definition of terms found in Rule 800 (General Requirements for Control of Fine Particulate Matter (PM-10) shall apply to this rule.

D. Exemptions

In addition to the exemptions listed in Rule 800, Section E, the following exemptions are established for this Rule:

D.1 Paved and unpaved driveways serving one single family residential dwelling.

D.2 Agricultural Operation Sites subject to Rule 806, Conservation Management Practices.

D.3 Recreational OHV Use Areas on public lands subject to Rule 800, General Requirements for Control of Fine Particulate Matter (PM-10).

E. Requirements

E.1 Unpaved Haul/Access Roads: No Person shall cause, suffer or allow the operation, use, or maintenance of any unpaved Haul/Access Road without complying with one or more of the requirements of Section F.1 so as to limit VDE to 20% opacity.

E.2 Unpaved Roads: On any Unpaved Road segment with 50 or more Average Vehicle Trips per Day, the owner/operator shall limit VDE to 20% opacity, as determined by the test methods for “Visual Determination of Opacity” in Rule 800, Appendix A, and comply with the requirements of a

Stabilized Unpaved Road by application and/or maintenance of at least one of the requirements of Section F.1.

E.3 The construction of any new Unpaved Road is prohibited within any area with a population of 500 or more unless the road meets the definition of a Temporary Unpaved Road. The Temporary Unpaved Road shall meet the definition of a Stabilized Unpaved Road as determined by the test methods in Rule 800, Appendix B, Section C, and where VDE is limited to 20% opacity.

E.4 Canal Roads: all Persons who cause, suffer or allow the operation, use or maintenance of any Canal Road with 20 or more Average Vehicle Trips per Day shall comply with one or more of the requirements of Section F.1 to comply with the requirements of a Stabilized Unpaved Road and limit VDE to 20% opacity, as determined by the test methods in Rule 800, Appendix A, and shall also comply with one or more of the requirements of Section F.2.

E.5 Unpaved Traffic Areas: All Persons who cause, suffer or allow the operation, use or maintenance of any Unpaved Traffic Area larger than one (1) acre and with 75 or more Average Vehicle Trips per Day shall comply with one or more of the requirements of Section F.3 and limit VDE to 20% opacity.

E.6 Paved Roads: any new or Modified Paved Roads shall comply with the requirements of section F.4.

E.7 Requirements for Existing Unpaved Public Roads in City and Rural Areas:

Each city or county agency with primary responsibility for any existing Unpaved Road shall take the following actions:

E.7.a By January 1, 2006 provide the APCD with a list of all Unpaved Roads under its jurisdiction in any city or Rural area(s), including data on length of, and Average Vehicle Trips per Day on, each Unpaved Road segment.

E.7.b By March 31, 2006 the County Public Works Department shall provide the APCD and comply with a compliance plan. The compliance plan shall include a compliance schedule indicating that during the period 2006 through 2015 a 10% per each fiscal year, beginning July 1 and ending June 30, of all Unpaved Roads subject to the requirements of this rule will comply with a 20% VDE and comply with the requirements of a Stabilized Unpaved Road (Treatment in excess of the annual requirement can be credited toward future year requirements). The plan shall identify the control measures implemented or that will be implemented at each Unpaved Road segment with 50 or more Average Vehicle Trips per Day. The plan shall clarify that the 10% stabilized each year differ from the roads previously stabilized so that 100% of roads are stabilized by 2015.

E.7.c By July 31 of each year, 2007 through 2016, the County Public Works Department shall submit to the APCD the total number of Unpaved Road miles which were mitigated during the previous fiscal year, a list of the specific mitigated roads, and the percentage of cumulative miles relative to the schedule provided pursuant to Section E.7.b. Once stabilized pursuant to Section E.7, Public Roads must comply with the requirements of a Stabilized Unpaved Road by application and/or maintenance of at least one of the requirements of Section F.1.

F. Best Available Control Measures for Fugitive Dust (PM-10)

F.1 UNPAVED ROADS, INCLUDING UNPAVED HAUL AND ACCESS ROADS:

F.1.a Pave.

F.1.b Apply Chemical Stabilization as directed by product manufacturer to control dust on Unpaved Roads.

F.1.c Apply and maintain Gravel, recrushed/recycled asphalt or other material of low Silt (<5%) content to a depth of three or more inches.

F.1.d Wetting. Apply water one or more times daily

F.1.e Permanent road closure

F.1.f Restrict unauthorized vehicle access.

F.1.g Any other method that effectively limits VDE to 20% opacity and meets the conditions of a Stabilized Unpaved Road.

F.2 CANAL ROADS:

F.2.a Stocking of Triploid Grass Carp in canals to reduce maintenance vehicle trips along Canal Banks to mechanically remove aquatic weeds.

F.2.b Installation of remote control delivery gates to eliminate manual gate operation by maintenance personnel in vehicles along Canal Banks.

F.2.c Implement Silt removal program to delay grading of spoil piles deposited on Canal Bank after cleaning operations until the next cleaning operation to eliminate vehicle access to Canal Bank.

F.2.d Permanent road closure.

F.2.e Conversion of open canals to pipeline.

F.2.f Lining canals to eliminate maintenance for Silt/weed control.

F.2.g Canal Bank surface maintenance.

F.3 UNPAVED TRAFFIC AREAS:

F.3.a Pave.

F.3.b Apply Chemical Stabilization as directed by product manufacturer to control dust on Unpaved Roads.

F.3.c Apply and maintain Gravel, recrushed/recycled asphalt or other material of low silt (<5%) content to a depth of three or more inches.

F.3.d Wetting. Apply water one or more times daily.

F.4 NEW OR MODIFIED PAVED ROADS

Any Person having jurisdiction over, or ownership of, public or private Paved Roads shall construct, or require to be constructed, all new or Modified Paved Roads in conformance with the Imperial County Public Works Department guidelines for width of shoulders and median shoulders as specified below:

F.4.a New arterial roads or streets or modifications to existing arterial roads or streets shall be constructed with paved shoulders that meet following widths:

Annual Average Daily Vehicle Trips	Minimum Paved or Stabilized Shoulder Width in Feet
1-2000	2
Greater than 2000	6

F.4.b New or modified collector roads or streets or local roads or streets shall be constructed with paved shoulders that meet following widths:

Annual Average Daily Vehicle Trips	Minimum Paved or Stabilized Shoulder Width in Feet
1-2000	2
Greater than 2000	4

F.4.c A curbing adjacent to and contiguous with the travel lane or paved shoulder or a road may be constructed, in lieu of meeting the paved shoulder width standard listed in Sections F.4.a and F.4.b. Any road paving projects constructing curbing in County road right of ways shall be approved by the Director of Public Works Department prior to construction.

F.4.d Intersections, auxiliary entry lanes, and auxiliary exit lanes may be constructed adjacent to and contiguous with the roadway, in lieu of meeting the paved shoulder width standard in Sections F.4.a and F.4.b.

F.4.e New Paved Road construction or modifications to an existing Paved Road that are required to comply with California Environmental Quality Act (CEQA) and National Environmental Policy Act (NEPA) determinations regarding environmental, cultural, archeological, historical, or other considerations addressed in such documents, are exempt from the paved shoulder width requirements specified in Section F.4.a.

F.4.f Whenever any Paved Road which has projected Annual Average Daily Vehicle Trips of 500 or more is constructed, or modified with medians, the medians shall be constructed with paved shoulders having a minimum width of four feet adjacent to the traffic lanes unless:

F.4.f.1 The medians of roads having speed limits set at or below 45 miles per hour are constructed with curbing; or

F.4.f.2 The medians are landscaped and maintained with grass or other vegetative ground cover to comply with the definition of Stabilized Surface.

F.4.g In lieu of complying with the paving or vegetation requirements a Person may apply oils or other Chemical Stabilizers/Suppressants to the required width of shoulder and median areas as specified in

Sections F.4.a and F.4.b. The material shall be reapplied and maintained to limit VDE to 20% opacity and fulfill conditions for a Stabilized Surface.

G. Record of Control Implementation

Any Person subject to the requirements of this rule shall compile and retain records that provide evidence of control measure application (i.e., receipts and/or purchase records). Such Person shall describe, in the records, the type of treatment or control measure, extent of coverage, and date applied. For control measures which require multiple daily applications, recording the frequency of application will fulfill the recordkeeping requirements of this rule (i.e., water being applied three times a day and the date) Records shall be maintained and be readily accessible for two years after the date of each entry and shall be provided to the APCD upon request.

H. Violations

Failure to comply with any provisions of this rule shall constitute a violation of Regulation VIII.

RULE 806 CONSERVATION MANAGEMENT PRACTICES
(Adopted 11/08/2005; Revised 10/16/2012)

A. Purpose

The purpose of this regulation is to reduce the amount of coarse Particulate Matter (PM-10) entrained in the ambient air as a result of emissions generated from Agricultural Operation Sites by requiring Conservation Management Practices to prevent, reduce, or mitigate PM-10 emissions.

B. Applicability

This rule applies to Agricultural Operation Sites located within Imperial County. Effective on and after January 1, 2013, an owner/operator shall implement the applicable CMPs selected for each Agricultural Operation Site. The provisions of this rule adopted on November 8, 2005 shall remain in effect until January 1, 2013 at which time the amendments adopted on October 16, 2012 shall take effect.

C. Definitions

In addition to the definitions of terms in Rule 800 (General Requirements for Control of Fine Particulate Matter (PM-10), the following definitions shall govern the implementation of this rule:

C.1 AGRICULTURAL OPERATIONS: The growing and harvesting of crops for the primary purpose of earning a living.

C.2 AGRICULTURAL OPERATION SITE: One or more agricultural parcels that meet the following:

C.2.a Are under the same or common ownership or operation, or which are owned or operated by entities which are under common control; and

C.2.b Are located on one or more contiguous or adjacent properties wholly within Imperial County.

C.3 AGRICULTURAL PARCEL: A portion of real property used by an owner or operator for carrying out a specific agricultural operation. Roads, vehicle/equipment traffic areas, and facilities, on or adjacent to the cropland are part of the agricultural parcel.

C.4 ALTERNATIVE TILLING: Till alternative rows for weed management, reducing approximately 50% of field activity related to tilling, in addition to stabilizing soil surface and reducing soil compaction.

C.5 APPLICATION EFFICIENCIES: Use more efficient application equipment so as to reduce a minimum of one ground operation. Examples include: compact or low volume spray equipment; aerial applications; micro-heads or infrared spot sprayers; electrostatic sprayers. Reduces soil compaction, passes and chemical usage.

C.6 BALING/LARGE BALES: Reduce a minimum of one pass through the field per acre by using large balers to harvest crops.

C.7 BED/ROW SIZE OR SPACING: Reduce a minimum of one tillage operation by Increasing or decreasing the size of the planting bed area (can be done for field and permanent crops) or adjusting spacing. Spacing adjustments reduce the number of passes and soil disturbance by increasing plant density/canopy through reduction of row width to contain PM within the canopy.

C.8 BULK MATERIALS CONTROL: Minimize visible dust emissions from bulk materials by using dust suppressant or water to form a stabilized surface, or using a tarp to fully cover the pile or truckbed, or using a wind barrier or 3-sided structure to reduce entrainment of fugitive dust.

C.9 CHEMIGATION/FERTIGATION: Reduce a minimum of one ground operation by applying chemicals through an irrigation system. This reduces the need to travel in the field for application purposes, thus reducing operations and soil disturbance while increasing the efficiency of the application.

C.10 CHIPS/MULCHES, ORGANIC MATERIALS, POLYMERS, ROAD OIL & SAND: Application of any nontoxic chemical or organic dust suppressant that meets all specification required by any federal, state, or local water agency and is not prohibited for use by any applicable regulations. Chips/Mulches and organic materials should meet the specifications in the mulches definition below. Polymers, road oil and sand should create a stabilized surface during high traffic times such as harvest.

C.11 COMBINED OPERATION: Combine equipment to perform several operations during one pass, thereby reducing a minimum of one tillage operation. Examples include: use of one-pass till equipment in ground preparation or crop tillage; and cultivation and fertilization of a field crop in a single pass. Other benefits are reduction of soil compaction and time to prepare fields, both of which can be precursors to additional tillage requirements. If a combined operation is accomplished through equipment change/technological improvement, that action is considered one CMP, and either Equipment Changes/Technological Improvements CMP or Combined Operations CMP may be selected in a CMP Plan, but not both.

C.12 CONSERVATION IRRIGATION: Reduce a minimum of one tillage operation related to weeding by conserving the amount of water used by using either drip, sprinkler, or buried/underground line irrigation. Conserving water reduces weed population, which in turn reduces the need for tillage and reduces soil compaction.

C.13 CONSERVATION MANAGEMENT PRACTICE (CMP): An activity or procedure that prevents, reduces, or mitigates PM-10 normally emitted by, or associated with, an agricultural activity.

C.14 CONSERVATION MANAGEMENT PRACTICES PLAN (CMP PLAN): A document prepared by the owner or operator of an Agricultural Operation site that lists the selected CMPs for implementation. The CMP Plan also contains, but is not limited to, contact information for the owner or operator, a description of the Agricultural Operation Site and locations of Agricultural Parcels, and other information describing the extent and duration of CMP implementation.

C.15 CONSERVATION TILLAGE (e.g.: no tillage, minimum tillage): A tillage system that reduces a minimum of three tillage operations. This system reduces soil and water loss by reducing the number of passes and by leaving crop residue on the field after harvest as well as managing the residue so that it remains intact during the planting season. It reduces the number of passes and amount of soil disturbance. It improves soil because it retains plant residue and increases organic matter.

C.16 COVER CROPS: Establish cover crops that maintain a minimum of 60 percent ground cover, as determined by the Line Transect Test Method. Native or volunteer vegetation that meets the minimum ground cover requirement is acceptable.

C.17 CROP RESIDUE MANAGEMENT: Maintain crop residue from previous crops until tilling for the next crop. Crop residues must maintain a minimum of 60 percent ground cover as determined by Line Transect Test Method. Implements such as undercuters or sweeps can maintain crop residues without burying or destroying residues.

C.18 CROPLAND - OTHER: This CMP category includes CMPs to reduce windblown emissions.

C.19 CROSS WIND STRIPCROPING: Establish crops in parallel strips across the prevailing wind erosion direction and arranged so that strips susceptible to wind erosion are alternated with strips having a protective cover that is resistant to wind erosion. The strips with the protective cover should be at least as wide as the strips susceptible to wind erosion.

C.20 EQUIPMENT CHANGES/TECHNOLOGICAL IMPROVEMENTS: Reduce a minimum of one tillage operation by modifying equipment or making technological improvements. Examples include flame cultivation or equipment that combines discing, chiseling and ring rolling. If an equipment change/technological improvement is made in order to combine operations, that action is considered one CMP; either Equipment Changes/Technological Improvements CMP or Combined Operations CMP may be selected in the CMP plan, but not both.

C.21 FALLOW LAND: Temporary or permanent removal from production. Eliminates entire operation/passes or reduces activities.

C.22 FIELD WINDBREAKS: Plant or maintain a single or multiple row of trees or shrubs adjacent to windward edge of the field as close to perpendicular as practical with the direction of erosive winds. Windbreaks such as trees or shrubs should be established at a right angle to the prevailing wind direction. Sites downwind of the windbreak are considered protected if they fall within an area that is less than or equal to 10 times the height of the windbreak. The windbreak should have a porosity of 50 %.

C.23 GRAVEL: Placing a layer of Gravel at least 3 inches in depth to minimize dust generated from vehicle movement and to dislodge any excess debris which can become entrained. Gravel should conform to the grading defined in Rule 800.

C.24 GREEN CHOP: Reduce a minimum of one ground operation by harvesting a forage crop without allowing it to dry in the field. This practice reduces soil disturbance and soil compaction.

C.25 GRINDING/CHIPPING/SHREDDING: Grinding pruning’s and orchard removals instead of burning; incorporate to soil. Reduces PM from burning crop residues.

C.26 GROUND OPERATION: An agricultural operation that is not a tillage operation that involves equipment passing across the field, such as a chemical spray application. A pass through the field may be a subset of a ground operation.

C.27 HAND HARVESTING: Reduce a minimum of one ground operation by harvesting a crop by hand. It reduces soil disturbance due to machinery passes.

C.28 INTEGRATED PEST MANAGEMENT: Reduce a minimum of one ground operation by using a combination of techniques including organic, conventional and biological farming concepts to suppress pest problems.

It creates beneficial insect habitat that reduces the use of herbicides/pesticides thereby reducing number of passes for spraying. It also reduces soil compaction and the need for additional tillage. If integrated pest management CMP uses the same practices described in the Organic Practices CMP, this action is considered one CMP, and either Integrated Pest Management CMP or Organic Practices CMP may be selected in a CMP plan, but not both.

C.29 IRRIGATION POWER UNITS: Use cleaner burning engines, electric motors (CMP only applicable if engines are cleaner than otherwise required by current local, state and federal requirements).

C.30 MULCHING: Reducing PM10 emissions and wind erosion and preserving soil moisture by uniformly applying a protective layer of plant residue or other material to a soil surface prior to disturbing the site to reduce soil movement. Mulching material shall be evenly applied, and if necessary, anchored to the soil. Mulch should achieve a minimum 70% cover, and a minimum of 2 inch height above the surface. Inorganic material used for mulching should consist of pieces of .75 to 2 inches in diameter.

C.31 NIGHT FARMING: Operate at night when moisture levels are higher and winds are lighter. It decreases the concentration of PM emissions during daytime and the increased ambient humidity reduces PM emissions during the night. Night farming should take place between sundown and sunrise.

C.32 NIGHT HARVESTING: Implementing harvesting practices at night when moisture levels are higher and winds are lighter. It reduces PM by operating when ambient air is moist, thereby reducing PM emissions. Night harvesting should take place between sundown and sunrise.

C.33 NO BURNING: Switching to a crop/system that would not require waste burning. It reduces emissions associated with burning.

C.34 NON TILLAGE/CHEMICAL TILLAGE: Reduce a minimum of one tillage operation by, for example, using a flail mower or low volume sprayers. It reduces soil compaction and stabilizes soil.

C.35 ORGANIC PRACTICES: Reduce a minimum of one ground or tillage operation by using biological control methods or non-chemical control methods. Examples include: organic certification, biological controls, mulches and humus. If an organic practice CMP uses the same practice as described in the integrated pest management CMP, this action is considered one CMP, and either Organic Practices CMP or Integrated Pest Management CMP may be selected in a CMP plan, but not both.

C.36 PAVING: To pave currently Unpaved Roads.

C.37 PERMANENT CROPS: Having an established permanent crop that is not replanted annually.

C.38 PRECISION FARMING (GPS): Reduce a minimum of one pass through the field per acre by using satellite navigation to calculate position in the field, therefore manage/treat the selective area. It reduces overlap and allows operations to occur during inclement weather conditions and at night thereby generating less PM.

C.39 PRE-HARVEST SOIL PREPARATION: Applying a water or stabilizing material to soil prior to harvest to form a visible crust. It reduces PM emissions at harvest.

C.40 REDUCED PRUNING: Reduce a minimum of one ground operation by reducing the frequency of pruning (e.g. one time per year, or every other year).

C.41 RESTRICTED ACCESS: To restrict or eliminate public access to unpaved private roads with signs or physical obstructions. At each access point, install signs or physical barriers such as gates, fencing, posts, signs, shrubs, trees that block or effectively control access to the area. It reduces vehicle traffic and thus reduces associated fugitive dust.

C.42 RIDGE ROUGHNESS: Establish stabilized ridges by normal tillage and planting equipment as close to perpendicular as practical with the direction of erosive winds (not appropriate for unstable soils such as sands or loamy sands). After establishment, ridges shall be maintained through those periods when wind erosion is expected to occur, or until growing crops provide enough cover to protect the soil from wind erosion. Ridge spacing should be no greater than 4 times the ridge height.

C.43 ROAD MIX: A mixture of tank bottoms from crude oil storage tanks, material from crude oil spills, or other crude-oil-containing soil mixed with aggregates and soils, that are used as a base cover materials for roads, parking lots, berms, tank and well locations, or similar applications.

C.44 SHED PACKING: Reducing a minimum of one pass through the field per acre by packing commodities in a covered or closed area, rather than field-pack. It reduces field traffic, thereby reducing PM emissions.

C.45 SHUTTLE SYSTEM/LARGE CARRIER: Reduce a minimum of one pass through the field per acre by hauling multiple or larger trailers/bins per trip.

C.46 SOIL AMENDMENTS: Organic or chemical materials uniformly applied to the soil for improvement (e.g: gypsum, lime, polyacrylamide).

C.47 SPEED LIMITS: Control speed limits to 15 mph on unpaved roads through worker behavior modifications, signage, or any other necessary means.

C.48 SULFUR REDUCTION OR ELIMINATION: Reduce a minimum of one ground operation by reducing or eliminating sulfur dusting, an organic chemical used to control disease in crop, ornamental and home and gardens.

C.49 SURFACE ROUGHENING: Produce and maintain stable clods or aggregates on the land surface by bedding, rough disking, or tillage that leaves the surface covered by stable clods. Soil clods prevent wind erosion because they resist the forces of the wind and because they shelter other erodible materials. This CMP should be implemented consistent with NRCS Code 609 – Surface Roughening.

C.50 TILLAGE OPERATION: An agricultural operation that mechanically manipulates the soil for the enhancement of crop production. Examples include discing, weeding, or bedding. A pass through the field may be a subset of a tillage operation.

C.51 TRACK-OUT CONTROL: Minimize any and all material that adheres to and agglomerates on all vehicle and equipment from unpaved roads and falls onto a paved public road or the paved shoulder of a paved public road. Install one of the following devices: a grizzly, a gravel pad or a wheelwash system at all intersections of unpaved roads and public roads.

C.52 TRANSGENIC CROPS: Use of GMO or Transgenic crops such as “herbicide-ready” to reduce a minimum of one tillage operation. It reduces the need for tillage or cultivation operations, as well as reduces soil disturbance. It can also reduce the number of chemical applications.

C.53 WATER APPLICATION: Application of water to unpaved roads and traffic areas to create a visibly moist surface.

C.54 WIND BARRIER: Reduce wind erosion by planting or maintaining perennial or annual plants established in rows or narrow strips interspersed throughout a crop field as close to perpendicular as practical with the direction of erosive winds. To be effective, the selected plant(s) must create a stand at least three feet tall, with a porosity of 50%.

D. Requirements for Agricultural Operation Sites:

D.1 All Persons who own or operate an Agricultural Operation Site of forty (40) acres or more in size shall implement in each Agricultural Parcel at least one of the Conservation Management Practices from each of D.1.a through D.1.f. unless they implement the Conservation Tillage CMP. On acres implementing the Conservation Tillage CMP, persons do not need to select additional measures for D.1.a, D.1.b or D.1.e, but do need to implement at least one CMP each from D.1.c, D.1.d and D.1.f. Persons may choose the same CMP for D.1.c and D.1.d since they apply to different land, but must choose a unique and individual CMP for each of D.1.a, D.1.b, D.1.e and D.1.f (unless using Conservation Tillage CMP) since they apply to the same land.

D.1.a Land preparation and cultivation, CMPs in Section E.1;

D.1.b Harvest activities, CMPs in section E.2;

D.1.c Unpaved Roads, CMPs in Section E.3;

D.1.d Unpaved Traffic Areas, CMPs in Section E.4;

D.1.e Cropland-Other CMPs, in Section E.5; and

D.1.f Windblown Dust Control CMPs in Section E.6.

D.2 Agricultural unpaved roads with greater than fifty (50) or more vehicle daily trips (VDT), or twenty (20) or more VDT with three (3) or more axle vehicles, must meet the stabilization and opacity requirements in Section E.3.

D.3 Agricultural unpaved equipment or traffic areas with fifty (50) or more VDT, or twenty (20) or more VDT with 3 or more axle vehicles, must meet the stabilization and opacity requirements in Section E.4.

D.4 The owner or operator of an Agricultural Operation Site may implement more than one Conservation Management Practices for one or more of the categories.

D.5 The owner or operator of an Agricultural Operation Site shall ensure that the implementation of each selected Conservation Management Practices does not violate any other local, state, or federal law.

D.6 The owner or operator of an Agricultural Operation Site may develop alternative CMPs. The owner or operator shall submit to the APCD a technical evaluation of the alternative CMPs, demonstrating that the alternative CMP achieves PM-10 emission reductions that are at least equivalent to the most effective CMPs available for the applicable operation (e.g., by eliminated equivalent passes or operations). The APCD will review the technical evaluation, and the alternative CMP must receive approval by the APCD before being included in the CMP Plan.

D.7 The owner or operator shall prepare a CMP Plan for each Agricultural Operation Site. The CMP Plan shall be made available to the APCD upon request. The CMP Plan shall be provided to the APCD within 72 hours of notice to the owner or operator.

E. Conservation Management Practices for Fugitive Dust (PM-10)

E.1 The owner or operator of an Agricultural Operation Site shall implement at least one of the following CMPs in each Agricultural Parcel to reduce PM10 emissions from land preparation and cultivation (CMP Category D.1.a). If the owner or operator selects “Fallow Land” as its CMP, the owner/operator must comply with section E.6 of this rule.

E.1.a Alternative Tilling,
E.1.b Bed/Row Size Spacing,
E.1.c Chemigation/Fertigation,
E.1.d Combined Operations,
E.1.e Conservation Irrigation,
E.1.f Cover Crops,
E.1.g Equipment Changes/Technological Improvements,
E.1.h Fallow Land,
E.1.i Integrated Pest Control,
E.1.j Mulching,
E.1.k Night Farming,
E.1.l Non Tillage /Chemical Tillage,
E.1.m Organic Pesticides,
E.1.n Precision Farming (GPS), or
E.1.o Transgenic Crops

E.2 The owner or operator of an Agricultural Operation Site shall implement at least one of the following CMPs in each Agricultural Parcel to reduce PM10 emissions from harvest activities (CMP Category D.1.b). If the owner or operator selects “Fallow Land” as its CMP, the owner/operator must comply with Section E.6 of this rule.

E.2.a Baling /Large Bales
E.2.b Combined Operations
E.2.c Equipment Changes/Technological Improvements
E.2.d Green Chop
E.2.e Hand Harvesting
E.2.f Fallow Land
E.2.g Night Harvesting
E.2.h No Burning
E.2.i Pre-Harvesting Soil Preparation
E.2.j Shed Packing
E.2.k Shuttle System/Large Carrier

E.3 The owner or operator of an Agricultural Operation Site shall implement at least one of the following CMPs for each unpaved road (CMP Category D.1.c) to reduce PM10 emissions at all times:

E.3.a Chips/Mulches, Organic Materials, polymers, road oil and sand,
E.3.b Gravel
E.3.c Paving,
E.3.d Restricted access
E.3.e Speed limit
E.3.f Track-out control
E.3.g Water Application
E.3.h Field windbreak

On each day that high traffic accounts for 50 or more vehicle daily trips (VDT), or 20 or more VDT with 3 or more axles, on an unpaved road segment, the owner/operator of an Agricultural Operation Site shall comply with the requirements of a stabilized unpaved road and limit VDE to 20% opacity by implementing or maintaining one or more of the following CMPs:

E.3.i Pave.
E.3.j Apply Chemical Stabilization as directed by product manufacturer to control dust on Unpaved Roads.
E.3.k Apply and maintain Gravel, recrushed/recycled asphalt or other material of low Silt (<5%) content to a depth of three or more inches.
E.3.l Water Application.
E.3.m Permanent road closure.
E.3.n Restrict unauthorized vehicle access.

E.4 The owner or operator of an agricultural operation site shall implement at least one of the following CMPs for each unpaved traffic area (CMP Category D.1.d) to reduce PM10 emissions at all times:

E.4.a Chips/Mulches, Organic Materials, Polymers, Road Oil and Sand,
E.4.b Gravel
E.4.c Paving
E.4.d Restricted Access
E.4.e Speed Limit
E.4.f Track-Out Control
E.4.g Water Application
E.4.h Field windbreak

On each day that high traffic accounts for 50 or more vehicle daily trips (VDT), or 20 or more VDT with 3 or more axles, on an Unpaved Traffic

Area larger than one (1) acre, the owner/operator of an Agricultural Operation Site shall comply with the requirements of a stabilized unpaved road and limit VDE to 20% opacity by implementing or maintaining one or more of the following CMPs:

E.4.i Pave.
E.4.j Apply Chemical Stabilization as directed by product manufacturer to control dust on Unpaved Roads.
E.4.k Apply and maintain Gravel, recrushed/recycled asphalt or other material of low Silt (<5%) content to a depth of three or more inches.
E.4.l Water Application.

E.5 The owner or operator of an Agricultural Operation Site shall implement at least one of the following CMPs in each Agricultural Parcel to reduce PM10 emissions from cropland-others (Category D.1.e). If the owner or operator selects "Fallow Land" as its CMP, the owner/operator must comply with Section E.6 of this rule.

E.5.a Alternate Tilling
E.5.b Application Efficiencies
E.5.c Bailing/Large Bales
E.5.d Bulk Materials Control
E.5.e Chemigation/Fertigation
E.5.f Conservation Irrigation
E.5.g Fallow Land
E.5.h Grinding/Chipping/Shredding
E.5.i Integrated Pest Management
E.5.j Irrigation Power Units
E.5.k Mulching
E.5.l Night Farming
E.5.m No Burning
E.5.n Non Tillage/Chemical Tillage
E.5.o Organic Practices
E.5.p Permanent Crops
E.5.q Reduced Pruning
E.5.r Soil Amendments
E.5.s Soil Incorporation
E.5.t Sulfur: Reduction or Elimination of Dusting
E.5.u Surface Roughening
E.5.v Transgenic Crops
E.5.w Wind Barrier

E.6 For windblown dust control (CMP Category D.1.f), the owner or operator of an agricultural operation site shall implement E.6.1. In addition to following E.6.1, if the owner or operator of an Agricultural Operation Site has fields that are in between crops or more permanently fallow, the owner or operator shall implement at least one of the CMPs in E.6.2.

E.6.1 When preparing a field for planting, minimize the time that newly tilled soil is smooth and dry by leaving the field surface with large clods for as long as possible and bedding and planting the field as soon as possible once it no longer has large clods.

E.6.2 For fields that are in between crops or are permanently fallow, the owner shall implement at least one of the CMPs below:

E.6.2a Cover Crop
E.6.2b Conservation Tillage
E.6.2c Crop Residue Management
E.6.2d Cross Wind Stripcropping
E.6.2e Field Windbreaks
E.6.2f Ridge Roughness
E.6.2g Surface Roughening
E.6.2h Wind Barrier

F. CMP Plan Preparation

An owner or operator shall prepare a CMP Plan for each Agricultural Operation Site. An owner or operator must maintain a CMP Plan that corresponds to the current crops being grown in the field and the corresponding CMPs for those crops. Each CMP Plan shall include, but is not limited to, the following information:

F.1 The name, business address, and telephone number of the owner or operator responsible for the preparation and implementation of the CMP Plan.

F.2 The signature of the owner or operator and the date that the CPM Plan was signed.

F.3 The location of the Agricultural Operation Site: cross roads; canal and gate number.

F.4 The crop grown at each location covered by the CMP Plan, total acreage for each crop, the length (miles) of unpaved roads, and the total area (acres or square feet) of the unpaved equipment and traffic areas to be covered by the CMP Plan

F.5 The CMPs being implemented for each crop, unpaved road, unpaved equipment and traffic area, and windblown dust control. The CMPs implemented should be described to verify that implementation is consistent with the CMP definitions in this rule.

F.6 Other relevant information as determined by the APCD.

G. Violations

Failure to comply with any provisions of this rule shall constitute a violation of Regulation VIII. Failure to comply with the provisions of a CMP Plan shall also constitute a violation of Regulation VIII.

H. Record of Control Implementation

Any Person subject to the requirements of this rule shall maintain a copy of the CMP Plan and any supporting documentation necessary to confirm implementation of the CMPs. An owner or operator implementing alterative CMPs shall maintain a copy of technical evaluation for alternative CMPs and documentation of APCD approval of alternative CMPs. Records shall be maintained for two years after the date of each entry and shall be provided to the APCD upon request.

Appendix G. Emissions Inventory Documentation for the Imperial County PM_{10} Nonattainment Area Maintenance Plan

Emissions inventories are one of the fundamental building blocks in the development of a State Implementation Plan (SIP or Plan). In simple terms, an emissions inventory is a systematic listing of the sources of air pollution along with the amount of pollution emitted from each source or category over a given time period. This document describes the emissions inventory included in the Plan for the Imperial County PM_{10} Nonattainment Area.

The California Air Resources Board (CARB) and Imperial County Air Pollution Control District (District) have developed a comprehensive, accurate, and current emissions inventory consistent with the requirements set forth in Section 182(a)(1) of the federal Clean Air Act. CARB and District staff conducted a thorough review of the inventory to ensure that the emission estimates reflect accurate emission reports for point sources, and that estimates for mobile and areawide sources are based on the most recent models and methodologies.

CARB also reviewed the growth profiles for point and areawide source categories and updated them as necessary to ensure that the emission projections are based on data that reflect historical trends, current conditions, and recent economic and demographic forecasts. Growth forecasts for most point and areawide sources were developed either by CARB or by the Southern California Association of Governments (SCAG) and provided to CARB through the South Coast Air Quality Management District. SCAG is the metropolitan planning organization representing Imperial County, along with five other counties in Southern California.

Emissions Inventory Overview

Emissions inventories are estimates of the amount and type of pollutants emitted into the atmosphere by industrial facilities, mobile sources, and areawide sources such as consumer products and paint. They are fundamental components of an air quality plan, and serve critical functions such as:

1) the primary input to air quality modeling used in attainment demonstrations;
2) the emissions data used for developing control strategies; and
3) a means to track progress in meeting emission reduction commitments.

The United States Environmental Protection Agency (U.S. EPA) regulations require that the emissions inventory for a PM_{10} SIP contain emissions data for directly emitted PM_{10} and its precursors: oxides of nitrogen (NOx), sulfur oxides (SOx), volatile organic compounds (VOC), and ammonia (NH_3). The inventory included in this plan substitutes VOC with reactive organic gases (ROG), which in general represent a slightly broader group of compounds than those in U.S. EPA's list of VOCs. Although precursor emissions are included in this Plan, elevated PM_{10} concentrations in Imperial County are dominated by primary PM_{10} emissions from wind-blown dust rather than by secondarily formed PM_{10}. The precursor contribution analysis in Appendix A demonstrates that secondary formation is negligible compared with directly emitted PM_{10}.

Agency Responsibilities

CARB and District staff worked jointly to develop the emissions inventory for Imperial County. The District worked closely with operators of major stationary facilities in their jurisdiction to develop the point source emission estimates. CARB staff developed the emission inventory for mobile sources, both on-road and off-road. The District and CARB shared responsibility for developing estimates for the nonpoint (areawide) sources such as paved road dust and agricultural burning. CARB worked with several State and local agencies such as the Department of Transportation (Caltrans), the Department of Motor Vehicles (DMV), the Department of Pesticide Regulation (DPR), and the California Energy Commission (CEC) to assemble activity information necessary to develop the mobile and areawide source emission estimates.

Inventory Base Year

The base year inventory forms the basis for all future year projections and also establishes the emission levels against which progress in emission reductions will be measured. U.S. EPA regulations establish that the base year inventory should be preferably consistent with the triennial reporting schedule required under the Air Emissions Reporting Requirements (AERR) rule. However, U.S. EPA allows a different year to be selected if justified by the state. CARB worked with the local air districts to determine the base year that should be used across the State. Since the South Coast Air Quality Management District typically aligns their base year inventory with the data collection period for their Multiple Air Toxics Exposure Study, which was last conducted in 2012, CARB selected 2012 as the base year to maintain consistency across the various plans being developed in the State. A 2016 inventory was forecasted from this 2012 base year inventory. This coincides with the Plan’s attainment year of 2016.

Forecasted Inventories

In addition to a base year inventory, U.S. EPA regulations also require future year inventory projections for specific years. Forecasted inventories are a projection of the base year inventory that reflects expected growth trends for each source category and emission reductions due to adopted control measures. CARB develops emission forecasts by applying growth and control profiles to the base year inventory.

Growth profiles for point and areawide sources are derived from surrogates such as economic activity, fuel usage, population, housing units, etc., that best reflect the expected growth trends for each specific source category. Growth projections were obtained primarily from government entities with expertise in developing forecasts for specific sectors, or in some cases, from econometric models. Control profiles, which account for emission reductions resulting from adopted rules and regulations, are derived from data provided by the regulatory agencies responsible for the affected emission categories.

Projections for mobile source emissions are generated by models that predict activity rates and vehicle fleet turnover by vehicle model year. As with stationary sources, the mobile source models include control algorithms that account for all adopted regulatory actions. This Plan includes forecasted emissions inventories for 2018-2030, which encompasses the maintenance period.

Temporal Resolution

Planning inventories typically include annual as well as seasonal (summer and winter) emission estimates. Annual emission inventories represent the total emissions over an entire year (tons per year), or the daily emissions produced on an average day (tons per day). Seasonal inventories account for temporal activity variations throughout the year, as determined by category-specific temporal profiles. The emission inventory used in the Plan is an annual inventory.

Quality Assurance and Quality Control

CARB has established a quality assurance and quality control (QA/QC) process involving CARB and District staff to ensure the integrity and accuracy of the emissions inventories used in the development of air quality plans. QA/QC occurs at the various stages of SIP emission inventory development. Base year emissions are assembled and maintained in the California Emission Inventory Development and Reporting System (CEIDARS). CARB inventory staff works with District staff, who are responsible for developing and reporting point source emission estimates, to verify these data are accurate. The locations of point sources, including stacks, are checked to ensure they are valid. Areawide source emission estimates are reviewed by CARB and District staff before their inclusion in the emission inventory. Additionally, CEIDARS is designed with automatic system checks to prevent errors such as double counting of emission sources. The system also makes various reports available to assist staff in their efforts to identify and reconcile anomalous emissions.

Future year emissions are estimated using the California Emission Projection Analysis Model (CEPAM), 2016 SIP Baseline Emission Projections, Version 1.05. Growth and control factors are reviewed for each category and year along with the resulting emission projections. Year to year trends are compared to similar and past datasets to ensure general consistency. Emissions for specific categories are checked to confirm they reflect the anticipated effects of applicable control measures. Mobile categories are verified with mobile source staff for consistency with the on-road and off-road emission models.

A summary of the information supporting the Imperial PM_{10} Nonattainment Area Maintenance Plan emissions inventory is presented in the sections below.

Point Sources

The inventory reflects actual emissions from industrial point sources reported to the District by the facility operators through calendar year 2012, in accordance with the requirements set forth in U.S. EPA's AERR rule. The data elements in the 2012 baseline inventory are consistent with the data elements required by the AERR rule. Estimation methods include source testing, direct measurement by continuous emissions monitoring systems, or engineering calculations. The point source categories that occur in the PM_{10} nonattainment area are listed below in Table 1.

Table 1
Point Source Categories

Source Category	Subcategory
Fuel Combustion	Electrical Utilities
	Cogeneration
	Manufacturing and Industrial
	Food and Agricultural Processing
	Service and Commercial
	Other (I.C. Reciprocating Engines)
Waste Disposal	Sewage Treatment
	Landfills
	Other
Cleaning and Surface Coatings	Laundering
	Degreasing
	Coatings and Thinners
	Adhesives and Sealants
Petroleum Production and Marketing	Petroleum Refining
	Petroleum Marketing
	Other (Petroleum Production & Marketing)
Industrial Processes	Food and Agriculture
	Mineral Processes

The point source inventory includes emissions from stationary area sources, which are categories such as internal combustion engines and gasoline dispensing facilities that are not inventoried individually, but are estimated as a group and reported as an aggregated total. Estimates for the following categories were developed by CARB:

Stationary Nonagricultural Diesel Engines

This category includes emissions from backup and prime generators and pumps, air compressors, and other miscellaneous stationary diesel engines that are widely used throughout the industrial, service, institutional, and commercial sectors. The emission estimates, including emission forecasts, are based on a 2003 CARB methodology derived from the OFFROAD model. Additional information on this methodology is available at:
https://www.arb.ca.gov/ei/areasrc/FULLPDF/FULL1-2.pdf

Agricultural Diesel Irrigation Pumps

This category includes emissions from the operation of diesel-fueled stationary and mobile agricultural irrigation pumps. The emission estimates are based on a 2003 CARB methodology using statewide population and include replacements due to the Carl Moyer Program. Emissions are grown based on projected acreage for irrigated farmland. Additional information on this category is available at:
https://www.arb.ca.gov/ei/areasrc/arbfuelcombagric.htm

Waste Disposal, Composting Facilities

This category includes emissions from composting facilities that process organic materials via an open windrow composting or aerated static pile processes. The emission estimates are based on a 2015 CARB methodology using facility specific emissions testing or an emission factor derived from testing at composting facilities. No growth is assumed for future years. Additional information on this methodology is available at: https://www.arb.ca.gov/ei/areasrc/index2.htm

Laundering

This category includes emissions from perchloroethylene (perc) dry cleaning establishments. The emission estimates are based on a 2002 CARB methodology that used nationwide perc consumption rates allocated to the county level based on population and an emission factor of 10.125 pounds per gallon used. Emissions were grown from the original estimates to 2012 using human population growth trends from SCAG. Additional information on this methodology is available at:
https://www.arb.ca.gov/ei/areasrc/onehtm/one3-1.htm

Degreasing

This category includes emissions from solvents in degreasing operations in the manufacturing and maintenance industries. The emissions estimates are based on a 2000 CARB methodology using survey and industry data, activity factors, emission factors and a user's fraction. Growth for this category is based on CARB/REMI industry-specific economic output. Additional information on this methodology is available at: https://www.arb.ca.gov/ei/areasrc/arbcleandegreas.htm

Coatings and Thinners

This category includes emissions from coatings and related process solvents. Auto refinishing emissions estimates are based on a 1990 CARB methodology using production data and a composite emission factor derived from surveys. Growth is based on projected vehicle miles traveled (VMT) provided by SCAG. Estimates for industrial coatings emissions are based on a 1990 CARB methodology using production and survey data, and emission factors derived from surveys. Estimates for thinning and cleaning solvents are based on a 1991 CARB methodology, census data and a default emission factor developed by CARB. Growth for these categories is projected using CARB/REMI industry-specific economic output and employment. Additional information on these methodologies is available at:
https://www.arb.ca.gov/ei/areasrc/arbcleancoatreproc.htm

Adhesives and Sealants

This category includes emissions from solvent-based and water-based solvents contained in adhesives and sealants. Emissions are estimated based on a 1990 CARB methodology using production data and default emission factors. Growth for this category is based on CARB/REMI industry-specific economic output. Additional information on this methodology is available at:
https://www.arb.ca.gov/ei/areasrc/arbcleanadhseal.htm

Gasoline Dispensing Facilities

CARB staff developed an updated methodology to estimate emissions from fuel transfer and storage operations at gasoline dispensing facilities (GDFs). The methodology addresses emissions from underground storage tanks, vapor displacement during vehicle refueling, customer spillage, and hose permeation. The updated methodology uses emission factors developed by CARB staff that reflect more current in-use test data and also accounts for the emission reduction benefits of onboard refueling vapor recovery (ORVR) systems. The emission estimates are based on the 2012 statewide gasoline sales data from the California Board of Equalization that were apportioned to the county level using fuel consumption estimates from CARB's on-road mobile sources model (EMFAC). Additional information on this category is available at:
https://www.arb.ca.gov/ei/areasrc/arbpetprodmarkpm.htm

Areawide Sources

Areawide sources are categories such as consumer products, unpaved road dust, fireplaces, and prescribed burning for which emissions occur over a wide geographic area. Emissions for these categories are estimated by both CARB and the local air districts using various models and methodologies. The areawide sources are listed below in Table 2.

Table 2
Areawide Sources

Source Category	Subcategory
Solvent Evaporation	Consumer Products
	Architectural Coatings and Related Solvents
	Pesticides/Fertilizers
	Asphalt Paving and Roofing
Miscellaneous Processes	Residential Fuel Combustion
	Farming Operations
	Construction And Demolition
	Paved Road Dust
	Unpaved Road Dust
	Fugitive Windblown Dust
	Fires
	Managed Burning and Disposal
	Cooking
	Other (Miscellaneous Processes)

A summary of the areawide methodologies is presented below:

Ammonia Emissions from Publicly Owned Treatment Works, Landfills, Composting, Fertilizer Application, Domestic Activity, Native Animals, and Native Soils

CARB staff updated the ammonia emissions inventory methodology for publicly owned treatment works, landfills, composting, fertilizer application, domestic activity, native animals, and native soils. Revisions for these categories consist primarily of updated activity data for the 2008 calendar year. Emission factors were revised only for fertilizer application.

Ammonia Emissions, Miscellaneous Sources

Ammonia emissions from miscellaneous domestic processes (human respiration and perspiration, smoking, pets, untreated human waste, etc.) were grown from a 2005 CARB estimate using DOF population projections. Ammonia emissions for other categories such as residential wood combustion, livestock husbandry, managed burning, and on-road motor vehicles, were estimated as part of the methodologies for those specific area source categories.

Consumer Products

The consumer products category reflects the four most recent surveys conducted by CARB staff for the years 2003, 2006, 2008, and 2010. Together these surveys collected updated product information and ingredient information for approximately 350 product categories. Based on the survey data, CARB staff determined the total product sales and total VOC emissions for the various product categories. The growth trend for most consumer product subcategories is based on the latest SCAG human population growth projections, except for aerosol coatings. Staff determined that a no-growth profile would be more appropriate for aerosol coatings based on survey data that show relatively flat sales of these products over the last decade. Additional information on CARB's consumer products surveys is available at:
https://www.arb.ca.gov/consprod/survey/survey.htm.

Architectural Coatings

The architectural coatings category reflects emission estimates based on a comprehensive CARB survey for the 2004 calendar year. The emission estimates include benefits of the 2000 and 2007 CARB Suggested Control Measures. These emissions are grown based on SCAG projections for number of households. Additional information about CARB's architectural coatings program is available at:
https://www.arb.ca.gov/coatings/arch/arch.htm

Pesticides

DPR develops month-specific emission estimates for agricultural and structural pesticides. Each calendar year, DPR updates the inventory based on the Pesticide Use Report, which provides updated information from 1990 to the most current data year available. The inventory includes estimates through the 2014 calendar year. For agricultural categories, emission forecasts for years 2015 and beyond are based on the average of the most recent five years. Growth for agricultural pesticides is based on CARB projections of harvested acreage provided by the U.S. Department of Agriculture (USDA). Growth for structural pesticides is based on CARB projections of housing expenditures.

Asphalt Paving/Roofing

Asphalt paving emissions for 2012 were estimated using a District methodology, and asphalt roofing emissions were grown from a 2005 estimate. Emissions are estimated based on tons of asphalt applied and a default emission factor for each type of asphalt operation. The growth profile for both categories is based on construction employment from the CARB/REMI forecasting model. Additional information on the District's methodology is available at: https://www.arb.ca.gov/ei/areasrc/distsolevapasphpav.htm

Residential Wood Combustion

CARB staff updated the methodology to reflect 2005 fuel use, and more recent emission factors and calculation approaches. The emission estimates reflect emission factors from U.S. EPA's National Emission Inventory. No growth is assumed for future years. Additional information on this methodology is available at: https://www.arb.ca.gov/ei/areasrc/arbmiscprocresfuelcom.htm

Farming Operations

CARB staff updated the inventory based on CARB methodologies for Agricultural Land Preparation and Agricultural Harvest Operations to reflect 2012 harvested crop acreage from the USDA's National Agricultural Statistics Service (NASS). NASS data are based on reports compiled by County Agricultural Commissioner staff. Emissions reflect crop and operation specific emission factors. Temporal profiles were updated based on crop specific activity profiles. In addition, the inventory reflects the emission reductions from District Rule 806. Growth is based on projected harvested acreage. The methodologies are available at: https://www.arb.ca.gov/ei/areasrc/arbmiscprocfarmops.htm

CARB staff updated the Livestock Husbandry methodology to reflect livestock population data based on the USDA's 2007 Census of Agriculture, and ammonia emission factors for dairy support cattle. A seasonal adjustment was added to account for the suppression of dust emissions in months in which rainfall occurs. Animal populations and emission factors for feedlots and dairies were updated for 2012 based on District data and California specific testing. CARB projects growth for feedlot cattle based on county livestock report data. Based on an analysis of livestock population trends, no growth is assumed for other livestock categories. In addition, the inventory reflects emission reductions from District Rules 420 and 217.
Additional information on CARB's methodology is available at: https://www.arb.ca.gov/ei/areasrc/arbmiscproclivestock.htm

Additional information on the District's update is available here: https://www.arb.ca.gov/ei/areasrc/districtmeth/imperial/2016mar16_dairyfeedlotops.pdf

Construction and Demolition

Emission estimates for building construction and road construction were grown from CARB estimates developed in 2002 and 1997, respectively. The growth profile for both categories is based on construction employment from the CARB/REMI forecasting model. In addition, the inventory reflects emission reductions from District Rules 801, 802 and 805. Additional information on this methodology is available at: https://www.arb.ca.gov/ei/areasrc/arbmiscprocconstdem.htm

Paved Road Dust

Paved road dust emissions for 2012 were estimated using an CARB methodology consistent with the current U.S. EPA method (AP-42). The emission estimates are based on VMT provided by SCAG, California-specific silt loading values, VMT distribution (travel fractions) for various paved road categories, and an Imperial County specific rain adjustment. Emissions were grown using VMT projections from SCAG. The inventory also reflects the emission reductions from District Rules 803 and 805. Additional information is available at:
https://www.arb.ca.gov/ei/areasrc/arbmiscprocpaverddst.htm

Unpaved Road Dust – Farm Roads

Emissions for unpaved farm roads were updated based on CARB's methodology and 2012 harvested crop acreage from NASS. Emissions reflect crop specific VMT factors and an emission factor based on California test data conducted by the University of California, Davis (UC Davis), and the Desert Research Institute (DRI). Temporal profiles were updated based on crop specific activity profiles. Growth for this category is based on harvested acreage. In addition, the inventory reflects the emission reductions from District Rule 806. The methodology is available at:
https://www.arb.ca.gov/ei/areasrc/arbmiscprocunpaverddst.htm

Unpaved Nonfarm Road Dust

Emissions from unpaved nonfarm roads were estimated from 2008 unpaved road data collected from the California Statewide Local Streets and Roads Needs Assessment, Caltrans, and local agencies. Dust emissions were calculated using an emission factor derived from tests conducted by UC Davis and DRI. In addition, a rainfall adjustment factor was applied. Staff assumed no growth for this category based on the assumption that existing unpaved roads tend to get paved as vehicle traffic on them increases, which counteracts any additional emissions from new unpaved roads. The inventory also reflects the emission reductions from District Rule 805. Additional information on this methodology is available at:
https://www.arb.ca.gov/ei/areasrc/arbmiscprocunpaverddst.htm

Fugitive Windblown Dust from Open Areas and Non-pasture Agriculture Lands

The District provided estimates of windblown fugitive dust derived from a model developed by ENVIRON Inc. under a contract with the District. The model assesses emission characteristics, hourly emission factors and hourly meteorological data for each land parcel within the modeling domain, and applies correction terms based on vegetative cover, as well as non-climatic corrections for agricultural lands. Based on these inputs, the model was used to estimate fugitive windblown dust emission from open areas and non-pasture agriculture lands in the Imperial County PM_{10} Nonattainment Area. Growth for agricultural lands is based on projected acreage from the California Department of Conservation's Farmland Mapping and Monitoring Program (FMMP). No growth is assumed for non-agricultural lands. The inventory also reflects the emission reductions from District Rules 804 and 806. Additional information

about CARB's methodology is available at:
https://www.arb.ca.gov/ei/areasrc/arbmiscprocfugwbdst.htm

Windblown Dust from Unpaved Roads

Emissions for this source category were estimated based on a 1997 CARB methodology reflecting unpaved road mileage and local parameters that affect wind erosion. The estimates assume no growth. Additional information on this methodology is available at: https://www.arb.ca.gov/ei/areasrc/arbmiscprocfugwbdst.htm

Fires

Emissions from structural and automobile fires were estimated based on a 1999 CARB methodology using the number of fires and the associated emission factors. Estimates for structural fires are calculated using the amount of the structure that is burned, the amount and content of the material burned, and emission factors derived from test data. Estimates for automobile fires are calculated using the weight of the car and components and composite emission factors derived from AP-42 emission factors. No growth is assumed for this category. Additional information on this methodology is available at: https://www.arb.ca.gov/ei/areasrc/arbmiscprocfires.htm

Managed Burning & Disposal

CARB updated the emissions inventory to reflect burn data reported by District staff for 2012. Emissions are calculated using crop specific emission factors and fuel loadings. Temporal profiles reflect monthly burn activity. Growth for agricultural burning is based on projected harvested acreage. No growth is assumed for burning associated with weed abatement. CARB's methodology for managed burning is available at:
https://www.arb.ca.gov/ei/areasrc/distmiscprocwstburndis.htm
Additional background information is available here:
https://www.arb.ca.gov/ei/see/see.htm

Commercial Cooking

Commercial cooking emissions were grown from a 2005 estimate. The emissions estimates were developed from the number of restaurants, the number and types of cooking equipment, the food type, and default emission factors. The growth profile reflects the latest population projections provided by SCAG.

Point and Areawide Source Emissions Forecasting

Emission forecasts (2013 and subsequent years) are based on growth profiles that in many cases incorporate historical trends up to the base year or beyond. The growth surrogates used to forecast the emissions from these categories are presented below in Table 3.

Table 3
Growth Surrogates for Point and Areawide Sources

Source Category	Subcategory	Growth Surrogate
Fuel Combustion	Electric Utilities	SoCAL Gas Company (SCG) 2014 report
	Cogeneration	ARB/REMI industry-specific economic output
	Manufacturing and Industrial Area Source/Natural Gas	SCG 2014 report
	Manufacturing and Industrial Others	ARB/REMI industry-specific economic output
	Food and Agricultural Processing Ag Irrigation I. C. Engines	Modeled estimate
	Food and Agricultural Processing Point Sources	ARB/REMI industry-specific economic output
	Service and Commercial Natural Gas	SCG 2014 Report
	Service and Commercial Other Fuels	ARB/REMI industry-specific employment
	Other, Diesel	ARB EMFAC model for fuel consumption
	Other Fuels	ARB/REMI industry specific economic output/employment
Waste Disposal	Sewage Treatment	SCAG population
	Landfills	SCAG population
	Other (Composting)	No growth
Laundering	Dry Cleaning	SCAG population
Degreasing	All	ARB/REMI industry-specific economic output
Coatings & Thinners	Auto Refinishing	SCAG Vehicle Miles Traveled (VMT)
	Others	ARB/REMI industry specific economic output/employment
Adhesives & Sealants	All	ARB/REMI industry-specific economic output
Petroleum Refining	All	ARB EMFAC model fuel consumption
Petroleum Marketing	All	ARB EMFAC model fuel consumption
Petroleum Production & Marketing	All	ARB/REMI industry-specific economic output
Food & Agriculture	All	ARB/REMI industry specific economic output

Table 3
Growth Surrogates for Point and Areawide Sources

Source Category	Subcategory	Growth Surrogate
Mineral Processes	All	ARB/REMI industry-specific economic output/employment
Other Industrial Processes	Electrical Power Generation	SCG 2014 report
	Others	ARB/REMI industry-specific economic output
Consumer Products	Consumer Products	SCAG population
	Aerosol Coatings	No growth
Architectural Coatings and Related Process Solvents	All	SCAG households
Pesticides/Fertilizers	Agricultural Pesticides	Harvested acreage
	Structural Pesticides	ARB housing expenditure
Asphalt Paving/Roofing	All	ARB/REMI industry-specific employment
Residential Fuel Combustion	Natural Gas	SCG 2014 report
	Woodstoves & Fireplaces - Wood	No growth
	Water Heating	SCAG households
	Cooking	SCAG households
	Other	SCAG households
Farming Operations	Tilling & Harvest Operations	Harvested acreage
	Livestock / Feedlot Cattle	County livestock report data/ARB
	Livestock / Others	No growth
Construction & Demolition	All	ARB/REMI industry-specific employment
Paved Road Dust	All	SCAG VMT
Unpaved Road Dust	Farm Roads	Harvested acreage
	Others	No growth
Fugitive Windblown Dust	Agricultural & Pasture Lands	ARB FMMP data
	Others	No growth
Fires	All	No growth
Managed Burning & Disposal	Agricultural Burning, Prunings & Field Crops	Harvested acreage
	Weed Abatement	No growth
Cooking	All	SCAG population
Other (Miscellaneous Processes)	All	SCAG population

Stationary Source Control Profiles

The emissions inventory reflects emission reductions from point and areawide sources subject to District rules and CARB regulations. The rules and regulations reflected in the inventory are listed below in Table 4.

Table 4
District and ARB Stationary and Areawide Source Control Rules and Regulations Included in the Inventory

Agency	Rule/Reg No.	Rule Title	Source Categories Impacted
District	217	Large Confined Animal Facilities (LCAF) Permits Required	Livestock Husbandry
District	420	Beef Feedlots	Livestock Operations
District	801	Construction and Earthmoving Activities	Construction and Demolition
District	802	Bulk Materials	Point Sources
District	803	Carry-Out and Track-Out	Paved Roads
District	804	Open Areas	Windblown Dust
District	805	Paved and Unpaved Roads	Paved and Unpaved Non-farm Roads
District	806	Conservation Management Practices	Tilling and Harvesting Operations, Windblown Dust, Unpaved Farm Roads Unpaved Traffic Areas
CARB	AC_SCM2007	Architectural Coatings 2007 SCM	Architectural coatings
CARB	ARCH_SCM	Architectural Coatings 2000 SCM	Architectural coatings
CARB	ARB_R003	Consumer Product Regulations & Amendments	Consumer products
CARB	ARB_R003_A	Consumer Product Regulations & Amendments	Consumer products
CARB	ARB_R007	Aerosol Coating Regulation	Consumer products / Aerosol coatings
CARB	GDF_HOSREG	Gasoline Dispensing Facilities - Hose Permeation	Petroleum marketing
CARB	ORVR	Fueling emissions from ORVR vehicles	Petroleum marketing

Mobile Sources

CARB uses the EMFAC model to assess emissions from on-road vehicles. Off-road mobile source emissions are estimated using a new modular approach for different source categories. On-road and off-road models account for the effects of various adopted regulations, technology types, and seasonal conditions on emissions.

On-Road Mobile Sources

Emissions from on-road mobile sources, which include passenger vehicles, buses, and trucks, were estimated using outputs from CARB's EMFAC2014 model. The on-road emissions were calculated by applying EMFAC2014 emission factors to the transportation activity data provided by SCAG from their 2016 adopted Regional Transportation Plan/Sustainable Communities Strategy (2016 RTP/SCS).

EMFAC2014 includes data on California's car and truck fleets and travel activity. Light-duty motor vehicle fleet age, vehicle type, and vehicle population were updated based on 2012 DMV data. The model also reflects the emissions benefits of CARB's recent rulemakings such as the Pavley Standards and Advanced Clean Cars Program, and includes the emissions benefits of CARB's Truck and Bus Rule and previously adopted rules for other on-road diesel fleets.

EMFAC2014 utilizes a socio-econometric regression modeling approach to forecast new vehicle sales and to estimate future fleet mix. Light-duty passenger vehicle population includes 2012 DMV registration data along with updates to mileage accrual using Smog Check data. Updates to heavy-duty trucks include model year specific emission factors based on new test data, and population estimates using DMV data for in-state trucks and International Registration Plan (IRP) data for out-of-state trucks.

Additional information and documentation on the EMFAC2014 model is available at: https://www.arb.ca.gov/msei/categories.htm#emfac2014

Off-Road Mobile Sources

Emissions from off-road sources were estimated using a suite of category-specific models or, where a new model was not available, the OFFROAD2007 model. Many of the newer models were developed to support recent regulations, including in-use off-road equipment, ocean-going vessels and others. The sections below summarize the updates made to specific off-road categories.

Cargo Handling Equipment (CHE)

The emissions inventory for the Cargo Handling Equipment category has been updated to reflect new information on equipment population, activity, recessionary impacts on growth, and engine load. The new information includes regulatory reporting data which provide an accounting of all the cargo handling equipment in the State including their model year, horsepower and activity. Background and supporting documents for the Cargo Handling Equipment Regulation are available here: https://www.arb.ca.gov/ports/cargo/cheamd2011.htm

Pleasure Craft and Recreational Vehicles

A new model was developed in 2011 to estimate emissions from pleasure craft and recreational vehicles. In both cases, population, activity, and emission factors were re-assessed using new surveys, registration information, and emissions testing. Additional information is available at: https://www.arb.ca.gov/msei/categories.htm#offroad_motor_vehicles

In-Use Off-Road Equipment

CARB developed this model in 2010 to support the analysis for amendments to the In-Use Off-Road Diesel Fueled Fleets Regulation. Staff updated the underlying activity forecast to reflect more recent economic forecast data, which suggests a slower rate of recovery through 2024 than previously anticipated. Additional information is available at: https://www.arb.ca.gov/msei/categories.htm#offroad_motor_vehicles

Locomotives

In 2016, CARB updated California's Class I and Class II line-haul locomotive model. The new model provides the following updates: age and model year distribution based on 2011 and 2014 rail company data, activity based on FAF data, fuel growth based on Board of Equalization historical rail data, and new locomotive populations, survival rates, and Tier distributions. To estimate emissions, CARB used duty cycle, fuel consumption and activity data reported by the rail lines in 2011. These results were combined with the Class III locomotive emissions inventory from previous SIPS, that were incorporated in the 2006 locomotive inventory, to create an overall California line-haul locomotive emissions inventory for the SIP. More information may be found at https://www.arb.ca.gov/msei/categories.htm#offroad_motor_vehicles.

Transport Refrigeration Units (TRU)

This model reflects updates to activity, population, growth and turn-over data, and emission factors developed to support the 2011 amendments to the Airborne Toxic Control Measure for In-Use Diesel-Fueled Transport Refrigeration Units. Additional information is available at: https://www.arb.ca.gov/msei/categories.htm#offroad_motor_vehicles

Fuel Storage and Handling

Emissions for fuel storage and handling were estimated using the OFFROAD2007 model. Additional information is available at: https://www.arb.ca.gov/msei/categories.htm#offroad_motor_vehicles

Diesel Agricultural Equipment

The inventory for agricultural diesel equipment (such as tractors, harvesters, combines, sprayers and others) was revised based on a 2008 survey of thousands of farmers, custom operators, and first processors. The survey data, along with information from the 2007 USDA Farm Census, was used to revise almost every aspect of the agricultural inventory, including population, activity, age distribution, fuel use, and allocation. This updated inventory replaces general information on farm equipment in the United States with one specific to California farms and practices. The updated inventory was compared against other available data sources such as Board of Equalization fuel reports, USDA tractor populations and age, and Eastern Research Group tractor ages and activity, to ensure the results were reasonable and compared well against outside data sources. Agricultural growth rates through 2050 were developed through a contract with URS Corp and UC Davis. Additional information is available at: https://www.arb.ca.gov/msei/categories.htm#offroad_motor_vehicles

Military Aircraft

Baseline emission estimates were developed for the El Centro Naval Air Facility by El Centro staff based on actual operational data and were submitted by the District.

Mobile Source Forecasting

Table 5 summarizes the data and methods used to forecast future-year mobile source emissions by broad source category groupings.

Table 5
Growth Surrogates for Mobile Sources

Category	***Growth Methodology***
On-Road Sources	
All	*Match total VMT projections provided by SCAG*
Off-Road Gasoline Fueled Equipment	
Lawn & Garden	*Household growth projection*
Off-Road Equipment	Employment growth projection
Recreational Boats	Housing starts (short-term) and human population growth (long-term)
Recreational Vehicles	Housing starts (short-term) and human population growth (long-term)
Off-Road Diesel-Fueled Equipment	
Construction and Mining	California construction employment data from U.S. Bureau of Labor Statistics
Farm Equipment	2011 study of forecasted growth by URS Corp.
Industrial Equipment	California construction employment data from Bureau of Labor Statistics
Trains (line haul)	Freight Analysis Framework (FAF) 2015 growth projections and historical Bureau of Transportation Statistics locomotive fuel trends (1990-2013 data)
Transport Refrigeration Units	Projection of historical Truck/Trailer TRU sales from ACT Research, adjusted for recession.
Off-Road Equipment (Other Fuels)	
Military Aircraft	The growth for military aircraft are based on estimates from El Centro Naval Air Facility staff that facilitate the fielding of new weapons systems, potentially expanding operations that accommodate all activities necessary to continue the national security mission.

Condensable Particulate Matter

Background

Condensable particulate matter (PM) is "material that is vapor phase at stack conditions, but which condenses and/or reacts upon cooling and dilution in the ambient air to form solid or liquid PM immediately after discharge from the stack."[1] Condensable PM is a component of primary PM, which is the sum of condensable and filterable PM. Filterable PM comprises "particles that are directly emitted by a source as a solid or liquid [aerosol] at stack or release conditions."[2] All condensable PM is assumed to be smaller than 2.5 microns (µm) in diameter; therefore, PM_{10} primary encompasses condensable PM and filterable PM less than 10µm, while $PM_{2.5}$ primary encompasses condensable PM and filterable PM less than 2.5µm. Consequently, the condensable PM value within PM_{10} primary and $PM_{2.5}$ primary are the same.

The AERR requires states to report annual emissions of filterable and condensable components of PM_{10} and $PM_{2.5}$, "as applicable," for large sources every inventory year and for all sources every third inventory year, beginning with 2011.[3] Subsequent emissions inventory guidance[4] from the U.S. EPA clarifies the meaning of the phrase "as applicable" by providing a list of source types "for which condensable PM is expected by the AERR." These source types are stationary point and nonpoint combustion sources that are expected to generate condensable PM and include, for instance, commercial cooking, fuel combustion at electric generating utilities, industrial processes like cement or chemical manufacturing, and flares or incinerators associated with waste disposal. The District reports condensable PM from stationary and area sources using the methodology outlined below.

Mobile sources emit PM in both filterable and condensable form; however, the AERR does not require states to report filterable and condensable PM separately for mobile sources. Emissions from mobile sources are reported in the emissions inventory in Appendix G as primary PM, e.g. the sum of filterable and condensable PM.

Methodology

For future emissions inventory cycles, the District intends to gather condensable PM data for stationary and area sources directly as part of routine data collection. In all previous inventories, however, the District has collected data on primary PM only, containing both filterable and condensable components without distinguishing between the two. Consequently, to be able to report emissions of the condensable component of PM_{10} separately as required by the AERR, the District must use conversion factors to convert primary PM to condensable PM.

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[1] 40 CFR §51.50
[2] Ibid.
[3] 40 CFR §51.15(a)(1) and §51.30(b)(1)
[4] U.S. EPA. *Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations*. May 2017. https://www.epa.gov/sites/production/files/2017-07/documents/ei_guidance_may_2017_final_rev.pdf

U.S. EPA has published an augmentation tool[5] which contains conversion factors for each source classification code (SCC) to convert filterable PM_{10} (PM10FIL) to condensable PM (PMCON). In this form, these conversion factors ($CF_{PM10FIL \rightarrow PMCON}$) are not useful because the District does not directly collect PM10FIL data. But, the following formula adjusts U.S. EPA's existing conversion factors to obtain new conversion factors for each SCC that convert from primary PM_{10} (PM10PRI)—data which the District does collect—to condensable PM ($CF_{PM10PRI \rightarrow PMCON}$):

$$CF_{PM10PRI \rightarrow PMCON} = \frac{CF_{\mathrm{PM10FIL \rightarrow PMCON}}}{(1 + CF_{\mathrm{PM10FIL \rightarrow PMCON}})}$$

The formula was derived as follows:

$$PM10PRI = PM10FIL + PMCON$$

and

$$PMCON = PM10FIL\ (CF_{\mathrm{PM10FIL \rightarrow PMCON}})$$

and

$$PMCON = PM10PRI(CF_{\mathrm{PM10PRI \rightarrow PMCON}})$$

$$\begin{aligned} \therefore \quad PM10PRI &= PM10FIL + PM10FIL\ (CF_{\mathrm{PM10FIL \rightarrow PMCON}}) \\ &= PM10FIL(1 + CF_{\mathrm{PM10FIL \rightarrow PMCON}}) \end{aligned}$$

and

$$\begin{aligned} CF_{\mathrm{PM10PRI \rightarrow PMCON}} &= \frac{PMCON}{PM10PRI} = \frac{PMCON}{PM10FIL(1 + CF_{\mathrm{PM10FIL \rightarrow PMCON}})} \\ &= \frac{PM10FIL\ (CF_{\mathrm{PM10FIL \rightarrow PMCON}})}{PM10FIL(1 + CF_{\mathrm{PM10FIL \rightarrow PMCON}})} = \frac{CF_{\mathrm{PM10FIL \rightarrow PMCON}}}{(1 + CF_{\mathrm{PM10FIL \rightarrow PMCON}})} \end{aligned}$$

To ensure that the calculated condensable PM values are smaller than the District-reported $PM_{2.5}$ values, a 1:1 ratio between PM_{10} and $PM_{2.5}$ is assumed, and the derived conversion factors are applied to convert primary $PM_{2.5}$ (PM25PRI) to condensable PM using the same method. That is, $CF_{PM10PRI \rightarrow PMCON} = CF_{PM25PRI \rightarrow PMCON}$ where $CF_{PM25PRI \rightarrow PMCON}$ represents the conversion factors that convert from primary $PM_{2.5}$—again, data the District does collect—to condensable PM. The resulting calculated condensable PM value is then the PMCON portion of both PM2.5PRI and PM10PRI since the condensable PM value within primary $PM_{2.5}$ are one and the same as the condensable PM value within primary PM_{10}.

[5] U.S. EPA. *PM Augmentation*. Air Emissions Inventories. May 20, 2016. https://www.epa.gov/air-emissions-inventories/pm-augmentation

Table H-1a. PM_{10} Emissions by Major Source Category in Imperial County, 2016-2030
Imperial County PM_{10} Plan

Source Category	PM_{10} (tons/day)														
	2016	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Stationary Sources															
Fuel Combustion	0.20	0.20	0.20	0.20	0.20	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21
Electric Utilities	*0.09*	*0.09*	*0.09*	*0.09*	*0.09*	*0.09*	*0.10*	*0.10*	*0.10*	*0.10*	*0.10*	*0.10*	*0.10*	*0.10*	*0.10*
Cogeneration	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Manufacturing and Industrial	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*
Food and Agricultural Processing	*0.01*	*0.01*	*0.01*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Service and Commercial	*0.07*	*0.07*	*0.07*	*0.07*	*0.08*	*0.08*	*0.08*	*0.08*	*0.08*	*0.08*	*0.08*	*0.08*	*0.07*	*0.08*	*0.08*
Other (Fuel Combustion)	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Waste Disposal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sewage Treatment	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Landfills	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Other (Waste Disposal)	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Cleaning and Surface Coatings	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Laundering	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Degreasing	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Coatings and Related Process Solvents	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Adhesives and Sealants	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Petroleum Production and Marketing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Petroleum Refining	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Petroleum Marketing	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Other (Petroleum Production and Marketing)	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Industrial Processes	3.99	4.14	4.27	4.41	4.56	4.69	4.83	4.96	5.10	5.25	5.39	5.54	5.69	5.85	6.01
Food and Agriculture	*0.30*	*0.31*	*0.31*	*0.32*	*0.32*	*0.33*	*0.33*	*0.34*	*0.34*	*0.35*	*0.35*	*0.36*	*0.36*	*0.37*	*0.37*
Mineral Processes	*3.67*	*3.81*	*3.95*	*4.08*	*4.22*	*4.35*	*4.48*	*4.61*	*4.75*	*4.89*	*5.03*	*5.17*	*5.32*	*5.47*	*5.62*
Metal Processes	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Other (Industrial Processes)	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*
Total Stationary Sources	**4.19**	**4.33**	**4.47**	**4.61**	**4.76**	**4.90**	**5.04**	**5.17**	**5.31**	**5.46**	**5.60**	**5.75**	**5.90**	**6.06**	**6.22**
Areawide Sources															
Solvent Evaporation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Consumer Products	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Architectural Coatings and Related Process Solv	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Pesticides/Fertilizers	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Asphalt Paving/Roofing	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Miscellaneous Processes	278.48	278.58	278.69	278.69	278.75	278.81	277.30	277.28	277.33	277.39	277.39	277.45	277.51	277.57	277.64
Residential Fuel Combustion	*0.05*	*0.05*	*0.05*	*0.05*	*0.05*	*0.05*	*0.05*	*0.05*	*0.05*	*0.05*	*0.05*	*0.05*	*0.05*	*0.05*	*0.05*
Farming Operations	*8.48*	*8.42*	*8.37*	*8.31*	*8.25*	*8.22*	*8.20*	*8.17*	*8.14*	*8.11*	*8.09*	*8.06*	*8.03*	*8.00*	*7.98*
Construction and Demolition	*3.02*	*3.16*	*3.29*	*3.40*	*3.51*	*3.59*	*3.66*	*3.71*	*3.76*	*3.82*	*3.90*	*3.98*	*4.06*	*4.14*	*4.22*
Paved Road Dust	*1.16*	*1.20*	*1.27*	*1.24*	*1.28*	*1.30*	*1.38*	*1.35*	*1.39*	*1.43*	*1.40*	*1.42*	*1.45*	*1.47*	*1.50*
Unpaved Road Dust	*51.88*	*51.87*	*51.85*	*51.84*	*51.83*	*51.82*	*50.22*	*50.21*	*50.20*	*50.20*	*50.19*	*50.18*	*50.18*	*50.17*	*50.16*
Fugitive Windblown Dust	*212.52*	*212.51*	*212.51*	*212.50*	*212.50*	*212.49*	*212.49*	*212.48*	*212.48*	*212.47*	*212.47*	*212.46*	*212.46*	*212.45*	*212.45*
Fires	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Managed Burning and Disposal	*1.30*	*1.28*	*1.27*	*1.26*	*1.25*	*1.24*	*1.23*	*1.23*	*1.22*	*1.22*	*1.21*	*1.20*	*1.20*	*1.19*	*1.19*
Cooking	*0.08*	*0.08*	*0.09*	*0.09*	*0.09*	*0.09*	*0.09*	*0.09*	*0.09*	*0.10*	*0.10*	*0.10*	*0.10*	*0.10*	*0.10*
Other (Miscellaneous Processes)	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Total Areawide Sources	**278.48**	**278.58**	**278.69**	**278.69**	**278.75**	**278.81**	**277.30**	**277.28**	**277.33**	**277.39**	**277.39**	**277.45**	**277.51**	**277.57**	**277.64**
Mobile Sources															
On-Road Vehicles	0.43	0.43	0.44	0.43	0.44	0.44	0.46	0.45	0.46	0.48	0.47	0.48	0.49	0.50	0.51
Off-Road Vehicles	1.07	1.06	1.05	1.05	1.04	1.04	1.04	1.55	1.55	1.55	1.56	1.57	1.57	1.58	1.59
Total Mobile Sources	**1.50**	**1.49**	**1.49**	**1.47**	**1.48**	**1.48**	**1.50**	**1.99**	**2.01**	**2.03**	**2.03**	**2.04**	**2.06**	**2.08**	**2.09**
Total for Imperial County	**284.17**	**284.40**	**284.65**	**284.77**	**284.99**	**285.19**	**283.84**	**284.44**	**284.66**	**284.88**	**285.02**	**285.24**	**285.48**	**285.71**	**285.96**

Notes:
Emissions for Imperial County were queried from the California Emissions Projection Analysis Model (CEPAM), Version 1.05.
Totals may not add up due to rounding.

Table H-1b. Condensable/Filterable PM_{10} Emissions by Major Source Category in Imperial County, 2016
Imperial County PM_{10} Plan

Source Category	PM_{10} Emissions (tons/day)		
	Total	**Condensable**	**Filterable**
Stationary Sources			
Fuel Combustion	0.199	0.028	0.171
Electric Utilities	*0.091*	*0.025*	*0.066*
Cogeneration	*0.002*	*0.001*	*0.001*
Manufacturing and Industrial	*0.029*	*0.000*	*0.028*
Food and Agricultural Processing	*0.005*	*0.001*	*0.004*
Service and Commercial	*0.072*	*0.000*	*0.071*
Other (Fuel Combustion)	*0.000*	*0.000*	*0.000*
Waste Disposal	0.000	0.000	0.000
Sewage Treatment	*0.000*	*0.000*	*0.000*
Landfills	*0.000*	*0.000*	*0.000*
Other (Waste Disposal)	*0.000*	*0.000*	*0.000*
Cleaning and Surface Coatings	0.000	0.000	0.000
Laundering	*0.000*	*0.000*	*0.000*
Degreasing	*0.000*	*0.000*	*0.000*
Coatings and Related Process Solvents	*0.000*	*0.000*	*0.000*
Adhesives and Sealants	*0.000*	*0.000*	*0.000*
Petroleum Production and Marketing	0.000	0.000	0.000
Petroleum Refining	*0.000*	*0.000*	*0.000*
Petroleum Marketing	*0.000*	*0.000*	*0.000*
Other (Petroleum Production and Marketing)	*0.000*	*0.000*	*0.000*
Industrial Processes	3.989	0.010	3.980
Food and Agriculture	*0.305*	*0.003*	*0.301*
Mineral Processes	*3.672*	*0.006*	*3.666*
Metal Processes	*0.000*	*0.000*	*0.000*
Other (Industrial Processes)	*0.013*	*0.000*	*0.013*
Total Stationary Sources	**4.188**	**0.038**	**4.150**
Areawide Sources			
Solvent Evaporation	0.000	0.000	0.000
Consumer Products	*0.000*	*0.000*	*0.000*
Architectural Coatings and Related Process Solvents	*0.000*	*0.000*	*0.000*
Pesticides/Fertilizers	*0.000*	*0.000*	*0.000*
Asphalt Paving/Roofing	*0.000*	*0.000*	*0.000*
Miscellaneous Processes	278.479	0.080	278.400
Residential Fuel Combustion	*0.046*	*0.000*	*0.046*
Farming Operations	*8.481*	*0.000*	*8.481*
Construction and Demolition	*3.017*	*0.000*	*3.017*
Paved Road Dust	*1.158*	*0.000*	*1.158*
Unpaved Road Dust	*51.881*	*0.000*	*51.881*
Fugitive Windblown Dust	*212.515*	*0.000*	*212.515*
Fires	*0.004*	*0.000*	*0.004*
Managed Burning and Disposal	*1.297*	*0.000*	*1.297*
Cooking	*0.080*	*0.080*	*0.000*
Other (Miscellaneous Processes)	*0.000*	*0.000*	*0.000*
Total Areawide Sources	**278.479**	**0.080**	**278.400**
Mobile Sources			
On-Road Vehicles	0.433	--	--
Off-Road Vehicles	1.066	--	--
Total Mobile Sources	**1.499**	**--**	**--**
Total for Imperial County	**284.167**	**--**	**--**

Notes:
Emissions for Imperial County were queried from the California Emissions Projection Analysis Model (CEPAM), Version 1.05.
"--" indicates that the portion of condensable/filterable PM is unknown/unmeasurable.
The condensable portion of each inventory category was calculated using an individual, source-specific conversion factor applied to the reported PM emissions value. The filterable portion was then calculated as the difference between the PM emissions value and its condensable portion.

Table H-1c. Condensable/Filterable PM_{10} Emissions by Major Source Category in Imperial County, 2030
Imperial County PM_{10} Plan

Source Category	PM_{10} Emissions (tons/day)		
	Total	**Condensable**	**Filterable**
Stationary Sources			
Fuel Combustion	0.212	0.031	0.181
Electric Utilities	*0.099*	*0.027*	*0.071*
Cogeneration	*0.002*	*0.001*	*0.001*
Manufacturing and Industrial	*0.032*	*0.001*	*0.032*
Food and Agricultural Processing	*0.003*	*0.001*	*0.002*
Service and Commercial	*0.075*	*0.000*	*0.075*
Other (Fuel Combustion)	*0.000*	*0.000*	*0.000*
Waste Disposal	0.000	0.000	0.000
Sewage Treatment	*0.000*	*0.000*	*0.000*
Landfills	*0.000*	*0.000*	*0.000*
Other (Waste Disposal)	*0.000*	*0.000*	*0.000*
Cleaning and Surface Coatings	0.000	0.000	0.000
Laundering	*0.000*	*0.000*	*0.000*
Degreasing	*0.000*	*0.000*	*0.000*
Coatings and Related Process Solvents	*0.000*	*0.000*	*0.000*
Adhesives and Sealants	*0.000*	*0.000*	*0.000*
Petroleum Production and Marketing	0.000	0.000	0.000
Petroleum Refining	*0.000*	*0.000*	*0.000*
Petroleum Marketing	*0.000*	*0.000*	*0.000*
Other (Petroleum Production and Marketing)	*0.000*	*0.000*	*0.000*
Industrial Processes	6.009	0.012	5.996
Food and Agriculture	*0.371*	*0.004*	*0.367*
Mineral Processes	*5.623*	*0.008*	*5.615*
Metal Processes	*0.000*	*0.000*	*0.000*
Other (Industrial Processes)	*0.015*	*0.000*	*0.015*
Total Stationary Sources	**6.221**	**0.043**	**6.178**
Areawide Sources			
Solvent Evaporation	0.000	0.000	0.000
Consumer Products	*0.000*	*0.000*	*0.000*
Architectural Coatings and Related Process Solvents	*0.000*	*0.000*	*0.000*
Pesticides/Fertilizers	*0.000*	*0.000*	*0.000*
Asphalt Paving/Roofing	*0.000*	*0.000*	*0.000*
Miscellaneous Processes	277.642	0.100	277.542
Residential Fuel Combustion	*0.046*	*0.000*	*0.046*
Farming Operations	*7.977*	*0.000*	*7.977*
Construction and Demolition	*4.221*	*0.000*	*4.221*
Paved Road Dust	*1.497*	*0.000*	*1.497*
Unpaved Road Dust	*50.164*	*0.000*	*50.164*
Fugitive Windblown Dust	*212.447*	*0.000*	*212.447*
Fires	*0.004*	*0.000*	*0.004*
Managed Burning and Disposal	*1.186*	*0.000*	*1.186*
Cooking	*0.100*	*0.100*	*0.000*
Other (Miscellaneous Processes)	*0.000*	*0.000*	*0.000*
Total Areawide Sources	**277.642**	**0.100**	**277.542**
Mobile Sources			
On-Road Vehicles	0.507	--	--
Off-Road Vehicles	1.588	--	--
Total Mobile Sources	**2.094**	**--**	**--**
Total for Imperial County	**285.957**	**--**	**--**

Notes:
Emissions for Imperial County were queried from the California Emissions Projection Analysis Model (CEPAM), Version 1.05.
"--" indicates that the portion of condensable/filterable PM is unknown/unmeasurable.
The condensable portion of each inventory category was calculated using an individual, source-specific conversion factor applied to the reported PM emissions value. The filterable portion was then calculated as the difference between the PM emissions value and its condensable portion.

Table H-2. ROG Emissions by Major Source Category in Imperial County, 2016-2030
Imperial County PM_{10} Plan

Source Category	ROG (tons/day)														
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Stationary Sources															
Fuel Combustion	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Electric Utilities	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*
Cogeneration	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Manufacturing and Industrial	*0.02*	*0.02*	*0.02*	*0.02*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*
Food and Agricultural Processing	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Service and Commercial	*0.02*	*0.02*	*0.02*	*0.02*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*
Other (Fuel Combustion)	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Waste Disposal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sewage Treatment	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Landfills	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Other (Waste Disposal)	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Cleaning and Surface Coatings	0.59	0.59	0.60	0.60	0.61	0.63	0.64	0.65	0.67	0.69	0.70	0.72	0.74	0.76	0.78
Laundering	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*
Degreasing	*0.30*	*0.30*	*0.30*	*0.30*	*0.31*	*0.31*	*0.32*	*0.33*	*0.33*	*0.34*	*0.35*	*0.36*	*0.38*	*0.39*	*0.40*
Coatings and Related Process Solvents	*0.19*	*0.20*	*0.20*	*0.20*	*0.21*	*0.21*	*0.22*	*0.22*	*0.22*	*0.23*	*0.23*	*0.24*	*0.24*	*0.25*	*0.25*
Adhesives and Sealants	*0.09*	*0.09*	*0.09*	*0.09*	*0.09*	*0.09*	*0.09*	*0.09*	*0.10*	*0.10*	*0.10*	*0.11*	*0.11*	*0.12*	*0.12*
Petroleum Production and Marketing	0.67	0.66	0.65	0.64	0.63	0.62	0.61	0.60	0.59	0.58	0.57	0.56	0.56	0.55	0.55
Petroleum Refining	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Petroleum Marketing	*0.67*	*0.66*	*0.65*	*0.64*	*0.63*	*0.62*	*0.61*	*0.60*	*0.59*	*0.58*	*0.57*	*0.56*	*0.55*	*0.55*	*0.54*
Other (Petroleum Production and Marketing)	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Industrial Processes	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Food and Agriculture	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Mineral Processes	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.01*	*0.01*	*0.01*	*0.01*
Metal Processes	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Other (Industrial Processes)	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Total Stationary Sources	**1.36**	**1.36**	**1.36**	**1.35**	**1.35**	**1.36**	**1.36**	**1.36**	**1.37**	**1.38**	**1.38**	**1.39**	**1.41**	**1.42**	**1.44**
Areawide Sources															
Solvent Evaporation	3.50	3.54	3.59	3.63	3.67	3.69	3.71	3.72	3.74	3.75	3.77	3.78	3.80	3.82	3.83
Consumer Products	*1.10*	*1.14*	*1.17*	*1.20*	*1.24*	*1.25*	*1.26*	*1.28*	*1.29*	*1.30*	*1.31*	*1.33*	*1.34*	*1.35*	*1.36*
Architectural Coatings and Related Process Solv	*0.47*	*0.49*	*0.51*	*0.53*	*0.55*	*0.56*	*0.57*	*0.58*	*0.59*	*0.60*	*0.61*	*0.62*	*0.62*	*0.63*	*0.64*
Pesticides/Fertilizers	*1.79*	*1.78*	*1.76*	*1.74*	*1.72*	*1.72*	*1.71*	*1.70*	*1.69*	*1.68*	*1.67*	*1.66*	*1.66*	*1.65*	*1.64*
Asphalt Paving/Roofing	*0.14*	*0.14*	*0.15*	*0.15*	*0.16*	*0.16*	*0.16*	*0.17*	*0.17*	*0.17*	*0.18*	*0.18*	*0.18*	*0.19*	*0.19*
Miscellaneous Processes	3.48	3.47	3.47	3.46	3.45	3.45	3.44	3.44	3.43	3.43	3.42	3.42	3.42	3.41	3.41
Residential Fuel Combustion	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*
Farming Operations	*2.53*	*2.53*	*2.53*	*2.53*	*2.53*	*2.53*	*2.53*	*2.53*	*2.53*	*2.53*	*2.53*	*2.53*	*2.53*	*2.53*	*2.53*
Construction and Demolition	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Paved Road Dust	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Unpaved Road Dust	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Fugitive Windblown Dust	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Fires	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Managed Burning and Disposal	*0.90*	*0.89*	*0.88*	*0.88*	*0.87*	*0.86*	*0.86*	*0.85*	*0.85*	*0.84*	*0.84*	*0.84*	*0.83*	*0.83*	*0.82*
Cooking	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*
Other (Miscellaneous Processes)	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Total Areawide Sources	**6.98**	**7.02**	**7.05**	**7.09**	**7.12**	**7.14**	**7.15**	**7.16**	**7.17**	**7.18**	**7.19**	**7.21**	**7.22**	**7.23**	**7.24**
Mobile Sources															
On-Road Vehicles	2.78	2.63	2.60	2.37	2.28	2.18	2.19	2.02	2.00	1.99	1.87	1.85	1.83	1.80	1.77
Off-Road Vehicles	4.13	4.08	4.03	3.97	3.93	3.89	3.87	4.08	4.08	4.08	4.07	4.06	4.05	4.05	4.06
Total Mobile Sources	**6.92**	**6.71**	**6.63**	**6.34**	**6.21**	**6.07**	**6.06**	**6.10**	**6.08**	**6.06**	**5.94**	**5.91**	**5.88**	**5.85**	**5.83**
Total for Imperial County	**15.26**	**15.09**	**15.04**	**14.77**	**14.68**	**14.56**	**14.57**	**14.62**	**14.62**	**14.62**	**14.51**	**14.51**	**14.50**	**14.50**	**14.51**

Notes:
Emissions for Imperial County were queried from the California Emissions Projection Analysis Model (CEPAM), Version 1.05.
Totals may not add up due to rounding.

