Salton Sea Management Program:

Dust Suppression Action Plan

July 31, 2020

Project Team

This plan was prepared by staff from the California Natural Resources Agency, the California Department of Fish and Wildlife, the California Department of Water Resources, the California Air Resources Board, and the following consultants supporting the Salton Sea Management Program: Cardno, the Desert Research Institute, and Tetra Tech.

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Additional Information

An electronic copy of this report and additional information about the Salton Sea Management Program (SSMP) can be found at www.saltonsea.ca.gov. To receive periodic updates on SSMP implementation, sign up at www.saltonsea.ca.gov or send an email to cnra-saltonsea@resources.ca.gov.

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Executive Summary

Improving air quality and creating habitat at the Salton Sea are key priorities for Governor Gavin Newsom and the California Natural Resources Agency (CNRA). The Sea's continuing decline in elevation and resulting exposure of lakebed are negatively impacting surrounding communities and reducing remaining habitat for fish and wildlife. To address these concerns, the Salton Sea Management Program (SSMP) was established in 2017. As a component of the SSMP's Phase I: 10-Year Plan, the Dust Suppression Action Plan (DSAP) is a guide to expediting the implementation of dust suppression and associated habitat projects. These proposed projects are intended to meet the goals of the SSMP and specific annual acreage targets outlined in State Water Resources Control Board Order WR 2017-0134.

The task of implementing specific projects involves four elements: *project planning areas* that define the footprint over which opportunities for dust suppression projects are evaluated; *project concepts* that propose specific dust suppression approaches, including habitat components; *project designs* that describe in detail the specific actions to be taken; and *implementation* that involves actual construction on the ground. The DSAP identifies and prioritizes a planning area of approximately 9,800 acres at locations of exposed lakebed around the Salton Sea. The DSAP lays out specific tasks, timelines and coordination to move from project planning area to implementation. CNRA, in collaboration with the California Department of Water Resources (DWR) and the California Department of Fish and Wildlife (CDFW), and with the support of the California Air Resources Board (CARB), is focused on implementing these projects. In this document, participating staff from these agencies are referred to as the *State Team*.

Dust is emitted from the exposed dry lakebed of the Salton Sea by the action of wind through a process termed *saltation*. Dust suppression methods often rely on increasing surface roughness to reduce wind speeds near the surface. This may be done by adding surface features through tillage of the ground, encouraging the growth of vegetation, or creating structures such as sand fences that act as wind breaks. Other methods include using moisture to increase adhesion of surface particles that limits their movement by wind directly by the application of water or through the addition of surface stabilizers with water. Dust emissions may also be controlled by covering an area with water, although this is challenging because of the limited availability of water in the desert

environment around the Salton Sea. Vegetation and ponded water serve the function of reducing dust emissions and also restoring habitat.

The DSAP proposes a variety of potential methods that may be used to implement dust suppression across nine defined project areas around the perimeter of the Salton Sea to be constructed between 2020 and 2022. These proposed project areas include the Species Conservation Habitat (SCH) Dust Project (to be constructed in 2020 within the footprint of the SCH Project); Wister-Frink; Kane Spring; Bombay Beach; San Felipe Fan; Tule Wash; the Clubhouse Area; Coachella Exposed Lakebed; and the North Shore Area. These areas were selected based on four factors: an evaluation of soil emissivity, potential for timely environmental permitting authorizations and access, sites with potential availability of short- and long-term water supplies, and sites with proximity to residential populations. Additional sites were selected based on public concerns related to dust emissions. Project concepts have been developed using a variety of dust suppression methods, including some that use water and some that do not. This diverse portfolio of approaches allows for exploring different methods that are best suited to different parts of the exposed lakebed, provides opportunities for creating habitat, and provides the flexibility needed to meet air quality regulatory requirements across different site conditions. Several of these project area definitions and dust suppression concepts build on work performed as part of the Imperial Irrigation District's (IID's) Air Quality Mitigation Program (AQM, IID, 2016), and with data reported in IID's Proactive Dust Control Plans (the most recent being the 2019-2020 Proactive Dust Control Plan).

Overall schedules for implementation of the DSAP projects are based on the State Team's experience with planning, permitting, design, and contracting to develop tasks and estimated timelines for different project areas. Many of the activities in individual project areas can be initiated concurrently, allowing the project concepts to proceed in the most expeditious manner possible. The State Team envisions this DSAP as a flexible working plan to outline the actions the SSMP proposes to undertake the time-critical needs of protecting local communities from the adverse effects of lakebed exposure in the coming years and of implementing the acreage requirements of State Board Order WR 2017-0134. The DSAP is also intended to be a living document and will be updated as new information is developed related to site conditions, confirmation of landownership, regulatory requirements, project construction, effective dust suppression approaches, and monitoring approaches.

Surface Roughening Near the Salton Sea (Photo Credit: IID).

Acronyms and Glossary

Term	Definition
AQMP	Imperial Irrigation District's Air Quality Mitigation Program
BACM	Best Available Control Measure, approved measures for controlling dust emissions
BBCSD	Bombay Beach Community Services District
BLM	U.S. Bureau of Land Management
CAAQS	California Ambient Air Quality Standards
CALMET	California Meteorological Model
CARB	California Air Resources Board
CDFW	California Department of Fish and Wildlife
CDPR	California Department of Parks and Recreation
CEQA	California Environmental Quality Act
CIMIS	California Irrigation Management Information System
CNRA	California Natural Resources Agency
CVWD	Coachella Valley Water District
DCM	dust control measure
DEM	digital elevation model
DRI	Desert Research Institute
DSAP	Dust Suppression Action Plan
DWR	California Department of Water Resources
ICAPCD	Imperial County Air Pollution Control District
IID	Imperial Irrigation District

Term	Definition
JPA	Joint Powers Authority
LiDAR	light detection and ranging, a tool for getting precise data on ground elevations
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NGO	nongovernment organization
O&M	operations and maintenance
PI-SWERL®	Portable In-Situ Wind Erosion Laboratory, a device used to obtain estimates of soil emissivity in a standard manner across large areas
PM	particulate matter, in this context refers to suspended dust in the air
$PM_{2.5}$	fine suspended particulate matter, less than 2.5 microns
PM_{10}	coarse suspended particulate matter, less than 10 microns
QSA	Quantification Settlement Agreement, an agreement among state, federal, and local agencies allowing the transfer of irrigation water from IID to the San Diego County Water Authority, Coachella Valley Water District, and Metropolitan Water District of Southern California for urban use
QSA JPA	Joint Powers Authority created to fund mitigation activities to address impacts of agricultural-to-urban water transfers from the QSA, including the AQMP
RWQCB	Regional Water Quality Control Board
saltation	wind‐driven, hopping motion of sand-sized particles across a surface
SANTRI	Standalone AeoliaN Transport Real-time Instrument
SCAQMD	South Coast Air Quality Management District
SCCSD	Salton City Community Services District
SCH	Species Conservation Habitat
soil emissivity	characteristic of soil surface to generate fine particulate emissions when subject to wind shear
TMDCI	Torres Martinez Desert Cahuilla Indians
UAV	unmanned aerial vehicle, also termed a drone, used for aerial imaging of project sites
USBR	U. S. Bureau of Reclamation
wind shear	Forces on surface created by wind that result in saltation and subsequent release of fine particulate material

1 Introduction

Improving air quality and creating habitat at the Salton Sea are key priorities for Governor Gavin Newsom and the California Natural Resources Agency (CNRA). The Sea's continuing decline in elevation and resulting exposure of lakebed negatively impact surrounding communities and reduce remaining habitat for fish and wildlife. To address these concerns, the Salton Sea Management Program (SSMP) was established in 2017. CNRA, in collaboration with the California Department of Water Resources (DWR) and the California Department of Fish and Wildlife (CDFW), and with the support of the California Air Resources Board (CARB), is focused on implementing multiple habitat and dust suppression projects around the Sea. In this document, participating staff from these agencies are referred to as the *State Team*.

The SSMP is focused on restoration of the Salton Sea ecosystem, pursuant to the Salton Sea Restoration Act, Fish & Game Code section 2930, *et seq.,* and on meeting the acreage requirements of State Water Resources Control Board Order WR 2017-0134. The SSMP released the Phase I: 10-Year Plan in 2017 and updated it in 2018 to guide state projects at the Salton Sea over the next decade (2018-2028). The plan lays out a high-level schedule for target project locations and identifies habitat and dust suppression acreage goals that meet the requirements of State Water Resources Control Board Order WR 2017-0134. This order, adopted in 2017, outlined the State Water Board's oversight role in monitoring and ensuring progress toward the goals of the SSMP, and sets annual milestones for habitat restoration and dust-suppression projects. As a component of the broader Phase I: 10-Year Plan, the Dust Suppression Action Plan (DSAP) is a guide to expedite the development and implementation of dust suppression project concepts. **Figure 1** shows the geograpic setting of the Sea and the exposed lakebed area over 2003–2020, with further declines in lake level expected in the coming decades.

The following general terminology is used in this document. The task of implementing specific projects involves four elements: project planning areas that define the footprint over which opportunities for dust suppression projects are evaluated; project concepts that propose specific dust suppression approaches; project designs that describe in detail the specific actions to be taken; and implementation that involves actual construction on the ground. Thus, a planning area requires a sequence of steps to result in a project, and

depending on site conditions and other regulatory constraints, not all planning areas may be converted to a project of equivalent area.

The DSAP identifies and prioritizes a planning area of approximately 9,800 acres for dust suppression projects at locations of exposed lakebed around the Salton Sea based on the best available scientific data, proximity to populated areas, ease of securing landowner access and environmental permitting, sites with potential availability of short- and long-term water supplies, and information obtained through public input. The DSAP builds on work performed as part of the Imperial Irrigation District's (IID's) Air Quality Mitigation Program (AQMP, IID, 2016), utilizing emissions estimates and dust control plans documented in subsequent annual reports and through online databases. The DSAP includes specific project areas identified in IID's Proactive Dust Control Plans (specifically the 2019-2020 Proactive Dust Control Plan, IID 2020c) and other areas identified through public input. Project concepts, utilizing a combination of dust suppression approaches are proposed at each of these areas.

Going forward, the State Team will perform the necessary steps to implement these project concepts, including obtaining permits from all necessary regulatory authorities and access from landowners, collecting additional field data as needed, and developing more detailed designs based on ground-level information. The required steps are described in this document. The DSAP is a working plan and will serve as a living document to be refined over time with better information to be collected at the project level—related to site data, land access, permitting and regulatory requirements. Project plans may also evolve through continued engagement with the community, stakeholders, and collaborating agencies. Projects will be developed to meet the specific regulatory requirements of various state, local and federal agencies with jurisdiction over the project areas, in particular, for these dust suppression projects, the requirements of air quality regulators such as the Imperial County Air Pollution Control District (ICAPCD) and the South Coast Air Quality Management District (SCAQMD).

The DSAP is created as a roadmap to facilitate the State Team's implementation of dust suppression projects; by itself, the DSAP is not intended to be a regulatory document, although such documents will be prepared over the course of project implementation. Such project-specific plans and designs will be prepared in consultation and collaboration with landowners, regulatory agencies, and various stakeholders as appropriate.

Figure 1. Salton Sea Setting, Historical Exposed Lakebed from 2003–2020, and Communities in the Region.

1.1 Salton Sea Regional Climate and Setting

The Salton Sea, in the southeastern part of the state, is California's largest lake in terms of surface area. Climatic conditions in the Salton Sea region are dominated by atmospheric changes associated with warm air from the high-pressure center of the Pacific Ocean. The coastal mountains prevent the intrusion of cool, damp air from California coastal areas into the region. As a result, the region experiences clear skies, extremely hot summers, mild winters, and little rainfall. The climate in the Salton Sea region is one of great extremes. The local rainfall is about 2.5 inches per year while the temperatures can often reach above 110 degrees Fahrenheit (°F) in the summer and below freezing in the winter. The flat terrain of the region and strong temperature differentials created by intense solar heating produces air stagnation conditions during winter nights from thermal inversions.

The prevailing high winds in the Salton Sea region are from the northwest through the southwest. High wind speeds vary by region around the Sea and are important for this work because of the potential for suspending dust from exposed areas. Winds greater than 25 mph are recorded on the central and southern shores of the Sea on about 1.4% of annual hours, and about 0.01% of annual hours on the northern shore. Peak hourly wind speeds reach 47 mph on the central and southern shores, and 28 mph on the northern shore. Periods of high winds occur most frequently during April and May.