Table H-3. NO_X Emissions by Major Source Category in Imperial County, 2016-2030

Imperial County PM_{10} Plan

Source Category	NO_X (tons/day)														
	2016	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Stationary Sources															
Fuel Combustion	1.63	1.62	1.61	1.60	1.71	1.71	1.71	1.70	1.69	1.69	1.68	1.67	1.66	1.66	1.66
Electric Utilities	*0.37*	*0.36*	*0.36*	*0.36*	*0.36*	*0.37*	*0.38*	*0.39*	*0.40*	*0.40*	*0.40*	*0.40*	*0.40*	*0.40*	*0.40*
Cogeneration	*0.02*	*0.02*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*
Manufacturing and Industrial	*0.44*	*0.44*	*0.44*	*0.43*	*0.48*	*0.47*	*0.46*	*0.46*	*0.45*	*0.45*	*0.45*	*0.44*	*0.44*	*0.43*	*0.43*
Food and Agricultural Processing	*0.11*	*0.10*	*0.10*	*0.09*	*0.09*	*0.09*	*0.08*	*0.08*	*0.08*	*0.08*	*0.08*	*0.07*	*0.07*	*0.07*	*0.07*
Service and Commercial	*0.69*	*0.69*	*0.69*	*0.68*	*0.76*	*0.75*	*0.75*	*0.74*	*0.73*	*0.73*	*0.73*	*0.72*	*0.72*	*0.72*	*0.73*
Other (Fuel Combustion)	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Waste Disposal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sewage Treatment	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Landfills	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Other (Waste Disposal)	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Cleaning and Surface Coatings	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Laundering	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Degreasing	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Coatings and Related Process Solvents	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Adhesives and Sealants	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Petroleum Production and Marketing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Petroleum Refining	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Petroleum Marketing	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Other (Petroleum Production and Marketing)	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Industrial Processes	0.07	0.08	0.08	0.08	0.08	0.09	0.09	0.09	0.09	0.10	0.10	0.10	0.10	0.11	0.11
Food and Agriculture	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*
Mineral Processes	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*	*0.05*	*0.05*	*0.05*	*0.05*	*0.05*	*0.05*	*0.05*	*0.06*
Metal Processes	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Other (Industrial Processes)	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*
Total Stationary Sources	**1.71**	**1.69**	**1.69**	**1.68**	**1.80**	**1.80**	**1.80**	**1.79**	**1.79**	**1.78**	**1.78**	**1.77**	**1.76**	**1.76**	**1.77**
Areawide Sources															
Solvent Evaporation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Consumer Products	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Architectural Coatings and Related Process Solv	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Pesticides/Fertilizers	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Asphalt Paving/Roofing	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Miscellaneous Processes	0.52	0.52	0.52	0.51	0.51	0.51	0.50	0.50	0.50	0.50	0.50	0.49	0.49	0.49	0.49
Residential Fuel Combustion	*0.09*	*0.09*	*0.09*	*0.09*	*0.09*	*0.09*	*0.09*	*0.09*	*0.09*	*0.09*	*0.09*	*0.09*	*0.09*	*0.09*	*0.09*
Farming Operations	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Construction and Demolition	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Paved Road Dust	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Unpaved Road Dust	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Fugitive Windblown Dust	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Fires	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Managed Burning and Disposal	*0.44*	*0.43*	*0.43*	*0.43*	*0.42*	*0.42*	*0.42*	*0.41*	*0.41*	*0.41*	*0.41*	*0.41*	*0.40*	*0.40*	*0.40*
Cooking	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Other (Miscellaneous Processes)	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Total Areawide Sources	**0.52**	**0.52**	**0.52**	**0.51**	**0.51**	**0.51**	**0.50**	**0.50**	**0.50**	**0.50**	**0.50**	**0.49**	**0.49**	**0.49**	**0.49**
Mobile Sources															
On-Road Vehicles	7.42	6.93	6.58	5.80	5.66	5.20	4.89	3.53	3.46	3.41	3.28	3.25	3.23	3.23	3.24
Off-Road Vehicles	7.49	7.25	6.94	6.65	6.39	6.13	5.84	7.67	7.45	7.22	7.00	6.80	6.62	6.44	6.27
Total Mobile Sources	**14.91**	**14.18**	**13.52**	**12.45**	**12.06**	**11.33**	**10.73**	**11.20**	**10.91**	**10.63**	**10.29**	**10.05**	**9.84**	**9.67**	**9.51**
Total for Imperial County	**17.14**	**16.40**	**15.72**	**14.65**	**14.36**	**13.63**	**13.03**	**13.49**	**13.20**	**12.91**	**12.56**	**12.31**	**12.10**	**11.92**	**11.77**

Notes:

Emissions for Imperial County were queried from the California Emissions Projection Analysis Model (CEPAM), Version 1.05.

Totals may not add up due to rounding.

Table H-4. SO_X Emissions by Major Source Category in Imperial County, 2016-2030
Imperial County PM_{10} Plan

Source Category	SO_X (tons/day)														
	2016	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Stationary Sources															
Fuel Combustion	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Electric Utilities	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Cogeneration	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Manufacturing and Industrial	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Food and Agricultural Processing	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Service and Commercial	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Other (Fuel Combustion)	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Waste Disposal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sewage Treatment	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Landfills	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Other (Waste Disposal)	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Cleaning and Surface Coatings	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Laundering	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Degreasing	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Coatings and Related Process Solvents	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Adhesives and Sealants	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Petroleum Production and Marketing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Petroleum Refining	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Petroleum Marketing	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Other (Petroleum Production and Marketing)	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Industrial Processes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Food and Agriculture	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Mineral Processes	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Metal Processes	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Other (Industrial Processes)	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Total Stationary Sources	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**
Areawide Sources															
Solvent Evaporation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Consumer Products	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Architectural Coatings and Related Process Solv	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Pesticides/Fertilizers	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Asphalt Paving/Roofing	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Miscellaneous Processes	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.07	0.07	0.07	0.07	0.07	0.07
Residential Fuel Combustion	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Farming Operations	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Construction and Demolition	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Paved Road Dust	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Unpaved Road Dust	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Fugitive Windblown Dust	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Fires	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Managed Burning and Disposal	*0.08*	*0.08*	*0.08*	*0.07*	*0.07*	*0.07*	*0.07*	*0.07*	*0.07*	*0.07*	*0.07*	*0.07*	*0.07*	*0.07*	*0.07*
Cooking	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Other (Miscellaneous Processes)	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Total Areawide Sources	**0.08**	**0.08**	**0.08**	**0.08**	**0.08**	**0.08**	**0.08**	**0.08**	**0.08**	**0.07**	**0.07**	**0.07**	**0.07**	**0.07**	**0.07**
Mobile Sources															
On-Road Vehicles	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Off-Road Vehicles	0.22	0.22	0.22	0.23	0.23	0.23	0.23	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Total Mobile Sources	**0.25**	**0.25**	**0.26**	**0.27**	**0.27**	**0.27**	**0.27**	**0.16**	**0.16**	**0.16**	**0.16**	**0.17**	**0.17**	**0.17**	**0.17**
Total for Imperial County	**0.34**	**0.34**	**0.34**	**0.35**	**0.35**	**0.35**	**0.35**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**

Notes:
Emissions for Imperial County were queried from the California Emissions Projection Analysis Model (CEPAM), Version 1.05.
Totals may not add up due to rounding.

Table H-5. NH_3 Emissions by Major Source Category in Imperial County, 2016-2030
Imperial County PM_{10} Plan

Source Category	NH_3 (tons/day)														
	2016	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Stationary Sources															
Fuel Combustion	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Electric Utilities	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Cogeneration	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Manufacturing and Industrial	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Food and Agricultural Processing	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Service and Commercial	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*
Other (Fuel Combustion)	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Waste Disposal	1.49	1.49	1.49	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.51	1.51	1.51
Sewage Treatment	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Landfills	*0.07*	*0.07*	*0.08*	*0.08*	*0.08*	*0.08*	*0.08*	*0.08*	*0.08*	*0.08*	*0.09*	*0.09*	*0.09*	*0.09*	*0.09*
Other (Waste Disposal)	*1.42*	*1.42*	*1.42*	*1.42*	*1.42*	*1.42*	*1.42*	*1.42*	*1.42*	*1.42*	*1.42*	*1.42*	*1.42*	*1.42*	*1.42*
Cleaning and Surface Coatings	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Laundering	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Degreasing	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Coatings and Related Process Solvents	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Adhesives and Sealants	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Petroleum Production and Marketing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Petroleum Refining	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Petroleum Marketing	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Other (Petroleum Production and Marketing)	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Industrial Processes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Food and Agriculture	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Mineral Processes	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Metal Processes	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Other (Industrial Processes)	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Total Stationary Sources	**1.49**	**1.50**	**1.50**	**1.50**	**1.50**	**1.50**	**1.51**	**1.51**	**1.51**	**1.51**	**1.51**	**1.51**	**1.51**	**1.51**	**1.51**
Areawide Sources															
Solvent Evaporation	15.34	15.19	15.04	14.89	14.74	14.66	14.59	14.52	14.45	14.37	14.30	14.23	14.16	14.09	14.02
Consumer Products	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Architectural Coatings and Related Process Solv	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Pesticides/Fertilizers	*15.34*	*15.19*	*15.04*	*14.89*	*14.74*	*14.66*	*14.59*	*14.52*	*14.45*	*14.37*	*14.30*	*14.23*	*14.16*	*14.09*	*14.02*
Asphalt Paving/Roofing	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Miscellaneous Processes	15.36	15.37	15.38	15.40	15.41	15.41	15.41	15.42	15.42	15.42	15.43	15.43	15.43	15.44	15.44
Residential Fuel Combustion	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Farming Operations	*14.80*	*14.80*	*14.80*	*14.80*	*14.80*	*14.80*	*14.80*	*14.80*	*14.80*	*14.80*	*14.80*	*14.80*	*14.80*	*14.80*	*14.80*
Construction and Demolition	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Paved Road Dust	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Unpaved Road Dust	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Fugitive Windblown Dust	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Fires	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Managed Burning and Disposal	*0.19*	*0.19*	*0.18*	*0.18*	*0.18*	*0.18*	*0.18*	*0.18*	*0.18*	*0.18*	*0.18*	*0.17*	*0.17*	*0.17*	*0.17*
Cooking	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Other (Miscellaneous Processes)	*0.37*	*0.39*	*0.40*	*0.41*	*0.42*	*0.43*	*0.43*	*0.44*	*0.44*	*0.45*	*0.45*	*0.45*	*0.46*	*0.46*	*0.47*
Total Areawide Sources	**30.70**	**30.56**	**30.42**	**30.28**	**30.14**	**30.07**	**30.00**	**29.93**	**29.87**	**29.80**	**29.73**	**29.66**	**29.60**	**29.53**	**29.46**
Mobile Sources															
On-Road Vehicles	0.21	0.21	0.22	0.20	0.20	0.20	0.21	0.20	0.20	0.20	0.19	0.19	0.19	0.20	0.20
Off-Road Vehicles	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Mobile Sources	**0.22**	**0.21**	**0.22**	**0.21**	**0.21**	**0.20**	**0.21**	**0.20**	**0.20**	**0.20**	**0.20**	**0.20**	**0.20**	**0.20**	**0.20**
Total for Imperial County	**32.41**	**32.27**	**32.14**	**31.99**	**31.85**	**31.78**	**31.72**	**31.64**	**31.58**	**31.51**	**31.43**	**31.37**	**31.30**	**31.24**	**31.17**

Notes:
Emissions for Imperial County were queried from the California Emissions Projection Analysis Model (CEPAM), Version 1.05.
Totals may not add up due to rounding.

Salton Sea Management Program
Phase I: 10-Year Plan
March 2017

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Appendices

Introduction

Under the leadership of Governor Edmund G Brown Jr., the 2014 California Water Action Plan set forth a vision for California water management that balances statewide water supply security with the protection of public, economic and ecological health. The Salton Sea offers a unique opportunity to preserve these values by leveraging a convergence of support from federal, state, and local stakeholders for a smaller and sustainable sea achieved through the projects outlined in this plan.

The Salton Sea is California's largest lake. Thirty-five miles long and 15 miles wide, the desert lake extends from the Coachella Valley into the Imperial Valley. Though saltier than the ocean, the Sea supports an abundance of fish, a food source for millions of migratory birds on the Pacific Flyway. Managing the Sea's natural, agricultural, and municipal water inflows to maximize bird and fish habitat and minimize fine-particle air pollution will allow California to protect regional health, ecological wealth and a stable water supply.

The Salton Sea formed in the Salton Trough in Imperial and Riverside counties. Much of the trough is below sea level and has a long history of periodic inundation from the shifting delta of the Colorado River or from infrequent storm events. The last Colorado River inundation of the area occurred in 1905 when an irrigation canal inlet gate failed and flooded much of the area. Since then, lake inflows have been primarily from agricultural activities in the area. Inflows from the New and Alamo rivers are primarily farm return flow water, although there is some inflow from Mexico, particularly during large precipitation events. Over the last several decades, water levels at the Salton Sea have declined and salinity concentrations have increased due to climate fluctuations, agricultural conservation measures, cropping practices and reduced inflows from Mexico. Recent water transfers from the Imperial Valley have further accelerated the rate of lake elevation decline and have increased the rate of salinity concentration. Declining lake levels threaten important bird habitat and pose public health risk due to particulate air pollution.

Over the last 40 years numerous ideas and plans have been proposed by various entities to restore the Salton Sea. None have been implemented for a variety of reasons, including lack of a shared vision, funding constraints, and reduced inflows.

In 2015, Governor Edmund G. Brown Jr. formed the Salton Sea Task Force with principle staff and members of various state agencies to identify short- and medium-term goals to respond to air quality and ecological threats at the Salton Sea. The Task Force developed actions for the Salton Sea that included:

- Develop and implement the Salton Sea Management Program through departments within the California Natural Resources and Environmental Protection Agencies
- Improve public outreach and local partnerships
- Accelerate project implementation and delivery

- Meet a short-term goal of 9,000 acres to 12,000 acres of dust suppression and habitat projects
- Establish a medium-term goal of 18,000 acres to 25,000 acres of dust suppression and habitat projects.

The State's Salton Sea Management Plan (SSMP) has several phases of development to protect air quality and ecosystem values at the Salton Sea. This draft technical memorandum prepared by the State of California outlines the SSMP's first, 10-year phase (Phase I Plan). It will guide State and federal actions to meet the commitments outlined in the Memorandum of Understanding (MOU) executed on August 31, 2016, and amended on January 18, 2017 by the Department of Interior (DOI) and the California Natural Resource Agency (CNRA). The MOU, among other things, identified a goal of developing projects to protect or improve air quality, wildlife habitat, and water quality as necessary to minimize human health and ecosystem impact at the Salton Sea in the mid-term. While guided by the MOU, the SSMP is a longer-term process that has been developed and will be implemented by the State of California. This first phase of development has been planned to expedite construction of habitat and to suppress dust on areas of playa that have been or will be exposed at the Salton Sea by 2028. The Phase I Plan outlines the process for developing additional management measurements for the Salton Sea that will be implemented in later phases.

The Phase I Plan also addresses the requirements of Assembly Bill 1095 (Garcia 2015) by including those projects deemed "shovel-ready projects" and including estimates of cost. Those projects include:

- Water backbone infrastructure, which will provide conveyance of river and Salton Sea water to air quality and habitat projects.
- SSMP air quality and habitat projects associated with the water backbone infrastructure
- The CNRA's Phase I Species Conservation Habitat Project (saline impoundments along the southern shore to support fish and wildlife)
- Red Hill Bay Project, an effort of the U.S. Fish and Wildlife Service and Imperial Irrigation District to restore habitat on the southeastern shore
- Torres-Martinez Wetland project, an effort of the Torres Martinez Desert Cahuilla Indians to build shallow wetlands along the northern edge of the Salton Sea.

The Phase I Plan considers the implications of the 17-year drought on the Colorado River. The drought may force reductions of Colorado River water to the Lower Basin States, which in turn could impact inflows to the Salton Sea. The U.S. Bureau of Reclamation, seven Colorado River basin states and key principals of several water management agencies have been developing a Drought Contingency Plan (DCP) that includes implemented and proposed actions to address the potential water shortage. The Department of Interior Order No. 3344 - *Actions to Address Effects of Historic Drought on Colorado River Water Supplies* (DOI, January18, 2017) further outlines the details of the DCP. One component of the Phase I Plan is to evaluate the current hydrologic modeling for the Salton Sea and to include some of the proposed actions in the model to evaluate their potential impact to Salton Sea inflows.

As the *Air Quality Planning and Implementation* section of this document notes, the air quality mitigation will consist of measures to keep exposed playa wet or vegetated. A series of Best Available Control Measures (BACM) are being evaluated by the Quantification Settlement Agreement (QSA) Water Transfer mitigation program, which was created under a 2003 agricultural-to-urban water transfer agreement involving the State of California, the Imperial Irrigation District, Coachella Valley Water District, and the San Diego County Water Authority. The work of determining these best strategies will be paid for by the QSA Joint Powers Authority. The Phase I Plan involves coordination among Imperial Irrigation District, Imperial County Air Pollution Control District, South Coast Air Quality Management District and other agencies to ensure that the latest information about how lakebed exposure may affect air quality is included in the development of BACM pilot projects.

In order to provide ample time for public input into this plan, the SSMP will schedule several regional workshops to solicit input from community members and stakeholders as well as provide necessary time for general public comment. This process will be announced via the program's website http://resources.ca.gov/salton-sea/.

Salton Sea Elevation and Exposure Modeling

A key issue at the Salton Sea is exposure of previously submerged lakebed, known as playa, as the lake surface shrinks. This playa exposure is subject to wind erosion and can be a source of fine airborne dust smaller than 10 micrometers, known as particulate matter 10, or PM10; as well as a source of PM 2.5. The dust is a significant health hazard and can contribute to respiratory illness in humans. It can also damage agricultural crops and wildlife and harm the region's tourism industry.

Understanding the extent, type and location of the exposed playa is important in developing a program to address playa emissivity. There also are regulatory requirements to provide an emission inventory, the creation of which demands an understanding of the extent of exposure possible over the course of the Phase I Plan.

The following is a brief explanation of the process used to create the playa exposure assumptions included in this 10-year plan.

Hydrology Inflow Modeling

As part of the initial environmental evaluation of the Imperial Irrigation District Water Conservation and Transfer Project (QSA water Transfer), the Salton Sea Accounting Model (SSAM) was used to estimate inflows and salt concentrations at the lake for the up to 75-year term of the QSA Water Transfer. This evaluation resulted in a series of mitigation measures designed to address water quality and to maintain the salinity trend at the lake. The measures also had a secondary effect of reducing the water elevation decline at the lake.

In 2012, in response to concerns over the results of the previous modeling, the Salton Sea water inflow and salt balance projections were reevaluated using the Salton Sea Analysis model (SALSA), originally developed in 2006 for the California Department of Water Resources' Salton Sea Ecosystem Restoration Program's environmental documentation. The SALSA model was integrated into the GoldSim modeling platform to provide an interface that would more easily allow for alternative scenario comparisons, allow for customized simulations, and provide for a stochastic simulation mode to evaluate uncertainty. The revised model results were compared/correlated with the additional years of measured elevation data available from 2003 to 2012 (latest available information). Since then, Imperial Irrigation District (IID) has revised the model based on new data and those revisions are included in the exposure projections presented here. Since there is some difference of opinion on the results of the latest hydrology, the State will evaluate the hydrologic model, compare the results with earlier versions and make it available for review as part of the preparation of the SSMP.

Along with the original parameters of the model (agricultural return flow water, mitigation water delivered to the lake, precipitation, groundwater inflow from the Coachella Valley, evaporation, etc.), the revised model has inputs for water use by the Species Conservation Habitat Project and for water-dependent air quality mitigation. The water demands for the habitat and water-dependent air quality mitigation components are determined based on surface area, evapotranspiration rates, total dissolved solids concentrations, and flow-through volumes. These variables can be manipulated in the model inputs to mimic various management scenarios. The various assumptions integrated into the model will be provided to stakeholders as part of the review of the hydrology model. The State will complete a revision/calibration of the SALSA hydrology model. Additional field data will be integrated into the model.

Initial conditions for the model are from the United States Geological Survey (USGS) stream gauge data from December 31, 2012, which measured the lake elevation at -231.35 feet below mean sea level (MSL) based on the North American Vertical Datum of 1988 (NAVD88). The baseline for the salinity concentration is approximately 52.7 parts per thousand (ppt) based on the average of samples taken by the U.S. Bureau of Reclamation at three fixed locations in the lake in February 2012.

A Monte Carlo simulation (stochastic process) is used to provide multiple runs with changes to multiple variables, based on their probability distribution. The runs are then statistically analyzed and an end-of-year Salton Sea water elevation is calculated for each year. The inflow data is combined with lakebed topography (bathymetry) to estimate playa exposure around the lake.

Salton Sea Bathymetry

The revised Salton Sea bathymetric data was developed by consultants from a variety of sources including light detection and ranging (LIDAR) survey technology and boat-based acoustic sonar imagery. This data was manipulated to develop bottom contours for the lake and immediate shore area. It also was used to estimate sediment depth and composition around some areas of the lake. Data relating to the bathymetric model was converted to NAV88 using the National Geodetic Survey's VERTON calculator and a standard conversion factor of 2.113 feet.

In order to evaluate the accuracy of the playa exposure model, satellite (Landsat 5, 7 and 8)imagery of the Salton Sea was captured and a spectral water index was used to identify areas covered by water. This was then compared to the results of the playa exposure evaluation model and the existing data from the USGS gauge to compare the results. In general, the results were comparable. But the evaluation identified differences in areas around the bays of the New and Alamo rivers. This is likely the result of errors in the bathymetric data caused by limitations of acoustical sonar data in shallow water areas (while these areas are currently dry, portions were flooded with shallow water during the sonar survey). The bay areas that were exposed in 2016 have been included in the exposure acreage, and the revised hydrology will evaluate the issue and determine if the bathymetric data need to be further adjusted. This information will be included in the revised hydrologic model review process.

Salton Sea Playa Exposure

Based on the above data, Table 1 summarizes the predicted year by year playa exposure from late 2018 to 2028, which totals approximately 48,300 acres. Additional hydrologic analysis will be completed to include potential impacts from the DCP that may revise inflows to the lake, which in turn will cause changes to the exposure profile. Revisions to the hydrology will change the estimated exposed acreage. It is likely that revisions will be made on an annual basis, as new information becomes available, and the revisions will be made available for review by stakeholders.

The original estimates for total playa exposure from the QSA water transfer were approximately 45,000 acres, and the model had the lake stabilizing in approximately 2035. The environmental documentation for the QSA recognized that the amount of exposure might change, and included requirements in the air quality mitigation program that additional modeling be conducted to further evaluate exposure.

Table 1. 2018–2028 Annual Exposure (Acres/Year)

YEAR	ACRES
2018	3,500
2019	4,200
2020	5,000
2021	5,600
2022	5,500
2023	5,300
2024	4,900
2025	4,300
2026	3,900
2027	3,300
2028	2,800
TOTAL	**48,300**

The exposure projections currently listed for the 10-year period differ from the projections for the original 2003 and later environmental document prepared as part of the QSA Water Transfer. As was noted previously, the State will evaluate the latest hydrology data and make the results of that evaluation available for review. There will be periodic comparisons of the actual playa exposed against what the model predicts will be exposed.

The SSMP Phase I Plan will be implemented within the exposed areas on the south and north ends of the lake. Some of the exposed area may not be emissive and will not require action from the Phase I Plan. The implementation process for the Phase I Plan is outlined in the *Implementation* section of this document.

Salton Sea Salinity

One of the measures incorporated into the QSA Water Transfer mitigation program was the revised Salton Sea Habitat Conservation Strategy, which required delivery of 800,000 acre feet of water to the Salton Sea to maintain the salinity trend at the lake. The delivery of this water mitigates to a large extent the decline in elevation of the lake. Delivery of this so-called “mitigation water” ends December 31, 2017.

The original and revised SALSA models calculate the salt concentration for the lake based on a simple mass balance algorithm. Salinity was modeled and then compared with measured salinity data from the U.S. Bureau of Reclamation’s salinity surveys conducted in February 2012. The model estimates that the salinity of the lake will be approximately 63.4 parts-per-thousand (ppt)at the end of 2018, and approximately 153.1 ppt in 2045. The most recent measurements of salinity (Reclamation 2016) recorded slightly over 59 ppt, which is higher than some of the model predictions.. Additional modeling will be conducted to confirm salinity trends and show any difference between the modeled and measured salinity. While the salinity projections may change based on the modeling, current projections can still be used for planning purposes.

Phase I – Background

Phase I is designed to address playa exposure by developing habitat or dust suppression projects on exposed playa. The location of habitat projects will be determined primarily based on site logistics such as water availability, soil suitability, and compatibility within the overall habitat landscape. If the primary objectives are met, location of habitat will be further informed by emissivity potential of the playa. Determination of playa emissivity will drive the location of the dust suppression projects. The development of new methods for evaluating emissivity is part of the QSA Water Transfer Air Quality Mitigation Program and the Phase I Plan. The process for determining more advanced methods of measuring emissivity is an ongoing process that is being coordinated with the two local air districts and the California Air Resources Board. More detail regarding measurement of emissivity is included in the *Air Quality Planning and Implementation* section of this document.

The projected playa exposure acreage is based on data from IID's revised hydrology model and will be reviewed by the State and other stakeholders. Figure 1 (all figures are contained in Appendix 1) illustrates the projected lake elevation in 2003, 2018, 2023 and 2028. The exposed playa acreage included in the Phase I Plan is depicted as shaded areas (zones) on the north and south end of the lake. Figures 2 and 3 are of playa exposure at the New River. Figures 4 and 5 depict exposure at the Alamo River, and Figure 6 depicts exposure at the north end of the lake. For graphical and design development purposes, the area encompassed in the Phase I Plan is divided into three increments of playa exposure by year: 2003–2018; 2018–2023 (green shading); and 2023–2028 (blue shading). However, the Phase I Plan addresses annual exposure of playa areas, as noted in Table 2, starting in 2018. The habitat projects will be concentrated in the 2018–2023 and 2023–2028, exposure zones. BACM pilot projects and the water management ponds will be located in the 2003–2018 exposed zone because they require exposed playa, and the water management ponds are located to facilitate gravity flow. Appendix 4 includes a preliminary implementation schedule that will be updated as design advances.

Table 2 summarizes the projected exposure and the amount of treatment of exposed emissive playa on an annual basis. There is lag time between playa exposure and construction of habitat or dust suppression techniques. This delay accounts for the seasonal elevation change of the lake (water elevations during a given year vary based on seasonal changes in inflow volumes), wave action wetting the exposed playa, and desiccation of the playa soil after exposure. Initial evaluations by the air quality management program suggest that the lag time is approximately 1.5 years to two years. A two-year lag time will be used for the purposes of developing annual target numbers. There will be periodic calibrations to assure that the predicted exposure is accurate.

Table 2. 2018–2028 Exposure and SSMP Phase I Projected Construction

YEAR	EXPOSED ACRES	PROPOSED CONSTRUCTION
2018	3,500	500
2019	4,200	1,300
2020	5,000	1,700
2021	5,600	3,500
2022	5,500	1,750
2023	5,300	2,750
2024	4,900	2,700
2025	4,300	3,400
2026	3,900	4,000
2027	3,300	4,000
2028	2,800	4,200
TOTAL	**48,300**	**29,800**

Table 2 notes more exposed playa area than proposed constructed area. Phase I concentrates on the north and south ends of the playa where the exposure is more pronounced. The proposed construction acreage is all of the shaded areas noted in Figures 1 to 6. The additional exposed area is primarily along the east and west sides of the lake. These areas are outside of the backbone water management infrastructure and will require additional development of water sources to be converted to habitat areas. These areas may require dust suppression methods to address emissions.

Some exposed areas around the lake may not require treatment, as they will be non-emissive or used for some other purpose, such as access for renewable energy projects or agriculture.

The Phase I Plan includes many of the concepts identified in the *Salton Sea Restoration and Renewable Energy Initiative* (Initiative) developed by IID and Imperial County in 2015 and revised in the IID's Backbone Infrastructure Concept Design memo of August 2016. Though the Initiative was developed primarily as a potential solution for exposed playa areas on the south end of the lake, the concept can also be applied to other areas around the lake. Phase I will incorporate two priority elements of the Initiative: 1) maintaining access for the development of renewable energy (primarily geothermal), and 2) incremental construction based on playa access and funding availability. The Torres-Martinez Desert Cahuilla Tribal nation (Torres) has developed plans for several projects on the north end of the lake that will be a part of Phase I. Habitat design will be informed by State and federal wildlife agencies, as well as academic and non-profit partners.

Dust suppression projects will be coordinated with the *Salton Sea Air Quality Mitigation Program* (IID/JPA July, 2016), the Imperial County Air Pollution Control District (ICAPCD), the California Air Resources Board (CARB) and the South Coast Air Quality Management District. The State will continue to coordinate with the Salton Sea Authority

(SSA), the Water Transfer Joint Powers Authority, IID, and ICAPCD on the development of BACM pilot projects per Imperial County's recent request for letters of interest from affected landowners and the SSA's Natural Resource Conservation Service grant process. The *Air Quality Planning and Implementation* section of this document provides additional detail.

To expedite Phase I, the SSMP design team will include State staff and outside consultants developing the design criteria for the water backbone infrastructure, as well as habitat and dust suppression projects at the north and south end of the lake. The team will work closely with State agencies, IID, SSA, SSMP Committees, the QSA water transfer agencies, and other stakeholders during the development of the project plans.

SB 839 (Statutes of 2015-16) grants the Department of Water Resources design/build contracting authority for the SSMP. This authority will expedite and provides a more flexible design and construction process as well as potentially reducing project costs. Design criteria and preliminary construction design will be used to develop and advertise for a design/build consultant to implement Phase I projects.

Phase I Planning and Design

The State of California will use the amount/rate of playa exposure (subject to lag time and other constraints) to plan and implement each year's annual increment of construction of projects in the Phase I Plan. Each year at a specific timeframe (likely December), the State will determine actual playa exposure using methods similar to those described above for evaluating the playa exposure model's accuracy and adjust the hydrology model if needed. The evaluation will include measuring the emissivity and potential for toxic emissions of the playa to determine if the exposed area requires mitigation. The Phase I Plan will require a certain amount of adaptive management, as there may be seasonal fluctuations at the lake or changes in annual exposures that may require adjustments to Plan implementation.

The exposed area to the west of the New River (Figures 2 and 3, Appendix 1) is identified as the first site to be developed because much of the area was included in the Species Conservation Habitat Project (SCH) environmental documentation and will not require significant additional regulatory compliance effort. The second area developed will be to east of the New River (Figures 4 and 5, Appendix 1). This area will be developed after construction of the SCH is substantially completed. (The SCH serves as both habitat and the water management pond for the SSMP projects on the east side of the river.) Additionally, the Torres project located on the north end of the lake will be developed (Figures 10 and 11, Appendix 1). Permitting work on other areas is underway and will be completed prior to planned construction dates,. The State is currently trying to determine the most expedient process for regulatory compliance and will make every effort to utilize existing California Environmental Quality Act and permitting documentation in that process.

Areas around the Alamo River (Figures 6, 7, 8, and 9, Appendix 1) will be developed later in the Phase I Plan, as they involve more access issues associated with geothermal development. The Red Hill Bay project is underway on the west side of the Alamo River (Figures 6 and 7, Appendix 1) and will be completed in 2017.

The development of the Phase I Plan is divided into water backbone infrastructure, habitat, and air quality components, as described in the following sections.

Water Backbone Infrastructure Design

The water backbone infrastructure (backbone) is part of the *Salton Sea Restoration and Renewable Energy Initiative* (IID 2015 and revised 2016), and is designed to supply agricultural return flow water for dust suppression, habitat projects and other potential land uses on the south end of the lake. The backbone will consist of a series of outlets from the Alamo and New rivers that supply agricultural return flow water to water management ponds located along the edges of the lakeshore adjacent to the rivers (Figure 1, Appendix 1). The water management ponds will include an inlet for Salton Sea water. The two water sources will be blended in the water management pond, and the resulting brackish water will be used for the habitat areas. The project water distribution system will deliver the brackish water from the water management ponds for habitat and dust suppression.

The Audubon report *Quantifying Bird Habitat at the Salton Sea - Informing the State of California's Salton Sea Management Plan*, October, 2016, details salinity levels tolerated by various avian species.. The Audubon report will help determine specific locations and salinity for the various habitat areas based on target species. Location of the various habitat types will be developed as part of the work planning effort that begins in March 2017.

The backbone is divided into sections based on the agricultural return flow water source. The New River is depicted in Figures 2 and 3 in Appendix 1, and the Alamo River is depicted in Figures 4 and 5 in Appendix 1. The river sections are further subdivided based on the location of the playa that will be served by each section, with the New River divided into east and west, and the Alamo River divided into north and south.

The State team (which includes various SSMP Advisory Committees), along with IID, the QSA Water Transfer agencies, and other stakeholders, will collaborate to develop design and construction standards for the Phase I water backbone delivery system. IID will be involved in the review and approval of the backbone system, as it will be connected to IID infrastructure. The criteria for the backbone water delivery system may include the following:

Geotechnical Evaluation

Utilizing existing data where practical, determine suitable substrate materials available for berm foundation and berm construction. This will be a limited evaluation similar to what was done for the SCH.

River Delivery System

Evaluate the construction and operation cost of a pump system versus the development of a river check dam structure to facilitate gravity flow from the river.

Identification of Existing Habitat Areas

Evaluate existing habitat and vegetation along the eastern side of the lake to determine if portions can be stabilized or enhanced (Figures 8 and 9). Vegetation, ponded water, and saturated soils in these areas are likely caused by natural or artificial blockage of the agricultural drains in the area. Consider the potential for water quality issues (selenium) in these areas and the potential for impacts to desert pupfish.

Design Criteria

Determine process for assessing the value of engineering of projects with an emphasis on developing standards that compare project longevity against the costs of building and maintenance.

Design-Year Storm

Determine the appropriate design year storm and develop flood control measures to accommodate that flow. The evaluation may include the development of sacrificial berms, cutouts or armoring of the channel to pass large volumes of water from the river channel to the Sea.

Channels

Evaluate the potential for pipe systems instead of open channels for the distribution system. Evaluate size, structure and composition (lined vs. unlined) of the distribution system.

Water Management Ponds

Determine the final structure, size, and location of the water impoundment ponds. Determine sediment control system. Evaluate berm construction parameters (material, compaction etc.).

Easement and Lease Protocols

To the extent practical, develop standardized easement and lease agreements for IID parcels and other parcels that will be used for SSMP projects.

Develop Contingency Plan for Funding Shortfalls

Develop a program to prioritize certain aspects of the Phase I Plan if funding is not available for the complete implementation. Considerations will include human health concerns, potential impacts to agricultural activities, and ecosystem management.

Operation, Maintenance, and Monitoring

Develop cost estimates for operation, maintenance, and monitoring activities associated with constructed facilities. The State will be responsible for implementing the operation, maintenance, and monitoring of the project. The DOI/CNRA MOU (Appendix 2) identifies federal funding for these activities for a ten-year period.

Compatibility with IID Draft Water Transfer Habitat Conservation Plan

The Phase I Plan will be developed to be compatible with the mitigation measures for desert pupfish, marsh birds, and other Salton Sea or drain species included in the draft Habitat Conservation Plan developed for the water transfer mitigation program.

Compatibility with IID/JPA Water Transfer Air Quality Mitigation Program

The State will coordinate with IID and their consulting team, ICAPCD, Water Transfer Joint Powers Authority, and South Coast Air Quality Management District (SCAQMD) to integrate compatible BACM pilot projects into Phase I of the SSMP. The State will coordinate with Water Transfer Joint Powers Authority partners to implement its air quality mitigation program. Efforts are underway to determine if accelerating portions of the air quality mitigation program are warranted. This coordination will be conducted through the existing Water Transfer Joint Powers Authority budget process and the existing mitigation development program for the water transfer.

This process will follow the four-step air quality mitigation guidelines outlined in the QSA Water Transfer environmental documentation.

Compatibility with Renewable Energy Projects

With the notable exception of the Red Hill Bay project, the initial projects described for Phase I are either outside or at the edges of the Known Geothermal Resource Area (KGRA). However, the remainder of the Phase I projects are within this zone. The State will continue to coordinate with the geothermal developers, regulatory agencies, and land owners to design the SSMP projects to minimize or eliminate conflicts with renewable energy development. Currently, the Phase I design assumes access provisions will be accommodated by the existing drain outlet corridors spaced approximately every half mile along the southeast portion of the lake. This may change as development proceeds.

Phase I – Implementation

Water Backbone Infrastructure Implementation

The 2018–2023 water management ponds will be the first facilities constructed as part of the water backbone infrastructure, followed by the habitat and dust suppression projects associated with each individual pond. The water management ponds likely will be constructed at the highest ground elevation on the playa as is practical to facilitate gravity delivery of water to the habitat and dust suppression water distribution system. The ponds will provide a blend of agricultural return flow water and Salton Sea water to the habitat and water-dependent dust-suppression project areas in the 2018–2023 zone exposure area. A second water management pond will be constructed in each section later in the Phase I Plan progression after the air quality and habitat projects in the 2018–2023 playa exposure zone have been started (*Appendix 4: Project Schedule*). Construction of the second water management pond will be completed prior to playa exposure in the 2023–2028 playa zone so that it can be used to supply water to habitat and air quality projects in that zone. To the extent practical, the water management ponds will be designed and constructed to provide fishery habitat.

Initial construction will start in the area to the west of the New River (Figures 2 and 3, Appendix 1) to take advantage of existing permits and authorizations. As the construction design for the area west of the New River is completed, the environmental documentation will be finalized for the remaining sites, and implementation will follow on the east side of the New River (Figures 4 and 5, Appendix 1) and the north end of the lake (Figures 10 and 11, Appendix 1). As an access plan for renewable energy is developed on the areas around the Alamo River, the water management ponds will be sequenced, with the initial pond providing water to the 2018–2023 zonecompleted first, and the second pond completed as the lake continues to recede, exposing more playa.

The habitat and dust suppression project distribution system will consists of a series of channels or pipelines that will distribute water from the water management ponds to the various habitat and dust suppression cells. The system will be designed to provide access corridors for renewable energy development. The State will coordinate with IID, Imperial County, geothermal developers, and others to assure that adequate access is maintained.

Habitat Descriptions

The State has partnered with numerous state and federal agencies along with the SSA, IID, Imperial County, Audubon, the University of California, and other academic organizations to develop and fund habitat and dust suppression projects around the Salton Sea.

The State also contracted with Audubon to develop the Audubon technical report, *Quantifying Bird Habitat at the Salton Sea* (Audubon, November 2016). The report identifies and quantifies the current acreage of each habitat type comparing it to the amount of habitat in previous years, and will be used to guide habitat program design. It should be noted that development of the habitat types listed below (with the possible exception of playa habitat) also will provide adequate dust suppression in those areas. The different habitat types identified by the report, their importance, and their potential development opportunities are as follows:

Permanent Wetlands with Vegetation

This habitat type is primarily located around the Salton Sea where the agricultural drains back up and flood or where land is deliberately flooded for habitat. Vegetation varies from invasive species such as tamarisk to cattails and bulrush. It is unclear if this habitat type will persist or be recreated at the Salton Sea. The current selenium bioaccumulation mitigation process is to maintain salinity of the various habitat types at a level that precludes or significantly reduces the growth of vegetation within the habitat areas. The SSMP planning process will evaluate the existing areas and the potential for developing additional areas.

Dry Playa Habitat

Exposed dry playa provides some specific nesting and general foraging habitat value, particularly near the water shoreline. This habitat type will tend to follow the receding shoreline and will likely always be part of the Salton Sea ecosystem in areas immediately upslope of the existing shoreline. However, as the salinity of the center lake area increases, it could change the invertebrate population, thus reducing the forage opportunity for the lake's existing bird population.

Therefore, additional playa habitat might be created or marginal habitat may be enhanced with small woody debris and sparse vegetation to further promote nesting areas. These areas could be incorporated into the shallow habitat cells by fluctuating water elevations on the shoreward edge of the cell, or less emissive playa areas might be identified and developed as habitat.

Mudflat, Sandflat, and Beach Habitat

This habitat type is the water/land interface (from wet substrate to less than 0.5 feet of water depth) along the lake shoreline. This habitat type is likely to continue at the lake as the water elevation decreases. The beach areas are normally high in invertebrate populations (insect and other arthropods) and provide foraging habitat for birds, but the extent and quality of the habitat may be degraded by increased salinity. As salinity increases, the invertebrate population may change from less salt-tolerant species to more salt-tolerant species, though it is unclear how, or if, this colonization will occur. Changes in the invertebrate population in turn may impact bird species with specific diets.

The Red Hill Bay project, currently under construction, will contain areas of this habitat type as a foraging area for shore and wading birds. The SCH will have areas of this habitat type along the shallow shoreline and around some of the island structures. The

SSMP shallow water habitat will contain areas of this habitat type along the shallower end of each pond.

Mid- and Deep-Water Habitat

The Audubon report described mid-water and deep-water as two different habitat types; they are combined here because it may be easier from a construction and management perspective to have both habitat types in one cell. The water depth in this habitat ranges from half a foot to more than 6 feet in depth. This type of habitat provides forage and refuge for fish and marine invertebrate populations. While there will be a considerable amount of mid- to deep-water habitat at the lake, the increases in salinity will likely render this habitat unsuitable for fish reproduction.

The areas noted below are designed, or could be modified, to provide initial mid- and deep-water habitat.

Species Conservation Habitat Project (SCH)

SCH is specifically designed as fish and avian habitat and will have areas that are more than 6 feet deep to accommodate a sustainable fishery. The project is located to the immediate east of the New River on exposed playa. It will be supplied water from an adjacent mixing basin that receives agricultural return flow water from the New River and saline water from the Salton Sea.

Torres- Martinez Wetland Project

The Torres-Martinez project on the north end of the lake is a mid- and deep-water habitat that should be suitable for fish. This project and the SCH will be used to evaluate construction and operation techniques to inform later development of mid- to deep-water habitat.

Water Management Ponds

The water management ponds included in the water backbone infrastructure may also serve as habitat for fish. These ponds will have berms that are six feet or less above the ground surface and likely will not impound water much higher than five feet above the ground surface. However, much of the material to build the berms will be excavated from the interior of the management pond and the total water depth will be deeper.

Red Hill Bay

While Red Hill Bay is generally considered shallow water habitat, there will be some areas of deeper water within the ponded areas. Additional evaluation is necessary to determine if these areas will sustain fish populations.

Habitat Implementation

Habitat projects associated with the first water management ponds will be concentrated in the 2018–2023 playa exposure zone based on the annual exposure, although some habitat or dust suppression projects might be included in the lower elevations of the 2003–2018 playa exposure zone, depending on actual playa exposure and site logistics.

The Red Hill Bay and the SCH are located in the 2002–2018 playa exposure zone. Along with the planned water management ponds, they will cover portions of the 2003–2018 playa exposure zone as they dry, thus reducing or eliminating potential dust emissions from those areas. The State will work with ICAPCD and IID to locate BACM pilot projects in the 2003–2018 playa exposure zone to further reduce the potential for dust emissions. Additional habitat will be planned for the 2018–2023 and 2023–2028 exposed areas. To the extent practical, the SSMP will strive to provide multiple benefit projects that combine dust suppression with habitat enhancement and other positive benefits.

From approximately 2019 to 2021, the second series of water management ponds will be constructed on 2003–2018 exposed playa zone to provide water to the 2023–2038 playa exposure zone. Actual construction of habitat and dust suppression projects in the 2023–2028 zone will commence when portions of that area are dry enough to allow equipment access.

Air Quality Planning and Implementation

The SSMP air quality component is modeled after the IID/Water Transfer Joint Power Authority air quality mitigation program (*Salton Sea Air Quality Mitigation Program*, IID July 2016) for the Imperial Irrigation District Water Conservation and Transfer Project. The SSMP recognizes the four-step process outlined in the final EIR/EIS and concentrates on *Step 2 – Implementing a Research and Monitoring Program* to define the parameters of dust suppression needs and identify solutions, and *Step 4 – Implementing Feasible Dust Suppression Projects* (BACM pilot projects) at the Salton Sea.

The State's SSMP air quality mitigation program will include coordination with IID, Coachella Valley Water District, QSA Water Transfer Joint Powers Authority, SCAQMD, ICAPCD, and CARB to develop BACM and to further develop and implement the emission monitoring process. The *Salton Sea Air Quality Mitigation Program* (IID July, 2016) contains more details on the air quality mitigation effort.

The SSMP envisions a mix of both water-dependent and waterless dust suppression projects in all phases of the SSMP. Ongoing evaluations of the criteria for determining which dust suppression techniques will be used in specific areas will continue as the QSA Water Transfer Air Quality Mitigation Program and the SSMP are developed. Some of the techniques, such as enhanced vegetation, could be considered waterless measures if designed to intercept the groundwater level, but they would require surface water for establishment. Many of these techniques are currently being evaluated for efficacy and longevity in the 2003–2018 playa exposure zone. Most of the methods have not been in place long enough to determine longevity or durability, but evaluations will continue.

Water Dependent

The water-dependent dust suppression includes all water impoundment areas (both water management ponds and habitat) as well as vegetation enhancement techniques, and salt or surface crust formation areas. Currently, the SSMP design team is evaluating the potential for seasonal flooding of some areas to provide habitat during migration or nesting seasons, and then reduction of water levels to keep the surface near saturation, which should provide dust suppression. Vegetation enhancement requires some amount of water to irrigate the plant material and leach salts out of the upper portion of the root zone.

Salt crust formation requires some amount of water to form the crust and periodic inundation to stabilize the crust. Initial evaluations of naturally formed salt and surface crusts around the sea (DRI and IID PISWERL results) suggest that the surface crusting weakens with conditions of lower temperature and higher humidity (approximately December - March). More evaluation is needed to determine if the weakening of the crust is sufficient to cause those areas to fail stability testing. Additional evaluation of salt crusts and the development of better emissivity determination techniques, already underway as part of the QSA Water Transfer Mitigation program, will continue as part of the initial phases of the SSMP.

The following table summarizes the projected unit costs for water-dependent dust suppression methods. These costs will likely change as the evaluation process continues.

Table 3. Projected Cost for Water-Dependent Dust Suppression Techniques

DUST SUPPRESSION METHOD	COST PER/ACRE
Vegetation Enhancement	$9,000
Vegetation Swale	$17,000
Managed Vegetation	$25,000
Shallow Flood	$25,000
Brine Stabilization	$21,000

The State, IID, Torres-Martinez, and other landholders are also considering groundwater wells that tap the shallow aquifer to supply water to the enhanced vegetation areas. Much of this aquifer is a result of perched water from agricultural irrigation. While there are some concerns with water quality, this process may provide water to some areas that lack access to a surface water supply. The north end has the most potential for near-surface groundwater, but there are other areas where the techniques may be used. The costs for this dust suppression technique have not been developed. The IID/Water Transfer Joint Power Authority air quality management team is currently monitoring groundwater elevations in a number of sites around the lake.

Waterless

The waterless dust suppression techniques may require an initial application of water, but generally do not dependent on periodic application of surface water. Some of these treatments cost less than some water-dependent treatments, but may require more operation and maintenance. Projected unit costs for these methods are noted below. These preliminary cost estimates will change as more information is developed. Some of these methods are currently under evaluation for longevity and efficacy in several areas around the Salton Sea.

Table 4. Projected Cost for Waterless Dust Suppression Techniques

DUST SUPPRESSION METHOD	COST PER/ACRE
Surface Roughening	$400
Moat and Row	$14,000
Suppressants/Surface Stabilizers	$2,000
Gravel Cover (2 inch)	$36,000
Gravel Cover (4 inch)	$48,000

Projected Costs and Funding

Project Costs

Cost projections for the various components of the Phase I Plan have been developed with the best available information. Projected costs include planning and design costs that are concentrated in the first years of the plan. The developed designs will be used throughout the 10-year implementation of the Phase I plan. The estimates are based on developing habitat in all of the shaded areas (except for renewable energy access or other identified land uses). These projections will change as additional information becomes available on site logistics and on the actual costs of the initial projects. Costs for the Red Hill Bay project and the SCH are not included in the projected costs as they are funded under other sources.

Appendix 3 includes a cost breakdown based on unit costs for each year. Annual costs, constructed acreage and funding availability are summarized in the following table:

Table 5. Projected Annual Cost, Acres Constructed, and Funding of SSMP Phase I 10-Year Plan

YEAR	NEWLY EXPOSED ACRES	PROPOSED CONSTRUCTION	PROJECTED TOTAL COST	AVAILABLE FUNDING	BALANCE
2018	3,500	500	$10.0 M	$10.0 M	($0.0) M
2019	4,200	1,300	$27.0 M	$27.0 M	($0.0) M
2020	5,000	1,700	$35.5 M	$35.5 M	($0.0) M
2021	5,600	3,500	$43.5 M	$7.5 M	($36.0) M
2022	5,500	1,750	$33.5 M	-	($33.5) M
2023	5,300	2,750	$35.5 M	-	($35.5) M
2024	4,900	2,700	$34.0 M	-	($34.0) M
2025	4,300	3,400	$42.5 M	-	($42.5) M
2026	3,900	4,000	$47.5 M	-	($47.5) M
2027	3,300	4,000	$37.5 M	-	($37.5) M
2028	2,800	4,200	$36.5 M	-	($36.5) M
TOTAL	**48,300**	**29,800**	**$383.0 M**	**$80.0 M**	**($303.0) M**

Expenditure Reporting and Process Accountability

CNRA will report each fiscal year on prior year expenditures made for SSMP implementation, availability of funds for future expenditures, and changes to the SSMP program.

Existing Funding

Water Bond Funding (Proposition 1)

Proposition 1, the $7.5 billion water bond passed by California voters in 2014, provided $80.5 million to fund development, permitting, and implementation of the SSMP. This funding is available over the next several years. The expenditure of these funds is reflected in the existing funding column of Table 5 above.

Wildlife Conservation Board Funding for SSMP Projects

The California Wildlife Conservation Board (WCB) approved a $14 million grant in November 2016 to help fund the SSMP's SCH. The grant, along with approximately $21 million from Proposition 84, will fund the construction of an approximately 640-acre aquatic habitat area to support a fishery and provide habitat for Salton Sea avian species.

In 2013, the WCB funded the design and construction of the electrical power distribution system through a grant to IID. The WCB also awarded an approximately $1.85 million grant to the IID to begin work on the Red Hill Bay project, a joint venture project with IID, U.S. Fish and Wildlife, Sonny Bono Salton Sea National Wildlife Refuge, and the State of California.

U.S. Department of Agriculture

The U.S. Department of Agriculture (USDA) recently approved the Salton Sea Regional Conservation Partnership Program to address habitat, air, and water quality on agricultural lands around the Salton Sea. The SSA will administer the $7.5 million grant for water conservation, wetland creation, and air quality mitigation. The wetland creation and air quality management portions of the grant will be used to develop pilot BACM projects and wetland habitat projects on parcels with an agricultural history.

The USDA funding is not included in the projections above. As the program is finalized and grantees are identified, the funding will be accounted for in the annual expenditure reporting process. The success of this grant program is intended to be a proof-of-concept for potentially larger-scale USDA funding. This program could be expanded to include non-agricultural lands at the Salton Sea.

Potential Funding Sources

Water Transfer Joint Powers Authority

The State will work with the members of the Water Transfer Joint Powers Authority to determine if funding included in the existing mitigation program can be utilized for SSMP projects that further the goals of the Water Transfer mitigation program. Currently the

State and IID are exploring acceleration of air quality mitigation efforts that will benefit both programs. The cost of the additional research into determining playa emissivity and methods that suppress dust are projected to range from $5 million to $8 million..

DOI/CNRA Memorandum of Understanding Funding

The MOU between DOI and the CNRA identified a framework for collaboration at the Salton Sea. The MOU calls for $30 million in federal funding over the next ten years for activities associated with the SSMP.

The amendment to the MOU further defines State and federal responsibilities related to dust emissions from the exposed playa at the Salton Sea.

Philanthropic Organizations

The Water Funder Initiative, a collaborative of leading philanthropic organizations, has committed to raise $10 million over the next five years to support implementation of a comprehensive plan to protect public health and the environment and promote renewable energy development at the Salton Sea.

Water Resource Development Act Funding

The Water Resources Development Act (WRDA) of 2016 maintains the $30 million funding identified in the 2007 WRDA bill. The U.S. Army Corps of Engineers (Corps) administers the part of the program pertinent to the Salton Sea. The 2016 Act recognizes the SSA as a preferred partner for funding agreements with the Corps. The 2016 Act also streamlines the methodology for the development and approval of related projects. This funding has not been appropriated.

USDA Partnerships and Funding

After successful implementation of the USDA/SSA grant noted above, additional funding may be possible through development of a partnership between the USDA and the SSMP using the Farm Bill (the Watershed Protection and Flood Prevention Act [PL566]). This program could address air quality, water quality and habitat on non-agricultural lands on and adjacent to the Salton Sea playa. This could include allowing public lands that endanger public health to be included in the USDA's Reserve Enhancement Program or the Environmental Quality Incentives Program.

Additional State and Local Funding

Funding and in-kind support may be available through future state appropriations, water agencies, local infrastructure financing districts, geothermal leases, and other public and private sources. The State will describe its ongoing evaluation of potential funding sources in the annual expenditure reporting process

Development of Planning Criteria for Additional Phases of the SSMP

The State is committed to continuing the SSMP process and will also work with the SSMP Science Committee, other committees, and stakeholders to evaluate concepts for later phases of the SSMP. The evaluation will include a hydrologic analysis to estimate inflows to the lake and water quality concerns that might impact both the current and later phases of SSMP. Specific areas of concern for evaluation by the Science, Project, and Long Range Planning Committees include:

Determine Habitat Functional Values

State and federal wildlife agencies, Audubon, and other stakeholders, in cooperation with the Science Committee, will develop additional analysis to evaluate the carrying capacity of created habitat versus existing habitat.

Determine Water Use

There is no issue with water availability for the Phase I Plan. However, water demands for the later phases must be calculated and compared to the revised inflow models to determine water availability in the longer term.

Salinity

The Science Committee will work with the stakeholders to evaluate the impact of salinity on the various habitats at the Salton Sea. While a range of salinity has been established for the habitat areas, the Science Committee will evaluate that range to determine its effectiveness.

Water Quality in Constructed Habitat

The Science Committee will evaluate the potential water quality issues associated with the constructed habitat. The water quality parameters will include an evaluation of methods to control nutrient concentrations, metal concentrations, biological/chemical oxygen demand, and other water column constituents. The evaluation of various water quality treatments (treatment wetland cells, bioreactors, algal uptake, and chemical treatments) may also be evaluated.

Selenium Management

Currently, the management of selenium bioaccumulation is based on managing salinity to reduce or eliminate vegetation, thus interrupting, or at least restricting, the bioaccumulation pathway. The Science Committee will look at other potential methods that might be more effective in selenium management.

Development of Best Available Control Measures

The State will work with IID and ICAPCD to integrate the development of BACM into the habitat design.

Harbor and Ancillary Facilities

Evaluate the potential for reconnecting, inundating, or treating harbors and boat docks along the east and west sides of the lake as part of the SSMP, and for reducing odor and vector issues. In some cases, this could include making the harbor functional for shallow draft boats.

Water Import Projects

Before consideration by the SSMP, the State will require that any water import project proposal include an engineering and logistic feasibility study conducted on behalf of the proponent by an accredited or licensed engineering, planning, or equivalent organization recognized by the State of California. The criteria for consideration of any such proposal will include the following requirements: (1) identify planning, development, construction, and operation costs, and (2) identify the funding source for each. Specifics on how the proposal would address salinity and other water quality concerns will also be required. Schedules detailing the phases and funding needs of each project must be provided.

Adaptive Management, Monitoring, and Contingency Planning

Adaptive management will be fundamental to the success of the SSMP. The adaptive management program will include review by the SSMP Science Committee, the other SSMP committees and the Salton Sea stakeholders. The program relies heavily on the early development of projects (SCH, Red Hill Bay, and other areas) to test aspects of design, construction, and management. These early lessons learned will be valuable in the efficient and economic development of later phases of the SSMP.

An adaptive monitoring program is under development and will be implemented by the State. It will include the identification of a fish stocking program for the SCH (and later habitat), development of a monitoring and management program for existing avian and fishery habitat, and a water quality monitoring program. It is anticipated that a draft of the plan will be available in 2017. Additionally, the California Department of Fish and Wildlife is in the process of evaluating a potential wider-scale monitoring program for the lake that could be combined with the current U.S. Bureau of Reclamation monitoring efforts and ongoing efforts of others. The monitoring program will be developed in compliance with the USGS guidelines for the Salton Sea monitoring and will utilize existing data to the extent practical.

At this point, the Phase I Plan is not fully funded. The State will continue to monitor the existing and potential funding sources and measure those against the projected costs for the projects in the implementation plan. Adjustments may be required to the plan to maintain adequate dust suppression in some areas while delaying the construction of water infrastructure and habitat (the more costly components). The State will coordinate with the stakeholders as adjustments to the Phase I Plan are considered.

The development of this contingency process will be evaluated starting in 2018 and will be done in two- to five-year increments over the course of the Phase I Plan. As part of the initial tasks undertaken in Phase I, a series of specific metrics will be developed to help assess funding opportunities and match them against projected costs for Phase I.

Outreach

The State is committed to a transparent and open process in the development and implementation of the SSMP. To that end, a set of advisory committees has been formed that meet periodically to discuss specific topics. Those committees include a Science Advisory Committee and committees on air quality, long-range planning, and a public outreach committee. The Public Outreach Committee conducted a series of 13 public outreach meetings around the greater Salton Sea area from April to August 2016 to introduce the SSMP to the public and to solicit input on Salton Sea issues and concerns.

The UC Riverside and UC Irvine Salton Sea programs conducted a series of voluntary surveys of meeting participants (pre- and post-meeting) to gauge the effectiveness of the communication effort. Approximately 43 percent of meeting attendees participated in the surveys. Approximately 36 percent felt they had gained knowledge on the Salton Sea and indicated an increase in their belief that the State was actively addressing issues at the Salton Sea. When asked to prioritize the issues of concern at the Sea, they identified environmental health, public health, and nature as their top three concerns.

One of the things identified after the last series of meetings was the difficulty in contacting some communities and the need to have more robust environmental justice outreach. CNRA, with support from State Water Resources Control Board, developed a communication plan that addresses those concerns and will help guide future outreach efforts. The State is working with several outreach firms and is developing a social media outreach program.

In order to provide ample time for public input into this plan, the SSMP will schedule several regional workshops to solicit input from community members and stakeholders as well as provide necessary time for general public comment. This process will be announced via the program's website http://resources.ca.gov/salton-sea/.

Conclusion

As the Salton Sea shrinks for a variety of reasons, air quality in Riverside, Imperial, and surrounding counties suffers, because particulates small enough to be dangerous to human health are picked up by the wind from the exposed lakebed. Huge populations of resident and migratory birds are at risk, too, especially the fish-eating birds that depend upon the tilapia that will no longer be able to survive in the Salton Sea if it grows increasingly salty. Sustainable habitat and air quality management at the Salton Sea is critical for the protection of regional public and ecological health, as well as the management of a stable Colorado River supply for California.

This draft Phase 1 Plan aims to protect public health and wildlife by focusing on the north and south ends of the sea where playa exposure is expected to be greatest and availability of agricultural return flows facilitate lowest cost habitat and air quality project development. The draft plan also includes a process for identifying management strategies for implementation in later phases.

As inflows to the Salton Sea decline over the next decade, this 10-year draft plan aims to mitigate harm to communities and ecosystems. The State is committed to leveraging resources, coordinating with a multitude of other agencies, engaging stakeholders, managing adaptively and learning as much as possible from the wildlife habitat and dust suppression projects now or soon to be underway.

Appendix 1. Figures

Figure 1. Salton Sea Management Program Overview (2018–2028)

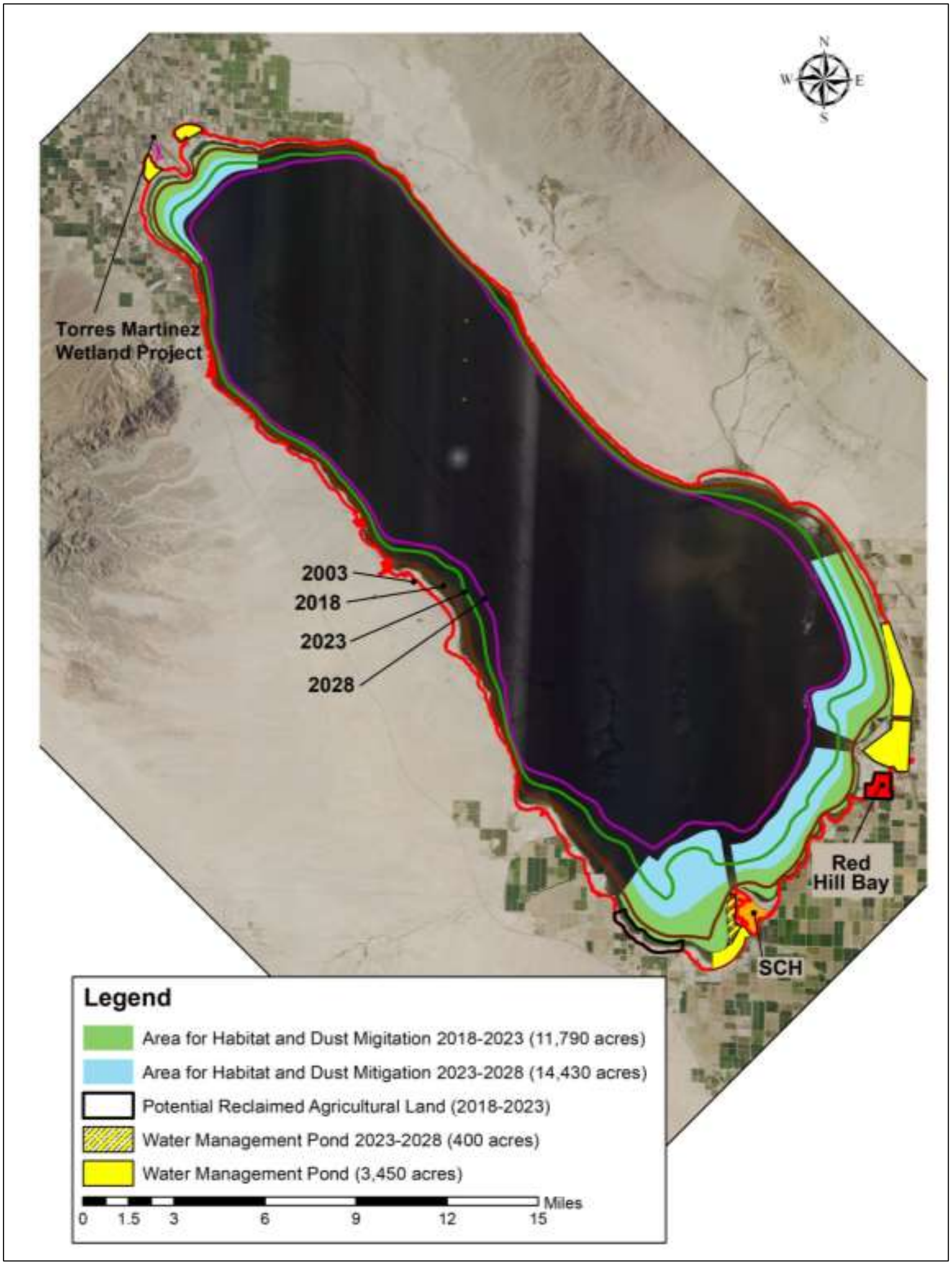


Figure 2. Salton Sea Management Program - SCH Phase 2 (2018-2023)

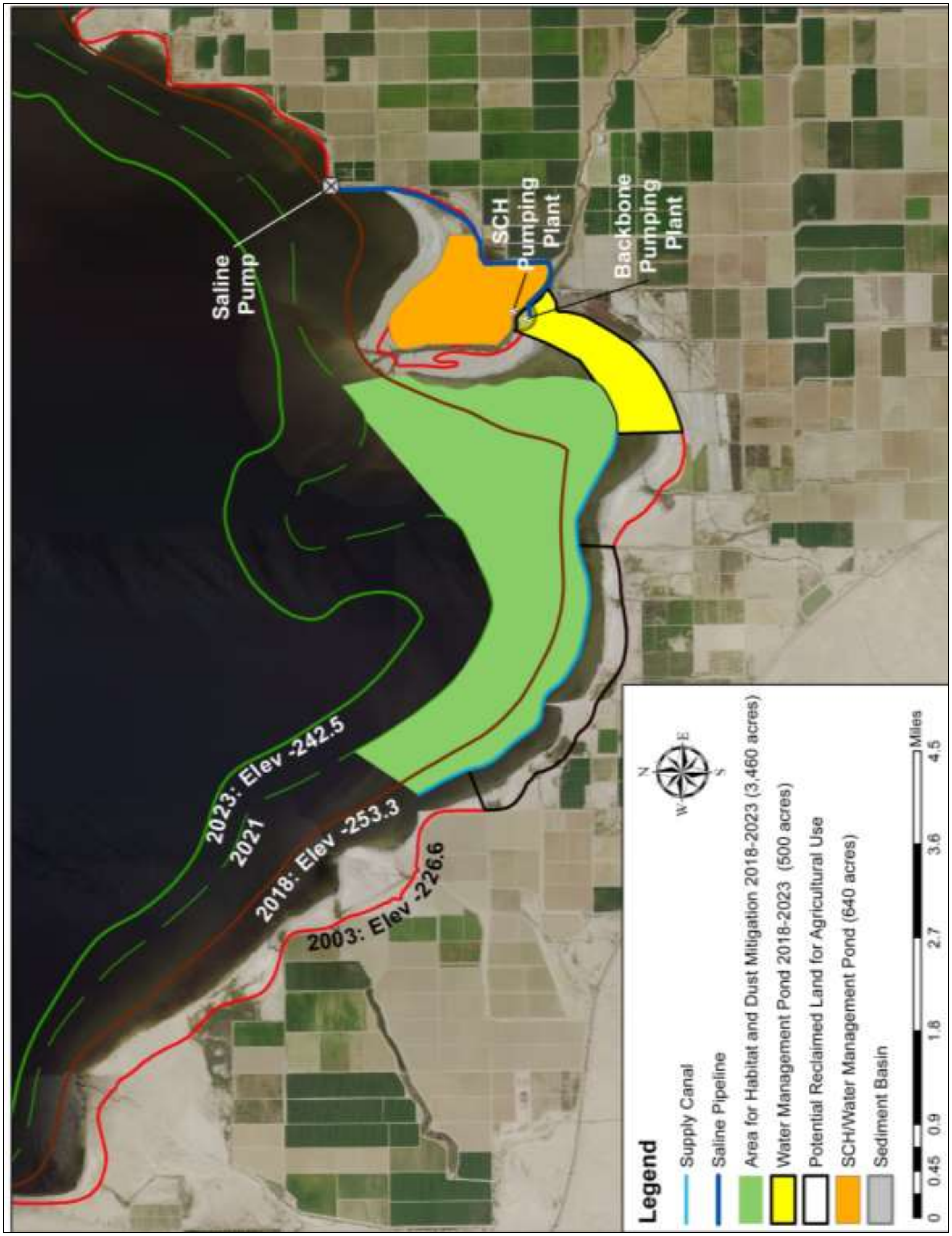


Figure 3. Salton Sea Management Program - SCH Phase 2 (2023–2028)

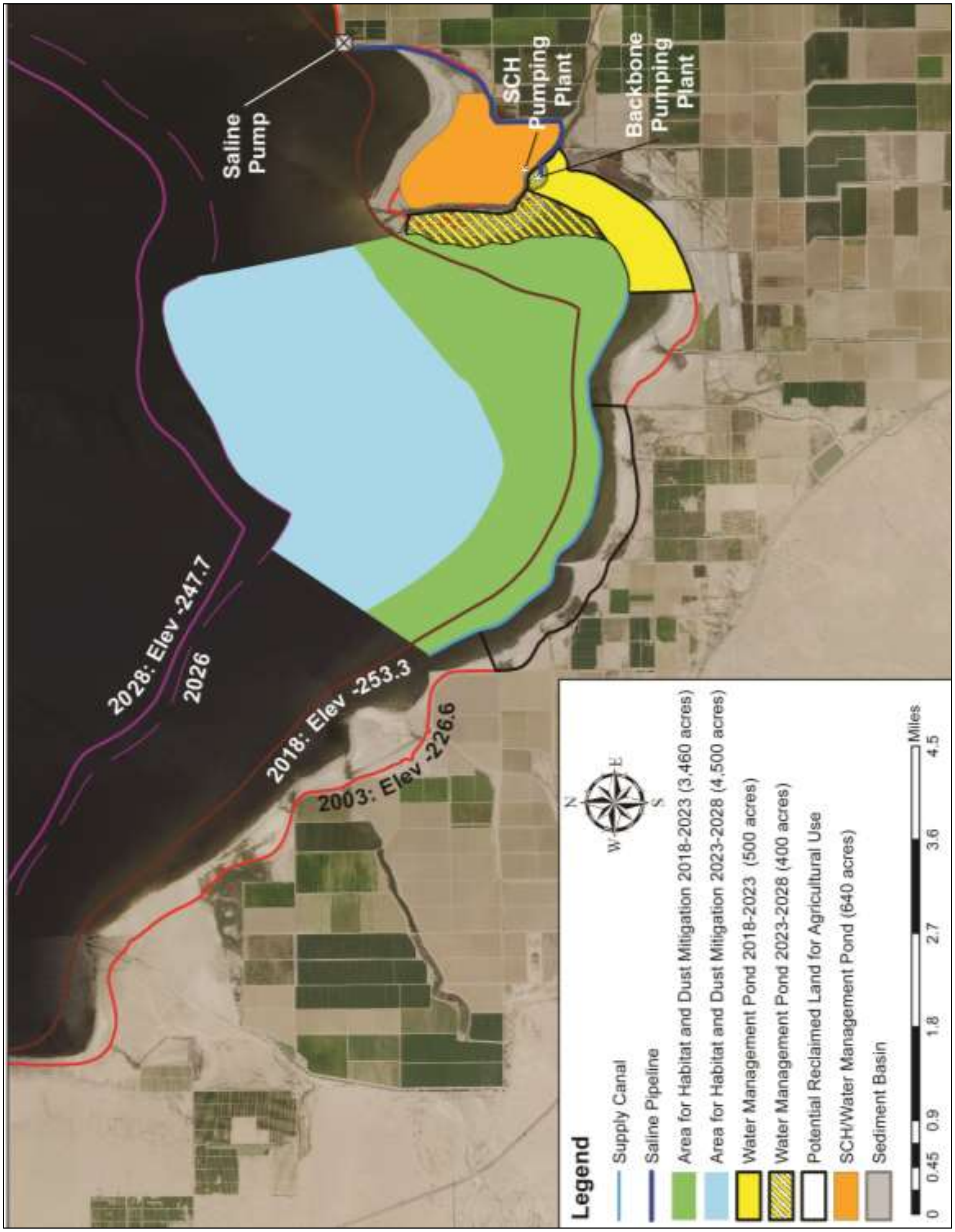


Figure 4. Salton Sea Management Program - New River East (2018–2023)

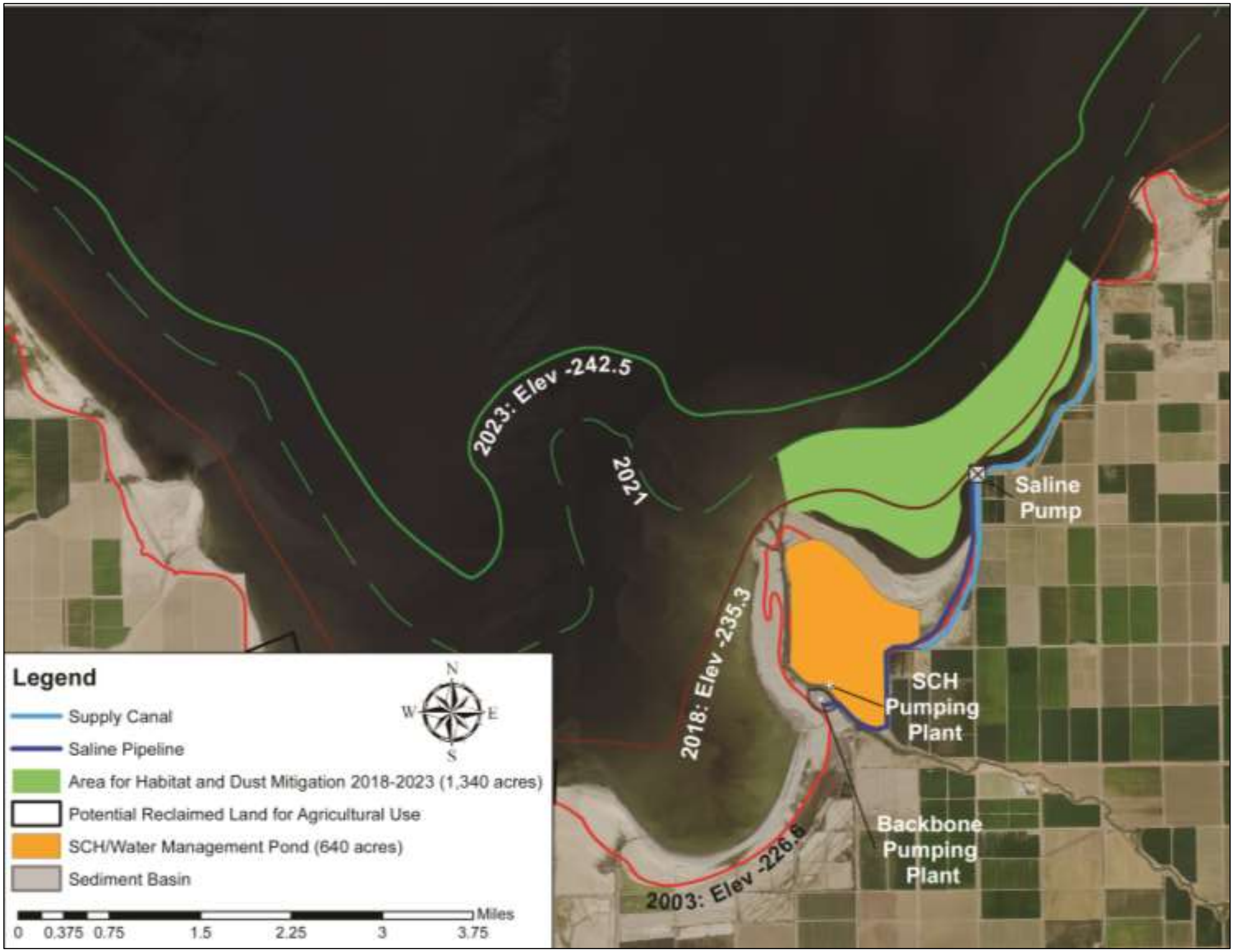


Figure 5. Salton Sea Management Program – New River East (2023–2028)

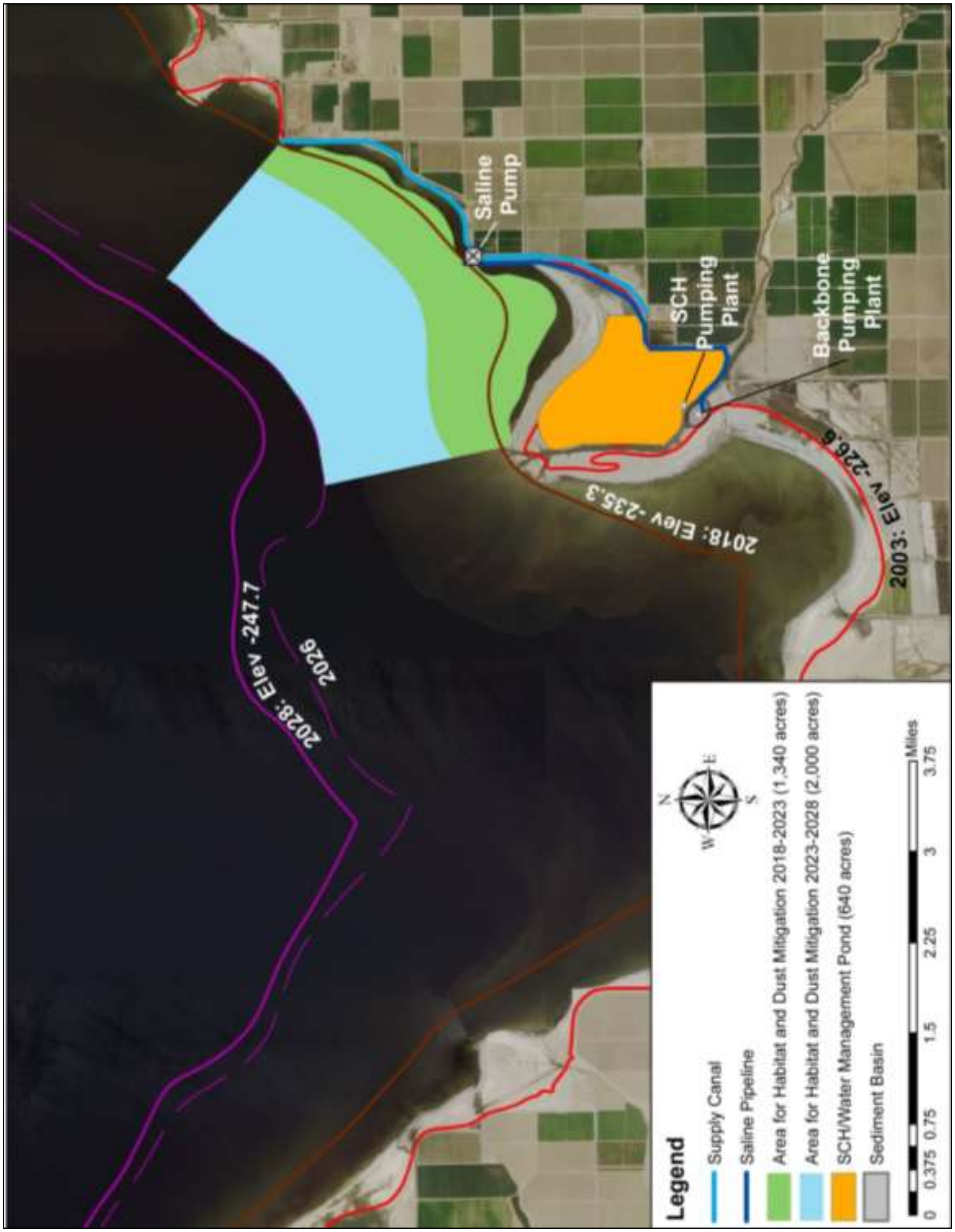


Figure 6. Salton Sea Management Program – Alamo River South (2018–2023)

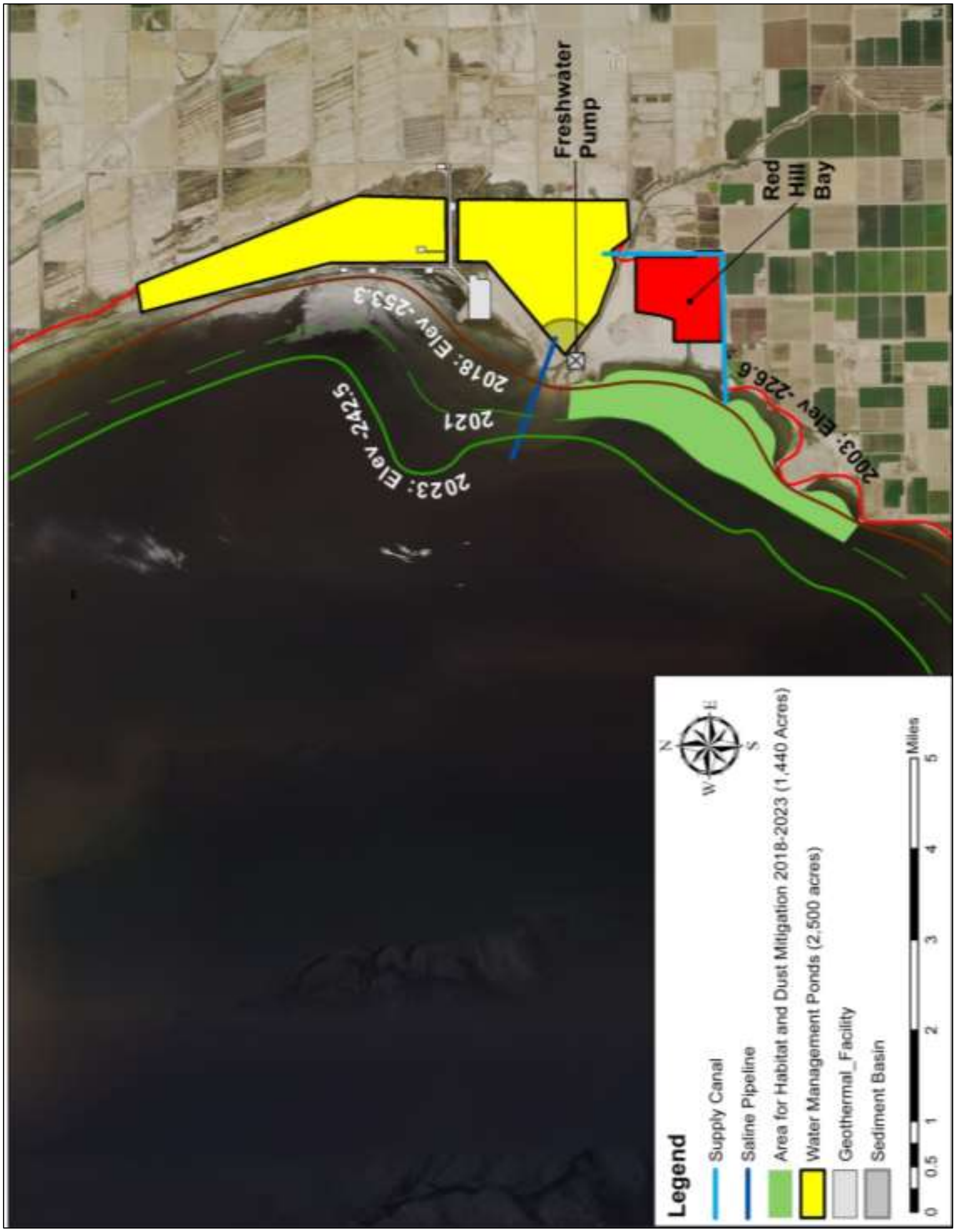


Figure 7. Salton Sea Management Program – Alamo River South (2023–2028)

Figure 8. Salton Sea Management Program – Alamo River North (2018–2023)

Figure 9. Salton Sea Management Program – Alamo River North (2023–2028)

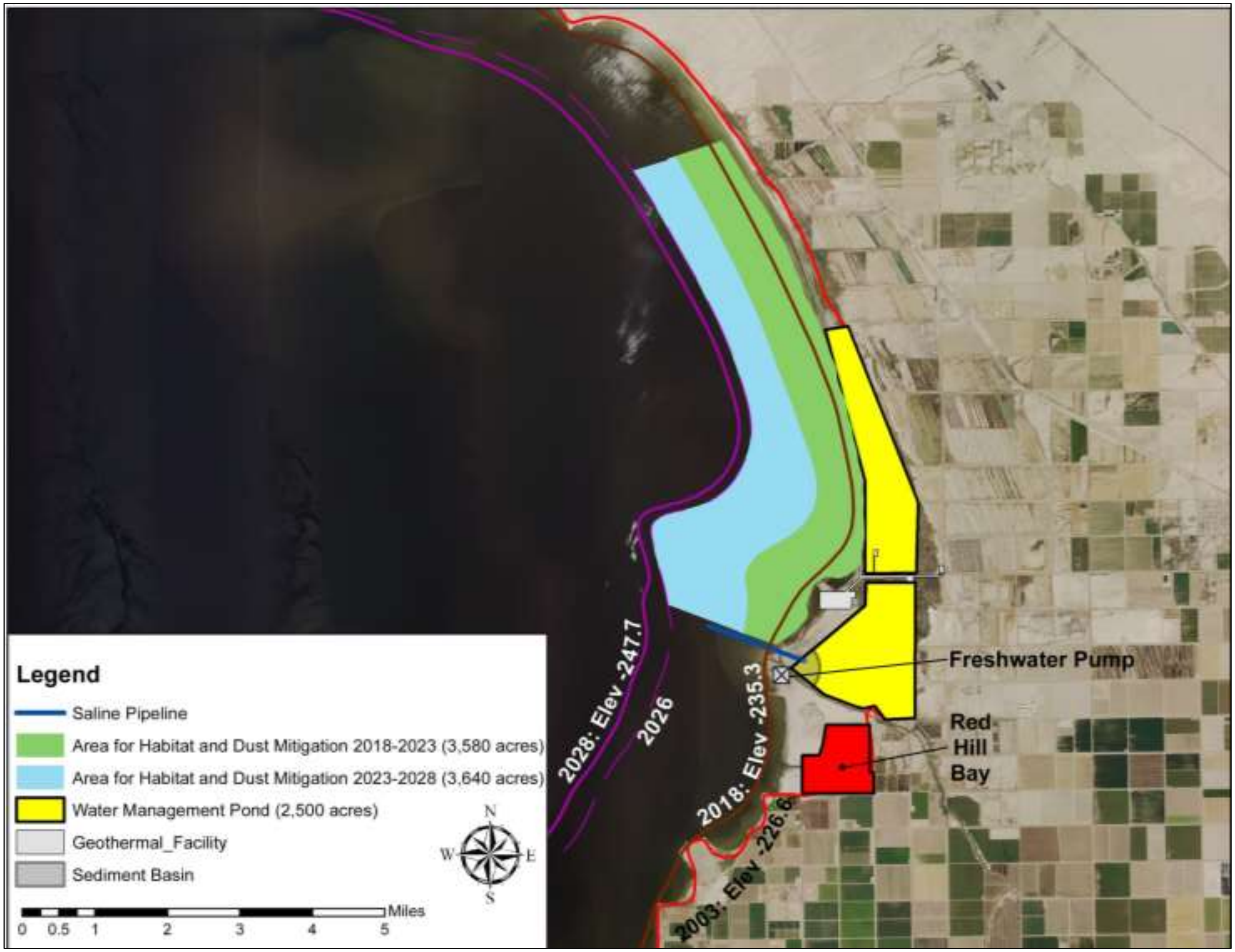


Figure 10. Salton Sea Management Program – Whitewater River (2018–2023)