The unique geographic and weather conditions in the Salton Sea region create daily patterns that differ by season. In the winter months, a layer of air at the ground surface cools after daily solar radiation diminishes before the air above cools, creating an inversion. The strongest inversions in the Imperial Valley occur at night during winter months and tend to concentrate pollutants as these periods are characterized by very low wind speeds and very little dispersion of pollutants (ICAPCD, 2018a). In valleys and low-lying areas, this condition increases as a result of cold air flowing toward the Sea from the surrounding mountains and pooling on the valley floor. During summer months, the air at ground level is heated in the morning and rises as surface temperatures increase. This allows marine air on the west side of the Peninsular Range to begin flowing over the mountain crest, down the eastern slope, and across the Imperial Valley (Evan, 2019). The rush of marine air produces wind gusts at ground level that have the potential to entrain loose soil particles, producing windblown dust.

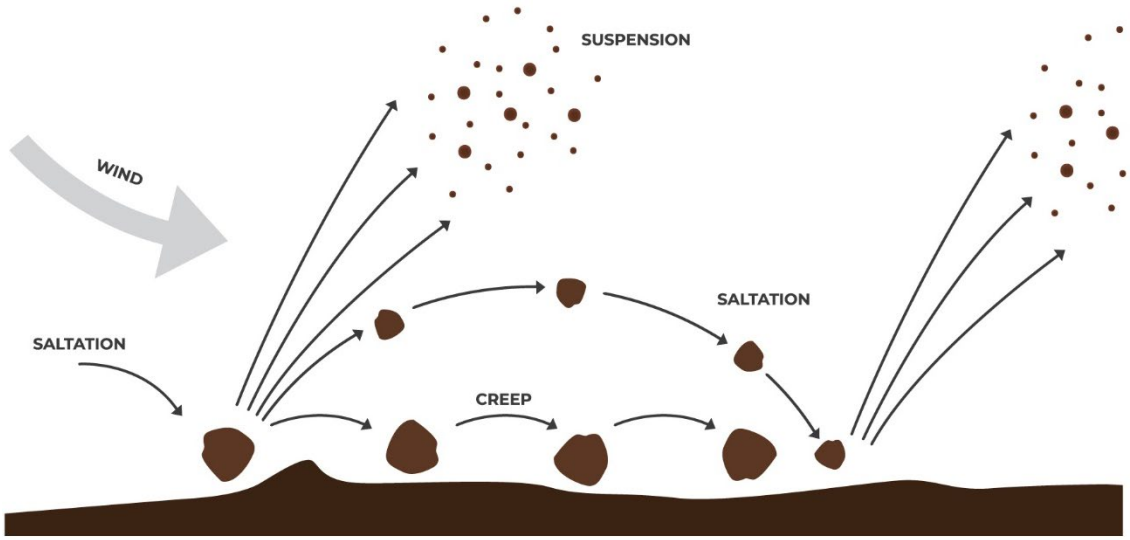
1.2 Dust Emissions from Lakebed and Management

Dust is emitted from the exposed dry lakebed of the Salton Sea by the action of wind, through a process termed *saltation*. Saltation is the wind-driven, hopping motion of sand-sized particles across a surface. This motion not only transports sand-sized particles but through bombardment of the surface, may also initiate the entrainment and subsequent transport by suspension of smaller dust particles (**Figure 2**). Since the emission of dust from dry surfaces is caused by the action of wind close to the ground surface, dust suppression methods often rely on increasing surface roughness to reduce wind speeds near the surface. This may be done by adding surface features through tillage of the ground, encouraging the growth of vegetation, or creating structures such as sand fences that act as wind breaks. Other methods include the use of moisture to increase adhesion

of surface particles that limits their movement by wind, directly by the application of water, or through the addition of dust suppressants with water.

Dust emissions may also be controlled by covering an area with water, although this is challenging because of the limited availability of water in a desert environment and because of the cost of transporting it to where it may be needed for dust suppression. However, projects using water to form shallow ponds or support vegetation also have the added benefit of restoring habitat while also controlling dust emissions.

Figure 2. Processes of Dust Emission from a Dry Lakebed. (Modified from Presley and Tatarko, 2009)



1.3 Ongoing Dust Suppression Projects

The 2003 Quantification Settlement Agreement (QSA) among multiple federal, State, and local agencies established a mechanism through which the environmental impacts of water transfers from IID to urban users outside the Salton Sea basin (to the San Diego County Water Authority, the Coachella Valley Water District, and the Metropolitan Water District of Southern California) can be mitigated. A Joint Powers Authority (JPA) was formed to fund these mitigation efforts. Funding from the JPA to IID and its consultants has supported studies, data collection, and dust suppression projects around the Salton Sea, including the preparation of the framework document on the Air Quality Mitigation Program (IID, 2016). Key information collected through the IID work includes data on soil conditions and soil emissivity around the perimeter of the Salton Sea, from field studies testing different dust suppression methods, from monitoring of air quality around the Salton Sea, and from modeling the role lakebed emissions play on regional air quality. In addition, this work has identified specific project areas and concepts for future implementation around the perimeter of the Sea (IID, 2020c), several of which are adopted in this plan. In the context of this plan, adoption refers to the use of IID's planning areas, site data, design concepts, and monitoring approaches as a starting point for the DSAP.

1.4 DSAP Project Prioritization

The air quality-related work performed by IID, described in greater detail in the following chapters, provides the foundation for the projects proposed in this DSAP. The State used the following criteria/factors to identify dust control sites:

- Available scientific data from around the Salton Sea (air and water quality, soil properties, meteorological data—notably wind direction and extreme wind events, and sand-related dust emissions) were used to locate projects in the most emissive areas.
- Sites were selected where it is envisioned that environmental permitting and access authorizations could be secured in a timely manner.
- Sites with potential availability of short- and long-term water supplies were selected to allow implementation of a wider array of dust suppression methods.
- Sites close to residential populations were identified to benefit communities from reduced emissions from exposed lakebed.

Recognizing the urgency to implement dust control projects on the exposed lakebed of the Salton Sea, the State Team organized the project areas in this plan into two groups. **Phase A** project areas are anticipated to have streamlined implementation and are proposed to be constructed starting in 2020. **Phase B** project areas might require additional planning and preparation before they can be implemented. Phase B projects are envisioned to be planned starting in 2020 and implemented in the field during 2021–2022. Importantly, Phase B project areas also provide habitat restoration benefits beyond dust suppression.

1.4.1 Phase A Project Approach

Phase A project areas are intended to be transitioned to implementation in 2020. These areas meet the criteria of being emissive and are anticipated to have less complex permitting and access needs. The project concepts for these areas will incorporate dust suppression methods that can be implemented expeditiously and have fewer planning and infrastructure requirements. Although the requirements are less extensive than for Phase B project concepts, there will still be a need for working with landowners, regulators, and stakeholders to move from the project concepts to site-specific designs, and to develop project designs and a monitoring network that can be used to demonstrate accomplishment of dust emission reduction goals. Phase A project areas will be converted in Phase B to include water-using projects that also provide habitat benefits.

1.4.2 Phase B Project Approach

Phase B project areas are to be transitioned to projects with planning initiated in 2020 and field implementation by the end of 2022. These project concepts may entail more complex permitting, access, and infrastructure requirements than Phase A projects. Additional data may need to be collected at some of these sites to help design the most suitable dust suppression approach. Project concepts in this group require application of water in some form such as for vegetation growth or shallow flooding, additional analysis

steps, and/or possibly dedicated conveyance infrastructure to be implemented. Because of the time needed to complete these steps, these project concepts are generally considered in Phase B. Also, all Phase A projects will also have a Phase B component, with a habitat benefit in addition to dust suppression.

1.5 Outreach and Engagement in Development of this Plan

Initial concepts related to DSAP elements were presented at several communities around the Salton Sea (see **Figure 1**) and to the primary agencies involved in air quality management. A draft of this DSAP was shared with the community and with air quality stakeholders, and feedback received was used to develop this DSAP draft. The outreach and engagement process is described below.

1.5.1 Outreach

In November 2019, the State met with the SSMP Community Engagement Committee to discuss a plan for effective and meaningful public outreach. Based upon the Committee's feedback, the State Team held public meetings in December 2019 in Mecca and Salton City to seek input about how dust affects residents and potential locations and methods for dust suppression projects. These meetings were specifically held prior to development of the draft DSAP to solicit early public input to help shape the plan. Feedback received during these meetings was incorporated into the criteria used to select projects identified in the draft DSAP.

After the release of the draft DSAP in February 2020, three more meetings were held in late February and early March to gather additional community input to help refine the DSAP. Meetings were held in Westmorland and Bombay Beach, and on the Torres Martinez Desert Cahuilla Indian reservation in Thermal (**Figure 3**). Appendix A presents a summary of the methodology, approach, and outreach efforts conducted in support of the DSAP public meetings.

This document was provided for Tribal review in July 2020 pursuant to the CNRA Tribal Communication and Consultation Policy.

Figure 3. Public Meetings Held at Tameka Gym on the Torres Martinez Desert Cahuilla Indians Reservation, Thermal, (*left*) and Bombay Beach (*right*).

1.5.2 Air Quality Stakeholder Coordination

The State is closely collaborating with IID and is committed to working with ICAPCD and SCAQMD to ensure that the DSAP meets all technical and regulatory requirements related to dust control. Beginning in December 2019, the State initiated DSAP-focused coordination with air quality-related stakeholders. This effort included conducting regular meetings and conference calls with IID; coordinating with ICAPCD; involving IID and CARB staff in the December 2019 public presentations; and having individual calls with ICAPCD, IID, CARB, and SCAQMD to review their comments on the draft DSAP.

The technical team members from both the State and IID collaborated regularly to share and understand the applicability of data collected and processed by IID and their consultants over the last 5 years (IID Air Quality Mitigation Program). The meetings allowed sharing of insight from IID's implementation of dust control projects on the exposed lakebed and of information regarding proposed project sites that have been developed by IID in consultation with ICAPCD.

1.5.3 Comments and Responses on Draft DSAP

In addition to the public and agency meetings, the State accepted written comments on the draft DSAP through March 27, 2020. Appendix B provides a summary of public and agency comments and responses. All public, stakeholder, and collaborating agency comments and input received during the meetings in December 2019 and February/March 2020 and submitted electronically, are posted on the CNRA Salton Sea website at www.saltonsea.ca.gov. Additional comments were also received from regulatory agencies on an Administrative Draft of the DSAP (dated June 4, 2020). These comments are also posted on the CNRA Salton Sea website. This document is a further revision reflecting these comments.

1.6 Proposed Project Areas

Based on the priorities established for the projects utilizing IID analyses and data, feedback from the community and other stakeholders, and the required dust suppression goals of State Board Order WR 2017-0134, this plan identifies a set of discrete project areas for planning and designing project concepts for expedited implementation using a two- phase approach. The project planning areas constitute a total of 9,800 acres, with 4,600 acres to be considered for implementation during Phase A and 5,200 acres to be considered for implementation during Phase B. It is anticipated that during the planning process some areas will be determined not suitable for implementation and that not all 9,800 acres will be implemented.

Table 1 summarizes the named project area acreages proposed to be completed during Phase A and Phase B. The project planning areas are located around the perimeter of the Sea, as shown in **Figure 4**. The subsequent chapters in the DSAP provide additional detail on the steps necessary to plan, implement and monitor dust suppression projects across these project areas. The first seven of the project areas in **Table 1** are adopted from IID's planning process (IID 2020c), and the last two are based on community input (Coachella Exposed Lakebed and Northshore). For these two areas, IID data suggest that emissivity is low, although there is a potential concern because of proximity to populations. The State

Team will perform additional analyses to evaluate the appropriateness of specific dust suppression approaches in these areas. Across all project areas, actual acreages of implemented projects may be smaller because of exclusions on areas where dust suppression actions cannot be performed. Such exclusions may occur for a variety of reasons, including, but not limited to: site access limitations, potential presence of endangered species, water availability limitations, and non-suitability of most dust suppression approaches given site-specific conditions.

Table 1. DSAP Project Areas and Acreages

Project area	Phase A (acres)	Phase B (acres)	Total acreage
Species Conservation Habitat	1,900		1,900
Wister-Frink (WF-1 and 2)	340	660	1,000
Kane Spring (KS-1–4)	1,100		1,100
Bombay Beach (BB-1 and 2)	400	480	880
San Felipe Fan (SFF-1 and 2)	860	860[a]	860
Tule Wash (TW-1 and 2)		1,850	1,850
Club House (CH-1)		780	780
Coachella Exposed Lakebed (CP-1–6)		1,340	1,340
North Shore		90	90
Approximate Total Acres	4,600	5,200	9,800

(*Source*: DWR, 2020)
Note:
a Vegetated area will be the same as surface roughening and, therefore, is not included in the Phase B total to avoid double counting.

Figure 4. Proposed Project Locations for Phase A and B.

1.7 Use of this Plan

This document serves as the State's roadmap for implementing dust suppression projects around the Salton Sea, in fulfillment of its planned obligations through the SSMP. This document provides a high-level summary of the project areas, project concepts, steps and timelines to implement these proposed projects. This plan conveys the State Team's current working plan and commitment to reduce dust emissions from exposed lakebed, and is meant to serve multiple audiences with an interest in the future of the Sea. As noted above, while this is not a regulatory document, the DSAP outlines the steps, including regulatory approvals, that will be needed for future project implementation. Detailed project-specific plans for design, implementation and monitoring must be developed for each area prior to implementation. Such plans will be developed in coordination with the relevant air district to ensure compliance with all air quality rules and regulations.

1.8 Report Organization

Chapter 2 of this report describes the range of dust suppression methods that have been applied with success, notably in other parts of southern California, where similar dry soil conditions are encountered. It is envisioned that the projects in this DSAP may apply one or a combination of these methods at different project sites if permitted by the relevant air district. Chapter 3 presents a summary of the project implementation approach, which involves making agreements for land ownership and site access, obtaining the necessary permits and compliance documents, and an overview of the steps involved in contracting for construction. Chapter 4 describes specific project areas around the Sea where the Phase A and Phase B projects are to be implemented, including a general outline of the schedule for major steps. The planned performance monitoring of projects to document their effectiveness in reducing dust emissions is described in Chapter 5. A summary of this report and planned future steps is presented in Chapter 6. Additional detailed information is included in appendices, including the approach used for outreach (Appendix A), a summary of comments and responses to the draft DSAP (Appendix B), and detailed tasks and timelines for the implementation of selected projects (Appendix C).

2 Dust Suppression Methods

This chapter summarizes the different methods that have demonstrated success in controlling dust emissions from dry surfaces, as part of work performed at the Salton Sea, Owens Lake, Oceano Dunes, and other areas. Where adequate information is available, the effectiveness of these methods in reducing dust emissions is described, although it should be noted that in most instances, the effectiveness of a given method depends on how it is designed and deployed. These methods, individually or in combination, are expected to be proposed for the majority of the Phase A and Phase B projects described in this DSAP.

Ten possible methods are described in this chapter. Of these, two (temporary surface roughening and dust suppressant application) are considered for use during Phase A; six will require additional analysis, design and infrastructure before field application and may be considered during Phase B (vegetation establishment, shallow-water habitat, sand fencing, engineered roughness, gravel coverage, and shallow flooding); and two are considered exploratory for possible use in the region (stormwater spreading and enhancing soil crusting). Projects using water for vegetation establishment or pond creation have habitat benefits beyond dust suppression.

The specific methods to be used will be part of the project design documents for each project area, and will depend on characteristics such as soil properties, wind speeds, local topography, and water availability. These designs will be based on consultations with landowners and regulatory agencies through the environmental compliance and permitting process. No one method is considered to be universally superior or applicable at all locations; the design approach will be to select the most cost effective and environmentally sustainable long-term mix of approaches that can meet the air quality compliance requirements at each location and also create habitat at the sea. This will be accomplished in future implementation phases of the DSAP.

2.1 Initial Site Preparation

Regardless of the dust suppression methodology to be used, some initial site preparation will be required. Clearing and grubbing of the project area might be necessary to remove dead vegetation, abandoned duck blinds, large rocks, tires, pieces of concrete,

vegetative/industrial debris, and other materials. Living, established native vegetation would be avoided to the maximum extent possible. A skid steer and/or backhoe equipped with tracks (or similar equipment) will be used to clear and grub the areas. Temporary routes may need to be established to access project areas. **Table 2** lists typical equipment that would be used for clearing and grubbing.

Table 2. Typical Construction Equipment for Clearing, Grubbing, and Roughening

Equipment Use	Implement Name	Example Implement Model	Anticipated Use Rating
Deep Tillage	Bullplow–Ditchplow	Yonkers and Johnson Model 400	Frequent
Shallow Tillage	Switchplow–Reversible Plow	Maschio Micro Model	Occasional
Land Leveling	Pull-Type Ejector Scraper	John Deere Model 2412DE	Infrequent
Ripping/Grubbing	Deep Ripper	Agrowplow Model AP91	Rare
Clearing	Track Bulldozer–Crawler Dozer	John Deere Model 750L Dozer	Rare
Minor Cleaning	Crawler Backhoe Loader	JCB Model 1CXT	Rare

2.2 Temporary Surface Roughening

Example of Temporary Surface Roughening at Salton Sea (Photo Credit: IID)

Temporary surface roughening is achieved by constructing 2–4-foot-deep furrows perpendicular to the prevailing wind. Furrows can also be constructed to follow the natural contour of the land where ephemeral streams exist to maximize the lateral spread of water and infiltration. Alternatively, furrows might be used to redirect storm flows away from the project area to avoid damage to it. A belted tractor similar to a Challenger MT775E will be used to pull the selected implement. The tractor will be equipped with Trimble EZ-Guide® 250 or similar global positioning system to allow accurate positioning of surface roughness features. A bull plow with cab-adjustable pitch (e.g., Yonkers and Johnson Model-400 or a similar model) will be used to create the furrows. Table 2 lists typical equipment that would be used to construct furrows. Phase A temporary surface roughening projects are proposed to be constructed in 2020, however it should be noted that approval of the relevant air district must be obtained prior to implementation of any surface roughening projects.

Surface roughening to control wind erosion has a rich history dating back to its use to aid in restoring the environmental damage associated with farm management practices that exacerbated wind erosion during the Dust Bowl (Chepil, 1950; Lee and Gill, 2015). The size and spacing of the rows and furrows control the effectiveness to reduce wind erosion. The IID uses the USDA SWEEP model (Tatarko et al., 2016) to estimate the ridge and furrow pattern needed to achieve a target effectiveness. Based on their use of SWEEP, IID estimates that 2-4 foot ridges/furrows will reduce wind erosion by 95% for areas of the Salton Sea where the soils texture is amenable to sustaining the ridge/furrow pattern. This method, i.e., roughening of the surface by farm implements to control wind erosion, has been applied in diverse geographic environments from the Great Plains of the USA (Zingg, 1954) to dust emitting shorelines of the Williston Reservoir in Central British Columbia Canada (Fryrear et al., 2009).

2.3 Dust Suppressant Application

Surface stabilizers (or dust suppressants) are chemical additives used to control fugitive dust originating from unpaved surfaces by improving the adhesion of particles. These products are used for projects that require PM_{10} control. Typical application uses water with one or a combination of chemicals (e.g., organic, mineral, or engineered polymers). They control dust by keeping the soil surfaces wet or wet longer, drawing moisture from the air, encapsulating dirt particles, or by binding dust particles together. Depending on the type of stabilizer used, balancing potential environmental concerns with the longevity of a particular application might be necessary.

Because most dust suppressants are water-soluble, rainwater can dissolve them. While transport from a dust suppression area to the Sea is of limited concern because of minimal rainfall and runoff, to avoid water quality concerns dust suppressant selection should nonetheless focus on organically based and ecosystem-friendly options. Dust suppressant application is planned with the use of trucks or aerially depending on access to specific locations.

Soil binders are a class of substances designed to bind with soils upon application and create a hardened surface that can withstand higher volumes of vehicle traffic, are water resistant, last longer, and can hold up under harsh conditions. Commercially available options include polymer emulsions manufactured from recycled products, for which the environmental properties are understood, and which may be suitable for application in the Salton Sea environment. Under harsh conditions, binders can be more effective in managing both PM_{10} and $PM_{2.5}$ particles. In addition, soil binders have a minimally higher water-to-product ratio for initial operation and maintenance (O&M) applications.

Some dust suppressant and binder manufacturers offer technical services to create a site-specific/application-specific product. Selecting a project-specific product can consider the following factors:

- Soil type such as clay, sand, or silt
- Water requirements
- Durability and longevity

- Ecosystem needs
- Magnitude and frequency of operations and maintenance

The use of these substances within the dust control areas may be a suitable dust control measure (DCM) for areas where surface roughening or other methods are not feasible. These products may also be suitable to apply to roadways and construction laydown/staging areas during construction activities. The State will evaluate the use of these products as part of the ongoing performance monitoring and data collection during implementation of Phase A and Phase B projects.

It is difficult to evaluate *a priori* the level of effectiveness that can be achieved by dust suppressant application for dust control for fugitive emissions from desert surfaces as this control method has not been widely applied for this purpose. If the integrity of the surface can be sustained by the suppressant application, i.e., the material can successfully keep particles bound in a coherent matrix, it does have the potential to be highly effective. The longevity of the suppressant to maintain this integrity and effectiveness will be product-, climate- and disturbance-level dependent (e.g., Gillies et al., 1999).

2.4 Vegetation Establishment—Post Surface Roughening

Vegetation establishment is a roughness-based DCM in which plants are used as porous, 3-dimensional barriers. The barriers induce friction on the air flow, reducing the applied shear force at the soil surface and, subsequently, reducing saltation and the resulting release of particulate matter of 10 microns or less in diameter (PM_{10}) emissions. Additionally, plants that tolerate abrasion and burial can actively trap and store saltating sands.

Plants, due to their porosity and permeability to airflow, are more effective at absorbing momentum than similar-size and shaped solid elements. Their effectiveness to reduce wind erosion and dust emissions is largely a function of the drag they exert on the boundary-layer winds (Gillies et al., 2000; 2002, 2010) and their potential to trap particles, which will be species specific. The effectiveness of plants to reduce wind erosion and dust emissions over large areas will be a function of their individual aerodynamic properties and the distribution density across the area. With knowledge of the plant's drag coefficient (Cd, see Gillies et al., 2002, 2010), erosion reduction targets can be used to estimate planting densities required to meet that target. Drag coefficients for some species are available in the literature, for example Wyatt and Nickling (1997) present a Cd for Creosote Bush (*Larrea tridentata*), which is a candidate species for vegetation projects at the Salton Sea, and Gillies et al. (2000, 2002) provide additional Cd data for other plants. Lancaster and Baas (1998) present data that shows the efficiency of salt grass (*Distichlis spicata*) to reduce sand transport at Owens Lake, CA. For an approximate cover of 12% of salt grass, sand flux was reduced by 90% compared an equivalent bare surface and by 95% for a cover of 17.5% (Lancaster and Baas, 1997). Establishing vegetation at appropriate levels offers an effective means to control wind erosion and dust emissions. Vegetation establishment should be prioritized for soils that are suitable for supporting their growth and sustenance. These soils are broadly characterized as coarse textured and with favorable internal drainage. The aim of

selecting areas for vegetation planting based on soil suitability is to minimize the need for large-scale infrastructure to supply irrigation water to plants. The direction of planting of hedgerows may be adapted based on prevailing wind directions at a site.

Along the transitional area from the desert to the lakebed, there is a change in the composition of natural vegetation, which suggests two distinct zones: One zone higher in elevation in which areas away from washes and drains are dominated by creosote bush (*Larrea tridentata*) and a second zone lower in elevation in which areas away from drain spills are dominated by iodine bush (*Allenrolfea occidentalis*). The hydrologic difference between the two zones most likely can be explained by the variation in depth to groundwater and the subsequent concentration of salts at the soil surface.

Example of Vegetation Establishment after Surface roughening at Salton Sea (Photo Credit: IID)

It is recommended that creosote bush be the target species for the upslope zone. Additionally, the presence of honey mesquite (*Prosopis glandulosa*) in that zone suggests it might be able to support this small tree, which has the potential to grow taller than other upslope species and therefore affect airflow to a greater degree. It is recommended that iodine bush be the target species for the downslope zone. In addition, the presence of four-wing saltbush (*Atriplex canescens* var. *macilenta*) and big saltbush (*Atriplex lentiformis*) suggests that the zone can support those species, which when co-planted could provide a hedgerow that is resilient to stressful environmental conditions.

Several agronomically sound lessons were learned from a series of vegetation tests, conducted by IID, including plot and field studies on the Salton Sea lakebed (IID 2017, 2019e, 2020c):

- Plant during the cool months of October through February.
- Grow plants as large as possible by spring.
- Buffer plants from environmental stressors when practical.

Establishing the vegetation requires that water resources be available. Because of the limited water supply infrastructure along the exposed lakebed, water will most likely be supplied to project areas by a combination of water quantity, quality, and timing. To address the uncertainty, simple water resource investigations will need to be performed so that practical irrigation systems can be designed.

In general, linear and point water applications are more effective than broadcast application on hypersaline soils with favorable internal drainage. Linear application includes widely spaced furrow flooding and linear systems with mobile precision drip applicators. Furrow flooding can occur passively under the force of gravity or actively using a pump and 8–12-inch pipe conveyance. Point applicators include conventional drip, subsurface drip, and micro-drip irrigation.

Associated infrastructure might include piped conveyance, open-channel conveyance, water applicators, sheet flow capture systems, surface water diversions, outflow drainage, tailwater recirculation systems, pump stations, power supplies, access routes, containment berms, and stormwater routing (Smesrud et al. 2004).