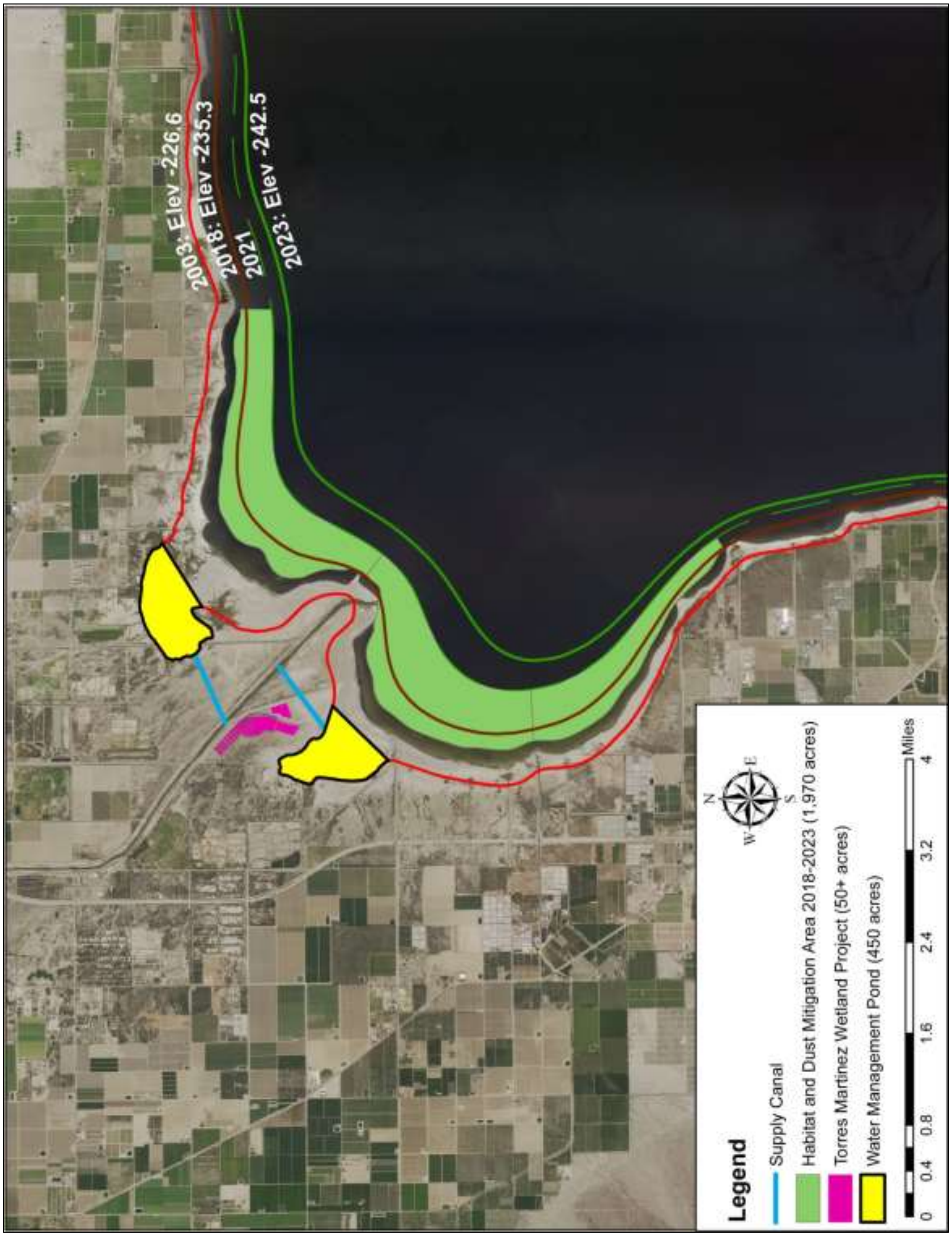
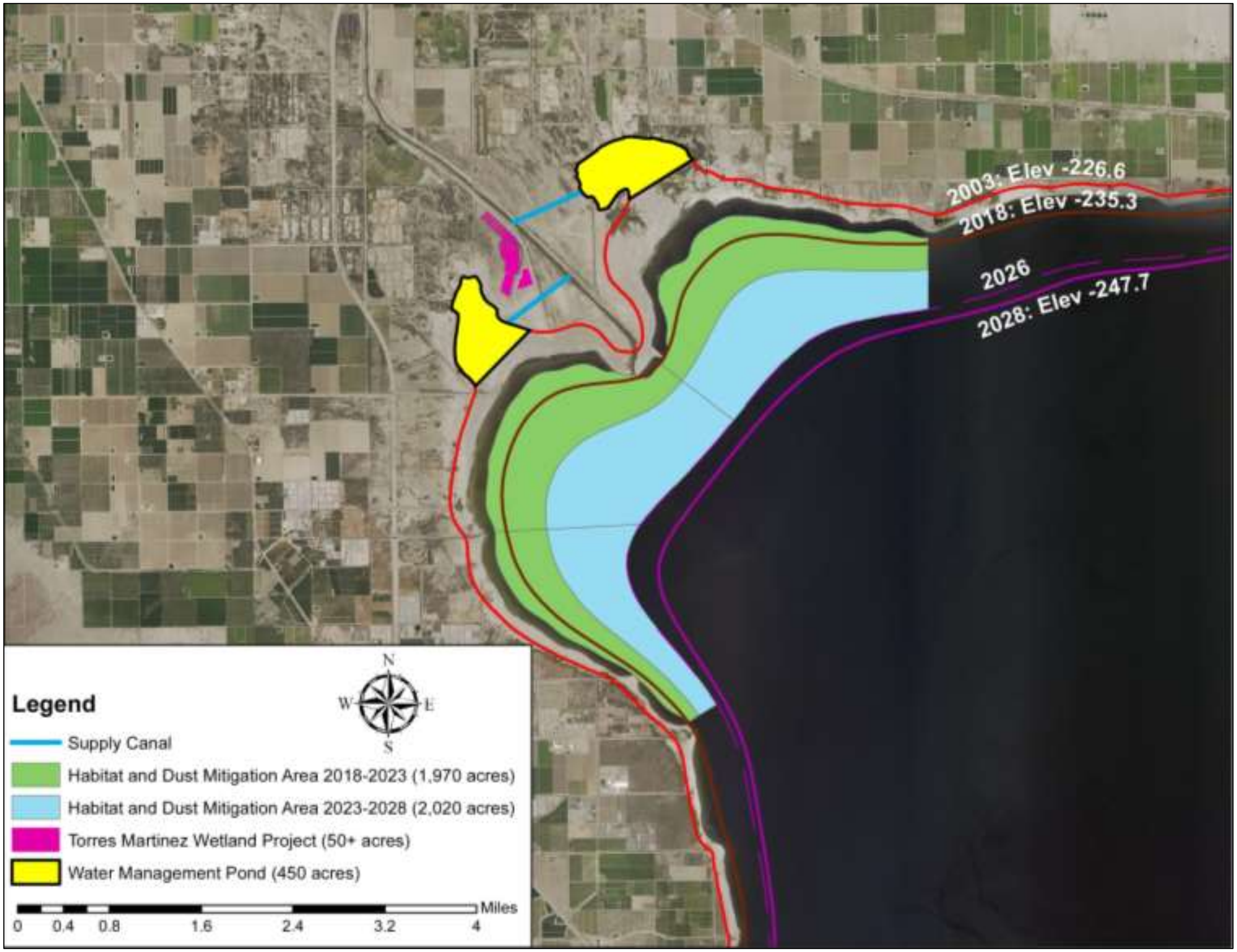


Figure 11. Salton Sea Management Program – Whitewater River (2023–2028)



Appendix 2. Cost Projections

Table 3-1

	NEW RIVER WEST	NEW RIVER EAST	ALAMO RIVER SOUTH	ALAMO RIVER NORTH	ALAMO COMBINED	WHITEWATER RIVER
BBI (acres)	900	640	1,250	1,250	2,500	450
Habitat (acres)	8,000	3,400	3,600	7,200	10,800	4,000
Channel (ft)	-	-	-	-	-	-
Pipelines (ft)	23,239	10,513	18,613	18,613	18,613	7,493
Pumps	3,750,000		3,750,000	3,750,000	3,750,000	3,750,000
2018–2023 Low berm (ft)	69,626	42,281	44,506	88,796	133,301	86,123
2023–2028 Low berm (ft)	30,548	23,807	25,999	47,159	73,159	36,640
2018–2023 Pond high berm (ft)	25,191	-	32,600	42,489	75,089	28,148
2023–2028 Pond high berm (ft)	24,154					
Spillways	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000
Flow control structures	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000
River crossing structure	$25,000	-	$25,000	$25,000	$25,000	
Flood control measure (River banks)	$2,112,000		$2,112,000	$2,112,000	$2,112,000	$2,112,000
Electrical	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000
Habitat features						
Design	$7,691,145	$1,943,858	$5,412,207	$7,722,339	$12,142,247	$5,800,410
Contingency - CT	$11,536,718	$2,915,788	$8,118,310	$11,583,508	$18,213,370	$8,700,615
Mobilization/Site prep	$6,991,950	$1,767,144	$4,920,188	$7,020,308	$11,038,406	$5,273,100
Construction mgmt (15%)	$10,487,925	$2,650,716	$7,380,282	$10,530,462	$16,557,609	$7,909,650
TOTAL COST	**$76,911,450**	**$19,438,584**	**$54,122,068**	**$77,223,388**	**$121,422,466**	**$58,004,100**
TOTAL COST + CT + MOBIL + MGMT	**$106,627,238**	**$26,948,946**	**$75,032,867**	**$107,059,697**	**$168,335,692**	**$80,414,775**

Table 3-2

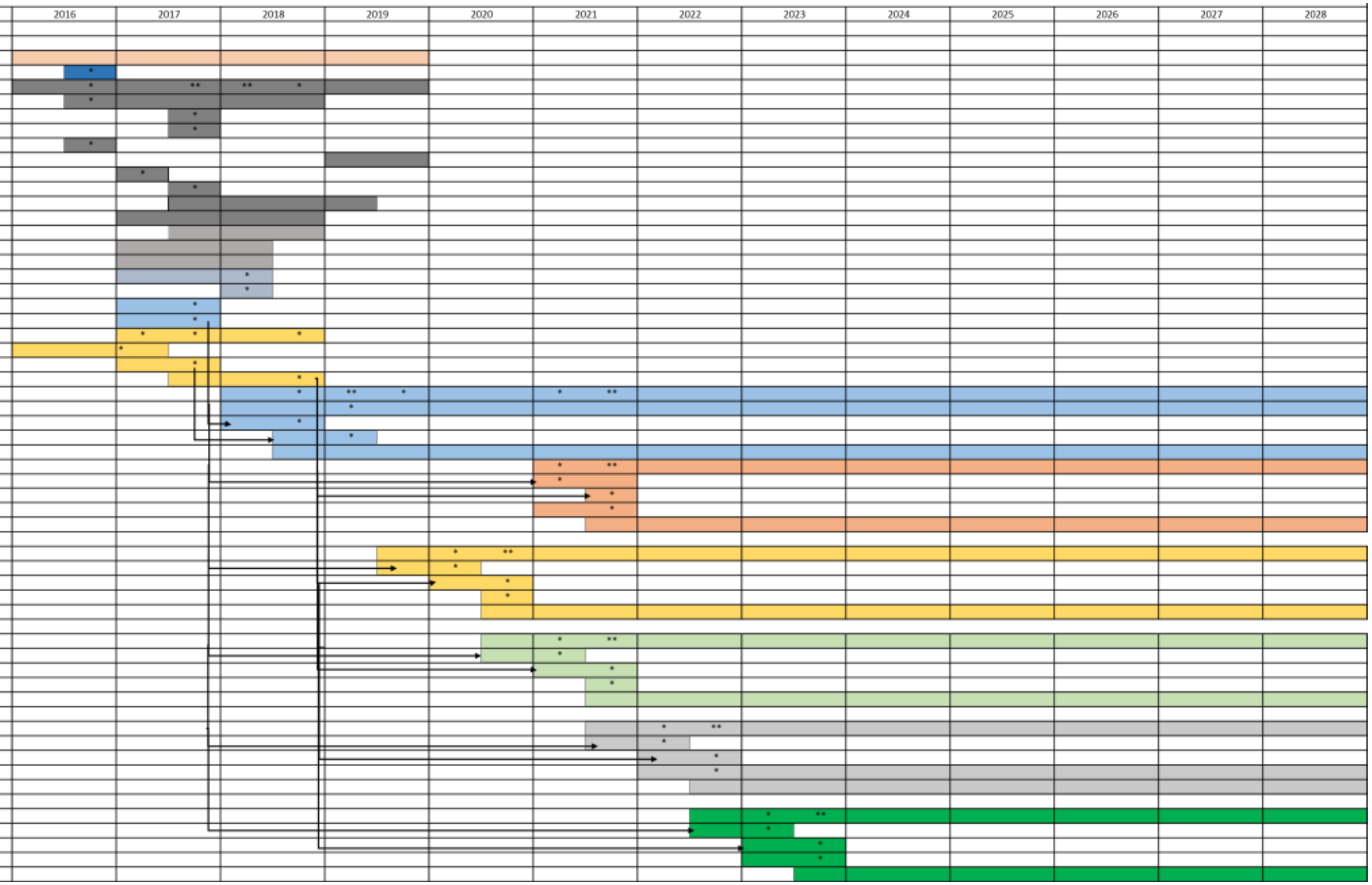
YEAR	COST	ACRES
2018	$10.00	500
2019	$27.00	1,300
2020	$35.50	1,700
2021	$43.50	3,500
2022	$33.50	1,750
2023	$35.50	2,750
2024	$34.00	2,700
2025	$42.50	3,400
2026	$47.50	4,000
2027	$37.50	4,000
2028	$36.50	4,200
TOTAL	**$383.00**	**29,800**

Table 3-3

	UNIT	UNIT COST	SOURCE
Saline Pump Station (45 cfs)	each	$2,500,000	DWR/DOE (SCH)
River Pump Station (75cCfs)	each	$1,250,000	DWR/DOE (SCH)
Berm (Water Storage)	foot	$800	IID/DWR/DOE (SCH)
Berm (Low Berm)	foot	$200	IID/DWR/DOE (SCH)
HDPE Pipeline			
24 Inch	foot	$225	DWR/DOE (SCH)
36 Inch	foot	$300	DWR/DOE (SCH)
Flow Control Structures	each	$100,000	DWR/DOE (SCH)
Outlets/Spillways	each	$50,000	DWR/DOE (SCH)
River Crossing Structure	each	$25,000	DWR/DOE (SCH)
Access Roads	foot	$150	DWR/DOE (SCH)
Habitat Features			
Tall Island	each	$200,000	DWR/DOE (SCH)
Loafing Island	each	$30,000	DWR/DOE (SCH)
Small Island	each	$100,000	DWR/DOE (SCH)
Habitat Channel	foot	$10	DWR/DOE (SCH)
Sheet Piles	foot	$200	DWR/DOE (SCH)
Electrical Work		$1,000,000	IID - SCH

Appendix 3. Ten-Year Phase I Plan Schedule

	Duration (months)	Start	Finish
Design Planning			
1-Programmatic Planning	48	Jan-16	Jan-20
On call Consultant*	6	Jul-16	Jan-17
a-Design Criteria	48	Jan-16	Jan-20
*Determine Goal**	30	Jun-16	Dec-18
Channel Criteria*	6	Jun-17	Dec-17
Water Impoundment Criteria*	6	Jun-17	Dec-17
Audubon Contract /Habitat criteria*	30	Jun-16	Dec-18
SCH MAMP Implementation (Se, fish habitat, water quality eval)	11	Jan-19	Dec-19
Develop Concept TM Wetland*	6	Jan-17	Jul-17
Finalized Hydro Model*	6	Jun-17	Dec-17
Develop BACM pilot Projects*	13	Jun-17	Jul-18
Define criteria/Coordination with IID air Qual. Pr.	23	Jan-17	Dec-18
b-Develop Evaluation Process for later phases	18	Jun-17	Dec-18
c-Identify Footprint	18	Jan-17	Jul-18
Coordination with Geothermal	18	Jan-17	Jul-18
Coordination with Land Owners	18	Jan-17	Jul-18
Coordinate with lease information with IID	6	Jan-18	Jul-18
2-Select Design Builder	12	Jan-17	Jan-18
Design Build Contractor*	12	Jan-17	Jan-18
3-Acquire Real Estate	24	Jan-17	Jan-19
Acquire Easements SCH*	14	Jan-16	Mar-17
Acquire Easements New River West*	24	Jan-17	Jan-19
Develop Easement process (IID, BLM, Private)*	12	Jan-18	Jan-19
New River West (Water Management Pond + Exposed Playa Treat.)	132	Jan-18	Jan-29
Water Backbone Infrastructure - Management Ponds (2 Ponds)	132	Jan-18	Jan-29
Preliminary Design	12	Jul-18	Jul-19
Final Design	12	Jan-19	Jan-20
Construction	114	Jul-19	Jan-29
Habitat/dust suppression and distribution system	102	Jul-20	Jan-29
Preliminary Design	12	Jan-21	Jan-22
Final Design	6	Jul-21	Jan-22
Permits	12	Jan-21	Jan-22
Construction	90	Jul-21	Jan-29
New River East (Water Management Pond + Exposed Playa Treat.)	114	Jul-19	Jan-29
Preliminary Design	12	Jul-19	Jul-20
Final Design	6	Jan-20	Jul-20
Permits	6	Jul-20	Jan-21
Construction	102	Jul-20	Jan-29
Whitewater River (Water Management Pond + Exposed Playa Treat.)	102	Jul-20	Jan-29
Preliminary Design	12	Jul-20	Jul-21
Final Design	6	Jan-21	Jul-21
Permits	6	Jul-21	Jan-22
Construction	90	Jul-21	Jan-29
Alamo South (Water Management Pond + Exposed Playa Treat.)	90	Jul-21	Jan-29
Preliminary Design/Identify Access for Geothermal	12	Jul-21	Jul-22
Final Design	12	Jan-22	Jan-23
Permits	6	Jul-22	Jan-23
Construction	78	Jul-22	Jan-29
Alamo North (Water Management Pond + Exposed Playa Treat.)	78	Jul-22	Jan-29
Preliminary Design/Identify Access for Geothermal	12	Jul-22	Jul-23
Final Design	12	Jan-23	Jan-24
Permits	6	Jul-23	Jan-24
Construction	66	Jul-23	Jan-29



MEMORANDUM OF UNDERSTANDING

BY AND BETWEEN

THE UNITED STATES DEPARTMENT OF THE INTERIOR

AND

THE STATE OF CALIFORNIA NATURAL RESOURCES AGENCY

REGARDING THE COORDINATION OF ACTIVITIES TO MANAGE THE SALTON SEA

I. INTRODUCTION AND BACKGROUND

The Salton Sea (Sea), an endorheic water-body, is California's largest lake and located in Imperial and Riverside Counties. The Sea is the modern incarnation of Lake Cahuilla, a prehistoric, intermittent freshwater sea that filled and evaporated multiple times over thousands of years as the Colorado River (River) meandered on its delta—shifting between emptying into the Gulf of California, or diverting northwest, into the Salton Trough.

In 1905 when the River flood flows breached an inadequate diversion structure (built by what was then the California Development Company), the full might of the River emptied once again into the basin. After 2 years the River's course was engineered back to the Gulf, and left behind was the Salton Sea. In 1924, certain specified lands beneath the Sea were designated a drainage reservoir by Presidential Order. Where the Sea would have evaporated once more, agricultural runoff from the Imperial and Coachella Valleys (with water from the Colorado River) and other sources has maintained its elevation and affected its composition over the last century.

The Sea loses approximately one million acre-feet of water a year to evaporation. Early on, the accumulation of salts and nutrients in the terminal lake, by its sustaining agricultural drainage waters, were acknowledged as a challenge to the future viability of the Sea. From the start, various studies were conducted to assess the issue, but no comprehensive actions were taken. Thirty or more species of sport fish were stocked by the California Department of Fish and Game between 1929 and 1956, and soon the Sea was enjoying more yearly visitors than Yosemite National Park. After a period of developmental boom and recreational success at the Sea, a series of storms and heavy River water use in 1977 and 1978 caused widespread flooding and inundation of seaside developments, and the properties were soon abandoned.

Recognizing that the QSA only provided mitigation flows for the Sea through 2017, and the need for projects that would acknowledge the current and projected resource conditions at the Sea, the State established the Salton Sea Task Force, by order of the Governor of California, in May 2015. Through the work of the Task Force, the State recognizes that immediate implementation of sustainable habitat and air quality management and mitigation at the Sea through a Salton Sea Management Program is critical for the protection of regional air quality, natural resources at the sea, and the management of a stable River water supply for California. After meetings with key stakeholders, the Task Force identified acreage targets for wildlife habitat, mitigation, and other projects, and found that implementation of a successful Salton Sea Management Program depends on the following three principles: 1) strong Federal, State, and local partnerships; 2) clear and achievable milestones with State-directed plans to achieve them; and 3) committed participation from all stakeholders who share the goals of protecting air quality, reducing habitat impacts, and maintaining a secure Colorado River Water Supply. These three principles are driving State-led decisionmaking on short, medium, and long term plans and projects, and require coordinating all available fiscal and technical resources to deliver them in an expedited manner.

The United States and the State have significant and complementary interests regarding development and enhancement of activities that provide certainty to the Sea, anticipate changes in the Sea's elevation, water quality and associated regional environment, and recognize the multiple values and unique opportunities the Sea embodies in the face of a changing climate, resource constraints, and the need to build resiliency and certainty in affected Tribal and regional communities.

II. PARTIES

This Memorandum of Understanding (MOU) is entered into by and between the United States through the Department of the Interior (DOI), and the State of California, through the California Natural Resources Agency (CNRA), and, hereafter referred to as "the Agencies," and will become effective as of the latest date shown below on the signature page.

The Agencies recognize the unique role and interests of tribal governments, including jurisdiction and decisionmaking, in the future of the Sea. The United States recognizes the United States' trust responsibility to all federally recognized Indian tribes and the duty to engage in meaningful government-to-government consultation prior to any action related to the Sea that impacts a tribe. Future activities to address conditions at the Sea must recognize Federal and State responsibilities to any affected tribes pursuant to applicable law (including settlement acts) and agreements, ensure protection of trust resources, and work in a spirit of partnership with affected Indian tribes.

Though not a party to this MOU, other Federal and State agencies, local governments and agencies, and non-profit, philanthropic, and academic institutions are recognized as potentially having jurisdiction, resources, decisionmaking roles, and common interests at the Sea, and will be essential to include for successful management activities and outcomes at the Sea. The Agencies will coordinate and consult with all of these entities as appropriate to develop specific tasks, timelines, and form subsequent agreements to further future partnership at the Sea.

III. PURPOSE

The Agencies enter into this MOU to ensure that long-term coordination between the Federal and State and Government will be recognized as a priority and will occur in order to facilitate prompt and informed decisionmaking regarding the natural and economic resources of the Sea.

The Agencies recognize that the purpose of this coordination is to facilitate specific, incremental and sequential projects in a timely manner that improve upon air and water quality, existing obligations to Native American communities, fish and wildlife habitat, water security, resource management processes and decisionmaking economic opportunities, and collaboration of scientific research efforts. Coordinating limited resources will be necessary to achieve common goals that address the natural resources and regional interests associated with the Sea.

IV. OBJECTIVES

Recognizing the State's role as lead on Sea management, in line with the findings of the Salton Sea Task Force, and the United States' agreement through this MOU to support the goals and principles of the Salton Sea Management Program (SSMP), and in furtherance of the purpose of this MOU, the Agencies affirm their commitments to undertake the following objectives:

A. In order to facilitate prompt decisionmaking, permitting accountability, and high-level coordination, the Agencies shall each identify at least one senior level policy official to participate in a Salton Sea Working Group (SSWG) tasked with ensuring interagency continuity in Sea management efforts and overseeing the implementation of—and any necessary updates to—this MOU.

B. The Agencies will work together as they coordinate with affected Colorado River Basin States, tribes, and local governments regarding implementation of this MOU.

C. The Agencies recognize that the State has identified a goal of 25,000 acres of wildlife habitat, air and water quality projects, and other projects as necessary to minimize human health and ecosystem impacts at the Sea in the mid-term (through 2025). See "Salton Sea Task Force – Agency Actions" – Attachment 1. The Agencies acknowledge this goal as critical, and a common target to reasonably work toward.

D. The Agencies will undertake an analysis of current Federal and State laws applicable to the Salton Sea to assess existing authorities, identify common objectives, explore opportunities to align authorities that benefit the purpose of this MOU, and inform areas for further coordination.

E. The Agencies will perform a funding analysis that identifies all current Federal and State spending on programs, projects, and studies related to, potentially benefiting, or impacting the Sea. The analysis should also identify opportunities to better coordinate and match existing spending and programs, and provide a foundation for further discussions on the anticipated financial need to reach acreage goals and creative means to meet them.

F. The Agencies will, within existing authorities, perform an analysis of land ownership, any existing Indian settlement obligations, leases, and other land use agreements in the region to facilitate project development and identify necessary coordination between parties to achieve the purpose of this MOU.

G. The Agencies will, within existing authorities, expand and integrate Sea science and monitoring programs to better inform decisionmaking, coordinate investigations, and aid adaptive management of the Sea. The Agencies will also assess the cost benefit of sharing office or other physical spaces in order to reduce the cost of science activities and increase their efficacy.

H. The Agencies will pursue a multi-year partnership with United States Department of Agriculture (USDA) Natural Resources Conservation Service, tribal governments, local agencies, and others, to advance projects to protect air quality and improve water quality of major inflows to Sea habitat.

I. The Agencies shall make every effort to ensure resources are allocated to expedite and prioritize permitting processes at the Sea.

J. The Agencies will explore the feasibility of developing a common decision support system that integrates the analyses called for in this MOU, the existing wealth of studies and data on the Sea, and any additional information necessary, into a single platform that facilitates the work of the Salton Sea Management Program and the purpose of this MOU.

In furtherance of these Objectives, the United States agrees to pursue the following, in accordance with applicable statutes, and to the extent appropriate and consistent with legislative appropriations, approved budgets, and funding opportunities:

1. $20 million to operation and maintenance costs of habitat and dust suppression projects associated with the SSMP;
2. $10 million for State managed monitoring of SSMP projects;
3. Continued USGS scientific and technical support on Sea issues during the implementation of the SSMP;
4. Continued USGS scientific input on, and review of, selenium management measures and target concentrations for selenium in created habitat at Sea;
5. Consideration of a Pilot Project under Phase 2 of the Colorado River Basin Study to continue the ongoing innovative and collaborative efforts underway at the Sea to increase security for California's Colorado River water supplies, consistent with DOI's efforts to increase security for other Basin States' water supplies.

V. GENERAL PROVISIONS

A. This MOU is subject, as applicable, to the laws of the United States of America and the State.

B. Nothing in this Agreement may be construed to obligate the United States or the State to any current of future expenditures in advance of the availability of legislative appropriations. Nor does this agreement obligate the United States or the State to spend funds on any particular project or purpose, even if funds are available.

C. The mission requirements, funding, personnel, and other priorities of the Agencies may affect their ability to fully implement all the provisions identified in this MOU.

D. Specific activities that involve the transfer of money, services, or property between the Agencies will require execution of separate agreements or contracts.

E. Nothing in this MOU is intended to or will be construed to restrict the Agencies from participating in similar activities or arrangements with other public or private agencies, organizations, or individuals.

F. Any information furnished between the Agencies under this MOU may be subject to the Freedom of Information Act, 5 U.S.C. 552, et seq. (FOIA) and the California Public Records Act, Gov. Code 6250, et.seq. (CPRA). The United States and the State agree to consult each other regarding any such relevant requests and prior to releasing potentially privileged or exempt documents, subject to any applicable regulatory, statutory, or judicial timeframe.

G. This MOU is not intended to, and does not, create any right or benefit, substantive or procedural, enforceable at law or in equity by any party against the United States or the State; their respective departments, agencies, or entities; their respective officers, employees, or agents; or any other person.

H. The Agencies anticipate consensus implementation of this MOU. In the unforeseen event that any disputes arise between the Agencies, the respective representatives and leadership of DOI and CNRA will work promptly to resolve any such matter.

I. This MOU shall remain in effect for an initial term of 10 years after its effective date and may be renewed if both Parties agree. This MOU may be terminated at any time by mutual consent of both Parties, or unilaterally by either Party after 30-days written notice to the other Party of intent to terminate.

J. Either Party to this MOU will consult with the other party in a timely manner prior to release of any statements for publication or public dissemination that refers to this MOU, to the Parties in connection with this MOU, or the name or title of any employee of the Parties in connection with this MOU.

K. Nothing in this MOU may be interpreted to imply that the United States endorses any product, service or policy of the State. Nothing in this MOU may be interpreted to imply that the State endorses any product, service or policy of the United States. Neither Party will take any action or make any statement that suggests or implies such type of endorsement.

L. The DOI and CNRA may amend or modify this MOU only by agreement of both Parties.

VI. APPROVALS

For the Department of the Interior:

Michael L. Connor
Deputy Secretary

Date 8/31/16

For the State of California:

John Laird
Secretary for Natural Resources

Date 8/31/16

Salton Sea Task Force
Agency Actions

The implementation of sustainable habitat and air quality management and mitigation at the Salton Sea through a Salton Sea Management Program is critical for the protection of regional air quality, natural resources at the sea, and the management of a stable Colorado River Supply for California. The Salton Sea Task Force recognizes the contributions of the local leadership, plans, and initiatives that have informed the Task Force process. Following meetings with key stakeholders, the Task Force finds that implementation of a successful Salton Sea Management Program depends on the following three principles: 1) strong state, federal, and local partnerships; 2) clear and achievable milestones with state-directed plans to achieve them; and 3) committed participation from all stakeholders who share the goals of protecting air quality, reducing habitat impacts, and maintaining a secure Colorado River Water Supply. These three factors will drive decision-making on a short- and a medium-term plan while leveraging fiscal and technical resources to deliver projects in an expedited manner.

The Natural Resources Agency will take the following actions over an accelerated timeline:

- **Begin immediate implementation and further development of Salton Sea management plan**
  - The plan will prioritize actions that respond to air quality and natural resources impacts while incorporating opportunities for regional economic development, including recreational and renewable opportunities that benefit implementation of the plan.
  - A science advisory committee will be utilized to provide scientific expertise into plan development.
  - Colorado River stakeholders will be asked to assist with the development of the plan. The Salton Sea Authority and its members will be asked to help facilitate local involvement.

- **Improve public outreach and local partnership**
  - Air quality and environmental impacts of a reduced Salton Sea will be felt foremost by the residents of the region. The state will provide a meaningful public forum to discuss Salton Sea issues locally and to develop future plans and actions.

- **Accelerate project implementation and delivery**
  - The state will work with Salton Sea, Colorado River partners to accelerate planning, state and federal permitting and construction.

- **Meet a short-term goal of 9,000-12,000 acres of habitat creation and dust suppression projects at the sea**
  - Projects to meet short-term goals will be achievable with available funding.
  - Short-term projects will address dust suppression and natural resources needs while laying the foundation for a long-term Salton Sea management framework.
  - Projects will be staged to address the expected progression of playa exposure and designed to provide access corridors for renewable energy development on those lands.

- **Set medium-term goal of 18,000-25,000 acres of habitat creation and dust suppression projects at the sea**
  - Funding plans to meet medium-term goals will need to be developed by the state with Salton Sea and Colorado River partners.

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Ensure Oversight by Regulatory Agencies:

- The State Water Resources Control Board will regularly monitor and assess progress on the implementation of the Salton Sea Management Program, including the development of management plans and funding options, and any potential action by the State Board.
- The State Water Resources Control Board will periodically hold public workshops as part of its monitoring and assessment function.
- The State Water Resources Control Board will work with the Colorado River Regional Water Board and the Administration to improve water quality and upstream co-benefits in the New River and the Alamo River.
- The California Air Resources Board will coordinate with local partners to address air quality impacts from the Salton Sea, work with Imperial and South Coast air districts to monitor air quality, and provide technical and scientific expertise to ensure effective mitigation of dust impacts from exposed playa.

Consider opportunities for increasing renewable energy development at and around the Salton Sea:

- As part of the implementation of the Clean Energy and Pollution Reduction Act of 2015 (SB 350), the California Energy Commission and the Public Utilities Commission will evaluate how renewables at and around the Salton Sea will further the goals of the integrated resources plans, including a balanced resource mix and the minimization of localized air pollutants.
- Within the next year, as part of planning to meet the 2030 greenhouse gas goals, the Public Utilities Commission, the Energy Commission and the Independent System Operator will consider renewable energy opportunities at and around the Salton Sea and the region, and any additional transmission that may be needed for the near term or long term.

Addendum to the August 31, 2016, Memorandum of Understanding

By and Between

The United States Department of the Interior

and

The State of California Natural Resources Agency

Regarding

The Coordination of Activities to Manage the Salton Sea

Whereas the Parties to the August 31, 2016, Memorandum of Understanding (MOU) have worked assiduously since its adoption to better identify actions and strategies that can further the purposes of the MOU; and

Whereas the Parties wish to ensure that there is a seamless and continuous effort in furtherance of the goals of the MOU during 2017, given the end of the mitigation flows identified in the 2003 Quantification Settlement Agreement (QSA) agreements, the importance of actions to support implementation of existing Colorado River conservation actions, and additional actions that may be taken in light of the ongoing historic drought on the Colorado River.

Therefore, the Parties find and agree that it is appropriate to supplement the MOU as follows:

1. The State of California (State) will coordinate with the Joint Powers Authority (JPA) parties to develop and implement a plan to facilitate and expedite use of the remainder of the JPA funds on projects to mitigate air quality impacts from emissions in the Salton Sea area resulting from the implementation of the QSA. The State will advocate, through the existing JPA budget process, for a plan that addresses air quality impacts as early as possible, while also maximizing cost-effective use of the funds to accomplish mitigation of air quality impacts. The State will consider strategies that will expend all the JPA funds by December 31, 2025, but such consideration will not foreclose strategies that extend the use of such funds beyond such date if such an approach is found to be more cost-effective and appropriate.

2. The Parties will comply with all applicable requirements of the Federal Clean Air Act and all implementing rules and regulations in connection with potential air quality emissions from Salton Sea playa lands owned or managed by the Parties that are exposed as a result of decline in elevation of the Salton Sea.

3. The State will adjust current targets for air quality and habitat projects at the Salton Sea when hydrology modeling is completed to reflect updated anticipated rates of exposure.

4. The Parties will coordinate on opportunities for renewable energy and economic development in the Salton Sea area as part of the Phase I - 10 year plan.

Signatures

For the Department of the Interior:

____________________________	______________
Michael L. Connor	Date
Deputy Secretary	

For the State of California:

John Laird	January 18, 2017
John Laird	Date
Secretary for Natural Resources	

Salton Sea Air Quality Mitigation Program

Prepared for:
Imperial Irrigation District
in coordination with the County of Imperial

Prepared by:
Formation Environmental, LLC
Air Sciences Inc.
PlanTierra LLC

JULY 2016

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List of Abbreviations

AOI	Area of Interest
BACM	Best Available Control Measure
BLM	Bureau of Land Management
CAA	Clean Air Act
CARB	California Air Resources Board
CFR	Code of Federal Regulations
CMP	Conservation Management Practice
CSC	Cox Sand Catcher
CVWD	Coachella Valley Water District
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ICAPCD	Imperial County Air Pollution Control District
IID	Imperial Irrigation District
IIDSS	Imperial Irrigation District Support System
KGRA	Known Geothermal Resource Area
LiDAR	Light Detection and Ranging
MNDWI	Modified Normalized Difference Water Index
MPH	Miles Per Hour
MWD	Metropolitan Water District of Southern California
NAAQS	National Ambient Air Quality Standards
NASA	National Aeronautics and Space Administration
NTS	Naval Test Station
OHV	Off-Highway Vehicles
PEIR	Programmatic Environmental Impact Report
PI-SWERL	Portable In-Situ Wind Erosion Laboratory
PM	Particulate Matter
PM_{10}	Particulate Matter less than 10 Microns in Aerodynamic Diameter
$PM_{2.5}$	Particulate Matter less than 2.5 Microns in Aerodynamic Diameter
PVID	Palo Verde Irrigation District
QSA	Quantification Settlement Agreement
RACM	Reasonable Available Control Measures
SC	Salton City
SCAQMD	South Coast Air Quality Management District
SDCWA	San Diego County Water Authority

SIP	State Implementation Plan
SPI	Sediment Profile Imaging
SSAM	Salton Sea Accounting Model
SS AQM Program	Salton Sea Air Quality Mitigation Program
SVRA	State Vehicular Recreation Area
SWIR	Short-Wave Infrared
SWRCB	State Water Resources Control Board
TEOM	Tapered Element Oscillating Microbalance
TIG	Terrestrial Image Georeferencing
tpd	Tons Per Day
tpy	Tons Per Year
UAV	Unmanned Airborne Vehicle
USGS	United States Geological Survey
VDE	Visible Dust Emissions
$\mu g/m^3$	Micrograms Per Cubic Meter

EXECUTIVE SUMMARY

This Salton Sea Air Quality Mitigation Program (SS AQM Program) was prepared by Imperial Irrigation District (IID) to provide a comprehensive, science-based, adaptive approach to address air quality mitigation requirements associated with the transfer of up to approximately 300,000 acre-feet per year of conserved water under the Quantification Settlement Agreement (QSA).[1] The conserved water transfer reduces the volume of agricultural return flow to the Salton Sea, thereby exposing the playa and increasing the potential for dust emissions that could affect communities near and around the Sea. The required air quality mitigation measures to address these potential dust emissions are generally defined as: 1) restricting access to the exposed playa, 2) researching and monitoring the exposed playa, 3) creating or purchasing offsetting emission reduction credits and 4) implementing direct emission reduction measures on the exposed playa.[2] This SS AQM Program expands upon these general mitigation measures with detailed methods to assess playa dust emissions and identify options to mitigate them. This SS AQM Program also provides support and options for land management decisions associated with the playa as the Salton Sea recedes.

Dust emissions, or $PM_{2.5}$ and PM_{10}[3], are hazardous to human health. Imperial County is currently designated as a serious nonattainment area for PM_{10} due, in part, to windblown dust. Future exposed playa is anticipated to be a new source of dust emissions; however, until it is exposed, the location, frequency and magnitude of future emissions are unknown. The objective of this SS AQM Program is to proactively detect, locate, assess and identify options to mitigate dust emissions from exposed Salton Sea playa. This program includes steps to characterize the actual emission potential of exposed playa as the Salton Sea recedes and options to proactively prevent the occurrence of significant dust emissions. This program also includes steps to understand dust emissions from desert areas adjacent to the Salton Sea, which is critical for distinguishing playa dust emissions from off-Sea sources and for understanding the potential impact of off-Sea sources on exposed playa.

A large portion of the Salton Sea is located in Imperial County, within the jurisdiction of the Imperial County Air Pollution Control District (ICAPCD). A smaller portion of the Salton Sea is in Riverside County, within the jurisdiction of the South Coast Air Quality Management District (SCAQMD). IID anticipates that some or all of the information from this SS AQM Program will be considered in future revisions to the Imperial County PM_{10} State Implementation Plan (SIP). The Imperial County PM_{10} SIP is the regulatory document that guides dust control efforts within Imperial County. This SS AQM Program was developed in coordination with the County of Imperial to be consistent with and provide additional technical and scientific information to inform the ICAPCD SIP revision process.

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[1] Impact AQ-7 is identified in the *Final Imperial Irrigation District Water Conservation and Transfer Project, Draft Habitat Conservation Plan Environmental Impact Report/Environmental Impact Statement*, SCH #99091142 (Final EIR/EIS), and the associated mitigation requirements are found in the *Imperial Irrigation District Water Conservation and Transfer Project Mitigation, Monitoring and Reporting Program*, dated September 2003 (MMRP).
[2] Mitigation Measure AQ-7 of the MMRP.
[3] Particulate matter less than 2.5 and 10 microns in diameter.

This executive summary provides the key questions to be answered by this SS AQM Program. It summarizes each component of the program and provides a flow chart of program implementation (Figure ES-1).

Air Quality Regulatory Framework

- **What air quality regulations influence this SS AQM Program?**

  The Clean Air Act (CAA) and State Implementation Plans (SIP). The CAA is a United States federal law designed to control air pollution at the national level. It requires the Environmental Protection Agency (EPA) to develop and enforce regulations to protect the public from airborne contaminants known to be hazardous to human health. Under the CAA, states are required to submit a SIP describing how air basins designated as nonattainment areas will be brought into compliance with federal and state ambient air quality standards. The SIP contains the plan for attaining the standards as soon as possible, but in no more than five years, based on the severity of the air pollution and the difficulty posed by obtaining cleaner air. The ICAPCD is the designated agency for developing and implementing the SIP for Imperial County, as is SCAQMD for Riverside County.

  Imperial County Air Pollution Control District Rules and Regulations. ICAPCD regulates fugitive dust emissions in Imperial County through its PM_{10} SIP and Regulation VIII rules. The Regulation VIII rules are based, in part, on an emissions inventory of fugitive dust sources (e.g., construction activities, agricultural operations, disturbed open areas). Rules are developed for each source category and identify the dust control measures (Best Available Control Measures or BACM) to reduce emissions. The type and intensity of dust control measures (e.g., apply water, establish vegetation, apply gravel or chemical stabilizers/suppressants) required to reduce emissions vary for each fugitive dust source.

  Regulation VIII is divided into seven rules. Three of the rules—800, 804 and 806—are relevant to this SS AQM Program. Rule 800 contains the definitions, exemptions, general requirements, administrative requirements and test methods that are applicable to all Regulation VIII rules. Rule 804 applies to open areas that contain disturbed surface area. The Salton Sea is currently categorized as an “open area” and ICAPCD can order implementation of dust control on the Salton Sea playa based on the current Rule 804. Rule 806 applies to agricultural operation sites and pertains to this SS AQM Program because some future exposed Salton Sea playa could be reclaimed for agricultural use.

  South Coast Air Quality Management District Rules and Regulations. SCAQMD regulates fugitive dust emissions in Riverside County and specifically within the Coachella Valley. Fugitive dust emissions are regulated through the Coachella Valley PM_{10} SIP and Regulation IV rules. Regulation IV is divided into several rules and rules 403 and 403.1 are relevant to this SS AQM Program. Rule 403 applies to any activity or man-made condition capable of generating fugitive dust. Rule 403.1 is a supplemental rule and it applies specifically to fugitive dust sources in the Coachella Valley. The dust control measures identified in the rules are similar to those identified in the ICAPCD rules.

Emissions Inventory and Monitoring Program

- **When and where will exposed playa occur?** The timing and location of future playa exposure is a function of the Salton Sea floor elevation and the Sea's response to inflows, salt loads and evaporation rates. A hydrologic model will be used to simulate projected playa exposure. These simulations will provide planning-level information about the timing and location of anticipated playa exposure. In addition, actual playa exposure will be mapped to provide a real time understanding of playa exposure and to validate the hydrologic model results. Playa exposure will be mapped using Landsat satellite imagery and a combination of United States Geological Survey gauge elevation data and high-resolution bathymetric data (collected in 2005). Results will be used to track actual playa exposure as it occurs, guide monitoring of exposed playa surfaces and adjust assumptions related to future hydrologic model projections.

- **How will the surface characteristics of the playa be determined?** The surface characteristics of exposed playa will be variable and must be reliably mapped because they are directly related to emission potential. Extensive survey methods originally developed for Owens Lake are being adapted for use at the Salton Sea. This includes monitoring protocols to accurately map existing playa surface characteristics (analogous to soil map units) using remotely sensed data resources and ground-based surface evaluations. Ground-based surface evaluations include detailed characterization of surface properties related to erosion (e.g., crust type, crust thickness, soil moisture). These datasets will then be used as calibration data to spatially map playa surface types, vegetation and other surface characteristics using LiDAR (Light Detection and Ranging), UAV (unmanned aerial vehicle) imagery and other sources of satellite-based imagery. These mapping efforts will be done periodically to provide an updated inventory of exposed playa surface units and associated physical characteristics.

- **How will the emission potential of different playa surface types be assessed?** The vulnerability of different playa surfaces to erosion is known to be highly variable. This SS AQM Program will assess which playa surfaces and conditions are actually emissive and establish PM_{10} emission rates for different types of surfaces. Emission potential will be assessed using a device called a Portable In-Situ Wind Erosion Laboratory (PI-SWERL). After placement on the ground surface, the PI-SWERL simulates varying wind speeds and measures the number and size of suspended particles within the device, thus providing an estimate of emission potential under a range of simulated wind conditions. PI-SWERL sampling will occur monthly on each identified playa surface type. Monthly results will facilitate a better understanding of the "dust season" on different parts of the playa. The dust season refers to times of the year when dust emissions typically occur under different climate and soil conditions.

- **How will actively emissive playa dust source areas be identified?** Active dust source areas must be quickly and reliably mapped so that dust control needs can be identified, prioritized and implemented. Active dust source areas will be mapped based on photographic, video and/or visual observations of dust plumes and the presence of erosion and depositional surface features. A high-resolution satellite or UAV image will be collected after each wind event where dust plumes are observed. The imagery will provide a photo-interpretive base for delineating source areas and focusing field investigations. Photographic evidence will also be collected for each delineated source area and linked to a GPS (global positioning system) location. Emission rates for each source area will be developed using the PI-SWERL.

- **How will dust emissions from desert areas around the Salton Sea be assessed?** Dust emissions and dust source areas from open areas adjacent to the Salton Sea affect this SS AQM Program in two ways: 1) dust emissions from the surrounding desert sources will mix with emissions from newly exposed playa, making it difficult to distinguish playa dust emissions from the surrounding off-Sea dust emissions and 2) sand intrusion from active alluvial fans and from dune migration toward the playa will increase the emissions potential of exposed playa due to the associated surface disturbance and erosion.

  This SS AQM Program will assess dust emissions from areas adjacent to the Salton Sea to establish the location, timing and magnitude of off-Sea emissions. The approach includes: (1) using data from the existing PM_{10} monitoring network to show the frequency, magnitude and direction of PM_{10} concentrations in the desert areas west of the Salton Sea; (2) a network of fixed sand motion monitoring instruments placed within various surface types; (3) video monitoring to provide visual evidence of dust emissions; and (4) PI-SWERL sampling to characterize the emission potential of various surface types (e.g., dry washes, alluvial fans, sand sheets, dunes). This information will be used to confirm the location and timing of off-Sea emissions and to support an updated PM_{10} emission inventory for the open area source category in the Imperial County PM_{10} SIP.

- **How will playa emissions data be evaluated and reported?** As playa is exposed, the surface characteristics and emission potential will be rigorously evaluated to provide multiple lines of evidence related to playa emissions, as described in the preceding sections. These data will be used to estimate emissions from high wind events and to quantify the tons of PM_{10} generated from each source area on the playa for each specific wind event. Maximum daily (tons per day) and total annual emissions (tons per year) will also be estimated. In addition, the California Puff (CALPUFF) modeling system will be used to model the impacts of the maximum daily emissions from exposed playa sources at monitoring stations located around Imperial and Riverside Counties. Initially, results from these evaluations will be used to establish criteria to prioritize dust source areas that have high emission potential. Once criteria are established, source areas with high emission potential will be prioritized for proactive dust control measures. Depending on the prioritization, proactive dust control measures may be implemented as soon as practicable or incorporated into the Annual Proactive Dust Control Plan for the following year (described in the following sections). Playa emissions will be summarized and reported in an annual Playa Inventory and Monitoring Report.

Dust Control Strategy / Planning and Implementation

- **What dust control measures are allowed by the ICAPCD Regulation VIII rules?** The Salton Sea is currently categorized as an "open area" under ICAPCD rules. Under Rule 804, if visible dust emissions (VDE) in open areas exceed 20 percent opacity or if stabilized surface conditions are not met (pursuant to Rule 800 specifications), then Best Available Control Measures (BACM) must be implemented. BACM for open areas include: (1) applying water or chemical dust suppressants to all un-vegetated areas, (2) establishing 50% vegetative cover on previously disturbed areas, (3) paving, applying and maintaining gravel or applying and maintaining chemical dust suppressants and (4) alternative BACM as approved by the ICAPCD. After implementation of BACM, monitoring is required to determine whether the stabilized surface criteria have been achieved.

IID and ICAPCD recognize the need for playa-specific surface stability definitions and emissions measurement methods, alternatives to VDE, alternative BACM and modified performance criteria. As this SS AQM Program is implemented, results will help guide the development of these playa-specific parameters.

- **How will decisions regarding implementation of dust control measures on exposed playa be made?** The overarching goal of this SS AQM Program is to identify the tools that can be used to prevent exposed Salton Sea playa from becoming a significant source of PM_{10} emissions based upon the best available science. A large part of implementing an effective dust control strategy is to identify and implement those dust control measures (DCMs) on emissive playa surfaces *before* they reach thresholds that prompt regulatory orders for dust control. This approach provides increased flexibility for implementing effective dust control measures in the most cost effective manner and for facilitating immediate dust control actions at the Salton Sea. The proactive dust control strategy will include broad-scale implementation of DCMs that are protective of air quality, but also adaptable given the variables regarding temporal exposure and the magnitude of future emissions.

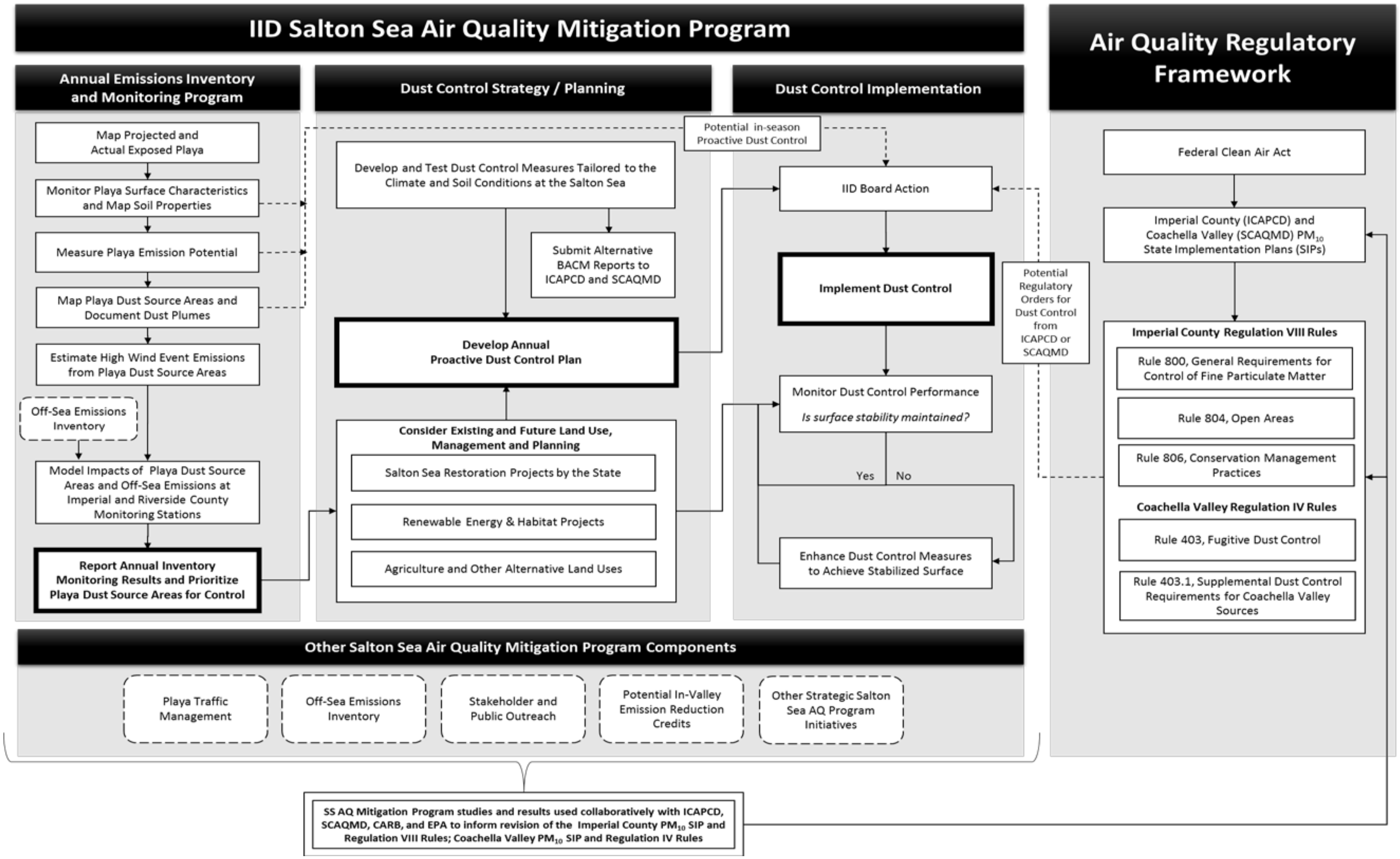
  On an annual basis and as playa is exposed each year, the surface characteristics and emission potential will be rigorously evaluated (i.e., Emissions Inventory and Monitoring Program). Initially, results from these evaluations will be used to establish criteria to identify areas of exposed playa that have high emission potential and prioritize dust control needs and measures. Criteria will be developed for each playa evaluation method (e.g., surface survey, PI-SWERL data, video monitoring), such that any individual line of evidence could be used to identify areas for proactive control. Once the criteria are established, IID will use the monitoring results to develop an Annual Proactive Dust Control Plan. The Annual Proactive Dust Control Plan will inform and take into account current and future land management and land use planning efforts, including those associated with Salton Sea restoration efforts by the State and other activities and projects planned by agencies and/or individuals for specific areas of the playa.

  After each Annual Proactive Dust Control Plan is reviewed and approved, if necessary, by the IID board, DCMs may be implemented in accordance with that plan. Yearly results from the Emissions Inventory and Monitoring Program will be used to prioritize DCM implementation on an on-going basis. As DCMs are implemented, they will be monitored to confirm that adequate surface stabilization is maintained. If the initial proactive DCM does not maintain a stabilized surface, the DCM will be further enhanced. This approach allows resources to be allocated efficiently and effectively, and in an expeditious manner to prevent significant sources of PM_{10}. The dust control strategy also includes development and testing of new DCMs and a playa traffic management plan as described below.

- **How will DCMs be selected for the unique conditions at the Salton Sea?** The dust control strategy includes the development and testing of new DCMs that are specifically tailored to the climate and soil conditions on and around the playa and that make efficient use of available resources. Some DCMs have been field-tested and proven to be effective and some DCMs need additional research prior to use at the Salton Sea. For those DCMs needing additional research, pilot field testing (pilot projects) may be pursued. Pilot projects allow IID to gain experience and understanding of locally-adapted methods of dust control and the site-specific factors that could affect their feasibility and cost. Pilot projects also are useful for determining the effectiveness of dust control and refining design criteria for full-scale implementation. This helps develop efficient and effective approaches for the design, construction and operation of DCMs on the playa.

- **How will off-highway vehicle (OHV) traffic be managed?** The dust control strategy includes development and implementation of a playa traffic management plan focused on public outreach and education. Extensive desert areas around the Salton Sea attract recreationalists and OHV traffic. Due to proximity, it is highly likely that OHV use would expand onto the playa as the Salton Sea recedes. This activity will disturb the natural stability of playa crust and soil surfaces and increase erodibility and PM_{10} emissions, as well as disturb DCMs being implemented on the playa. Prevention of vehicle-related disturbances is the most important and cost-effective measure available to prevent and control dust emissions.
- **How will information related to this SS AQM Program be shared with others?** This SS AQM Program is focused on monitoring and mitigating dust emissions from exposed Salton Sea playa. There are numerous agencies and landowners involved in activities at the Salton Sea from an air quality and habitat perspective. Communication and coordination among these agencies is essential to the success of this SS AQM Program. IID will coordinate implementation of this SS AQM Program with these agencies and provide an annual progress report.

FIGURE ES-1. SS AQM PROGRAM COMPONENTS AND WORKFLOW. Each component of this SS AQM Program is used to identify, prioritize and guide implementation of dust control measures on exposed Salton Sea Playa. This flowchart identifies important program components and how they are used to guide dust control implementation.



1 INTRODUCTION

This document sets out the general parameters of the Salton Sea Air Quality Mitigation Program (SS AQM Program) prepared for the Imperial Irrigation District (IID). As explained in more detail below, this SS AQM Program expands on the air quality monitoring and mitigation requirements resulting from the conserved water transfers under the Quantification Settlement Agreement (QSA). The objective of this SS AQM Program is to proactively detect, locate, assess and identify options to mitigate dust emissions from exposed Salton Sea playa. This SS AQM Program also provides scientific support and options for land management decisions associated with the playa as the Salton Sea recedes.

This SS AQM Program provides a comprehensive, science-based, adaptive approach to address air quality mitigation requirements to assist in the decision-making process for implementation of air quality mitigation. This program has a limited focus and does not expand into other areas that may provide air quality mitigation as a secondary benefit, but serves other primary purposes, such as habitat creation and restoration or renewable energy development. Further, this program is not intended to provide a restoration plan for the Salton Sea or to make predetermined decisions regarding the implementation of air quality mitigation. This SS AQM Program provides for an annual on-going process to detect, locate, assess and identify options to mitigate dust emissions from exposed Salton Sea playa, which ultimately provides the scientific support to the IID to make decisions regarding the implementation of specific mitigation measures. Several outside factors will contribute to the decision-making process and this program is intended to work with and in light of those factors, including in coordination with any other Salton Sea restoration and mitigation activities taken by other agencies and/or stakeholders. The technical details supporting this document are included in the appendices.

2 BACKGROUND AND REGULATORY FRAMEWORK

This section describes the background and regulatory framework for this SS AQM Program, including the the conserved water transfers under the QSA that are expected to accelerate Salton Sea playa exposure beginning in 2017 and the air quality monitoring and mitigation requirements under the QSA. The regulatory framework is discussed next, including the Clean Air Act (CAA) and its requirements for submitting a State Implementation Plan (SIP) for nonattainment areas, the Imperial County PM_{10} SIP, the Coachella Valley PM_{10} SIP, various Imperial County Air Pollution Control District (ICAPCD) and South Coast Air Quality Management District (SCAQMD) rules that guide future dust control efforts on the Salton Sea playa, and the Environmental Protection Agency (EPA) Exceptional Event Rule.

2.1 THE QUANTIFICATION SETTLEMENT AGREEMENT AND THE JOINT POWERS AUTHORITY

The QSA is a series of agreements that provide for a long-term conserved water transfer of up to 303,000 acre-feet annually from IID to the San Diego County Water Authority (SDCWA) and the

Coachella Valley Water District (CVWD).[4] These conserved water transfers under the QSA allow California to limit its demand on Colorado River water to its annual 4.4 million acre-feet entitlement and ensures water supply reliability throughout Southern California.

The QSA caps IID's annual consumptive water use to 3.1 million acre-feet and provides for the transfer of conserved water outside of Imperial County. IID conserves the water for transfer through various conservation programs. The transfer of the conserved water means less water is applied to the farm land within the Imperial County, which in turn means reduced agricultural return flows into the Salton Sea causing the Sea elevation to recede over time.

2.1.1 THE QSA AIR QUALITY MONITORING AND MITIGATION REQUIREMENTS

Pursuant to the California Environmental Quality Act (CEQA), California Public Resources Code sections 21000 et seq., the environmental impacts of the conserved water transfers under the QSA were analyzed in an environmental impact report[5] and then monitoring and mitigation measures were included in a Mitigation, Monitoring and Reporting Program (MMRP) to ensure that identified impacts are monitored and mitigated for the life of the QSA.[6] The Final EIR/EIS identified potential air quality impacts from windblown dust from exposed Salton Sea playa as a result of the conservation of up to approximately 300,000 acre-feet reducing the volume of agricultural inflows to the Sea.[7] The requirements for monitoring and mitigating dust emissions from the exposed Salton Sea playa are identified in the Final EIR/EIS[8] and as Mitigation Measure AQ-7 in the MMRP.[9] The specific section of the Final EIR/EIS is provided in Appendix A of this SS AQM Program for reference. The Salton Sea air quality monitoring and mitigation requirements, in pertinent part, are as follows:

1. **Restrict Access**: Public access, especially off-highway vehicle access, would be limited, to the extent legally and practicably feasible, to minimize disturbance of natural crusts and soils surfaces in future exposed shoreline areas.
2. **Research and Monitoring**: A research and monitoring program would be implemented incrementally as the Sea recedes. The research phase would focus on development of information to help define the potential for problems to occur in the future as the Sea elevation is reduced slowly over time. Research would:
    a. Study historical information on dust emissions from exposed shoreline areas.
    b. Determine how much land would be exposed over time and who owns it.

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[4] Or the Metropolitan Water District of Southern California in place of CVWD under certain circumstances. For more details see the *Quantification Settlement Agreement By and Among Imperial Irrigation District, The Metropolitan Water District of Southern California and the Coachella Valley Water District* and the *Agreement for Acquisition of Water Between Coachella Valley Water District and the Metropolitan Water District of Southern California*, both dated October 10, 2003.
[5] *Final Imperial Irrigation District Water Conservation and Transfer Project, Draft Habitat Conservation Plan Environmental Impact Report/Environmental Impact Statement*, SCH #99091142 (Final EIR/EIS)
[6] *Mitigation, Monitoring and Reporting Program for the IID Water Conservation and Transfer Project EIR/EIS*, dated June 2008 (MMRP).
[7] Section 3.16.2, pages 3-70 to 3-71.
[8] Section 3.9.5, pages 3-50 to 3-52.
[9] Impact AQ-7, Table 1, pages 21-22.

c. Conduct sampling to determine the composition of “representative” shoreline sediments and the concentrations of ions and minerals in salt mixtures at the Sea.
d. Analyze [data] to predict responses of Salton Sea salt crusts and sediments to environmental conditions, such as rainfall, humidity, temperature and wind.
e. Implement a meteorological, PM_{10} and toxic air contaminant monitoring program to begin under existing conditions and continue as the [Sea recedes]. The goal of the monitoring program would be to observe PM_{10} problems or incremental increases in toxic air contaminant concentrations associated with [receding Sea levels] and to provide a basis for mitigation efforts.
f. If incremental increases in toxic air contaminants (such as arsenic or selenium, for example) are observed at the receptors and linked to emissions from exposed shoreline caused by [receding Sea levels], conduct a health risk assessment to determine whether the increases exceed acceptable thresholds established by the governing air districts and represent a significant impact.
g. If potential PM_{10} or health effects problem areas are identified through research and monitoring and the conditions leading to PM_{10} emissions are defined, study potential dust control measures specific to the identified problems and the conditions at the Salton Sea.

3. **Create or Purchase Offsetting Emission Reduction Credits**: This step would require negotiations with the local air pollution control districts to develop a long-term program for creating or purchasing offsetting PM_{10} emission reduction credits.[10]
4. **Direct Emission Reductions at the Sea**: If sufficient offsetting emission reduction credits are not available or feasible, Step 4 of this mitigation plan would be implemented. It would include either, or a combination of:
   a. Implementing feasible dust mitigation measures; and/or
   b. If feasible, supplying water to the Sea to re-wet emissive areas exposed by the [receding Sea].

In addition to the Final EIR/EIS Salton Sea air quality monitoring and mitigation requirements, the QSA is subject to compliance with the terms and conditions of several state and federal permits and approvals. This includes the California State Water Resources Control Board (SWRCB) Revised Order WRO 2002-0013 approving the water transfers (SWRCB Order). This SWRCB Order incorporated the Final EIR/EIS air quality mitigation measures. The SWRCB Order additionally requires IID to evaluate dust control measures to determine their feasibility and delegates to the Water Rights Division Chief the authority to determine, in consultation with the ICAPCD, SCAQMD and the California Air Resources Board (CARB), whether any dust mitigation measures identified are feasible.

[10] Note: ICAPCD and SCAQMD do not currently support programs for creating or purchasing PM_{10} emission reduction credits. Therefore, this SS AQM Program does not address PM_{10} emission reduction credits. However, this SS AQM Program does not preclude future negotiations with local regulatory agencies to investigate the development of a long-term program for creating or purchasing offsetting PM_{10} emission reduction credits.

This SS AQM Program does not alter or replace any of these Salton Sea air quality monitoring and mitigation requirements. Rather, it expands on and provides greater detail of these monitoring and mitigation requirements. The Salton Sea playa that is exposed as a direct result of the water transfers under the QSA is subject to the air quality monitoring and mitigation requirements described above under the Final EIR/EIS and the SWRCB Order, in addition to all other federal, state and local laws, rules and regulations pertaining to air quality.

2.1.2 The QSA Joint Powers Authority

Under the QSA and supporting legislation, the State of California has assumed financial responsibility for QSA-related mitigation, with the exception of the first $133 million (in 2003 dollars) in QSA mitigation costs paid by CVWD, SDCWA and IID.[11] The *Quantification Settlement Agreement Joint Powers Authority Creation and Funding Agreement* was entered into by the State of California, CVWD, SDCWA and IID in October 2003. In that agreement, the Quantification Settlement Agreement Joint Powers Authority (QSA JPA) was created to pay for environmental mitigation requirements and costs "by and through the collection, holding, investing and disbursing of funds."[12] The funds managed by the QSA JPA are from the water agencies for the first $133 million (in 2003 dollars) and then from the State of California for environmental mitigation costs in excess of that limit.[13]

The QSA JPA must adopt an annual budget for the payment of environmental mitigation costs.[14] As IID, or any other party implementing mitigation, incurs direct costs for environmental mitigation activities under the approved budget, IID, or that other party, is reimbursed by the QSA JPA for those costs.[15] The QSA JPA is allowed, but not required, to "adopt a long-term financing plan to assure that sufficient funds are available to meet the reasonably expected annual costs" for environmental mitigation.[16]

Concurrent with the QSA, IID prepared a draft Habitat Conservation Plan (HCP) to cover permitting under the Endangered Species Act (ESA) for activities done under the QSA including conservation programs and mitigation measures. The HCP was prepared in coordination with the U.S. Fish and Wildlife Service (USFWS) and the California Department of Fish and Wildlife (CDFW) and provides specific biological conservation measures for implementation of the QSA, which were included in the MMRP for the QSA. Mitigation measures associated with the HCP are managed by an Implementation Team (IT), which is set forth in the HCP and corresponding mitigation measures. The IT is not directly responsible for managing air quality mitigation, except to the extent that implementation of any air quality mitigation might have an impact on the species covered in the HCP or other wildlife.

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[11] For a detailed discussion regarding California's Salton Sea restoration and QSA mitigation obligations under the QSA and State legislation see the *Petition of Imperial Irrigation District for Modification of Revised Water Rights Order 2002-0013* filed with the California State Water Resources Control Board on November 18, 2014 (http://www.iid.com/water/salton-sea-initiative/swrcb-petition). For the contractual obligations associated with restoration and mitigation see the *Quantification Settlement Agreement Joint Powers Authority Creation and Funding Agreement* and the *Environmental Cost Sharing, Funding, and Habitat Conservation Plan Development Agreement*, both dated October 10, 2003.

[12] Section 2.2 of the QSA JPA Creation and Funding Agreement.

[13] Articles IX and XIV of the QSA JPA Creation and Funding Agreement.

[14] Section 10.1 of the QSA JPA Creation and Funding Agreement.

[15] Section 10.3 of the QSA JPA Creation and Funding Agreement.

[16] Section 10.2 of the QSA JPA Creation and Funding Agreement.

Nevertheless, the IT provides recommendations to the QSA JPA for adjustments to implementation of the HCP-related mitigation measures and corresponding adjustments to the annual budget. IID coordinates with and keeps the IT informed of air quality mitigation activities to ensure that all activities are in compliance with the HCP and associated permits.

IID, in coordination with the QSA JPA and the IT, prepares an annual budget for review and approval by the QSA JPA. The annual budget is done on a fiscal year basis. As part of that process, IID identifies the air quality mitigation activities that are anticipated for the upcoming year and includes those mitigation costs in the QSA JPA annual budget. Approval of the budget represents a determination by the QSA JPA that the mitigation costs in the budget are subject to reimbursement by the QSA JPA funding. After approval of the budget, IID implements the various mitigation activities included in the annual budget and submits periodic invoices to the QSA JPA for reimbursement. This SS AQM Program anticipates that IID will continue to coordinate with the QSA JPA on inclusion in the annual QSA JPA budget of the air quality monitoring and mitigation activities identified in this program according to the regular process.

2.1.3 Salton Sea Mitigation Water

The SWRCB Order requires IID to deliver mitigation water to the Salton Sea for a period of 15 years, until the end of 2017. The mitigation water is delivered to the Salton Sea in accordance with a schedule that increases each year associated with the ramping up of the water conservation schedules for that 15-year period and reaching a peak amount in 2017 of 150,000 acre-feet.[17] The primary purpose of the delivery of the mitigation water to the Salton Sea was intended to avoid salinity impacts to the Sea specifically affecting fish and wildlife for 15 years.[18] However, a secondary effect of the mitigation water delivered to the Salton Sea is to artificially supply a portion of the reduced flows to the Sea thereby benefitting the elevation by postponing the recession of the Sea to a significant extent until after the mitigation water ceases to be delivered in 2017. The 15-year period assumed that the State would have a Salton Sea restoration plan developed during that time and implementation of restoration activities would be underway.[19]

2.1.4 Salton Sea Restoration

In addition to the QSA mitigation funding obligations, under the QSA and supporting legislation, the State of California has assumed responsibility to restore the Salton Sea, including the associated financial responsibility, with the exception of $30 million in funds contributed to the Salton Sea Restoration Fund by CVWD, SDCWA and IID.[20] The State of California has embarked upon a Salton Sea restoration program.[21] That program is being carried out concurrent with the air quality monitoring and

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[17] Exhibit D of the QSA JPA Creation and Funding Agreement.

[18] For further details regarding the purpose of the 15 years of Salton Sea mitigation water see the SWRCB Order, the *Final Addendum to the IID Water Conservation and Transfer Project, Final EIR* dated September 2003, and the HCP.

[19] For further detail see IID's SWRCB Petition (footnote 11) and the SWRCB Revised Water Rights Order 2002-0013.

[20] See footnote 11. See also the California State Auditor's *Salton Sea Restoration Fund: The State Has Not Fully Funded a Restoration Plan and the State's Future Mitigation Costs are Uncertain, Report 2013-101* dated November 2013 (https://www.bsa.ca.gov/reports/agency/301 and http://www.bsa.ca.gov/pdfs/reports/2013-101.pdf).

[21] See http://resources.ca.gov/salton-sea/.

mitigation activities set forth in this SS AQM Program. IID anticipates that this program and the implementation of the air quality monitoring and mitigation coming out of this program can inform the State's Salton Sea restoration program and decisions being made under that program. This SS AQM Program provides scientific-based options for addressing air quality that can be used as part of the State's restoration activities. Nevertheless, the State's Salton Sea restoration program and funding associated with those restoration activities is separate from this SS AQM Program.

2.2 THE CLEAN AIR ACT

The CAA [22] is a United States federal law designed to control air pollution at the national level. It requires the Environmental Protection Agency (EPA) to develop and enforce regulations to protect the public from airborne contaminants known to be hazardous to human health. The CAA contains many requirements related to air quality programs and activities. Two areas of those requirements have a direct bearing on this SS AQM Program. They are air quality and emission limitations[23] and plan requirements for nonattainment areas.[24]

The CAA declares that protecting and enhancing the nation's air quality promotes public health.[25] The law encourages prevention of regional air pollution and establishment of regional control programs.[26] It also provides technical and financial assistance for air pollution prevention at both the state and local government level.[27] The CAA also covers cooperation, research, investigation, training and other activities related to air quality.[28] Grants for air pollution planning and control programs and for interstate air quality agencies and program cost limitations are also included in the CAA.[29]

The CAA mandates air quality control regions designated as either attainment or nonattainment areas.[30] Attainment areas are those that meet the national standards for primary or secondary ambient air quality.[31] Nonattainment areas are those that do not meet the standards.[32] Imperial County and Coachella Valley are currently designated as *serious* nonattainment areas for PM_{10}.

Additionally, the CAA contains the requirements for nonattainment areas.[33] Under the CAA, states are required to submit a SIP describing how the nonattainment areas will be brought into compliance with federal and state ambient air quality standards.[34] The SIP contains the program for attaining the

[22] 42 United States Code sections 7401 et seq.
[23] 42 USC sections 7401-7431.
[24] 42 USC sections 7501-7515.
[25] 42 USC section 7401(b).
[26] 42 USC sections 7401(a) and (b).
[27] 42 USC sections 7401(a) and (b).
[28] 42 USC sections 7402-7403.
[29] 42 USC sections 7405-7406.
[30] 42 USC section 7407.
[31] 42 USC section 7410.
[32] 42 USC section 7410.
[33] 42 USC sections 7501-7515.
[34] 42 USC section 7410.

standards as soon as possible but in no more than five years, based on the severity of the air pollution and the difficulty posed by obtaining cleaner air.[35]

The CAA is implemented according to Title 40 of the Code of Federal Regulations Part 51. According to the federal regulations, SIPs must include the following elements:[36]

- **Emission Inventory**: Detailed inventory of emissions from point and area sources. The inventory must be based upon measured emissions or, where measured emissions are not available, documented emission factors.
- **Control Strategy**: Control strategy for bringing the area into attainment with federal and state air quality standards. The control strategy should identify the sources to be controlled, as well as the type and intensity of control measures applied to reduce emissions. This includes identification of the responsible agency, as well as procedures for monitoring compliance and handling violations.
- **Control Estimate**: Summary of emission levels projected to result from application of the control strategy.
- **Attainment Demonstration Modeling Analysis**: A demonstration of adequacy of the control strategy by means of applicable models, databases and other requirements found in the EPA's Guideline of Air Quality Models.
- **Contingency Planning**: Contingency measures to be applied in the event that the standards are not achieved in the specified time period.

SIPs must be approved by the EPA, or revised if approval is contingent on making changes, and must specify whether local governments or the State will implement and enforce the various changes.[37]

The ICAPCD is the responsible regulatory agency for the SIP in Imperial County and the SCAQMD is the responsible regulatory agency for the SIP in Riverside County. The roles and applicable air quality rules of each local regulatory agency are described below.

2.3 IMPERIAL COUNTY AIR POLLUTION CONTROL DISTRICT

The ICAPCD is the local regulatory agency for air quality compliance within Imperial County. The ICAPCD has a board of directors that adopts the policies and regulations for air quality within Imperial County and is managed by the Air Pollution Control Officer. In addition to developing SIPs for Imperial County as required by the CAA, the ICAPCD has adopted the *Rules and Regulations of the Imperial County Air Pollution Control District*, which includes eleven regulations (Regulations I to XI) each of which is broken down into separate rules.[38]

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[35] 42 USC section 7502.
[36] 40 CFR Part 51, subpart G.
[37] 40 CFR Part 51, subparts A and F.
[38] Located at http://www.co.imperial.ca.us/AirPollution/index.asp?fileinc=comprules.

2.3.1 IMPERIAL COUNTY PM_{10} SIP

On August 11, 2009, the ICAPCD Board held a public hearing and unanimously adopted the *Final 2009 Imperial County State Implementation Plan for Particulate Matter Less Than 10 Microns in Aerodynamic Diameter* (IC 2009 PM_{10} SIP).[39] The IC PM_{10} SIP was based on emission inventory projections for the period of 2006-2010 compared against the baseline year of 2005. Highlights of the IC 2009 PM_{10} SIP include the following:

- Five exceedance days (that is, days exceeding the federal 24-hour PM_{10} standard) were recorded during the period from 2006 through 2008, with 24-hour average PM_{10} concentrations ranging from 167 to 291 micrograms per cubic meter ($\mu g/m^3$). For any given exceedance day, from one to five compliance monitors were affected.
- Two of the exceedance days were associated with PM_{10} transport from Mexico. On each of these days, a single compliance monitor was affected (Grant Calexico). The remaining three exceedance days were associated with high wind speed conditions. On high wind days, two to five compliance monitors were affected.
- On low wind speed days, significant sources of dust included tilling, entrained dust from unpaved roads and open areas. Ninety-nine percent of emissions from open areas were from non-populated areas such as dunes, grasslands and barren areas.
- On an annual basis, wind-blown dust sources accounted for 73 percent of the total PM_{10} emissions in the Imperial County. Other large dust sources include: entrained dust from unpaved roads (19.4 percent of the total) and farming (3.3 percent of the total). All other sources were individually less than one percent of the total emissions.
- The IC 2009 PM_{10} SIP control strategy reduced the maximum daily emissions from 235 tons per day (tpd) to 219 tpd, a difference of 16 tpd.
- The control strategy focused on (greatest to least reduction): entrained city/country roads (reduction of 8.04 tpd), tilling (reduction of 2 tpd), non-pasture agricultural land (reduction of 1.99 tpd), other open areas (reduction of 1.19 tpd), wind-blown dust on unpaved farm roads (reduction of 1.11 tpd), wind-blown dust from city/county roads (reduction of 0.69 tpd) and “track out” (reduction of 0.37 tpd). All other sources were individually reduced less than 0.3 tpd.
- The IC 2009 PM_{10} SIP assumed a restoration program would be implemented at the Salton Sea and therefore did not account for future emissions from exposed playa.
- Dust emissions from the open desert areas located west of the Salton Sea were not captured by the IID special purpose monitoring network because it had not been established yet and therefore did not influence the IC 2009 PM_{10} SIP control strategy.

The ICAPCD is preparing a 2016 PM_{10} SIP as required by the CAA and the EPA regulations. This updated PM_{10} SIP may evaluate two major changes in the conditions and assumptions used as the basis for the IC

[39] ENVIRON International Corporation, 2009 (http://www.arb.ca.gov/planning/sip/planarea/imperial/imperialsip.htm and http://www.co.imperial.ca.us/airpollution/attainment%20plans/final%20ic%202009%20pm10%20sip%20document.pdf).

2009 PM_{10} SIP: (1) a more comprehensive method for estimating exposed playa emissions and (2) CARB certified data from the six special purpose PM_{10} monitors operated and maintained by IID around the Salton Sea (see Section 3.1.2.5.1). The latter changes may influence the overall dust control strategy in Imperial County because the IID special purpose monitors indicate source areas that were either nonexistent in the years leading up to the IC 2009 PM_{10} SIP, or were not captured by the PM_{10} monitoring network established at the time.

2.3.2 Imperial County Air Pollution Control District Regulation VIII

The ICAPCD Regulation VIII was adopted on October 10, 1994, and revised on November 25, 1996, to comply with Reasonably Available Control Measures (RACM) to control fugitive dust emissions. On November 11, 2005, this regulation was revised again to include Best Available Control Measures (BACM) and was further divided in a series of seven individual rules. On October 16, 2012, the ICAPCD again adopted revisions to several of the rules contained in Regulation VIII to address further BACM concerns by EPA. On April 12, 2016, the ICAPCD adopted revisions to one rule, Rule 804 pertaining to disturbed open areas and described in further detail below, to provide a process for approval of alternative BACM not already listed as BACM for disturbed open areas in the rule.

Regulation VIII contains BACM as required by the CAA for "serious" PM_{10} nonattainment areas. Regulation VIII requires BACM for source categories such as: construction activities, disturbed open areas, paved roads and agricultural operations. Regulation VIII allows operators to determine the control techniques sufficient to limit visible dust emissions to 20 percent opacity and, if applicable to that source, to implement requirements for a stabilized surface. Dust control plans and recordkeeping are also required under the Regulation's provisions. Regulation VIII also includes test methods and standards.

Regulation VIII is divided into seven rules. Three of the rules—800, 804 and 806—are relevant to this SS AQM Program. Each relevant rule is described below.

2.3.2.1 Rule 800, General Requirements for Control of Fine Particulate Matter

Rule 800 contains the definitions, exemptions, general requirements, administrative requirements and test methods that are applicable to all Regulation VIII rules. Section C of Rule 800 contains the definitions that are essential to understanding each specific rule. Section F contains the general requirements that establish basic guidelines for dust control material(s), specifies requirements that the dust control material(s) must meet ICAPCD, SWRCB, CARB and EPA regulations, and contains guidelines for development of Bureau of Land Management (BLM) and Border Patrol dust control plans. Section G contains administrative requirements for test methods. Appendices A and B contain the test methods for visual determination of opacity and determination of surface stabilization, respectively. The latter contains methods for determining: visible crust strength (ball drop test), threshold friction velocity (sieve measurements to assign soil texture), surface protection from flat and standing vegetation and surface stabilization from rock armoring using the rock test method.

Rule 800 requires recreational off-highway vehicle (OHV) areas to apply BACM to mitigate fugitive dust emissions. On each day of an off-road event and/or competition during which 50 average vehicle daily trips per day will occur on an unpaved road segment, the owner or operator shall limit Visible Dust Emissions (VDE) to 20 percent opacity and comply with the requirements of a stabilized unpaved road by application, reapplication, or maintenance of at least one of the following control measures:

- Watering;
- Applying uniform layer of washed gravel;
- Paving;
- Restricting access;
- Restricting speed below 15 mph;
- Applying chemical or organic dust suppressants;
- Applying “road mix;” or
- Using any other method that can be demonstrated to effectively limit VDE to 20 percent opacity and meets the conditions of a stabilized unpaved road surface.

2.3.2.2 Rule 804, Open Areas

Rule 804 applies within rural areas to any open area of 3 acres or more that contains at least 1000 square feet of disturbed surface area. This rule pertains to the Salton Sea because exposed playa around the Sea qualifies as open areas under this rule. Section D of the rule contains exemptions for agricultural operation sites subject to Rule 806 and recreational OHV Use Areas on public lands subject to Rule 800. Section E contains requirements to apply BACM to limit VDE to 20 percent opacity and meet conditions for stabilized surface, and to install barriers to prevent unauthorized vehicle access to stabilized areas. Section F sets forth the permissible BACM for open areas. BACM for open areas includes: (1) applying water or chemical dust suppressants to all unvegetated areas, (2) establishing vegetation on previously disturbed areas, (3) paving, applying and maintaining gravel, or applying and maintaining chemical dust suppressants and (4) implementing alternative BACM that has gone through the approval process set forth in section G.

2.3.2.3 Rule 806, Conservation Management Practices

Rule 806 applies to all agricultural operation sites of 40 or more acres in size. This rule pertains to the Salton Sea because some exposed playa could be reclaimed for agricultural use (this occurred during previous dry periods). Section C of the rule contains definitions that are essential to understand the main terms and Conservation Management Practices (CMPs) in this rule. Section D contains requirements for agricultural operation sites to implement at least one CMP for land preparation and cultivation, harvest activities, unpaved roads and unpaved traffic areas. This section also contains guidelines for operators to develop alternative CMPs. In addition, this section requires the owner/operator to prepare a CMP plan and make it available upon request. Section E contains CMPs for land preparation and cultivation, harvesting, unpaved roads and unpaved traffic areas. Section F contains guidelines to develop a CMP plan.

2.4 SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

The SCAQMD is the local regulatory agency for air quality compliance within Riverside County. SCAQMD has a governing board that adopts the policies and regulations for air quality within Riverside County and is managed by the Executive Officer. SCAQMD has adopted a SIP specifically for the Coachella Valley, which includes the Salton Sea Air Basin and establishes controls needed to demonstrate expeditious attainment of the PM_{10} standards in that area. SCAQMD has also adopted the *Rules of the South Coast Air Quality Management District*, which includes thirty-five regulations (Regulations I to XXXV) each of which is broken down into separate rules.[40]

2.4.1 COACHELLA VALLEY PM_{10} SIP

On June 21, 2002, the SCAQMD held a public hearing and adopted the *Final 2002 Coachella Valley PM_{10} State Implementation Plan* (CV 2002 PM_{10} SIP).[41] After years of demonstrating attainment of the PM_{10} standards, PM_{10} levels in the years 1999-2001 did not demonstrate attainment of the annual average PM_{10} National Ambient Air Quality Standards, but Coachella Valley had attained the 24-hour PM_{10} standard since 1993. The CV 2002 PM_{10} SIP addressed the rise in PM_{10} levels and established additional controls needed to demonstrate expeditious attainment of the PM_{10} standards. The CV 2002 PM_{10} SIP modified previous analyses and programs, including additional control measures for construction and earthmoving activities, farming, paved and unpaved roads, parking lots, vacant lands and farming. As required by the CAA and the EPA regulations, the CV 2002 PM_{10} SIP included a revised emissions inventory, a control strategy and a demonstration of attainment. At the time of adoption, the SCAQMD committed to revising the CV 2002 PM_{10} SIP with the latest approved mobile source emission estimates, planning assumptions and fugitive dust source emission estimates.[42]

On August 1, 2003, the SCAQMD held a public hearing and adopted the *Final 2003 Coachella Valley PM_{10} State Implementation Plan* (CV 2003 PM_{10} SIP).[43] The CV 2003 PM_{10} SIP contained an updated emissions inventory, emission budgets and attainment modeling.

2.4.2 SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT REGULATION IV

The SCAQMD Regulation IV generally addresses prohibitions relating to air quality. The rules regulating PM_{10} that are relevant to this SS AQM Program include Rules 403 and 403.1.

2.4.2.1 RULE 403, FUGITIVE DUST

Rule 403 applies to any activity or man-made condition capable of generating fugitive dust. Section C of the rule contains the definitions necessary to understand the rule. Section D sets out requirements and prohibitions relating to fugitive dust emissions. For instance, no person shall cause or allow the

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40 Located at http://www.aqmd.gov/home/regulations/rules/scaqmd-rule-book.

41 Located at http://www.aqmd.gov/home/library/clean-air-plans/coachella-valley-pm10-plan and http://www.aqmd.gov/home/library/clean-air-plans/coachella-valley-pm10-plan/final-2002-cv-pm10-plan.

42 http://www.aqmd.gov/home/library/clean-air-plans/coachella-valley-pm10-plan.

43 Located at http://www.aqmd.gov/docs/default-source/clean-air-plans/pm10-plans/final-2003-coachella-valley-pm10-state-implementation-plan.pdf?sfvrsn=2.

emissions of fugitive dust from any active operation, open storage pile, or disturbed surface area such that 1) the dust remains visible in the atmosphere beyond the property line of the emission source or 2) the dust emission exceeds 20 percent opacity, if the dust emission is the result of movement of a motorized vehicle. Section G provides exemptions to the rule. Table 1 of the rule sets out control measures permitted to address certain source categories.