2.5 Shallow-Water Habitat

Audubon California developed a proposal for an integrated habitat and dust control project that could enhance an existing wetland near Bombay Beach (Audubon California 2019). The proposal is based on the knowledge that invasive tamarisk uses large amounts of water and continues to encroach upon wetted areas, choking out native vegetation. Applying active water management in this case can result in the associated water infrastructure serving a dual purpose: supplying water to the wetland and partially diverting the irrigation water to upland species in the dust control areas adjacent to the wetland. By making water source-specific adjustments, this concept of dual-purpose water infrastructure could be applied to other areas around the lakebed.

Maintaining a surface covering of water on a potentially dust emissive surface is a highly effective dust control method and as long as the cover of water is maintained it should be 100% effective. The exposure of dry areas will potentially reduce the effectiveness if those areas become subject to erosive winds.

The amount of water consumed by tamarisk in this region has been estimated at up to 7 acre-feet per acre per year. The removal of the invasive, non-native, and water-intensive tamarisk from the creeks and drain channels will likely yield more discharge into these wetted areas. Additionally, the removal of tamarisk within the wetted area will prevent its further encroachment, providing a greater opportunity for water-efficient native plants to establish. Wetland vegetation management could also include planting native plants in these wetted areas.

The strategic placement of new berms and reinforcement of existing berms will increase the residence time of surface water within these systems. This increase in residence time can translate into a larger managed wetted footprint. The benefits of expanding the wetted footprint include an increase of food supply and availability of various habitat types for migrating and resident bird species (e.g., foraging, nesting, and refugia). Berm

construction may include reworking exposed lakebed by grading and excavating. Depending on the site conditions, berm construction could occur in wetted areas.

Water diversion, conveyance, and supply systems will likely need to be developed and adapted to the local water sources. Adjacent to the wetted area, water-efficient DCMs such as hedgerows of native upland vegetation could be implemented. The water diversion, conveyance, and supply infrastructure can be designed to provide controlled flows into the wetland during most of the year and provide infrequent flows to the adjacent dust control areas during the cool season.

Substantial effort has gone into defining the lower end of the water demand for hedgerows and upland vegetation to minimize the need for water diversion (IID, 2020c). Available data suggest that the water requirement is about 0.1 acre-foot of water per acre per year (IID, 2020c). Additional research is proposed, however, to further define the water requirements for establishing and maintaining long-term persistence of upland vegetation. Additional management can be used to minimize the impact on the wetland. One example includes timing the irrigation diversion event to occur during a large discharge event such as fall sowing in agricultural drainsheds and stormwater runoff in unmanaged watersheds.

Several habitat types within these wetland areas could be targeted for management efforts, including habitat islands, permanent vegetated wetlands, and shallow-water habitat. Proposed habitat enhancements would vary by habitat type:

- Habitat islands: Increase vegetation structure and topographic diversity; provide habitat for roosting, foraging, and nesting; and enhance adjacent channels and open-water features.
- Permanent vegetated wetlands: Increase edge vegetation coverage and density; enhance emergent vegetation establishment; and improve hydrologic connectivity, water residence times, and depth of channels and shallow pond areas.
- Shallow-water habitat: Improve hydrologic connectivity by creating small drainage channels and shoreline-fringe habitat; and increase habitat diversity to support nesting, foraging, and resting sites.

Adaptive management and ongoing maintenance are proposed for these wetland areas. Ongoing maintenance of these habitat systems will likely include the development of features that influence the consistency of flooding, extending the life of features that hold water, cleaning water infrastructure and removing non-native invasive species. As conditions change at the Sea, there is potential for additional marsh areas to form and develop around existing drains and creeks. The locations for restoration projects would be within the exposed lakebed of the Sea and in the vicinity of agricultural drains and perennial creeks.

2.6 Sand Fencing

Example of Sand Fencing at Oceano Dunes (Photo Credit : DRI)

Fences of various construction materials and design are used to control the location and rate of erosion and deposition of sand and snow. By extension, the control of saltation of sand-sized particles moving across sediments containing silt and clay-sized particles will also affect the dust emission process driven by the ballistic impact of these grains on the surface. The drifting and settling of sand behind and in front of a porous fence occurs because the wind speed on both the upwind and downwind sides is less than that far upwind of a fence, and particles are slowed as they pass through the openings in the fence material. The slowing of the wind and particles allows deposition to occur, mainly in the lee of the fence. In areas of abundant sand supply, fences become buried over time, requiring either the removal of accumulated sand or the installation of additional sand fences on top, upwind, or downwind of the buried fences. Typical sand fencing construction methods include the following:

- Attaching perforated plastic fence material of specified porosity (40%-50%) to stakes at prescribed intervals.
- Weaving cedar or other lightweight wood strips into the holes of a wire fence, which is then attached to metal stakes.
- For a permanent sand fence, large wooden posts are set deeply into the ground, with large wooden planks running horizontally between the posts.

The depth and spacing of posts and the orientation of the installed fences to prevailing winds depends on site-specific conditions. The California Department of Parks and Recreation has been implementing a complex sand fencing system at the Oceano Dunes State Vehicular Recreation Area to control dust emissions from the off-highway vehicle riding area. This system is being used to capture and sequester saltating sand particles to reduce emissions of PM_{10} to improve air quality downwind of the Park. An underlying assumption is that the dust emission decreases at the same percent reduction as the observed decrease in sand flux.

Prior to large scale installation at the Park a pilot project was undertaken to quantify the effectiveness of the fence arrays to modulate sand flux (Gillies et al., 2017). The pilot project determined that 4-foot-high fences spaced 7 fence-heights apart reduced sand flux for the entire array area by 78%, and 86% for the area greater than 27 fence heights into the array. Fence arrays at Oceano Dunes have been installed and removed on a

seasonal basis and for some areas where temporary fences were emplaced vegetation has been established to provide permanent control.

The placement of arrays of sand fences in areas of Oceano Dunes have been guided by emissivity measurements made with the PI-SWERL device (Etyemezian et al., 2007, 2014) and modeling to identify source areas impacting key receptor sites (Mejia et al., 2018). Once in place, the effectiveness of sand control reduction is monitored using sand traps (Fryrear, 1986) installed outside of the array on the upwind edge and at locations through the array. Upwind and downwind PM monitors have also been used to examine the change in PM concentration across the fetch of the array (Gillies et al., 2017) that has indicated PM levels are lower on the downwind side indicating dust emissions have been reduced by the presence of the fences. The Oceano Dunes sand fencing project is currently being implemented on approximately 65 acres of state property, a very labor-intensive and costly effort. The relevance of this project to the Salton Sea is the potential for aspects of it to be used in areas at the Sea where methods of effective sand stabilization and dust control are still being evaluated. Combining this type of DCM with other methods under consideration in the DSAP might support vegetation enhancement in the most emissive areas of the exposed lakebed where only limited water sources are available (California Department of Parks and Recreation, 2019).

Examples of Engineered Roughness Elements at Owens Lake (Straw Bales and Manufactured), Photo Credit: DRI

2.7 Engineered Roughness

The method of engineered roughness (Etyemezian and Gillies, 2016) for wind erosion control involves the placement of large roughness elements of prescribed size and distribution on a surface susceptible to dust emissions. The roughness elements modulate the threshold friction speed on the surface by absorbing momentum from the wind and reduce the sand flux and saltation (Gillies et al., 2015, 2018). The size and spatial distribution of the roughness elements determines the sand control effectiveness, and this is determined with the use of an empirical model (Gillies et al., 2015). The amount of sand flux reduction to be attained is based on the management objective of the project under consideration. The roughness elements can be manufactured, or

assembled using available agricultural byproduct material, such as straw bales, if it can be processed into large and stable forms.

Engineered roughness can be a temporary control method that applies immediate control of sand flux and dust emissions or it can be used to create conditions of reduced sand flux and moisture loss to provide a more suitable environment to support vegetation establishment and growth. The vegetation can eventually replace the roughness elements to control the sand flux and dust emissions.

Engineered roughness has been demonstrated by Gillies and Lancaster (2012) and Gillies et al. (2015) to be effective to control sand flux at the Ocean Dunes State Vehicular Recreation Area, Oceano, CA, and Keeler, CA, respectively. At the Keeler dunes near Owens Lake CA, Gillies et al. (2015) demonstrated that straw bales used as roughness elements distributed in a pattern mimicking a natural vegetation pattern and at a density of approximately 1000 per hectare reduced the sand flux by 92% (±9%) compared to sand flux in the absence of the straw bales. This should also reduce the associated dust emissions by at least the same percentage. The density and distribution of roughness (of a size similar to those used by Gillies et al. (2015, 2018)) to achieve target effectiveness values can be estimated using the Equation presented by Gillies et al. (2015, Eq. 4)

2.8 Gravel Coverage

The use of a gravel blanket (cover) to control PM_{10} has been successful for roadways, construction laydown/staging areas and open areas on large projects throughout the United States. Gravel cover as a dust control measure involves placing a layer of gravel, or gravel over a geotextile base, on emissive exposed lakebed surfaces to protect them from the wind, thereby reducing dust emissions. Gravel blanket coverage is very effective at controlling dust during periods of high wind velocity, capturing saltating sand particles within the interstitial spaces in the gravel. At Owens Lake, gravel blankets have been effective on essentially any type of soil surface. Gravel test plots on Owens Lake that have been in place for approximately 17 years continue to protect emissive surfaces beneath. These areas are maintained to ensure adequate gravel coverage and address repairs from water erosion. Employing the following steps to install gravel coverage will ensure that the gravel blanket will remain an effective PM_{10} control measure. These steps include:

1. Identify and secure a suitable gravel source near the treatment area.
2. Confirm that gravel composition will not react with existing soil and water types at the treatment site (leaching and erosion resistant).
3. Select gravel larger than three-eighths of an inch in diameter.
4. Identify the haul route and use traffic control measures, as needed, to ensure safe transport of the aggregate material to the treatment area (comply with local air quality district rules related to transporting aggregate from mining operations).
5. Grade/blade area for treatment to direct water runoff and drainage.

6. If the application area is susceptible to high-volume surface water flows (i.e., flash flooding), then other features such as dissipaters and desiltation/retention areas might be needed to slow the downstream water flow and potential siltation from upstream flows to minimize the erosion and burying of gravel.
7. Incorporate drains and channels, as needed, in the exposed lakebed to direct drainage.
8. Install a permanent permeable geotextile fabric over the treatment area.
9. Cover area with a layer of gravel (required thicknesses at Owens Lake are four inches without a geotextile base or two inches with a base).

At Owens Lake, the installed gravel coverage was able to withstand wind speeds of 90 miles per hour. While this high level of wind rarely occurs at Owens Lake, the gravel coverage was found to withstand typical sustained wind speeds of 50 miles per hour. Areas at Owens Lake with gravel coverage were found to control nearly all PM_{10} emissions.

Once the gravel cover has been applied to the exposed lakebed, limited maintenance is required to maintain an effectiveness near 100%. Ongoing site inspection for erosion and presence of fine sands, however, are required. Fine particles covering or significantly infilling the gravel can render the method ineffective. Typical O&M requirements include the following actions:

1. Visual monitoring to ensure that the gravel blanket has not filled with saltating sand particles eroded by flooding or filled with flood-borne silt.
2. Harrow the gravel to limit the amount of fine particles by settling out the fines that deposit in between the gravel spaces and bringing clean gravel back to the surface.
3. If the gravel blanket requires maintenance due to in-filling, apply additional gravel to the exposed lakebed so that the original blanket performance standard is maintained.

At Owens Lake, ongoing maintenance staffing requires one full-time employee per 5 square miles of gravel coverage and an average ongoing maintenance amount of gravel of 7,000 cubic yards per square mile per year (allowing for complete gravel replacement once every 50 years). While this method has proven to be very effective, it is also very costly compared to other dust control methods. The State will continue to consider this method for dust control in conjunction with other methods, especially in areas where no other options are feasible because of topography, soil type, and water supply. At the Salton Sea, as noted above, the use of gravel cover may be effective for higher traffic areas or access roads or in combination with other methods in smaller areas for highly emissive areas.

2.9 Shallow Flooding

Wet surfaces are resistant to windblown dust emissions (Hardebeck et al., 1996) and should achieve 100% effectiveness if wetness across the surface can be maintained. This is because the saturated soil particles at the ground surface are heavier than dry particles

and because the surface tension of interstitial water tends to hold soil particles together in agglomerates that are too heavy to be entrained by wind shear forces. When the surface soil particles dry, the bonds between particles left by evaporated moisture cause the particles to form a weak crust that, in the absence of physical disturbance, is sufficient to resist wind shear and particle entrainment. The shallow flooding DCM has been demonstrated to provide dust control over large areas at Owens Lake (GBUAPCPD, 2008). For this to work enough water has to be applied to maintain surface moisture levels over a minimum of 75% of the treated area (GBUAPCD, 2016). This is achieved at Owens Lake with large volumes of clean water and associated conveyance, drainage, and recirculation infrastructure.

The water demand for shallow flooding is approximately 3 to 4 acre-feet of water per year to suppress dust from an acre of lakebed. This water is pulse-flowed in monthly applications between October and June of each year. To apply the shallow flooding control method at Salton Sea, water use agreements and substantial infrastructure would be needed in order to supply enough water at specific areas. The relationship between wetted extent and PM_{10} control efficiency is known and straightforward to monitor for performance using openly available satellite imagery (Groeneveld and Barz, 2013).

Shallow flooding can be applied using different techniques. These techniques can be grouped into two categories: sheet flooding and pond flooding. Sheet flooding is similar to surface irrigation in agriculture (Walker and Skogerboe, 1987). Sheet flooding may consist of preparing a subarea by leveling the land and bounding it by shallow earthen banks. Water may then be applied at the top end of a cell and be permitted to advance over the length of the cell in the form of a thin sheet. Pond flooding is similar to constructed ponds. Pond flooding consists of preparing a near-level cell by bounding it with deep rock-faced water containment berms. Large volumes of water are applied submerging the cell with enough water to counter the water loss processes.

Associated infrastructure for shallow flooding may include piped or open channel conveyance, water applicators, outflow drainage, tailwater recirculation systems, pump stations, power supply, access routes, containment berms, and stormwater routing (Smesrud et al., 2004). The infrastructure, power, water, and time cost of this DCM may be substantial, and may need to be quantified on a site-specific basis. Additionally, the adverse environmental impacts of the management of these systems should be considered, which might include further soil salinization, concentration of selenium in the pond water, and the water balance of the Salton Sea.

2.10 Stormwater Spreading

Stormwater spreading is a method by which stormwater is spread laterally across the landscape and retained long enough to meet project objectives. This project type is to be used in conjunction with the vegetation establishment DCM. At a few locations around the Salton Sea lakebed, the right combination of environmental conditions has yielded natural stormwater spreading events. These conditions consisted of low-velocity stormwater or drain water intersecting shallow on-contour wave action berms. The natural stormwater spreading events have yielded near-continuous hedgerows of iodine bush. Fortunately, at one of the locations, a set of near-surface piezometers were

positioned and data from these instruments revealed the unconfined aquifer was recharged by the spreading (IID, unpublished data). The goal of a stormwater spreading project is to mimic this natural process and optimize the use of ephemeral surface water runoff.

Stormwater spreading provides the opportunity for deep infiltration (more than 1 foot of water), which is much larger than a heavy rain event (typically no greater than 0.2 feet of water) in the region. Stormwater runoff events have the highest probability of occurrence during the cool months of mid-November–March. The timing is critical as evaporation is low, which enables the surface soil moisture to persist for a longer duration than the flood event, which may pass within hours. The coupling of deep infiltration and low evaporation can also result in salts being leached from the soil surface. As the stormwater slows, suspended seed and fine sediment settle out, typically yielding favorable soil-seed contact. In this dry environment, these processes yield a favorable zone in which the water potential at the seed lasts for several months, long enough for seeds to take root.

A quantitative assessment of the watershed's hydrology and local hydraulics will need to be performed to optimize a stormwater spreading event. Once the assessment has been completed, diversion points and alignments can be identified, structures developed, and an array of linear infiltration basins specified so the system will operate passively for a range of infrequent but large discharge events. Diversion structures will be fit to the range of anticipated discharges and could consist of simple grading, earthen berms, sandbag weirs, rock gabions, Arizona crossings, or concrete structures. Sedimentation basins might also be used. Open-channel or piped conveyance may be needed to conduct water into the infiltration basins. Linear basin depth could be shallow (less than 1 foot), moderate (1–3 feet), or deep (more than 3 feet). In the array of linear infiltration basins, the amount of inadvertent breaching can range from zero to an acceptable level of random breaching. Assuming some random breaching, the infiltration arrays could be oriented on near-contour positions to enable a cascading effect.

This method can be applied to distribute water from a range of discharge events. It should be noted, however, that for any given year in these arid watersheds, based on regional rainfall patterns, it is probable that no appreciable discharge will occur (few of these creeks are gauged to provide historical data). Conversely, it is probable that a large discharge might prove unmanageable using a modest infrastructure. Nonetheless, this method of water distribution provides a means to slow the flow of high-quality stormwater, enabling it to contribute to establishing and/or enhancing upland vegetation on the exposed lakebed. This technology will be especially valuable in locations with few water source options such as along the western shore. To ensure a reliable irrigation water supply during drought periods, it is recommended that this technology be coupled with an on-demand water source.

Storm water spreading will directly reduce dust emissions for surfaces that are submerged beneath water and remain effective until the soil moisture content remains above a few percent (Gillies, 2013). Storm water spreading will indirectly reduce sand transport and dust emissions if it results in supporting an increased plant density. Plants

are highly effective at modulating sand transport and dust emissions once they reach critical density distributions and coverage of surface (see Section 2.3).

2.11 Enhancing Soil Crusting Using Biocementation or Soil Amendments

The presence of a surface crust on soils, in the absence of disturbance, has been observed to create a condition that is highly resistive to wind erosion (Gillette, 1974; Gillies, 2013). Crusts can be formed by biotic or abiotic processes. Crusting or soil aggregation arising from either process can be enhanced through the addition of amendments, which make the surface more resistant to wind erosion processes. A potential biotic-based crust enhancement technique is biocementation, which utilizes soil microbes to, for example, precipitate the mineral calcite to enhance inter-particle bonding. Enhancement of calcite precipitation requires the presence of microbes capable of performing urea hydrolysis (Gomez et al., 2014, 2017). This process potentially requires laboratory cultivation, transportation, and seeding of non-native bacterial species into the soils to be amended. Using a process known as bio-stimulation (e.g., Fujita et al., 2008) it has been demonstrated that native soil microorganisms may also be encouraged to increase their cementation capacity. Abiotic amendments have also been demonstrated to enhance soil crusting and aggregation thus improving their ability to resist erosion, but they have not been widely applied and are still in the development phase. For example, the addition of biochar (from pyrolysis of biomass materials) in arid areas has been used to promote fertility and soil aggregate stability (e.g., Jian and Wang, 2013). In addition to biochar as a soil amendment for wind erosion control, Feizi et al. (2019) investigated the feasibility of using the clay mineral bentonite and polyvinyl acetate for reducing the wind erosion in desert areas outside cities in Iran. Their wind tunnel experiments demonstrated bentonite amended soils to be the most effective soil erosion control measure for reducing soil loss. This control method does require a thorough characterization of soil properties to allow an appropriate amendment mixture to be developed.

The level of effectiveness to control wind erosion and dust emissions that can be achieved by augmenting surface crusting by biotic or abiotic means has not been quantified, but the approach is technologically sound as creating or increasing the strength of bonding between soil particles increases the threshold wind speed needed for entrainment and initiation of erosion and it also modulates the strength of dust emissions once erosion begins (Gillies, 2013).

3 Project Implementation: Compliance Needs, Approach, and Current Status

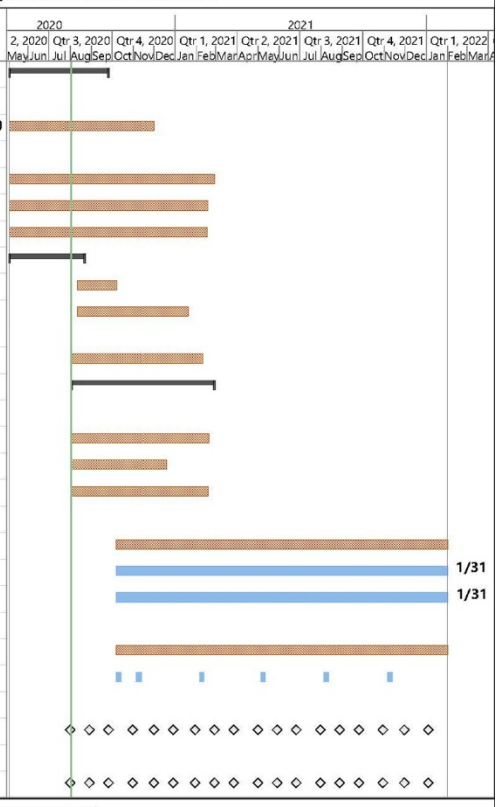
This chapter summarizes the steps that need to be taken as project concepts are transitioned to project implementation. Project implementation involves three key steps prior to design and construction: site access from landowners, permitting and environmental compliance, and contracting for construction. At this time Phase A steps are well understood, and an overview schedule of the specific steps associated with implementation of projects during Phase A is shown in **Figure 5**, including contracting, site access, compliance and dust control plan development, and construction. The schedule also shows the more continuous processes on monitoring, maintenance and inspections, and coordination meetings. A more detailed listing of these steps is shown in Appendix C. Future versions of the DSAP will similarly outline Phase B steps as they are better defined.

In the initial stages, this work has focused on coordination with a variety of state, local, and federal agencies with landownership and with jurisdiction over specific environmental attributes in the project areas, such as endangered species, air quality, and water quality. The State Team is actively engaged in this coordination based on the project concepts that have been developed at this point (described in Chapter 4). The current understanding of the compliance needs and the ongoing coordination efforts with different agencies are summarized in this chapter. To expedite approval, project boundaries and dust suppression approaches are subject to adjustment due to access, environmental compliance, or other factors.

Figure 5. Summary-Level Schedule of Actions Related to Implementation of Phase A Projects.

Summary Level Phase A Dust Control Program Implementation Schedule

ID	Task Name	Duration	Start	Finish
1	**CONTRACTING**	**103 days**	**Tue 5/5/20**	**Fri 9/25/20**
17				
18	**SITE ACCESS AGREEMENTS**	**146 days**	**Tue 5/5/20**	**Mon 11/30/20**
24				
25	**PHASE A, WEST SIDE TRACK**	**204 days**	**Tue 5/5/20**	**Fri 2/26/21**
26	**SCH Dust Control Project**	**196 days**	**Tue 5/5/20**	**Tue 2/16/21**
27	**Prepare Environmental Compliance Documents**	**196 days**	**Tue 5/5/20**	**Mon 2/15/21**
52	**Prepare Temporary Dust Control Plan**	**79 days**	**Tue 5/5/20**	**Fri 8/21/20**
58	**Implement Surface Roughening (725 acres)**	**40 days**	**Wed 8/12/20**	**Wed 10/7/20**
81	**Apply Dust Supressants As Needed on Emissive Areas (up to 810 acres)**	**106 days**	**Wed 8/12/20**	**Tue 1/19/21**
98	**Kane Spring Surface Roughening (1,100 acres)**	**128 days**	**Mon 8/3/20**	**Tue 2/9/21**
129	**San Felipe Fan Surface Roughening (860 acres)**	**140 days**	**Mon 8/3/20**	**Fri 2/26/21**
158				
159	**PHASE A, EAST SIDE TRACK**	**134 days**	**Mon 8/3/20**	**Thu 2/18/21**
160	**Wister-Frink 1 Surface Roughening (340 acres)**	**96 days**	**Mon 8/3/20**	**Fri 12/18/20**
183	**Bombay Beach 1 Surface Roughening (400 acres)**	**133 days**	**Mon 8/3/20**	**Wed 2/17/21**
210				
211	**MONITORING**	**325 days**	**Wed 10/7/20**	**Mon 1/31/22**
212	Conduct Sand Flux Monitoring and Analysis	325 days	Wed 10/7/20	Mon 1/31/22
213	Conduct PM10 Monitoring and Analysis	325 days	Wed 10/7/20	Mon 1/31/22
214				
215	**MAINTENANCE AND INSPECTIONS**	**325 days**	**Wed 10/7/20**	**Mon 1/31/22**
216	**Perform Maintenance & Inspections**	**325 days**	**Wed 10/7/20**	**Mon 1/31/22**
223				
224	**MONTHLY MEETING WITH USACE**	**353 days**	**Fri 7/31/20**	**Fri 12/31/21**
243				
244	**MONTHLY MEETING WITH IID, ICAPCD & SCAQMD**	**371 days**	**Mon 8/3/20**	**Mon 1/31/22**



Phase A Dust Control Program
Date: Mon 8/3/20

Task | Milestone ◆ | Summary

California Department of Water Resources (DWR) | Page 1 of 1 | Tetra Tech, Inc.

3.1 Land Ownership and Site Access

A key factor influencing the implementation of projects in the DSAP is landownership. The State owns very little property around the Salton Sea. Major landowners include IID, U.S. Bureau of Reclamation (USBR), U.S. Bureau of Land Management (BLM), and the Torres Martinez Desert Cahuilla Indians (TMDCI). **Table 3** summarizes landownership of project areas. **Figure 6** shows the current landownership at project areas. A first step in implementation will therefore involve obtaining site access agreements. Inclusion of areas in this plan does not infer that access agreements have or will be reached. Any access agreements will be reached voluntarily. A description of the status of access agreements for the major landowners is summarized below.