2.4.2.2 Rule 403.1, Supplemental Fugitive Dust Control Requirements for Coachella Valley Sources

Rule 403.1 applies only to fugitive dust sources in Coachella Valley. Section C of the rule contains the definitions necessary to understand the rule. Section D sets out the general requirements of the rule. Section E provides the requirements for a fugitive dust control plan and other requirements for construction projects or other earth-moving activities. Section F identifies the requirements for a fugitive dust control plan, including submittal and approval. Section G specifies wind monitoring implementation requirements and Section I provides the exemptions to the rule.

2.5 EPA Exceptional Event Rule

Because of its extremely dry climate and vast areas of undeveloped desert land, PM_{10} concentrations in Imperial County and the Coachella Valley are dominated by fugitive dust emissions. The primary sources of high PM_{10} concentrations in Imperial County are: (1) soil disturbance caused by wind and human activity, (2) transport of high PM_{10} concentrations from Mexicali, Mexico, and (3) occasionally, wildfires. High PM_{10} concentrations caused by uncontrollable natural events such as high winds and wildfires may qualify as "Exceptional Events" under current EPA rules and therefore may be excluded from compliance calculations. These events must be properly documented according to the EPA's Exceptional Event Rule guidelines. Both ICAPCD and IID will commit resources and work together to 1) identify and document potential exceptional events that may have been influenced by Salton Sea exposed playa and/or open areas in the surrounding area and 2) apply to EPA for concurrence on the documentation in order to exclude these data in future attainment determinations.

3 SS AQM Program Description

This SS AQM Program is divided into three parts: (1) an updated PM_{10} emission inventory for playa and non-playa sources, (2) a control strategy for playa sources only and (3) a general estimated cost analysis. The program objectives are six-fold:

1. Identify and characterize playa sources as the Salton Sea recedes to facilitate implementation of proactive dust control measures[44] and BACM (currently defined by Rule 804).
2. Investigate the location, magnitude, seasonality and frequency of dust emissions in the desert areas located west of the Salton Sea. This will facilitate future support documentation to exclude data clearly associated with Exceptional Events.

[44] This is the monitoring portion of Objective 3.

3. Proactively control dust emissions from exposed Salton Sea playa to prevent the occurrence of significant dust emissions.
4. Pilot-test new dust control measures that are specifically tailored to the climate and soil conditions on and around the Salton Sea playa and that make efficient use of available resources and submit for approval successfully tested dust control measures as potential new alternative BACM according existing rules.
5. Identify opportunities to establish new procedures and rules and/or improve existing procedures and rules to fully and successfully implement this SS AQM Program.
6. Develop a general understanding of associated estimated costs and cost areas needing further analysis.

Objectives 1 and 2 are addressed in the PM_{10} emission inventory section (Section 3.1). Objectives 3, 4 and 5 are addressed in the dust control strategy section (Section 3.2). Objective 6 is addressed in the estimated cost analysis section (Section 3.3).

3.1 PM_{10} Emissions Inventory

This section describes the methods used to characterize dust emissions from playa and non-playa sources around the Salton Sea.

3.1.1 Playa Sources

Playa exposure and its associated surface and emissions characteristics are a major focus of this SS AQM Program. Research and monitoring are focused on understanding the location and timing of playa exposure, salt crust surface characteristics and the associated emission potentials.

3.1.1.1 Approach

This section describes the methods that will be used to evaluate playa emissions as the Salton Sea recedes. The generalized approach is as follows:

- Observe and document the extent of playa exposure (see Section 3.1.1.2).
- Characterize the emission potential of exposed playa surfaces (see Section 3.1.1.3).
- Record the time and location of dust plumes or any other indication of dust emission activity (see Section 3.1.1.4).
- Map active source areas using remote sensing methods (see Section 3.1.1.5).
- Quantify total annual and daily dust emissions from active source areas (see Section 3.1.1.6).
- Model dust emissions to evaluate potential impacts at PM_{10} compliance monitors (see Section 3.1.1.7).

Each bullet is described in the sections below. As mentioned above, this information is required to facilitate the proactive dust control planning described in Section 3.2.

3.1.1.2 PLAYA EXPOSURE

Projecting future playa exposure as well as tracking actual playa exposure and land ownership of exposed playa is an important aspect of this SS AQM Program. Each component is described below.

3.1.1.2.1 PROJECTED FUTURE EXPOSURE

The timing and location of future playa exposure is a function of the hydrologic response of the Salton Sea to external forces, such as inflows, salt loads and evaporation rates. The Salton Sea Accounting Model (SSAM) was originally developed by Reclamation to simulate the effects of the water transfers under the QSA on Salton Sea surface elevation and salinity. In 2006, the hydrologic modeling framework was revised to incorporate additional data, water balance improvements and add flexibility to the model. The updated model is called the Salton Sea Analysis model (or SALSA model) developed for the Programmatic Environmental Impact Report (PEIR) for the Salton Sea Ecosystem Restoration Program, which was prepared under the direction of the California Department of Water Resources and the California Department of Fish and Wildlife[45] on behalf of the Natural Resources Agency.[46] The SALSA model has since been updated further and is referred to as the SALSA2 model. CH2M[47] is currently preparing a hydrology analysis of the Salton Sea using the SALSA2 model. Details regarding the most recent updates to the model and the assumptions used for the hydrology modeling and analysis will be described in a separate report prepared by CH2M for IID anticipated to be released in the summer of 2016.

The SALSA2 modeling and projected Salton Sea playa exposure is important to this SS AQM Program for several reasons. Projecting future exposed playa will assist in the PM_{10} emission inventory by identifying where, when and the amount of exposed playa that will contribute to the inventory. The SALSA2 modeling will be used for comparative purposes to actual exposed playa as the Salton Sea recedes and will thereby inform the PM_{10} emission inventory as it is carried out. The comparisons that will be drawn are described in further detail below. Additionally, projections of the exposed playa will be used as a tool for planning and decision-making for determining the best use of resources in implementation of the various steps of this program, including the dust control strategy (Section 3.2). Anticipating where, when and the amount of playa that will be exposed will help shape the development of the dust control strategy. Finally, projecting the exposed playa directly attributable to the water transfers under the QSA will allow for the mitigation requirements under the QSA to be fulfilled in accordance with the QSA Final EIR/EIS and the SWRCB Order. While the SALSA2 model is the most current hydrologic modeling, any future updated modeling and projections can be used in the same manner in this SS AQM Program.

3.1.1.2.2 ACTUAL PLAYA EXPOSURE

Monitoring of the actual Salton Sea surface elevation and associated playa exposure is important for understanding potential air quality impacts. This information will provide a real-time understanding of actual playa exposure as it occurs and will help to validate the SALSA2 model results. Two independent

[45] Formerly the California Department of Fish and Game.
[46] Formerly the California Resources Agency.
[47] CH2M Hill, Inc.

methods have been developed to quantify actual playa exposure. Each is summarized below. Technical details on monitoring actual exposed playa are in Appendix B.

USGS Salton Sea Elevation. Salton Sea elevation is monitored continuously by the United States Geological Survey (USGS).[48] The monitored Sea elevation data provide the basis for extracting a shoreline from high-resolution bathymetric data (Figure 3-1). All data from the USGS gauge are collected in National Vertical Datum of 1929 (NGVD29). To ensure consistency when using the bathymetric data or comparing to SALSA2 model results, all data must be converted to North American Vertical Datum of 1988 (NAVD88) using the standard conversion factor of 2.113 feet (given the geographic coordinates of the gauge and using the National Geodetic Survey's VERTCON calculator). GIS tools have been developed to provide near real-time estimates of shoreline location and therefore playa exposure (as compared to the modeled projections of playa exposure described above).

A subset of USGS-based Salton Sea elevation and gauge readings have been compiled from 2003 to 2015 (year-end Sea elevations) (Table 3-1). These USGS-based Sea elevation and gauge readings can be compared to SALSA2 model projections or other hydrologic modeling projections in the future. Results from this comparison can indicate the accuracy of the modeling projections for Sea elevations and consistency with the bathymetric data.

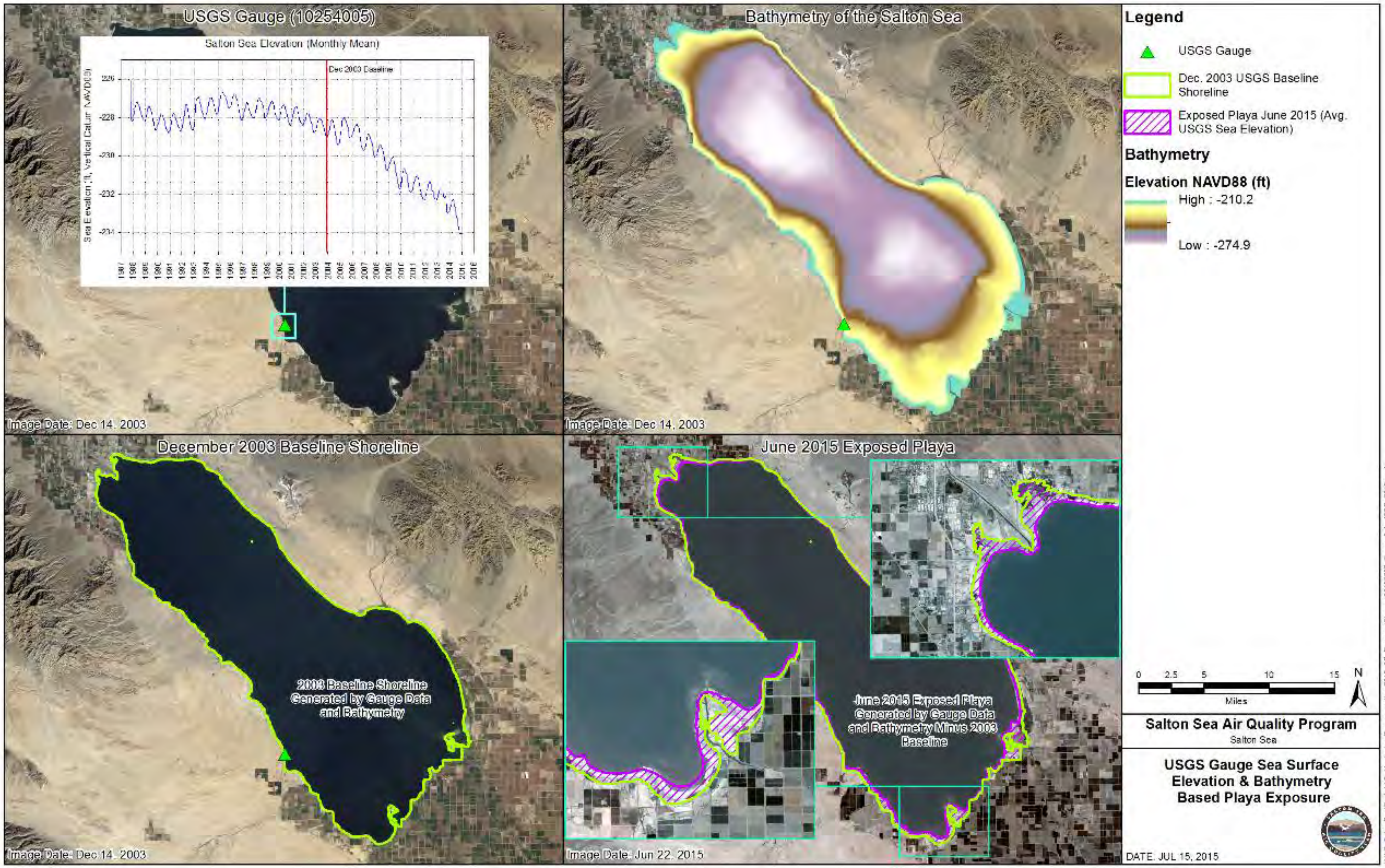
TABLE 3-1. USGS GAUGE EXPOSURE ESTIMATES

USGS Gauge Reading (Month)	Average Monthly USGS Salton Sea Elevation (ft NAVD88)	USGS / Bathymetry Playa Exposure (Acres)
12/2003	-229.0	Baseline (0 Acres)
12/2005	-226.9	207
12/2006	-227.6	2,071
12/2008	-228.5	5,244
12/2009	-229.5	7,653
11/2011	-230.2	8,254
12/2013	-230.8	10,029
11/2014	-232.0	12,787
06/2015	-231.7	12,074

48 USGS Site 10254005 Salton Sea NR Westmoreland, CA.

FIGURE 3-1. USGS GAUGE LOCATION AND SHORELINE EXTRACTION PROCESS FOR JUNE 2015

The USGS gauge Salton Sea surface elevation for June 2015 was used to demonstrate actual playa exposure from December 2003 to June 2015.



Landsat Satellite Imagery: The accuracy of the USGS gauge-based shoreline is a function of the Salton Sea elevation data from the USGS as well as the precision of the underlying bathymetric data. Therefore, an independent method for assessing exposed playa was developed using satellite imagery. Specifically, the Landsat 5 (1984 to 2013), Landsat 7 (1999 to present) and Landsat 8 (2013 to present) satellites provide current and historic imagery on an 8-to-16-day basis for the Salton Sea. A spectral water index called the Modified Normalized Difference Water Index (MNDWI) (Equation 1) was used to identify standing water associated with the Salton Sea from Landsat imagery. MNDWI is based on the fact that water absorbs energy at shortwave-infrared (SWIR) wavelengths. The integration of the green band into the equation reduces noise associated with other land-based features.[49] A date-specific threshold of MNDWI was then established to isolate the Salton Sea water body and associated shoreline (Figure 3-2).

EQUATION 1 - MNDWI

$$MNDWI = \frac{\rho\ green - \ \rho\ SWIR}{\rho\ green + \ \rho\ SWIR}$$

Table 3-2 depicts the Landsat MNDWI playa exposure compared to USGS gauge Sea elevation playa exposure (year-end Sea elevations). Results indicate that the two methods produce comparable actual playa exposure estimates and are in a 1:1 relationship with an R^2 of 0.98 (Figure 3-3). Further evaluation of individual dates revealed that the USGS gauge and bathymetric approach over-estimated playa exposure in the southern portion of the Salton Sea north of the Alamo River (Figure 3-4). These differences are likely due to errors in the bathymetric model. Acoustic sonar data (captured in 2005 and used as the basis for the bathymetric model) are unreliable in waters less than 1-meter deep (e.g. bay areas around the New and Alamo Rivers). The Landsat MNDWI does not rely on the bathymetric data, so it is able to accurately quantify the Salton Sea extent and therefore playa exposure (Figure 3-4).

Actual playa exposure will continue to be monitored and reported on a quarterly basis using the Landsat imagery as well as the USGS Sea elevation approach. Results of the quarterly monitoring will be shared with the Imperial County and ICAPCD. Results will also be used to update future SALSA2 model projections. Technical details on the monitoring are provided in Appendix B.

[49] Lei Ji, Li Zhang and Bruce Wylie, *Analysis of Dynamic Thresholds for the Normalized Difference Water Index* (2009).

FIGURE 3-2. LANDSAT MNDWI PLAYA EXPOSURE ESTIMATE

Landsat imagery and the MNDWI water index is used to delineate the Salton Sea shoreline for 2003 and 2015.

TABLE 3-2. LANDSAT MNDWI AND USGS GAUGE PLAYA EXPOSURE ESTIMATES

Landsat MNDWI Date	Landsat MNDWI Playa Exposure (Acres)	USGS Gauge Reading (Month)	Average Monthly USGS Salton Sea Elevation (ft NAVD88)	USGS / Bathymetry Playa Exposure (Acres)
12/15/2003	Baseline (0)	12/2003	-229.0	Baseline (0)
11/17/2005	478	12/2005	-226.9	207
12/06/2006	1,848	12/2006	-227.6	2,071
12/11/2008	3,565	12/2008	-228.5	5,244
12/14/2009	7,050	12/2009	-229.5	7,653
11/02/2011	8,499	11/2011	-230.2	8,254
12/25/2013	10,242	12/2013	-230.8	10,029
11/26/2014	13,470	11/2014	-232.0	12,787
06/22/2015	12,619	06/2015	-231.7	12,074

FIGURE 3-3. LANDSAT MNDWI VS. USGS GAUGE PLAYA EXPOSURE

Landsat MNDWI playa exposure regressed against USGS gauge estimates. Results show the strong relationship and consistent relationship between the two actual playa exposure monitoring methods.

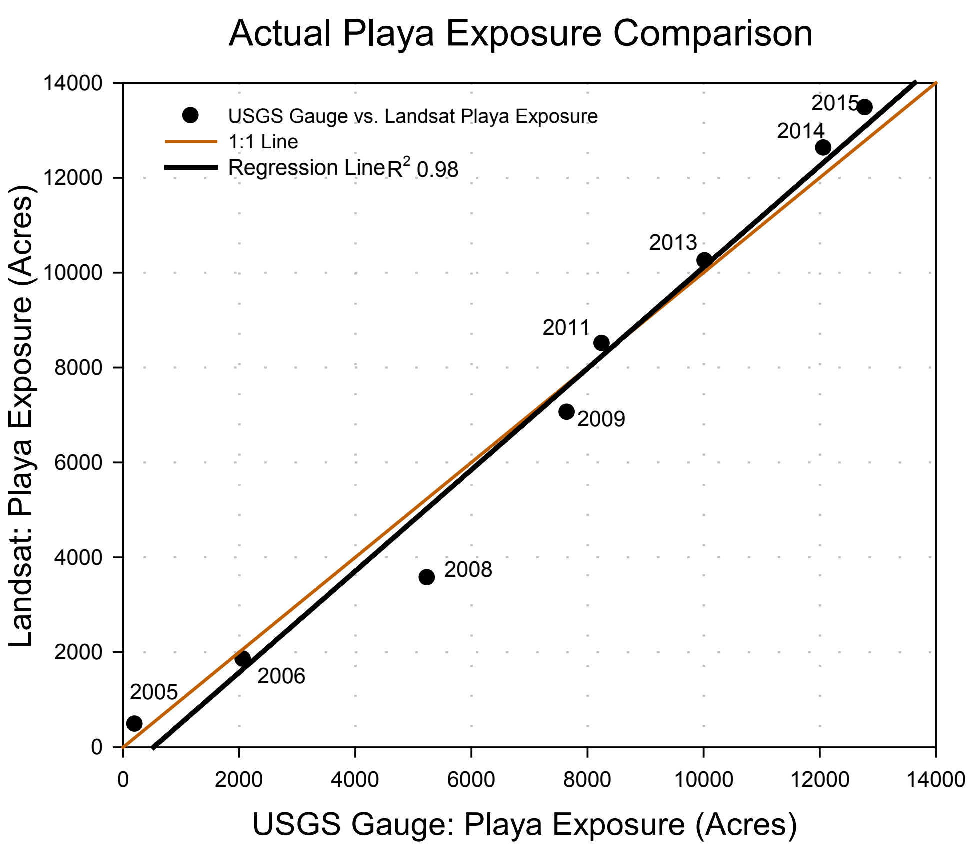


FIGURE 3-4. LANDSAT MNDWI AND USGS GAUGE EXPOSURE FOR 2008

Landsat imagery was able to accurately capture the shoreline in 2008 around the Alamo and New River areas. These shallow water areas have limited acoustic data for generation of the bathymetric layer and therefore are more error-prone when used to generate playa exposure at certain Salton Sea elevations.

3.1.1.2.3 Exposed Playa Land Ownership

The incremental projected and actual playa exposure data will be overlain with land ownership information. Landowners are responsible for compliance with the air quality requirements contained in the local rules and regulations within that district (i.e., ICAPCD or SCAQMD). The playa exposed as a direct result of the water transfers under the QSA involves the added monitoring and mitigation requirements under the QSA Final EIR/EIS and the SWRCB Order. This added layer of compliance does not change the underlying air quality requirements for land within either local district. The overlay of the projected and actual playa exposure data with the land ownership information simply provides planning level information of land actually impacted or expected to be impacted by the receding Salton Sea.

3.1.1.3 Surface Characteristics

Playa salt crusts, sand sheets, beach deposits and soil surfaces (surfaces) are a major focus of this SS AQM Program because they represent potential sources of PM_{10} emissions. The mechanisms for production of PM_{10} emissions from playas are relatively well understood. In general, large sustained emissions from playas occur when sand, or sand-sized particles, are moved by high wind (generally 15 miles per hour or greater) such that they begin to bounce or "saltate" across the playa surface. As the moving particles repeatedly impact the fragile salt crust, they can dislodge smaller particles into the air and generate dust. This also can expose underlying and sometimes more erodible soil layers. While the mechanism of saltation is well understood, the vulnerability of different playa surfaces to erosion is not well understood and is known to be highly variable (both spatially and temporally). For instance, some playa surfaces have characteristics that make them more susceptible to erosion (i.e., fluffy, loose salt crust), whereas other surfaces are rigid and sturdy and strongly resist erosion.

Overall, playa surfaces dominated by coarser-textured (sandy) soils have more predictable emissions because emissions are largely a factor of saltating sand. In contrast, emissions from playa surfaces with finer-textured, clay soils have less predictable emissions because of sensitivity to environmental influences (e.g., climatic, hydrologic and anthropogenic). For example, annual weather patterns, including timing of precipitation events, high wind speeds, diurnal temperature changes, depth to groundwater and relative humidity can cause playa surface mineralogy dynamics to change, and increase (or decrease) the potential risk of erosion. The emission inventory under this SS AQM Program will identify the playa surface characteristics and surface mineralogy dynamics that create salt crust conditions vulnerable to erosion. These activities will be designed to provide a better understanding of salt crust formation and erosion at the Salton Sea.

Research and monitoring of playa surface characteristics are divided into two broad categories: existing playa and future playa. Each is described below. Technical details on this monitoring approach are provided in Appendix B.

3.1.1.3.1 Existing Playa

Existing playa surfaces provide insight into the range of conditions that may be reasonably expected as other playa surfaces are gradually exposed. Specifically, properties controlled by evaporate (water-soluble salt) mineral dynamics (e.g., surface type, surface crust thickness and surface crust hardness) will be mapped and monitored because they are directly related to the spatial and temporal nature of PM_{10} dust emissions.[50]

Extensive playa surface survey monitoring methodology originally developed for Owens Lake is being adapted for use at the Salton Sea. This includes monitoring protocols and methodology to accurately map existing playa surface characteristics (analogous to soil map units) using remotely sensed data resources and ground-based surface evaluations. Ground-based surface evaluations include detailed characterization of surface properties related to erosion (Table 3-3). These datasets will then be used as calibration data to spatially map playa surface types, vegetation and other surface characteristics using LiDAR (Light Detection and Ranging), UAV (unmanned aerial vehicle) imagery and other sources of satellite-based imagery (Figure 3-5). These mapping efforts will be done periodically to provide an updated inventory of exposed playa surface units and associated physical characteristics. These data will be used in the assessment of playa emissions potential (see Section 3.1.1.4). Surface classification and mapping methodology will be further adapted as playa exposure progresses and a wider diversity of playa surface categories may become apparent.

[50] Buck, B., J. King, and V. Etyemezian. Effects of Salt Mineralogy on Dust Emissions, Salton Sea, California (2011), Soil Sci. Soc. Am. J. 75:1958–1972. doi:10.2136/sssaj2011.0049.

FIGURE 3-5. EXAMPLE PLAYA SURFACE CLASSIFICATION MAP

This playa surface classification map was developed using high-resolution aerial imagery and LiDAR data. Playa surface map units and vegetation characteristics provide information related to emissions potential of exposure playa.

TABLE 3-3. SURFACE PROPERTIES COLLECTED DURING SURFACE CHARACTERIZATION EVENTS

Surface Property	Description
Crust Type	Crust categories may include: smooth, botryoidal, weak botryoidal, hummocky and networked. The dominant crust type of the observation area will be characterized, and if other types are present in smaller amounts, they will be noted as inclusions. Additional crust categories may be developed specifically for the Salton Sea Playa.
Crust Thickness	Crust thickness is measured from the top of salt crust to the top of soil. In some places, the salt crust will be divided into two distinctly different layers: top crust and sub crust. Top crust is usually a harder, salt-cemented crust that forms a shell over the surface. Sub crust usually has weak structure (i.e., soft or crumbly) and extends from the bottom of the top crust to the underlying, often looser soil. In some cases, a top crust will exist without a sub crust and will be directly overlaying the soil. Total crust thickness is considered the sum of top crust and sub crust.
Soil Moisture	Soil moisture will be qualitatively assessed for the first one to two inches of soil directly below the crust. Soil moisture can be classified based on USDA-NRCS classification parameters (Schoenenberger et al., 2002). Soils will usually range from slightly moist to saturated where crust exists and dry to saturated where no crust exists.
Crust Relief	Crust relief is measured to provide a more refined understanding of surface roughness. Roughness affects wind resistance and surface wind velocities and is therefore useful in wind-erosion modeling. Crust relief is determined by measuring the distance from the bottom of a crust depression to the top of a typical crust ridge. Networked, botryoidal and hummocky crusts usually have the greatest relief.
Crust Hardness	Crust hardness indicates the degree of erosion resistance. Crust hardness can be characterized by the amount of force necessary to crush the salt crust by hand according to USDA-NRCS guidelines (Schoenenberger et al., 2002). On average, smooth and weak botryoidal crust types are the softest, while networked and hummocky crusts are harder. Hardness of both top crust and sub crust will be assessed if distinct surface and sub crusts are present. In addition, the "ball drop method" will be used to evaluate crust hardness at each location using Rule 800 specifications
Penetration Resistance	Penetration resistance can be measured with a penetrometer. A penetrometer is inserted through the total crust depth to assess crust resistance. Local penetration resistance can vary substantially and will be measured at several points to calculate an average penetration resistance for a crust type.
Surface Erosion	Surface erosion is generally characterized as a percentage of total crust area that appears to have been eroded by wind. This can be done with visual or remote-sensing techniques.
Free Surface Sand	Free surface sand is visually determined by estimating the percentage of free, sand-sized particles in a square meter of playa surface. The amount of free sand can vary seasonally with crust development, because forming crusts can encapsulate surface sand as they harden. Free sand particles on the surface are often very fine and settle into very small depressions in crust surfaces.
Percentage Vegetation, Overflow and Other Features	Percent surface area of vegetative cover, dune area, berm area, overflow area and representative playa area will be estimated. These estimates will provide a distribution of small inclusions relative to the dominant mapped surface condition. These features also have implications for the formation of crusts and erodibility; percent overflow area and vegetative cover are probably the most influential of these features. The surface area assessment can be performed visually (from the ground) or using remote-sensing techniques.

3.1.1.3.2 FUTURE PLAYA

This SS AQM Program will assess inundated playa soils using datasets and analyses related to Salton Sea floor bathymetry and sediment characteristics. Acoustic sonar data collected by the Bureau of Reclamation were analyzed to provide planning level information on surface soil characteristics of the currently inundated playa. These data were collected at two sonar frequencies (50 khz and 200khz) and combined with ground-truth data of soil sediment characteristics (Figure 3-6). The resulting spatial maps predict surface sediment texture, soft sediment depth, surface roughness/complexity and barnacle bed locations. These data are valuable for understanding the types of soils and surfaces that will be exposed as the Salton Sea recedes and for establishing monitoring protocols for specific soil types. In addition, results also provide insight into the types of dust control measures that may work well in specific regions of future exposed playa.

If additional datasets and analyses are required to provide greater detail on currently inundated playa soils, then they will be developed as part of this SS AQM Program. This may include optical Salton Sea floor mapping products designed to quantify sediment characteristics. This can be accomplished using various techniques, but the most promising technique is Sediment Profile Imaging (SPI). SPI is an optical remote monitoring technique used to image, measure and analyze the physical, chemical and biological parameters in aquatic environments to a depth of eight inches or more.

3.1.1.4 Assessing the Emission Potential of Exposed Playa Surfaces

This SS AQM Program will assess which playa surfaces and conditions are actually emissive and identify source areas associated with erosion events. This section describes the purpose of assessing emission potential, the field measurement system and the sampling program.

3.1.1.4.1 Purpose

Periodically assessing the emission potential of exposed Salton Sea playa will serve three purposes:

1. Periodic updating of the emission inventory for exposed Salton Sea playa. To the extent practical, the emission inventory will be refined to differentiate the *active* exposed playa sources (see Section 3.1.1.5).
2. Characterizing the "dust season(s)" on the Salton Sea playa; that is, the times of the year when dust emissions typically occur under different climate and soil conditions.
3. Establishing PM_{10} emission rates (in units of mass per unit area per unit time, e.g. $\mu g/m^3$) for different types of exposed playa. The data will be used to model the PM_{10} contributions at nearby monitoring stations.

The next two sections describe the measurement system and how it will be used on Salton Sea playa.

3.1.1.4.2 Field Measurement System

The emission potential of exposed playa surfaces will be assessed using a device called the Portable In-Situ Wind Erosion Laboratory (PI-SWERL), developed by Vicken Etyemezian and others at the Desert Research Institute, Reno, Nevada (Figure 3-7). The PI-SWERL instrument is an open-bottomed, cylindrical chamber with a top-mounted, direct-current motor that spins a metal ring inside the chamber about 2.5 inches above, and parallel to, the soil surface. Principles of fluid mechanics allow simulation of the turbulence conditions that produce dust storms in the surrounding environment. The spinning ring creates a shear stress profile (which produces turbulence), lofting soil and dust particles, and passing them through particle samplers (both sand-sized and dust-sized particles). The PI-SWERL electronically measures the number and size of suspended particles over the duration of a test cycle, typically less than 10 minutes. By controlling the speed of the ring to simulate varying wind speeds, the potential for a soil surface to produce PM_{10} dust emissions can be determined under a range of simulated wind conditions.

FIGURE 3-6. SOIL CHARACTERISTICS OF FUTURE EXPOSED PLAYA FROM ACOUSTIC SONAR DATA

Acoustic sonar data from the Bureau of Reclamation were used to map sediment characteristics of future exposured playa. This information will be used for planning monitoring activities and dust control as playa is exposed.

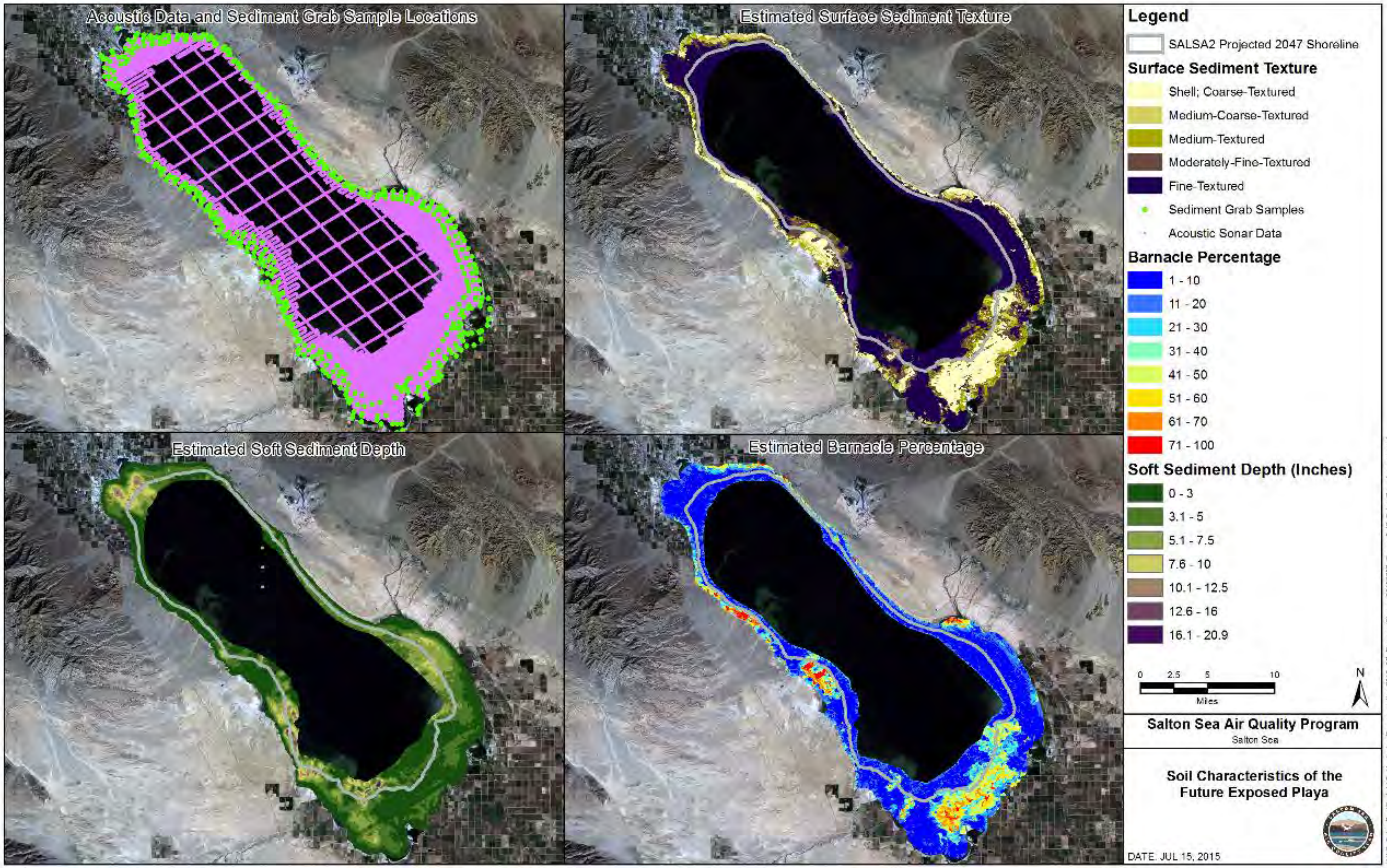


FIGURE 3-7. PORTABLE IN-SITU WIND EROSION LABORATORY (PI-SWERL)

The PI-SWERL (silver chamber on the right side of photograph) uses a tri-wheeled buggy (left side of photograph) to transport the instrument and all supporting components. The PI-SWERL measures 30 centimeters (roughly 12 inches) in diameter.

The PI-SWERL is a highly portable, easy-to-use device that measures potential sand motion and dust emissions from surfaces under field conditions. The advantage of the PI-SWERL over the traditional rectangular field wind tunnels is its portability combined with rapid testing at a site. The ease and speed of conducting tests allows the investigator to perform many replicate measurements in an efficient manner (typically 25-35 tests daily). The instrument has been used to evaluate potential sand motion and PM_{10} emissions throughout the southwestern United States, as well as abroad.[51]

3.1.1.4.3 PI-SWERL OPERATION ON SALTON SEA PLAYA

This SS AQM Program includes a PI-SWERL sampling program. PI-SWERL sampling will occur monthly on each identified playa surface type, barring wet soils or other conditions that might limit site access. Monthly results will facilitate a better understanding of the "dust season" on different parts of the

[51] King, James, et al. 2011. Dust emission variability at the Salton Sea, California, USA. Aeolian Research 3.1: 67-79; Macpherson, Torin, et al. 2008. Dust emissions from undisturbed and disturbed supply-limited desert surfaces. Journal of Geophysical Research: Earth Surface (2003–2012) 113.F2; Goossens, Dirk, and Brenda Buck. 2009. Dust dynamics in off-road vehicle trails: measurements on 16 arid soil types, Nevada, USA. Journal of environmental management 90.11: 3458-3469; Bacon, Steven N., et al. 2011. Total suspended particulate matter emissions at high friction velocities from desert landforms. Journal of Geophysical Research: Earth Surface (2003–2012) 116.F3.

Salton Sea playa. Each surface type will be randomly sampled with a fixed number of replications. Replications are essential for understanding the range of variability that exists within an identified surface type.

The PI-SWERL sampling program will occur across the entire exposed playa, not just the portion that is actively emissive. However, additional sampling will occur within and around the active source areas. Appendix B contains a detailed sampling plan, including the process for determining the number of sampling locations and replications within each surface type.

3.1.1.5 Delineating Active Areas on Exposed Playa

The success of the proactive dust control program described in Section 3.2.1 depends on having available the means to quickly and reliably map dust sources over the vast areas of exposed Salton Sea playa. An efficient way to accomplish this would be to take high-resolution aerial photographs of the playa during high-wind events. The photographs would be evaluated to reveal areas with the highest dust concentrations, which would help to differentiate source areas from more dispersed dust plumes. Relatively low altitude flights over the surface should allow closer inspection of surface activity.

Another approach, albeit somewhat more complicated and costly, would involve traversing the playa with scanning LiDAR mounted on a commercial aircraft. Dust sources would be revealed by filtering out the ground and any low-return-intensity signals indicating a dispersed dust plume. The filtered results would be associated with the highest dust concentrations from or near the point of emissions.

Mapping the playa several times during a single high wind event and then comparing the results across several high wind events would produce a greater understanding of where and how often dust emissions are occurring on the playa. The information would be applied to help prioritize proactive dust controls. Both aerial mapping methods are expensive, but would produce far greater certainty than other fixed monitoring technologies and would lead to a far more cost-effective system than simply placing dust control measures everywhere on the playa.

Several organizations and vendors have this capability, including NASA's Jet Propulsion Laboratory in Pasadena, California. An on-call contract would be necessary to ensure that aircraft can be deployed as needed during active dust storms.

3.1.1.6 Estimating Emissions on Active Areas

The PI-SWERL sampling and active area delineation will enable two types of emission estimates: maximum daily emissions (tpd for active source areas) and total annual emissions (tons per year [tpy] for all active source areas). Each is described below.

3.1.1.6.1 Maximum Daily Emissions

The PI-SWERL-measured emission potential is expected to vary over time depending on the surface type, climate conditions (e.g., temperature, wind speed, wind direction) and other factors. Similarly, the source areas active at any one time are also expected to vary by the same conditions. Accordingly, the maximum daily emissions will be computed by multiplying the maximum daily active area (in square meters) by the maximum emission potential (in grams of PM_{10} per square meter per day) *for each identified source type*. The sum of all the source types on the playa yields the maximum daily emissions for the entire playa (converted to tpd). Maximum daily emissions will be computed on a yearly basis.

3.1.1.6.2 Total Annual Emissions

In similar fashion, the total annual emissions will be estimated by summing the product of the average active area per month (in square meters) by the average emission potential (in tons of PM_{10} per square meter per month) for all source types and months. The final units will be in tpy.

3.1.1.7 Modeling Impacts at Monitoring Stations

The CALPUFF modeling system will be used to model the impact of the maximum daily emissions from exposed playa sources at monitoring stations located around Imperial and Riverside Counties. The purpose is to assess the relative contribution of exposed playa sources at the monitors. The difference between the observed PM_{10} concentrations at the monitors and the CALPUFF-predicted PM_{10} concentration is that the CALPUFF emission rates will be based on the maximum daily emission estimate (see Section 3.1.1.6.1).

3.1.2 Non-Playa Sources

This section describes the methods used to evaluate dust emissions from the open areas around the Salton Sea. This section also summarizes the methods used to compute total annual emissions and maximum daily emission rate by surface type within the area of interest (AOI). The approach, AOI, surface types, monitoring and estimation of emission rates are described below. Detailed technical information on the off-Sea inventory plan is provided in Appendix C.

3.1.2.1 Approach

Several lines of evidence will be used to establish the location, timing and magnitude of dust emissions from off-Sea areas, including: (1) "PM_{10} roses"[52] using data from the PM_{10} monitoring network on the west side of the Salton Sea; (2) a network of fixed sand motion monitoring instruments placed within various surface types; (3) video monitoring to provide visual evidence of dust emissions; and (4) PI-SWERL sampling to characterize the emission potential of various surface types.

This information will be used to confirm the location and timing of off-Sea emissions and to support an updated PM_{10} emission inventory that may be used for the revised Imperial County PM_{10} SIP (see Section 2.3.1).

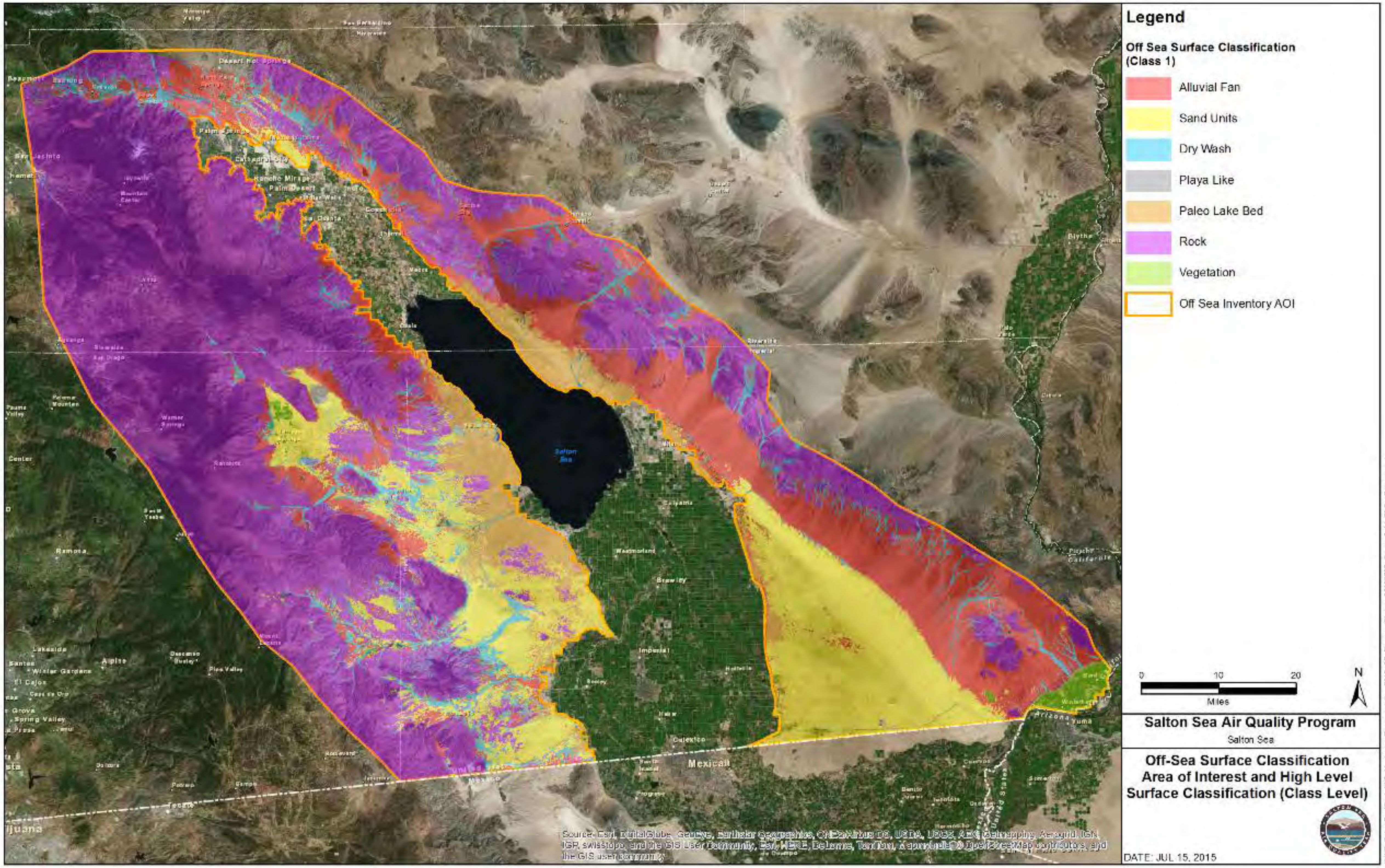
3.1.2.2 Area of Interest

The off-Sea inventory AOI is a 5,805-square-mile area that encompasses the Salton Trough and portions of the surrounding mountain ranges (Figure 3-8). Its southern margin follows the Mexican-American border. It does not include the agricultural areas of the Imperial and Coachella Valleys, nor the Salton Sea. This AOI extent was chosen because it represents the majority of desert surfaces that account for open-area emissions in the Salton Sea Air Basin.

[52] PM_{10} roses are similar to wind roses; however, in the case of the former, the "petals" show the frequency, magnitude and direction of PM_{10} concentrations rather than wind speed.

FIGURE 3-8. OFF-SEA SOURCE INVENTORY AREA OF INTEREST (AOI)

The extent of the off-Sea source inventory AOI encompasses the desert surface in the Salton Sea Air Basin contributing to open area emissions.



3.1.2.3 Surface Types

A surface type classification system was developed in order to quantify off-Sea dust sources. The classification system was created by researching the desert surfaces present in the region, targeted field investigations and the photointerpretation of satellite imagery. The surface types used in this classification system are detailed below (Table 3-4 and Figure 3-9, Figure 3-10, Figure 3-11 and Figure 3-12). Vegetative cover and surface armoring will be spatially mapped using remote sensing based imagery techniques.

Table 3-4. Off-Sea Surface Classification Legend

Class	Sub-Class	Description	Erosion Risk
1-Dry Wash Units	Sand Dominated	Ephemeral drainage dominated by well sorted, fine to coarse grained sand.	High
	Silt Dominated	Ephemeral drainage dominated by silt. Undisturbed silt found in dry washes is often present as a fragile thin mud-cracked sheet.	High
	Gravel Dominated	Ephemeral drainage dominated by gravel.	Low
	Gravel and Sand	Ephemeral drainage consisting of gravel evenly distributed among a sandy matrix. Poor to moderately sorted. The upper surface often has been coarsened by wind erosion and/or OHV activity.	Medium
	Gravel and Silt	Ephemeral drainage consisting of gravel evenly distributed among a silty matrix. Poor to moderately sorted. The upper surface often has been coarsened by wind erosion and/or OHV activity.	Medium
2-Alluvial Fan Units	Sand Dominated	Alluvial fan deposits consisting of primarily sand. Typically located near the periphery of the fan.	High
	Sand and gravel	Alluvial sand capped by gravel lag. Typically located near the middle of the fan.	Medium
	Cobbles	Alluvial fan deposits consisting of sand, gravel and cobbles. Typically located near the top of the fan.	Low
3-Sand Units	Sand Dunes	Active aeolian dune and erosional interdune surface. Large asymmetrical, elongated Transerve dunes are the most common in this region. Dunes are > 1.5 M and typically fine to medium grained.	High
	Sand Sheet	Active aeolian deposit. Flat to low angle, uniform, expansive sand surface. Typically fine to medium grained.	High
	Sand over Alluvium	Sand sheets and coppice dunes < 1.5 m in height superimposed on alluvium. Coppice dunes are small vegetated sand mounds that form when a shrub impedes the flow of air and causes sand grains to settle out on the downwind side of the shrub.	High
4-Paleo Lakebed	Silt-Dominated	Well sorted lacustrine silt deposits from pre-historic Lake Cahuilla.	High
	Cobble over Silt	Large Cobbles regularly distributed among silt situated along the margin of pre-historic Lake Cahuilla. The cobbles serve as armory for the vulnerable underlying silt. The cobbles were deposited by wave action from Lake Cahuilla.	Medium
	Gravel and Sand	A mixture of gravel and sand present on old beach ridges formed by wave action.	Low
6-Rock Units	Sandstone	Highly friable, heavily eroded sandstone. Often taking the form of steep gullies.	Medium
	Bedrock	Undifferentiated bedrock. A consolidated hard surface that is not emissive.	Very Low

Class	Sub-Class	Description	Erosion Risk
7- Offshore Playa Unit	Offshore Playa	Independent depressions that once held water and now have formed evaporites among very delicate mud-cracked silt. The underside of the mud cracks has a distinct micaceous sheen.	High

FIGURE 3-9. (A) SAND-DOMINATED DRY WASH WITH HEAVY OHV TRAFFIC AND (B) GRAVEL- AND SAND-DOMINATED ALLUVIAL FAN

A. Sand-Dominated Dry Wash with Heavy OHV Traffic

B. Gravel- and Sand-Dominated Alluvial Fan

FIGURE 3-10. (A) LARGE SAND SHEET AND (B) THE ALGODONES DUNE FIELD

A. Large Sand Sheet

B. The Algodones Dune Field

FIGURE 3-11. (A) COBBLES DISTRIBUTED OVER SILT-DOMINATED PALEO LAKEBED AND (B) SILT-DOMINATED PALEO LAKEBED

A. Cobbles Distributed over Silt-Dominated Paleo Lakebed

B. Silt-Dominated Paleo Lakebed

FIGURE 3-12. (A) SANDSTONE BEDROCK AND (B) OFFSHORE PLAYA

A. Sandstone Bedrock

B. Offshore Playa

3.1.2.4 OFF-SEA / OPEN AREA LAND OWNERSHIP

The majority of the land within the off-Sea inventory AOI is owned by the federal government, the State of California and private landowners. In the east, the Algodones Dunes, the Chocolate Mountains and portions of the Mecca and Indio Hills are owned by the federal government. They also own the San Jacinto Mountains in the northwest and a large portion of the land south of the Superstition Hills. The State of California owns the Santa Rosa Mountains, Anza Borrego State Park and a large portion of the surrounding area in the west. Private land is interspersed throughout the AOI.

3.1.2.5 Monitoring Components

The monitoring components needed to confirm the location and timing of off-Sea emissions and to support an updated PM_{10} emission inventory are discussed below. Appendix C contains a more detailed description of each component.

3.1.2.5.1 Ambient PM_{10} Concentrations

Since February 2010, five-minute- and one-hour-average ambient PM10 concentrations have been recorded continuously at six locations around the Salton Sea, including two on the west side of the Salton Sea: one at Salton City and the other at the Naval Test Station (Figure 3-13). All stations measure PM_{10} as well as particulate matter less than 2.5 microns in aerodynamic diameter, or $PM_{2.5}$ (Table 3-5). The PM coarse fraction is calculated as: $PM_{Coarse} = PM_{10} - PM_{2.5}$.

All six stations have all been in continuous operation since the start of the program. For the first two years, ICAPCD maintained the instruments and CARB conducted annual audits of the instruments. However, in July 2011, IID took over responsibility for operating and maintaining the PM_{10} network. IID is also responsible for operating and maintaining the meteorological instruments described in the next section.

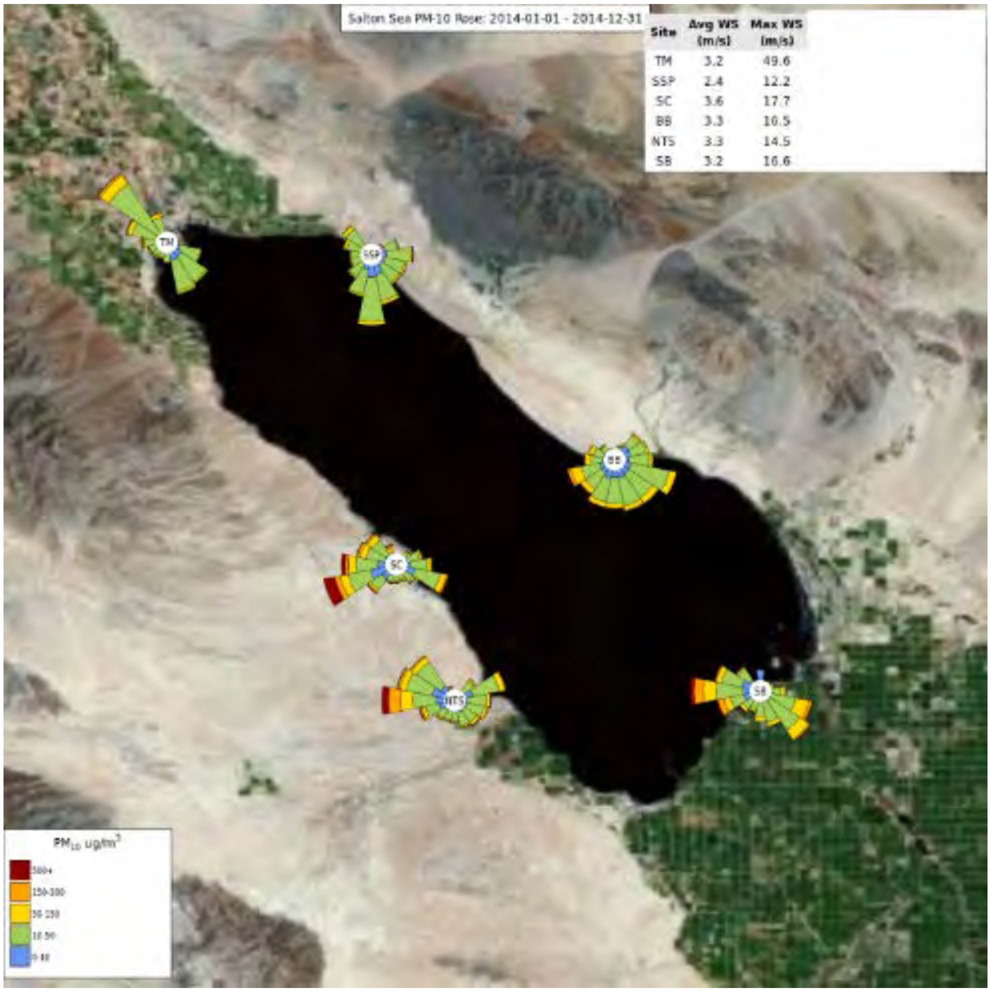
Figure 3-13. Salton Sea PM10 Monitoring Locations

TABLE 3-5. SALTON SEA AEROMETRIC MONITORING INSTRUMENTS

Parameter	Instrument	Comment
Particulate Matter Concentrations	Thermo Fisher Scientific TEOM 1405-D	Real-time measurements of PM_{10} and $PM_{2.5}$
3-Dimensional Wind Speed and Direction	R. M. Young Sonic Anemometer, Model 8100	10-meter height
Horizontal Wind Speed	R. M. Young Gill 3-Cup Anemometer, Model 12101	1-, 2- and 10- meter heights
Ambient Temperature	R. M. Young Platinum Temperature Probe, Model 41342VF	2-meter and 10-meter with aspirated radiation shields
Relative Humidity	R. M. Young Relative Humidity/Temperature Probe, Model 41382VF	2-meter with multi-plate radiation shield
Net Radiation	Met One Instruments Net Radiometer, Model 097	1-meter

The PM_{10} data, along with the meteorological data described in the next section, will be used to generate dust (or PM_{10}) roses for the west side of the Salton Sea. PM_{10} roses are especially useful because they are easy to interpret and reveal the frequency, magnitude and direction of dust sources affecting each PM_{10} monitor. An example set of PM_{10} roses is presented in Figure 3-14. Note that for the year 2014, significant dust sources existed in the desert area west of the Naval Test Station (NTS) monitor and west-southwest of the Salton City (SC) monitor. Appendix C contains a detailed description of the ambient PM_{10} monitoring protocol.

FIGURE 3-14. EXAMPLE SET OF PM10 ROSES FOR SALTON SEA, 2014



3.1.2.5.2 METEOROLOGY

The TEOMs described in Table 3-5 each have a co-located 10-meter-tall meteorological tower equipped with the instruments needed to calculate surface roughness length as well as to support standard regulatory air dispersion models (e.g., AERMOD and CALPUFF). The meteorological instruments mounted on each tower are summarized in Table 3-5. The three-dimensional sonic anemometer data are used to calculate five-minute and hourly wind directions.

3.1.2.5.3 SAND MOTION

Sand motion monitors, including Sensits and Cox Sand Catchers (CSC), will be used to establish real-time horizontal sand fluxes on the various off-Sea surface types identified within the AOI. Horizontal sand flux data, combined with surface-type-specific emission factors (either from published scientific literature or from the PI-SWERL), will be used to calculate vertical PM_{10} fluxes on the surfaces. The individual-area PM_{10} fluxes (in grams of PM_{10} per square meter per hour) will be summed to yield the area-wide PM_{10} emissions. Appendix D contains a detailed description of the sand motion monitoring protocol.

3.1.2.5.4 PI-SWERL Sampling

PI-SWERL sampling will occur periodically on the surface types identified within the off-Sea inventory AOI. Appendix D contains a detailed description of the PI-SWERL sampling protocol.

3.1.2.5.5 Video Monitoring

Portable video monitoring systems will be scattered around the AOI, focused primarily on the most active dust-producing areas west of the Salton Sea. Appendix D contains a detailed description of the video monitoring protocol.

3.1.2.6 Estimating Emission Rates

The various types of monitoring and active area delineation will enable two types of emission estimates: maximum daily emissions (tpd for active source areas) and total annual emissions (tpy for active source areas).

3.1.2.6.1 Maximum Daily Emissions

Maximum daily emissions will be computed by each of the following methods:

- Method 1: Worst-day measured horizontal sand fluxes coupled with PI-SWERL-generated emission factors.
- Method 2: PI-SWERL-generated vertical PM_{10} fluxes (varies with surface friction velocity, u_*) coupled with CALMET[53] estimates of surface friction velocity as a function of the worst-day meteorology.

Each of these methods will be applied to individual source areas identified using the methods described in Section 3.1.2.2, Area of Interest. The individual-area results will be totaled to yield the maximum daily emissions for the AOI. The results will be expressed in units of tpd.

3.1.2.6.2 Total Annual Emissions

The total annual emissions will be calculated using the same methods outlined above in Section 3.1.2.6.1, except that the worst-day horizontal sand fluxes in Method 1 will be replaced with average daily horizontal sand fluxes (averaged over one year) and the PI-SWERL-generated vertical PM_{10} fluxes in Method 2 will be applied for each day of the year (i.e., using the meteorology from each day) and then summed. The results will be expressed in units of tpy.

3.1.3 Updates to the Emission Inventories

The Salton Sea playa emission inventory described in Section 3.1.1 will be updated annually. Monitoring results related to the location and timing of playa exposure, salt crust surface characteristics and the

[53] CALMET, part of the CALPUFF modeling system, is a diagnostic meteorological model that reconstructs 3-dimensional wind and temperature fields starting from meteorological measurements, orography and land use data. http://www.arb.ca.gov/html/soft.htm

associated emission potentials will be evaluated on an on-going basis and may be done in consultation with the Imperial County and ICAPCD. Results will be used to (1) identify and prioritize implementation of proactive DCMs on active source areas and (2) inform development of Annual Proactive Dust Control Plans (Section 3.2.1.2).

For purposes of this SS AQM Program, the off-Sea emission inventory described in Section 3.1.2 is currently planned to be performed only once unless and until it is necessary to perform this inventory again due to substantial changes in the off-Sea emission sources. However, Imperial County, ICAPCD and/or IID may choose to update the off-Sea emission inventory at any time for any reason or in the event the source characteristics change (either for better or worse). The updated inventories may consider the use of new technologies and methods as they become available.

3.2 DUST CONTROL STRATEGY

This section describes the dust control strategy for PM_{10} emissions from exposed Salton Sea playa. The main components of the dust control strategy will be collaboratively developed with the Imperial County and ICAPCD, and include the following:

- Develop and implement proactive dust control measures (DCMs) to prevent source areas from becoming a significant source of PM_{10} emissions. This includes development and testing of new DCMs that are specifically tailored to the climate and soil conditions on and around the Salton Sea playa.
- Develop a dust control strategy that can comply with the ICAPCD Regulation VIII rules to the maximum extent possible, utilizing opportunities for alternative BACM to be approved, and identify opportunities to establish new procedures and rules and/or improve existing procedures and rules to fully and successfully implement an effective dust control strategy.
- Develop and implement a playa traffic management plan focused on public outreach and education to prevent disturbance and erosion due to off-highway vehicle (OHV) traffic.

3.2.1 CONCEPTUAL PROACTIVE DUST CONTROL STRATEGY

The goal of proactive dust control is to prevent exposed Salton Sea playa from becoming a significant source of PM_{10} emissions, which will help protect the public health of the communities near and around the Sea. The proactive dust control strategy would be collaboratively developed with the Imperial County and ICAPCD. It will include broad-scale implementation of DCMs that are protective of air quality, but that are also adaptable given the unknowns regarding temporal exposure and the magnitude of future emissions. As playa is exposed, the surface characteristics and emission potential will be rigorously evaluated (see Section 3.1.1). Initially, results from these evaluations will be used to establish criteria to identify and prioritize areas of exposed playa that have high emission potential. Criteria will be developed for each playa evaluation method (e.g., PI-SWERL data, video monitoring), such that any individual line of evidence could be used to prioritize proactive control areas. Once the criteria are established, IID will use the monitoring results to develop and implement an Annual Proactive Dust Control Plan. Results from the active source delineations will be used to prioritize DCM implementation on an on-going basis. This process is illustrated in Figure ES-1.

Each site would be monitored after DCM implementation to confirm that adequate surface stabilization is maintained. If the initial proactive DCM implementation on the site does not achieve a stabilized surface or if visible emissions occur, then the DCM would be further enhanced. This approach allows resources to be allocated efficiently and effectively, and in an expeditious manner to prevent significant sources of PM_{10} emissions.

The success of a proactive dust control strategy requires the development and testing of DCMs that can be quickly implemented, adequately maintain a stabilized surface and prevent the spread of emissive source areas as playa is exposed. Several DCMs have been field-tested and proven to be effective on playas, while other measures need additional research prior to use at the Salton Sea. Examples of proactive DCMs that could be used at the Salton Sea include surface stabilizers, soil roughening, water-efficient vegetation, vegetated swales, vegetation beach ridge enhancement and roughness elements, such as straw bales. Detailed descriptions of DCMs are included as Appendix E. Some of these measures require further pilot field testing to understand their effectiveness on Salton Sea playa (Section 3.2.1.1).

3.2.1.1 Pilot-Testing for New Dust Control Measures

The dust control strategy includes the development and testing of new DCMs for proactive control and/or for approval as BACM by the ICAPCD and the EPA. The DCMs will be specifically tailored to the climate and soil conditions on and around the Salton Sea playa and make efficient use of available resources. Some DCMs have been field-tested and proven to be effective and some DCMs need additional research prior to use at the Salton Sea. For the more novel and untested approaches, pilot field testing (pilot projects) will occur. The purpose of the pilot projects will be to perform field tests to understand DCM performance on the Salton Sea playa and to support ICAPCD and EPA approval of these DCMs as BACM.

As part of this SS AQM Program, IID is working cooperatively with Imperial County and ICAPCD on several DCM pilot projects. A surface stabilizer pilot project was completed in 2011 and surface roughening and plant community enhancement pilot projects were implemented in 2015. A vegetated swale pilot project is currently being planned. Pilot project sites were selected to represent the range of future playa surface and emission characteristics. Potential sites also were screened according to factors influencing their suitability, including, but not limited to: size, land ownership, permitting challenges, compatibility with anticipated operations and potential future land uses.

Pilot projects will allow IID, the Imperial County and ICAPCD to gain experience and understanding of novel, locally-adapted methods of DCMs and the site-specific factors that could affect their feasibility and cost. Pilot projects also are useful for determining the effectiveness of a DCM and refining design criteria for full-scale implementation. This helps develop efficient approaches for the design, construction and operation of DCMs on the playa.

3.2.1.2 Annual Proactive Dust Control Planning and Implementation

Results from the playa emissions inventory (Section 3.1) will be used to develop an Annual Proactive Dust Control Plan. The plans will be developed by IID in the first quarter of every year and may be done in consultation with the Imperial County and ICAPCD. They will include a synthesis of monitoring data for the prior year and will identify and prioritize areas for implementation of proactive DCMs. The plans may also incorporate considerations related to the transition of proactive dust control areas to alternative land uses, such as agriculture or habitat restoration.

3.2.2 ICAPCD Regulation VIII Rules for the Salton Sea Playa

IID intends to develop a proactive dust control strategy that complies with the regulatory requirements of ICAPCD and SCAQMD. However, IID recognizes that it may not be possible to maximize a proactive dust control strategy within existing rules and regulations. Therefore, there is a need to identify opportunities to establish new procedures and rules and/or improve existing procedures and rules to fully and successfully implement an effective dust control strategy to the maximum extent possible.

Exposed Salton Sea playa is subject to the ICAPCD Regulation VIII Rules related to the control of fugitive dust (see Section 2.3.2). Exposed Sea playa is currently subject to Rule 804 (see Section 2.3.2.2). There are several limitations in Rule 804 that would need to be addressed to allow maximum flexibility in implementing a proactive dust control strategy, including new DCMs specifically tailored to conditions on and around the Salton Sea playa.

The following list summarizes some of the limitations of Rule 804 and approaches for addressing them.

- Rule 804 applies to all persons who own or otherwise have jurisdiction or control over an open area. Landowners of exposed playa should have an opportunity to implement dust control in coordination with a responsible third party. While Rule 804 does not prohibit this from occurring, it does not specifically identify this opportunity and how it would work within the rule framework. Potential benefits for the ICAPCD include consolidated points of contact, improved coordination of dust mitigation (particularly for small, fragmented parcels) and consolidated responsible party resources.

- The existing definitions of a stabilized surface do not consider exposed playa surface characteristics and even though playa surfaces may be stable, they may not meet the definitions in Rule 800. A stabilized surface may be more appropriately defined by a broader set of performance standards and measurements, which could be verified through performance monitoring.

  For areas that do not meet the definition of a stabilized surface, the responsible parties should be able to proactively maintain or create a stabilized surface by any scientifically-based and tested reasonable means. The parties could monitor exposed playa to verify stability. In the event that the surface is not stabilized, then the parties would be required to augment the DCM to achieve stability with more intense control methods. This proactive dust control approach is described in more detail in Section 3.2.1.

- Opacity observations are required to determine compliance with VDE standards, and must be conducted in accordance with the test procedures for "Visual Determination of Opacity" as described in Appendix A of Rule 800**.** Opacity observations to determine compliance with VDE standards are not an appropriate method to attribute dust plumes to specific source areas on such a vast land surface. Surfaces that meet the definition of stabilized surface should be considered adequately controlled. Furthermore, the air basin is designated as serious nonattainment for PM_{10} and isolated plumes are difficult to identify with standard opacity observations. This is a concern due to the significance of off-lake sources. According to the IC 2009 PM_{10} SIP (page 2-1):

> "The vast majority of PM_{10} emissions impacting Imperial County originate from natural, non-anthropogenic sources (for instance, fugitive dust from barren lands alone accounts for >55% of average daily emissions). During high winds, Imperial County's desert areas can produce PM10 emissions over 50 times greater than the emissions from any anthropogenic source, including agricultural crop land."

3.2.3 Playa Traffic Management

The dust control strategy includes development and implementation of a playa traffic management plan. Extensive desert areas around the Salton Sea attract recreationalists and OHV traffic. OHV use is expected to expand onto the playa as the Salton Sea recedes. This activity will disturb the natural stability of playa crust and soil surfaces and increase erodibility and PM_{10} emissions. This is caused by the physical destruction of the fragile crusts by passes of vehicle tires. Tires pulverize the surface into sand-sized particles (Figure 3-15). These particles are then picked up by the wind, commencing saltation, and leading to loosening of many more particles downwind. This cascading effect increases erodibility on and around designated trails. The larger the footprint of vehicle use (through repeated passes), the larger the impact on the fragile playa crust.

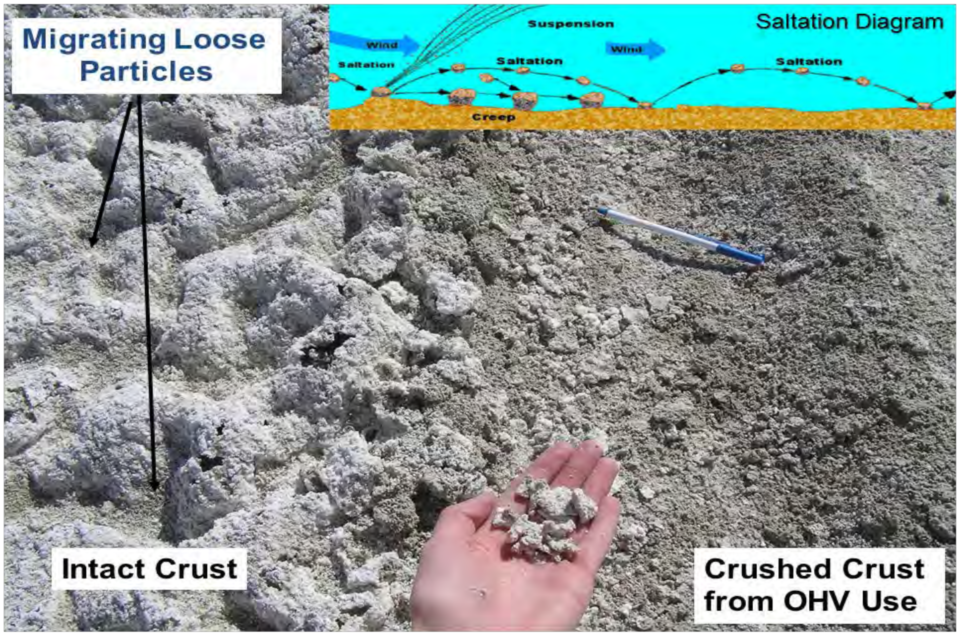


FIGURE 3-15. PHOTO OF SALT CRUST PULVERIZED BY OFF-HIGHWAY VEHICLE TRAFFIC

Prevention of vehicle related disturbances is the most important and cost-effective measure available to prevent and control emissions. Therefore, the playa traffic management plan will focus on limiting public access on fragile playa crusts to the extent legally and reasonably feasible. The ICAPCD, Bureau of Land Management (BLM) and California State Parks have found that approaches such as public outreach, education, sign posting, strategic fencing, gate installation and selectively closing or maintaining roads and trails are effective methods to control OHV activity. Therefore, rather than physical restriction of playa access, this SS AQM Program will focus on developing a plan that includes these approaches (Table 3-6).

TABLE 3-6. PLAYA TRAFFIC MANAGEMENT PLAN – PROGRAM ITEMS AND APPROACH

Program Item	Approach
Partnership and Educational Efforts	• Leverage partnerships relative to resource areas. Work cooperatively with partners to share resources and effectively manage OHV use around the Salton Sea. • Initiate public outreach effort which encourages OHV users to adopt a land use ethic that responsible OHV riders respect land resources and do not travel cross playa off roads and trails except in managed open areas. • Develop an education program in partnership with other federal and state agencies, counties, tribes, communities, OHV dealerships, user and other interest groups to teach the recreating public about the value of public land resources and how they can protect the environment while enjoying their recreation activities.
Land Use / Playa Planning	• Identify sensitive land resource and biological resource areas. • Determine appropriate use of these areas (if any). • Special emphasis on sensitive areas – Managing sensitive areas to ensure non-impairment.

Program Item	Approach
Restrictive Orders and Monitoring	• Encourage the public to adopt a land use ethic that, except in managed open areas, cross country travel off roads and trails should no longer be considered a responsible use of vehicles. • Restrict vehicle use through signage, enforcement and education in: sensitive playa areas, mitigation facilities, habitat facilities, energy facilities, cultural sites, etc. • Ensure compliance through increased enforcement, posting signs, providing information and monitoring activities and impacts. Work to gain the cooperation and assistance of local government, private citizens and interest groups in completing these actions and obtaining voluntary compliance.
Adaptive Management	• Periodically look back at approach in place. Identify lessons learned and incorporate those into the revised management approach with partners. • Through monitoring results, identify if/where existing trails need to be augmented.

With the help of the basic framework outlined in Table 3-6, a Playa Traffic Management Plan will be more fully developed by IID in coordination with the Imperial County, ICAPCD, the resource agencies, California State Parks and other interested stakeholders. The plan will include an assessment element to gauge success of the plan and to determine whether modifications to the plan are necessary.

3.3 ESTIMATED PROGRAM COSTS

This section describes the rationale for estimating SS AQM Program costs. The cost estimates and assumptions described below should be considered "order of magnitude" because they were prepared without the benefit of site-specific dust control criteria or detailed designs necessary for more accurate cost estimation. Therefore, these estimates are for planning purposes only, derived from experience at Owens Lake and based on the assumptions outlined in the following sections.

3.3.1 COST ASSUMPTIONS

The following sections detail the assumptions used to develop long-term estimated program costs associated with implementing this SS AQM Program.

3.3.1.1 RATE OF PLAYA EXPOSURE

The timing and location of future playa exposure is a function of the hydrologic response of the Salton Sea to external forces, such as inflows, salt loads and evaporation rates. This cost estimate uses reasonable incremental playa exposure acreage estimates, which will be adjusted according to the results of the updated SALSA2 modeling that will be published in the hydrologic report anticipated to be released this summer. It is clear that actual playa exposure rates will affect the amount of playa that may become emissive and ultimately require dust control, thereby affecting the program costs.

For the purpose of estimating costs, a series of 6 construction phases between 2020 and 2045 were identified as dust control implementation periods. Yearly playa exposure estimates were then aggregated to these timeframes and considered in the cost estimate calculations (Table 3-7).

TABLE 3-7 PLAYA EXPOSED FOR EACH CONSTRUCTION PHASE (ROUNDED TO THE NEAREST THOUSAND)

Year / Phase	Playa Exposed Per Phase (Acres)	Total Playa Exposed (Acres)
2020 / Phase 1	25,000	25,000
2025 / Phase 2	21,000	46,000
2030 / Phase 3	13,000	59,000
2035 / Phase 4	6,000	65,000
2040 / Phase 5	3,000	68,000
2045 / Phase 6	2,000	70,000

3.3.1.2 EMISSIVE CHARACTERISTICS OF THE PLAYA

The vast majority of the future exposed Salton Sea Playa is currently inundated. This makes it difficult to estimate the acreage of future playa that will be emissive (including the magnitude, timing and location of emissions) and require dust control. Restoration activities, including habitat projects and renewable energy development, on the future exposed playa are also uncertain with regard to location, size and timing. Additionally, other land management activities, which may or may not be included in the State's restoration activities, but may occur for other reasons are uncertain as well. Given these unknowns, the cost estimates assume 75 percent of the total playa exposure will be open, emissive and require some level of dust control. As a point of comparison, roughly 60 percent of the exposed Owens Lake playa is currently controlled.

3.3.1.3 DCMS APPROVED AS BACM

The types of DCMs available for implementation on future Salton Sea playa is an important component of the cost estimate. As described in Section 2.3.2.2, all exposed playa within the Imperial County is currently subject to ICAPCD Rule 804, Open Areas. Permissible BACM for open areas include: (1) applying water or chemical dust suppressants to all unvegetated areas, (2) establishing vegetation on previously disturbed areas, and (3) paving, applying and maintaining gravel, or applying and maintaining chemical dust suppressants. Additionally, alternative BACM may become permissible BACM once it has been approved by ICAPCD and the EPA according to the procedure outlined in Rule 804.

This SS AQM Program focuses on developing a proactive dust control strategy specific to the Salton Sea with DCMs that are science-based, practical, effective and feasible, and are anticipated to be approved as BACM for Salton Sea surfaces. While IID recognizes that air quality is ultimately regulated by the local air quality districts and the EPA and this program is structured to work with those agencies and within the applicable regulations, this program takes a broad and proactive approach that is not limited to currently approved BACM. This program anticipates further coordination with the local air quality districts and the EPA as described in Section 4. Nevertheless, an important step in that coordination is DCM pilot projects and studies, which will be a basis to expand the list of DCMs available for approval as BACM.

There are a significant amount of scientific and experience-based resources informing the development of this SS AQM Program. However, there are many unknowns that cannot be known for the Salton Sea until pilot-testing can be done on exposed Salton Sea playa with specific DCMs. DCM pilot projects are necessary to inform all interested parties of the broad range of technical issues associated with dust control implementation on the Sea playa. This includes factors such as hydrology, vegetative cover establishment, dust control effectiveness required, water supply planning, constructability and appropriate design criteria to meet dust control objectives.

For purposes of the program cost estimates provided in this SS AQM Program, Table 3-8 outlines the percentage breakdown of DCMs assumed for currently approved BACM under ICAPCD Rule 804 and, for comparison, DCMs anticipated to become approved BACM (both assume DCMs on 75 percent of total exposed playa). The assumptions made in Table 3-8 take the most cost-effective breakdown of DCMs under each scenario purely for informational purposes of providing a program cost estimate. In addition to estimated cost-effectiveness, the DCM percentage breakdown was developed using available surface soil texture information (Section 3.1.1.3). Approximately 42 percent of the future exposed playa will consist of fine textured soils suitable for surface roughening and/or moat and row; 36 percent medium textured soils potentially suitable for surface roughening, moat and row or vegetation establishment; and 22 percent coarse textured soils suitable for vegetation establishment. Table 3-8 is not a plan or proposal for specific DCMs to be implemented on exposed Salton Sea playa. The percentage of DCMs may be revised at any time and will be revised as actual exposed playa is mitigated by the implementation of specific DCMs. As discussed in this program, decisions regarding the type, location and timing of implementing DCMs on exposed playa are to be made on an annual basis as playa is exposed and analyzed to determine the dust control strategy needs of that playa and other contributing outside factors, such as available funding.

ICAPCD Rule 804 currently has only a limited number of approved BACM: water efficient vegetation (to achieve the 50 percent cover requirements), shallow flooding, chemical dust suppressants and gravel cover. This SS AQM Program takes a proactive approach that is not limited by approved BACM, but anticipates that all DCMs outlined in Appendix E will be approved as BACM as allowed under the alternative BACM process under Rule 804.

TABLE 3-8 ASSUMED DCM IMPLEMENTATION PERCENTAGES FOR APPROVED BACM UNDER ICAPCD RULE 804 AND ALL DCMS IDENTIFIED IN THIS PROGRAM

DCM	Rule 804 Approved BACM	All Identified DCMs
Surface Roughening	0%	42%
Moat and Row	0%	3%
Dust Suppressants	0%	0%
Veg. Enhancement	0%	35%
Veg. Swale	0%	10%
Water Efficient Vegetation	85%	7%
Shallow Flood	10%	2%
Brine Stabilization	0%	1%
Gravel Cover (2 inch thickness)	5%	0%
Gravel Cover (4 inch thickness)	0%	0%
Total	**100%**	**100%**

3.3.1.4 DCM UNIT COST

A description of each DCM used in this cost estimate is provided in Appendix E. The estimated capital costs per DCM (Table 3-9) include construction costs plus engineering design, construction management and engineering services during construction. Operation and maintenance costs (Table 3-9) are based on an assumed percentage of construction cost. It is important to note that these cost estimates are reasonable and based on actual experience at the Salton Sea or Owens Lake, with the exception of dust suppressants, which involves a product that can be priced and purchased. However, air quality mitigation at Owens Lake is the only similar and comparable situation to that of the Salton Sea and that situation is very different from the Salton Sea in many respects including timing of implementation and the largely reactive approach that has been taken. There are no documented resources for costs specific to air quality mitigation associated with these DCMs implemented on a large-scale area of varying soil characteristics and other factors to be considered. Therefore, these cost estimates remain high-level estimates of DCMs that have largely not been performed at the Salton Sea to date and where design, construction and engineering costs may be greatly affected by the unique location, climate and other factors associated with this area. These cost estimates will be refined as this SS AQM Program is implemented.

TABLE 3-9 ESTIMATED DUST CONTROL MEASURE UNIT CAPITAL AND O&M COSTS (2014$)

Dust Control Measure	Capital (Per Acre)	Estimated O&M (% of Capital)	Information Source
Surface Roughening	$400	75.00%	IID AQ Program to date
Moat and Row	$14,000	10.00%	LADWP personal communication
Dust Suppressants	$2,000	100.00%	Cargill (Magnesium Chloride)
Vegetation Enhancement	$9,000	7.50%	IID AQ Program to date
Vegetative Swale	$17,000	7.50%	IID AQ Program to date
Managed Vegetation	$25,000	4.50%	LADWP personal communication
Shallow Flood	$25,000	2.00%	LADWP personal communication
Brine Stabilization	$21,000	0.25%	LADWP personal communication
Gravel Cover (2 inch thickness)	$36,000	0.25%	LADWP personal communication
Gravel Cover (4 inch thickness)	$48,000	0.25%	LADWP personal communication

Cost assumptions for water conveyance infrastructure (Table 3-10) were obtained from the Salton Sea Ecosystem Restoration Program, Draft Programmatic Environmental Impact Report (PEIR), Appendix H. Cost estimates from the PEIR were adjusted to 2014 dollars using the U.S. Department of Commerce, Bureau of Economic Analysis, Table 1.1.9. Implicit Price Deflators for Gross Domestic Product [Index numbers, 2009=100] seasonally adjusted values. It was assumed that costs for this infrastructure would begin two years prior to the first dust control construction phase. Water conveyance is likely required to facilitate irrigation of vegetation in certain areas, especially in locations where groundwater cannot be accessed, and potential water based DCMs on the playa as the Sea recedes.

TABLE 3-10 CAPITAL COST ESTIMATES FOR CONVEYANCE INFRASTRUCTURE AS PRESENTED IN THE PEIR FOR AIR QUALITY MANAGEMENT

Infrastructure	PNA Estimates, Appendix H7 of PEIR ($ 2006)	Total Construction Costs ($ 2014)
Sedimentation Basin	40,776,000	46,741,835
Roads	689,000	789,806
Western AQM Canal (70 cfs, 42 mi)	30,224,000	34,645,998
Eastern AQM Canal (60 cfs, 40 mi)	25,845,000	29,626,318
Central AQM Canal (40 cfs, 10 mi)	4,555,000	5,221,431
Saltwater Conveyance for AQM	13,740,000	15,750,265
Pupfish Channels (30 mi)	9,110,000	10,442,861
Other Construction (5%)	6,246,950	7,160,926
Construction Subtotal	131,185,950	150,379,439
Contingency (30%)	39,355,785	45,113,832
Engineering, Legal, and Administration (12% of Construction Costs)	20,465,008	23,459,193
Total Capital Cost	**191,006,743**	**218,952,464**
Yearly O&M (3.5% of Construction)	**4,591,508**	**5,263,280**

Notes:

Values have been rounded and may not add directly

Values from the PEIR PNA, Appendix H7 are in 2006 dollars and have been escalated to 2014 dollars using U.S. Department of Commerce, Bureau of Economic Analysis, Table 1.1.9. Implicit Price Deflators for Gross Domestic Product [Index numbers, 2009=100] Seasonally adjusted

All values do include costs for land acquisition, easement, or taxes

AQM = Air Quality Management

3.3.2 ESTIMATED PROGRAM COSTS

Using the assumptions outlined in Section 3.3.1, a spreadsheet calculator was developed to estimate costs (using 2014 dollars) through 2076 for currently approved BACM under ICAPCD Rule 804 and the proactive dust strategy using all DCMs identified in this SS AQM Program. The spreadsheet calculator was developed to facilitate changes in assumptions outlined in Section 3.3.1 as more is learned through implementation of this SS AQM Program (e.g., dust control implementation schedule, emission characteristics of the playa, DCM costs, BACM approval, etc.). Table 3-11 provides a summarized version of the total cost on a five-year time step. Given the uncertainty associated with the assumptions outlined in Section 3.3.1, a -15% and +25% multiplier was applied to the final estimate to generate a cost range.

For implementation of the BACM currently approved under Rule 804, the total cost estimate in 2047 (timeframe of estimated maximum playa exposure) is $2.86BN, with a range of $2.43BN to $3.58BN. For implementation of the DCMs identified in this SS AQM Program regardless of approval as BACM, the total cost estimate in 2047 is $1.49BN, with a range of $1.27BN to $1.86BN. Estimated costs for implementation of the BACM currently approved under Rule 804 in 2076 (at the end of the water transfer) is $4.56BN, ranging from $3.88BN to $5.70BN. Estimated costs for implementation of the DCMs identified in this SS AQM Program regardless of approval as BACM for this same timeframe is $2.59BN, ranging from $2.11BN to $3.24BN. As discussed above, these are high-level estimates intended for informative purposes only and will be refined as this SS AQM Program is implemented and more is learned from this implementation.

As shown in Table 3-11, the estimated cost of implementing BACM currently approved under Rule 804 is nearly double the cost of the implementation of the DCMs identified in this SS AQM Program regardless of approval as BACM. This is mainly due to the limited amount of BACM currently available under Rule 804 as well as the 50% cover requirements for vegetation in Rule 804. This underscores the need for IID to to continue work with the Imperial County and ICAPCD immediately to seek approval of alternative BACM under Rule 804 and to identify opportunities to establish new procedures and rules and/or improve existing procedures and rules to fully and successfully implement this SS AQM Program. As stated previously, such opportunities should include new BACM performance measures (i.e., determining if the surface is adequately stabilized).

TABLE 3-11 Summary of Dust Control Total Costs (2014$)

	Rule 804 Approved BACM Estimated Cost ($BN)			All Identified DCM Estimated Cost ($BN)		
Year	Total Cost	Total Cost (-15%)	Total Cost (+25%)	Total Cost	Total Cost (-15%)	Total Cost (+25%)
2020	$0.60	$0.51	$0.75	$0.25	$0.22	$0.32
2025	$1.25	$1.06	$1.56	$0.59	$0.50	$0.74
2030	$1.72	$1.46	$2.14	$0.81	$0.69	$1.01
2035	$2.09	$1.77	$2.61	$1.02	$0.86	$1.27
2040	$2.42	$2.06	$3.03	$1.21	$1.03	$1.52
2047	$2.86	$2.43	$3.58	$1.49	$1.27	$1.86
2050	$3.04	$2.58	$3.80	$1.60	$1.36	$2.00
2055	$3.33	$2.83	$4.17	$1.79	$1.52	$2.24
2060	$3.63	$3.08	$4.53	$1.98	$1.69	$2.48
2065	$3.92	$3.33	$4.90	$2.18	$1.85	$2.72
2070	$4.21	$3.58	$5.26	$2.37	$2.01	$2.96
2076	$4.56	$3.88	$5.70	$2.59	$2.21	$3.24

4 AGENCY COMMUNICATION, COORDINATION AND REPORTING

This section describes agency communication and coordination, as well as a summary of reporting.

4.1 AGENCY COMMUNICATION AND COORDINATION

As described in detail in this document, this SS AQM Program is focused on monitoring and mitigating dust emissions from exposed Salton Sea playa. Accordingly, communication and coordination with several local, state and federal agencies, as well as other stakeholders, will be essential to the success of this program. Different agencies will be involved in different aspects of this program. For instance, the Imperial County, ICAPCD, SCAQMD, CARB and EPA will need to be involved in efforts to expand approved BACM. IID will be communicating and coordinating with the Natural Resources Agency and other state agencies to ensure that the State's restoration activities are informed by and coordinated with the implementation of this program and that, likewise, air quality mitigation activities are informed by and coordinated with the State's restoration activities. Further, the QSA JPA and its member agencies will be involved for funding purposes according to the process described above (Section 2.1.2). IID will coordinate implementation of this SS AQM Program with these agencies and stakeholders as necessary and on an on-going basis. Additionally, IID anticipates that quarterly progress updates will be provided as appropriate and in a forum or format to be determined. IID will prepare an annual progress report that will document detailed aspects of implementation of this program on an annual basis.

4.2 SUMMARY OF REPORTING

A variety of documents will be prepared throughout implementation of this SS AQM Program. Documents may include: technical memoranda describing results of research and monitoring activities; Annual Proactive Dust Control Plans (Section 3.2.1.2); conceptual and final designs for DCMs; and outreach materials for the general public. Progress reports as described above will also be prepared to document progress and findings from implementation of this SS AQM Program. IID will ensure that final and complete materials will be available to the public and posted to the IID website.

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APPENDIX A – MASTER RESPONSE ON SALTON SEA AIR QUALITY MONITORING AND MITIGATION PLAN IN FINAL EIR/EIS

AIR QUALITY

3.9 Master Response on Salton Sea Air Quality Monitoring and Mitigation Plan

3.9.1 Introduction

Commenters have requested additional discussion of measures that might be practical, available, and feasible for problem assessment and avoiding, minimizing, and mitigating potential dust and air quality impacts associated with exposed shoreline around the Salton Sea caused by the Project. This master response is intended to address those comments.

3.9.2 Difficulties Associated with Impact Assessment

Comments on the Air Quality Section of the Draft Environmental Impact Report/ Environmental Impact Statement (EIR/EIS) vary widely but tend to acknowledge that prediction of the scale or intensity of future dust impacts is not possible, given the limited available information on submerged areas and the variability of conditions that might promote or inhibit dust emissions at the Salton Sea. Notes from the Salton Sea Authority on the Salton Sea Air Quality Workshop held April 3, 2002, concluded, "At this time there is neither enough data nor enough exposed shoreline to predict with any credibility where, when, or how bad the emissions will be." As stated in the Draft EIR/EIS, several factors prevent any reasonable quantitative estimate of emissions and associated impacts from the exposed shoreline:

- Lack of data regarding sediment characteristics.
- Lack of data relating sediment characteristics to surface stability and actual emissions rates.
- Spatial variations in sediment characteristics and land surface erodibility.
- Temporal variations in wind conditions.
- Temporal variations in factors contributing to the formation of salt crusts and otherwise influencing the tendency of land surfaces to emit dust in high winds.

It is also not possible to perform modeling of potential impacts on ambient concentrations of PM10 (particulate matter with a diameter of less than 10 micrometers) in areas around the Sea without information on mass emission rates, location, or the areal extent of emissive land surfaces.

3.9.3 Similarities to and Differences from Owens Lake

Several comments pointed to similarities between exposure of sediments at Salton Sea and at Owens Lake, suggesting that similar dust emissions and air quality problems could ensue with lowering of the Salton Sea elevation. This response is based on available information and considerable experience at Owens Lake (where a large dust mitigation program is being implemented by the Los Angeles Department of Water and Power) and at the Salton Sea (where Imperial Irrigation District [IID] has operated for many decades).

At the April 3, 2002 Air Quality Workshop held by the Salton Sea Authority, it was concluded that definitive data are lacking for prediction of PM10 emissions from exposed seabed sediments. However, several general observations regarding this comparison shed light on the level of risk of major dust emissions resulting from exposure of sediments at the Salton Sea.

Driving forces for dust emissions include wind and sand. Winds at the Salton Sea have been compared with those at Owens Lake in the Master Response on *Air Quality – Wind Conditions at the Salton Sea* in Section 3.16 of this Final EIR/EIS. Those data (Table 3.9-1) show that the frequency of high winds at the Salton Sea are much less frequent than at Owens Lake.

TABLE 3.9-1
Comparison of wind-speed frequency at 10 m above the ground surface for Salton Sea and Owens Lake

Site	>8.5 m/s (19 mph)	>11.0 m/s (25 mph)
Niland (near Salton Sea)	4.4%	1.4%
Tower N3 (Owens Lake)	18.9%	7.9%

Above a threshold wind velocity, sand if it is present on the surface, saltates (skips on the surface), and with each impact may break coherent soil crust and eject finer material upward into the airstream. So pronounced is the correlation of sand motion with PM10 emissions that, at Owens Lake, one of the primary tools for mapping dust emissions for mitigation is sand motion.

The sources of sand at Owens Lake are relatively steep-gradient streams feeding the lake, with few control structures to impede flow and cause sediment removal upstream of the lakebed. This has resulted in the following sand distribution at Owens Lake:

- A relatively continuous ring of sand dunes surrounding Owens Lake at its shoreline.
- Extensive areas of mobile sand (known locally as "sand sheets") on the lakebed surface.
- Extensive areas of lakebed with deep sand deposits mapped as the dominant soil type.

In contrast, there is very little sand to blow in the southeastern shore areas of the Salton Sea, where bathymetry suggests that sediments would be most extensively exposed. This is because of shallow gradients and extensive control on tributary rivers. Likewise, sand sources such as dunes are absent in this area. Where sand dunes do occur along the western side of the Sea, bathymetry suggests sediment exposure would be very limited. Therefore, the co-occurrence of sand sources and exposed lakebed, which is so widespread and problematic at Owens Lake, appears to be largely absent in this area of the Salton Sea.

Exposed soil surfaces are more resistant to wind erosion when they are roughened or covered with a stable crust. When saline sediments are exposed by lowered water levels, the crust that forms at the soil surface is cemented by salt, and its strength is largely dependent on the strength of this cementation. The salt chemistry at Owens Lake results in a high proportion of sodium-carbonate evaporite salts that change radically in degree of hydration and volume at temperature variations within the range commonly experienced at Owens Lake. This has the effect of softening the crust and increasing rates of breakage and emissions. Comparing the makeup of salts in the Salton Sea (Bertram Station) and at Owens Lake (subsurface drainage or aerated groundwater), the following observations can be made (see Figure 3.9-1):

- There is much more (26 percent) calcium and magnesium at the Salton Sea; cations at Owens Lake contain 97 percent sodium.
- Carbonate and bicarbonate are virtually absent at the Salton Sea; they make up about 29 percent of anions at Owens Lake.
- Sulfate levels at Salton Sea (29 percent) are more than twice Owens Lake levels (12 percent).

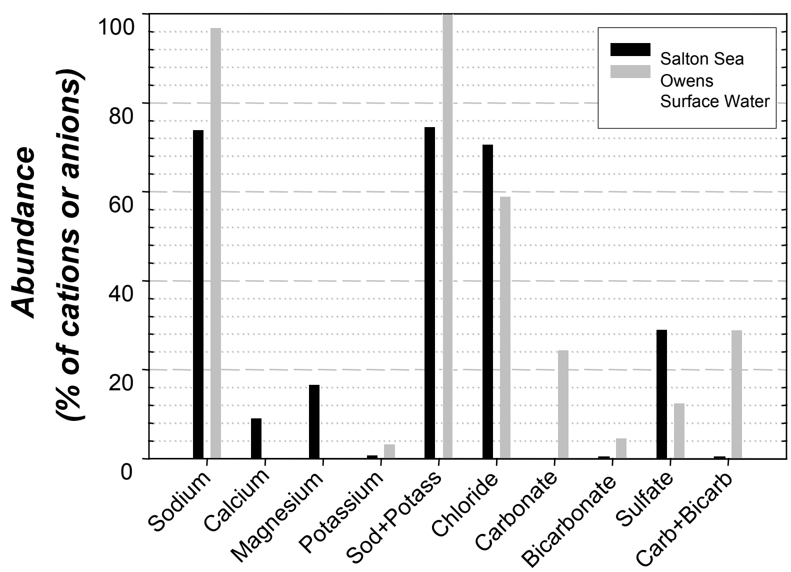

Figure 3.9-1

Relative abundance of major cations and anions at Salton Sea (Bertram Station, 1996-2001) and in subsurface drainage water at Owens Lake (Agrarian and Tree Rows sites, October 1998). Abundance for cations (sodium, calcium, magnesium, and potassium) is given as a percentage of the total cations, and for anions (chloride, carbonate, bicarbonate, and sulfate) as a percentage of total anions (milliequivalents/liter).

Further, the range of temperature variation at the Salton Sea is quite distinct from (generally warmer than) Owens Lake. The particular climatic interaction with salt minerals at Owens Lake influences dust emissions. This will also be the case at the Salton Sea. At the April 3 Air Quality Workshop, it was generally acknowledged that interactions between Salton Sea climate and minerals are undefined and constitute a pressing research need.

Sea levels have fluctuated over the period since the Sea filled during 1905 to 1907, resulting in periodic and extended exposure of significant Sea sediments. Such exposure at Owens and Mono Lakes generated unmistakable dust emissions. While there has been no systematic monitoring program at the Salton Sea, there does not appear to be any substantial anecdotal information that these areas have historically contributed observable dust emissions.

This is consistent with observations of soil crusts in the Salton Sea area. Crusts re-form when rain falls on these desert lakebeds and then progressively break apart over time; the extent and rate of breakage indicate the erosive forces to which the crusts are subjected, and, to some extent, the amount of wind erosion. Year-old crusts are generally heavily damaged in emissive areas at Owens Lake. Relatively old crusts (at least 18 months) generally show little damage at the Salton Sea.

In summary, weaker driving forces at Salton Sea, especially the absence of sand in potentially exposed areas, are consistent with observations suggesting that exposed sediments are not as emissive as they have been at Owens Lake.

3.9.4 Difficulties Associated with Specific Prescription of Mitigation

Without information on the nature and extent of the potential problem to be mitigated, it is unwise and impractical to propose or commit prematurely to costly dust control mitigation measures. Further, the dust control mitigation measures studied and under implementation at other lakebeds, such as Mono and Owens, may not be feasible or practical at the Salton Sea, given limitations on financial resources and the constraints on water availability for mitigation in this desert area. Nor would it be prudent to propose use of ratepayers' money to fund dust control measures for a problem that does not currently exist and may never materialize.

Under shoreline exposure scenarios, it is currently impossible to predict the extent and intensity of potential increases in dust emissions or the associated increases in ambient concentrations of the pollutant PM10 in excess of standards. The Draft EIR/EIS describes conditions at the Salton Sea that would naturally inhibit PM10 suspension, i.e., the combination of moisture present in the unsaturated zone beneath the exposed playa, the probable formation of dried algal mats and stable salt crusts consisting of chloride and sulfate salts, and the relatively low frequency of high wind events at the Salton Sea. In the best case, no problem would occur; in the worst case, a problem would emerge at some later date, after 2035, as the Sea's shoreline becomes exposed. Shoreline exposure caused by the Project will be delayed until that date because of implementation of the Salton Sea Habitat Conservation Strategy, which would provide mitigation water to the Sea to offset reductions in inflow caused by the Project. See the Master Response on *Biology – Approach to Salton Sea Habitat Conservation Strategy* in Section 3.5. IID would be responsible for impacts associated with implementation of the Proposed Project, apart from impacts associated with shoreline exposure anticipated from Baseline conditions.

3.9.5 Monitoring and Mitigation Plan

Rather than focusing on site-specific and costly dust control mitigation for an undefined and future potential problem, a phased approach is proposed to detect, locate, assess, and resolve this potentially significant impact. The following 4-step plan would be implemented to mitigate significant PM10 emissions and incremental health effects (if any) from Salton Sea sediments exposed by the Proposed Project:

(1) **Restrict Access.** Public access, especially off-highway vehicle access, would be limited, to the extent legally and practicably feasible, to minimize disturbance of natural crusts and soils surfaces in future exposed shoreline areas. Prevention of crust and soil disturbance is viewed as the most important and cost-effective measure available to avoid future dust impacts. IID or other governmental entities own or control most of the lands adjacent to and under the Salton Sea. Fencing and posting would be installed on these lands in areas adjacent to private lands or public areas to limit access.

(2) **Research and Monitoring.** A research and monitoring program would be implemented incrementally as the Sea recedes. The research phase would focus on development of information to help define the potential for problems to occur in the future as the Sea elevation is reduced slowly over time. Research would:

   (a) Study historical information on dust emissions from exposed shoreline areas.

   (b) Determine how much land would be exposed over time and who owns it.

   (c) Conduct sampling to determine the composition of "representative" shoreline sediments and the concentrations of ions and minerals in salt mixtures at the Sea. Review results from prior sampling efforts. Identify areas of future exposed shoreline with elevated concentrations of toxic substances relative to background.

   (d) Analyze to predict response of Salton Sea salt crusts and sediments to environmental conditions, such as rainfall, humidity, temperature, and wind.

   (e) Implement a meteorological, PM10, and toxic air contaminant monitoring program to begin under existing conditions and continue as the Proposed Project is implemented. Monitoring would take place both near the sources (exposed shoreline caused by the Project) and near the receptors (populated areas) in order to assess the source-receptor relationship. The goal of the monitoring program would be to observe PM10 problems or incremental increases in toxic air contaminant concentrations associated with the Proposed Project and to provide a basis for mitigation efforts.

   (f) If incremental increases in toxic air contaminants (such as arsenic or selenium, for example) are observed at the receptors and linked to emissions from exposed shoreline caused by the Project, conduct a health risk assessment to determine whether the increases exceed acceptable thresholds established by the governing air districts and represent a significant impact.

   (g) If potential PM10 or health effects problem areas are identified through research and monitoring and the conditions leading to PM10 emissions are defined, study potential dust control measures specific to the identified problems and the conditions at the Salton Sea.

(3) **Create or Purchase Offsetting Emission Reduction Credits.** This step would require negotiations with the local air pollution control districts to develop a long-term program for creating or purchasing offsetting PM10 emission reduction credits. Credits would be

used to offset emissions caused by the Proposed Project, as determined by monitoring (see measure 2, above). IID proposes negotiation of an offset program that would allow purchase of credits available under banking programs, such as Imperial County Air Pollution Control District Rule 214 for agricultural burning. Other means of dust control and PM10 emissions reductions available for application to agricultural operations in the IID service area would also be pursued for credit banking opportunities (e.g., managing vacant lands, improving farming practices to reduce PM10, and paving roads). This step would not be used to mitigate toxic air contaminants (if any); Step 4 would be necessary if toxic air contaminants pose a significant health issue.

(4) **Direct emission reductions at the Sea.** If sufficient offsetting emission reduction credits are not available or feasible, Step 4 of this mitigation plan would be implemented. It would include either, or a combination of:

(a) Implementing feasible dust mitigation measures. This includes the potential implementation of new (and as yet unknown or unproven) dust control technologies that may be developed at any time during the term of the Proposed Project; and/or

(b) If feasible, supplying water to the Sea to re-wet emissive areas exposed by the Proposed Project, based on the research and monitoring program (Step 2 of this plan). This approach could use and extend the duration of the Salton Sea Habitat Conservation Strategy.

If, at any time during the Project term, feasible dust mitigation measures are identified, these could be implemented in lieu of other dust mitigation measures or the provision of mitigation water to the Sea. Thus, it is anticipated that the method or combination of methods could change from time to time over the Project term.

The success of the proposed plan is dependent on coordination and cooperation of the involved parties and the air quality regulatory agencies. Coordination, communication, staff commitment, and funding will be required in each phase of the proposed research, monitoring, and emissions reduction program.

3.9.6 Impact Assessment; Feasibility of Implementation

The Draft EIR/EIS concludes that windblown dust from exposed shoreline caused by the Proposed Project may result in potentially significant and unavoidable air quality impacts that could not be mitigated. This conclusion was based upon (1) uncertainty regarding the actual air quality impacts of Salton Sea shoreline exposure, because of the lack of sufficient records or research regarding emissive potential, and (2) uncertainty regarding the availability or feasibility of mitigation measures. This conclusion was intended to be conservative in view of the broad disclosure goals of the California Environmental Quality Act and the National Environmental Policy Act.

This master response is intended to propose a method for identifying the scope of actual air quality impacts caused by the Project and for identifying and implementing potentially feasible mitigation measures that could reduce those impacts. The proposed mitigation is potentially sufficient to avoid or suppress PM10 emissions to less than significant levels. However, a level of uncertainty remains regarding whether short-term and long-term impacts can be mitigated to a less-than-significant level, as described below. Therefore, the conservative conclusion that these impacts are potentially significant and cannot be mitigated has been retained in this Final EIR/EIS.

With the implementation of Salton Sea Habitat Conservation Strategy, shoreline exposure caused by the Project would not begin until some time after the year 2035. Up to an estimated 16,000 acres of shoreline would potentially be exposed between 2035 and end of the Project term as a result of full implementation of the Proposed Project. The mitigation plan described above works in concert with the Salton Sea Habitat Conservation Strategy and is expected to reduce air quality impacts and PM10-related health effects. However, problem assessment and mitigation implementation would occur subsequent to the development of potential dust emissions. Therefore, interim impacts could be significant.

It is uncertain what the conditions in the Salton Sea Air Basin will be as of 2035 when Project impacts may begin to occur. The Imperial Valley portion of the Salton Sea Air Basin is currently a moderate nonattainment area and the Riverside County/Coachella Valley portion is currently a serious nonattainment area for the National Ambient Air Quality Standard for PM10. The attainment status of the Basin in 2035 cannot be ascertained; however, the Clean Air Act requires a plan for attainment well in advance of that date.

Cost and water availability may affect the feasibility of certain dust mitigation measures and the proposed delivery of water to the Sea to re-wet emissive areas, as proposed under the mitigation plan described above. If mitigation water is generated by non-rotational fallowing within the IID water service area, this may result in significant impacts to agriculture, as described in Section 3.5 of the Draft EIR/EIS. Fallowing may also adversely affect the Imperial Valley economy, as described in Section 3.14 of the Draft EIR/EIS. Before approving the Project, the Lead Agencies must balance the benefits and impacts of the Project as well as the effects and feasibility of proposed mitigation measures.

APPENDIX B – EXPOSED PLAYA PM_{10} INVENTORY

B.1 Experimental Design

This section describes the experimental design of the PM_{10} (particulate matter less than 10 microns in diameter) emission inventory for exposed Salton Sea playa, including the inventory goal and objectives, approach, data collection and analysis, mapping and characterization of playa surfaces, collection of aerometric data, and delineation of active plume areas.

B.1.1 Goal and Objectives

The goal of the PM_{10} emission inventory for exposed Salton Sea playa is to develop an updated PM_{10} emission inventory for consideration in the 2016 Revised Imperial County PM_{10} State Implementation Plan (SIP). An accurate PM_{10} emission inventory is a critical aspect of preparing an effective dust control strategy and attainment demonstration modeling analysis.

The objectives of this emission inventory are four-fold:

1. To evaluate the PM_{10} emission *potential* of different exposed playa surfaces over time, with and without a protective surface crust.

2. To gain a better understanding of the length of the dust season on different exposed playa surfaces.

3. To develop methods for remotely observing and mapping active PM_{10} emission sources on exposed Salton Sea playa.

4. To use the information and data gathered to develop a refined estimate of exposed playa PM_{10} emissions.

The initial phase of the playa PM_{10} emission inventory will be completed in 2016. Follow-up inventory estimates will occur at roughly three-year intervals (next estimate in 2018) using updated equipment and methods, if available.

B.1.2 Approach

The approach for assessing PM_{10} emissions from current and future exposed Salton Sea playa is as follows:

1. Map the extent of exposed Salton Sea playa *by surface type* (e.g., coarse, intermediate, fine, barnacles, crusted vs. non-crusted, etc.) before the start of each playa *dust season*.[1]

2. Conduct PI-SWERL sampling to characterize the emission potential of each surface type over the course of the dust season.

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[1] The period of time during which the playa is particularly susceptible to wind erosion (assumed to be January through February).

3. Record the time and location of dust plumes or any other indications of dust emission activity.
4. Map active dust source areas using remote sensing methods.
5. Quantify maximum hourly and total annual emissions from active source areas.
6. Model dust emissions to evaluate potential impacts at PM_{10} compliance monitors.

Each of these items is discussed in more detail below.

B.1.3 Data Collection and Analysis

This section describes data collection and analysis for mapping and characterizing playa surfaces, for aerometric data, and for delineating active plume areas.

B.1.3.1 Mapping and Characterizing Playa Surfaces

This section describes the mapping and characterization of currently exposed playa surfaces and future exposed playa surfaces.

B.1.3.1.1 Current Exposed Playa

This section describes the objectives, methods, and reporting for mapping and characterizing current exposed playa surfaces.

B.1.3.1.1.1 Objectives

The objective is to map and characterize the surface types of exposed Salton Sea playa. Specifically, properties controlled by evaporate (water-soluble salt) mineral dynamics (e.g., surface type, surface crust thickness, and surface crust hardness) will be mapped and monitored because they are directly related to the spatial and temporal nature of PM_{10} dust emissions (Buck et al. 2011). A secondary objective is to better understand the range of conditions that may be reasonably expected as future playa surfaces are gradually exposed.

B.1.3.1.1.2 Methods

Extensive playa surface survey monitoring methodology originally developed for Owens Lake is being adapted for use at the Salton Sea. This includes monitoring protocols and methodology to accurately map playa exposure and playa surface characteristics (analogous to soil map units) using remotely sensed data resources and ground-based surface evaluations. In addition, mineralogy and groundwater chemistry will be evaluated. Each is described below.

Playa Exposure

Monitoring of the actual Sea surface elevation and associated playa exposure is important for understanding potential air quality impacts. This information will provide a real-time understanding of actual playa exposure as it occurs and will help to validate the SALSA2 model results. Two independent methods have been developed to quantify playa exposure.

- **USGS Sea Elevation.** Salton Sea elevation is monitored continuously by the USGS (USGS Site 10254005 Salton Sea NR Westmoreland CA). The monitored Sea elevation data provide the basis for extracting a shoreline from high-resolution bathymetric data. As discussed previously, all data from the USGS gauge are collected in NGVD29 and must be converted to NAVD88 using the standard conversion factor of 2.113 feet when using the bathymetric data or comparing to SALSA2 model results. GIS tools have been developed to provide near real-time estimates of shoreline location and therefore playa

- **Landsat Satellite Imagery:** The accuracy of the USGS gauge-based shoreline is a function of the Sea elevation data from the USGS as well as the precision of the underlying bathymetric data. Therefore, an independent method for assessing exposed playa was developed using satellite imagery. Specifically, the Landsat 5 (1984 to 2013), Landsat 7 (1999 to present), and Landsat 8 (2013 to present) satellites provide current and historic imagery on an 8-to-16-day basis for the Salton Sea. A spectral water index called the Modified Normalized Difference Water Index (MNDWI) (Equation 1) was used to identify standing water associated with the Salton Sea from Landsat imagery. MNDWI is based on the fact that water absorbs energy at shortwave-infrared (SWIR) wavelengths. The integration of the green band into the equation reduces noise associated with other land-based features (Zhang and Wylie 2009). A date-specific threshold of MNDWI was then established to isolate the Salton Sea water body and associated shoreline.

  EQUATION 1 – MNDWI

  $$MNDWI = \frac{\rho\ green - \rho\ SWIR}{\rho\ green + \rho\ SWIR}$$

Actual playa exposure acreage will continue to be monitored and reported on a quarterly basis using the Landsat imagery as well as the USGS Sea elevation approach. Results of the quarterly monitoring will be shared with Imperial County and ICAPCD.

Playa Surface Characteristics

Playa surface characteristics will include detailed characterization of surface properties at various locations, including each PI-SWERL sampling location (see Section B.1.3.2.1.2 for sampling locations). Surface properties are shown in Table B-1. Collector for ArcGIS will be used to record surface characterization data. Unit-defining crust types will be photographed with Collector and linked to the sampling location and associated surface characterization data. The predominant map unit will be described and mapped. The occurrence of significant amounts of surface sand also will be mapped because these features identify important depositional areas.

The furthest extent of the Salton Sea is typically marked by beach ridges formed by Sea wave action. The intervening areas between beach ridges are generally consistent in terms of exposure time and duration of salt crust development. Thus, playa map units are expected to coincide with these areas. Several salt crust types may be mapped within each map unit due to topographic anomalies where water may have pooled longer or drained earlier than the surrounding area.

Table B-1. Surface Properties Collected During Surface Characterization Events

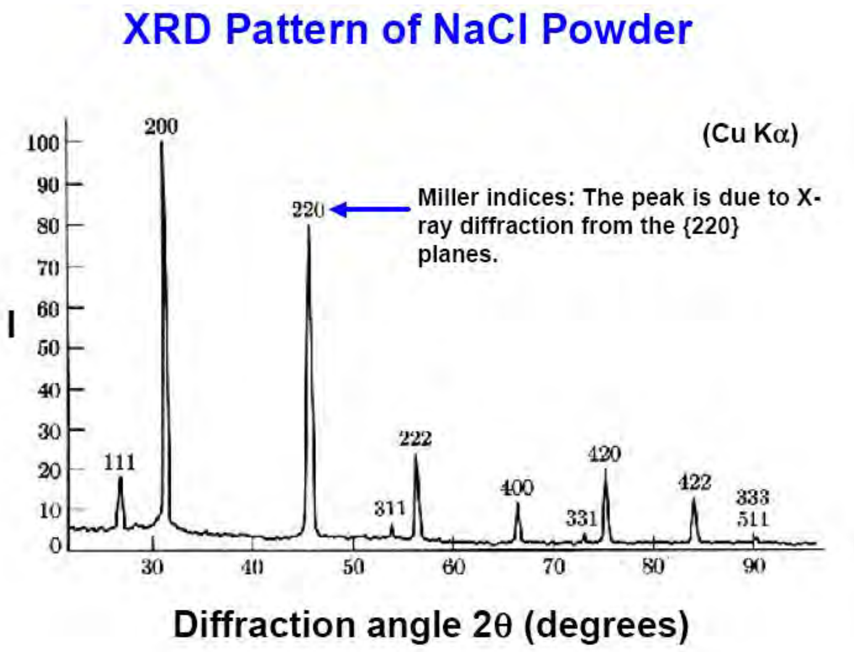
Surface Property	Description
Crust Type	Crust categories may include: smooth, botryoidal, weak botryoidal, hummocky, and networked. The dominant crust type of the observation area will be characterized, and if other types are present in smaller amounts, they will be noted as inclusions. Additional crust categories may be developed specifically for the Salton Sea playa.
Crust Thickness	Crust thickness is measured from the top of salt crust to the top of soil. In some places, the salt crust will be divided into two distinctly different layers: top-crust and sub-crust. Top-crust is usually a harder, salt-cemented crust that forms a shell over the surface. Sub-crust usually has weak structure (i.e., soft or crumbly) and extends from the bottom of the top-crust to the underlying, often looser soil. In some cases a top-crust will exist without a sub-crust and will be directly overlaying the soil. Total crust thickness is considered the sum of top-crust and sub-crust.
Crust Hardness	Crust hardness indicates the degree of erosion resistance. Crust hardness can be characterized by the amount of force necessary to crush the salt crust by hand according to United States Department of Agriculture Natural Resources Conservation Service (USDA-NRCS) guidelines (Schoenenberger et al. 2002). On average, smooth and weak botryoidal crust types are the softest, while networked and hummocky crusts are harder. Hardness of both top-crust and sub-crust will be assessed if distinct surface and sub-crusts are present. In addition, the “ball drop method” will be used to evaluate crust hardness at each location using Rule 800 specifications.
Penetration Resistance	Penetration resistance can be measured with a penetrometer. A penetrometer will be inserted through the total crust depth to assess crust resistance. Local penetration resistance can vary substantially and will be measured at several points to calculate an average penetration resistance for a crust type. Penetration resistance readings will be recorded in pounds per square inch (psi). The penetrometer reads in tons per square foot, but the reading is easily converted to psi by multiplying the result by 13.89.
Surface Type and Boundary Type	The surface and boundary types are general field descriptions of the characterized site. The surface types may be classified as open water, saturated mineral soil, saturated salt crust, dry-low relief salt crust, and dry-high relief salt crust. The surface boundaries may be classified as diffuse, distinct, gradual, abrupt, and other.
Soil Moisture	Soil moisture will be qualitatively assessed for the first one to two inches of soil directly below the crust. Soil moisture can be classified based on USDA-NRCS classification parameters (Schoenenberger et al. 2002). Soils will usually range from slightly moist to saturated where crust exists, and dry to saturated where no crust exists.
Soil Texture	Soil texture will be qualitatively assessed for the first one to two inches of soil directly below the crust. Soil texture will be described as fine textured, moderately fine textured, medium textured, moderately coarse textured, coarse textured, or shell.
Free Surface Sand	Free surface sand will be visually determined by estimating the percentage of free, sand-sized particles in a square meter of playa surface. The amount of free sand can vary seasonally with crust development, because forming crusts can encapsulate surface sand as they harden. Free sand particles on the surface are often very fine and settle into very small depressions in crust surfaces.

Surface Property	Description
Salt Efflorescence	Salt efflorescence is generally a white coating of salt on a surface. At the Salton Sea it is usually seen on top of thinly developed salt crusts. Salt efflorescence is a concern as it consists of extremely fine crystal mats which are very fragile and may be pulverized with the slightest touch.
Crust Relief	Crust relief will be measured to provide a more refined understanding of surface roughness. Roughness affects wind resistance and surface wind velocities, and is therefore useful in wind-erosion modeling. Crust relief will be determined by measuring the distance from the bottom of a crust depression to the top of a typical crust ridge. When applicable, macro- and micro-relief will be differentiated. Networked, botryoidal, and hummocky crusts usually have the greatest relief.
Surface Erosion and Deposition	Surface erosion is generally characterized as a percentage of total crust area that appears to have been eroded by wind. This can be done with visual or remote-sensing techniques. A qualitative description will also be provided using descriptors such as buffed, slightly buffed, scoured, sand shadows, dunes, etc.
Percentage Vegetation, Overflow, and Other Features	Percent surface area of vegetative cover, dune area, berm area, overflow area, and representative playa area will be estimated. These estimates will provide a distribution of small inclusions relative to the dominant mapped surface condition. These features also have implications for the formation of crusts and erodibility; percent overflow area and vegetative cover are probably the most influential of these features. The surface area assessment can be performed visually (from the ground) or using remote-sensing techniques.

Mineralogy

Salt mineralogy and crystal habit affect the vulnerability of various playa surfaces to wind erosion (Buck et al., 2011). The mineralogy of the dominant surfaces will be quantified using a portable X-Ray Diffraction (XRD) device known as the TERRA Portable XRD System. The XRD System bombards finely ground and homogenized samples with X-ray radiation, yielding bulk mineralogy. Bulk mineralogy is determined by measuring the angle and intensity of diffracted X-rays as they pass through the sample. Diffracted X-rays produce two dimensional diffraction patterns, each corresponding to different crystal orientations. Through Fourier Transforms, the two-dimensional diffraction patterns yield three-dimensional images of electron density within a crystalline sample, which further shows the positions and bond types of atoms in the sample. Every mineral has a unique chemical composition, or range of compositions, and the relationship of atoms (in terms of position and bond types) reveals its mineralogy. Figure B-1 is an example of typical output data from the XRD System.

Figure B-1. Example Output from a TERRA Portable XRD System



Salt crust samples will be collected at PI-SWERL sampling locations (see Section B.1.3.2.1.2 for sampling locations). Samples will be collected with a stainless-steel hand trowel and gloved (nitrile) hands. Samples will be processed in the field by pulverizing the salt crust (with tools included with the XRD System) and placing the sample into the sample chamber for analysis with the XPowder software. Remaining sample material will be reserved for possible additional analysis, pending mineralogy results.

Analysis results will be compared to the American Mineralogist Crystal Structure Database (AMCSD) to determine mineralogy. The AMCSD is a crystal structure database that contains each mineral structure published in the American Mineralogist, The Canadian Mineralogist, the European Journal of Mineralogy and Physics and Chemistry of Minerals, as well as selected data sets from other journals (Downs and Wallace, 2003). The XRD System data will then be used to correlate salt mineralogy to potential PM_{10} emissivity based on the PI-SWERL results.

Groundwater Chemistry

Playa salt crust mineralogy characteristics are controlled by the evaporation of shallow groundwater (Buck et al., 2011). Specifically, loosely cemented sodium sulfate salts are known to have higher emission rates than sodium chloride salts (Buck et al., 2011). Therefore, shallow groundwater will be sampled and analyzed to quantify groundwater chemistry characteristics at each PI-SWERL sample location. Groundwater chemistry data will serve as the basis for predicting the minerals that will precipitate from solution as a result of evaporation. This analysis includes four main steps:

1. **Sample Groundwater**. Representative groundwater samples will be collected at each of the five salt crust study sites, which include Bombay Beach, Alamo River, New River South, Poe Road and the Salton City Club House (Figure B-2). Groundwater will be sampled from one access tube installed in the near-surface aquifer system at each of the salt crust study sites. One round of groundwater samples will be conducted in 2016 in support of the emissions inventory. Additional sampling events at selected sites may be conducted, as needed.

   Prior to groundwater sampling, manual groundwater level measurements will be collected from the access tubes completed at the salt crust study sites. Groundwater samples and water level measurements will be collected in accordance with SOP No. 4, *Groundwater Sampling and Water Level Measurements* (Appendix D5). Groundwater will be sampled using a peristaltic pump and dedicated tubing unless the depth to water is too great in which case an alternative purge method will be used. Groundwater samples will be collected using one of the methods described in SOP No. 4, *Groundwater Sampling and Water Level Measurements* (Appendix D5). It is likely that the low-flow sampling method will be used. All non-dedicated sampling equipment will be decontaminated between each sample location in accordance with SOP No. 7, *Equipment Decontamination* (Appendix D6). Immediately following sample collection, samples will be appropriately labeled, placed in resealable plastic bags, and placed in a cooler with wet ice in accordance with SOP No. 2, *Sample Custody, Packaging and* Shipment (Appendix D7).

2. **Analyze Groundwater Samples**. Samples will be analyzed for laboratory and field parameters, including major minterals. Field water quality parameters include temperature, pH, specific conductance, dissolved oxygen (DO), and oxidation reduction potential (ORP). Field parameters will be measured in accordance with SOP No. 4, *Groundwater Sampling and Water Level Measurements* (Appendix D5). Prior to the collection of field water quality parameters, the water quality meters will be calibrated in accordance with SOP No. 31, *Water Quality Meter Calibration* (Appendix D8). All groundwater field parameters will be measured using a flow-through cell to ensure representative groundwater measurements from the aquifer.

Figure B-2. Representative Groundwater Monitoring Locations

3. **Review Lab Results**. A review of laboratory data quality indicators, including data completeness, quality and validation, will be performed upon receipt of the data reports prepared by the laboratory. Any data quality issues will be identified before the data are accepted for use in geochemical modeling.

4. **Simulate Evaporation and Mineral Precipitation Reactions**. Lab data will be used to develop aqueous complexation and chemical-reaction models. The aqueous models will be based on site-specific and empirical data. The Geochemist's Workbench® will be used to simulate evaporation and the resulting mineral precipitation reactions. Input data will be entered into The Geochemist's Workbench® computer code. The Geochemist's Workbench® can access thermodynamic data from a number of widely used databases, including the Lawrence Livermore National Laboratory (LLNL 1995) and MINTEQA2 (EPA 2006) databases. It also accomodates the Debye-Hückel and Harvie-Moller-Weare activity models to allow for modeling of solutions with a wide range of dissolved solids content.

   The resulting aqueous complexation models will be evaluated to identify the types of open-system reactions (e.g., mineral precipitation due to oversaturation in solution) that are predicted to take place in situ, as well as the potential for sorption of groundwater constituents to, or desorption from, aquifer solids. For the mineral solids that are predicted to precipitate from solution, their stability and solubility will be evaluated for the range of measured redox and pH conditions.

B.1.3.1.1.3 Reporting

Results of mapping and characterizing current exposed playa surfaces will be reported as outlined in Table B-2. Table B-2, Summary of Reporting for Playa Emissions Inventory, is located at the end of Appendix B.

B.1.3.1.2 Future Exposed Playa

This section describes the objectives, methods, and reporting for mapping and characterizing future exposed playa surfaces.

B.1.3.1.2.1 Objectives

The objective of this effort is to assess the physical characteristics of the inundated playa soils using available data sets and analyses related to Salton Sea floor bathymetry and sediment characteristics. This information will be used to quantify the types of soils and surfaces that will be exposed as the Sea recedes and develop "analoges" with playa already exposed. This information will also be used to stratify PI-SWERL sampling locations and then extrapolate that information to estimate the range in emissive conditions of the future exposed playa. In addition, results also provide insight into the types of dust control measures that may work well in specific regions of future exposed playa.

B.1.3.1.2.2 Methods

Acoustic sonar data collected by the Bureau of Reclamation were analyzed to provide planning-level information on surface soil characteristics of the currently inundated playa. These data were combined with ground-truth data of soil sediment characteristics. The combination of these data sets was used to generate surface soil sediment characteristics on the playa. The resulting spatial maps predict surface sediment texture, soft sediment depth, surface roughness/complexity, and barnacle bed locations. The following sections detail the methods used to characterize the subsurface characteristics of the inundated Salton Sea playa.

Data Collection

Acoustic sonar data were collected on behalf of the Bureau of Reclamation by Quester Tangent (QTC) between October and December 2004. Simultaneously, surface grab samples were also collected by the Salton Sea Authority. A total of 24 survey days were required to collect all the data. Over 3 million 200 kHz echoes and over 3 million 50 kHz echoes were logged by each system. The systems digitally acquired each raw echo at a rate of approximately four per second and logged the waveform for post-processing. Both the full waveform (FWF) and envelope data were logged by the system. The sonar data were stored in a QTC proprietary format.

GPS navigation data were simultaneously logged as comma-delimited ASCII (American Standard Code for Information Interchange) records (as a National Marine Electronics Association Global Positioning System Fix Data [NMEA GPGGA] string). The GPS system was a CSI Wireless Inc. DGPS MAX, with an OmniSTAR subscription to improve positioning accuracy. OmniSTAR is a “sub-meter” level of service. A typical 24-hour sample of Virtual Base Station will show a 2-sigma (95 percent) of significantly less than 1-meter horizontal position error, and the 3-sigma (99 percent) horizontal error will be close to 1 meter. It operates in real time, and without the need for local base stations or telemetry links. In post-processing, the sonar and navigation records were merged based on a high-resolution time-stamp tagged to each record at the time of logging.

Classification and Processing

The amplitude and shape of an acoustic signal reflected from the sea floor is determined by the sea bottom roughness, the contrast in acoustic impedance between water and sea floor, and perturbations caused by inhomogeneities in the substrate’s volume. Remote seabed classification requires an acoustic data acquisition system, an algorithm set to analyze the data, an implementation method to determine the seabed type, and ground-truth data to relate the acoustic classification to seabed features.

The QTC VIEW seabed classification system by Quester Tangent was used to process the echo trace, and filtering algorithms were used to suppress noise. Echo description was accomplished using several algorithms to extract 166 echo shape features, known as full feature vectors (FFVs), from each trace. Multivariate statistical analysis then identified the best feature combinations to distinguish groups of echoes representing different seabed surface characteristics. The feature combinations are reduced to three primary values, known as Q-values, which describe each echo.

Echo classification is accomplished using the three Q-values; it is assumed that the acoustic response from like seabed surfaces will be similar. When Q1, Q2, and Q3 are plotted in orthogonal Q-space, seabed surfaces with similar acoustic responses will form clusters. An echo was classified using its position in Q-space with respect to the clusters generated from calibration data—the echo being classified the same as the closest cluster.

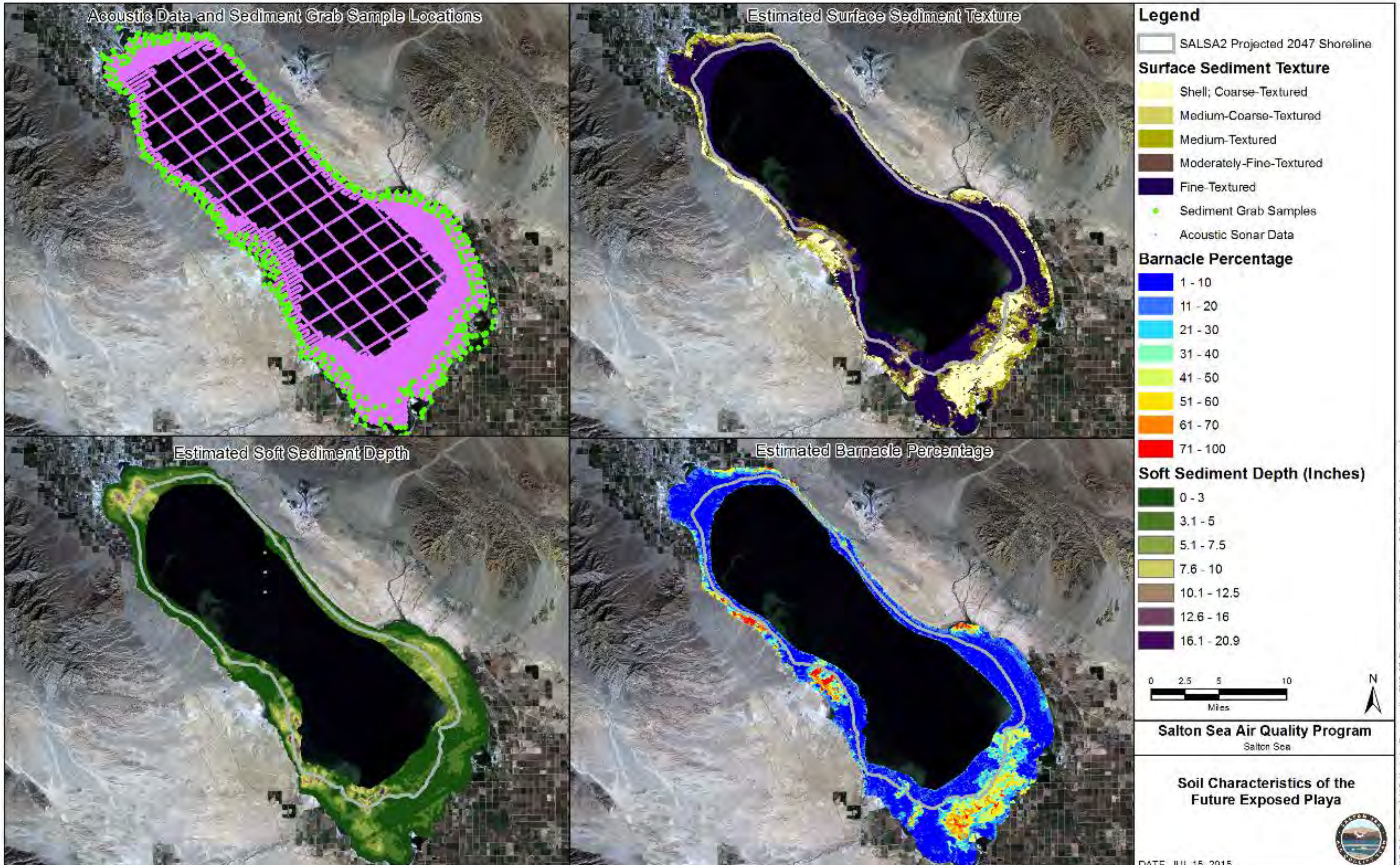
The echo classification in Q-space was done without prior knowledge of the sediment at the sites. Therefore, without a catalogue associating clusters to sediment type, unsupervised classification was used to statistically generate clusters from Q-values alone. Final Q-values for each frequency were appended to each echo location to generate a spatial point map of values.

Generation of Sediment Maps

Point Q-values for each frequency were further processed using geostatistical techniques to spatially interpolate between point values and create a spatially continuous map (Figure B-3). The sea floor depths calculated by the two different frequencies were also used to generate complexity calculations and soft sediment depth (Figure B-3).

Sediment grab samples collected by the Salton Sea Authority were statistically compared to the interpolated acoustic Q-values to create spatial maps of sediment depth, soil texture, surface roughness/complexity, and barnacle bed locations.

Figure B-3. Soil Characteristics of Future Exposed Playa from Acoustic Sonar Data



Uncertainty

Due to the nature of the acoustic sonar and grab samples, there is significant uncertainty in the final sediment maps. In addition, wave action, currents, and other disturbances since the time of the acoustic survey could have significant impacts on the spatial structure of the sea floor sediments. That said, this layer provides the best available information for understanding the range of surface sediment characteristics of the future Salton Sea playa.

B.1.3.1.2.3 Reporting

Results of mapping and characterizing future exposed playa surfaces will be reported as outlined in Table B-2, Summary of Reporting for Playa Emissions Inventory. Table B-2 is located at the end of Appendix B.

B.1.3.2 Aerometric Data

This section describes the aerodynamic data collection activities that will occur as part of the design of the PM_{10} inventory for the exposed Salton Sea playa.

B.1.3.2.1 PI-SWERL Sampling

The PI-SWERL sampling objectives, locations and frequency, instrumentation, operation and maintenance procedures, analysis, and reporting activities for the exposed Salton Sea playa PM_{10} inventory are described in the following sections.

B.1.3.2.1.1 Objectives

The primary objective of PI-SWERL sampling is to characterize the PM_{10} emission potential for distinct surface types on exposed Salton Sea playa. A secondary objective is to gain a more complete understanding of the “dust season” on the playa (assumed to be January through February). The vulnerability of various playa surfaces to wind erosion is a function of salt mineralogy and crystal habit, both of which are influenced by climate variables: precipitation, relative humidity, and ambient temperature (Buck et al. 2011). For the remainder of the year (i.e., March through December), the playa surfaces are thought to have a more durable crust and are therefore more resistant to wind erosion and PM_{10} emissions. The PI-SWERL sampling will help to verify whether this is the case.

B.1.3.2.1.2 Sampling Locations and Frequency

PI-SWERL sampling will be performed on seven distinct surface types found around the Salton Sea (Section B.1.3.1.2). They are:

- Types 1-3, Coarse-textured soils with barnacles:
    - 0-30% barnacle cover
    - 31-60% barnacle cover

    - >60% barnacle cover

- Type 4, Medium-coarse-textured soils
- Type 5, Medium-textured soils
- Type 6, Moderately fine-textured soils
- Type 7, Fine-textured soils

Forty-two sampling sites will be selected in the field for the initial PI-SWERL investigation, including: seven surface types, two “treatments” (i.e., undisturbed crust and disturbed crust), and three replications for each combination of surface type and treatment (7 x 2 x 3 = 42 sampling sites). The sampling sites will be selected from within relatively large, uniform areas with the target surface conditions. However, much of the current exposed shoreline is a mosaic of various surface types. For these areas, emission potential will be assessed by taking the area-weighted average of the component types over a suitably large characteristic area; for example, 160 acres. Maps of preliminary sampling locations are shown in Figure B-4, Figure B-5, and Figure B-6.

Figure B-4. Preliminary PI-SWERL Sampling Locations, Surface Type 1 (Torres-Martinez)

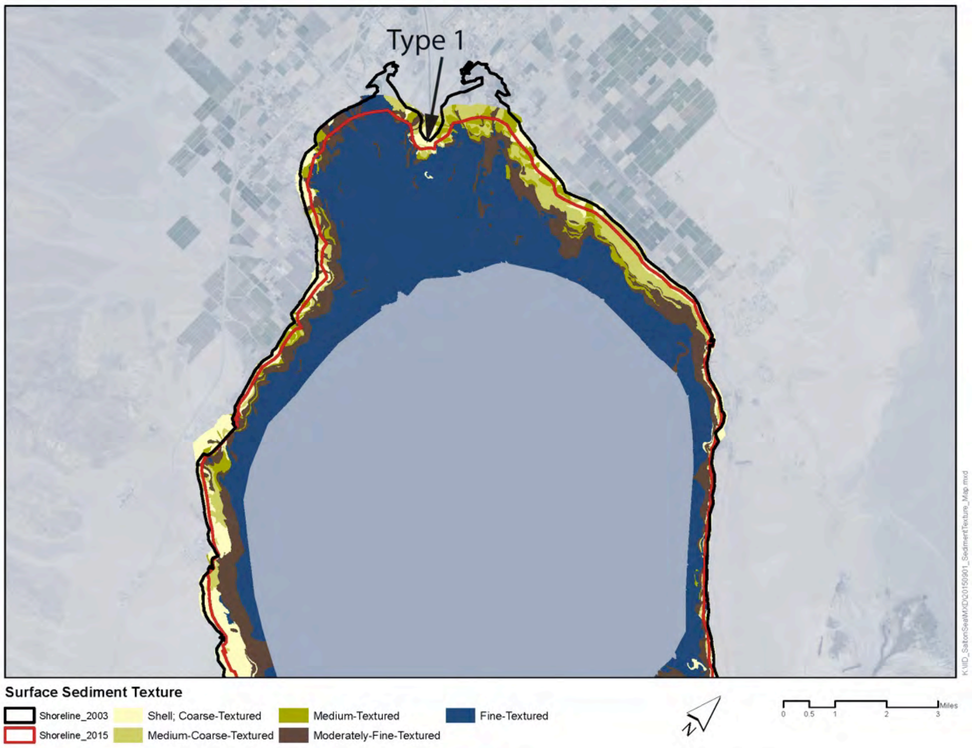


Figure B-5. Preliminary PI-SWERL Sampling Locations, Surface Types 2 and 3 (Bombay Beach) and Surface Types 4 and 5 (Salton City)

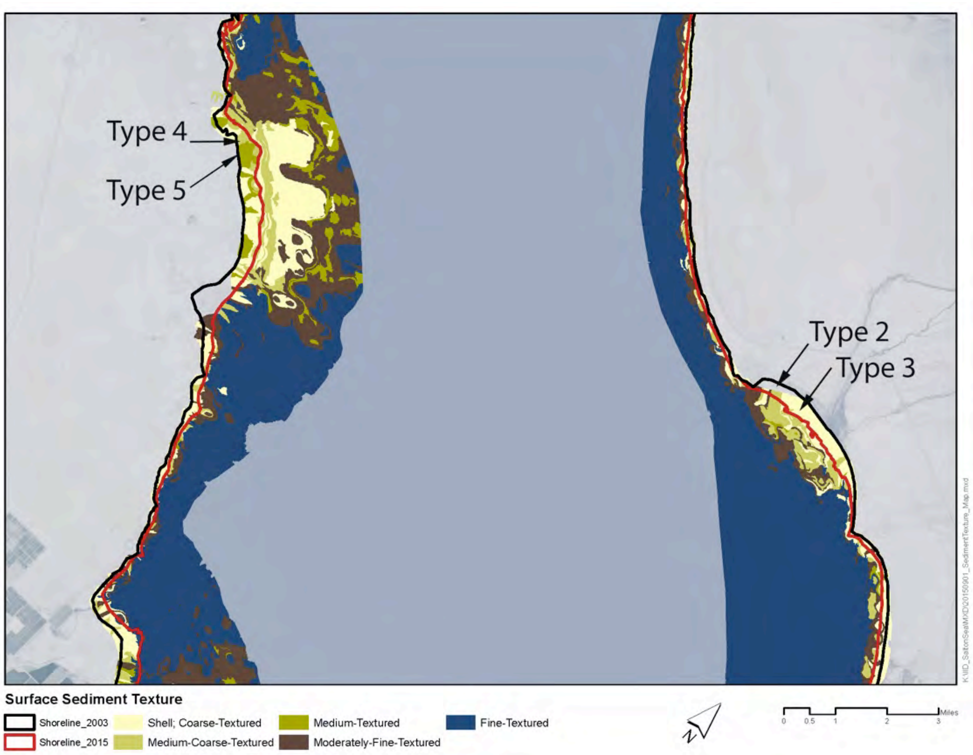
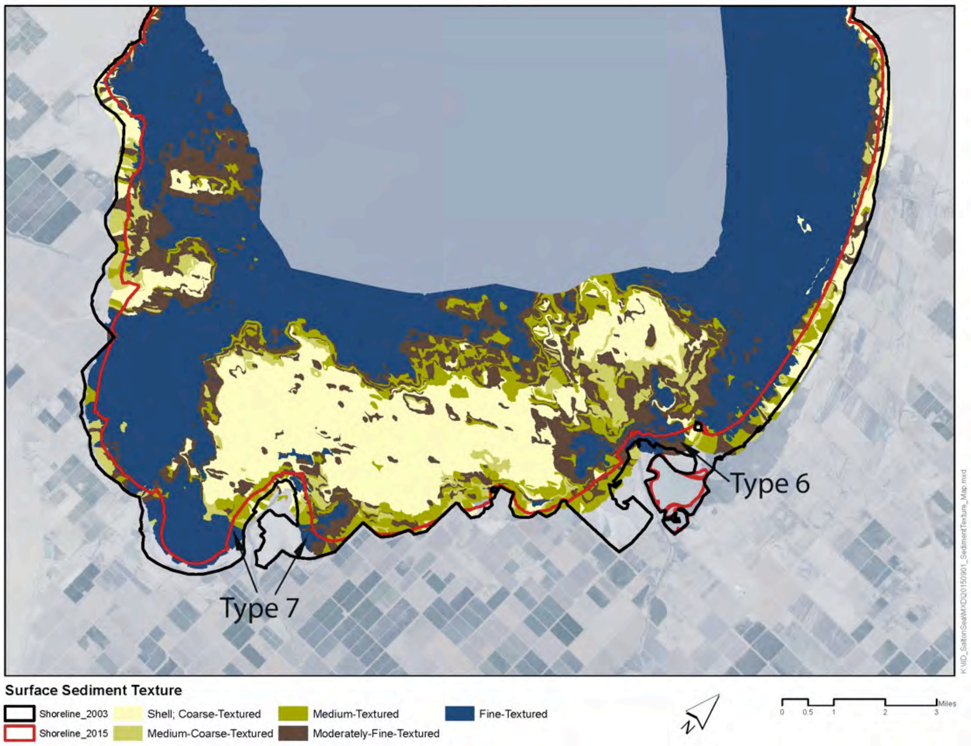


Figure B-6. Preliminary PI-SWERL Sampling Locations, Surface Types 6 and 7 (New River)



Eleven sampling times (events) are planned for the first year of operation. PI-SWERL sampling events are estimated for the following dates:

- Two events in November (1st and 15th, 2015)
- Two events in December (1st and 15th, 2015)
- Two events in January (1st and 15th, 2016)
- Two events in February (1st and 15th, 2016)
- Three events in March (1st, 15th, and 31st, 2016)

These sampling events bracket the assumed January-through-February dust season by at least one month. Bracketing will help to gain a better understanding of the true length of the dust season.

A soil scientist will accompany the PI-SWERL team to characterize the PI-SWERL sample locations as well as the surrounding playa. It is important to characterize the spatial variability of surface types because surfaces are not as uniform as they sometimes appear on maps.

Only the first six months of PI-SWERL sampling have been budgeted (November 2015 through April 2016). Future sampling events will be budgeted as needed. The timing and intensity of sampling events will be dictated by the areal extent of playa exposure and the desire to learn more about how the playa emission potential changes over time.

B.1.3.2.1.3 Instrumentation

Required instrumentation includes the PI-SWERL apparatus, described below. Labeled diagrams of the PI-SWERL apparatus are found in Appendix D.1, Standard Operating Procedures: PI-SWERL.

Development of the PI-SWERL (Figure B-7) by Victor Etyemezian and others at the Desert Research Institute (DRI) in Reno, Nevada, was motivated by a need for a portable device to test and measure the potential for wind erosion and dust emissions from real-world surfaces. Large wind tunnels, the conventional mode of measurement prior to the PI-SWERL, required long setup times and often a team of people to operate. In comparison, the PI-SWERL is easy to move, requires minimal setup time, and can be operated by a single person.[2] A prototype was developed in 2000 and tested alongside the University of Guelph's large wind tunnel in Guelph, Ontario, Canada. This testing provided early indication of the feasibility of the PI-SWERL concept. Since then, several models have been used in many field investigations, including measuring emission potential on Owens Lake and Salton Sea playas.

Figure B-7. PI-SWERL Apparatus

The PI-SWERL uses a tri-wheeled buggy to transport the instrument and all supporting components. This photograph shows an Air Sciences Inc. crew member sampling surface emission potential at Area T23 on the Owens Lake playa, California.

The PI-SWERL comprises an open-bottomed, cylindrical chamber operated by a direct-current motor that spins an annular metal ring about 2.5 inches above and parallel to the soil surface. Principles of fluid mechanics allow simulation of high winds and ground-level turbulence that typically produce dust

[2] For safety and efficiency, two-person teams are recommended.

emissions. The spinning ring creates known wind shear, lofting soil and dust particles and passing them through particulate monitors. The PI-SWERL electronically measures the number and size of entrained particles over the duration of a test cycle, typically less than 10 minutes. By controlling the speed of the ring to simulate varying wind speeds, the potential for a soil surface to produce PM_{10} dust emissions can be determined under a range of simulated wind conditions.

The PI-SWERL-derived PM_{10} and sand flux compared favorably to standard laboratory measurements in two separate calibration studies sponsored by the Los Angeles Department of Water and Power (LADWP). In 2011, the PI-SWERL PM_{10} flux using a DustTrak was calibrated against the gravimetric PM_{10} flux at DRI's laboratory in Reno, Nevada (Gillies and Zhou 2012). Overall, the DustTrak-to-gravimetric PM_{10} flux relationships were excellent with regression coefficients (R^2) between 0.85 and 0.99.

In a separate investigation in 2012, PI-SWERL particle counts based on an Optical Gate Sensor (OGS) were calibrated against the measured sediment flux at the University of Guelph's 1.2-meter wind tunnel (Nickling 2012). Very strong ($R^2 > 0.93$) linear relationships were found between the measured sediment flux and the OGS counts for laboratory sand and for two of the Owens Lake soils (located at Study Area 3 and Lizard Tail). A much lower ($R^2 = 0.4256$), but still statistically significant, linear relationship at the 95 percent confidence level was associated with Cottonwood soils.

B.1.3.2.1.4 Operation and Maintenance Procedures

Appendix D.1, Standard Operating Procedures: PI-SWERL, describes the PI-SWERL operation and maintenance activities (including precautions), start-up and operating procedures, periodic cleaning and maintenance procedures, and records management (including use of the SWERLView software).

B.1.3.2.1.5 Analysis

This section summarizes the process for transforming the PI-SWERL data to graphs and tables of PM_{10} emission flux versus surface friction velocity. These output graphs and tables are later used to calculate maximum hourly and annual PM_{10} emission rates (see Section B.2).

Data Output from PI-SWERL

Each PI-SWERL run will consist of a ten-minute cycle. Each cycle consists of a 60-second cleaning step at the onset of the test (friction velocity of zero) and five incremental steps with a constant friction velocity (Figure B-8). The cleaning step purges the test chamber from any residual particulate matter that might be left in the system from prior tests. The five incremental steps are based on stable blade rotations (RPM, or rotations per minute) and represent known friction velocities (through an internal instrument calibration) that can be compared to those observed in the meteorological monitoring network around the Sea (for example, Table B-3). Based on this comparison, the highest friction velocities evaluated in the PI-SWERL will be similar to or exceed those observed around the Salton Sea (depending on the location).

Figure B-8. Example Output from PI-SWERL Test Cycle

Periods of constant (target) friction velocity, are indicated by the gray bars. The gold line represents surface friction velocity (m s^{-1}). The blue line is the normalized PM_{10} emission rate (dimensionless). The green line is the normalized horizontal sand motion (dimensionless).

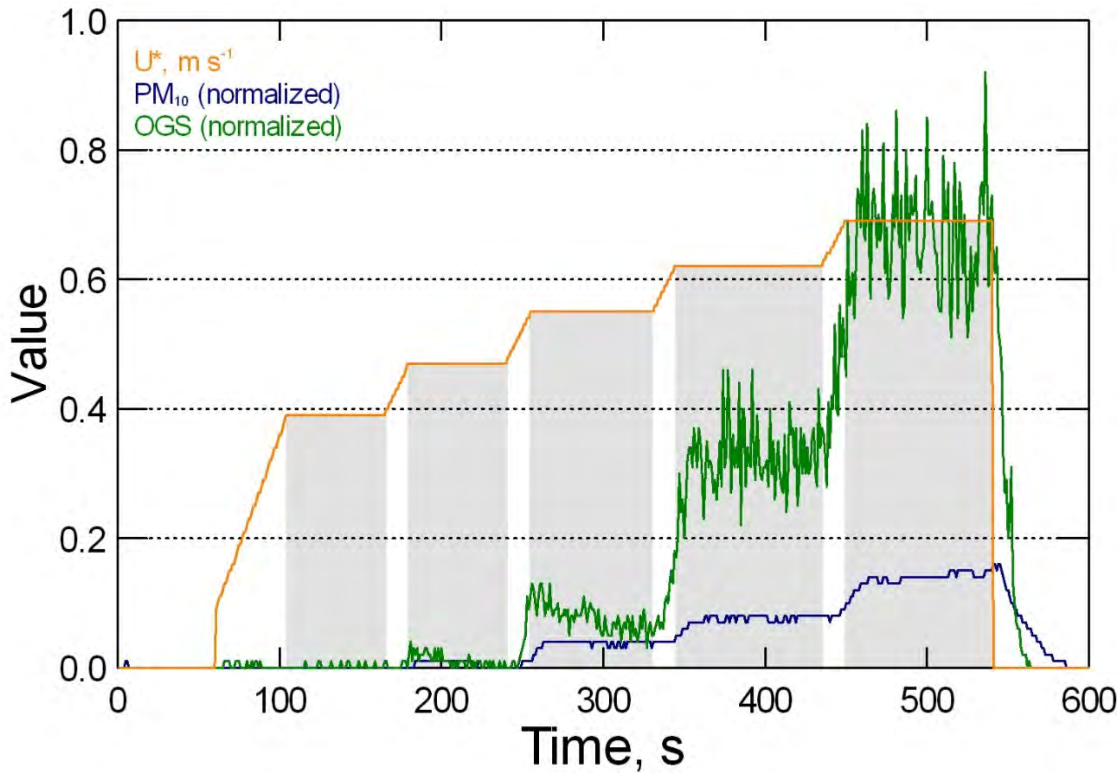


Table B-3. Meteorological Parameters Associated with Different PI-SWERL Rotation Rates

Rotation Rate (RPM)	Surface Friction Velocity (cm s^{-1})	Wind Speed at 10 Meters Above Ground †	
		(m s^{-1})	(mph)
2000	39	11	25
2500	47	13	30
3000	55	15	34
3500	62	17	39
4000	69	19	43

† Assumes a roughness length (z_0) of 0.1 mm representative of smooth playa conditions

Over the course of each test, the PI-SWERL generates several data streams, which are electronically saved on a one-second basis. A portion of the output describes test characteristics (for example, test ID, GPS coordinates, etc.), another portion is primarily used in the data validation step (for example, air flow rate, actual versus targeted RPM), and a third portion of the data is used to characterize the emissions from the evaluated surface. Of the latter, the following data fields are used in the data analysis (see Figure B-8):

- Friction velocity, u_*: Calculated from RPM, which varies stepwise within each test. The same RPM steps are used across all PI-SWERL tests.
- PM_{10}: Measured as a concentration (mg m^{-3}) but converted to vertical emission flux ($\mu g\ m^{-2}\ s^{-1}$).
- OGS: Measures the intensity of sand motion within the PI-SWERL chamber; expressed as number of particle counts per second.

Identification of Emission Flux "Regime"

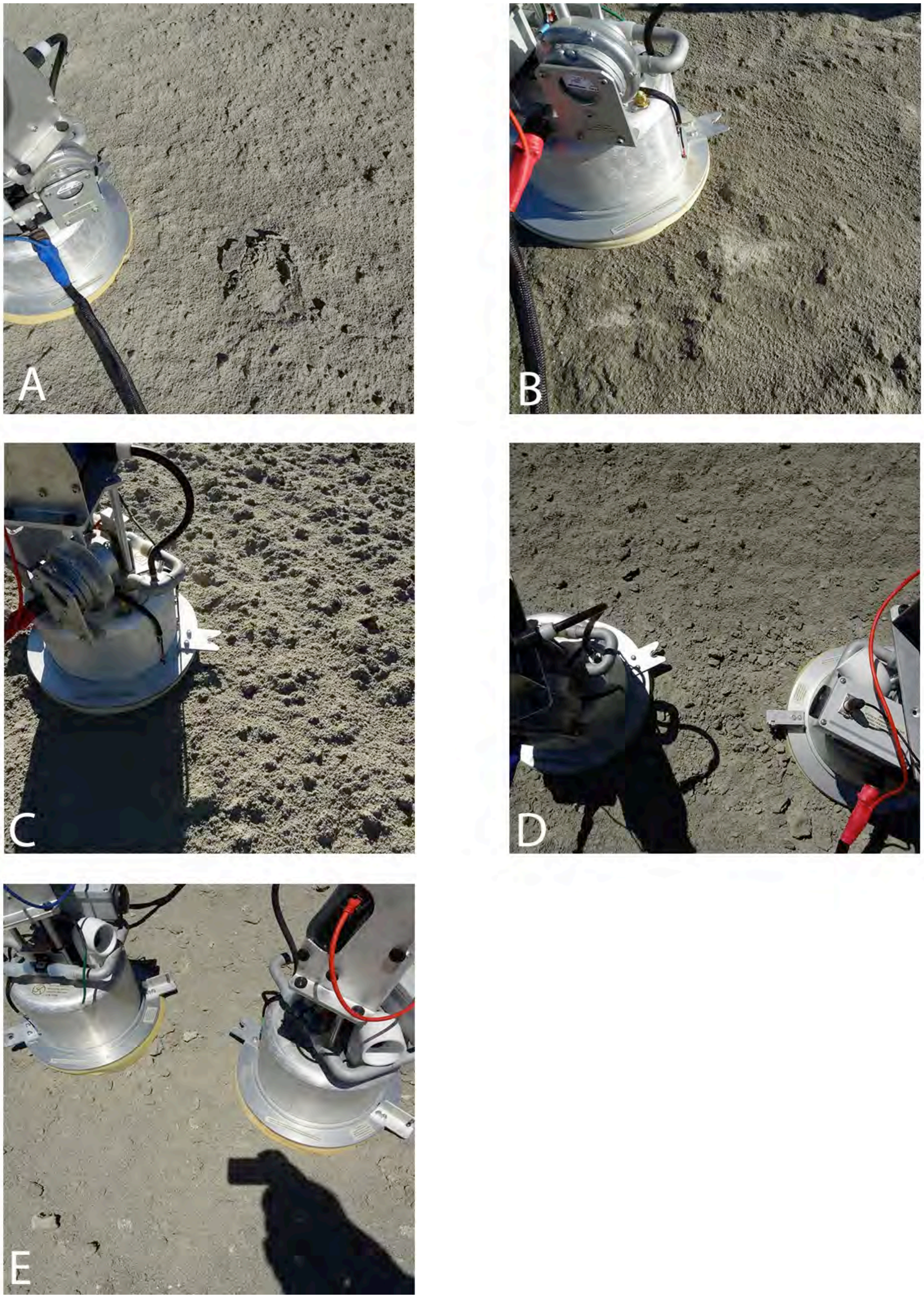
Sand motion and PM_{10} emission profiles vary with soil type and surface conditions. This section summarizes five examples covering the range of surface conditions, from low sand motion/low PM_{10} emissions to high sand motion/ high PM_{10} emissions. An overview of the associated surface characteristics is given in Table B-4. Photographs are shown in Figure B-9. All of these examples are based on measurements on sandy soils at the Owens Lake playa (June 2015). A similar spectrum of soil and surface conditions can be found on exposed Salton Sea playa.

Table B-4. Representative Surface Types for Salton Sea

Representative Surfaces	Crust Moisture	Crust Condition	"Free" Surface Sand	PM_{10} Emission Potential	Sustained PM_{10} Emissions?
A	Dry	Undisturbed	Negligible	Low	No
B	Moist	Undisturbed	Negligible	Low	No
C	Dry	Undisturbed	Abundant	Intermediate	Yes, Intermediate
D	Dry	Disturbed	Minimal	Intermediate	No
E	Dry	Disturbed	Abundant	High	Yes, High

Figure B-9. Photographs of Representative Surface Types

The identification letters (shown in lower left-hand corner of each panel) correspond to those used in Table B-4 and in later summary figures.



Sand motion and PM_{10} flux profiles for each of the representative surfaces are presented in Figure B-10 through Figure B-14. Note that the sand motion and PM_{10} flux profiles are both normalized and therefore dimensionless.

Figure B-10 shows the sand motion and PM_{10} flux profiles for a dry, stable (that is, hard) salt crust (see Figure B-9, Surface Type A). Sand motion and PM_{10} flux are both low for this surface, with values lying close to the x-axis for all RPM levels. The OGS readings are within the instrument noise range, and the PM_{10} concentrations within the PI-SWERL chamber are at ambient levels.

A similar pattern exists on the surface characterized by a moist, stable salt crust (Figure B-11, Surface Type B). As with the dry salt crust example (Surface Type A), the OGS readings are within the instrument noise range, but in this case a small amount of superficial PM_{10} is available for entrainment at high RPMs. The PI-SWERL is capable of recording these low emission rates but they are insignificant in their contribution to the 24-hour average PM_{10} concentrations.

Surface Type C (Figure B-12) is an example of a dry salt crust with abundant free sand on the surface, generating sustained high sand motion with sustained intermediate PM_{10} emissions with increasing RPM.

Stable salt crusts have the potential to protect surfaces from erosion, especially if there is little to no erodible material on the surface to accelerate erosion and crust degradation. This was the case with Surface Types A, B, and C above. However, once the crust is broken, the PM_{10} emission rates increase significantly. In future PI-SWERL sampling events, sand motion and PM_{10} flux profiles will be generated for both disturbed and undisturbed salt crusts.

Figure B-10. Example Surface Type A, Profile: Undisturbed Dry Crust, Negligible Free Sand, Low Sand Motion, Low PM_{10} Emissions

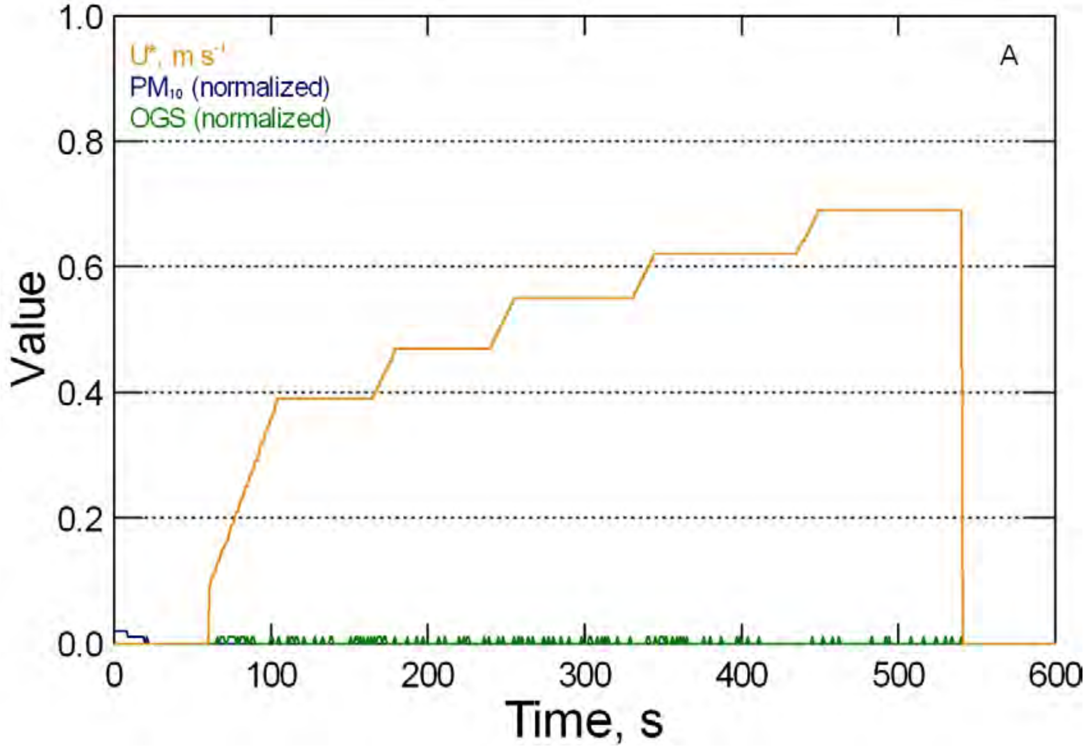


Figure B-11. Example Surface Type B, Profile: Undisturbed Moist Crust, Negligible Free Sand, Low Sand Motion, Low PM_{10} Emissions

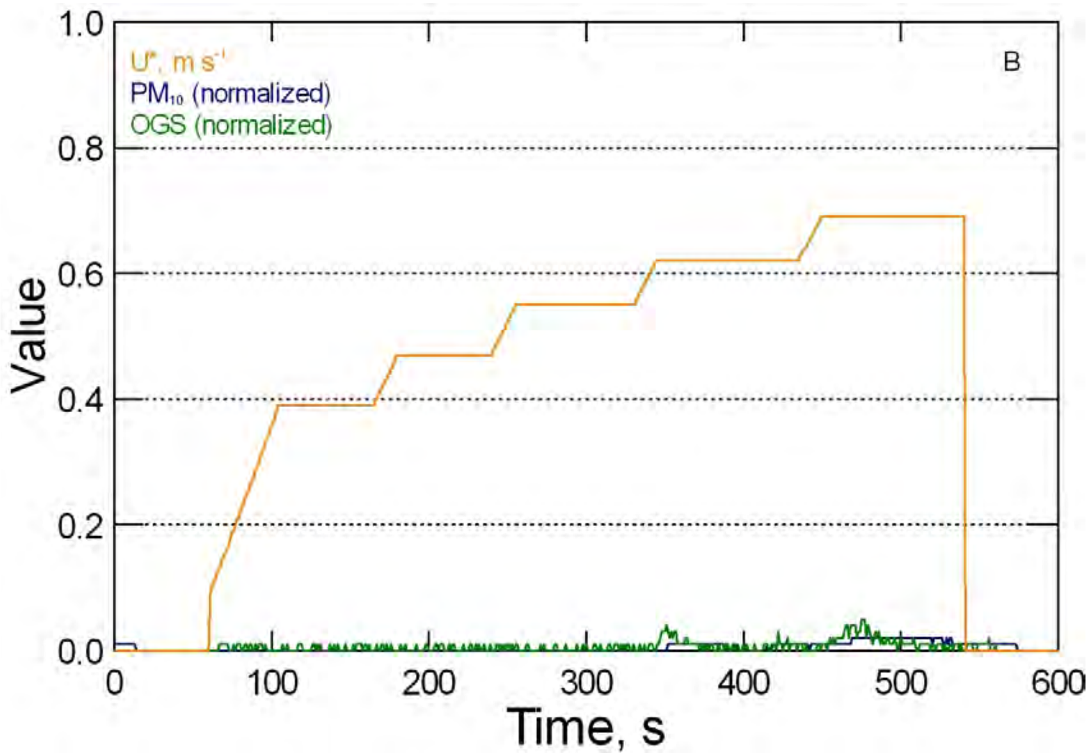
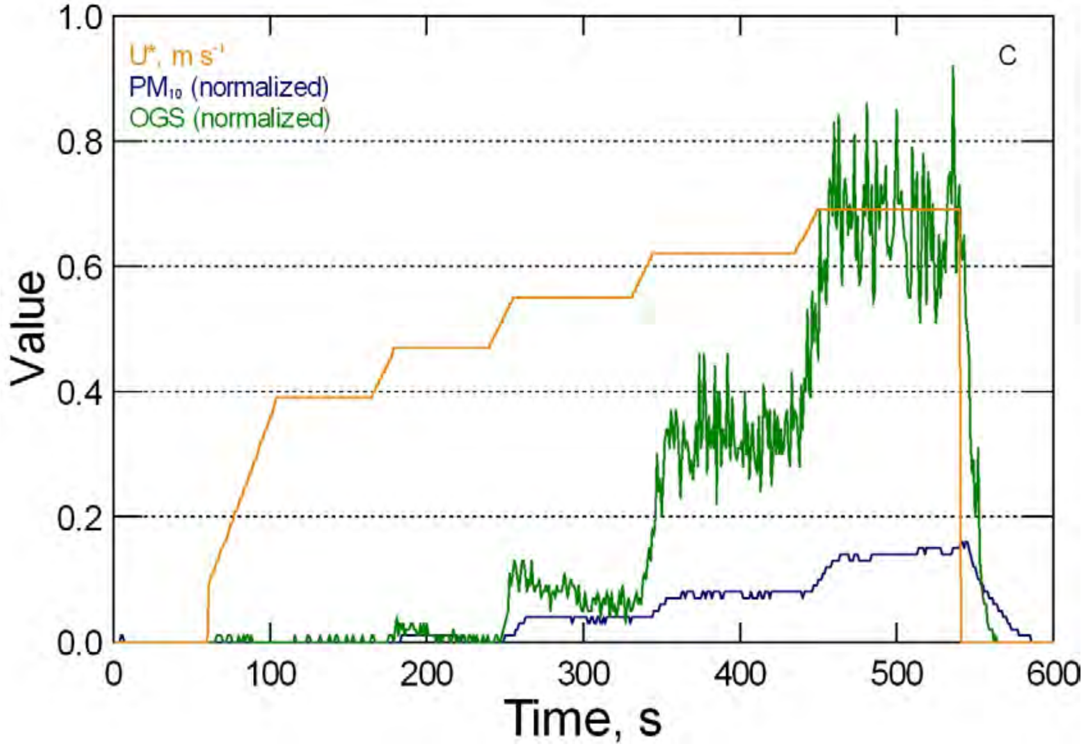


Figure B-12. Example Surface Type C, Profile: Undisturbed Dry Crust, Abundant Free Sand, High Sand Motion, Intermediate PM_{10} Emissions



Surface Type D (Figure B-13) is one with a disturbed crust, but little free sand on the surface to act as an abrasive agent. Sand motion and PM_{10} emissions both spiked at higher RPMs, but the increase lasted only about a minute before plummeting back to background levels. As with Surface Type C, the higher PM_{10} emissions are unlikely to contribute significantly to 24-hour PM_{10} concentrations.

Surface Type E (Figure B-14) is characterized by a disturbed crust with abundant free sand on the surface acting as an abrasion agent. The lack of durable crust produced a virtually unlimited supply of sand, causing sustained high sand motion with very high sustained PM_{10} emissions—the highest of any surface tested. Under this scenario, the higher PM_{10} emissions are expected to contribute significantly to ambient concentrations over extended periods of time (see discussion below regarding temporal and spatial averaging).

Figure B-13. Example Surface Type D, Profile: Disturbed Dry Crust, Minimal Free Sand, Low Sand Motion, Spikes in PM_{10} Emissions

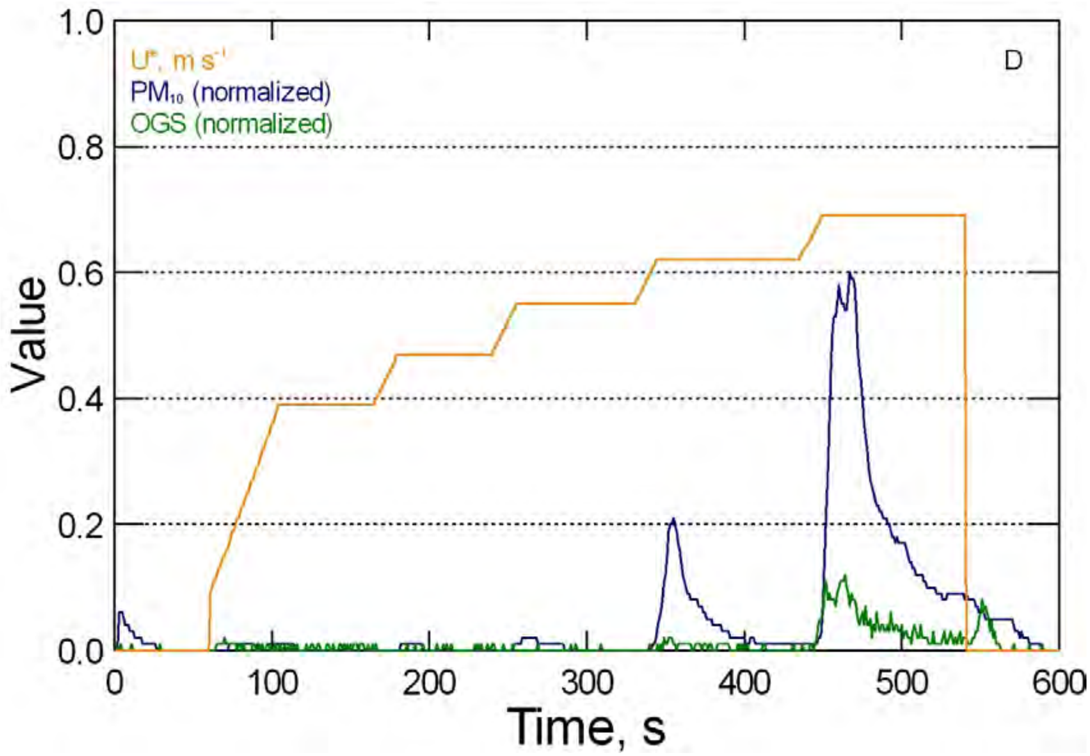
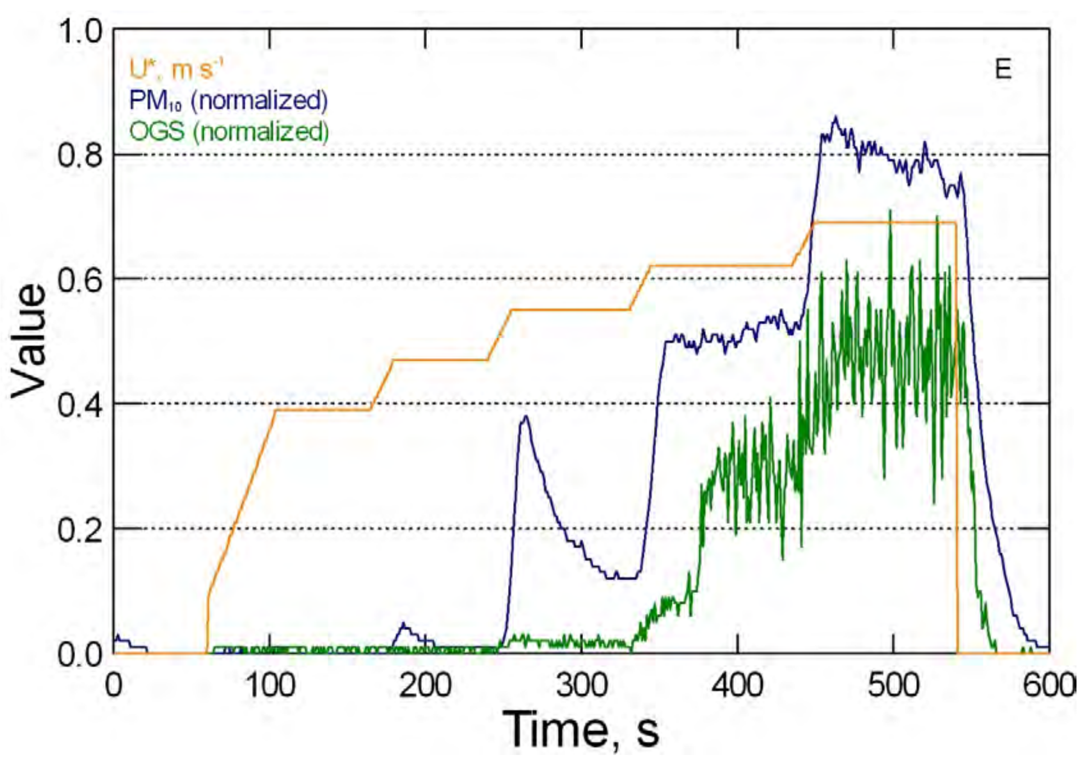


Figure B-14. Example Surface Type E, Profile: Disturbed Dry Crust, Abundant Free Sand, Sustained High Sand Motion, Sustained High PM_{10} Emissions



Generation of Emission Flux Versus Friction Velocity Curves

In the next step, PM_{10} emissions and sand motion are expressed as a function of the surface friction velocity, allowing for estimating the potential PM_{10} emissions at a given wind speed in the field. The PM_{10} emission rates are geometrically averaged over each time step characterized by constant RPM (therefore, constant friction velocity; see Figure B-8), and then geometrically averaged over the replicate runs within a specific surface type (Figure B-15). Several features become apparent from these relationships:

1. PM_{10} emission rates vary strongly by u_* and surface type (top panel, Figure B-15).
2. Threshold friction velocities[3] vary by surface type (middle panel, Figure B-15).
3. K-factors[4] vary by u_* and surface type for all sand fluxes above background levels (surface types C and E) (bottom panel, Figure B-15).
4. Several surface types (A, B, D) have PM_{10} emissions rates and sand activity that do not exceed background (instrument noise) levels. These surfaces are considered non-emissive under all wind speeds that would occur under normal conditions on the Salton Sea playa.

Some of the surface types are characterized by PM_{10} emission rates that are above background levels (top panel, Figure B-15), but the PM_{10} emissions are short-lived (spikes) and not supported by sustained sand motion. Examples include surface types A, B, and D across all u_* values, and surface types C and E at low u_* values. In these cases, the surfaces are highly resistant and/or sand fluxes are not high enough to generate significant, sustained PM_{10} emissions (compare the middle panel of Figure B-15 with Figure B-10 through Figure B-14).

The duration of PM_{10} emissions is important when extrapolating the PI-SWERL emission rates to longer time periods; that is, 24 hours and above. For this reason, a persistence factor has been imposed to calculate longer-term PM_{10} emission rates:

$$ER_{LT} = \overline{ER_{ST}} \cdot PF \qquad \textbf{Equation B-1}$$

where ER_{LT} is the long-term average PM_{10} emission rate (g m^{-2} $event^{-1}$), $\overline{ER_{ST}}$ is the geometric-mean emission rate (g m^{-2} s^{-1}) for each RPM level within a PI-SWERL run, and PF is a persistence factor (s $event^{-1}$) defined as follows:

$$PF = \left(\frac{1}{60}\right)\left(\frac{1}{5}\right) = 3.3\ x\ 10^{-3} \qquad \textbf{Equation B-2}$$

[3] The friction velocity at which sand particles begin to move.
[4] Vertical PM_{10} flux divided by horizontal sand flux.

This approach assumes that when PM_{10} fluxes are not stable but rather short-duration *spikes*, the spike duration is typically one minute in the PI-SWERL chamber (for example, see Figure B-13 and Figure B-14). Significant PM_{10} emissions, on the other hand, are generated by high-wind events lasting more than five hours.[5] The five-hour-equivalent PM_{10} emission rates in Equation B-1 are calculated by dividing the one-minute-average PI-SWERL PM_{10} emission rates by 60 s hr^{-1} to yield PM_{10} emissions per hour, and again by 5 hr $event^{-1}$ to yield PM_{10} emissions for a five-hour event.

The persistence factor is only applied to surface types and RPM levels that spike and drop to zero or near-zero within the one-minute to 90-second RPM run. The persistence factor is not applied to surface types and RPM levels with PM_{10} emission rates that do not drop to zero.

Adjusting all non-sustained emission rates in Figure B-15 by the five-hour persistence factor reduces most of the surface-type emissions to very low levels (Figure B-16; filled symbols), leaving only PM_{10} emissions sustained by sand motion as significant for longer-term emission calculations (Figure B-16; open symbols).

[5] Supported by analysis of high-wind events at Bombay Beach from 2010 to 2015.