Currently, DWR has an easement agreement with IID, for specific IID-owned parcels within and around the SCH project area. The easement allows the State access to implement dust suppression projects on the covered IID parcels as part of Phase A of this plan. The State will be required to enter into separate access agreements for the dust suppression projects presented in other areas around the Salton Sea, with IID and other landowners.

Table 3. Land Ownership by Project Area and Subarea

Project Area and Subarea	Landowners
Coachella Playa (CP-1)	CVWD/IID
CP-2	TMDCI
CP-3	IID/TMDCI
CP-4	TMDCI/IID
CP-5	IID/USBR
CP-6	TMDCI/Private/CVWD
Bombay Beach (BB-1)	IID/USBR /Private
BB-2	IID
Wister-Frink (WF-1)	IID
WF-2	IID/City of Los Angeles/BLM
Club House (CH-1)	IID/ USBR /TMDCI/Private
Kane Spring (KS-1)	IID/BLM
KS-2	IID
KS-3	IID/ USBR
KS-4	IID/ USBR
Species Conservation Habitat (SCH-1)	IID/BLM
SCH-2	IID/BLM
SCH-3	IID
SCH-4	IID
SCH-5	IID/BLM
SCH-6	IID/BLM
San Felipe Fan (SFF-1)	IID/ USBR
SFF-2	IID/ USBR
Tule Wash (TW-1)	USBR /IID/Private/Federal
TW-2	Private/Federal/ USBR
North Shore (NS-1)	IID/Federal/Private
NS-2	IID

Source: DWR 2020.

Figure 6. Land Ownership Overlaid on Proposed Dust Suppression Project Areas.

The workflow process for obtaining access to parcels at each site will include development of agreements, negotiations with the landowner, execution of agreements, and certification that properties are available for access. It is anticipated that obtaining agreements for properties in sites with a larger number of individual property owners will require more extensive work but will use the same process. Access agreements with certain public agencies, such as IID and CVWD, will require the approval of that agency's Board of Directors at a duly noticed public meeting.

The State has shared potential project areas with USBR and BLM to begin the right-of-way agreement process. DWR and BLM are working on obtaining a right-of-way agreement for parcels within the SCH area. The agreement will allow the State access to implement dust suppression projects on BLM parcels at the SCH site as part of Phase A of this plan. The State will be required to enter into separate easement or land-use agreements for the dust suppression projects planned for other BLM-owned parcels around the Salton Sea.

The NEPA process must be completed prior to entering agreements allowing construction of projects on federal lands. The process of obtaining access agreements for federal lands is anticipated to take several months, assuming a NEPA categorical exclusion can be applied to the project. This includes biological and cultural surveys, as well as additional environmental compliance requirements.

Access agreements for other landowners in **Table 3** will be sought as projects are initiated.

3.2 Permitting and Environmental Compliance

Initial evaluation of project concepts has taken place to identify anticipated compliance needs for each project and schedule projects accordingly. Compliance-related criteria for identifying projects for Phase A and B included projects anticipated to be outside the jurisdiction of the U.S. Army Corps of Engineers (USACE), to not have endangered species concerns, and with minimal or no environmental compliance requirements. The agencies that will be involved in permitting and approving projects are described below. The State Team intends to consult with these regulatory agencies as current projects are transitioned to more detailed designs, with goal of developing final project designs that meet the requirements of these agencies. Therefore, if project concepts are found to have regulatory constraints during permitting, they will be adjusted to avoid constraints or will be included in the forthcoming programmatic NEPA planning and permitting process for the SSMP Phase I:10-Year Plan as described below.

3.2.1 U.S. Army Corps of Engineers 404 Permitting

The USACE is working closely with the State on a programmatic approach to NEPA coverage for the SSMP Phase I: 10-Year Plan and as such has been working closely with the State on data collection and compilation. The State and the USACE have entered into an agreement under the Water Resources Development Act that will streamline permitting. The State worked with the USACE on the Bruchard Road project and developed a mutually acceptable approach for USACE review. As indicated above, Phase

A and B projects will be projects that avoid impacts to areas under USACE jurisdiction. Projects in the DSAP will be reviewed using the same approach used for the Bruchard Road project, which includes:

- A desktop review for potential aquatic resources under USACE jurisdiction;
- A field review to verify/augment the desktop review to determine if any areas of USACE jurisdiction are within the project footprint; and
- If possible, elimination of areas within the proposed project footprint determined to be within USACE jurisdiction or carried out as part of a later phase.

The process of conducting aquatic resources delineations (ARDs) for projects within selected project areas has begun and will be completed prior to construction activities. The USACE will complete a "Verification" process for each ARD to identify any jurisdictional areas for avoidance.

3.2.2 CDFW Lake and Streambed Alteration Agreement

The desktop and field reviews, along with pre-notification consultation, will provide the necessary information for submittal of Lake and Streambed notification(s) to CDFW. Dedicated CDFW staff on the SSMP team will assist with preparation of notification(s) to facilitate expedited review and issuance of any required Lake and Streambed Alteration Agreement (LSAA). Preparation of the notification(s), including fieldwork, could take up to 30 days. It is anticipated that a LSAA could be issued within 90 days of submittal of a notification, so up to 120 days from initiation to execution of the agreement is allotted; however this work will be prioritized to expedite project delivery.

3.2.3 Colorado River Regional Water Quality Control Board Permits

The construction or operation of some dust suppression projects may have impacts on water bodies that are regulated by the Colorado River Regional Water Quality Control Board (RWQCB). This may include direct discharges of pollutants (regulated by the National Pollutant Discharge Elimination System, or NPDES, permit) or stormwater discharges from project areas (requiring a Stormwater Pollution Prevention Plan or SWPPP). Depending on the project, an application would be filed with the RWQCB. These are typically issued within 60 days of receiving a complete application. The process is anticipated to take up to 90 days, including data collection and permit processing.

3.2.4 California Environmental Quality Act (CEQA)

Any discretionary action that would be implemented under the SSMP by the California Natural Resources Agency (CNRA) which may cause either "a direct physical change in the environment, or a reasonably foreseeable indirect change in the environment" is considered a project under CEQA and would require analysis relative to this law. CEQA analysis for the State's SSMP Phase I: 10-Year Plan was completed in the Species Conservation Habitat (SCH) Project Final Environmental Impact Statement/Environmental Impact Report (EIS/EIR), finalized in August 2013, and the September 2017 Addendum to the SCH EIS/EIR (State Clearinghouse No. 2010061062). Among other issues, these documents analyzed the impacts of the 10-Year Plan dust control projects around the

perimeter of the Salton Sea. The State Team will evaluate each project prior to implementation to determine whether any of the conditions described in Title 14 of the California Code of Regulations, sections 15162 or 15164, have occurred to trigger the need for additional CEQA analysis.

3.2.5 National Environmental Protection Act (NEPA)

As described above, the State is currently working with the USACE on a programmatic approach to NEPA for the SSMP Phase I: 10-Year Plan. Projects within the DSAP that are not anticipated to be subject to NEPA or that may potentially qualify for categorical exclusions have been identified for Phase A and Phase B. For these areas, NEPA compliance will be completed by federal landowners using categorical exclusions. If during environmental analysis it is determined that these projects are subject to NEPA and do not qualify for a categorical exclusions, they will be evaluated to see if they can be redesigned for avoidance, or they would be included for NEPA coverage under the programmatic NEPA document for the SSMP Phase I: 10-Year Plan. For projects on federal land that are not subject to a categorical exclusion, the USACE would include the landowner as a cooperating agency under the programmatic NEPA document.

3.2.6 Federal Endangered Species Act and California Endangered Species Act

Project concepts or project areas found to require ESA and CESA consultation would not be carried out as part of the DSAP and would be subsumed under the Programmatic NEPA planning and permitting process described above.

3.2.7 Groundwater Well Permitting

Groundwater will be evaluated as water source for sustaining vegetation at certain project locations. A series of monitoring wells is proposed around the perimeter of the Sea, as described in Chapter 5. Prior to well construction, the State will investigate the proposed well sites. DWR geologists will coordinate with the drilling contractor to obtain clearance to drill and construct wells at each site from the appropriate county permitting agency. DWR will also obtain any permits for groundwater use that may be required under new regulations being developed by local groundwater sustainability agencies under California's Sustainable Groundwater Management Act.

3.2.8 Imperial County Air Pollution Control District (ICAPCD)

ICAPCD has regulatory authority over the contribution or control of any potentially airborne dust particles in Imperial County. Any dust control projects located within ICAPCD's jurisdiction are subject to applicable Air District Rules and Regulations. ICAPCD's jurisdiction covers the majority of the Salton Sea region except for the northern extent of the Salton Sea, which falls under the jurisdiction of SCAQMD.

The intent of Regulation VIII of ICAPCD's Rules and Regulations "is to reduce the amount of PM_{10} entrained in the ambient air as a result of anthropogenic fugitive 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" (ICAPCD, 2018). The specific rules that apply to the implementation of dust control measures in Imperial County include Rule 401 for visible emissions, Rule 801 for construction projects, Rule 804 addressing open areas, and Rule 805 covering paved and unpaved roads.

Rule 401 limits visible emissions from any single source to 20 percent opacity. This opacity limit is also repeated in Rules 801, 804, and 805.

The provisions of Rule 801 apply to each dust control project that includes the disturbance of soil for the installation of infrastructure or for surface roughening. These provisions include limits on visible dust emissions of 20 percent opacity from mechanical soil disturbance activities, and compliance with opacity and Stabilized Surface requirements for inactive disturbed surfaces. Dust control plans must be submitted to and approved by ICAPCD prior to commencement of project implementation for each construction project larger than five acres in size.

As described in the ICAPCD State Implementation Plan for PM_{10}, "The purpose of Rule 804 is to reduce the amount of PM_{10} that is emitted from non-agricultural open areas…" (ICAPCD, 2018). This rule applies to the control of windblown dust from the exposed Salton Sea lakebed. In addition, the rule also identifies the best available control measures (BACMs) for surface stabilization that include applications of water or dust suppressant, application of gravel, and establishment of vegetation. The DSAP proposes some unlisted dust control measures, and the State Team will consult with ICPACD to determine the appropriate path forward for ensuring that these measures meet BACM standards.

Rule 805 applies to the portions of dust control projects that involve vehicular travel over unpaved surfaces. The intent of the rule is to control PM_{10} emissions from unpaved road travel and windblown dust emissions from unpaved roads used to access project sites.

In addition, Rule 925 (General Conformity) applies to the control of dust from dust control projects that are implemented on federal land or which depend in whole or part on federal funding or permits for implementation. Dust control projects that emit less than 70 tons of PM_{10} per year in Serious PM_{10} nonattainment areas, and projects that emit less than 100 tons of PM_{10} per year in PM_{10} maintenance areas, are exempt from the requirements of this Rule. As of April 2, 2020, the U.S. Environmental Protection Agency (USEPA) has proposed to redesignate Imperial County from "Serious nonattainment" to "attainment" for the PM_{10} ambient air quality standard. Upon final approval of redesignation by USEPA, dust control projects emitting less than 100 tons of PM_{10} per year will be exempt from Rule 925. By comparison, total annual emissions of PM_{10} from exposed Salton Sea lakebed were estimated by IID to be 385.9 tons per year, with the most emissive portion emitting 7.27 ton/km^2 (= 18.83 ton/mi^2) (IID, 2020d). Since the goal of each dust control project is to reduce windblown PM_{10} emissions from exposed lakebed surfaces, none of the projects included in this plan are anticipated to trigger the requirements of Rule 925.

In order to ensure compliance with ICAPCD rules, the State is committed to working with ICAPCD and acknowledges the role of ICAPCD in approving any dust control projects, project designs, and appropriate performance measures for project areas within its jurisdiction. The State will work collaboratively with the ICAPCD to obtain permits and approvals prior to construction. This commitment also applies to addressing fugitive dust generated from construction activities associated with implementation of these projects. Coordination with ICAPCD has been initiated and the State will involve ICAPCD in future planning efforts for project areas within its jurisdiction.

3.2.9 South Coast Air Quality Management District (SCAQMD)

SCAQMD has regulatory authority over the contribution or control of any potentially airborne dust particles in the Salton Sea region within Riverside County. Similar to ICAPCD, any dust control projects located within SCAQMD's jurisdiction are subject to applicable Air District Rules and Regulations.

Rule 403 requires actions to prevent, reduce, or mitigate human-made fugitive dust emissions. This Rule requires use of BACMs to mitigate fugitive dust and sets limits on visible dust and monitoring PM_{10} measurements. Rule 403.1 is supplemental to Rule 403 and only applies to activities in the Coachella Valley. Rule 403.1 is intended to reduce or prevent the PM_{10} emissions from human-made fugitive dust sources.