Figure B-15. Relationship between PM_{10} Emission Rate (Upper Panel) and Sand Motion (Lower Panel) versus Surface Friction Velocity [Log_{10}-transformed scale] by Surface Types (A-E)

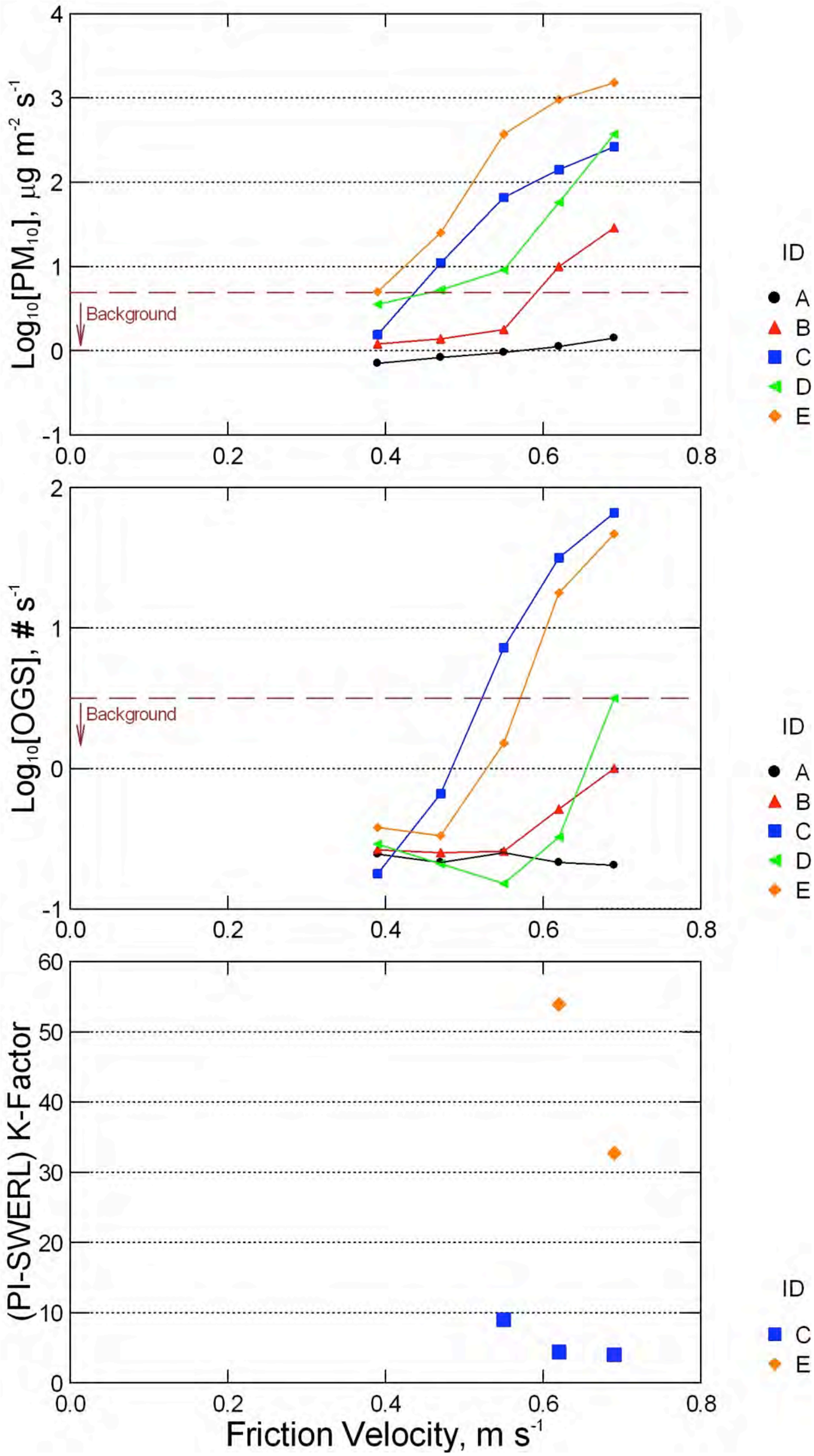
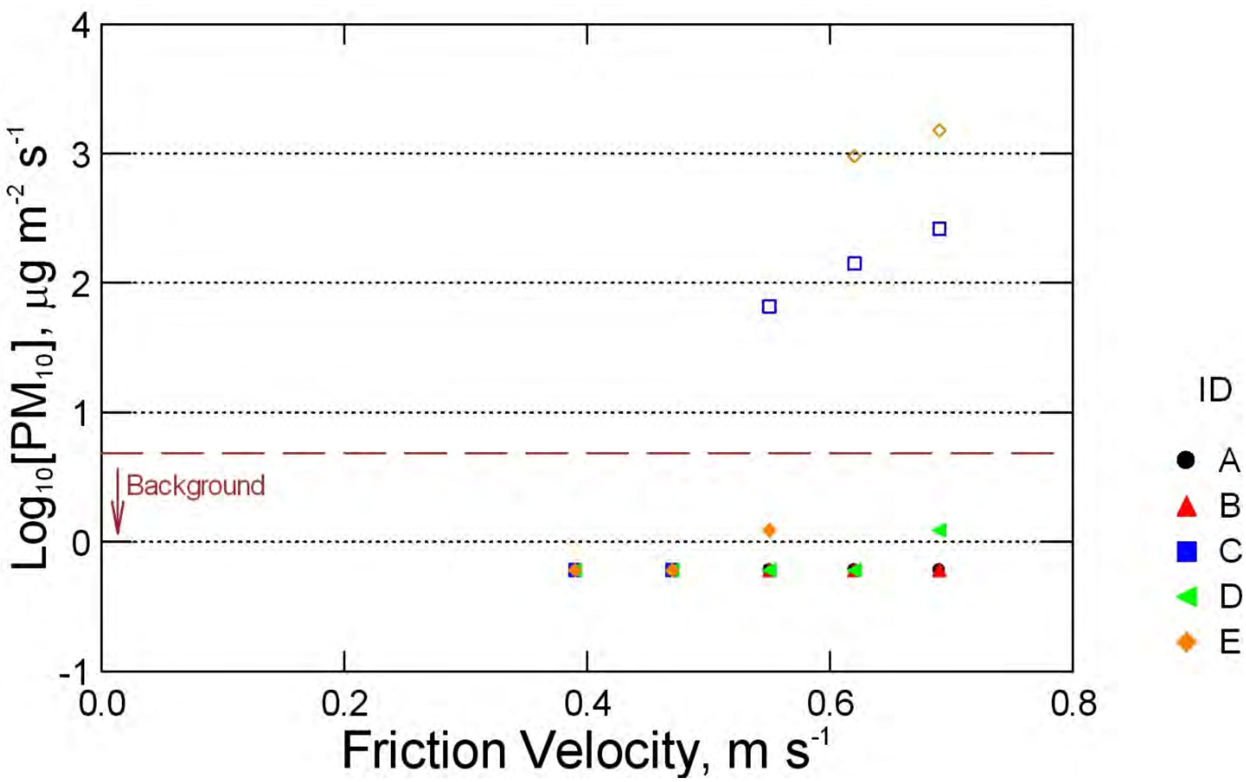


Figure B-16. Relationship between PM_{10} Emission Rate and Friction Velocity Adjusted for Persistence Factor in Equation B-2

Sustained and non-sustained (temporary) emissions are shown as open and filled symbols, respectively.



<u>Generation of Mathematical Relationships between PM_{10} and Friction Velocity</u>

Mathematical relationships between PM_{10} emission flux and u_* will be determined by fitting curves to the data points using SYSTAT 13 or equivalent statistical and graphical software. The form of the fitted equations is not yet known.

B.1.3.2.1.6 Reporting

PI--SWERL results will be reported as outlined in Table B-2, Summary of Reporting for Playa Emissions Inventory. Table B-2 is located at the end of Appendix B.

B.1.3.2.2 Meteorological Monitoring

This section describes the exposed Salton Sea playa emission inventory meteorological monitoring objectives, instrumentation, sampling locations and times, instrument operation and maintenance, analysis, and reporting.

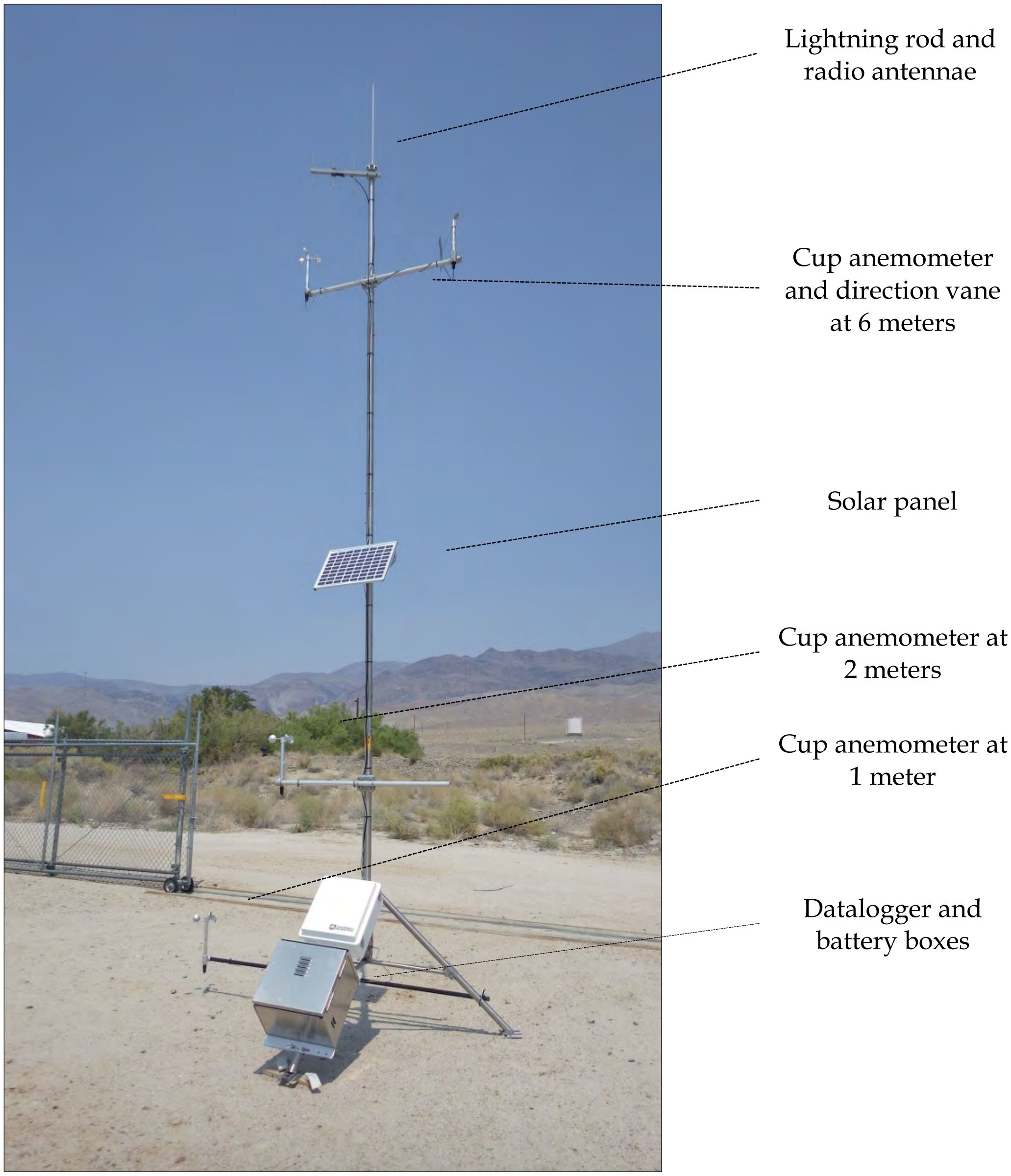
B.1.3.2.2.1 Objectives

Meteorological data will be used in the Salton Sea playa emission inventory in one of two ways: (1) estimating PI-SWERL-generated PM_{10} emission rates, with friction velocity as the independent variable, or (2) input to the CALMET meteorological modeling analysis, used in the CALPUFF dispersion modeling analysis to evaluate potential impacts at Salton Sea PM_{10} compliance monitors.

B.1.3.2.2.2 Instrumentation

Meteorological sensors will be mounted on a tripod with a 6-meter-tall mast (Figure B-17). Cup anemometers will be mounted on the mast at three heights above ground: at 1, 2, and 6 meters. Met One Instruments (Met One) model 014A mini wind speed sensors will be installed at the 1-meter height; standard Met One model 014A wind speed sensors will be installed at the 2- and 6-meter heights. A Met One 024A wind direction sensor will also be mounted at the 6-meter height. Other required instrumentation includes: a solar panel, a deep-cycle marine battery, a datalogger, a radio modem, radio antennae, and a grounding rod.

Figure B-17. Salton Sea Portable Meteorological Tower with Cup Anemometers at 1, 2, and 6 Meters above Ground



B.1.3.2.2.3 Sampling Locations

A total of six meteorological monitoring locations will be chosen on the playa for assessing hourly values of surface friction velocity, u_*. The sampling locations will be distributed relatively evenly along the eastern, southern, and western portions of the playa as the Sea recedes. Sites will be chosen that are well away from any natural or human-made obstructions that would affect surface roughness, including fences, buildings, vegetation, and dunes.

Friction velocity is a *reference* wind velocity generally applied to motion near the ground where the *shear stress* (i.e., frictional force of wind acting parallel to the surface) is often assumed to be independent of height and approximately proportional to the square of the mean velocity (the "Square Law"):[6]

$$u_* \simeq \sqrt{shear\ stress} = \sqrt{\frac{\tau}{\rho}} \qquad \textbf{Equation B-3}$$

where τ is the Reynolds number and ρ is air density. Here, u_* is the velocity for which the Square Law applies.

B.1.3.2.2.4 Sampling Times

The portable meteorological stations will be operated continuously from November 2015 (planned commencement date of monitoring) through the end of project. Mean hourly wind speeds will be calculated by the datalogger for each sensor height at each site.

B.1.3.2.2.5 Operation and Maintenance Procedures

Operation and maintenance of the meteorological instruments are described in Appendix D.2, Standard Operating Procedures: Sand Flux and Meteorological Monitors. Appendix D.2 includes: site check and audit forms, data processing and quality assurance/quality control (QAQC) procedures, and calibration and audit procedures for the Met One 014A wind speed and Met One 024A wind direction sensors.

B.1.3.2.2.6 Analysis

Friction velocity (u_*) and roughness length (z_0) are derived by fitting the hourly average wind velocity (x axis) against height above ground (y axis) on a log-log scale. The slope of the line is u_*; the y-intercept is z_0.

As stated previously, hourly u_* values will be used to calculate hourly vertical PM_{10} emission fluxes using the relationship between PM_{10} emission flux and u_* derived from the PI-SWERL.

B.1.3.2.2.7 Reporting

Reports summarizing, among other things, hourly wind speed and wind direction data, and collection statistics and results of the quality control review will be reported as outlined in Table B-2, Summary of Reporting for Playa Emissions Inventory. Table B-2 is located at the end of Appendix B.

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[6] Sutton, O. G. 1953. Micrometeorology. p. 76.

B.1.3.2.3 Video Monitoring

This section describes the Salton Sea playa video monitoring objectives, equipment and monitoring locations, image collection rates, operation and maintenance procedures, image analysis procedures, and reporting.

B.1.3.2.3.1 Objectives

Video monitoring, in the form of time-lapse panoramic images from two locations at opposite ends of the Sea, serves several valuable purposes:

1. To document general visibility conditions within the Salton Sea airshed from vantage points located well above the sea elevation. Special focus will be given to days on which one or more Imperial Valley meteorological stations record wind speeds that are above the threshold required to generate dust.

2. To document the location, frequency, and relative intensity of dust plumes originating on exposed Salton Sea playa.

3. To document the location, frequency, and relative intensity of dust plumes traveling across the Salton Sea from sources *not* associated with the Salton Sea playa (including a mixture of playa and off-Sea emissions).

B.1.3.2.3.2 Equipment and Monitoring Locations

Two types of visual monitoring systems will be installed around the Salton Sea: a set of fixed-location, scanning cameras designed to provide high-resolution panoramic images of the Imperial Valley airshed, and a set of six portable video monitoring cameras deployed around playa emission *hotspots*.

The fixed location scanning sites will use Roundshot 360-degree panoramic scanning camera equipment (Figure B-18) and software with a Web interface for remote viewing.[7] The camera systems will be mounted in a camouflaged all-weather enclosure and surrounded by a 10-foot by 10-foot by 10-foot cyclone fence enclosure with a locking gate for added security.

Figure B-19 shows the proposed locations for the scanning cameras. The north camera location will be centered eastward and scan 195° between NNW and SSE to capture the north and western playas, as well as the easternmost off-Sea areas on the west side of the Sea. The south camera will be centered northwestward and scan 225° between SSW and ENE to capture the southern and western playas. A set of example time-lapse panoramic images (compressed horizontal scale) is presented in Figure B-20 to illustrate the output from the cameras.

[7] http://www.roundshot.com/xml_1/internet/de/intro.cfm

Figure B-18. Roundshot Livecam D2 360° Scanning Equipment with Weatherproof Case

Figure B-19. Proposed Sites for Roundshot Scanning Cameras

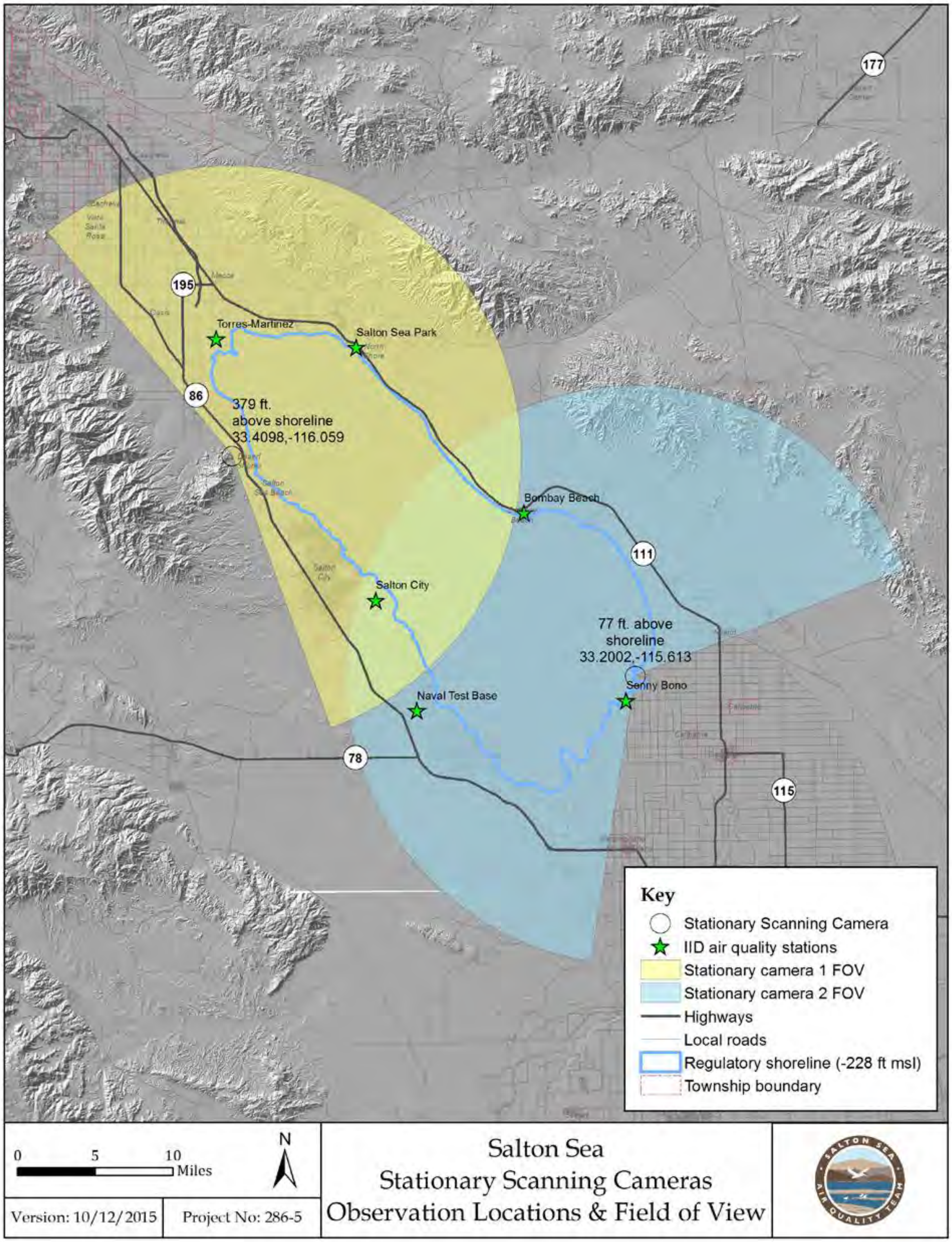


Figure B-20. Time-Lapse Panoramic Images Taken with Roundshot Livecam D2 360° Scanning Camera (El Paradiso, St. Moritz, Switzerland)
The photographs have been compressed horizontally, producing a “fish eye” effect that doesn’t exist in the original images.

The portable video camera systems will be equipped with the StarDot Corporation 10-megapixel (MP) H.264d Special Bundle, which includes a StarDot 10MP SC day/night camera (Figure B-21) with Dotworkz ST-BASE outdoor enclosure, a Veracity Power-over-Ethernet (PoE) injector, and a Tripp Lite outdoor-rated 100-foot patch cable.[8] In addition, each site will be equipped with an 8–48-millimeter vari-focal lens, providing a 4.5°–45° field of view (FOV) that may be adjusted according to specific site conditions. The StarDot camera will be mounted at the 2-meter height on a tripod (similar to the one shown in Figure B-17). Siting of the video camera stations will occur later, when and if dust emission hotspots are observed on the playa.

[8]http://californiapc.com/IP-Cameras-Enclosures-Lenses-Accs/StarDot-NetCam-Bundles/

Figure B-21. StarDot Technologies SC H.264 Camera

B.1.3.2.3.3 Image Collection Rates

Both camera systems will operate continuously during daylight hours. The collection rate on the Roundshot scanning camera depends on the scanning angle and available bandwidth (a full 360° panorama is approximately 250 MB). The scan duration for a 180° panoramic image is on the order of three seconds. One Roundshot panoramic image and one StarDot still-frame image will be captured and stored at least every 15 minutes.

B.1.3.2.3.4 Operation and Maintenance Procedures

Operation and maintenance of the video monitoring stations are described in Appendix D.3, Standard Operating Procedures: Roundshot Livecam D2 and in Appendix D.4, Standard Operating Procedures: StarDot Technologies SC H.264. Each of these appendices includes installation and operation procedures, and site check forms, for the Roundshot camera system (fixed stations) and the StarDot camera system (portable stations), respectively.

B.1.3.2.3.5 Image Analysis Procedures

In the laboratory, the images will be filtered to include those taken on days when wind speeds exceed the threshold for dust generation (nominally, more than four hours with average wind speeds greater than 5 meters per second at a height of 10 meters above ground). All of the captured images will be securely stored, backed up, and available for viewing on a secure website.

Filtered images will be reviewed by an analyst to qualitatively identify and track areas of playa that display dust activity. This review will inform any subsequent decisions to site portable StarDot cameras near emissions hotspots.

B.1.3.2.3.6 Reporting

Reports summarizing, among other things, days with 10-meter wind speeds above the threshold for dust generation, and a qualitative description of images showing evidence of dust plumes will be reported as outlined in Table B-2, Summary of Reporting for Playa Emissions Inventory. Table B-2 is located at the end of Appendix B.

B.1.3.3 Delineating Dust Plumes and Active Source Areas

This section describes the objectives, methods, and reporting for delineating dust plumes and active source areas on the currently exposed Salton Sea playa.

B.1.3.3.1 Objectives

The objective is to quickly and reliably map and delineate active dust plumes and source areas over the vast areas of exposed Salton Sea playa during the dust season.

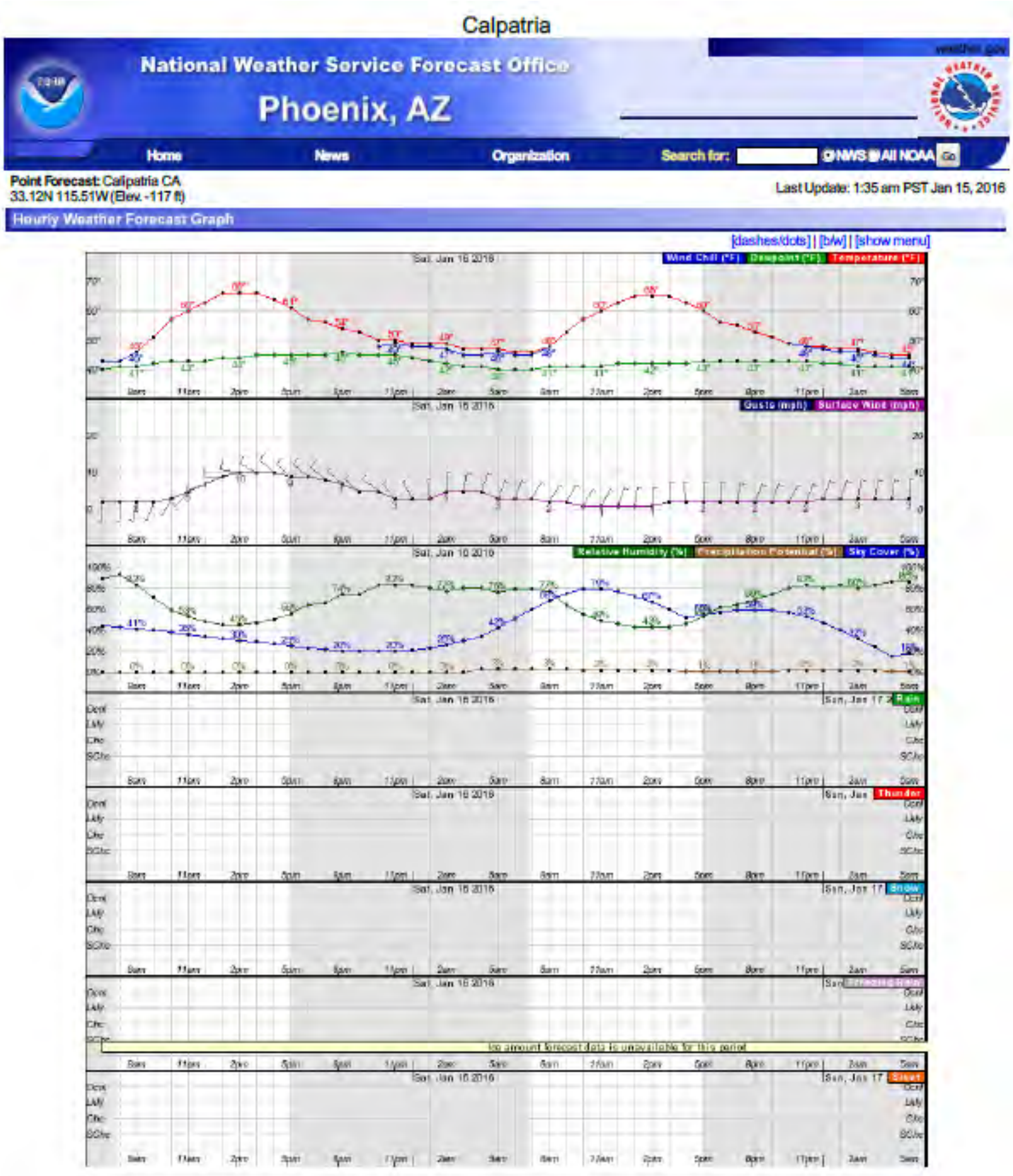
B.1.3.3.2 Methods

A combination of visual monitoring, video monitoring, satellite imagery, and field investigations will be used to monitor dust plumes and identify source areas after high wind events. Visual monitoring and video monitoring will be used to identify dust plumes. Mapping and delineation of eroded and emissive sources areas will be completed using a combination of satellite imagery, ultra-high resolution Unmanned Aerial System (UAS) imagery and field investigations immediately after a high wind event. Detailed methods are listed as follows.

B.1.3.3.2.1 Plume Observations

Weather forecasts from the National Weather Service will be evaluated on a daily basis. An example weather forecast is provided in Figure B-22. During times of predicted high wind events, visual observers will be deployed around the playa to specific vantage points. This includes Red Hill Bay in the South, and the Santa Rosa Mountains in the North. Maps and mobile GIS tools will be used to track plumes and identify locations where emissions are occurring from the playa surface. In addition, video monitoring results will be evaluated after these events to help isolate playa locations where emissions occurred. Meteorological data will be evaluated from all available network locations to determine the magnitude of wind conditions around the playa.

Figure B-22. Example Weather Forecast



B.1.3.3.2.2 Delineating Active Source Areas

Each wind event where visual plume observations occurred on the Playa would also trigger a high-resolution image collection for delineating active source areas. Mapping of specific source areas will be prioritized based on video and/or visual observations of identified plumes. Source areas will be identified primarily based on the presence of scoured areas. Scoured surfaces are usually denoted by a topographically low area (in the range of 1-7 cm below surrounding surfaces) with a hard surface.

Routine satellite or UAS imagery will be acquired after high wind events to aid in the field delineation of active source areas. Specifically, imagery will be used as a photo-interpretive base for delineating source areas on the playa. Maps of active source areas will be generated using Collector for ArcGIS with the recently collected imagery in the background. Salt crust units containing large scoured surfaces after high-wind events will be delineated and surface characterization data for those crust types will be recorded in Collector. The surface characterization include: crust type, top crust thickness, top crust hardness, penetration resistance, sub-crust thickness, sub-crust hardness, surface type, boundary type, soil moisture, soil texture, surface sand percent, salt efflorescence, macro-relief, micro-relief, surface erosion and deposition, and vegetative cover (see Table B-1). Photographic evidence will also be collected at each observation point and linked to the GPS location in Collector.

B.1.3.3.3 Reporting

Results of delineating dust plumes and active source areas on exposed playa surfaces will be reported as outlined in Table B-2, Summary of Reporting for Playa Emissions Inventory. Table B-2 is located at the end of Appendix B.

B.2 Quantifying PM_{10} Emissions on Exposed Salton Sea Playa

This section describes the procedures used to compute the maximum-day and annual PM_{10} emission estimates for exposed Salton Sea playa.

B.2.1 Maximum-Day PM_{10} Emissions

The Salton Sea playa maximum-day emissions will be computed as follows:

$$E_{Max-Day} = \sum_{n=1}^{N} \left(A_n \cdot \overline{F_{MaxDay,n}} \cdot 9.5 \ x \ 10^{-2} \right) \qquad \textbf{Equation B-4}$$

where $E_{Max-Day}$ is the maximum-day mass emissions of PM_{10} (tons per day, tpd) summed for surface types *n=1* through *N* (the maximum number of surface types assigned), A_n is the total area (m^2) within each surface type n, $\overline{F_{MaxDay,n}}$ is an average maximum-day PI-SWERL-derived vertical PM_{10} emission flux ($g\ m^{-2}\ s^{-1}$) by surface type n, and 9.5 x 10^{-2} is a constant of proportionality to convert from seconds to days and from grams to tons of PM_{10}.

The $\overline{F_{MaxDay,n}}$ term in Equation B-4 is parameterized as follows:

1. PI-SWERL sampling is first used to define relationships between the vertical PM_{10} flux, *F*, and u_* for each surface type *n* represented on the exposed playa. The relationships will be determined with curve-fitting algorithms. The form of the equations is not yet known but expected to vary by surface type.

2. Next, an array of portable, six-meter-tall meteorological stations will be used to produce an array of spatially averaged hourly u_* values by surface type *n* on the playa. The hourly u_* values are then used in the PI-SWERL relationships to derive spatially averaged hourly vertical emission fluxes:

$$\overline{F_{n,h}} = f\left(\overline{u_{*,n,h}}\right) \qquad \textbf{Equation B-5}$$

3. Next, the hourly vertical PM_{10} fluxes are averaged over successive 24-hour periods to produce daily average vertical PM_{10} fluxes by surface type *n* (day index denoted by subscript *d*):

$$\overline{F_{n,d}} = \frac{\sum_{h=1}^{24} \overline{F_{n,h}}}{24} \qquad \textbf{Equation B-6}$$

4. The array of daily vertical PM_{10} fluxes is then queried to identify the day *d* with the highest average vertical PM_{10} flux (i.e., the "maximum-day" flux) for each surface type *n*:

$$\overline{F_{MaxDay,n}} = max \begin{matrix} 365 \\ d = 1 \end{matrix} \Bigg| \; \overline{F_{n,d}} \qquad \textbf{Equation B-7}$$

5. These values are then used in Equation C-3 to express the maximum-day mass of PM_{10} emissions within the area of interest (AOI).

6. Maximum-day emissions will be computed using PI-SWERL and CALMET meteorological data collected during the period of investigation.

B.2.2 Annual PM_{10} Emissions

The annual mass of PM_{10} emissions from off-Sea sources is calculated as follows:

$$E_{Annual} = \sum_{n=1}^{N} \sum_{h=1}^{8760} \left(A_n \cdot \overline{F_{n,h}} \cdot 3.97 \; x \; 10^{-3}\right) \qquad \textbf{Equation B-8}$$

where E_{Annual} is the annual mass emissions of PM_{10} (tons per year, tpy) for all hours in a year from *h*=1 through 8,760, and for all surface types represented on exposed Salton Sea playa from *n=1* through *N*. Here, A_n is the total area (m^2) for surface type n, $\overline{F_{n,h}}$ is the PI-SWERL-derived vertical PM_{10} emission flux ($g\ m^{-2}\ s^{-1}$) for hour *h* and surface type n, and 3.97 x 10^{-3} is a constant of proportionality to convert from seconds to hours and from grams to tons of PM_{10}.

The total area A_n within surface type *n* will be determined using Geographic Information System (GIS) mapping techniques.

The average hourly vertical emission flux, $\overline{F_{n,h}}$, in Equation B-8 is parameterized as follows:

$\overline{F_{n,h}} = f\left(\overline{u_{*,n,h}}\right)$ for all *h* satisfying $u_{*,n,h} \geq u_{*t,n}$ **Equation B-9**

where $f\left(\overline{u_{*,n,h}}\right)$ is the PI-SWERL-derived relationship expressing vertical PM_{10} flux (g m^{-2} s^{-1}) as a function of surface friction velocity, u_*, and $u_{*t,n}$ is the threshold friction velocity for surface type *n*. $\overline{u_{*,n,h}}$ is the spatially averaged u_* values located within surface type *n*:

$$\overline{u_{*,n,h}} = \left.\frac{\sum_{s=1}^{S}(a_s \cdot u_{*s})}{\sum_{1}^{S} a_s}\right|_{n,h}$$ **Equation B-10**

where a_s and u_{*s} are the area and u_* values assigned to each portable meteorological station located within surface type *n*.

Annual emissions will be computed using PI-SWERL, u_*, u_{*t}, and active-area data collected during the period of investigation.

B.2.3 Future Emission Inventory Updates

The exposed Salton Sea playa emission inventory will be updated once every three years using the latest standards and best practices available at the time.

B.2.4 Reporting

Results of the emissions inventory will be reported as outlined in Table B-2, Summary of Reporting for Playa Emissions Inventory. Table B-2 is located at the end of Appendix B.

Table B-2. Summary of Reporting for Playa Emissions Inventory

	Topic	Items to be Reported	Frequency
1	Mapping and Characterizing Playa Surfaces	Results of mapping and characterizing current exposed playa surfaces, and future exposed playa surfaces	Initial report due on or before June 1, 2016. In subsequent years, reports will be generated at the end of each dust season (by June 1st of each year).
2	PI-SWERL Sampling	Results of PI-SWERL monitoring	
3	Meteorological Monitoring	Report summarizing, among other things: hourly wind speed and wind direction data, and collection statistics and results of the quality control review	
4	Video Monitoring	Report summarizing, among other things: days with 10-meter wind speeds above the threshold for dust generation, and a qualitative description of images showing evidence of dust plumes	
5	Delineating Active Plume Areas	Results of active plume delineations	
6	Annual PM10 Emissions	Results summarizing maximum-day and annual PM_{10} emission estimates for exposed playa	

APPENDIX C – OFF-SEA PM_{10} INVENTORY

C.1 Experimental Design

This section describes the experimental design of the off-Salton-Sea (off-Sea) PM_{10} (particulate matter less than 10 microns in diameter) emission inventory, including the inventory goal and objectives, approach, data collection and analysis, mapping and characterization of off-Sea surfaces, collection of aerometric data, and delineation of active plume areas.

C.1.1 Goal and Objectives

Similar to the exposed playa PM_{10} emission inventory described in Appendix B, the goal of the off-Sea inventory is to develop a refined estimate of PM_{10} emissions for consideration in the 2016 Revised Imperial County PM_{10} State Implementation Plan (SIP).

The objectives of the off-Sea PM_{10} emission inventory are three-fold:

1. To characterize the magnitude, duration, and frequency of dust emissions from discrete surface strata within the Off-Sea Source Inventory Area of Interest (Off-Sea AOI) shown in Figure 3-14 (main body) of Salton Sea Air Quality Program. The Off-Sea AOI is a 5,805-square-mile area encompassing the Salton Trough and portions of the surrounding mountains, and extending as far south as the United States-Mexico border.
2. To provide greatest focus on the desert areas west of Salton City in and around the Ocotillo Wells State Vehicular Recreation Area (SVRA). PM_{10} roses[9] generated for the period from 2009-2013 show that the highest and most frequent hourly PM_{10} concentrations originate in the desert area west of the Sea. Other parts of the Off-Sea AOI are also important, but of lower priority for this initial inventory effort.
3. To develop a refined estimate of PM_{10} emissions for consideration in the 2016 Revised Imperial County PM_{10} State Implementation Plan (SIP).

Several lines of evidence will be used to establish the location, timing, and magnitude of dust emissions from off-Sea areas, including: (1) PM_{10} roses showing the frequency, magnitude, and direction of the highest PM_{10} concentrations originating in the desert areas west of the Sea; (2) a network of fixed sand motion monitoring instruments placed within various surface types to monitor activity there; (3) video monitoring to provide photographic evidence of dust emissions; and (4) PI-SWERL sampling to characterize the emission potential of various surface types. Element 1 is designed to provide corroborating evidence of emission activity within the Off-Sea AOI. Elements 2 through 4 will be incorporated directly into the maximum-day and annual PM_{10} emission estimates discussed below.

[9] PM_{10} roses are similar to wind roses but, in the case of the former, the “petals” show the frequency, magnitude, and direction of PM_{10} concentrations rather than wind speed.

C.1.2 Approach

The approach for assessing PM_{10} emissions from current and future off-Sea desert lands is as follows:

1. Map and characterize the desert areas west of the Salton Sea by landform (e.g., sand dunes, alluvial fans, washes) and surface type (e.g., sand, rock-armored surfaces, Paleolithic lake sediments).
2. Sample with the PI-SWERL to characterize the emission potential of each surface stratum at the beginning and end of the investigation (around November 1, 2015, and May 1, 2016).
3. Prioritize the surface strata in terms of emission potential (from high to low) using the PI-SWERL data collected in step 2, above.
4. Install portable sand motion monitoring instruments (including meteorological instruments) on medium- and high-priority surface strata.
5. Deploy portable video monitoring stations around the highest priority surface strata to record the time and location of dust plumes and/or human activity.
6. Quantify maximum day and total annual emissions from active source areas.

Each of these items is discussed in more detail below.

C.1.3 Data Collection and Analysis

This section describes data collection and analysis for mapping and characterizing off-Sea surfaces, for aerometric data, and for delineating active plume areas.

C.1.3.1 Mapping and Characterizing Surfaces

This section describes the mapping and characterization of off-Sea surfaces.

C.1.3.1.1 Objectives

The objective of the off-sea mapping effort is to quantify the extent and characteristics of the landforms and surface types found within the desert areas west of the Salton Sea. This information will be used to guide and scale the PM_{10} emission potential of distinct landforms sampled with the PI-SWERL (see Section C2).

C.1.3.1.2 Methods

This section described the methods to characterize landform classes and to map landforms.

C.1.3.1.2.1 Landform Classes

A surface type classification system was developed in order to quantify the dominant Off-Sea landforms and their characteristics (surface, vegetation, and armoring). The classification system was created by researching the desert surfaces present in the region, targeted field investigations, and the photointerpretation of satellite imagery. The surface types used in this classification system are detailed in Table C-1 and Figures C-1 through C-4.

Preliminary field data to develop the classification system was collected using the ESRI Collector App on a ruggedized tablet. Imagery and field domains were pre-loaded onto tablets before use. This interface allowed the seamless collection of geo-referenced field points, photos, and notes. Data collected using the Collector App was then synced to Arc GIS Online (AGOL) and is available to all Team members as documentation of ground truth for further mapping efforts.

Table C-1. Surface Types used to Characterize Off-Sea Landforms

Class	Sub-Class	Description	Erosion Risk
1-Dry Wash Units	Sand Dominated	Ephemeral drainage dominated by well sorted, fine to coarse grained sand.	High
	Silt Dominated	Ephemeral drainage dominated by silt. Undisturbed silt found in dry washes is often present as a fragile thin mud-cracked sheet.	High
	Gravel Dominated	Ephemeral drainage dominated by gravel.	Low
	Gravel and Sand	Ephemeral drainage consisting of gravel evenly distributed among a sandy matrix. Poor to moderately sorted. The upper surface often has been coarsened by wind erosion and/or OHV activity.	Medium
	Gravel and Silt	Ephemeral drainage consisting of gravel evenly distributed among a silty matrix. Poor to moderately sorted. The upper surface often has been coarsened by wind erosion and/or OHV activity.	Medium
2-Alluvial Fan Units	Sand Dominated	Alluvial fan deposits consisting of primarily sand. Typically located near the periphery of the fan.	High
	Sand and gravel	Alluvial sand capped by gravel lag. Typically located near the middle of the fan.	Medium
	Cobbles	Alluvial fan deposits consisting of sand, gravel, and cobbles. Typically located near the top of the fan.	Low
3-Sand Units	Sand Dunes	Active aeolian dune and erosional interdune surface. Large asymmetrical, elongated Transerve dunes are the most common in this region. Dunes are > 1.5 M and typically fine to medium grained.	High
	Sand Sheet	Active aeolian deposit. Flat to low angle, uniform, expansive sand surface. Typically fine to medium grained.	High
	Sand over Alluvium	Sand sheets and coppice dunes < 1.5 m in height superimposed on alluvium. Coppice dunes are small vegetated sand mounds that form when a shrub impedes the flow of air and causes sand grains to settle out on the downwind side of the shrub.	High
4-Paleo Lakebed	Silt-Dominated	Well sorted lacustrine silt deposits from pre-historic Lake Cahuilla.	High
	Cobble over Silt	Large Cobbles regularly distributed among silt situated along the margin of pre-historic Lake Cahuilla. The cobbles serve as armory for the vulnerable underlying silt. The cobbles were deposited by wave action from Lake Cahuilla.	Medium
	Gravel and Sand	A mixture of gravel and sand present on old beach ridges formed by wave action.	Low
6-Rock Units	Sandstone	Highly friable, heavily eroded sandstone. Often taking the form of steep gulleys.	Medium
	Bedrock	Undifferentiated bedrock. A consolidated hard surface that is not emissive.	Very Low

Class	Sub-Class	Description	Erosion Risk
7- Offshore Playa Unit	Offshore Playa	Independent depressions that once held water and now have formed evaporites among very delicate mud-cracked silt. The underside of the mud cracks has a distinct micaceous sheen.	High

Figure C-1. (A) Sand-Dominated Dry Wash with Heavy OHV Traffic, and (B) Gravel- and Sand-Dominated Alluvial Fan

A. Sand-Dominated Dry Wash with Heavy OHV Traffic

B. Gravel- and Sand-Dominated Alluvial Fan

Figure C-2. (A) Large Sand Sheet, and (B) The Algodones Dune Field

A. Large Sand Sheet

B. The Algodones Dune Field

Figure C-3. (A) Cobbles Distributed Over Silt-Dominated Paleo Lakebed, and (B) Silt-Dominated Paleo Lakebed

A. Cobbles Distributed over Silt-Dominated Paleo Lakebed

B. Silt-Dominated Paleo Lakebed

Figure C-4. (A) Sandstone Bedrock, and (B) Offshore Playa

A. Sandstone Bedrock

B. Offshore Playa

C.1.3.1.2.2 Landform Mapping

Landforms will be spatially quantified/mapped using a mixture of the field ground truth data mentioned above, photo-interpretation of satellite imagery, and Object Based Imagery Analysis techniques (OBIA). NAIP satellite imagery will be segmented using Trimble eCognition. Pixels within the imagery that share common characteristics will be bundled together to create objects that delineate the landforms. Using the ground truth data, samples will be selected from these objects and classified according to their landform classification (Table C-1). This will be accomplished by consulting the imagery, a Digital Elevetion Model (DEM), and the field ground truth data. Once a reasonable distribution of samples have been collected across the different landforms, they will then be used as training data to inform the random forest data mining classification. The output of the random forest data mining classification is a spatial map depicting the major landforms. This output will be manually reviwed for quality control and additional ground data will be collected to determine the accuracy / uncertainty associated with the final mapping product.

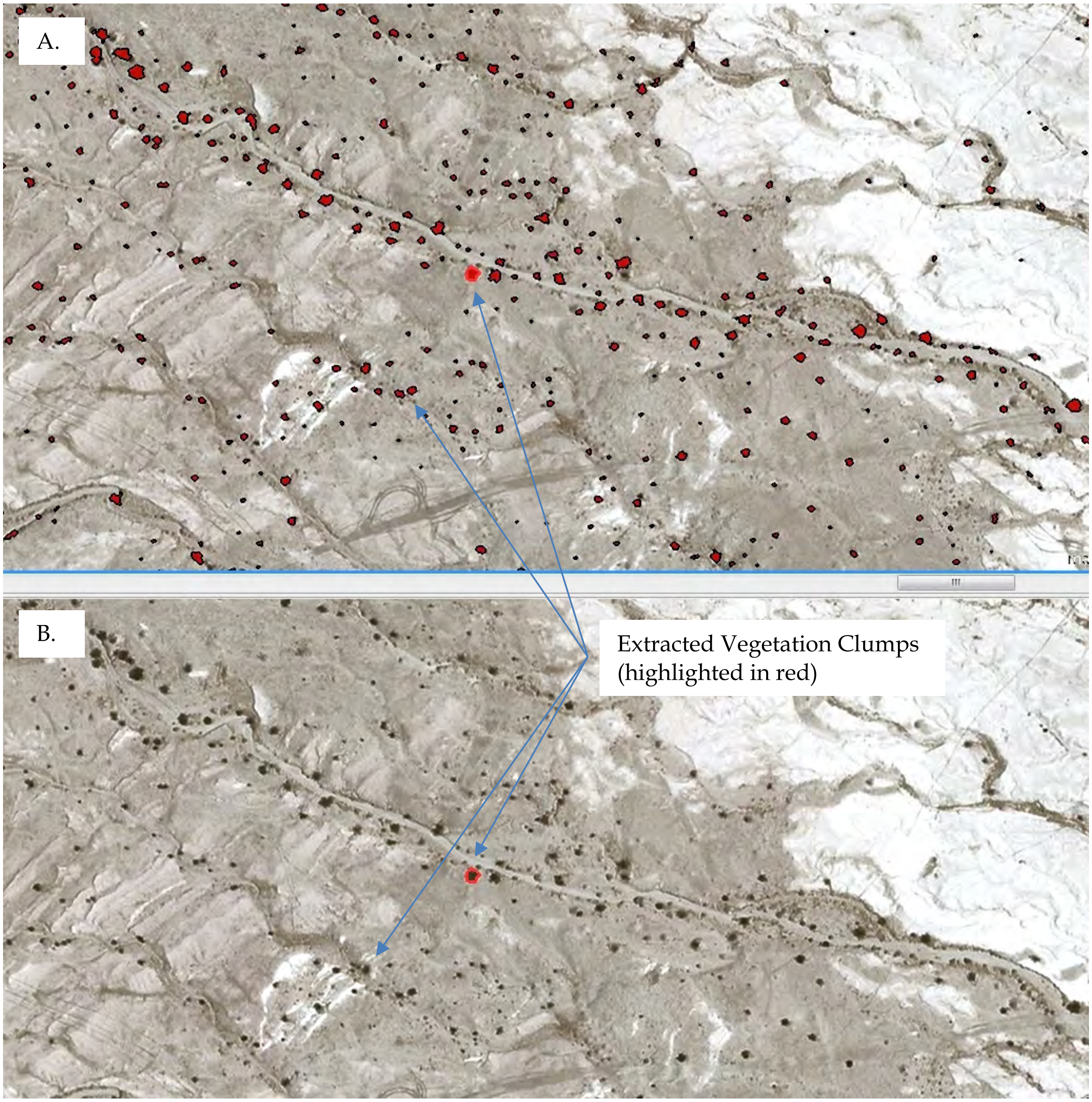
Vegetative cover within the off-sea area will be extracted from a natural color, 1 foot spatial resolution aerial imagery collected in 2011. This will be combined with NAIP high resolution 4 band aerial imagery collected in 2012. The NAIP imagery provides additional detail in the Near Infrared region (which is sensitive to vegetation photosynthesis), while the 1 foot natural color imagery will be used to delineate the edges of the vegetation structure. An example of the vegetation extraction for a portion of the off-sea area is provided in (Figure C-5). Results of the vegetation extraction process will be aggregated to a 1 acre grid to calculate an area weighted average percent cover on a conitinuous scale.

Final results of the landform mapping will be summarized in the final off-Sea inventory documentation.

C.1.3.1.3 Reporting

Results of mapping and characterizing off-Sea surfaces will be computed and reported as outlined in Table C-3, Summary of Reporting for Off-Sea Emissions Inventory. Table C-3 is located at the end of Appendix C.

Figure C-5. Example Vegetation Extraction for a Portion of the Off-Sea Area



C.1.3.2 Aerometric Data

This section describes the aerodynamic data collection activities that will occur as part of the PM_{10} inventory for off-Sea sources.

C.1.3.2.1 PI-SWERL Sampling

The PI-SWERL sampling objectives, sampling locations and frequency, instrumentation, operation and maintenance procedures, analysis, and reporting activities are described in the following sections.

C.1.3.2.1.1 Objectives

The objective of PI-SWERL sampling is to characterize the PM_{10} emission potential of distinct landforms and surface types found within the desert areas west of the Salton Sea. These surfaces include, but are not limited to: alluvial fans with flood silt channels and deposits, stably vegetated sand dunes, actively migrating sand dunes, and sand sheets with various degrees of rock armoring, among others. The vulnerability of desert surfaces to wind erosion is not expected to change seasonally, at least not to the extent expected on exposed playa surfaces where salt mineralogy and crystal habit is being influenced by changing temperature and moisture conditions (Buck et al. 2011). Modest seasonal differences may be observed on desert surfaces, particularly after flash flood events on the alluvial fans and flood silt deposition areas, but even in these cases the emission potential is expected to return to earlier, roughly equilibrium conditions after a relatively short period of drying.

The results of the PM_{10} sampling will be used to assign the emission potential of various surfaces. Surfaces with medium to high emission potential will then be targeted for more extensive sand flux and meteorological monitoring.

C.1.3.2.1.2 Sampling Locations and Frequency

PI-SWERL sampling will be performed on up to 17 distinct surface types found in the desert areas west of the Salton Sea. These are presented below in Table C-2 (condensed version of Table 3-4 in the main body of the Salton Sea Air Quality Program).

Of these major surface types, four are considered to be non-emissive and as such will be excluded from the PI-SWERL sampling. The exclusions apply to: Types 3, 8, 14, and 16. These sites are gravel-, cobble-, or bedrock-dominated surfaces with low overall erosion risk. The 13 remaining surface types have a significant component of sand and silt and will be included in the PI-SWERL sampling.

Table C-2. Major Surface Types Found in Desert Area West of the Salton Sea

Type Number	Description	Erosion Risk*
1	Dry wash, sand dominated	High
2	Dry wash, silt dominated	High
*3***	*Dry wash, gravel dominated*	*Low*
4	Dry wash, gravel and sand	Medium
5	Dry wash, gravel and silt	Medium
6	Alluvial fan, sand dominated	High
7	Alluvial fan, sand and gravel	Medium
*8***	*Alluvial fan, cobbles*	*Low*
9	Sand dunes	High
10	Sand sheet	High
11	Sand over alluvium	High
12	Paleo lakebed sediments, silt dominated	High
13	Paleo lakebed sediments, cobble over silt	Medium
*14***	*Paleo lakebed sediments, gravel and sand*	*Low*
15	Rock, sandstone	Medium
*16***	*Rock, bedrock*	*Very Low*
17	Offshore playa	High

* Overall risk of erosion from wind and water combined with vehicular traffic. This is not the same as the "emission potential" being evaluated with the PI-SWERL.
** Excluded from PI-SWERL sampling because of low expected emission potential.

A total of 130 PI-SWERL sampling sites will be selected in the field for the initial PI-SWERL investigation, including: 13 surface types, 2 separate geographic locations, and 3-5 replications for each combination of surface type and location (13 surface types x 2 locations x 5 replications = 130 samples per event). The estimated sampling time in the field is 40 hours, including site-to-site travel time and assuming a production rate of 36 PI-SWERL samples per day. Individual sampling sites will be selected from relatively large, uniform areas characterized by each of the targeted surface types.

PI-SWERL sampling will be performed twice during the initial study phase: once in November 2015, and again in March 2016.

C.1.3.2.1.3 Instrumentation

Required instrumentation includes the PI-SWERL apparatus, described below. Labeled diagrams of the PI-SWERL apparatus are found in Appendix D.1, Standard Operating Procedures: PI-SWERL.

Development of the PI-SWERL (Figure C-6) by Victor Etyemezian and others at the Desert Research Institute (DRI) in Reno, Nevada, was motivated by a need for a portable device to test and measure the potential for wind erosion and dust emissions from real-world surfaces. Large wind tunnels, the conventional mode of measurement prior to the PI-SWERL, required long setup times and often a team of people to operate. In comparison, the PI-SWERL is easy to move, requires minimal setup time, and can be operated by a single person.[10] A prototype was developed in 2000 and tested alongside the University of Guelph's large wind tunnel in Guelph, Ontario, Canada. This testing provided early indication of the feasibility of the PI-SWERL concept. Since then, several models have been used in many field investigations, including measuring emission potential on Owens Lake and Salton Sea playas.

Figure C-6. **PI-SWERL Apparatus**

The PI-SWERL uses a tri-wheeled buggy to transport the instrument and all supporting components. This photograph shows an Air Sciences Inc**.** crew member sampling surface emission potential at Area T23 on the Owens Lake playa, California.

[10] For safety and efficiency, two-person teams are recommended.

The PI-SWERL comprises an open-bottomed, cylindrical chamber operated by a direct-current motor that spins an annular metal ring about 2.5 inches above and parallel to the soil surface. Principles of fluid mechanics allow simulation of high winds and ground-level turbulence that typically produce dust emissions. The spinning ring creates known wind shear, lofting soil and dust particles and passing them through particulate monitors. The PI-SWERL electronically measures the number and size of entrained particles over the duration of a test cycle, typically less than 10 minutes. By controlling the speed of the ring to simulate varying wind speeds, the potential for a soil surface to produce PM_{10} dust emissions can be determined under a range of simulated wind conditions.

The PI-SWERL-derived PM_{10} and sand flux compared favorably to standard laboratory measurements in two separate calibration studies sponsored by the Los Angeles Department of Water and Power (LADWP). In 2011, the PI-SWERL PM_{10} flux using a DustTrak was calibrated against the gravimetric PM_{10} flux at DRI's laboratory in Reno, Nevada (Gillies and Zhou 2012). Overall, the DustTrak-to-gravimetric PM_{10} flux relationships were excellent with regression coefficients (R^2) between 0.85 and 0.99.

In a separate investigation in 2012, PI-SWERL particle counts based on an Optical Gate Sensor (OGS) were calibrated against the measured sediment flux at the University of Guelph's 1.2-meter wind tunnel (Nickling 2012). Very strong ($R^2 > 0.93$) linear relationships were found between the measured sediment flux and the OGS counts for laboratory sand and for two of the Owens Lake soils (located at Study Area 3 and Lizard Tail). A much lower ($R^2 = 0.4256$), but still statistically significant, linear relationship at the 95 percent confidence level was associated with Cottonwood soils.

C.1.3.2.1.4 Operations and Maintenance Procedures

Appendix D.1, Standard Operating Procedures: PI-SWERL, describes the PI-SWERL operation and maintenance activities (including precautions), start-up and operating procedures, periodic cleaning and maintenance procedures, and records management (including use of the SWERLView software).

C.1.3.2.1.5 Analysis

The analysis procedures for the off-Sea PI-SWERL data are the same as those described earlier in Appendix B for exposed playa surfaces (see Section B.1.3.2.1.5). The relationships developed between vertical PM_{10} flux and surface friction velocity are used in Section C.2 to calculate maximum day and annual PM_{10} emission rates.

C.1.3.2.1.6 Reporting

PI-SWERL results will be computed and reported as outlined in Table C-3, Summary of Reporting for Off-Sea Emissions Inventory. Table C-3 is located at the end of Appendix C.

C.1.3.2.2 Sand Flux Monitoring

The sand flux monitoring objectives, sampling locations and frequency, instrumentation, operation and maintenance procedures, analysis, and reporting activities are described in the following sections.

C.1.3.2.2.1 Objectives

Sand flux data will be used in the off-Sea emission inventory to compute the vertical PM_{10} emission rates based on measured horizontal sand fluxes and PI-SWERL-generated K-factors[11] (see Sections C.2.1.1 and C.2.2.1 of this document).

C.1.3.2.2.2 Sampling Locations and Frequency

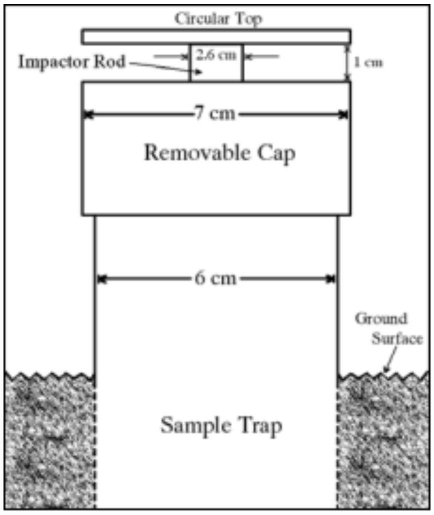
The numbers and locations of sand flux monitoring sites will be determined after the initial PI-SWERL sampling is complete and the various surfaces have been prioritized in terms of emission potential. For planning purposes, 18 off-Sea sand flux monitoring sites have been budgeted. Once installed, the sand flux instruments will be operated continuously for the duration of the project.

C.1.3.2.2.3 Instrumentation

Sand flux will be estimated using a combination of Cox Sand Catchers (CSCs) and Sensits. CSCs are passive collection instruments that capture windblown sand and sand-sized particles. The CSC is composed of a 6-cm-diameter PVC tube mounted vertically in the ground (Figure C-7 and Figure C-8). CSCs were designed and constructed by the Great Basin Unified Air Pollution Control District as a simple, easy-to-use instrument capable of withstanding the harsh conditions on Owens Lake. CSCs have no moving parts and can collect sand for a month or more without overloading its storage capacity. Field personnel visit CSC sites to measure the mass of the collected sand catch.

[11] $K = F/Q$, where F is the vertical PM_{10} emission flux (g cm^{-2} s^{-1}) and Q is the horizontal sand flux (g cm^{-2} s^{-1}).

Figure C-7. Schematic Diagram of Cox Sand Catcher



Courtesy of Great Basin Unified Air Pollution Control District

Figure C-8. Photograph of Cox Sand Catcher

Sample Inlet (1.2 cm^2)

Removable Collection Tube

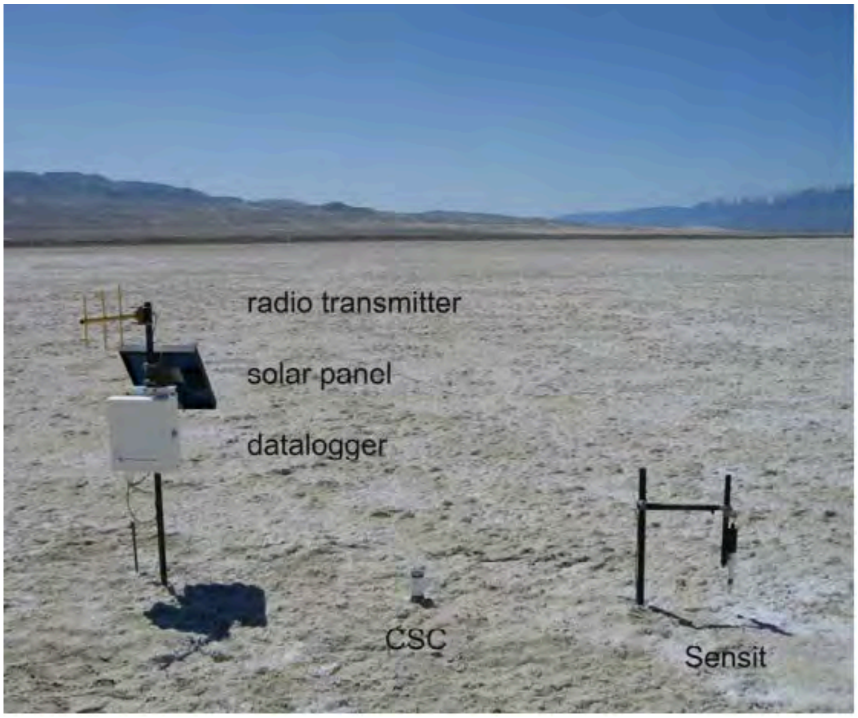
Courtesy of Great Basin Unified Air Pollution Control District

Sensits are passive, real-time electronic sensors that measure the kinetic energy or the particle counts of sand-sized particles as they *saltate*, or leap, across the surface under high winds. Sensits are used to time-resolve the CSC mass (g collection period^{-1}) into estimates of hourly sand flux (g cm^{-2} hr^{-1}). The Sensit collection surface is a highly sensitive piezoelectric ring that records striking particles in one of two ways: as a particle count (PC; total number of particle strikers per unit time), or as kinetic energy (KE; cumulative kinetic energy of striking particles per unit time). In general, PC is more stable and therefore more useful than KE because its signal does not saturate as readily as KE under very high saltation sand masses. For this reason, PC will be the primary basis for apportioning the CSC sand masses into one-hour sand fluxes. KE will be used only if the PC data are not of sufficient quantity to correctly apportion the masses. Several quality control graphs will be generated, including: (1) $\log_{10}$(PC) versus $\log_{10}$(KE); (2) $\log_{10}$(PC) and $\log_{10}$(KE) as a function of time; and (3) $\log_{10}$(PC) and $\log_{10}$(KE) as a function of wind speed.

CSCs and Sensits will be co-located at each site and positioned with their sensing surfaces at 15 cm above the local ground level. This is designed to record the movement of high-energy soil particles moving across the soil surface during high-wind events.

Figure C-9 shows a Sensit suspended above the ground on the right, and a CSC mounted in the ground on the left. A datalogger will record 5-minute Sensit data during active saltation periods. Data collection will be triggered by particle count activity and will continue until particle counts are zero for an hourly period. Each datalogger will have a radio transmitter that will send Sensit data to the IID's field office once a day to provide updates on erosion activity at each site. These daily updates will be used to alert field personnel to active source areas for possible Global Positioning System (GPS) mapping and inspection. Daily transmission of the data may be temporarily suspended if the solar battery power is low due to extended days of cloud cover.

Figure C-9. Example of Sand Flux Monitoring Site



C.1.3.2.2.4 Operation and Maintenance Procedures

Operation and maintenance of the sand flux instruments is described in Appendix D.2, Standard Operating Procedures: Sand Flux and Meteorological Monitors. Topics in Appendix D.2 include: principles of operation, safety precautions, sampling interferences, site location and installation, CSC sample collection procedure, and others.

Sand will be collected from the CSC tubes at least once a month. Additional collections will be made after larger wind events if Sensit activity indicates that the CSC might be close to full.

The tubes will be labeled with the site ID number and date and transported to the IID's Salton City Field Office for drying, weighing, and recording. IID will make the sand mass data available to ICAPCD (or other interested agencies) if requested.

Each Sensit's own datalogger will record sand flux data as one-hour totals via electronic signal. The Sensit dataloggers will be programmed using IID's customized script and equipped with radio modems linked to IID's Salton City Field Office. Within a geographic area, individual Sensits will transmit to a single radio relay modem, which in turn will transmit to the IID field office. At the same time the sand masses are collected, the data from the associated Sensits will be downloaded in the field to a laptop computer. The laptop data will be then uploaded and stored on IID and Air Sciences servers for later quality control checks and data analysis. The raw (i.e., pre-quality control) Sensit data collected during the manual download will be provided to IID as part of the monthly reporting.

C.1.3.2.2.5 Analysis

Hourly sand fluxes will be calculated for each Sensit/CSC site by multiplying the collection-period ratio of sand mass to Sensit response by the hourly Sensit response (either PC or KE).

If PC is used to time-apportion the CSC sand masses, the hourly sand fluxes (g cm^{-2} hr^{-1}) at site *n* and hour *t* will be calculated as follows:

$$q_{n,t} = \left(S'_{n,t}\right) \cdot \left[\frac{CSC_{n,p}}{\sum_{t=1}^{N}\left(S'_{n,t}\right)}\right] \cdot \frac{1}{1.2}$$ **Equation C-1**

where

$S'_{n,t}$ = Sensit total PC for site *n* and hour *t* (dimensionless)

$CSC_{n,p}$ = CSC mass for site *n* and collection period *p* (grams)

N = Total number of hours in CSC collection period *p*

Note that the hourly sand flux is divided by 1.2 cm^2, which is the CSC equivalent inlet opening size for flux calculation purposes.

If KE is used to time-apportion the CSC sand masses, the hourly sand fluxes (g cm^{-2} hr^{-1}) at site *n* and hour *t* will be calculated as follows:

$$q_{n,t} = \left(S_{n,t} - S_{n,bg}\right) \cdot \left[\frac{CSC_{n,p}}{\sum_{t=1}^{N}\left(\left(S_{n,t} - S_{n,bg}\right)\right)}\right] \cdot \frac{1}{1.2}$$ **Equation C-2**

where

$S_{n,t}$ = Sensit total KE reading for site *n* and hour *t* (dimensionless)

$S_{n,bg}$ = Sensit KE background reading for site *n* (dimensionless)

C.1.3.2.2.6 Reporting

Reports summarizing, among other things, the CSC sand mass and Sensit response data, collection statistics and results of the quality control inspection, and calculated hourly sand flux will be reported as outlined in Table C-3, Summary of Reporting for Off-Sea Emissions Inventory. Table C-3 is located at the end of Appendix C.

C.1.3.2.3 Meteorological Monitoring

This section describes the off-Sea emission inventory meteorological monitoring objectives, instrumentation, sampling locations and times, instrument operation and maintenance procedures, analysis, and reporting.

C.1.3.2.3.1 Objectives

Meteorological data will be used in the off-Sea emission inventory in two ways: (1) as input data for the CALMET meteorological modeling analysis used to estimate vertical PM_{10} flux as a function of surface friction velocity, and (2) as input data for the CALPUFF dispersion modeling analysis to evaluate "hotspot" impacts at Salton Sea PM_{10} compliance monitors.

C.1.3.2.3.2 Instrumentation

The meteorological instrumentation is the same as that described in Appendix B, Section B.1.3.2.2.2.

C.1.3.2.3.3 Sampling Locations and Frequency

One 6-meter-tall meteorological tower will be installed at each of the 18 proposed off-Sea sand flux monitoring sites described in Section C.1.3.2.2.2 above. The sites will be determined later, after the initial PI-SWERL sampling and subsequent prioritization of surfaces by emission potential is complete.

C.1.3.2.3.4 Operation and Maintenance Procedures

Operation and maintenance of the meteorological instruments is described in Appendix D.2, Standard Operating Procedures: Sand Flux and Meteorological Monitors. Appendix D.2 includes: site check and audit forms, data processing and quality assurance/quality control (QAQC) procedures, and calibration and audit procedures for the Met One 014A wind speed and Met One 024A wind direction sensors.

C.1.3.2.3.5 Analysis

For the playa inventory, the meteorological data will be used to calculate the hourly surface friction velocity (u_*) and roughness length (z_0) by fitting the hourly average wind velocity (x axis) against height above ground (y axis) on a log-log scale. The slope of the line is u_* and the y-intercept is z_0. For the off-Sea inventory, however, the hourly wind speed and wind direction data will be used in the CALMET meteorological model[12] to produce gridded fields of surface friction velocity with inputs of fixed-point meteorological data and gridded inputs of terrain elevation, land use category, and (optionally) surface roughness length, albedo, and vegetation leaf area index, among others.

As discussed later, the gridded hourly u_* values will be used to calculate hourly vertical PM_{10} emission fluxes using the relationships between PM_{10} emission flux and u_* derived from PI-SWERL sampling (see Sections C.2.1.1 and C.2.2.1).

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12 http://www.src.com/calpuff/download/CALMET_UsersGuide.pdf

C.1.3.2.3.6 Reporting

Reports summarizing, among other things, hourly wind speed and wind direction data, collection statistics, and results of the quality control review will be reported as outlined in Table C-3, Summary of Reporting for Off-Sea Emissions Inventory. Table C-3 is located at the end of Appendix C.

C.1.3.2.4 Video Monitoring

This section describes the off-Sea desert area video monitoring objectives, equipment and monitoring locations, image collection rates, operation and maintenance procedures, image analysis procedures, and reporting.

C.1.3.2.4.1 Objectives

Video monitoring serves several useful purposes:

1. To document the locations of active dust sources in the desert areas west of the Salton Sea.

2. To document the location, frequency, and relative intensity of dust plumes originating at those locations.

3. To document the frequency and relative intensity of dust plumes traveling into and across the off-Sea desert area from sources farther upwind.

C.1.3.2.4.2 Equipment and Monitoring Locations

Video monitoring in the off-Sea desert areas will be performed with a network of 8 portable camera systems scattered around the desert area west of the Salton Sea. The cameras will be sited such that each AOI is observed by at least two cameras with fields of view (FOV) perpendicular to each other to facilitate qualitative analysis of plume activity. Historical wind patterns will be employed to ensure that the cameras are sited upwind of the most frequent wind directions with average wind speeds greater than 5 meters per second at a height of 10 meters above ground.

The portable video camera systems will be equipped with the StarDot Corporation 10-megapixel (MP) H.264d Special Bundle, which includes a StarDot 10MP SC day/night camera (see Figure B-21) with Dotworkz ST-BASE outdoor enclosure, Veracity Power-over-Ethernet (PoE) injector, and Tripp Lite outdoor-rated 100-foot patch cable.[13] In addition, each site will be equipped with an 8–48-millimeter vari-focal lens, providing a 4.5°–45° FOV that may be adjusted according to specific site conditions. As many as possible of the 8 cameras will be installed on 30-meter cellular towers to minimize equipment costs. The remaining cameras will be mounted above the permiter fence on a tripod (similar to the 6-meter-tall tower shown in Figure B-17).

For added security, each video monitoring station not mounted on a cellular tower may be surrounded by a 10-foot-square by 10-foot-tall cyclone fence enclosure with a locking gate.

[13] http://californiapc.com/IP-Cameras-Enclosures-Lenses-Accs/StarDot-NetCam-Bundles/

C.1.3.2.4.3 Image Collection Rates

The StarDot cameras will be operated during daylight hours only. One still-frame image will be captured and stored every 15 minutes, with all cameras on the same collection schedule to facilitate analysis.

C.1.3.2.4.4 Operation and Maintenance Procedures

Operation and maintenance of the video monitoring stations are described in Appendix D.3, Standard Operating Procedures: Roundshot Livecam D2 and in Appendix D.4, Standard Operating Procedures: StarDot Technologies SC H.264. Each of these appendices includes installation and operation procedures, and site check forms, for the Roundshot camera system (fixed stations) and the StarDot camera system (portable stations), respectively.

C.1.3.2.4.5 Image Analysis Procedures

In the laboratory, the folder of still images will be filtered to include those taken on days when wind speeds exceed the threshold for dust generation (nominally, more than four hours with average wind speeds greater than 5 meters per second at a height of 10 meters above ground). The filtered images will then be used to qualitatively assess the location, frequency, and magnitude of dust plumes originating in the desert area west of the Salton Sea.

Since the AOIs will be covered by at least two cameras with perpendicular FOV capturing images simultaneously, an estimate of plume location and height can be determined with triangulation. An azimuth/elevation angle grid will be developed for each camera FOV. An analyst will review an image of interest to determine the azimuth angles of both sides of plumes in the image; the same will be done for an image viewing the same AOI from a different angle. The intersection of the plume extent "rays" from both images will identify the approximate locations and sizes of the plumes. Once the triangulated position is determined, the height of each plume can be determined using the elevation angle.

C.1.3.2.4.6 Reporting

Reports summarizing, among other things, days with 10-meter wind speeds above the threshold for dust generation, and a qualitative description of images showing evidence of dust plumes will be reported as outlined in Table C-3, Summary of Reporting for Off-Sea Emissions Inventory. Table C-3 is located at the end of Appendix C.

C.2 Quantifying PM_{10} Emissions from Off-Sea Desert Areas

This section describes the procedures used to compute the maximum-day and annual PM_{10} emission estimates for source areas located in the off-Sea desert areas located west of the Salton Sea.

C.2.1 Maximum-Day PM_{10} Emissions

Maximum-day emissions will be computed by one of two methods: surface friction velocity, and horizontal sand flux. Each of these methods is described below.

For both methods, the maximum-day PM_{10} emissions will be computed using the following equation:

$$E_{Max-Day} = \sum_{n=1}^{N} \left(A_n \cdot \overline{F_{MaxDay,n}} \cdot 9.5\ x\ 10^{-2} \right)$$ **Equation C-3**

where $E_{Max-Day}$ is the maximum-day mass emissions of PM_{10} (tons per day, tpd) summed for surface types *n=1* through *N* (the maximum number of surface types assigned), A_n is the total area (m^2) with each surface type n, $\overline{F_{MaxDay,n}}$ is an average maximum-day PI-SWERL-derived vertical PM_{10} emission flux (g m^{-2} s^{-1}) by surface type n, and 9.5 x 10^{-2} is a constant of proportionality to convert from seconds to days and from grams to tons of PM_{10}.

The two methods differ in how $\overline{F_{MaxDay,n}}$ is parameterized. The surface friction velocity method uses CALMET meteorological modeling to generate gridded u_* estimates across the meteorological domain in conjunction with PI-SWERL-derived relationships expressing vertical PM_{10} emission flux as a function of u_*. The horizontal sand flux method uses PI-SWERL-generated *K*-factors[14] for various surfaces of interest, multiplied by location-specific horizontal sand flux, *Q*, to compute location-specific vertical PM_{10} fluxes.

With either method, the hourly PM_{10} fluxes are summed over time and space to estimate the maximum-day emission estimates for the off-Sea AOI.

C.2.1.1 Surface Friction Velocity Method

The procedure for parameterizing $\overline{F_{MaxDay,n}}$ in Equation C-3 is as follows. First, PI-SWERL sampling is used to define the relationship between *F* and u_* for each of the surface types *n* represented in the AOI. The relationships will be determined later with curve fitting algorithms.

The CALMET meteorological model is then used to produce a three-dimensional array (two spatial variables plus time) of gridded hourly u_* values within the off-Sea AOI. The gridded u_* values are subsequently aggregated by surface type *n* and averaged to produce a two-dimensional array (surface type and time) of $\overline{u_{*,n,h}}$ values. The spatially averaged u_* values are then used in the PI-SWERL relationships to derive spatially averaged hourly vertical emission fluxes:

$$\overline{F_{n,h}} = f\left(\overline{u_{*,n,h}}\right)$$ **Equation C-4**

In the final steps, the hourly values are averaged over successive 24-hour periods to produce daily average vertical PM_{10} fluxes by surface type *n* (day index denoted by subscript *d*):

$$\overline{F_{n,d}} = \frac{\sum_{h=1}^{24} \overline{F_{n,h}}}{24}$$ **Equation C-5**

The array of daily vertical PM_{10} fluxes is then queried to identify the day *d* with the highest average vertical PM_{10} flux (i.e., the "maximum-day" flux) for each surface type *n*:

[14] *K = F/Q*, where *F* is the vertical PM_{10} emission flux (g cm^{-2} s^{-1}) and *Q* is the horizontal sand flux (g cm^{-2} s^{-1}).

$$\overline{F_{MaxDay,n}} = \max_{d=1}^{365} \Big| \overline{F_{n,d}} \qquad \textbf{Equation C-6}$$

These values are then used in Equation C-3 to express the maximum-day mass of PM_{10} emissions within the AOI.

Maximum-day emissions will be computed using PI-SWERL and CALMET meteorological input data for a one-year period.

C.2.1.2 Horizontal Sand Flux Method

With the horizontal sand flux method, the spatially averaged hourly vertical emission flux, $\overline{F}$, is the product of the spatially averaged hourly horizontal sand flux, $\overline{Q}$, and the PI-SWERL-derived K-factor,[15] K_f, for each surface type *n* and hour *h*:

$$\overline{F_{n,h}} = \overline{Q_{n,h}} \cdot \overline{K_{f,n}} \qquad \textbf{Equation C-7}$$

Here, $\overline{Q_{n,h}}$ is the spatially averaged hourly horizontal sand flux for all sand motion monitoring stations within surface type *n* (g m^{-2} s^{-1}), and $\overline{K_{f,n}}$ is the spatially averaged K_f for all PI-SWERL monitoring sites within surface type *n*.

The hourly values are then averaged over successive 24-hour periods to produce daily average (denoted by subscript *d*) vertical PM_{10} fluxes by surface type *n*:

$$\overline{F_{n,d}} = \frac{\sum_{h=1}^{24} \overline{F_{n,h}}}{24} \qquad \textbf{Equation C-8}$$

The maximum-day vertical emission flux, $\overline{F_{MaxDay,n}}$, is then computed by scanning all days to find the maximum value of $\overline{F_{n,d}}$. This procedure will be performed for all days of the year, from *d* = 1 through 365:

$$\overline{F_{Max-Day,n}} = max \begin{matrix} 365 \\ d=1 \end{matrix} \Big| \overline{F_{n,d}} \qquad \textbf{Equation C-9}$$

The total area within surface type *n* will be determined using Geographic Information System (GIS) mapping techniques.

C.2.2 Annual PM_{10} Emissions

Annual emissions will be computed using the same two methods described in the previous section: the surface friction velocity method, and the horizontal sand flux method.

For both methods, the equation used to compute the annual mass of PM_{10} emissions from off-Sea sources is as follows:

$$E_{Annual} = \sum_{n=1}^{N} \sum_{h=1}^{8760} \left(A_n \cdot \overline{F_{n,h}} \cdot 3.97\ x\ 10^{-3} \right) \qquad \textbf{Equation C-10}$$

where E_{Annual} is the annual mass emissions of PM_{10} (tpy) for all hours in a year from *h*=1 through 8,760, and for all surface types represented with the AOI from *n=1* through *N*. Here, A_n is the total area (m^2)

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15 Wind tunnel calibrations of *F* and *Q* reported in: Nickling, W. G. 2012. 2011 PI-SWERL Research Study, Final Report, Owens Lake Dust Mitigation Program, Agreement No. 300-1-SUB7, Task Order No. 300-10. Prepared for Air Sciences Inc., Golden, CO, by W. G. Nickling, Nickling Environmental Ltd., Cambridge, ON, Canada. 58 pp.

for surface type n, $\overline{F_{n,h}}$ is the PI-SWERL-derived vertical PM_{10} emission flux (g m^{-2} s^{-1}) for hour *h* and surface type n, and 3.97 x 10^{-3} is a constant of proportionality to convert from seconds to hours and from grams to tons of PM_{10}.

The total area A_n for each surface type *n* will be determined using GIS mapping techniques. For the off-Sea desert region, the A_n values are not expected to change significantly over time but will be periodically updated as necessary.

C.2.2.1 Surface Friction Velocity Method

With the surface friction velocity method, the average hourly vertical emission flux, $\overline{F_{n,h}}$, in Equation C-10 is parameterized as follows:

$$\overline{F_{n,h}} = f\left(\overline{u_{*,n,h}}\right) \text{ for all } h \text{ satisfying } u_{*,n,h} \geq u_{*t,n} \qquad \textbf{Equation C-11}$$

where $f\left(\overline{u_{*,n,h}}\right)$ is the PI-SWERL-derived relationship expressing vertical PM_{10} flux (g m^{-2} s^{-1}) as a function of surface friction velocity, u_*, and u_{*t} is the threshold friction velocity for surface type *n*. $\overline{u_{*,n,h}}$ is the area-weighted average of the CALMET gridded u_* values within each surface type *n*:

$$\overline{u_{*,n,h}} = \left.\frac{\sum_{s=1}^{S}(a_s \cdot u_{*s})}{\sum_1^S a_s}\right|_{n,h} \qquad \textbf{Equation C-12}$$

where a_s and u_{*s} are the area and u_* values assigned to CALMET grid cell *s*.

Annual emissions will be computed using PI-SWERL, u_{*t}, and CALMET meteorological data collected during the period of investigation.

C.2.2.2 Horizontal Sand Flux Method

With the horizontal sand flux method, the average hourly vertical emission flux, $\overline{F_{n,h}}$, in Equation C-10 is parameterized as follows:

$$\overline{F_{n,h}} = \overline{Q_{n,h}} \cdot \overline{K_{f,n}} \qquad \textbf{Equation C-13}$$

where $\overline{Q_{n,h}}$ is the spatially averaged hourly horizontal sand flux for all sand motion monitoring stations within surface type *n* (g m^{-2} s^{-1}), and $\overline{K_{f,n}}$ is the spatially averaged K-factor for all PI-SWERL monitoring sites located within surface type *n*.

Annual emissions will be computed using PI-SWERL and sand flux monitoring data collected during the period of investigation.

C.2.3 Future Inventory Updates

The off-Sea emission inventory will be updated as needed based on changes in conditions

C.2.4 Reporting

Results of the emission inventory will be reported as outlined in Table C-3, Summary of Reporting for Off-Sea Emissions Inventory. Table C-3 is located at the end of Appendix C.

Table C-3. Summary of Reporting for Off-Sea Emissions Inventory

	Topic	Items to be Reported	Frequency
1	Mapping and Characterizing Off-Sea Surfaces	Results of mapping and characterizing current off-sea surfaces	Initial report due on or before June 1, 2016. In subsequent years, reports will be generated as needed.
2	PI-SWERL Sampling	Results of PI-SWERL monitoring	
3	Sand Flux Monitoring	Report summarizing, among other things: the CSC sand mass and Sensit response data, collection statistics and results of the quality control inspection, and calculated hourly sand fluxes	
4	Meteorological Monitoring	Report summarizing, among other things: hourly wind speed and wind direction data, and collection statistics and results of the quality control review	
5	Video Monitoring	Report summarizing, among other things: days with 10-meter wind speeds above the threshold for dust generation, and a qualitative description of images showing evidence of dust plumes	
6	Emissions Inventory	Report summarizing off-Sea emissions inventory results and supporting data (items 1 through 5, above)	

APPENDIX D – STANDARD OPERATING PROCEDURES

APPENDIX D.1.
STANDARD OPERATING PROCEDURES:
PI-SWERL

Standard Operating Procedure
Miniature
PI-SWERL with DustTrak Ver. 1.3a
Dust Monitoring
Revision 3

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Tables

1.0 SCOPE AND APPLICABILITY

This document provides procedures for properly operating and maintaining the miniature PI-SWERL with DustTrak. The PI-SWERL is a portable instrument that is used to measure the potential for soil wind erosion and dust suspension (Users Guide Version 1.3a, 2011). It is designed with the intention that minimal personnel can operate it. It should be noted that the description of the standard operating procedures (SOP) are not intended as a comprehensive guide to use of the PI-SWERL. Anyone using the instrument should become sufficiently familiar with the PI-and DustTrak user manuals (see reference section), in order to operate these instrument correctly and safely.

1.1 Principals of Operation

Section 1.2 Overview of the PI-SWERL. Additional information in the instrument can be found in the User's Guide. Figures 1 and 2 provide visual images of the instrument.

Figure 1. PI-SWERL Unit and Carrier

Figure 2. PI-SERL Unit Details

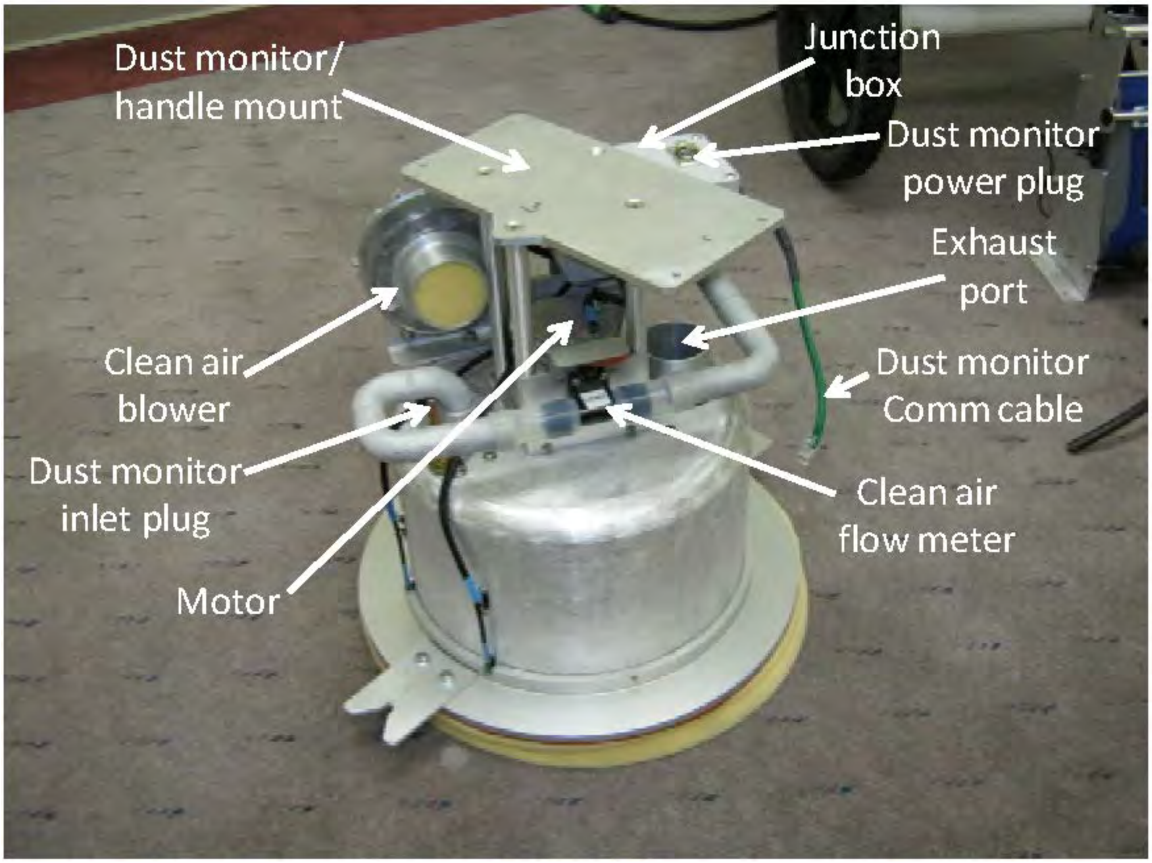
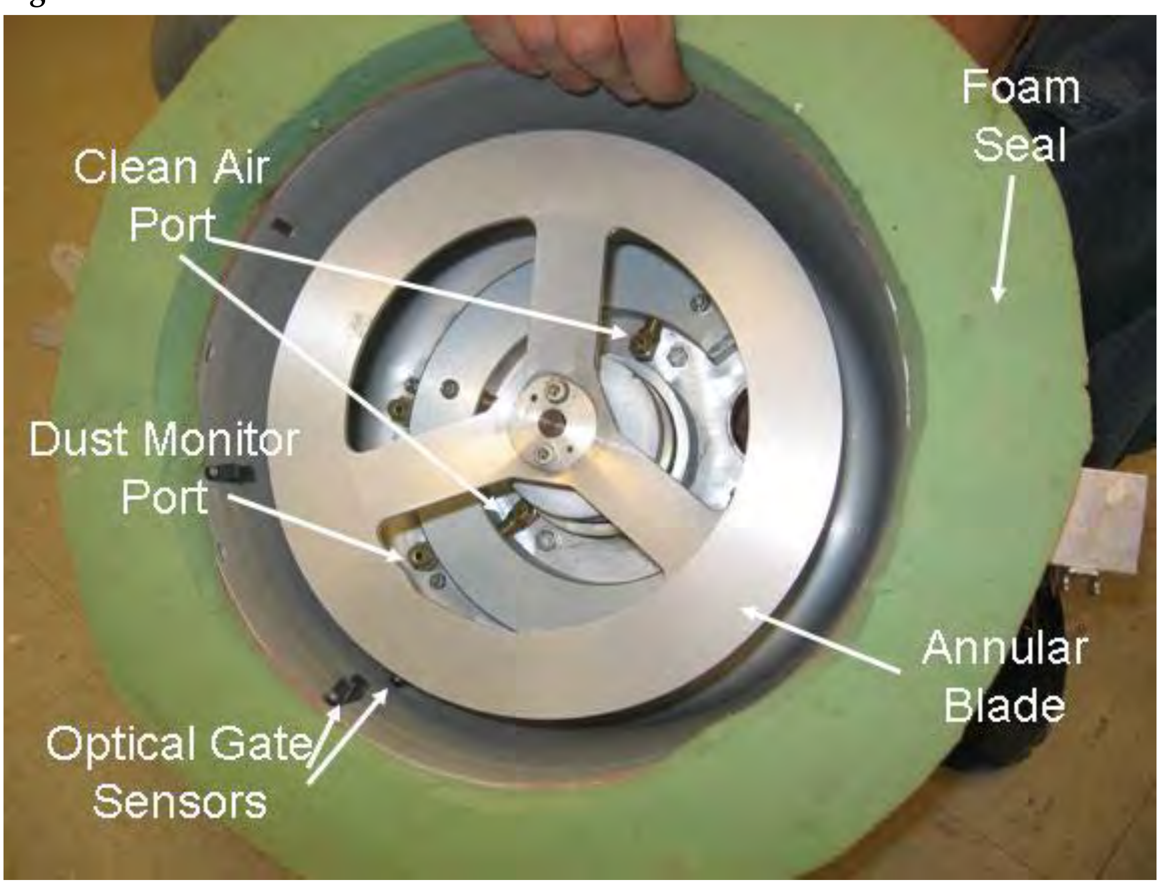


Figure 3. View Inside PI-SWERL Chamber



1.2 Safety Precautions

Normal precautions should be taken to avoid electrical shock and/or dismemberment of body parts. Disconnect power before working with electrical components. Ensure that all moving parts have come to a complete stop before moving or handling instrument.

Use caution when working on elevated surfaces as to not damage the instrument or risk personal injury (due to loosened objects from fast spinning blade).

1.3 Sampling Interferences/Precautions

- Areas with visible moisture should be avoided.
- Sampler should rest on smoothest part of surface with minimal gaps under foam.
- Sampling surfaces should not be disrupted.
- Vegetation should be cut down if anticipated to interfere with rotating blade, but not completely removed.
- Avoid large rocks that could damage instrument.

1.4 Equipment and Supplies

- DustTrak with holder
- Battery pack and backup battery
- Control and backup cables (10 or 20 foot)
- Trimble (GPS unit)
- Garden shovel
- Air tank with air
- PI-SWERL
- Cart
- Site map

1.5 Sampling Locations

Locations will be selected by the Project and Site Manager. Methods of site selection will depend on type of sampling effort. For repeated systematic sampling efforts the sites to be sampled will be selected prior to sampling, loaded onto the Trimble, and reviewed by field staff at least one day prior to sampling. For exploratory surveys the general areas to be sampled, as well as surface types of interest will be identified by the Project and Site Manager. However, actual sampling locations will be determined in the field.

1.6 Operational Procedures

1.6.1 Introduction

The PI-SWERL and DustTrak units need be checked and cleaned regularly as part of the quality control (QC) program. The DustTrak is used to measure particulate concentrations, specifically, particulate matter with an aerodynamic diameter ten micron or less (PM_{10}), in the PI-SWERL chamber. The Optical Gate Sensors (OGS) are a set of four sensors (two sensors at two heights above the surface) that provide a measure of sand motion within the chamber. At this time the PI-SWERL is not an EPA certified instrument, and therefore there are no required calibration protocols. Per recommendation by the manufacturer, the DustTrak will be factory cleaned and calibrated annually by TSI. In addition, if two PI-SWERL units are available on site, periodic co-located testing is recommended to verify that both DustTrak units track each other (and one unit is not systematically skewed up or down).

1.6.2 Initial setup of sampler

Confirm the following before leaving the shop:

1. PI-SWERL will turn on.

2. DustTrak is connecting with the PI-SWERL software.

3. Battery is fully charged.

4. Foam on PI-SWERL is secure.

5. Extra control cable and battery are present.

6. The zero calibration on the DustTrak (DustTrak manual, page 19) has been run.

1.6.3 Steps to be performed to start sampling

1. Locate sampling site and travel to sampling site

    - Use truck to transport PI-SWERL to reasonably close walking distance to sampling location. For safety it recommended to transport the carrier (transport cart) strapped down in the pickup bed, and the actual PI-SWERL instrument in the cab of the pickup.

    - Load PI-SWERL unit onto cart, and locate first sampling location using the coordinate file uploaded onto the Trimble

    - Depending on site access and travel distance to sampling site, the PI-SWERL can be transported to test site using one of two methods:

        - Using the cart that PI-SWERL unit is mounted on

        - Using ATV and trailer, where PI-SWERL and cart securely strapped into cart

2. Turn on the PI-SWERL unit once at sampling site

- Ensure that the control cable linking the PI-SWERL to the control unit is properly connected and secure at each end. A red LED on the switch will light up to indicate that the power is on.
    - Note: Control cable must be securely connected before the PI-SWERL unit is turned on.
- Ensure that the communications cable linking the monitor to the control unit is properly connected and secure at the control unit.
    - Note: Communications cable must be securely connected before the PI-SWERL unit is turned on.
- Ensure that the battery power cable is properly connected and secure, located inside the control unit housing.
    - Note: Power cable must be securely connected before the PI-SWERL unit is turned on.
- Toggle the main power switch to 'ON' (located at the rear of the control unit).
- Toggle the computer monitor's momentary switch to 'ON' (located below the monitor, facing downward) and confirm that the green LED is illuminated above the monitor screen.
    - Note: Occasionally the cursor will appear to dart wildly about the monitor upon initial start-up. This is a known glitch in the system and is best corrected by briefly pressing the monitor's momentary power switch to reboot the system.

3. Select program a sampling event

Program the sampler to run first test

- From the desktop, double click, SwerlView.
- The Test Specification Panel will appear. Choose the program you wish to run.
    - Note: Evaluation to be run can vary by test and will be coordinated by Project and Site Manager. If new program is developed, onsite staff will verify that test specifications are transferred correctly to PI-SWERL Software.
- The Test Description Panel will appear. Input the Test Description and Comment (for example):

    - Test Description: Bombay Beach
    - Comment: Site 45

- Select Run at the bottom. Important: Once Run is selected the test will begin. Ensure that the sampler is properly placed before selecting Run.
- Document site conditions using digital camera, as well as surface information. Surface information forms can either be loaded onto the Trimble, field tablet, or, hardcopy if needed. In addition, maintain brief written field log to aid in data QC.

4. Movement from one site to the next

- Ensure that the test has been completed.
- Confirm that the annular blade has been turned off and stopped running.
- Place sampler on the docking plate.
- Coil control cable around sampler, make sure not to twist it.
- Note: If control cable becomes too twisted, disconnection of the cable and untwisting may need to be performed
    - Note: Do not disconnect the control cable until the monitor has been shut down and the control unit powered off
- Latch toggle clamp on front of docking plate.
    - Note: toggle clamp might come loose during travel. During travel check occasionally to make sure that clamp is still attached. The tension on the clamp may need to be adjusted over time.
- If traveling short distances on the playa (~10 minutes between sites) it is not necessary to power down the PI-SWERL or computer if using the field cart to transport the instrument.

5. Setting up at new sampling site

- Unlatch toggle clamp.
- Uncoil control cable.
- Place sampler onto test area.

6. If unit was left running, repeat starting step 3 (program should go to prior test by default, if new test desired a different test needs to be selected). If unit was turned off for travel or "uncoiling" the cable, repeat starting step 1.

1.6.4 Cleaning and Maintenance of PI-SWERL and DustTrak

The following procedures are to be performed at end of each sampling day.

1. Cleaning of the PI-SWERL
   - Make sure all power is off on the PI-SWERL. Remove the DustTrak holder. Tilt the PI-SWERL so that it is at a 45˚ or greater angle. Using the air tank and a pressure nozzle blow out the inside of the PI-SWERL. Avoid blowing air directly into the Clean Air Ports.
   - Blow out the exhaust port, and outside of PI-SWERL.
   - Remove air intake filter, and blow out.
   - Wipe computer screen with clean cloth or recommended monitor cleanser.
2. Cleaning of the DustTrak
   - Wipe display screen with clean cloth or recommended monitor cleanser.
   - Blow any visible dust off with air tank.
3. General Instrument Maintenance
   - A description of general maintenance tasks and the recommended frequency is provided in the table 1-1.

Table 1-1. Instrument Maintenance Tasks

Frequency	Maintenance Item
Every Sample Day	Inspect all cables for cracks or abnormal wear. Confirm full charge on batteries. Re-zero DustTrak at the beginning of each sampling day, prior to first measurement
Every 20 sampling events, or as necessary	Run zero flush program. When necessary clean out sampler with compressed air.
After every 2 full days of field use	Clean DustTrak monitor (see DustTrak manual for details)
Every 1 month	Repeat steps from Sample Day.

Frequency	Maintenance Item
Every 1 to 3 months	Clean DustTrak inlet filter: monthly during dust season,; every 2 to 3 months during non-dust season
Long-term PI-SWERL care	Vacuum dust and sand particles from battery section of control box, vacuum lid. Carefully vacuum electrical connectors. Remove dust from field cart using hand brush or handheld vacuum.

1.7 Data Records and Management

STEPS TO DOWNLOAD RUN DATA:

- Turn on the PI-SWERL unit following the procedures in section 1.6.3.
- Insert a flash drive into one of the open USB ports located below the monitor, facing downward.
- Open the 'Shortcut to Swirlerdata' folder located on the control screen desktop. Alternatively, using Windows Explorer, open folder used to store the data (c:/Swirlerdata/) and find folder with results for that day (for example, all files for June 7, 2011 will be stored in folder named "20110607."
- Select the appropriate files, named for the date of the test event, right-click, and copy over to the flash drive.
- Remove the flash drive from the monitor following safe removal practices, shut down the monitor, then switch the control unit power off.

2.0 REFERENCES

Dust-Quant LLC. User's Guide for the Miniature Portable In-Situ Wind ERosion Lab (PI-SWERL). Model 8530/8532 DustTrak™ II Aerosol Monitor: Operation and Service Manual. PN6001893, Revision F (January 2011)

Environmental Protection Agency. 2007. Guidance for Preparing Standard Operating Procedures (SOPs). EPA/600/B-07/001. April 2007. Accessed August 27, 2015. http://www.epa.gov/QUALITY/qs-docs/g6-final.pdf.

APPENDIX D.2.
STANDARD OPERATING PROCEDURES:
SAND FLUX AND METEOROLOGICAL MONITORS

Standard Operating Procedure
Sand Flux/Meteorological Monitoring Station Installation and Operation at Salton Sea

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CONTENTS PAGE

Appendices

1.0 INTRODUCTION

This document describes the procedures for properly locating, installing, and operating a sand flux and meteorological monitoring station for use in the Salton Sea Air Basin. The station is designed to be adaptable, so that any combination of sand flux and meteorological instruments can be used, depending on the measurement scenario. The station consists of a Sensit, Cox Sand Catcher (CSC), three levels of wind speed measurements, a single level of wind direction, a solar power system, and data storage and telemetry equipment. This document has been written specifically for application to Salton Sea project and may not be applicable to other jobsite locations.

This document is in accordance with the Environmental Protection Agency's *Guidance for Preparing Standard Operating Procedures (SOPs)* (EPA 2007).

1.1 Principles of Operation

Windblown dust emissions occur when the force of wind becomes sufficiently strong to initiate the movement of soil particles across an erodible surface, generating particulate matter less than 10 microns in diameter (PM_{10}) from the surface. As the wind speed increases, sand sized particles are lifted by fluid drag force and start hopping across the surface in a process known as saltation (Bagnold, 1941; Shao, 2008). As the sand strikes the surface, it frees fine particles which are entrained into the air stream and are carried downwind. The amount of PM_{10} released is a complex function of environmental conditions (e.g. wind, precipitation, and temperature), soil properties (e.g. soil texture, composition, and aggregation), and land-surface characteristics (e.g. topography, surface disturbance, vegetation cover, and/or other non-erodible elements). It is assumed that the vertical PM_{10} emission rate is proportional to the horizontal sand flux, which is measured at a reference height of 15 cm using a CSC and electronic Sensit. The CSC is a passive sampling device used to collect sand and sand-sized particles being transported across the site by the wind. The Sensit is a cylindrical electronic device that records particle count and kinetic energy of the sand particles that strike the sensing surface. The Sensit data are used to time-resolve the sand mass collected by the CSC, resulting in a horizontal sand flux measurement.

Wind speeds are measured at 6-m, 2-m, and near the ground to resolve the vertical wind profile and provide an estimate of the surface friction velocity at the site. The wind speeds are measured using a Met One 014A anemometer or Met One 014A mini anemometer. These anemometers consist of three aluminum cups mounted on a cup assembly hub and shaft. The shaft includes a magnetic assembly to open and close a reed switch, generating a pulse signal with a frequency that is linear with the wind speed.

The wind direction is measured at 6-m using a Met One 024A Wind Vane. This sensor measures wind direction from 0 to 360 degrees with a 5-degree accuracy specification. The wind vane assembly consists of a counterweighted aluminum arm and vertical air foil mounted to an aluminum hub. The hub is attached to a stainless steel shaft which is connected to a potentiometer. When the shaft is rotated, the potentiometer varies the sensor resistance in relation to wind direction, resulting in a linear change in output voltage with wind direction.

1.2 Safety Precautions

- All field staff should carry a working cell phone and wear the appropriate Personal Protective Equipment (PPE).
- Disconnect power before working with electrical components.
- Take normal precautions to avoid electrical shock.

1.3 Sampling Interferences/Precautions

- Check the forecast to ensure safe weather and environmental conditions before visiting a sand flux/meteorological station. Site visits and maintenance should only occur under low wind conditions to avoid operator interferences in the data signal.
- Ensure proper grounding for good performance.
- Avoid using a field vehicle to access the monitoring site. If vehicle access is necessary and unavoidable, the field vehicle must always be parked at a minimum of 10 meters away from the monitoring site.
- All access to the monitoring site should be from the direction that has the lowest frequency of high winds to avoid disturbing the surface upwind of the sensors. At Salton Sea, high winds from the east are extremely rare; therefore, access should be from the east.
- All data should be collected using Pacific Standard Time (PST). Configure all field laptops and tablets devices using PST to prevent accidental datalogger clock updates to Pacific Daylight Savings Time (PDT).
- The site operator needs to confirm that a datalogger program is appropriately configured with the monitoring site ID and the Sensit serial number. Database problems are likely to occur if either the site ID or Sensit serial number is incorrect.

2.0 SITE LOCATION AND INSTALLATION

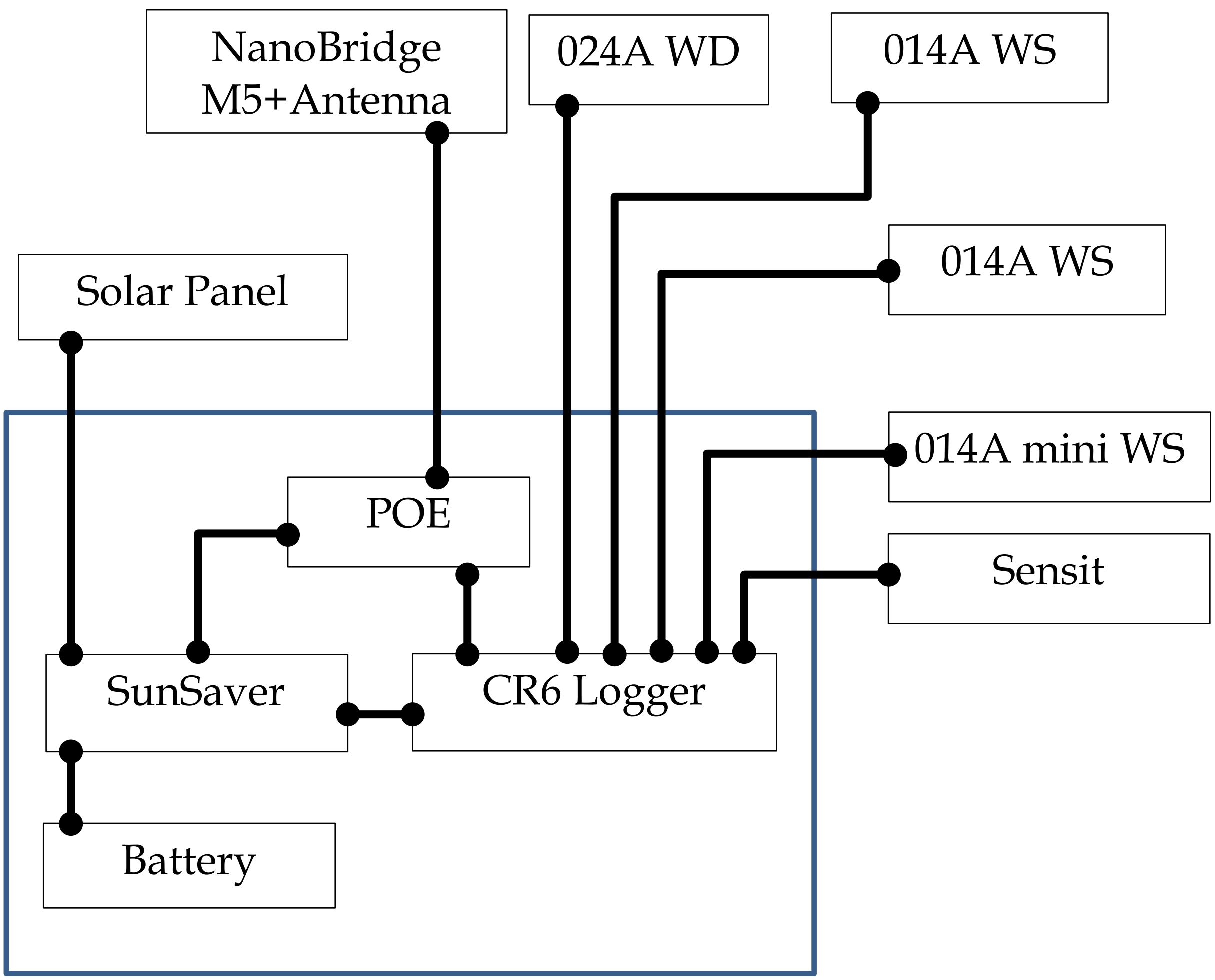
2.1 Equipment and Supplies

- CSC assembly and empty sand collection tube
- Sensit Assembly:
  - Sensit model H14-LIN
  - 1″ diameter iron pipe (lengths of ~5′, ~2′, and ~1′) and two 1″x1″ Nurail fittings
  - 1-foot foam pipe insulation
  - PVC tape and cable ties
- One Met-One 024A Wind Vane
- Two Met-One 014A anemometers with 6-m and 3-m cable heights.
- One Met-One 014A mini anemometer with cable
- Two 4-foot cross-arms with support brackets
- Either one 8-foot 1″ pipe or one 10″ support stand for the 014 Mini
- Four 1″x3/4″ Nurail fittings
- Logger and battery enclosure (BBA3):
  - Back plate
  - CR6 Datalogger
  - SunSaver 10 charge regulator
  - 110ah external storage battery
  - Power-Over-Ethernet (POE) Adaptor
- 90 W solar panel with mounting bracket
- NanoBridge M5 Ethernet radio with antenna
- 20 foot tripod with anchors and guy wire kit
- Grounding package, including 6′ copper grounding rod, clamp, cable, and lightning rod
- Various U-bolts
- Portable GPS unit with monitoring site location file pre-loaded
- T-post pounder
- Packing putty
- Soil coring auger (4″ diameter)
- Small straight-bladed screwdriver
- Large Allen keys

- Keypad for CR6
- Metric measuring tape
- Combination wrench set
- 20-mil PVC pipe wrap tape
- RS-232 cable

2.2 Wiring Diagram

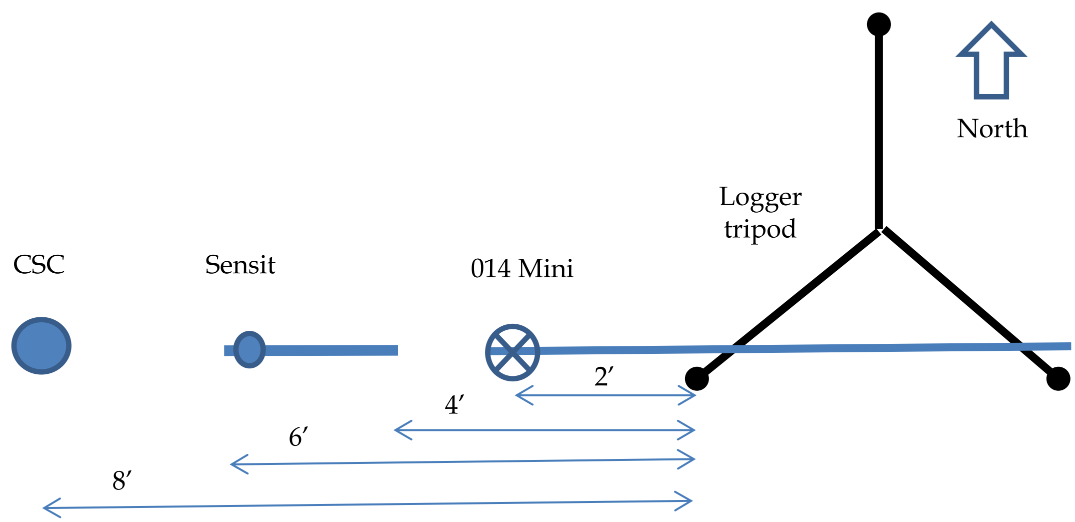
The wiring diagram for the instruments, datalogger and power system is shown below.



2.3 Monitoring Site Location and Installation

1. Before deploying, prepare the enclosure by installing the back plate on the left side of the back wall. Make sure there is an accessible wiring access port at the left back side of the enclosure. Mount the CR6 datalogger, SunSaver Regulator, and POE Adaptor to the back plate.
2. Prepare the CR6 datalogger by loading the appropriate program and entering the correct Sensit serial number and site ID. Make sure the logger is set to Pacific Standard Time.
3. Using standard navigation procedures and the portable GPS unit, locate the appropriate monitoring site. The site should be approximately 8′ by 10′ and be generally level with minimal obstruction in the predominant wind directions. Instruments are to be installed in a west-to-east alignment, with the CSC on the west, the Sensit in the center and the datalogger tripod on the east as shown below. All access to the monitoring site should be from the direction that has the lowest frequency of high winds to avoid disturbing the surface upwind of the sensors. **Ensure that all field personnel approach the location only from that preferred direction**. At Salton Sea, high winds from the east are extremely rare; therefore, access should be from the east to avoid disturbing the surface upwind of the sensors.
4. Begin by installing the datalogger tripod. Refer to the Tripod Installation Manual Models CM110, CM115, CM120 (Campbell Scientific, Inc. 2015) for detailed tripod installation instructions. Orient the legs so that one leg points north and the other two to the south as shown below. The legs should be placed so the mast tilts to the northeast direction.

Figure 1. Sensit/Met Station Instrumentation Orientation



5. Place the ground level anemometer support:
    a. If the low-level anemometer is being held by a pole, attach an 8-foot pole to the base of the south facing legs so that the pole extends to the west. The pole should be level and placed at a height of about 4 inches above ground.
    b. If the low level anemometer is being held by a stand, place the center of the stand two feet west of the southwest foot of the tripod.
6. Next, mark a location approximately 4 feet due west of the southwest foot of the tripod and install the ~5′ pipe for the Sensit stand using the post pounder, leaving approximately 24″ above the ground.
7. Continue by marking a location approximately 8′ due west of the southwest foot of the tripod for the CSC. Measure the length of the CSC from the bottom of the gasket to the bottom of the CSC. Using the coring auger, bore a hole at this location for the CSC, with an initial depth equal to this length.
8. Install the CSC into the bored hole until the center of the inlet sits at 15 cm (6″) from the surface. Soil may need to be added or removed at the bottom of the hole to reach this dimension. If soil is added, make sure to pack the soil down firmly before setting the CSC to ensure it will not settle later. Once the height is correct, pack excess soil around the CSC until it is firmly set into the ground. **Carefully distribute remaining loose soil in an area that is away from predominant high wind directions.**
9. Assemble the remainder of the Sensit stand using the 1″ iron pipe and Nu-Rail clamps. The ~2′ horizontal arm should be oriented in a westerly direction, and the bottom of the ~1′ vertical arm should be positioned approximately 25 cm (10″) above the ground level.
10. Wrap the foam insulation around the short vertical arm of the Sensit stand. Trim the foam so it does not extend below the end of the pipe.
11. Position the Sensit on the foam insulation so that the center of the crystal sensor ring is 15 cm (6″) above the ground surface. With the help of an assistant, use the PVC tape to tightly bind the Sensit to the vertical arm of the Sensit stand. Carefully wrap and secure the Sensit cable to the Sensit stand, leaving enough slack for future Sensit height adjustments. Run the Sensit cable along the ground back toward the tripod.
12. Mount the enclosure to the north leg of the tripod, leaving at least a 2″ gap between the enclosure and the surface.
13. Ensure that the external power lead is connected to the correct lugs on the 110ah battery, and then install the battery into the enclosure.
14. Attach the solar panel to the south legs of the tripod so the panel faces south. An angle-iron bracket may be used to securely attach the panel. Make sure the ends of the solar panel cables are taped so the leads do not short out.

15. Drive the grounding rod into the ground at a convenient location near the enclosure. Attach the grounding clamp and grounding wire to the rod.
16. Mark the 2-m height above ground on the mast. Lower the mast and mark the 5-m height. Attach the lightning rod to the very top of the mast, then attach the NanoBridge M5 radio antenna just below. Aim the dish in the direction of the receiving station. Attach the Ethernet cable to the NanoBridge and cable tie it to the mast.
17. Attach the two cross-arms to the mast for the 2-m and 6-m measurements using the 2-m and 5-m marks as reference. Orient the cross-arms in an east-west direction, using a declination value of 11.5° East for Salton City, with the upper cross arm attached at its midpoint and the lower attached so the pole extends west.
18. Using the 1″x 3/4″ Nu-Rail fittings, attach a 024A vane to the east side of the upper cross arm. Ensure that the stainless steel shoulder screw is installed in the 024A instrument hub.
19. Aided by a compass, align the sensor so that the counter weight is oriented toward true south. When the sensor is properly aligned, remove the stainless steel shoulder screw from the instrument hub and ensure that the vane assembly rotates smoothly. Retain the stainless steel shoulder screw for future audit procedures.
20. Attach the cables to the sensors and label the lead end of the cables so identification on the logger side is easier. Ensure that the connector is properly keyed, and finger-tighten the knurled ring.
21. Using the 1″x3/4″ Nu-Rail fittings, attach a 014A anemometers to the west side of the upper and mid-level cross arms.
22. Attach the sensor cable to the connector on the 014A. Ensure that the connector is properly keyed, and finger-tighten the knurled ring.
23. Secure all cables to the mast using cable ties, allowing slack for adjustment. Raise the mast and collect the cables, securing the cables to the tripod allowing slack at the mast hinge so the mast can be raised and lowered freely.
24. Attach the 014A mini anemometer to the ground level pole or stand, using either a Nu-Rail fitting or threaded rod. Adjust the height based on the application (for example, 15 cm if used with a Sensit). Wire the sensor with a shielded twisted pair cable and run the cable back to the logger, securing with cable ties.
25. Confirm that the SunSaver charge controller has been turned off, pass all loose leads through the access port, and then complete all remaining electrical connections:
    - Charge leads from the solar panel to the charge terminals on the SunSaver
    - External battery lead to the appropriate plug on the SunSaver
    - Connect the wind vane to the CR6 datalogger (U1 and U2).
    - Connect the three anemometers to the CR6 datalogger (6-m in U3, 2-m in U5, and ground level in U7).

- Attach the Sensit lead to the datalogger, according to the attached example wiring diagram (Appendix A) for the appropriate Sensit model (using C1 and C2).
- Connect the Ethernet cable from the NanoBridge to the POE adaptor.
- Attach a short Ethernet cable from the CR6 logger to the POE adaptor.
- Ground the wire between the ground lug on the underside of the enclosure to the clamp on the ground rod.

26. Firmly pack putty around the wiring access port in the bottom of the enclosure in an effort to prevent moisture and insects from entering the enclosure.
27. Carefully loop and wrap all loose leads to a convenient location on the tripod using the 20-mil PVC tape or cable ties.
28. Turn on the SunSaver. Following the CR6 SOP, confirm that the correct site ID and Sensit serial number have been entered into the datalogger program. Verify that the datalogger clock is set to PST.
29. Check the height of the CSC inlet and the Sensit sensor ring and adjust as necessary.
30. Confirm that the Sensit is responding normally by evaluating its response in real-time. Select **Num Display** from the toolbar, and then select **Display 1** to view the real-time station data. Rub the sensor with a pen or similar object, and view the results in **Display 1**. A properly operating Sensit will display a measurable reading (a non-zero value) for the particle count (PC) and kinetic energy (KE) data fields. If these values are **0** during a manual agitation, the Sensit is not operating properly or is not wired correctly. Inspect the integrity of the Sensit cable, verify the datalogger connections, and check the instrument again. If the Sensit is still not responding normally, notify the project monitoring manager for further instruction.
31. Confirm that the wind speed and direction are responding correctly.
32. Determine the wind direction program multiplier by dividing the sensor's full scale input voltage (FSIV) by 360 degrees. The FSIV is the maximum voltage output from the wind vane. When an instrument's program multiplier is found, it must then be entered into the existing datalogger program, replacing any previously defined value.
33. When all instrumentation is installed and operating, begin a site log entry, either electronically on the field laptop or using hard copy forms provided.
34. Audit the wind speed following the procedures in Section 4.

2.4 Data Records and Management

After the site installation is complete and the station is under stable operating conditions, the field technician must complete the initial Site Check and Audit Form. A hard copy is found in Appendix B if an electronic copy is not available on the field laptop.

3.0 SITE VISIT PROCEDURES

3.1 CSC Tube Preparation

1. Disassemble empty sample tubes, removing any caps, rubber rings, and rubber stoppers from the clear plastic tube.
2. Clean all parts of the sample tube using soap and water with a bottle brush and tube plunger as necessary. Ensure that all old sample material and residue have been removed from each piece.
3. Using rubbing alcohol, remove any existing notes that have been written on the tube.
4. Allow all pieces to fully dry before reassembly.
5. Reassemble tubes with only a rubber stopper fully inserted into the bottom of the tube. The stopper should be inserted with the larger diameter up and the smaller diameter flush with the bottom of the clear tube. Do not install the rubber ring or cap at this time.
6. Following the operational procedures for the Scientech electronic balance (Appendix C), weigh each sample tube assembly to a resolution of 0.1 grams.
7. Using a permanent marker, write the tare weight of each empty sample tube assembly directly on the sample tube.
8. Insert a cap/stopper on the tube inlet. The sample tube is now ready for installation at a sampling site.

3.2 Field Collection Procedures

Sand flux monitoring sites must only be approached from an easterly direction. It is best to walk to each site; if an ATV is used for access, the vehicle must be parked no closer than 10 m from the monitoring site.

1. Before leaving the field office, ensure that the field computer is configured to PST to prevent an erroneous update of the datalogger to PDT. If the Sensit and meteorological data are being telemetered, then the data set should be checked prior to the site visit to confirm that the instruments are operating and identify possible issues. Sensits with little activity or no activity should have their response checked
2. Once at site, begin by recording the “Start Time” on the electronic Site Check and Audit Form on the most recent “Field_Site_Logger”workbook. Continue by entering data in the appropriate fields on the Site Check and Audit Form.
3. Inspect the station for any obvious damage, alignment issues, excessive dirt build-up, loose wiring connections, frayed or chewed cables, or vandalism. With some soil types and pole materials, the pole may not lock into place and the Sensit assembly may rotate in the wind. This should be noted on the electronic Site Check and Audit Form, and corrective action must be taken to stop further rotations. Record all corrective actions on the Site Check and Audit Form.

4. Look for evidence of rain splatter. If rain splatter is seen, check the appropriate box in the site log and take a picture of the Sensit and CSC documenting the splatter.
5. Unlock the enclosure and connect the field computer to the datalogger using an RS-232 cable. Following the data collection procedure in the appropriate datalogger SOP, confirm that the datalogger clock setting is correct and collect all data saved for that site.
6. While still connected to the station, select **Num Display** from the toolbar, and then select **Display 1** to view the real-time station data. Here you can check the station battery voltage.
   - Test the Sensit response in real-time, and view the results in **Display 1**. Rub the sensor with a pen or similar object. A properly operating Sensit will display a measurable reading (a non-zero value) for the particle count (PC) and kinetic energy (KE) data fields. If these values are **0** during a manual agitation, the Sensit is not operating properly. For instances of improper Sensit operation, inspect the integrity of the Sensit cable and verify that the datalogger connections are solid. If the problem is not resolved during the field visit, notify the project monitoring manager for further instruction. The Sensits should be tested during each CSC collection event and for Sensit troubleshooting diagnostic visits.
   - If a Sensit needs to be removed from field deployment and replaced with a new instrument, follow these steps:
     - Modify the datalogger program to include the serial number of the new Sensit, and upload the new program to the datalogger. It is imperative that the datalogger program modification be completed accurately. Reference instructions in the appropriate datalogger manual (Campbell Scientific Inc., 2015b) for guidance.
     - Following modification of the datalogger program and its successful upload to the datalogger, manually test the Sensit to verify its appropriate response.
     - Once operation of the Sensit has been verified, wait at least 10 minutes before downloading the data.
     - Open the downloaded **Min05** comma-separated variable DAT data file in Microsoft Excel and verify that the site ID and Sensit serial number are correct. If the values are correct, the Sensit has been successfully changed and the datalogger program appropriately updated.
     - Consult with the monitoring manager on the need to collect the CSC tube and to replace it with a new one, if requested.
     - Take the Sensit to the field office, where it should be bench-tested to verify operation status (working or not).
     - If the Sensit is still not working at the shop, dispose of it.
     - If the Sensit is working at the field shop, test the instrument and system to establish the reason for failure in the field.

7. Confirm that the height from the playa surface to the center of the Sensit's sensor ring is 15 cm ±1 cm. Adjust this height as necessary and record the final dimension and any corrective actions taken on the electronic Site Check and Audit Form.
8. Carefully remove the CSC inlet head and set it aside. Brush any portion of the sand sample that has gathered on the top rim of the sample tube into the tube.
9. Remove the sample tube from the CSC. Remove the rubber top ring. Remove the cap from the tare-weighted "clean" sample tube and place it on the recently removed sample tube. Confirm that the site ID has been written on the sample tube, and, using a permanent marker, write the date of the collection.
10. Install the rubber top ring to the "clean" tube. Using a permanent marker, write the site ID on the "clean" sample tube. Insert the "clean" tube into the CSC and carefully reinstall the CSC inlet head.
11. Confirm that the height from the playa surface to the center of the CSC inlet is 15 cm ±1 cm. Adjust this height as necessary and record the final dimension and any corrective actions taken on the electronic Site Check and Audit Form.
12. Using a field camera, take one or more photos of the sample tube, showing a clear view of the collected sand sample, the site ID, and the collection date as written on the sample tube, as well as the surface conditions immediately adjacent to the sampling location.
13. Verify operation of the wind speed and direction sensors. If an audit is needed, conduct it at this time, following the procedures from Section 4.
14. The field computer may now be disconnected from the station.
15. Finish the field collection by recording the "End Time" on the electronic Site Check and Audit Form prior to leaving the sampling location.
16. Carefully return the samples back to the field office, keeping the tubes upright.

3.2.1 Maintenance and Adjustments

Review the performance of the all sensors and determine what adjustments are required, if any. Follow the maintenance and adjustment guidelines presented in the Instruction Manual (see the Campbell Scientific website for specific instrument manuals).

3.2.2 Post-Adjustment System Checks

If any maintenance or adjustments were performed, the steps listed in the Pre-Adjustment System Checks section of this procedure should be repeated and recorded on the Wind Speed Calibration Form. Results of the post-adjustment checks should be closely evaluated. If the output values do not closely match the expected values, perform troubleshooting, maintenance, and adjustments as needed to correct the sensor response. If the sensor is not deemed repairable, it should be replaced as soon as possible from the stock of back-up sensors for the monitoring project.

3.3 Post-Collection Procedures

1. After all of the CSC sand mass samples are collected, the tubes are transported in an upright position and delivered to the field office for weighing.
2. Once at the field office, store the sample tubes upright in a secure location. If the samples are wet or damp, remove the caps from each sample tube to allow the samples to dry for several days. This drying process may be expedited by using a small fan to gently blow clean, dry air across the open ends of the sample tubes.
3. Generate a weigh sheet from the Excel based spreadsheet.
4. Prepare the Scientech electronic balance for measuring the mass of each sample.
5. Start the weighing session by verifying the scale accuracy with NIST[1] weights, following the appropriate operational procedures (Appendix C).
6. Record the site ID as written on the sample tube in the appropriate fields on the CSC Weigh Data spread Sheets (Appendix D). Continue to fill out the remaining fields as the data are available.
7. Begin by preparing an empty Ziploc storage bag for each sand sample. Write the site ID and collection date on the bag. Weigh the empty storage bag using the electronic balance. Write this "Empty Bag" weight directly on the empty bag for future reference and also on the Weigh Data Sheets.
8. Carefully pour each sand sample into its previously prepared Ziploc bag, being careful to not lose any remaining portion of the sample. Remove the stopper at the bottom of the sample tube and brush any sample that remains on the bottom stopper into the storage bag. With a clean tube plunger, push any remaining portion of the sand sample through the tube and out the bottom, into the storage bag. Using tweezers, carefully remove any insects or foreign material from the sample. Weigh the bag containing the sample, and record this value on the Weigh Data Sheets as the "Full Bag" weight.
9. Calculate the difference of the "Full Bag" weight and the "Empty Bag" weight, and record this value as the "Sample Weight" on the Weigh Data Sheets.
10. Repeat this process for all sample tubes.

    Note: Every tenth sample "Full Bag" should be re-weighed. The re-weigh data must be recorded in the Re-Weigh Section of the CSC Weigh Data Sheets (Appendix D).
11. Finish weighing by verifying the scale accuracy with NIST weights.
12. All samples should be stored in the laboratory for future reference.
13. Enter the CSC sample weigh data into the spreadsheet. Scan the completed hard-copy CSC Weigh Data Sheets, and archive a digital copy of the hard-copy notes and spreadsheet file to the Air Sciences Cataloger server. Distribute the sand-flux sample weigh data to all interested parties.

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[1] National Institute of Standards and Technology

3.4 Data Records and Management

Field personnel must maintain a thorough and complete set of site visit records. Every maintenance, CSC collection, or data download visit must be recorded on the Site Check and Audit Form. A hard copy of this form is provided in Appendix B if an electronic copy is not available on the field laptop. All hard copy forms must be stored at the project office.

4.0 AUDIT PROCEDURES

This section provides procedures for properly auditing the performance of the Met One 014A Wind Speed Sensor and the Met One 024A Wind Direction Sensor.

4.1 Equipment and Supplies

- R.M. Young 18811 (or similar model) anemometer drive, motor, and attachment accessories
- R.M. Young 18802 (or similar model) anemometer drive, motor, and attachment accessories
- Met One 050 Torque wheel and black plastic screws (0.1 gm-cm)
- Tripod-mounted, survey-grade compass
- Site log book/audit sheets

4.2 Wind Speed Audit Procedures

Follow the steps below to audit the performance of the Met One 024A Wind Direction Sensor. Refer to the particular manufacture sensor instructions for a more detailed instrument protocol.

1. Remove the three-cup anemometer wheel from the sensor shaft.
2. Place the plastic adapter bushing on top of the wind sensor column assembly.
3. Attach the anemometer drive support bar assembly to the plastic bushing and gently tighten the clamp tension screw.
4. Slide the rubber tubing off the flexible coupling adapter onto the wind sensor shaft.
5. Attach the motor to the bar assembly and carefully align the anemometer and motor coupling, gently tighten the clamp on the motor assembly, and tighten the collar of the flexible coupling adapter to the shaft of the motor.
6. The sensor is then challenged at the speeds specified on the Wind Speed Calibration Form (30 through 1,800 revolutions per minute [RPM]). Note that both the 18802 and 18811 anemometer drives are needed to complete the entire range. The speeds measured by the datalogger for each specific RPM input value are compared to the calculated wind speed values. The equation for calculating wind speed as a function of anemometer drive RPM is provided on the Wind Speed Audit Form.
7. Carefully disassemble the anemometer drive materials upon completion of the testing.

Prior to installing the three-cup anemometer wheel, the sensor shall undergo a starting torque test. Follow these steps to perform the torque test for the 014A wind speed sensor with the torque wheel.

1. Remove the 014A from its mounting hardware and fix it to a horizontally leveled surface.
2. Attach the torque wheel to the anemometer shaft.

3. Measure the starting torque and record it on the Wind Speed Audit Form. If the starting torque of the sensor is greater than 0.288 g-cm (0.004 in-oz.) clockwise or counterclockwise, the bearings may need to be refurbished.

4.3 Wind Direction Audit Procedures

Follow these steps to audit the performance of the Met One 024A Wind Direction Sensor.

1. Record the audit start time and the site information on the audit form.
2. Measure the orientation of the instrument crossarm using the tripod-mounted compass, taking into account the local magnetic declination (approximately 11.5° East for Salton Sea).
3. To ensure accuracy in this value, when possible, measure the crossarm orientation from a point located on the opposite end of the crossarm to confirm that both measurements are 180° apart.
4. Record the angle of the crossarm orientation as the initial source degree audit point on the audit form. Each consecutive audit point shall be calculated at 90° clockwise from its preceding audit point and recorded on the audit form.
5. Following safe working procedures, carefully lower the meteorological tower until the wind instruments are at a convenient working height.
6. While an assistant monitors the output at the logger display, hold the wind vane in a position that is parallel to the crossarm while recording the angular value as reported by the logger display.
7. Rotate the wind vane 90° clockwise, hold it in this position, and again record the logger display value on the audit form (a small square may be used to confirm that the wind vane is held at 90° to the crossarm). Repeat this step for the final two audit points.
8. The Met One 024A Wind Vane is supplied with a locking shoulder screw. Insert this locking shoulder screw, which will lock the wind vane at 180°. Record the source value and the logger display value on the audit form.
9. Carefully remove the wind vane from the rotational shaft and install the Met One 050 torque wheel on the sensor shaft. Measure the starting torque in both clockwise and counter-clockwise directions and record these values on the audit form. If the starting torque of the sensor is greater than 6.48 g-cm (0.09 in-oz.) clockwise or counterclockwise, the bearings may need to be refurbished.
10. Replace the wind vane on the instrument shaft, install the shoulder screw, and check the potentiometer orientation. If necessary, adjust the potentiometer until the value matches the reading recorded in Step 8.
11. Carefully return the meteorological tower to the upright, operational position.
12. Record the audit end time on the audit form.

4.4 Data Records and Management

At the conclusion of the audit, follow these steps.

1. Complete all audit forms, noting any adjustments made, maintenance performed, and/or corrective actions, if taken.
2. Note the specific time that the audit for the wind speed sensor began and ended.
3. Invalidate the entire time period during which the sensors were compromised or removed.
4. Sign and date the audit form under any comments made.
5. When possible, collect a scanned image of the hard-copy document for electronic archival purposes.

Refer to Appendices B and E for site check and audit forms.

4.5 Troubleshooting

Refer to the instrument specific instruction manuals for troubleshooting guidelines.

5.0 REFERENCES

Air Sciences Inc. 2015a. *Standard Operating Procedure: Calibration and Audit Procedures for the Met One 024A Wind Direction Sensor*

Air Sciences Inc. 2015b. *Standard Operating Procedure: Calibration and Audit Procedures for the Met One 014A Wind Speed Sensor.*

Air Sciences Inc. 2015c. *Standard Operating Procedure: Configuration and Operation of the Campbell Scientific CR6 Dataloggers*.

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Appendix A: Example Sensit Wiring Conventions

EXAMPLE SENSIT WIRING CONVENTIONS

H11B Sensit

- White (positive) – 12v
- Black (negative) – Ground
- Red (particle count) – P1
- Brown (kinetic energy) – P2
- Green (kinetic energy power) – Unused
- Blue (particle count power) – Unused

H11-LIN and H14-LIN Sensits

- Red (positive) – 12v
- Black (negative) – Ground
- White (particle count) – P1
- Orange (or occasionally Brown, kinetic energy) – P2
- Blue (PHA output) – Unused
- Green (Gain) – If Sensit response is weak, gain should be connected to 12v

Appendix B: Site Check and Audit Form

AIR SCIENCES INC.

AIR MONITORING PROGRAM
SITE CHECK AND AUDIT FORM

Date: Start Time (PST):

Operator(s): End Time (PST):

Site ID: Battery Voltage:

Visual Inspection: ☐ Pass ☐ Fail Observations:

Datalogger Information

Serial #: Type:

☐ Data Download Final Data Record Date/Time:

Maintenance and Operations

☐ Solar Panel Cleaned ☐ Datalogger Clock Check Reset Clock? ☐ Yes ☐ No

☐ Audit Conducted ☐ Ground/Wiring Connection Check Fittings Secure? ☐ Yes ☐ No

Comments:

Sensit/CSC Equipment Check

Sensit Serial Number (e.g., 123):

Radio Tested: ☐ Yes ☐ No Radio Serial Number:

Note: Measurement is from the ground surface to the middle of the sensor ring.

Sensor Height (cm): System Response to Manual Test: ☐ Yes ☐ No

Evidence of Rain Splatter? ☐ Yes ☐ No Photo Taken? ☐ Yes ☐ No

CSC Inlet Height (cm): ☐ Tube Removed for Weighting

Second CSC Inlet Height (cm): ☐ Second Tube Removed for Weighting

Comments:

Note: Measurement is from the ground surface to the middle of the inlet opening.

Estimate and Document the Parameters Below

Parameter	Estimated	Logger	Audit
Speed 6 m (m/s)			
Direction* (deg)			
Speed 2 m (m/s)			
Speed 15 cm (m/s)			

*Direction wind is from

Comments/Unusual Occurrences or Weather

Signature:

Appendix C: Scientech Electronic Balance Operation

SCIENTECH ELECTRONIC BALANCE OPERATION

Note: This electronic balance is sensitive to air movement, changes in temperature, vibration, direct sunlight, etc., and should be set up on a solid surface that is free of these conditions.

1. Confirm that the electronic balance is level. If necessary, adjust the feet until the balance is level.
2. Turn on the balance by pressing the **ON/OFF** button. Allow the balance to reach equilibrium for one hour before proceeding.
3. Confirm that the balance is set to measure in grams. Ensure that the balance pan is clean and free of any foreign matter.
4. Allow the balance display to stabilize, and press the **ZERO** button to establish the zero set point.
5. Perform a multipoint verification. One at a time, place each of the six calibration weights (200 mg, 1 g, 10 g, 100 g, 1000 g, and 2000 g) on the balance pan. Allow each reading to stabilize and record the displayed weight on the Scale Weight Calibration Section of the CSC Weigh Data Sheet. Verification weights should be within ±0.1 g from the target, as this is the resolution of the scale.
6. Proceed by weighing each sample. Be careful to allow the display to stabilize before recording any mass data. Confirm that the display returns to zero before proceeding with the next measurement and placing anything on the balance pan.
7. Re-weigh every tenth sample bag to confirm repeatability and record this re-weigh in the Re-Weigh Section of the CSC Weigh Data Sheet.
8. After all samples have been weighed, perform a second multipoint verification. One at a time, place each of the six calibration weights on the balance pan. Allow each reading to stabilize and record the displayed weight on the Scale Weight Calibration Section of the CSC Weigh Data Sheet. Verification weights should be within ±0.1 g from the target, as this is the resolution of the scale.
9. The electronic balance may now be powered off and covered for storage.

<u>Reference</u>

Scientech. 2006. *Scientech Series 12000 Electronic Balance Setup and Operating Procedures PN11756C*. September 21, 2006. http://www.affordablescales.com/pdfs/users_manual_pdf/sm50.pdf. Accessed October 6, 2015.

Appendix D: Sample CSC Weigh Data Sheets

Salton Sea Air Monitoring Program **Collection #__________________**

CSC SAMPLE LOCATION	COLLECTION DATE	COLLECTION TIME	EMPTY BAG WT. (g)	FULL BAG WT. (g)	SAMPLE WEIGHT (g)	SCALE OP. & DATE	CATCH FULL (YES/NO)	CATCH WET OR DAMP (WET/DRY)	SPILL OR LEAK (YES/NO)	HEIGHT OF CATCH (cm)	ANY MATERIAL OTHER THAN SAND (YES/NO) If yes, describe other material	COMMENTS

RE-WEIGH SECTION:

(REWEIGH EVERY 10th Sample WEIGHED)

REWEIGHED CSC SAMPLE LOCATION	COLLECTION DATE	COLLECTION TIME	FULL BAG WT. (g)	SCALE OP. & DATE

SCALE WEIGHT CALIBRATION SECTION:

(check scale before and after every group of measurements)

WEIGHT	DISPLAY	TIME	DATE
200 mg			
1 g			
10 g			
100 g			
1 kg			
2 kg			
200 mg			
1 g			
10 g			
100 g			
1 kg			
2 kg			

Appendix E: Wind Speed and Direction Audit Forms

METEOROLOGICAL AUDIT/CALIBRATION DATA

AIR SCIENCES INC.

Client:
Job No.:
Site:

Date:
Time In:
Time Out:

Auditors:

Data Logger Model :
Serial No.:

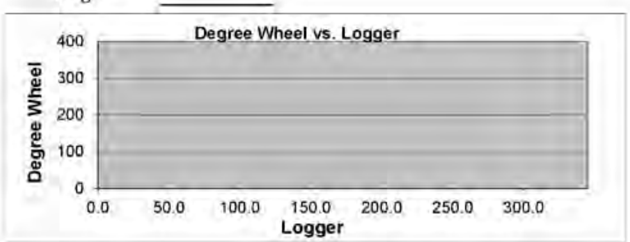
WIND DIRECTION 024A CALIBRATION, Upper: Height = ________ (m)

Model: ________________ Serial No.: ________

System Linearity Check Declination = ________ East

Orientation	Compass (Degrees)	Target (Degrees)	Logger Reading (Degrees)	Difference (Degrees)	Acceptance Criteria
1. Crossarm (E)			-		±5
2. Crossarm (W)			-		±5
3. Vane (locked)	-				±5

	Initial Logger (Degrees)	Difference (Degrees)	Corrected Logger (Degrees)	Difference (Degrees)	Acceptance Criteria
45					±3
90					±3
135					±3
180					±3
225					±3
270					±3
315					±3
Avg					



WIND DIRECTION 024A AUDIT, Upper Level Height = ________ (m)

Model: ________________ Serial No.: ________

Performance Audit Declination = ________ East

Orientation	Compass (Degrees)	Target (Degrees)	Logger Reading (Degrees)	Difference (Degrees)	Acceptance Criteria
1. Crossarm (E)					±5
2. Crossarm (W)					±5
3. Vane (locked)	-				±5

	Logger (Degrees)	Difference (Degrees)	Acceptance Criteria
90			±5
180			±5
270			±5
360			±5
Avg			

Bearing Torque Test (Passing 6.48 gm-cm)

Clockwise ________ gm-cm

Counterclockwise ________ gm-cm

WIND SPEED 014A, Upper Height = ____________ (m)

Drive Model Number: ____________ Disk Model Number: ____________

Drive Serial Number: ____________ Disk Serial Number: ____________

System Linearity Check

	Input rpm	Target* m/s	Logger Reading m/s	Difference m/s	Acceptance Criteria (±)
1.	0.0	0.4			0.0
2.	30.0	1.2			0.26
3.	60.0	2.0			0.30
4.	90.0	2.8			0.34
5.	180.0	5.2			0.46
6.	300.0	8.4			0.62
7.	600.0	16.4			1.02
8.	900.0	24.4			1.42
9.	1400.0	37.8			2.09
10.	1800.0	48.4			2.62

Met One
*Target (mps) = (rpm/37.5067)+0.447

Bearing Torque Test (Passing 0.288 gm-cm)

Clockwise ____________ gm-cm

Counterclockwise ____________ gm-cm

WIND SPEED 014A, Mid Level Height = ____________ (m)

Drive Model Number: ____________ Disk Model Number: ____________

Drive Serial Number: ____________ Disk Serial Number: ____________

System Linearity Check

	Input rpm	Target* m/s	Logger Reading m/s	Difference m/s	Acceptance Criteria (±)
1.	0.0	0.4			0.0
2.	30.0	1.2			0.26
3.	60.0	2.0			0.30
4.	90.0	2.8			0.34
5.	180.0	5.2			0.46
6.	300.0	8.4			0.62
7.	600.0	16.4			1.02
8.	900.0	24.4			1.42
9.	1400.0	37.8			2.09
10.	1800.0	48.4			2.62

Met One
*Target (mps) = (rpm/37.5067)+0.447

Bearing Torque Test (Passing 0.288 gm-cm)

Clockwise ____________ gm-cm

Counterclockwise ____________ gm-cm

WIND SPEED 014A, Lower Level Height = ____________ (m)

Drive Model Number: ____________ Disk Model Number: ____________

Drive Serial Number: ____________ Disk Serial Number: ____________

System Linearity Check

	Input rpm	Target* m/s	Logger Reading m/s	Difference m/s	Acceptance Criteria (±)
1.	0.0	0.4			0.0
2.	30.0	1.2			0.26
3.	60.0	2.0			0.30
4.	90.0	2.8			0.34
5.	180.0	5.2			0.46
6.	300.0	8.4			0.62
7.	600.0	16.4			1.02
8.	900.0	24.4			1.42
9.	1400.0	37.8			2.09
10.	1800.0	48.4			2.62

Met One
*Target (mps) = (rpm/37.5067)+0.447

Bearing Torque Test (Passing 0.288 gm-cm)

Clockwise ____________ gm-cm

Counterclockwise ____________ gm-cm

COMMENTS

Invalidated meteorological data from: ____________

NOTES:

Signature: ____________ **Date:** ____________

APPENDIX D.3.
STANDARD OPERATING PROCEDURES: ROUNDSHOT LIVECAM D2

Standard Operating Procedure
Roundshot Livecam D2 Installation and Operation at Salton Sea

Document Information:

Document Title	Air Sciences Standard Operating Procedure Roundshot LiveCam D2 Installation and Operation at Salton Sea
Document Number	SOP_Roundshot-LiveCam_SS_0
Date of Origination	September 14, 2015

Authorizations and Approvals:

Title	Name	Date	Signature
Technical Writer/Editor	Jessica Crichfield	09/14/2015	
Data Collections Manager	Kent Norville	09/14/2015	

Revision History:

Description of Changes	Revision Number	Date	Authorization and Approval

CONTENTS PAGE

Appendices

1.0 INTRODUCTION

This document describes the procedures for properly locating, installing, and operating a Roundshot Livecam D2 video monitoring station for use in the Salton Sea Air Basin. The station consists of a digital scan unit, lens, motor unit, weatherproof viewing enclosure, and mast holder for the video system; a solar power system; and data storage and telemetry equipment. This document has been written specifically for application to Salton Sea project and may not be applicable to other jobsite locations.

This document is in accordance with the Environmental Protection Agency's *Guidance for Preparing Standard Operating Procedures (SOPs)* (EPA 2007).

1.1 Principles of Operation

Video observations are a critical component of a windblown dust activity monitoring network, providing near-real-time "eyes" that are always on, tracking and recording dust plume activity continuously over large areas. To provide full coverage, video networks routinely consist of several strategically placed stationary cameras surrounding an area, with the collective fields of view (FOV) providing complete observational coverage. There exists a trade-off with a stationary camera site between FOV and resolution: a high FOV will observe a large area at low resolution, and at focal lengths less than 18mm will also introduce distortion. On the other hand, a large focal length (20mm and higher) will increase resolution but narrow the FOV substantially and necessitate more cameras to observe the same area.

The Roundshot Livecam digital camera observation platform alleviates this trade-off by using a motor-driven scanner to create a horizontal FOV of up to 360°. The camera consists of a 3-linear RGB vertical line sensor coupled with a Nikon Nikkor-style lens (up to 70mm focal length) mounted on a motorized turntable. Turning the base while capturing 1-pixel-wide line "images" creates a single panoramic frame. Thus, the horizontal FOV is not diminished when the focal length is increased, allowing a single station to observe a wide area at high resolution.

1.2 Safety Precautions

- All field staff should carry a working cell phone and wear the appropriate Personal Protective Equipment (PPE).
- Disconnect power before working with electrical components.
- Take normal precautions to avoid electrical shock.

1.3 Sampling Interferences/Precautions

- Check the forecast to ensure safe weather and environmental conditions before visiting a video station. Site visits and maintenance should not occur under high wind or stormy conditions to avoid damaging equipment and injury to the operator.
- Ensure proper grounding for good performance.

- If vehicle access is necessary, the field vehicle must always be parked a minimum of 10 meters away from the monitoring site.
- All data should be collected using Pacific Standard Time (PST). Configure all field laptops, tablets, on-site computers, and other devices (e.g. a GPS) using PST to prevent accidental computer clock updates to Pacific Daylight Savings Time (PDT).
- The site operator needs to confirm that the video capture software is appropriately configured with the monitoring site ID included in the image filenames. Database and website problems are likely to occur if the site ID is incorrect or absent.

2.0 SITE LOCATION AND INSTALLATION

2.1 Equipment and Supplies

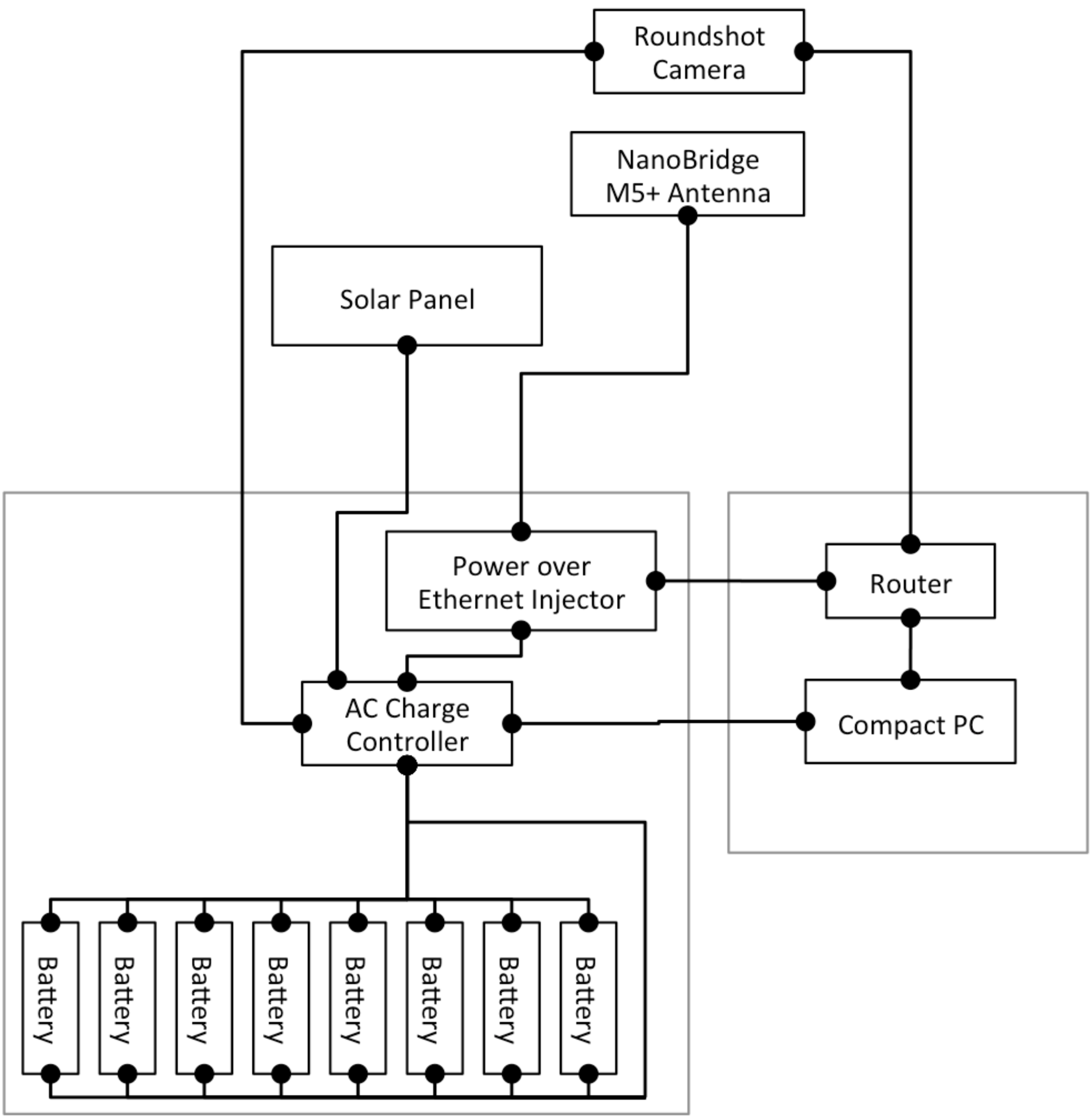
- Roundshot Assembly
    - Waterproof cover ("hat")
    - Cover screws (3)
    - Insulation ring
    - Roundshot D2 digital scan unit
    - Lens (Nikkor AF-S 18-55mm zoom lens or AF-S 70mm telephoto lens)
    - Motor electronics unit (turntable base)
    - Silica gel pack
    - Waterproof power/communications connector
    - Mast holder
    - Power and Ethernet cables with waterproof plugs
- NEMA[1] Enclosure
    - Router
    - Compact PC (eee box PC, fitPC, or similar) with 2 GB RAM and ≥256GB HDD
    - Mimo monitor, flexible rugged keyboard, mini-mouse (for PC operation on-site)
- "Job box" battery enclosure (3 enclosures; only one enclosure will contain the power system)
    - Charge regulator (1)
    - Combiner Box (1)
    - Power-Over-Ethernet (POE) Adapter for the NanoBridge (1)
    - 110ah external storage batteries (8 total, max. 3 per enclosure)
    - Pre-fab 24"–36" cables for joining the batteries in parallel
- 90 W solar panel with mounting bracket
- NanoBridge M5 Ethernet radio with antenna
- 20′ tripod with anchors and guy-wire kit
- Grounding package, including 6′ copper grounding rod, clamp, cable, and lightning rod
- Various U-Bolts
- Portable GPS unit with monitoring site location file pre-loaded
- T-Post pounder

[1] National Electrical Manufacturers Association

- Packing putty
- Small straight-bladed screwdriver
- Large Allen keys
- Metric measuring tape
- Combination wrench set
- 3” waterproof tape

2.2 Wiring Diagram

The wiring diagram for the instruments, datalogger, and power system is shown below.



2.3 Roundshot Monitoring Site Location and Installation

1. Before deploying, prepare the enclosure by installing the back plate on the back wall. Make sure there is an accessible wiring access port at the left back side of the enclosure. Mount the AC charge controller, POE Adaptor, combiner box, and inverter to the back plate.
2. Wire the charge controller, combiner box, and inverter. Refer to TriStar Solar System Controller Installation and Operation Manual pp. 9–18.
3. Prepare the compact PC by loading the Roundshot software and configuring system settings. Refer to the Roundshot Livecam D2 HD Instruction Manual (Seitz Phototechnik AG, 2013), pp. 9–11 for detailed instructions on preparing the PC. Make sure the PC is set to Pacific Standard Time (PST). Configuring the Roundshot camera with the software is done on-site.
4. Prepare the mast holder. Refer to the Roundshot Livecam D2 HD Instruction Manual (Seitz Phototechnik AG, 2013), pp. 7–8 for detailed instructions on mounting the mast holder to the tripod mast. *An adapter may be required match the inner diameter of the mast holder to the outer diameter of the mast.*
5. Using standard navigation procedures and the portable GPS unit, locate the appropriate monitoring site. The site should be approximately 10′ by 10′ and generally level with minimal obstructions. All access to the monitoring site should be from the direction that is out of the FOV of the camera as much as possible. **Ensure that all field personnel approach the location only from that preferred direction**. The FOV will be specific to each site and should be recorded during site installation.
6. Begin by installing the tripod. Refer to the Tripod Installation Manual Models CM110, CM115, CM120 (Campbell Scientific, Inc. 2012) for detailed tripod installation instructions.
7. Mount the NEMA enclosure to the north leg of the tripod, leaving at least a two-inch gap between the enclosure and the surface. Arrange the compact PC inside the enclosure.
8. Arrange the job boxes around the tripod. Place three batteries each into two of the boxes, and two into the third box that will contain the AC power system. Ensure the box with the power system is closest to the NEMA enclosure. Connect the batteries in parallel with the pre-fab power cables, making sure the end leads are taped.
9. Attach the solar panel to the south legs of the tripod so the panel faces south. An angle-iron bracket may be used to securely attach the panel. Make sure the ends of the solar panel cables are taped so the leads do not short out.
10. Drive the ground rod into the ground at a convenient location near the enclosures. Attach the grounding clamp and grounding wire to the rod.
11. Lower the mast. Attach a cross-arm to the mast 0.5m from the top of the mast. Attach the lightning rod to the crossarm, then attach the NanoBridge M5 radio antenna just below the

crossarm. Aim the dish in the direction of the receiving station. Attach the Ethernet cable to the NanoBridge and cable-tie it to the mast.

12. Mount the Roundshot to the top of the mast with the pre-prepared mast holder. Refer to the Roundshot Livecam D2 HD Instruction Manual (Seitz Phototechnik AG, 2013), p. 69 for instructions on proper camera handling. Attach the power and Ethernet cables with waterproof plugs. Label the lead end of the cables so identification on the PC side is easier.
13. Secure the cables to the cross arm and mast using cable ties, allowing slack for adjustment. Raise the mast and collect the cables, securing the cables to the tripod allowing slack at the mast hinge so the mast can be raised and lowered freely.
14. Confirm that the AC charge controller has been turned off, pass all loose leads through the access port in the job box, and then complete all remaining electrical connections:
    - Charge leads from the solar panel to the charge terminals on the AC charge controller
    - Battery cable lead to the combiner box on the AC charge controller
    - Roundshot power plug and compact PC plug to the inverter included with the AC charge controller
    - Roundshot and compact PC Ethernet cables to the router
    - The Ethernet cable from the NanoBridge to the POE adaptor
    - An Ethernet cable from the router to the POE adaptor
    - Ground wire between the ground lug on the underside of the enclosure to the clamp on the ground rod
15. Firmly pack putty around the wiring access ports in the NEMA enclosure and job boxes in an effort to prevent moisture and insects from entering the enclosures.
16. Carefully loop and wrap all loose leads to a convenient location on the tripod using cable ties.
17. Turn on the AC charge controller and compact PC. Verify that the PC clock is set to PST.
18. Configure the Roundshot camera. Configuration includes adjusting the tilt angle, which will require lowering the mast (potentially several times), and programming the image collection characteristics. Refer to the Roundshot Livecam D2 HD Instruction Manual (Seitz Phototechnik AG, 2013), pp. 12–44 for detailed instructions on camera configuration. To determine the camera degree of rotation, starting point, and end point; the collection frequency; and the image resolution, refer to the monitoring study plan.
19. Once the camera is configured, lower the mast once more and secure the camera dome to the mast assembly. Place a silica gel pack inside the dome, making sure that will not obstruct the camera once the mast is raised, and secure dome with the rubber O-Ring and screws. Finish sealing the dome seam by wrapping it with waterproof tape.
20. When all instrumentation is installed and operating, begin a site log entry, either electronically on a field laptop or using the hard copy forms provided in Appendix A.

2.4 Data Records and Management

After the site installation is complete and the station is under stable operating conditions, the field technician must complete the initial Site Check Form electronically on the most recent "Field_Site_Logger"workbook. This workbook can be found on the "Salton Sea Field Operations" Dropbox folder.

3.0 SITE VISIT PROCEDURES

3.1 Field Collection Procedures

If the camera images are being telemetered, the images should be checked prior to the site visit to confirm that the cameras are operating and identify possible issues. Refer to the Roundshot Livecam D2 HD Instruction Manual (Seitz Phototechnik AG, 2013), pp. 69–72 for maintenance and troubleshooting.

It is best to walk to each site; if an ATV is used for access, the vehicle must be parked no closer than 10 m from the monitoring site.

1. Before leaving the field office, ensure that you have extra waterproof tape, silica gel packs, lens cleaner, and a can of compressed air in case the camera dome must be unsealed and cleaned.
2. Begin by recording the “Start Time” on the electronic Site Check Form in the most recent “Field_Site_Logger”workbook. Continue by entering data in the appropriate fields on the Site Check Form.
3. Inspect the station for any obvious damage, alignment issues, excessive dirt build-up, loose wiring connections, frayed or chewed cables, or vandalism. Record all corrective actions on the Site Check Form.
4. Lower the mast, wipe clean the camera dome window, and look for evidence of moisture or dust inside the dome. If moisture/dust is seen, check the appropriate box in the site log and proceed with inspecting and cleaning the camera assembly:
    a. Look for evidence of damage to the dome seal or any other possible entry point for water/dust, noting this in the site log.
    b. Unseal the dome by removing the waterproof tape. Clean the inside of the dome and rest it in a relatively clean spot (such as inside a job box) to prevent damage or dirtying.
    c. Clean the camera assembly by dusting with compressed gas. Clean the camera lens with a lens cleaner. Inspect the assembly for damage (e.g. rusting) and then promptly reseal the dome, applying fresh waterproof tape around the seam.
5. Unlock the job box that contains the charge controller. Check the status (including voltage) of the solar power system by viewing the indicator lights on the front of the charge controller. Anything other than a solid green light may mean a problem with the power system. Refer to TriStar Solar System Controller Installation and Operation Manual Appendix 3 for detailed information on status indicators and troubleshooting. Note any corrective actions in the Site Log.
6. Unlock the NEMA enclosure and connect to the PC with the Mimo monitor, keyboard, and mouse stored on-site. Check the computer clock and adjust if necessary, noting any changes in the Site Log.
7. Finish the field collection by recording the “End Time” on the electronic Site Check Form prior to leaving the sampling location.

3.2 Data Records and Management

Field personnel must maintain a thorough and complete set of site visit records. Every maintenance or data download visit must be recorded on the Site Check Form electronically in the most recent "Field_Site_Logger." This workbook can be found on the "Salton Sea Field Operations" Dropbox folder.

4.0 REFERENCES

Air Sciences Inc. 2015a. *Standard Operating Procedure: Calibration and Audit Procedures for the Met One 024A Wind Direction Sensor*

Air Sciences Inc. 2015b. *Standard Operating Procedure: Calibration and Audit Procedures for the Met One 014A Wind Speed Sensor.*

Air Sciences Inc. 2015c. *Standard Operating Procedure: Configuration and Operation of the Campbell Scientific CR6 Dataloggers*.

Campbell Scientific Inc. 2015. *Tripod Installation Manual Models CM110, CM115, CM120*. https://s.campbellsci.com/documents/us/manuals/cm110-cm115-cm120.pdf. Accessed October 6, 2015.

Environmental Protection Agency. 2007. *Guidance for Preparing Standard Operating Procedures (SOPs)*. EPA/600/B-07/001. April 2007. http://www2.epa.gov/sites/production/files/2015-06/documents/g6-final.pdf. Accessed October 6, 2015.

Seitz Phototechnik AG. 2013. *Roundshot Livecam D2 HD Instruction Manual*. Seitz Phototechnik AG Hauptstr. 14 8512 Lustdorf / Switzerland. May 2013.

TriStar Solar. Nd. *Solar System Controller Installation and Operation Manual*. Morningstar Corporation 1098 Washington Crossing Road Washington Crossing, PA 18977 USA.

Appendix A: Site Check Form

VIDEO MONITORING PROGRAM
SITE CHECK FORM

Date: | Start Time (PST):
Operator(s): | End Time (PST):
Site ID: | Battery Voltage:

Visual Inspection: ☐ Pass ☐ Fail Observations:

Computer Information

Serial #: | Type:

☐ Data Download Final Data Record Date/Time:

Maintenance and Operations

☐ Solar Panel Cleaned ☐ Computer Clock Check Reset Clock? ☐ Yes ☐ No

☐ Camera Dome Window Cleaned ☐ Ground/Wiring Connection Check Fittings Secure? ☐ Yes ☐ No

Comments:

Video Equipment Check

Camera Serial Number:

Ethernet Bridge Tested? ☐ Yes ☐ No Ethernet Bridge Serial Number:

Evidence of water/dust intrusion into the dome? ☐ Yes ☐ No Camera Response to Manual Test? ☐ Yes ☐ No

Evidence of computer reboot? ☐ Yes ☐ No Silica gel pack inside camera dome replaced? ☐ Yes ☐ No

Evidence of tampering/vandalism? ☐ Yes ☐ No Solar power system status normal? ☐ Yes ☐ No

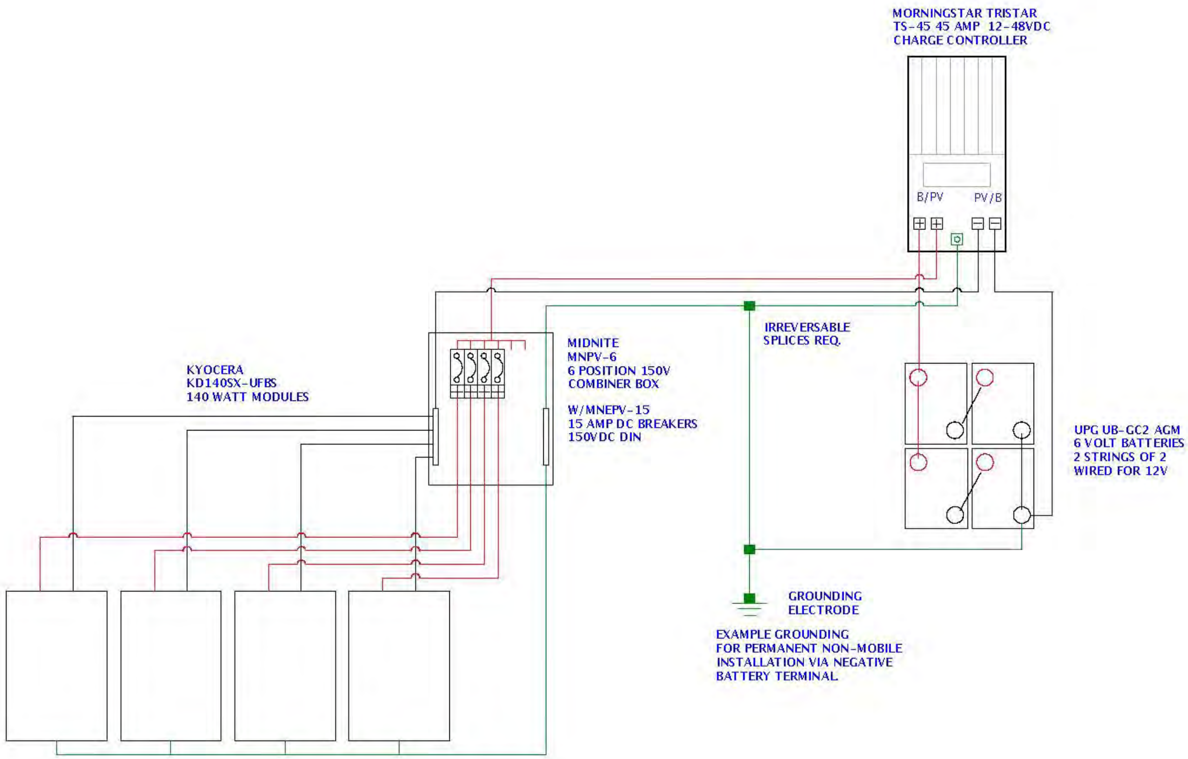
Comments:

Unusual Occurrences or Weather:

Signature: ____________________

Appendix B: Solar Panel Wiring Diagram

12 VOLT SYSTEM



Wholesale Solar
DC Off-Grid Wire Diagram
for Air Sciences

IMPORTANT:

READ ALL MANUALS COMPLETELY PRIOR TO INSTALLATION OF SYSTEM COMPONENTS & WIRING FOR ADDITIONAL & CRITICAL INSTALLATION SEQUENCES, SAFETY INFORMATION, & OPERATION PROCEDURES.

BATTERIES MUST BE CONNECTED TO CHARGE CONTROLLER PRIOR TO PV MODULE CONNECTIONS FOR PROPER SYSTEM FUNCTION.

ALL WIRING MUST COMPLY WITH NEC GUIDELINES AND LOCAL AUTHORITY HAVING JURISDICTION.

THIS DRAWING DEPICTS TYPICAL WIRING PATHS. IT MAY NOT REPRESENT THE ACTUAL LAYOUT OF THE EQUIPMENT OR LOCATION OF WIRING TERMINATION LOCATIONS.

PLEASE REFER TO THE SUPPLIED MANUALS AND LABELS FOR ACTUAL LOCATIONS.

APPENDIX D.4.
STANDARD OPERATING PROCEDURES: STARDOT TECHNOLOGIES SC H.264

Standard Operating Procedure
StarDot Technologies SC H.264 Installation and Operation at Salton Sea

Document Information:

Document Title	Air Sciences Standard Operating Procedure StarDot Technologies SC H.264 Installation and Operation at Salton Sea
Document Number	SOP_StarDot-H264_SS_0
Date of Origination	September 14, 2015

Authorizations and Approvals:

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Data Collections Manager	Kent Norville	09/14/2015	

Revision History:

Description of Changes	Revision Number	Date	Authorization and Approval

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Appendices

1.0 INTRODUCTION

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This document is in accordance with the Environmental Protection Agency's *Guidance for Preparing Standard Operating Procedures (SOPs)* (EPA 2007).

1.1 Principles of Operation

Video observations are a critical component of a windblown dust activity monitoring network, providing near-real-time "eyes" that are always on, tracking and recording dust plume activity continuously over large areas. To provide full coverage, video networks consist of several strategically placed stationary cameras surrounding an area, with the collective fields of view (FOV) providing complete observational coverage. There exists a trade-off with a stationary camera site between FOV and resolution: a high FOV will observe a large area at low resolution, and at focal lengths less than 18mm will also introduce distortion. On the other hand, a large focal length (20mm and higher) will increase resolution but narrow the FOV substantially and necessitate more cameras to observe the same area. In addition, high-resolution images require more available bandwidth to transfer data for remote observation.

The StarDot SC H.264 digital camera provides maximum flexibility to achieve optimum FOV and resolution by employing a scalable RGB sensor, up to 10 megapixel (MP) resolution, and allowing the use of vari-focal lenses. The camera IP-ready and is equipped with Power over Ethernet (PoE), with a single Ethernet cable powering the device and transferring data. Image capture is configurable by setting the resolution, saturation, contrast, exposure (shutter speed), and color balance.

1.2 Safety Precautions

- All field staff should carry a working cell phone and wear the appropriate Personal Protective Equipment (PPE).
- Disconnect power before working with electrical components.
- Take normal precautions to avoid electrical shock.

1.3 Sampling Interferences/Precautions

- Check the forecast to ensure safe weather and environmental conditions before visiting a video station. Site visits and maintenance should not occur under high wind or stormy conditions to avoid damaging equipment and injury to the operator.
- Ensure proper grounding for good performance.

- If vehicle access is necessary, the field vehicle must always be parked a minimum of 10 meters away from the monitoring site.
- All data should be collected using Pacific Standard Time (PST). Configure all field laptops, tablets, on-site computers, and other devices (e.g. a GPS) using PST to prevent accidental camera clock updates to Pacific Daylight Savings Time (PDT).
- The site operator needs to confirm that the video capture software is appropriately configured with the monitoring site ID included in the image filenames. Database and website problems are likely to occur if the site ID is incorrect or absent.

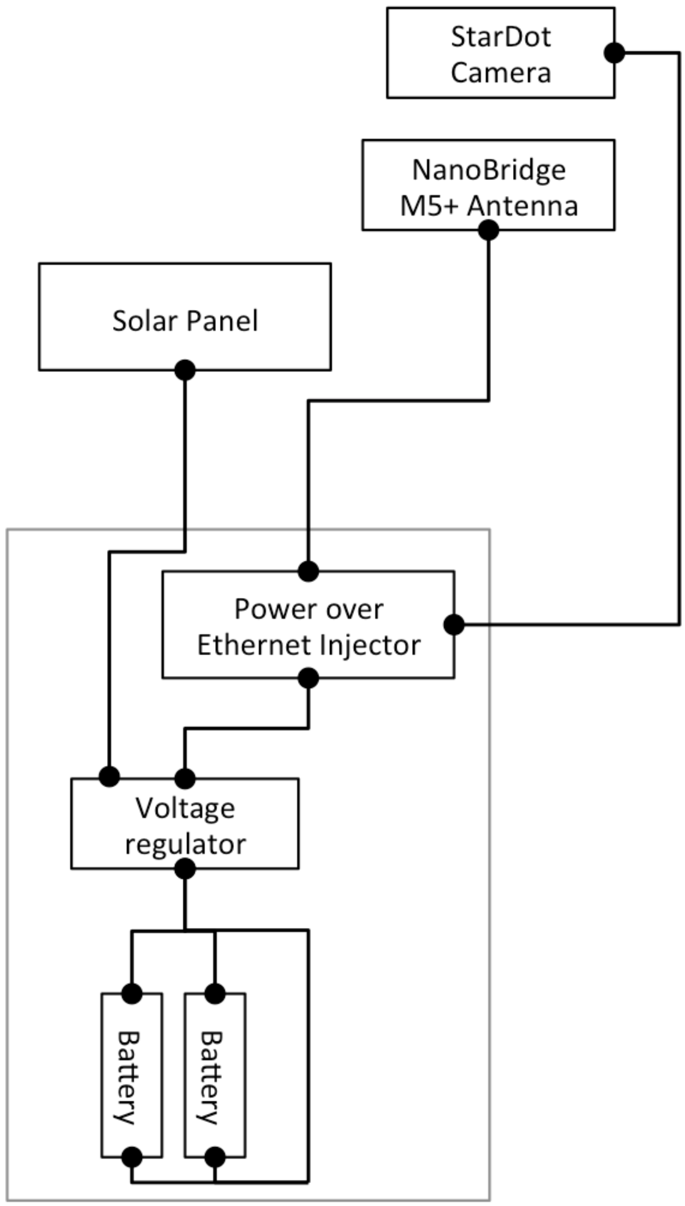
2.0 SITE LOCATION AND INSTALLATION

2.1 Equipment and Supplies

- StarDot camera Assembly
  - Dotworkz ST-BASE outdoor enclosure
  - StarDot SC H.264 camera
  - StarDot 8–48mm vari-focal lens (LEN-M848MN)
- Tripp Lite outdoor rated 100-ft. patch cable
- Battery Enclosure (3-battery)
  - Veracity Power-over-Ethernet (PoE) injector
  - Sunsaver 10A 12V voltage regulator
  - Campbell Scientific backplate (18826)
  - 100ah external storage batteries (2 total)
  - Battery cables
- 90 W solar panel with mounting bracket
- NanoBridge M5 Ethernet radio with antenna
- 20‘ tripod with anchors and guy-wire kit
- One 4-foot cross-arm with support brackets
- 6’ Copper grounding rod, clamp, and cable
- Various U-Bolts
- Portable GPS unit with monitoring site location file pre-loaded
- Field laptop with an Ethernet jack, Ethernet cable, and a standard web browser for configuring camera settings
- T-Post pounder
- Packing putty
- Small straight-bladed screwdriver
- Metric measuring tape
- Combination wrench set

2.2 Wiring Diagram

The wiring diagram for the instruments, communications, and power system is shown below.



2.3 StarDot Monitoring Site Location and Installation

1. Before deploying, prepare the enclosure by installing the back plate on the back wall. Make sure there is an accessible wiring access port at the left back side of the enclosure. Mount the voltage regulator and PoE Adaptor to the back plate.

2. Make sure the field laptop is set to Pacific Standard Time (PST). Configure the StarDot camera network and assign it an IP address. Refer to the NetCam SC H.264 Mexapixel Hybrid IP Camera User's Manual (StarDot Technologies, 2010), pp. 7–8 for detailed instructions. Bookmark the IP address (e.g. http://192.168.1.5) in the field laptop web browser; the remainder of the camera configuration is done on-site via a web browser.
3. Using standard navigation procedures and the portable GPS unit, locate the appropriate monitoring site. The site should be approximately 10′ by 10′ and generally level with minimal obstructions. All access to the monitoring site should be from the direction that is out of the FOV of the camera as much as possible. **Ensure that all field personnel approach the location only from that preferred direction**. The FOV will be specific to each site and should be recorded during site installation.
4. Begin by installing the tripod. Refer to the Tripod Installation Manual Models CM110, CM115, CM120 (Campbell Scientific, Inc. 2015) for detailed tripod installation instructions.
5. Mount the enclosure to the north leg of the tripod, leaving at least a two-inch gap between the enclosure and the surface. Arrange the batteries inside the enclosure. Connect the batteries in parallel with the power cables, making sure the end leads are taped.
6. Attach the solar panel to the south legs of the tripod so the panel faces south. An angle-iron bracket may be used to securely attach the panel. Make sure the ends of the solar panel cables are taped so the leads do not short out.
7. Drive the ground rod into the ground at a convenient location near the enclosures. Attach the grounding clamp and grounding wire to the rod.
8. Lower the mast and mark the 4-m height. Attach the lightning rod to the very top of the mast, then attach the NanoBridge M5 radio antenna just below. Aim the dish in the direction of the receiving station. Attach an Ethernet cable to the NanoBridge and cable tie it to the mast.
9. Mount the camera enclosure to the mast with a U-Bolt using the 4-m mark as a reference. Place the camera inside the enclosure and connect an Ethernet cable to the NET port on the back of the camera. Seal the enclosure, placing a silica gel pack inside to reduce moisture.
10. Secure the cables to the cross arm and mast using cable ties, allowing slack for adjustment. Raise the mast and collect the cables, securing the cables to the tripod allowing slack at the mast hinge so the mast can be raised and lowered freely.
11. Confirm that the voltage regulator has been turned off, pass all loose leads through the access port in the enclosure, and then complete all remaining electrical connections:
    - Charge leads from the solar panel to the charge terminals on the voltage regulator
    - Battery cable lead to the voltage regulator
    - NanoBridge Ethernet cable and camera Ethernet cable to the PoE adapter
    - Ground wire between the ground lug on the underside of the enclosure to the clamp on the ground rod

12. Firmly pack putty around the wiring access ports in the enclosure in an effort to prevent moisture and insects from entering the enclosures.
13. Carefully loop and wrap all loose leads to a convenient location on the tripod using cable ties.
14. Turn on the voltage regulator. Unplug the NanoBridge from the PoE adapter and plug in the field laptop.
15. Configure the StarDot camera using the field laptop. Configuration includes adjusting the tilt angle, which will require lowering the mast (potentially several times), and programming the image collection characteristics. Refer to the NetCam SC H.264 Mexapixel Hybrid IP Camera User's Manual (StarDot Technologies, 2010), pp. 12–40 for detailed instructions on camera configuration. Ensure the timezone is set to PST. Leave settings for contrast, exposure, and image quality in the "auto" or default mode. To determine the camera collection frequency; data transfer delay; and the camera resolution, refer to the monitoring study plan.
16. Once configuration is complete, plug the NanoBridge back in to the PoE adapter.
17. When all instrumentation is installed and operating, begin a site log entry, either electronically on a field laptop or using the hard copy forms provided in Appendix A.