The State is committed to collaborating with SCAQMD staff and recognizes the role of SCAQMD in approving dust control project designs and performance measures for project areas in its jurisdiction. The State will work collaboratively with the SCAQMD to obtain permits and approvals prior to construction. This commitment also applies to addressing fugitive dust generated from construction activities associated with implementation of these projects. This coordination has already started and the State will continue to involve the SCAQMD in the planning associated with DSAP projects within its jurisdiction.

3.2.10 Compliance with Construction and Operations Permitting Requirements

Implementation of DCMs will require compliance with measures and conditions of approval intended to limit construction impacts. The types of construction-related measures could include:

- Addressing fugitive dust from roads and open areas;
- Installation of traffic controls for the transit of heavy equipment and worker vehicles to project sites;
- Notifications to adjacent landowners of pending construction activities;
- Consideration of the use of a construction hotline for the public to contact the State to express construction activity-related concerns; and
- Use of onsite safety/security measures, such as exclusionary fencing, worker safety programs, and use of and onsite security.

3.3 Overview of Construction Contracting

Implementation of DSAP projects will require specialized contractors for design and construction. DWR staff are working on building additional contract capacity and agreements to support the development of the proposed projects. This includes securing contractors, entering into agreements with local agencies and leveraging internal DWR and CDFW expertise to complete the work All three options will be pursued concurrently to optimize the State's ability to develop and implemented the projects proposed in the DSAP.

The timeline for construction contracting involves three phases: a competitive bid and contractor selection, an interagency agreement between DWR and CDFW, and an agreement between DWR and IID. An example of the time frames needed for the different tasks in contracting is shown in Appendix C. As shown in this Gantt chart, the contracting process has been placed first in sequence, to provide the State Team the contractor resources to implement projects in the following months.

4 Site-Specific Action Plans

The DSAP has selected project areas based on four factors: an evaluation of soil emissivity, potential for timely environmental permitting and land access authorizations, sites with potential availability of short- and long-term water supplies, and sites with proximity to residential populations. Sites with potential access to water supplies have been selected to allow project options that both suppress dust and create habitat, such as through shallow flooding and the support of vegetation. Nine areas have been identified for project implementation, as introduced in Chapter 1. Site-specific action plans have been developed for each area. The project areas are as follows:

- SCH Dust Project
- Wister-Frink
- Kane Spring
- Bombay Beach
- San Felipe Fan
- Tule Wash
- Clubhouse Area
- Coachella Exposed Lakebed Area
- North Shore Area

The first seven of the areas above are also part of IID's planning efforts as documented in their 2019-2020 Proactive Dust Control Plan (IID 2020c). IID's efforts on the emissions inventory have generated a spatial dataset summarizing the annual PM_{10} emissions potential across the lakebed. An overview of estimated areal emissions and a key soil property (percent sand content) based on IID field data is shown in **Figure 7**. Emissions by project area, computed from IID estimates, are shown in **Table 4**. The methodology accounts for the spatial variability in soil emissivity, existing roughness, and wind speed. The result provides a consistent, quantitative, and physically-based method to assess which source areas are contributing the most PM_{10} to the airshed. These results were used to inform the identification of dust suppression project areas. The impacts of these lakebed emissions expressed as exposure to PM_{10} concentration at the population

centers surrounding the lakebed is a very important yet currently unanswered question. The State Team will look to a focused collaboration on resolving this question, because it is especially pertinent to the last of the project areas on the above list (Coachella Exposed Lakebed and North Shore Area).

Project-specific plans for each area are discussed in the following sections. Each project area is associated with a brief narrative description of the dust control approaches to be considered given our current understanding. The approaches may be modified based on additional data collection, data analysis, implementation of test-plot studies, and consultation with regulatory agencies and landowners. Going forward, implementation plans will be developed for each project area that will include additional details on specific elements such as project design, permitting needs, and approach for compliance with all applicable regulations. Portions of planning areas that are targeted for other restoration activities by the SSMP or partner organizations will be excluded from these implementation plans. It should be noted that the ultimate goal of these project concepts, particularly after completion of Phase B, is to develop sustainable areas that limit dust emission and also provide a variety of habitat through ponds, stormwater spreading and vegetation establishment.

Figure 7. Dust Emissions and Sand Content on the Exposed Lakebed of the Salton Sea, Based on Data from IID AQM Program.

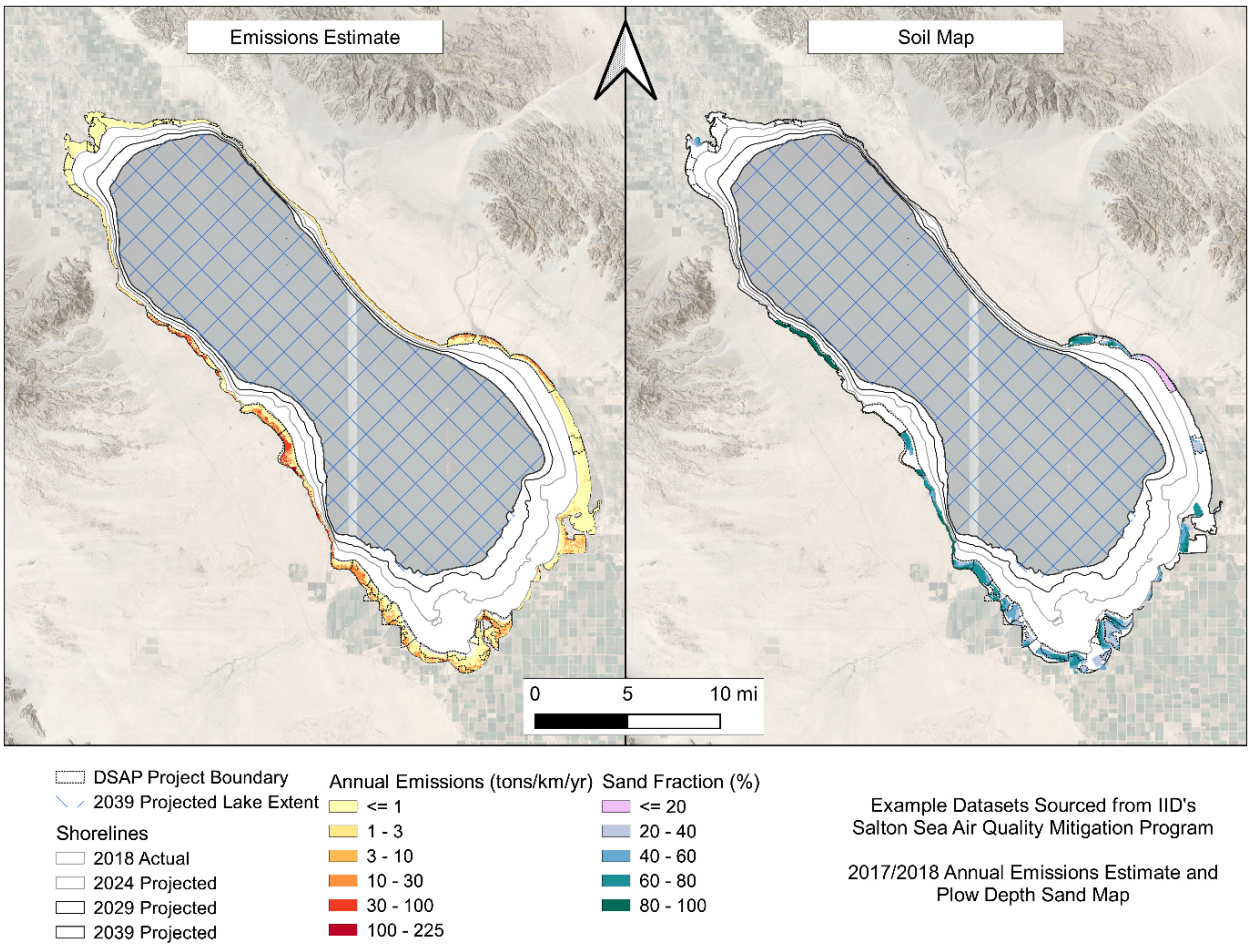


Table 4. Project Areas and Emissions Based on IID Gridded Estimates

Project Area Name	Project Area Code	Phase	Acres	Estimated Annual PM_{10} Emissions (tons per year)	Project Area Contribution to Total Lakebed Emissions (percent)
Bombay Beach 1	BB-1	Phase A	374	12,910	2.6
Bombay Beach 2	BB-2	Phase A	449	11,320	2.28
Club House 1	CH-1	Phase B	615	62,320	12.54
Club House 2	CH-2	Phase B	161	11,730	2.36
Coachella Lakebed 1	CP-1	Phase B	139	60	0.01
Coachella Lakebed 2	CP-2	Phase B	107	10	0
Coachella Lakebed 3	CP-3	Phase B	239	80	0.02
Coachella Lakebed 4	CP-4	Phase B	202	90	0.02
Coachella Lakebed 5	CP-5	Phase B	81	20	0
Coachella Lakebed 6	CP-6	Phase B	575	110	0.02
Coachella Lakebed 7	CP-7	Phase B	48	10	0
Kane Springs 1	KS-1	Phase A	237	4,810	0.97
Kane Springs 2	KS-2	Phase A	134	2,330	0.47
Kane Springs 3	KS-3	Phase A	493	8,120	1.63
Kane Springs 4	KS-4	Phase A	222	3,040	0.61
North Shore 1	NS-1	Phase B	63	60	0.01
North Shore 2	NS-2	Phase B	30	30	0.01
San Felipe Fan 1	SFF-1	Phase A	350	13,550	2.73
San Felipe Fan 2	SFF-2	Phase A	506	30,010	6.04
Species Conservation Habitat 1	SCH-1	Phase A	964	15,810	3.18
Species Conservation Habitat 2	SCH-2	Phase A	151	340	0.07
Species Conservation Habitat 3	SCH-3	Phase A	83	1,820	0.37
Species Conservation Habitat 4	SCH-4	Phase A	120	5,120	1.03
Species Conservation Habitat 5	SCH-5	Phase A	197	70	0.01
Species Conservation Habitat 6	SCH-6	Phase A	424	4,370	0.88
Tule Wash 1	TW-1	Phase B	1092	41,430	8.34
Tule Wash 2	TW-2	Phase B	902	90,950	18.31
Wister Frink 1	WF-1	Phase A	342	590	0.12
Wister Frink 2	WF-2	Phase B	639	16,780	3.38
TOTAL FROM ALL AREAS ABOVE					**68.01**

4.1 SCH Dust Project

This area is the site of the future creation of 3,770 acres of habitat ponds that will act as a fishery for tilapia that will provide habitat for piscivorous birds. This project is set to begin construction in the fall of 2020 and be completed by the end of 2023 (SSMP, 2020). The land that the project will be constructed on is primarily exposed lakebed and contains areas that have become emissive. Since the area will ultimately be a wetted habitat area, only temporary dust suppression methods are proposed.

The total SCH area can be divided into four areas for dust suppression purposes:

- Areas of low emissivity, consisting mostly of locations that are wetted by drain outlets or are adjacent to the New River.
- Areas where dust suppression is complete. These are areas where surface roughening has been accomplished by IID and by the State's Bruchard Road Dust Suppression Project, which was completed in January 2020.
- Areas targeted for additional surface roughening, totaling 950 acres.
- Areas targeted for aerial spraying of dust suppressants, totaling up to 810 acres.

The State intends to implement additional dust control projects at this site this summer, starting in August 2020. The timeline for implementation of the SCH plan is shown in **Figure 8**. A detailed plan of project implementation is shown in Appendix C.

Acreage: Approximately 1,900 acres planned

Landowners: IID and BLM

Dust Control Methods: Dust control measures need to be implemented quickly to address areas that have the potential to be emissive and in a manner that will not affect construction of the SCH habitat ponds. As discussed above, temporary surface roughening is proposed for implementation in areas that do not have natural features that need to be retained for the SCH project. Other areas that have native soils or topographic features that are essential to SCH design or environmental compliance will be monitored for emissivity. If deemed emissive, dust suppressants proposed to be applied. A map illustrating the proposed methods of dust suppression to be implemented in the SCH area is provided in **Figure 9**.

Figure 8. Timeline for Implementation of the SCH Dust Suppression Project.