2.4 Data Records and Management

After the site installation is complete and the station is under stable operating conditions, the field technician must complete the initial Site Check Form electronically on the most recent "Field_Site_Logger"workbook. This workbook can be found on the "Salton Sea Field Operations" Dropbox folder.

3.0 SITE VISIT PROCEDURES

3.1 Field Collection Procedures

If the camera images are being telemetered, the images should be checked prior to the site visit to confirm that the cameras are operating and identify possible issues.

It is best to walk to each site; if an ATV is used for access, the vehicle must be parked no closer than 10 m from the monitoring site.

1. Before leaving the field office, ensure that you have extra silica gel packs, waterproof tape, lens cleaner, and a can of compressed air in case the camera enclosure must be unsealed and cleaned.
2. Begin by recording the "Start Time" on the electronic Site Check Form in the most recent "Field_Site_Logger"workbook. Continue by entering data in the appropriate fields on the Site Check Form.
3. Inspect the station for any obvious damage, alignment issues, excessive dirt build-up, loose wiring connections, frayed or chewed cables, or vandalism. Record all corrective actions on the Site Check Form.
4. Lower the mast, wipe clean the camera enclosure window, and look for evidence of moisture or dust inside the dome. If moisture/dust is seen, check the appropriate box in the site log and proceed with inspecting and cleaning the camera assembly:
    a. Look for evidence of damage to the enclosure seal or any other possible entry point for water/dust, noting this in the site log.
    b. Unseal the enclosure. Remove the camera, resting it in a relatively clean spot (such as inside the battery enclosure) to prevent damage or dirtying, and clean the inside of the enclosure.
    c. Clean the camera assembly by dusting with compressed gas. Clean the camera lens with a lens cleaner. Inspect the assembly for damage (e.g. rusting) and then promptly return to enclosure and reseal, applying waterproof tape around the seam if necessary.
5. Unlock the battery enclosure and connect a field laptop to the PoE adapter. Check the camera clock and adjust if necessary, noting any changes in the Site Log.
6. Finish the field collection by recording the "End Time" on the electronic Site Check Form prior to leaving the sampling location.

3.2 Data Records and Management

Field personnel must maintain a thorough and complete set of site visit records. Every maintenance or data download visit must be recorded on the Site Check Form electronically in the most recent "Field_Site_Logger." This workbook can be found on the "Salton Sea Field Operations" Dropbox folder.

4.0 REFERENCES

Campbell Scientific Inc. 2015. *Tripod Installation Manual Models CM110, CM115, CM120*. https://s.campbellsci.com/documents/us/manuals/cm110-cm115-cm120.pdf. Accessed October 6, 2015.

StarDot Technologies. 2010. NetCam SC H.264 Mexapixel Hybrid IP Camera User's Manual. 6820-H StarDot Technologies. Orangethorpe AveBuena Park, CA 90620 U.S.A.

Environmental Protection Agency. 2007. *Guidance for Preparing Standard Operating Procedures (SOPs)*. EPA/600/B-07/001. April 2007. http://www2.epa.gov/sites/production/files/2015-06/documents/g6-final.pdf. Accessed October 6, 2015.

Appendix A: Site Check Form

VIDEO MONITORING PROGRAM
SITE CHECK FORM

Date:	Start Time (PST):
Operator(s):	End Time (PST):
Site ID:	Battery Voltage:

Visual Inspection: ☐ Pass ☐ Fail Observations:

Computer Information

Serial #:	Type:

☐ Data Download Final Data Record Date/Time:

Maintenance and Operations

☐ Solar Panel Cleaned	☐ Camera Clock Check	Reset Clock? ☐ Yes ☐ No
☐ Camera Enclosure Window Cleaned	☐ Ground/Wiring Connection Check	Fittings Secure? ☐ Yes ☐ No

Comments:

Video Equipment Check

Camera Serial Number:

Ethernet Bridge Tested? ☐ Yes ☐ No	Ethernet Bridge Serial Number:
Evidence of water/dust intrusion into the dome? ☐ Yes ☐ No	Camera Response to Manual Test? ☐ Yes ☐ No
Evidence of camera malfunction? ☐ Yes ☐ No	Silica gel pack inside camera enclosure replaced? ☐ Yes ☐ No
Evidence of tampering/vandalism? ☐ Yes ☐ No	Solar power system status normal? ☐ Yes ☐ No

Comments:

Unusual Occurrences or Weather:

Signature:

APPENDIX D.5.
STANDARD OPERATING PROCEDURES:
SOP 4, GROUNDWATER SAMPLING AND WATER LEVEL MEASUREMENTS

FORMATION ENVIRONMENTAL

STANDARD OPERATING PROCEDURE No. 4

GROUNDWATER SAMPLING AND WATER LEVEL MEASUREMENTS

1.0 SCOPE AND APPLICABILITY

This Standard Operating Procedure (SOP) describes the protocol to be followed during measurement of water levels and depths of monitoring wells and piezometers, and for water quality sampling from monitoring wells. The procedures presented herein are intended to be general in nature and are applicable when referenced by site-specific or project-specific planning documents. Appropriate modifications to the procedures may be made to accommodate project-specific protocols when approved in writing or via email by the Project Manager.

The objectives of the groundwater sampling procedures are to minimize changes in groundwater chemistry during sample collection and to maximize the probability of obtaining a representative, reproducible groundwater sample.

2.0 BASIS FOR METHODOLOGY

The methods and procedures described in this SOP were developed from these sources:

- USEPA Standard Operating Procedure for the Standard/Well-Volume Method for Collecting a Ground-Water Sample from Monitoring Wells for Site Characterization.

- USEPA Region 1 (2010) Low Stress (low flow) Purging and Sampling Procedure for the Collection of Ground Water Samples from Monitoring Wells. EQASOP-GW-001. Region 1 Low-Stress (Low-Flow) SOP, Revision Number 3, July 30, 1996, Revised January 19, 2010.

- USEPA (2002) Ground-Water Sampling Guidelines for Superfund and RCRA Project Managers, Ground Water Forum Issue Paper. U.S Environmental Protection Agency, Technology Innovative Office, Office of Solid Waste and Emergency Response, Washington D.C., EPA 542-S-02-001.

- U.S. Geological Survey (USGS) (variously dated) National Field Manual for the Collection of Water-Quality Data: U.S. Geological Survey

Techniques of Water-Resources Investigations, Book 9, Handbooks for Water-Resources Investigations, Chapters A1-A9.

3.0 WATER LEVEL AND WELL DEPTH MEASURMENT PROCEDURES

Prior to performing water level and well depth measurements, the construction details and previous measurements for each well or piezometer shall be reviewed by the field geologist or other field personnel so any anomalous measurements may be identified. Well construction details and previous measurements shall be available in the field for review.

In general, water-level measurements shall be performed before groundwater is removed from the well by purging or sampling.

3.1 Equipment

Equipment that may be necessary to perform measurements (depending on measurements to be performed):

- Well/piezometer construction details;
- An electronic water-level meter with accuracy of 0.01 foot;
- Water Level Monitoring Record Sheet, Groundwater Sampling Record or field notebook; and
- Weighted surveyor's rope (measured to the nearest 0.1 foot).

3.2 Measuring Point

A measuring point (MP) shall be selected and marked for each monitoring well and piezometer in which water level measurements will be made. Generally, the MP will be on the north side of the top of the well casing. The MP will be permanently marked using an indelible marker or a notch cut into the PVC casing. When the top-of-casing elevation of a monitoring well or piezometer is surveyed, the licensed surveyor shall measure the MP elevation and reference this measurement to an appropriate datum (such as feet above mean sea level).

3.3 Water Level Measurements

When water levels are measured to describe the groundwater potentiometric surface, the water level will be measured prior to purging. All wells to be gauged during a monitoring event and used to construct the potentiometric surface should have water levels measured within the same 24-hour period, as practical. All water level measurements will be recorded to the nearest 0.01 foot. Instruments used for each measurement will be noted on the Groundwater Sampling Record (attached form or similar). Water levels are measured using the electronic probe method, as discussed below.

An electronic probe consists of a contact electrode attached to the end of an insulated electrical cable, and a reel which houses an ammeter, a buzzer, or other closed circuit indicator. The indicator shows a closed circuit and flow of current when the electrode touches the water surface.

The procedure for measuring water levels with an electric probe is as follows:

1. Switch on and test that the battery is charged and set the sensitivity dial to the middle position.
2. Lower the probe into the well until the ammeter or buzzer indicates a closed circuit. Raise and lower the probe slightly until the shortest length of cable that gives the maximum response on the indicator is found.
3. With the cable in this fixed position, note the depth to water from the Measuring Point (MP).
4. Repeat as necessary until at least two identical duplicate measurements are obtained.

Calibration of the electronic probe will be checked at regular intervals as part of regular maintenance measuring the position of the electrode to check that the calibration marks on the electronic probe correspond to those on a weighted surveyor's rope or other suitable measuring device.

3.4 Well Depth Measurements

The total depth of a well shall be measured by sounding with a weighted surveyor's rope or other suitable measuring device. For shallow wells, the electronic water-level probe may also be used as a measuring device. Procedures to be followed are specified below.

A. For calibration, measure the distance between the zero mark on the end of the measuring tape and the bottom of the weight to the nearest 0.1 foot at the beginning of each well depth measurement activity day, and whenever the apparatus is altered.

B. To measure well depth, lower a weighted tape into the well until the tape becomes slack or there is a noticeable decrease in weight, which indicates the bottom of the well. Care should be taken to lower the tape slowly to avoid damage to the bottom of the well by the weight. Raise the tape slowly until it just becomes taut, and with the tape in this fixed position, note the tape reading opposite the MP to the nearest 0.1 foot. Add the values from the distance from the end of the tape to the end of the weight together, round this number to nearest 0.1 foot, and record the resulting value as "Total Depth (feet [ft], below measuring point [BMP])" on the Groundwater Sampling Record or field notebook.

3.5 Documentation and Records Management

Water levels observed in wells selected for the groundwater level monitoring program will be tabulated on the Groundwater Sampling Record form during each monitoring period (in print or electronic format – see attached form) or in the field notebook. The date and time of each measurement will also be recorded in the field. All water level measurements shall be recorded to the nearest 0.01 foot, and all depth measurements shall be noted to the nearest 0.1 foot.

Water level data will be recorded as feet BMP so that water level elevations may be calculated from the depth-to-water measurement (from the MP) and the surveyed elevation of the MP at each well or piezometer. The MP will also be described and documented in the Groundwater Sampling Record and/or field notebook (i.e., top of PVC casing, top of protective casing, or below ground surface).

Well depth measurements may also be recorded on the Groundwater Sampling Record.

4.0 GROUNDWATER SAMPLE COLLECTION PROCEDURES

4.1 Low Flow Sample Collection

For wells that are sampled for regulatory compliance, a low flow sample collection technique shall be employed whenever possible to ensure that representative groundwater samples are collected from each well. Additionally, low flow sampling is to be the preferred method for groundwater sampling unless site specific conditions warrant a volume-based approach or a non-purge approach such as a HydraSleeve™ (as discussed in Sections 4.2 and 4.3, respectively).

A. Measure the depth to water (water level must be measured to nearest 0.01 feet) relative to a reference MP on the well casing with an electronic water level indicator or steel tape and recorded.

B. For wells with non-dedicated equipment (i.e., no dedicated tubing, pump, or docking station), place the pump at the wellhead and slowly lower the pump and tubing down into the well until the location of the pump intake is set to the midpoint of the screened interval, unless otherwise specified in the monitoring plan. Care should be taken to minimize disturbance to the water column during insertion of the pump. A variable rate submersible centrifugal or positive displacement type pump (i.e., bladder or piston pump) will be used for purging and sampling; however, if the water table is less than 20 ft below ground surface (bgs) a peristaltic pump may be employed as long as the constituents measured are not influenced by negative pressures. The pump and associated tubing used shall be constructed of inert materials and compatible with the parameter(s) to be collected. The placement of the pump intake should be positioned with a calibrated sampling pump hose, sounded with a weighted-tape or using a pre-measured hose. Refer to the available well information to determine the depth and length of the screened interval. The pump should be adequately supported once it has been lowered to ensure that it will not shift during purging. Record the depth of the pump intake after lowering the pump into location. For wells with dedicated pumping equipment, pump depth should be confirmed and equipment condition recorded.

C. Measure the water level (nearest 0.01 feet) and record the information on the Groundwater Sampling Record and/or in the field notebook. The water level indicator should remain in the well to allow for periodic measurement of the water level during purging.

D. Connect the discharge line from the pump to a flow-through cell to measure field water quality parameters. If turbidity measurements are to be collected using a separate instrument from that employed to monitor water quality in the flow through cell, a "T" connection is needed prior to the flow-through cell to allow for the collection of water for turbidity measurements. The discharge line from the flow-through cell must be directed to a container to hold the purge water during the purging and sampling of the well.

E. Start the pump at its lowest speed setting and slowly increase the speed until discharge occurs. Adjust pump speed until little or no drawdown is evident (less than 0.33 ft). If the minimal drawdown that can be achieved exceeds 0.33 feet but remains stable, continue purging until field parameters stabilize. Typically flow rates should be within 0.1 L/min to 0.5 L/min; however highly productive aquifers may allow for higher flow rates to be used. Adjustments to the flow rate to achieve stabilization should be made as quickly as possible to minimize agitation of the water column. It should be noted that this goal may be difficult to achieve under some circumstances due to geologic heterogeneities within the screened interval, and may require adjustment based on well-specific conditions and site experience.

F. Measure the discharge rate of the pump using a calibrated discharge volume measurement and stopwatch. Also, measure the water level and record both flow rate and water level on the Groundwater Sampling Record and/or in the field notebook. Continue purging, monitor and record water level and pump rate every three to five minutes during purging.

G. During purging, a minimum of one tubing volume (including the volume of water in the pump and flow-cell) must be purged prior to recording the water-quality indicator parameters. Then monitor and record the water-quality indicator parameters every three to five minutes. The water-quality indicator field parameters are turbidity, dissolved oxygen, specific conductance, pH, ORP, and temperature. The parameters are considered to have stabilized if on three successive readings of the water quality field parameters meet the following criteria:

- pH +/- 0.1 S.U.
- Specific Conductance 3% difference
- Temperature +/- 1ºC
- ORP +/- 10 mV
- Turbidity 10% difference for values greater than 10 NTU
- Dissolved Oxygen 10% difference

H. If a stabilized drawdown in the well can't be maintained at 0.33 feet and the water level is approaching the top of the screened interval, reduce the flow rate or turn the pump off (for 15 minutes) and allow for recovery. It should be noted whether or not the pump has a check valve. A check valve is required if the pump is shut off. Begin pumping at a lower flow rate, if the water draws down to the top of the screened interval again, turn pump off and allow for recovery. If two tubing volumes (including the volumes of water in the field pump and flow-cell) have been removed during purging, then sampling can proceed next time the pump is turned on. This information should be noted in the field notebook or Groundwater Sampling Record.

I. If specified in the monitoring plan, a clean plastic disposable apron may be placed adjacent to or around the well to prevent equipment and sample containers from coming into contact with surface materials, prior to collecting samples from a well. Alternatively, a clean field table may be set up near the well. If used, the table will be cleaned (Section 5.1) before and after use at each well.

J. During sampling, maintain the same pumping rate or reduce slightly for sampling in order to minimize any additional disturbance of the water column. Samples should be collected directly from the discharge port of the pump tubing prior to passing through the flow-cell. The sequence of the sampling is immaterial unless filtered (dissolved) samples are collected which must be done last. All sample containers should be filled with minimal turbulence by allowing the groundwater to flow from the tubing gently down the inside of the container. In the event that the groundwater is turbid (greater than 10 NTUs) a filtered metals sample may be collected. If a filtered metals sample is to be collected, then an in-line filter is fitted at the end of the discharge tubing and the sample is collected after the filter.

   Sample bottles that <u>do not</u> contain preservative should be rinsed with the sample water prior to filling.

K. Remove the pump from the well. Decontaminate the pump and tubing if non-dedicated equipment is used.

L. Where more than one well within a specific field or site is to be sampled, the sampling sequence should begin with the well having the lowest suspected level of contamination, if known. Successive samples should be obtained from wells with increasing suspected contamination. If the relative degree of suspected contamination at each well cannot be reasonably assumed, sampling should proceed from the perimeter of the site towards the center of the site. The sampling sequence should be arranged such that wells are sampled in order of increasing proximity to the suspected source of contamination, starting from the wells upgradient of the suspected source.

M. Sampling activity for each monitoring well will be recorded on a Groundwater Sampling Record and the stabilized field parameters may also be recorded in the field notebook.

4.2 Volume-Based Sample Collection

In instances where low-flow sampling is not possible based on site-specific conditions (a minimum and stable drawdown cannot be maintained) samples from wells will be collected using a volume-based approach, if the yield of the well is sufficient, as follows:

A. The depth to water in a well and the total depth will be measured using the procedures discussed in Section 3, above.

B. A positive displacement pump, submersible pump, and/or bailer will be used for removing the groundwater from the monitoring wells (purging). Equipment used for purging and sampling may be permanently installed (dedicated) in the monitoring wells. Care must be taken that bailers and/or tubing are constructed from materials that will not affect the sample analyses. The well pump intake is to be set at the midpoint of the screened interval, unless otherwise specified in the monitoring plan in a manner consistent with that specified for the low-flow sampling above. Pumping is to be performed in such manner as to remove stagnant water while trying to minimize exposing the screened interval to atmospheric conditions and obtain the most representative sample.

C. Wells will be pumped or bailed until at least the volume of water removed is equal to three well casing volumes (volume of standing water in the well based upon total depth of well, the depth to water, and the well casing diameter). The purge rate must not reach a point where the recharge water is entering the well in an agitated manner (cascading water over the screen interval) and the water level in the well during purging should not be allowed to drop below the pump intake. During pumping, water level measurements will be collected (as described for low-flow sampling) and the purging rate adjusted to ensure that these conditions do not occur.

D. To ensure that the water samples are representative of the water-yielding zone, periodic measurements of the temperature, pH, dissolved oxygen, ORP, specific conductance and turbidity will be made. A flow-through cell may be used if purging with a pump. Measurements will be recorded for the initial water removed at a minimum following each well volume purged. Note that indicator parameters dissolved oxygen and ORP cannot be accurately measured using discrete samples obtained during bailing (due to exposure to the atmosphere and entrained air becoming trapped in the sampling probe). These parameters will only be collected using a flow-through cell. The sample will be collected only when the indicator parameters have stabilized (as discussed above in Section 4.1). No more than six well volumes should be removed to prevent the effects of over pumping. If the indicator parameters have not stabilized following six well volumes the field instruments will be recalibrated and checked for possible malfunction. If no problems are found, sampling can be conducted; however, the Project Manager will be notified and all information will be recorded in the field notebook and/or Groundwater Sampling Record. If the yield of the well is low such that it can be bailed or pumped dry, then the recharged groundwater in the well will be considered representative regardless of the number of casing volumes of groundwater removed, since all standing water in the well has been replaced by recharge from the water-yielding zone. If a well is purged dry, the well can be sampled upon 90% recovery or after two hours, whichever occurs first.

E. If specified in the monitoring plan, a clean plastic disposable apron may be placed adjacent to or around the well to prevent equipment and sample containers from coming into contact with surface materials, prior to collecting samples from a well. Alternatively, a clean field table may be set up near the well. If used, the table will be cleaned (Section 5.1) before and after use at each well.

F. Sample containers prepared specifically for the required analyses by the analytical laboratory or their supplier will be used for sample collection. Glass sample bottles should be filled to near the top. To account for slight expansion due to temperature changes, leave headspace approximately equivalent to the volume of liquid which would fill the bottle's cap. Plastic sample bottles should be filled completely. Splashing of the water in the sample container and exposure to the atmosphere shall be minimized during sampling. The container cap will be screwed on tightly immediately after filling the sample container. Under this protocol, samples should be collected in order of decreasing volatility (i.e., most volatile samples will be collected first). Sample filtration, if necessary, is discussed in Section 4.5 of this SOP.

Sample bottles that do not contain preservative should be rinsed with the sample water prior to filling.

G. Where more than one well within a specific field or site is to be sampled, the sampling sequence should begin with the well having the lowest suspected level of contamination, if known. Successive samples should be obtained from wells with increasing suspected contamination. If the relative degree of suspected contamination at each well cannot be reasonably assumed, sampling should proceed from the perimeter of the site towards the center of the site. The sampling sequence should be arranged such that wells are sampled in order of increasing proximity to the suspected source of contamination, starting from the wells upgradient of the suspected source.

H. Sampling activity for each monitoring well will be recorded on a Groundwater Sampling Record and the stabilized field parameters may also be recorded in the field notebook.

4.3 Non-Purge Sample Collection Using a HydraSleeve™

In monitoring wells with very low yield and/or where low-flow sampling or volume-based purging is not practical, a non-purge method, sampling using a HydraSleeve™, may be used to collect groundwater samples by the following procedure:

A. The depth to water in a well and the total well depth will be measured using the procedures discussed in Section 3, above. This measurement can be used to determine the preferred position of the HydraSleeve within the well screen.

B. Determine the necessary length of HydraSleeves needed for the specific well screen length and/or water column height to recover the necessary sample volume. HydraSleeves are manufactured in standard lengths of 30, 36, and 60 inches. However, up to three 30-inch HydraSleeves may be installed in series on a single tether (using plastic cable ties) to achieve more volume. Alternatively, a TurboSleeve may be used, which is a larger HydraSleeve that allows recovery of more sample volume. Per manufacturer's recommendations, the TurboSleeve should be allowed to equilibrate in the well for 24 hours before retrieval to allow for full compression of the sleeve for full sample recovery (see step G below).

C. Measure the correct amount of tether cord needed to suspend the HydraSleeve in the well so the weight will not rest on the bottom of the well and the desired depth is achieved.

D. Remove the HydraSleeve from its packaging, unfold and hold it by its top. Crimp the top of the HydraSleeve by folding the hard polyethylene reinforcing strips at the holes.

E. Attach the spring clip to the holes to ensure the top of the HydraSleeve will remain open until the sampler is retrieved. Attach the tether to the spring clip with a strong knot (or tether can be attached to one of the holes at the top of the HydraSleeve).

F. Fold the flaps with the two holes at the bottom of the HydraSleeve together and slide the weight clip through the holes. Attach the weight to the bottom of the weight clip to ensure the HydraSleeve will descend to the desired depth.

G. To deploy the HydraSleeve, carefully lower the HydraSleeve on its tether to the desired depth in the water column. Hydrostatic pressure will keep the self-sealing check valve at the top of the HydraSleeve closed and ensure that it remains flat and empty and will only fill with groundwater from the desired interval when it is retrieved.

H. To retrieve the HydraSleeve to collect groundwater samples, pull up the tether 30 to 45 inches (36 to 54 inches for longer HydraSleeves) in one smooth motion at a rate of about one inch per second or faster. This motion will open the top check valve and allow the HydraSleeve to fill. When the HydraSleeve is full, the top check valve will close and the full weight of the HydraSleeve can be felt by the sampler. Continue to pull the HydraSleeve upward to the top of the well to retrieve. Two persons are needed to retrieve a TurboSleeve, if used, due to its length and flexibility.

I. Once recovered, decant and discard the small volume of water trapped in the HydraSleeve above the top check valve.

J. To fill sample bottles, remove the discharge tube from its sleeve. While holding the HydraSleeve at the check valve, puncture the HydraSleeve just below the check valve with the pointed end of the discharge tube. Discharge the water into the sample bottles as needed.

K. Any leftover water from the HydraSleeve can be poured into a separate vessel for the measurement of groundwater field parameters as needed.

L. Dispose each used HydraSleeve after use at an individual well.

4.4 Non-Purge Sample Collection by Bailer

In monitoring wells with very low yield where low-flow sampling or volume-based purging is not practical and sampling with HydraSleeves^{TM} is not feasible, sampling by bailer without purging the well may be used to collect groundwater samples.

Sampling by bailer may be used by the following procedure:

A. The depth to water in a well and the total depth will be measured using the procedures discussed in Section 3, above. This measurement can be used to determine the height of water and the volume of groundwater within the well screen.

B. A clean, sufficiently weighted PVC or polyethylene bailer will be used attached to a pre-measured length of either coated stainless steel cable or nylon rope tether for each well to be sampled by bailing.

C. The bailer will be slowly lowered through the water column to the well screen interval on the pre-measured tether. Slow and consistent movement of the bailer downward through the well allows the water within the well to pass through the bailer.

D. When the desired depth within the well screen interval is reached, the downward movement of the bailer will immediately be reversed and the bailer slowly retrieved to the surface. This action allows the bailer to collect water representative of conditions within the well screen interval while minimizing generation of turbid conditions within the well.

E. Steel cable or rope will not be allowed to touch the ground surface during retrieval. A reel, tub, tarp, or plastic sheeting can be used to prevent contact with the ground.

F. Upon retrieval of the bailer, sample bottles for total and dissolved metals analysis will be filled first, followed by the remaining sample bottles for other parameters. If more sample volume is needed, the bailer will again be slowly lowered to the screen interval and retrieved as necessary until required sample bottles have been filled.

G. If a filtered metals sample is to be collected, the necessary volume can be filtered from one clean, non-preserved sample bottle as needed.

H. Field parameters will be measured in the instrument cup or other rinsed container following collection of sample bottles. A small aliquot of sample volume will be poured from the bailer for the collection of field parameters.

I. If the well bails dry but additional sample volume is required, the volume will be removed from the well via bailer if such recharge occurs in the well within 24 hours.

4.5 Sample Filtration

When required, a field-filtered water sample will be collected using a disposable, in-line 0.45 micron (μm) filter. The water sample will be pumped through the filter attached directly to the discharge tubing. A peristaltic pump and a clean section of Tygon (polyvinylchloride) tubing, silicone tubing, or other appropriate method may be used if the sample is collected via bailer. The filter cartridge will be rinsed according to the manufacturer's recommendations. If there are no recommendations available, for rinsing pass through a minimum aliquot of 100 ml of sample water prior to collection of sample in to the containers. Both the filter and tubing will be disposed between samples.

4.6 Sample Containers and Volumes

The sample containers will be appropriate to the analytical method and will be obtained from the water analysis laboratory or other approved source. Different containers will be required for specific groups of analytes in accordance with USEPA Methods, project-specific requirements, and/or other local jurisdictional guidance. The sampler will confirm with the laboratory performing the analyses that appropriate bottleware and preservatives are used and ensure that a sufficient volume of sample is collected.

4.7 Sample Labeling

Sample containers will be labeled with self-adhesive tags. Each sample will be labeled with the following information using waterproof ink:

- Project identification;
- Lab Name;
- Sample identification;
- Date and time samples were obtained;
- Matrix;
- Requested analyses and method;
- Bottle type;
- Treatment (preservative added, filtered, etc.);
- Lab QC (if applicable); and
- Initials of sample collector(s).

4.8 Sample Preservation and Storage

If required by the project or analytical method, water samples submitted for chemical analysis will be stored at 4 ºC in ice-cooled, insulated containers immediately after collection. Preservation and storage methods depend on the chemical constituents to be analyzed and should be discussed with the laboratory prior to sample collection. USEPA and/or other local jurisdictional requirements and/or the requirements of a project-specific plan (e.g., sampling and analysis plan, work plan, quality assurance project plan, etc.) shall be adhered to in preservation and storage of water samples.

4.9 Sample Custody

Samples shall be handled and transported according to the sample custody procedures discussed in JRS SOP No. 2 (SAMPLE CUSTODY, PACKAGING, AND SHIPMENT). Sampling personnel shall document each sample on the Chain-of-Custody Record

4.10 Field Measurements

Specific conductance, pH, dissolved oxygen, ORP, temperature, and turbidity measurements will be performed on water samples at the time of sample collection. The only exceptions will be for DO and ORP when the samples are collected via bailer or in those instances where a flow-through cell cannot be used. Data obtained from these (or other) field water quality measurements will be recorded on the appropriate sampling records or in the field notebook. Separate aliquots of water shall be used to make field measurements (i.e., sample containers for laboratory analysis shall not be reopened).

For groundwater samples, field measurement intervals will be as presented above. If the parameters have not stabilized, check to insure that the field instruments are operating correctly and remain calibrated. Recalibrate the instruments if needed, if an instrument cannot be calibrated it will be labeled needing repair and removed from service. Field measurements and purging will continue until three consecutive readings have stabilized to within the following limits or until a maximum of six casing volumes have been removed:

- pH +/- 0.1 S.U.;

- Specific Conductance 3% difference;
- Temperature +/- 1ºC;
- ORP +/- 10 mV;
- Turbidity 10% difference for values greater than 10 NTU; and
- Dissolved Oxygen 10% difference.

4.10.1 Temperature Measurement

Temperature will be measured directly from the water source or from a separate sample aliquot. Temperature measurements will be made with a mercury-filled thermometer, bimetallic-element thermometer, or electronic thermistor. All measurements will be recorded in degrees Celsius (°C). When a flow-through cell is used the temperature can be measured directly via a multi-parameter instrument as per the manufacturer's instructions.

4.10.2 pH Measurement

A pH measurement will be made by dipping the probe directly into the water source or into a separate sample aliquot. Prior to measurement, the container in which the field parameter sample will be collected will be acclimated to the approximate temperature of the sample. This can be accomplished by immersing the container in water removed from a well during the purging process. The pH measurement will be made as soon as possible after collection of the field parameter sample, preferably within a few minutes, using a pH electrode. The value displayed on the calibrated instrument will be recorded after the reading has stabilized. If the value falls outside of the calibrated range, then the pH meter will be recalibrated using the appropriate buffer solutions. When a flow-through cell is used, the pH can be measured directly via a multi-parameter instrument as per the manufacturer's instructions.

4.10.3 Dissolved Oxygen

Dissolved oxygen (DO) will be measured by using a suitable multi-parameter meter that can be placed into a flow-through cell and sealed such that exposure to the atmosphere is prevented. DO measurements will be reported in milligrams per liter (mg/L). The instrument will be calibrated in accordance with JRS SOP No. 31 (WATER QUALITY METER CALIBRATION).

4.10.4 Oxidation Reduction Potential

Oxidation Reduction Potential (ORP) will be measured by using a suitable multi-parameter meter that can be placed into a flow-through cell and sealed such that exposure to the atmosphere is prevented. ORP measurements will be reported in mV. The instrument will be calibrated in accordance with JRS SOP No. 31 (WATER QUALITY METER CALIBRATION).

4.10.5 Specific Conductance Measurement

Specific conductance will be measured by dipping the probe directly into the water source or into a separate sample aliquot. The probe must be immersed to the manufacturer's recommended depth. Specific conductance will be reported in micromhos/cm or microsiemens/cm at 25 ºC. If the meter is not equipped with an automatic temperature compensation function, then the field value will be adjusted at a later time using the temperature data and the following formula:

$$SC_{25} = SC_T / [1 + \{(T - 25) \times 0.025\}]$$

where: SC_{25} = specific conductance at 25 ºC
SC_T = specific conductance measured at temperature T (ºC)
T = sample temperature (ºC)

The value displayed on the calibrated instrument will be recorded after the reading has stabilized. If the value falls outside of the calibrated "range" set by the range dial on the instrument, then the range setting will be changed to a position that gives maximum definition. If the specific conductance value falls outside of the calibrated range of the conductivity standard solution, then the instrument will be recalibrated using the appropriate standard prior to measurement. When a flow-through cell is used the specific conductance can be measured directly via a multi-parameter instrument as per the manufacturer’s instructions.

4.10.6 Turbidity

Turbidity will be measured by using a field portable nephlometer separate from the multi-parameter meter used for DO and ORP and capable of reading down to 0.1 NTU. Turbidity will be measured directly from the water source or from a separate sample aliquot. The instrument will be calibrated at least daily prior to initiating field activities and periodically throughout the day or as recommended by the instrument manufacturer. Turbidity measurements will be reported in nephlometric turbidity units (NTU). When a flow-through cell is used, the turbidity can be measured directly via a multi-parameter (e.g., YSI Sonde 6920) instrument, if so equipped, as per the manufacturer's instructions.

4.10.7 Equipment Calibration

Equipment used to measure field parameters will be calibrated daily in the field in accordance with JRS SOP No. 31 (WATER QUALITY METER CALIBRATION) prior to any measurements being taken.

5.0 DOCUMENTATION

5.1 Groundwater Sampling Record

Each sampling event for each monitoring well will be recorded on a Groundwater Sampling Record form (which may be in paper or electronic format) or in the field notebook.

The documentation should include the following:

- Project identification;
- Location identification;
- Sample identification(s) (including quality control samples);
- Date and time of sampling;
- Purging and sampling methods;
- Sampling depth;
- Name(s) of sample collector(s);
- Inventory of sample bottles collected including sample preservation (if any), number, and types of sample bottles;
- Total volume of water purged;

- Results of field measurements and observations (time, cumulative purge volume, temperature, pH, specific conductance, turbidity, sediment, color, purge rate);
- Equipment cleaning record;
- Description and identification of field instruments and equipment; and
- Equipment calibration record; and
- Number of photos (if any were taken).

When the sampling activity is completed, the Groundwater Sampling Record (whether in print or electronic format) will be checked by the Project Manager or his/her designee, and the original record will be placed in the project file.

6.0 QUALITY ASSURANCE/QUALITY CONTROL

6.1 Equipment Decontamination/Cleaning

Steel surveyor's tapes, electric well probes, and other measuring tapes shall be cleaned prior to use and after measurements in each well are completed. Cleaning shall be accomplished by either: (1) washing with a laboratory-grade detergent/water solution, rinsing with clean, potable, municipal water, final rinsing with distilled or deionized water, or (2) steam cleaning followed by rinsing with distilled or deionized water.

Sample bottles and bottle caps will be pre-cleaned and prepared by the analytical laboratory or their supplier using standard USEPA-approved protocols. Sample bottles and bottle caps will be protected from dust or other contamination between time of receipt by the sampler(s) and time of actual usage at the sampling site.

Groundwater sampling equipment may be dedicated to a particular well at a project site. Prior to installation of this equipment, all equipment surfaces that will be placed in the well or may come in contact with groundwater will be cleaned to prevent the introduction of contaminants.

Sampling equipment that will be used at multiple wells or sampling locations will be cleaned after sampling at each location is completed in accordance with the SOP entitled EQUIPMENT DECONTAMINATION (JRS SOP No. 7).

Equipment such as submersible electric pumps, which cannot be disassembled for cleaning, will be cleaned by circulating a laboratory-grade detergent (e.g., Alconox) and potable water solution through the assembly, followed by clean potable water from a municipal supply, and then by distilled or deionized water. Equipment cleaning methods will be recorded on the Groundwater Sampling Record.

6.2 Technical and Records Reviews

The Project Manager or designated reviewer will check and verify that documentation has been completed and filed per this procedure.

In addition, all calculations of water-level elevations must be reviewed before they are submitted to the project file and used to describe site conditions. The calculation review should be performed by technical personnel familiar with this procedure. Evidence of the completed review and any necessary corrections to calculations should also be submitted to the project file.

7.0 REFERENCES

U.S. Environmental Protection Agency (USEPA), Region 9. Standard Operating Procedure for the Standard/Well-Volume Method for Collecting a Ground-Water Sample from Monitoring Wells for Site Characterization. Available online at: www.epa.gov/region9/qa/pdfs/finalgwsamp_sop.pdf.

USEPA, 2010. Low Stress (Low Flow) Purging and Sampling Procedure for the Collection of Ground Water Samples from Monitoring Wells._EQASOP-GW-001 Region 1 Low-Stress (Low-Flow) SOP, Revision Number 3, July 30, 1996, Revised January 19, 2010. http://www.epa.gov/region1/lab/qa/pdfs/EQASOP-GW001.pdf

USEPA, 2002, Ground-Water Sampling Guidelines for Superfund and RCRA Project Managers, Ground Water Forum Issue Paper. U.S Environmental Protection Agency, Technology Innovative Office, Office of Solid Waste and Emergency Response, Washington D.C., Douglas Yeskis, EPA Region 5, Chicago IL, and Bernard Zavala, EPA Region 10, Seattle, WA, EPA 542-S-02-001. May 2002. http://www.epa.gov/superfund/remedytech/tsp/download/gw_sampling_guide.pdf

U.S. Geological Survey (USGS), variously dated. National Field Manual for the Collection of Water-Quality Data: U.S. Geological Survey Techniques of Water-Resources Investigations, Book 9, Chapters A1-A9. Available online at http://pubs.water.usgs.gov/twri9A.

APPENDIX D.6.
STANDARD OPERATING PROCEDURES:
SOP 7, EQUIPMENT DECONTAMINATION

STANDARD OPERATING PROCEDURE No. 7

EQUIPMENT DECONTAMINATION

1.0 SCOPE AND APPLICABILITY

This Standard Operating Procedure (SOP) describes the methods to be used for decontamination of all reusable field equipment that could become contaminated during use and/or sampling. Field equipment may include split spoons, reusable bailers, trowels, scissors, shovels, hand augers, or any other type of equipment used during field activities. Decontamination is performed as a quality assurance measure and a safety precaution; it prevents cross contamination between samples and also helps to maintain a clean working environment. The procedures presented herein are intended to be general in nature and are applicable when referenced by site-specific or project-specific planning documents. Appropriate revisions may be made to accommodate site-specific conditions or project-specific protocols when approved in writing or via email by the Project Manager.

Decontamination is achieved primarily by rinsing with liquids which may include: steam, soap and/or detergent solutions, potable water, distilled weak acid solution, and/or methanol or other solvent. Equipment may be allowed to air dry after being cleaned or may be wiped dry with chemical-free towels or paper towels if immediate re-use is necessary.

At most project sites, decontamination of equipment that is re-used between sampling locations will be accomplished between each sample collection point. Waste produced by decontamination procedures, including waste liquids, solids, etc., will be discharged to the land surface and will not be allowed to runoff into any water body.

2.0 BASIS FOR METHODOLOGY

The methods and procedures described in this SOP were developed from these sources:

- ASTM D5088. Standard Practice for Decontamination of Field Equipment

Used at Waste Sites. American Society for Testing and Materials (ASTM) International, West Conshohocken, PA, 2008.

- Parker and Ranney, 1997a. Decontaminating Ground Water Sampling Devices, CRREL Special Report 97-25, U.S. Army Engineer Cold Regions Research and Engineering Laboratory, Hanover, NH.

- Parker and Ranney, 1997b. Decontaminating Materials Used in Ground Water Sampling Devices, CRREL Special Report 97-24, U.S. Army Engineer Cold Regions Research and Engineering Laboratory, Hanover, NH.

3.0 PROCEDURES

3.1 Responsibilities

It is the responsibility of the field sampling supervisor to ensure that proper decontamination procedures are followed and that all waste materials produced by decontamination are properly managed. It is the responsibility of the project safety officer to draft and enforce safety measures that provide the best protection for all persons involved directly with sampling and/or decontamination.

It is the responsibility of any subcontractors (e.g., drilling contractors) to follow the proper, designated decontamination procedures that are stated in their contracts and outlined in the Site-Specific Health and Safety Plan. It is the responsibility of all personnel involved with sample collection or decontamination to maintain a clean working environment and ensure that any contaminants are not negligently introduced to the environment.

3.2 Supporting Materials

Materials needed for equipment decontamination include:

- Cleaning liquids: laboratory grade soap and/or detergent solutions (Alconox, etc.), potable water, distilled water, methanol, weak nitric acid solution, etc.
- Personal protective safety gear as defined in the Site-Specific Health and Safety Plan
- Chemical-free towels or paper towels

- Disposable nitrile gloves
- Cleaning containers: plastic and/or stainless steel pans and buckets
- Cleaning brushes
- Steam cleaner

3.3 Methods

The extent of known contamination will determine the degree of decontamination required. If the extent of contamination cannot be readily determined, cleaning should be done according to the assumption that the equipment is highly contaminated. Decontamination procedures should account for the types of contaminants known or suspected to be present. In general, high levels of organic contaminants should include an organic solvent wash step, and high levels of metals contamination should include a weak acid rinse step.

The procedures listed below constitute the full field decontamination procedure. If different or more elaborate procedures are required for a specific project, they may be specified in the project planning documents. Such variations in decontamination protocols may include all, part, or an expanded scope of the decontamination procedure stated herein.

1. Remove gross contamination from the equipment by dry brushing, and rinse with potable water.
2. Wash with laboratory-grade detergent solution or steam cleaner.
3. Rinse with potable water or steam cleaner.
4. Rinse with methanol (optional, for equipment potentially contaminated by organic compounds).
5. Rinse with acid solution (optional, for equipment potentially contaminated by metals).
6. Rinse with distilled or deionized water or steam cleaner.
7. Repeat entire procedure or any parts of the procedure as necessary.
8. Air dry.

4.0 DOCUMENTATION

Field notes will be kept describing the decontamination procedures followed. The field notes will be recorded according to procedures described in SOP No. 1 (FIELD DOCUMENTATION).

5.0 QUALITY CONTROL

To assess the adequacy of decontamination procedures, field rinsate blanks may be required. The specific number of field rinsate blanks will be defined in the project-specific Sampling and Analysis Plan (SAP) or Quality Assurance Project Plan (QAPP).

Rinsate blanks with elevated or detected contaminants will be evaluated by the Project Manager, who will relay the results to the field personnel. Such results may be indicative of inadequate decontamination procedures that require corrective actions (e.g., retraining).

6.0 REFERENCES

ASTM D5088-02 (2008). Standard Practice for Decontamination of Field Equipment Used at Waste Sites. American Society for Testing and Materials (ASTM) International, West Conshohocken, PA, 2008. Available online at http://www.astm.org/

Parker and Ranney, 1997a. Decontaminating Ground Water Sampling Devices, CRREL Special Report 97-25, U.S. Army Engineer Cold Regions Research and Engineering Laboratory, Hanover, NH.

Parker and Ranney, 1997b. Decontaminating Materials Used in Ground Water Sampling Devices, CRREL Special Report 97-24, U.S. Army Engineer Cold Regions Research and Engineering Laboratory, Hanover, NH.

APPENDIX D.7.
STANDARD OPERATING PROCEDURES:
SOP 2, SAMPLE CUSTODY, PACKAGING, AND SHIPMENT

STANDARD OPERATING PROCEDURE No. 2

SAMPLE CUSTODY, PACKAGING, AND SHIPMENT

1.0 SCOPE AND APPLICABILITY

The following Standard Operating Procedure (SOP) describes the protocol for sample custody and packaging and shipment of samples. The procedures presented herein are intended to be general in nature and are applicable when referenced by site-specific or project-specific planning documents. Appropriate modifications to the procedures may be made when approved in writing or via email by the Project Manager.

This SOP applies to any liquid or solid sample that is being transported by the sampler, a courier, or an overnight delivery service.

2.0 BASIS FOR METHODOLOGY

The methods and procedures described in this SOP were developed from these sources:

- 49 CFR 173. Shippers – Shippers – General Requirements for Shipping. United States Code of Federal Regulations available online at http://www.gpoaccess.gov/cfr/index.html
- 49 CFR 178. Specifications for Packaging. United States Code of Federal Regulations available online at http://www.gpoaccess.gov/cfr/index.html
- ASTM D 4220-95 (2000). Standard Practices for Preserving and Transporting Soil Samples, American Society for Testing and Materials available online at http://www.astm.org/
- ASTM D 4840-99 (2010). Standard Guide for Sampling Chain-of-Custody Procedures. American Society for Testing and Materials available online at http://www.astm.org/

3.0 PROCEDURES

The objectives of this packaging and shipping SOP are to minimize the potential for sample breakage, leakage, or cross contamination; to provide for preservation at the proper temperature; and to provide a clear record of sample custody from collection to analysis.

3.1 Packaging Materials

The following is a list of materials that will be needed to facilitate proper sample packaging:

- Chain-of-Custody (COC)/Request for Analysis (RA) forms;
- Analyte List;
- Coolers (insulated ice chests) or other shipping containers as appropriate to sample type;
- Transparent packaging tape;
- Duct tape or similar (for sealing cooler drain);
- Zip-lock type bags (note: this is used as a generic bag type, not a specific brand name);
- Large garbage bags;
- Protective wrapping and packaging material;
- Contained ice (packaged and sealed to prevent leakage when melted) or “Blue Ice”; and
- Chain-of-Custody seals.

3.2 Sample Custody from Field Collection to Laboratory

After samples have been collected, they will be maintained under chain-of-custody procedures. These procedures are used to document the transfer of custody of the samples from the field to the designated analytical laboratory. The same chain-of-custody procedures will be used for the transfer of samples from one laboratory to another, if required.

The field sampling personnel will complete a COC/RA form and provide an Analyte List for each separate container of samples to be shipped or delivered to the laboratory for chemical or physical (geotechnical) analysis. Information contained on the form will include:

1. Project identification;
2. Date and time of sampling;
3. Sample identification;
4. Sample matrix type;
5. Sample preservation method(s);
6. Number and types of sample containers;
7. Sample hazards (if any);
8. Requested analysis(es);
9. Method of shipment;
10. Carrier/waybill number (if any);
11. Signature of sampling personnel;
12. Name of Project Manager;
13. Signature, name and company of the person relinquishing and the person receiving the samples when custody is being transferred;
14. Date and time of sample custody transfer;
15. Condition of samples upon receipt by laboratory; and
16. Chain of Custody identification number.

The samples will be carefully packaged into shipping containers/ice chests.

The sampling personnel whose signature appears on the COC/RA form is responsible for the custody of a sample from the time of sample collection until the custody of the sample is transferred to a designated laboratory, a courier, or to another employee for the purpose of transporting a sample to the designated laboratory. A sample is considered to be in their custody when the custodian: (1) has direct possession of it; (2) has plain view of it; or (3) has securely locked it in a restricted access area.

Custody is transferred when both parties to the transfer complete the portion of the COC/RA form under "Relinquished by" and "Received by." Signatures, printed names, company or organization names, and date and time of custody transfer are required. Upon transfer of custody, the sampling personnel who relinquished the samples will retain a copy of the COC/RA form.

3.3 Sample Custody within Laboratory

The designated laboratory will assume sample custody upon receipt of the samples and COC/RA form. Sample custody within the analytical laboratory will be the responsibility of designated laboratory personnel. The laboratory will document the transfer of sample custody and receipt by the laboratory by signing the correct portion of the COC/RA form. Upon receipt, the laboratory sample custodian will note the condition of the samples, by checking the following items:

1. Agreement of the number, identification and description of samples received by comparison with the information on the COC/RA form; and
2. Condition of samples (any bottle breakage; leakage, cooler temperature, etc.).

If any problems are discovered, the laboratory sample custodian will note this information on the "Laboratory Comments/Condition of Samples" section of the COC/RA form, and will notify the sampling personnel or Project Manager immediately. The Project Manager will decide on the final disposition of the problem samples.

The laboratory will retain a copy of the COC/RA form and return an electronic copy to the originator with the final laboratory report of analytical results. The original of the COC/RA form will be retained as part of the permanent documentation in the project file. A record of the history of the sample within the laboratory containing sample status and storage location information will be maintained in a logbook, or a computer sample tracking system, at the laboratory. The following information will be recorded for every sample access event:

1. Sample identification;
2. Place of storage;
3. Date(s) and time(s) of sample removal and return to storage;
4. Accessor's name and title;
5. Reason for access; and
6. Comments/observations (if any).

The laboratory will provide a copy of the logbook or computer file information pertaining to a sample upon request.

3.4 Sample Custody during Inter-Laboratory Transfer

If samples must be transferred from one laboratory to another, the same sample custody procedures described above will be followed. The designated laboratory person (sample custodian) will complete a COC/RA form and sign as the originator. The laboratory relinquishing the sample custody will retain a copy of the completed form. The laboratory receiving sample custody will sign the form, indicating transfer of custody, retain a copy, and return the original record to the originator with the final laboratory report of analytical results. The COC/RA form will be retained as part of the permanent documentation in the project file.

3.5 Packaging and Shipping Procedure

All sample containers will be properly labeled and all samples will be logged on the COC/RA form in accordance with the procedures explained.

All samples will be packed in the cooler so as to minimize the possibility of breakage, cross-contamination, and leakage. Before placing the sample containers into the cooler, all sample bottle caps will be checked and tightened if necessary. A large garbage bag will be placed as a liner inside the cooler and duct tape (or similar) will be used to seal off any drain openings on the inside and/or outside of the cooler. Bottles made of breakable material (e.g., glass) will also be wrapped in protective material (e.g., bubble wrap, plastic gridding, or foam) prior to placement in the cooler. Each sample set or soil tube liner (for a California, Shelby Tube or Split-spoon Sampler) will be placed into a zip-lock bag to protect from cross-contamination and to keep the sample labels dry. Sample containers will be placed upright in the cooler. Stacking glass sample bottles directly on top of each other will be avoided.

If required by the method, samples will be preserved to 4°C prior to the analysis. Water ice or “blue ice” will be used to keep the sample temperatures at 4°C. The ice will be placed in two zip-lock bags if the samples are to be transported by someone other than the sampler (e.g., a courier or overnight delivery service). The zip-lock bags of ice will be placed in between, on the bottom, and/or on top of the sample containers so as to maximize the contact between the containers and the bagged ice. If the sampler is transporting the samples to the laboratory shortly after sample collection, the water ice may be poured over and between the sample bottles in the cooler.

If there is any remaining space at the top of the cooler, packing material (e.g., Styrofoam pellets or bubble wrap) will be placed to fill the open space of the cooler. After filling the cooler, the garbage bag will be sealed, a copy of the COC/RA form and Analyte List will be placed in a zip-lock bag and taped to the inside of the cooler lid, the top of the cooler will be closed, and the cooler will be shaken to verify that the contents are secure. Additional packaging material will be added if necessary.

When transport to the laboratory by the sampler is not feasible, sample shipment will occur via courier or overnight express shipping service that guarantees shipment tracking and next morning delivery (e.g., Federal Express Priority Overnight or UPS Next Day Air). The same procedures will be followed to pack and fill the cooler and provide the COC/RA form and Analyte List, as if the sampler were transporting the samples to the laboratory. The cooler will be taped shut with packaging tape. Packaging tape will completely encircle the cooler, and chain-of-custody seals will be signed and placed across the front and side of the container opening.

Copies of all shipment records provided by the courier or overnight delivery service will be retained and maintained in the project file.

4.0 DOCUMENTATION AND RECORDS MANAGEMENT

Daily Field Records or a field notebook with field notes will be kept describing the packaging procedures and the method of shipment. Copies of all shipping records and chain-of-custody records will be retained in the project file.

5.0 QUALITY ASSURANCE

The Project Manager or designated reviewer will check and verify that documentation has been completed and filed per this procedure.

6.0 REFERENCES

49 CFR 173. Shippers – General Requirements for Shipments and Packagings. United States Code of Federal Regulations. Available online at http://www.gpoaccess.gov/cfr/index.html

49 CFR 178. Specifications for Packaging. United States Code of Federal Regulations. Available online at http://www.gpoaccess.gov/cfr/index.html

ASTM D 4220-95 (2000). Standard Practices for Preserving and Transporting Soil Samples, ASTM International, West Conshohocken, PA, 2000. Available online at http://www.astm.org/

ASTM D 4840-99 (2010). Standard Guide for Sampling Chain-of-Custody Procedures, ASTM International, West Conshohocken, PA, 2010. Available online at http://www.astm.org/

ACZ Laboratories, Inc.

CHAIN of CUSTODY

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Report to:

Name:	Address:
Company:	
E-mail:	Telephone:

Copy of Report to:

Name:	E-mail:
Company:	Telephone:

Invoice to:

Name:	Address:
Company:	
E-mail:	Telephone:

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES ☐ NO ☐

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified

Are samples for SDWA Compliance Monitoring? **Yes** ☐ **No** ☐

If yes, please include state forms. Results will be reported to PQL for Colorado.

Sampler's Name: ______________ **Sampler's Site Information** **State**______________ **Zip code**__________ **Time Zone**________

***Sampler's Signature:** ______________________

*I attest to the authenticity and validity of this sample. I understand that intentionally mislabeling the time/date/location or tampering with the sample in anyway, is considered fraud and punishable by State Law.

PROJECT INFORMATION

ANALYSES REQUESTED ***(attach list or use quote number)***

Quote #:

PO#:

Reporting state for compliance testing:

Check box if samples include NRC licensed material? ☐

SAMPLE IDENTIFICATION	DATE:TIME	Matrix	# of Containers								
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
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Matrix: SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

Level 4B reporting requested

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY:	DATE:TIME	RECEIVED BY:	DATE:TIME

APPENDIX D.8.
STANDARD OPERATING PROCEDURES:
SOP 31, WATER QUALITY METER CALIBRATION

STANDARD OPERATING PROCEDURE No. 31

WATER QUALITY METER CALIBRATION

1.0 SCOPE AND APPLICABILITY

This Standard Operating Procedure (SOP) describes the protocol to be followed for calibration of the field water quality sampling multi-parameter instrument used during environmental monitoring and sampling activities. The procedures presented herein are intended to be general in nature and are applicable when referenced by site-specific or project-specific planning documents. Appropriate modifications to the procedures may be made to accommodate project-specific protocols when approved in writing or via email by the Project Manager or detailed in a project work plan, sampling plan, or quality assurance project plan.

The objective of calibrating field instruments is to establish the accuracy and reliability of the instrument and to ensure that field readings are consistent with other measurements.

2.0 BASIS FOR METHODOLOGY

The methods and procedures described in this SOP were developed from this source:

- U.S. Geological Survey (USGS) (variously dated) National Field Manual for the Collection of Water-Quality Data: U.S. Geological Survey Techniques of Water-Resources Investigations, Book 9, Handbooks for Water-Resources Investigations, Chapters A1-A9.

3.0 EQUIPMENT AND SUPPLIES

3.1 Multi-Parameter Sensors

Multi-parameter sensors can vary between manufacturers of instruments and as technology advances. The following are the sensors generally used on multi-parameter instruments for collecting water quality parameters: water temperature, pH, specific electrical conductance (SC), oxidation-reduction potential (ORP), and dissolved oxygen (DO). Turbidity is generally measured using a separate meter, but there are some instruments for which the turbidity sensor is included with the multi-meter sensor cluster.

- pH – sensor has a range between 2 to 12, or 0 to 14 pH units
- Water Temperature – sensor has a range of at least -5 to +45 degrees Celsius
- SC – sensor is temperature compensating, and measures in microsiemens per centimeter (uS/cm) or mS/cm
- DO – 2 types of sensors (polarographic and optical) both sensors range from 0.05 to 20 milligrams per liter (mg/L)
- ORP – sensor uses a platinum electrode, and measures in millivolts (mV)

3.2 Calibration Supplies

The following supplies are needed to calibrate a multi-parameter instrument: specific sensor buffers, standards, and calibration solutions, field notebooks, deionized water, bucket(s), disposable gloves, scrub brushes, and paper tissues.

4.0 CALIBRATION PROCEDURE

The multi-parameter instrument will be calibrated in the field once daily by personnel according to manufacturer's instructions prior to the collection of any samples. All calibration details will be recorded in a field notebook including, but not limited to: instrument type, instrument serial number, readings prior to calibration, buffers used, readings after calibration, names of personnel calibrating, and date and time of calibration. The following are general guidelines to follow when calibrating a multi-parameter instrument:

A. Follow the manufacturer instructions;
B. Set the meter to the correct measurement units;
C. Allow the meter to warm up (at least 10 minutes or according to manufacturer recommendation);
D. Calibrate the instrument in a temperature-stable environment;
E. Use the calibration cup for calibration;
F. Use the recommended volume of calibration solution during calibration;
G. Do not over tighten the calibration cup;
H. Rinse the sensor with deionized water prior to the use of calibration solution, then rinse with a small amount of the calibration solution to be used before calibrating; and
I. Calibrate the meter sensors in the following order: water temperature, SC, DO, pH, and ORP.

4.1 Multi-Point Calibration

4.1.1 Water Temperature

Check to ensure the accuracy of the temperature sensor at least every 3 months if the multi-parameter instrument is in frequent use or according to the manufacturer's recommendations. The accuracy of the temperature sensor will be verified against a certified NIST-traceable digital or liquid-in-glass thermometer. Completely submerge the multi-parameter meter temperature sensor and allow at least 1 minute for the temperature to equilibrate and stabilize. Record the temperature value in degrees Celsius (°C). If the difference between the readings does not fall within the manufacturer-specified accuracy, contact the supplier or manufacturer for the next steps.

4.1.2 Specific Conductance (SC)

Calibration for SC is performed using a one-point calibration. Use the standard recommended by the manufacturer or a standard that is similar in conductivity to the sample water. The calibration cup and sensor will first be rinsed using a small amount of calibration solution prior to the start of calibration. Next the calibration cup will be filled with the recommended volume of calibration solution and the sensor completely submerged. When the readings stabilize save the calibration point and record in the field notebook the readings before and after calibration in uS/cm.

4.1.3 Dissolved Oxygen (DO)

Follow the manufacturer's guidelines for care, proper setup, and calibration of the DO sensor for the instrument in use. Whenever possible, ensure that the DO sensor has been appropriately calibrated by the instrument supplier or party responsible for maintenance prior to using the instrument in the field.

4.1.4 pH

Calibration of the pH sensor is performed using a two-point calibration. Select the pH 7 buffer as well as a second pH buffer (pH 4 or pH 10) that brackets the expected range of sample water pH. A calibration check using a third buffer can be performed at the end of calibration. To start, the calibration cup and sensor will be rinsed with deionized water and then with a small amount of the first buffer. Next the calibration cup will be filled with enough of the first buffer to completely cover the pH and temperature sensors (the pH value is temperature dependent). Wait for the pH and temperature sensors to equilibrate to the temperature of the buffer and record the temperature reading after stabilization. Adjust the calibration reading (to the true pH value at that temperature) using the chart provided by the buffer manufacturer. Record the temperature and pH readings before and after calibration of the first buffer in the field notebook. Follow the same steps starting with the rinsing of the calibration cup and sensor for the second buffer. If a third buffer is used to check the calibration, follow the same steps, but do not lock in a calibration point.

4.1.5 Oxidation-Reduction Potential (ORP)

Calibration of the ORP sensor is generally performed using a one-point calibration at a known temperature. The manufacturer's recommendation will be followed for calibration. The calibration cup and sensor will first be rinsed with a small amount of the solution. Next fill the calibration cup with enough of the solution to completely submerge the ORP sensor. Wait for the readings to stabilize and then enter the correct value of the solution at the current temperature. Record the ORP readings before and after calibration in mV, as well as the solution values used in the field notebook.

4.2 One-Point Calibration

Calibration may be performed using the In-Situ Quick Cal Solution when an In-Situ smarTROLL™ MP handheld water quality meter is used. The Quick Cal Solution performs a one-point calibration of all smarTroll™ MP sensors (pH, ORP, SC, and DO) at the same time. The manufacturer's recommendations will be followed for calibration as well as the following use and storage guidelines:

- Shake well before use;
- Allow to warm to room temperature before using;
- Store in refrigerator (needs to be stored in dark and cool environment);
- Use within three weeks after opening (document on bottle and calibration records when opened);
- Unopened shelf life is six months (check and document expiration date of bottle); and
- One-time use only (i.e. solution should not be re-used following single calibration).

5.0 DOCUMENTATION

The Project Manager or designated reviewer will check and verify that documentation of instrument calibration has been completed and the calibration records are filed in the project records.

6.0 REFERENCES

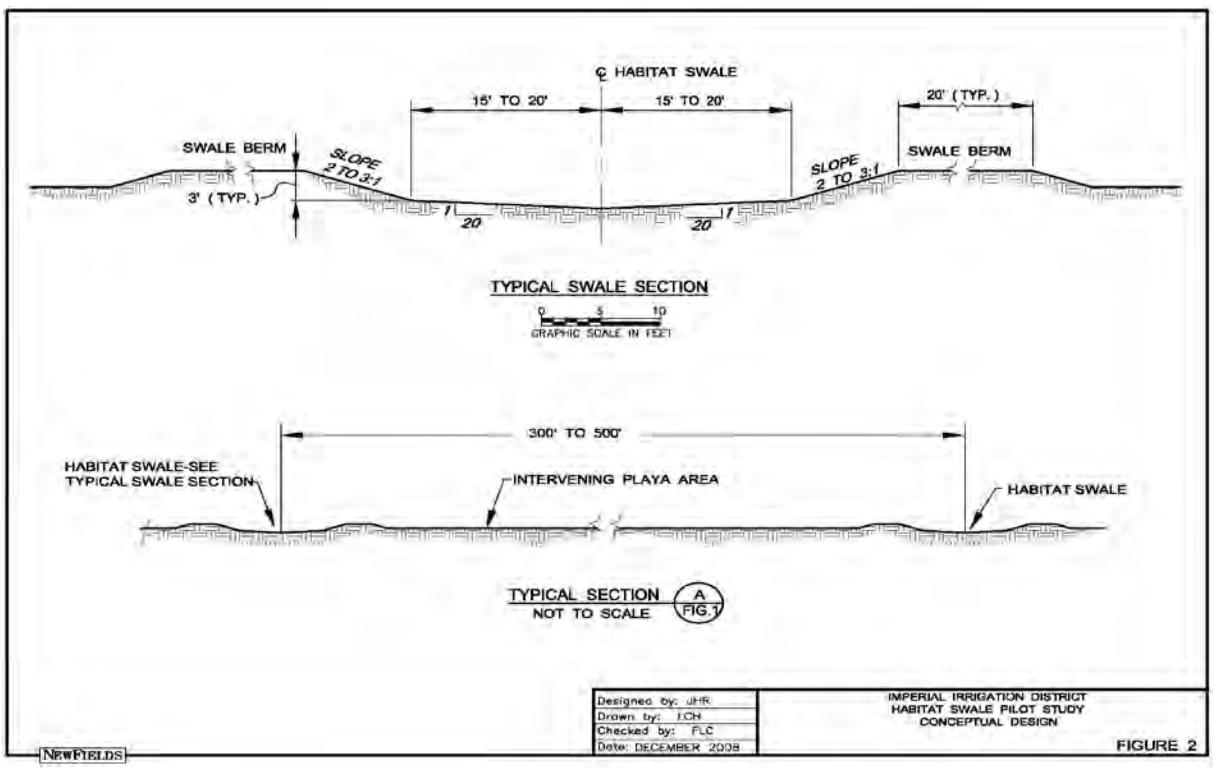
U.S. Geological Survey (USGS), variously dated. National Field Manual for the Collection of Water-Quality Data: U.S. Geological Survey Techniques of Water-Resources Investigations, Book 9, Handbooks for Water-Resources Investigations, Chapters A1-A9. Available online at http://pubs.water.usgs.gov/twri9A.

APPENDIX E – DUST CONROL MEASURE DESCRIPTIONS

E.1 Vegetated Swales

Habitat swales are vegetated, earthen channels constructed by raising pairs of parallel berms approximately 60 feet apart, with adjacent pairs of berms spaced 200 to 500 feet from one another (Figure E-1). Habitat swales operate on the principle of interrupting wind fetch (the distance that wind has traveled over an unobstructed area) on a playa, leading to reduced wind velocity at the soil surface and suppression of sand flux and dust emissions in downwind areas. After vegetation is established, swales capture sand and immobilize it beneath the plant community's canopy. A combination of periodic surface wetting, natural crusting, regional reduction in sand motion, and reduced surface wind velocities due to sheltering of areas downwind of the swales results in dust control over the entire swale and inter-swale area.

Figure E-1. Habitat Swale Cross-Section Conceptual Design



E.1.1 Configuration

As described above, swales will consist of parallel berms approximately 60 feet apart. The swales will be designed with a 30- to 40-foot bottom width and four feet total depth. The top width of each earthen side berm will be approximately 20 feet, with the top of the berm approximately two feet above existing grade. The configuration of the swales will be refined during design based on site-specific investigations (i.e., topography, surface erosion potential, primary wind direction) and desired dust control efficiency.

The swales and berms will be constructed from local, on-site materials. The import or borrow of soil, and the disposal of excess fill will be minimized.

Channel lengths and profile gradients will depend on site topography, but in general will be designed so that pulsed irrigation flows can be sustained along the full length of the swale without requiring excessively large and erosive flows at the head end. Given the relatively level topography of the sea floor (and therefore exposed playa in the future), longitudinal profile gradients are expected to be low. The swale cross-section will be sloped toward the center, where there will be a low-flow channel to provide drainage. Swale tailwater will be recycled for other uses or will flow to the Sea. Analysis of soil, wind, and water erosion potential will be conducted during the design phase and will help to determine adequate design criteria.

To achieve regional reductions in sand motion, and thus dust emissions, a network of swales (as described above) will be constructed at intervals of 200 to 500 feet, with traffic avoided to the maximum extent feasible on the intervening playa. A combination of natural crusting, regional reduction in sand motion, and reduced surface wind velocities due to sheltering of areas downwind of the swales will result in dust control over the entire swale and inter-swale area. Final swale spacing will be determined during the design phase as a function of topography, surface erosion potential, primary wind direction, and desired dust control efficiency targets.

E.1.2 Vegetation

Swale cross-sections would mimic natural channels, in which pulsed flow would spread laterally from the cross-section's low point. This favors development of a broad swath of vegetation, ranging from hydrophytic near the centerline to xeric and halophytic along the margins. Plant species will be selected based on suitability for range of the hydrologic regime and saline soil conditions of the site and location along the length of the swale (i.e., wetter conditions on the swale bottom and upstream; drier, more saline conditions on the swale margins and downstream).

In general, species will include sedges, rushes, and similar wetland vegetation located in the bottom and head end of the swale; grasses and other herbaceous species on both sides and downstream reaches of the swale; and shrub species up to the boundaries of anticipated swale seepage. Rhizomatous species should predominate in the swale because they increase the likelihood of re-establishment during long-term maintenance/management without the need for extensive re-planting. Vegetative cover within the swale will be established quickly, with gradual succession to more diverse native species. Stands of vegetation will provide ecological benefits (i.e., microhabitats) similar in character to desert wetlands and xeric native desert vegetation. This vegetation approach tends to discourage (but does not eliminate) establishment of invasive species, such as Tamarisk.

E.1.3 Operation

The swales will be irrigated by pulse irrigation to shorten water's residence/travel time and therefore minimize stagnant water in the swales. During establishment, drain water (inflows to the Sea) would be pulsed through each swale bi-weekly. As vegetation is established, inflows will likely be reduced to a frequency of every few weeks, or longer, as needed to maintain vegetative growth. After establishment, water would be pulsed through each swale 5 to 12 times annually. The timing and duration of the pulses will be a function of inflow availability, soil conditions, and plant irrigation needs. Irrigation frequency and duration will be evaluated during design and the pilot study.

Water flow into each swale will be controlled with slide gates. Open-channel flow will be measured near each gate structure to measure flows entering each swale. The number of swales that can be irrigated simultaneously will be determined by balancing the required flow rate with the available inflow supply. Details regarding flows into the swales, such as amount of flow, cycle times, cutoff time, and other parameters, will be developed during the final design phase.

Tractor and backhoe/excavation (mainly tracked) equipment will be used during construction and operation of the swales and irrigation systems; lighter, wheeled equipment may be employed for planting/maintenance of vegetation. Intermittent tractor and/or backhoe access will be required during the maintenance activities, including, but not limited to, cultivation and weed control. Intermediate access between periods of maintenance will likely be by small utility four-track vehicles.

E.2 Plant Community Enhancement

The central concept of this Dust Control Measure (DCM) is managed enhancement of existing vegetation onto new playa areas. As the Sea recedes, plant communities along the shoreline may naturally expand, especially where freshwater inflows create fresher, shallow groundwater and/or leach salts from newly exposed playa and create more favorable growing conditions (Figure E-2). Species would likely include a mix of sedges, rushes, and similar wetland vegetation located near the wet shoreline; grasses and other herbaceous species near the middle of the landscape; and shrub species in drier areas near and above the historic shoreline. These plant communities can achieve plant cover densities that postpone or eliminate the need for more resource-intensive DCMs.

Figure E-2. Existing Playa Vegetation Would be Expanded and Enhanced Under the Plant Community Enhancement Dust Control Measure

E.2.1 Configuration

The central concept of the vegetation enhancement DCM is enhancement of existing vegetation that can spread onto new playa as the Sea recedes. Configuration of the DCM, selection of vegetative species, and irrigation design will be determined by the existing vegetation and site-specific (landscape position, hydrologic, and salinity) conditions. Species would likely be a mix of sedges, rushes, and similar wetland vegetation located near the wet shoreline; grasses and other herbaceous species near the middle of the landscape; and shrub species in drier areas near and above the historic shoreline. Hydrophytic vegetation would likely line watercourses as they cross the playa.

As the Sea continues to recede, it is anticipated that the species mix (with the right management) will migrate down the playa with the shoreline. Over time, needed vegetation densities may no longer be sustainable in some areas without additional inputs, such as irrigation and/or artificial drainage. At this point, based on monitoring data, sensitive areas would likely be transitioned to another DCM as needed to sustain dust mitigation performance.

E.2.2 Operation

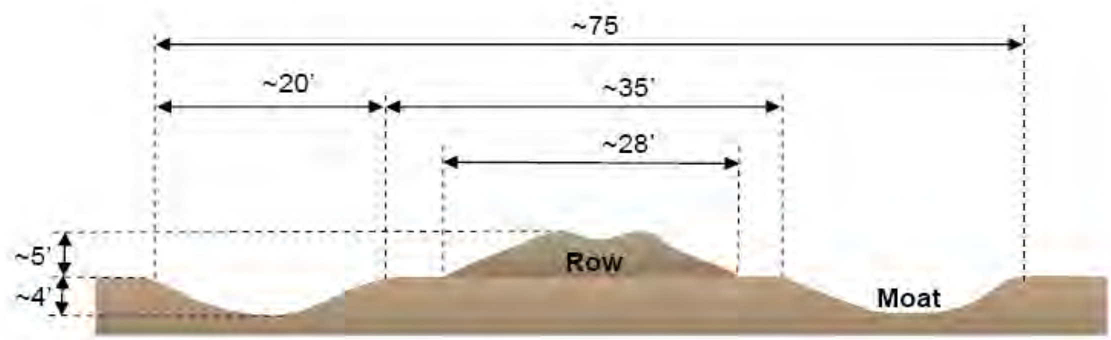
Any combination of flood, pulse, or drip irrigation may be used to meet plant water demand. When needed, fertilizer will be added to irrigation water to stimulate and support vegetative cover levels needed to meet the dust control efficiency requirements. The applied nutrients may include, but are not limited to: nitrogen, phosphorus, and potassium fertilizers, as well as small amounts of micronutrients. Soil and plant tissue will be monitored to determine fertilizer application rates based on plant nutrient needs, and to avoid excess application that might induce off-site migration of applied nutrients.

Tractor and tillage (tracked and/or wheeled) equipment may be used during construction and operation of the DCM, and for planting/maintenance of vegetation. Intermittent tractor and/or backhoe access will be required during the maintenance activities, including, but not limited to, cultivation and weed control. Intermediate access between periods of maintenance will likely be with personal and small utility four-track vehicles.

E.3 Moat and Row

Moat and row consists of an array of earthen berms (rows) flanked on either side by ditches (moats). Figure E-3 is a conceptual cross-section of this type of DCM. Spacing can vary depending on the surface type, the control effectiveness required, and the intensity of adjacent sand sources. Moats control dust by capturing moving soil particles and rows physically shelter the downwind playa by lifting wind velocity profiles, thereby reducing velocity at the soil surface. Moats and rows are constructed to run perpendicular to primary wind vectors. Dust control effectiveness can be enhanced by reducing the distance between rows, increasing the height of the rows, vegetating rows, or using gravel, sand fences, or similar methods to enhance sand capture between rows.

Figure E-3. Conceptual Cross-Section of a Moat and Row Dust Control Measure



E.3.1 Configuration

Moats and rows are generally parallel to one another and spaced at variable intervals so that fetch between rows is conducive to dust control. Spacing can vary depending on the surface type, the control effectiveness required, or exposure to and capture of sand coming from offsite. Previous experience indicates that Moat and Row spacing will generally vary from 250 to 1,000 feet. Spacing of Moat and Row elements is interdependent with cross-section design criteria (e.g., taller elements that shelter longer downwind fetches can be more widely spaced).

E.3.2 Operation

During operation, the Moat and Row array may need to be altered, improved, or maintained to achieve the required level of dust control. The extent, nature, and timing of these operational activities will be determined by monitoring results. Operational activities may include the following:

1. Construction of additional, intermediate moats and rows
2. Repair of existing moats and rows, mainly through excavation of adjacent playa to form new moats, and burial of sand-filled Moat and Row margins with spoil, effectively fattening the original row in the repaired section

3. Addition of sand fences to increase row height or to enclose the site along an unprotected margin

4. Watering of moats or area between Moat and Row elements

5. Irrigation and planting of vegetation on rows or area between Moat and Row elements

6. Gravel armoring along the tops of rows to prevent erosion of the row

E.4 Water-Efficient Vegetation

In this DCM, control is achieved by vegetating playa surfaces with salt- and drought-tolerant species that stabilize and suppress soil and sand movement beneath their canopies. Water-efficient vegetation pilot projects will be conducted to assess the effect of different levels of infrastructure, vegetation density, and vegetation uniformity on dust control efficiency, as well as water use and cost efficiency.

E.4.1 Configuration

Vegetation will be seeded or planted on raised beds 1 to 3 feet high and spaced 5 to 15 feet apart (center-to-center). Previous work on dry, saline playas suggests that the most desirable species for dust control are salt- and drought-tolerant, may be rhizomatous (growth by the spread of underground roots and shoots), and must provide adequate cover even during dormant periods. Saltgrass (*Distichlis spicata*) is a common species, but native shrubs, such as salt bushes (*Atriplex* spp.), greasewood (*Sarcobatus vermiculatus*), and seepweed (*Suaeda moquinii*) may also be used alone or in combination with saltgrass. A mix of native species will provide the needed diversity to maintain adequate cover levels, reduce water demand, and suppress invasive species. Species diversity will also allow better cover within the vegetated areas because different species can occupy different microhabitats. This vegetation approach tends to exclude (but does not eliminate) invasive species, such as Tamarisk.

E.4.2 Operation

Flood, pulse, or drip irrigation will be used to meet plant water demand needs. When needed, fertilizer will be added to irrigation water to stimulate and support adequate vegetative growth and cover levels needed for dust control. The applied nutrients may include, but are not limited to: nitrogen, phosphorus, and potassium fertilizers, as well as small amounts of micronutrients. Soil and plant tissue will be monitored to determine fertilizer application rates based on plant nutrient needs, and to avoid excess application that might induce off-site migration of applied nutrients.

Where soil or groundwater conditions so dictate, drainage improvements will be made to reduce the influence of saline shallow groundwater on the plant root zone. Drainage improvements may include: augmentation of natural drainage by increasing the size (height and width) of the raised beds; excavation of drainage interceptor canals; and/or installation of a subsurface drainage network to maintain an adequate depth of leached and unsaturated soil for plant rooting. Drains will consist of perforated plastic pipes installed in covered trenches and placed between 4 and 10 feet below ground surface. The drains will be enveloped by coarse material (fine gravel or sand) and wrapped in a fabric liner to prevent sediment movement into the perforated pipe, while still allowing for water collection. Final site conditions, design needs, operational inputs, vegetative cover levels, and control efficiency requirements will determine the ultimate mix of infrastructure to achieve dust control.

Tractor and backhoe/excavation (tracked and/or wheeled) equipment will be used during construction and operation of the DCM and irrigation systems, and for planting/maintenance of vegetation. Intermittent tractor and/or backhoe access will be required during the maintenance activities, including, but not limited to, cultivation and weed control. Intermediate access between periods of maintenance will likely be with personal and small utility four-track vehicles.

E.5 Surface Roughening

This DCM consists of roughening the land surface, typically with conventional tillage implements, depending on soil conditions and the target roughness. The roughened surface is less susceptible to erosion due to the lifting of the boundary layer of moving air further above the land surface, and due to the capture of mobile sand within the furrows created by the roughened surface. To maintain control over time, Surface Roughening may need to be repeated periodically as the land surface may be smoothed by erosion, sedimentation, and settling.

E.5.1 Configuration

Where less than 100 percent of the land surface can be tilled to achieve target levels of control, Surface Roughening can be done in blocks or strips that facilitate tillage by minimizing turning, and that avoid traffic on untilled areas to the maximum extent practicable. The long axis of tilled blocks should be oriented perpendicular to the principal wind vectors. Long, uninterrupted fetches across untilled areas should be avoided.

For heavier (more clayey) soils, relatively deep cuts will require substantial draft power and have a relatively narrow working width (per pass), whether soil is turned with a dozer blade or plow. However, resulting roughness is substantial and should not require re-tillage as frequently as lighter soils.

On lighter (sandier) soils (which are rare on the Salton Sea playa), Surface Roughening may be more superficial and may be done with lighter, wider equipment (e.g., a sandfighter). It should therefore proceed more rapidly, but will likely have to be maintained at more frequent intervals.

E.5.2 Operation

Surface Roughening has significant cost and operational advantages over other dust control approaches. Relative to other DCMs, it can be designed and installed at fairly low cost with unspecialized equipment. However, maintenance costs may be significant, depending on the average return time for maintenance and the types of implements used. One of the great strengths of Surface Roughening, where applicable, is its potential for flexible, rapid, and relatively low-cost deployment.

The main challenges of Surface Roughening are the need to adapt the approach to soil conditions and required level of control, and the potentially frequent maintenance activity. It could also be that, as soils dry on the playa, the effectiveness of Surface Roughening may decline, and the cost of adequate control may increase. Over time, Surface Roughening could also potentially become a significant dust source, both due to dust emissions during the tillage operation, and if the roughened surfaces are no longer sufficiently moist and stable to provide control. On the other end of the spectrum, when soils are too moist, it is difficult to achieve the draft power needed to pull or push equipment, and workability of the soil, functioning of equipment, and resulting roughened surface conditions can all be compromised.

E.6 Shallow Flooding

The goal of the Shallow Flood DCM is to provide dust control by maintaining a sufficiently wet surface, thereby reducing saltation and dust emissions. The areal extent of wettingdepends mainly upon the amount of water present on the surface, evaporation rate and lake bed topography, and required control efficiency.

E.6.1 Configuration

Shallow flooding can vary from sheet flow, with , consists of releasing water from arrays of low-flow water outlets spaced at intervals of between 60 and 100 feet along pipelines laid along lake bed contours. The pipelines are spaced between 500 and 800 feet apart. This arrayed configuration of water delivery creates large, very shallow sheets of braided water channels. Water depths in sheet flooded areas are typically at most just a few inches deep. The lower edge of sheet flooded areas has containment berms to capture and pond excess flows. The water slowly flows across the typically very flat lake bed surfaces downhill to tail-water ponds where pumps recirculate the water back to the outlets.

To maximize project water use efficiency, flows to sheet flow areas are regulated at the outlets so that only sufficient water is released to keep the soil wet. Although the quantity of excess water is minimized through system operation, any water that does reach the lower end of the control area is collected and recirculated back through the water delivery system. At the lower end of the sheet flooded areas, or at intermediate locations along lower elevation contours, excess water are collected along collection berms and pumped back up to the outlets to be reused.

Pondflooded areas have water containment berms that allow ponds to be formed that submerge the emissive lake bed areas. These ponds are much deeper than sheet-flooded areas—pond waters are up to four feet deep. The containment berms are typically rock-faced to protect them from wave erosion. Water is usually delivered through one large water inlet per pond. Water is delivered to the pond area until the pond reaches a size and depth sufficient to submerge the required amount of emissive area. Water delivery then ceases until evaporation reduces the pond size to a set minimum.

Non-wetted infrastructure associated with the Shallow Flood DCM includes raised berms, roadways, equipment pads and their associated sloped shoulders. In some cases the shoulders are rock-faced to protect them from wave erosion. Well-traveled roads are typically paved with gravel; less-traveled roads and berms are unpaved. Shallow Flooding requires water transmission, distribution and outlet infrastructure, excess water retention, collection and redistribution infrastructure and the construction of electrical power lines, access roads and water control berms

E.6.2 Operation and Maintenance

Water flows during the dust season will be maintained to provide the required water coverages in substantially evenly distributed standing water or surface-saturated soil. Maintenance activities associated with Shallow Flooding consist of grading, addition of supplemental water outlets, and berming on the control areas to ensure uniform water coverage and prevention of water channeling. Other activities include regular and preventative maintenance of pipeline, valves, pumping equipment, berms, roads and other infrastructure.

E.6.3 Monitoring

The actual wetness coverage for Shallow Flooding areas can be determined using Landsat Satellite Imagery. Satellite imagery is assessed using the Shortwave Infrared band (SWIR) and thresholding to derive a spatial map of standing water and saturated soil surfaces. The following portions of the areas designated for control with Shallow Flooding are exempted from the wetness coverage requirements:

1) Raised berms, roadways and their shoulders necessary to access, operate and maintain the control measure which are otherwise controlled and maintained to render them substantially non-emissive.

2) Raised pads containing vaults, pumping equipment or control equipment necessary for the operation of Shallow Flooding infrastructure which are otherwise controlled and maintained to render them substantially non-emissive.

E.7 Gravel Cover

Gravel Cover forms a non-erodible surface when the size of the gravel is large enough that the wind cannot move the surface. If the gravel surface does not move, it protects finer particles from being emitted from the surface. Gravel and rock coverings have been used successfully to prevent wind erosion from mine tailings in Arizona (Chow and Ono, 1992).

E.7.1 Configuration

A two to four-inch layer of coarse gravel (½ to 1½-inch and larger rocks) laid on the surface of the playa will prevent PM10 emissions by: (a) preventing the formation of efflorescent evaporite salt crusts, because the large pore spaces between the gravel particles disrupt the capillary movement of saline water to the surface where it can evaporate and deposit salts; and (b) creating a surface that has a high threshold wind velocity so that direct movement of the large gravel particles is prevented and the finer particles of the underlying lake bed soils are protected. Gravel Cover is effective on essentially any type of soil surface.

E.7.2 Operation and Maintenance

Once the Gravel Cover has been applied to the playa, limited maintenance would be required to preserve the Gravel Cover. The gravel will be visually monitored to ensure that the Gravel Cover was not filled with sand or dust, or had not been inundated or washed out from flooding. If any of these conditions were observed over large areas, additional gravel will be transported to the playa and applied to the playa surface

E.8 Alternative Land Use

Alternative land use practices can be implemented to cover exposed playa and thus eliminate or significantly mitigate the potential for emissions. Example land use practices include the following:

- **Reclamation of agricultural land.** Portions of exposed playa may be reclaimed for more conventional agricultural activities, such as graminoid forage crops typically grown in the Imperial Valley, or aquaculture crops, such as algae. These crops may be harvested for protein (food) or used as biomass for conversion to energy.

  The development of exposed playa for agriculture will be constrained by irrigation infrastructure, irrigation water availability, and agricultural markets. Certain areas around the southwest quadrant of the Sea have soil types that are suitable for conventional agricultural production of crops. The areas west of the New River delta include soil associations/complexes that are silty clays and various loams. The soils are also considered non-hydric and moderately- to well-drained. Aquaculture farming (i.e., algae and other aquatic vegetation) may be located on exposed playa areas with less suitable soils types. IID will continue evaluating areas around the Sea to evaluate reclamation potential for agricultural activity.

  IID is also evaluating several halophytic plants that might be suitable for crop use in playa areas or other high salt content soils. Vegetating playa with high salt tolerant plants may allow the reclamation of playa areas with less well drained soils and/or soils with higher salt content. IID may also elect to reclaim areas of playa for agricultural purposes or to develop specific crop types that could be used on playa areas without partnering with local entities.

- **Energy Generation Projects.** Energy generation projects that use geothermal and solar resources may also be located on exposed playa. The surface facilities needed to generate energy from these resources could be located on exposed playa and could also, with prior planning and design modification, be co-located with habitat projects.

  Geothermal: The Refined Conceptual Modeling and a New Resource Estimate for the Salton Sea Geothermal Field, Imperial Valley, California (Hulen, et. al. Sept 2002) defined the geothermal resources at the Salton Sea as more extensive than previously thought. The so-called Salton Sea Shallow Thermal Anomaly is mapped from east of the New River delta, through the Alamo River delta area and the Morton Bay/Mullet Island area and along the east side of the Salton Sea to the Imperial Wildlife Area-Wister Unit. The potential geothermal area extends out into the Sea up to three miles in some areas.

Solar: There are two types of solar energy recovery being considered for installation on exposed playa: photovoltaic panel technology and solar gradient ponds. Photovoltaic panel technology is a relatively well proven technology, although it has not been tested on the extreme environment of the Sea playa.

Solar gradient ponds, which extract energy by using solar rays to heat the lower water layer in a stratified impoundment, are being considered as a longer-term (greater than five years) use for the playa. While this technology has been moderately successful in other areas, it has not been tested in the Imperial Valley.

E.9 Species Conservation Habitat and other Habitat-Based Uses

Biological habitat is another type of land use that can cover exposed playa and thus eliminate or significantly mitigate the potential for emissions (analogous to Shallow Flood). Numerous habitat restoration projects are proposed in the Salton Sea area in an effort to sustain the fish and wildlife currently dependent on the Sea. Some of these projects will extend onto areas of the playa that would otherwise be exposed. These projects include, but are not limited to, the following:

- The Species Conservation Habitat Project will be located at the southern end of the Sea and will create up to 3,770 acres of relatively shallow water habitat. Ponds to support fish and wildlife species will be constructed and operated by the CA Department of Fish and Game and supplied with a combination of brackish and saline water, blended to maintain an appropriate salinity range.

- The US Fish and Wildlife Service has proposed development of approximately 700 acres of wading and shore bird habitat in Red Hill Bay in an effort to maintain wetland habitat values on this part of the National Wildlife Refuge.

- There is also potential for the Wister Unit of the Imperial Wildlife Area or the Sonny Bono Salton Sea National Wildlife Refuge Complex to expand habitat onto exposed playa.