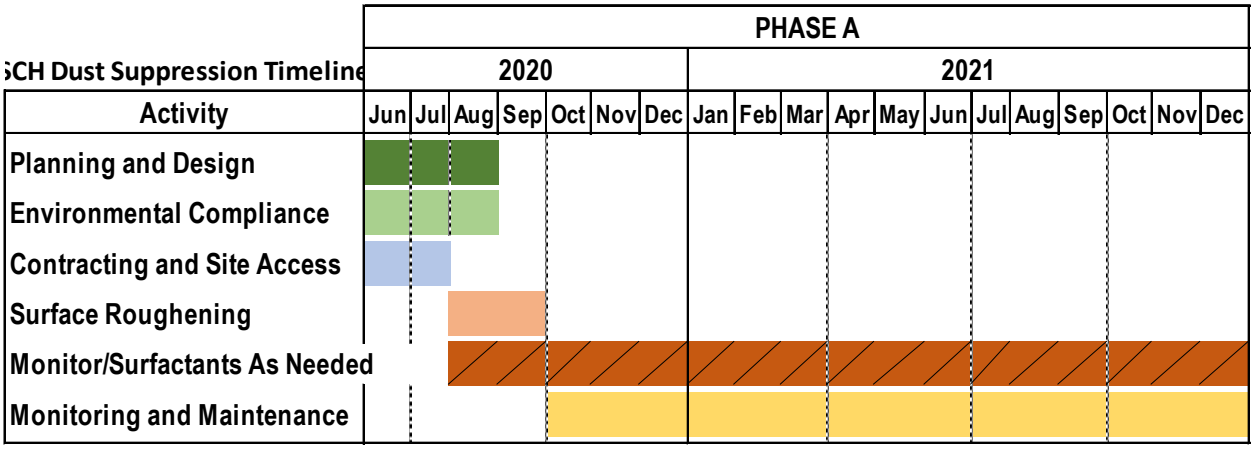
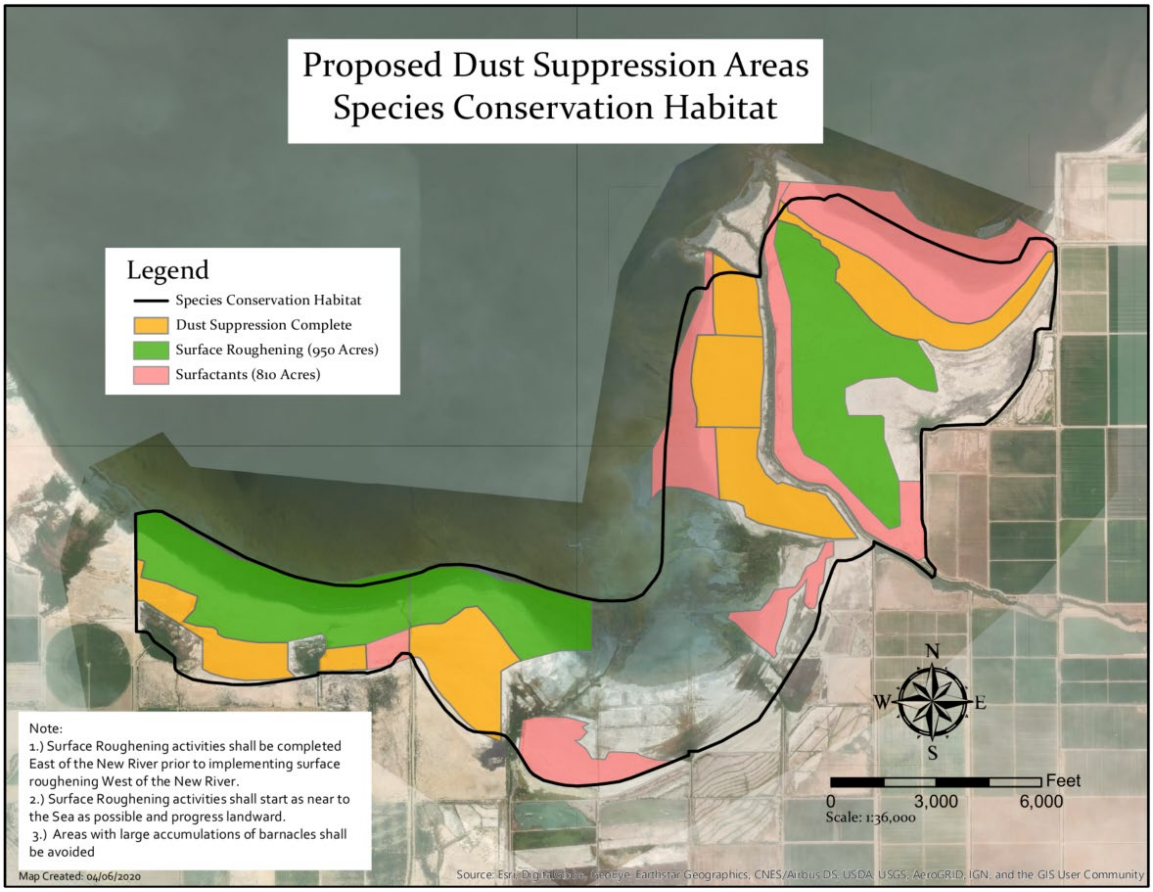


Figure 9. Planned SCH Dust Suppression Areas and Methods.



4.2 Wister-Frink Area

The Wister-Frink area is split into two project areas WF-1 and WF-2. The WF-1 project area is roughly 340 acres and positioned downslope of the Wister Wildlife Refuge. WF-1 is characterized as moderate to high emissivity and is almost completely bounded by vegetation supported by agricultural run-off. The proposed approach for WF-1 is to implement temporary surface roughening in Phase A. In Phase B for the same area, agricultural run-off water during the cool season would then be redirected into select furrows to establish repeating sets of hedgerows consisting of salt tolerant shrubs.

The WF-2 area is roughly 660 acres and is positioned just to the northwest of the northern extent of IID's agricultural water supply and drainage infrastructure. The southeastern portion of the WF-2 project area is bounded by vegetation supported by run-off from IID drains. The soil in WF-2 is fine textured across the site which makes this area suitable for surface roughening due to substantial soil cohesion as well as suitable for shallow water habitat due to a low vertical hydraulic conductivity resulting in an efficient ponding potential. Additionally, there is an impeding layer present in the top meter of the soil profile across the WF-2 site which will increase the site's capacity for ponding water and likely limit the rooting depth of salt tolerant vegetation. Given the site characteristics a shallow one-foot surface roughening treatment is proposed for Phase A as to provide immediate dust suppression but limit the disturbance of the impeding layer. Due to proximity to water supply infrastructure and the site potential for ponding, shallow water habitat is proposed for Phase B. This would require water agreements with IID and some minor water infrastructure to supply water to the shallow water habitat. A preliminary timeline for implementing the Wister-Frink area project is illustrated in **Figure 10**., and a map showing the project area appears in **Figure 11**.

Acreage: WF-1: Phase A-340 acres for surface roughening converted to vegetation establishment in Phase B. WF-2: 660 acres of surface roughening converted to shallow water habitat in Phase B.

Landowners: IID, City of Los Angeles, and BLM

Dust Control Methods: WF-1: Phase A 340 acres for surface roughening converted to vegetation in Phase B. WF-2: 660 acres of shallow surface roughening converted to shallow water habitat in Phase B.

Figure 10. Preliminary Timeline for Implementation of the Wister-Frink Dust Suppression Project.

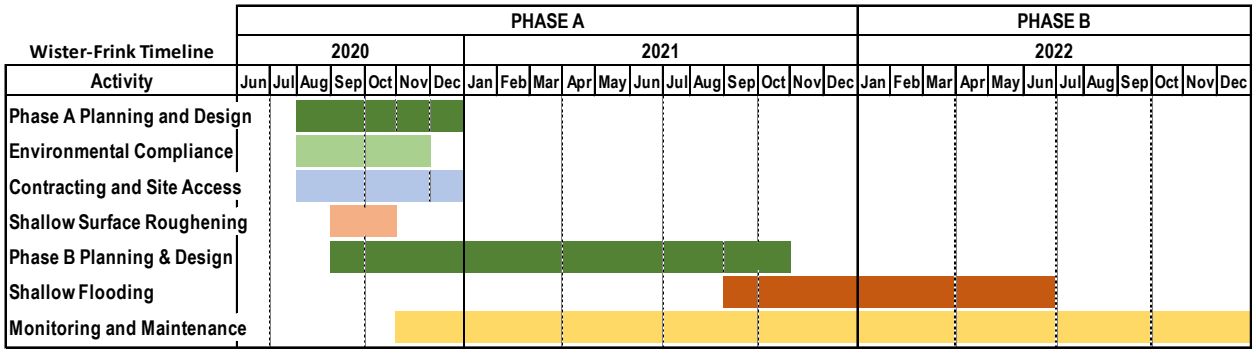
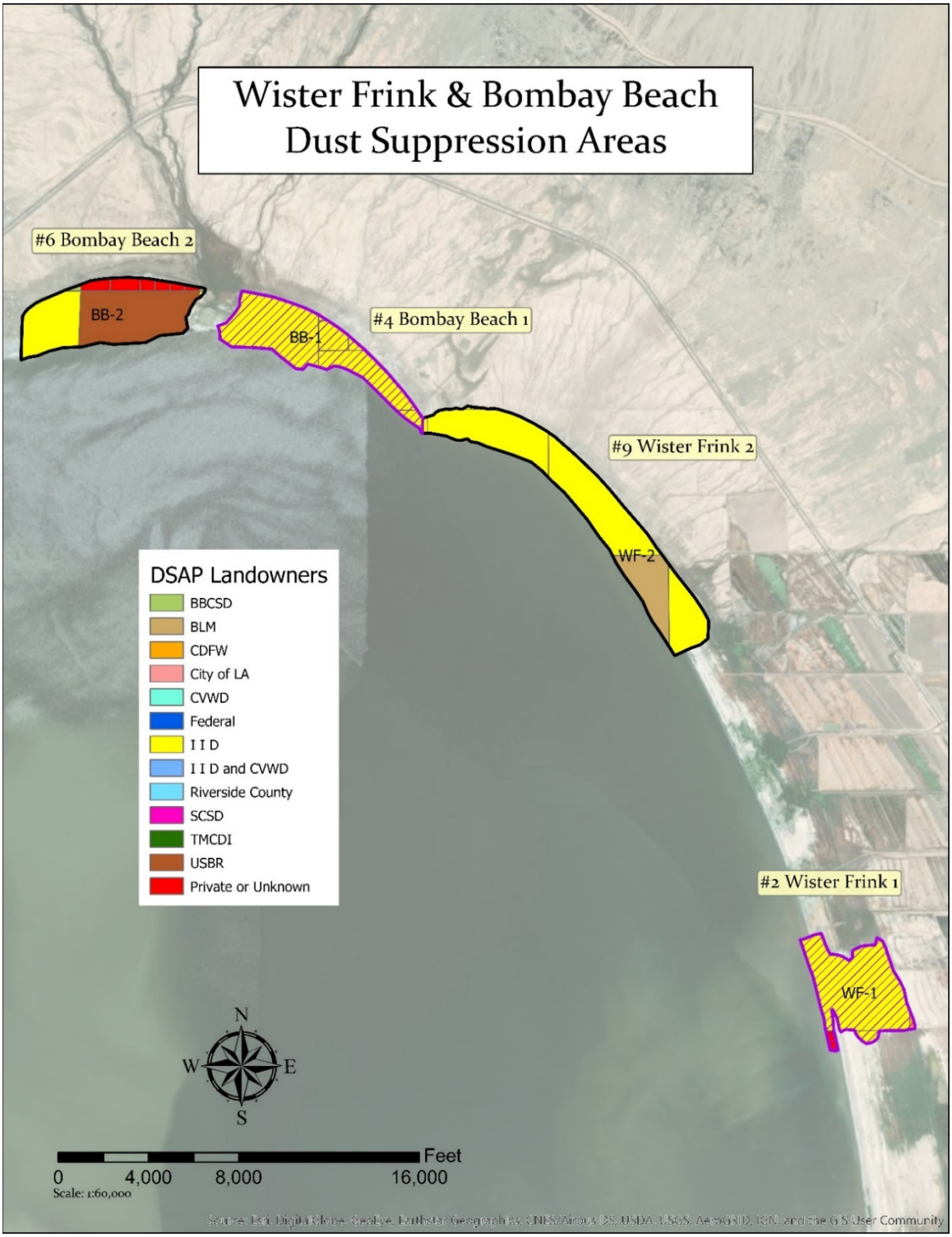


Figure 11. Wister-Frink and Bombay Beach Dust Suppression Areas. Hatched Areas Represent Phase A Projects.



4.3 Kane Spring

The Kane Spring dust suppression area is located downstream of several agricultural fields. The irrigation tailwater from these fields drains to three ditches: San Felipe Wash in the north, Drain Twenty-two in the middle, and Drain Twenty in the south. The proposed dust suppression plan for this project area is a combination of surface roughening and vegetation establishment using the water from the three drainage ditches. The geometry of the surface roughening area will be designed to have the capacity to contain the drainage water in order to help vegetation growth. **Figure 12** shows the preliminary timeline for the Kane Spring dust suppression project and **Figure 13** provides a map of the area.

Acreage: 1,100 acres

Landowners: IID, USBR and BLM

Dust Control Methods: Surface roughening and vegetation establishment.

Figure 12. Preliminary Timeline for Implementation of the Kane Spring Dust Suppression Project.

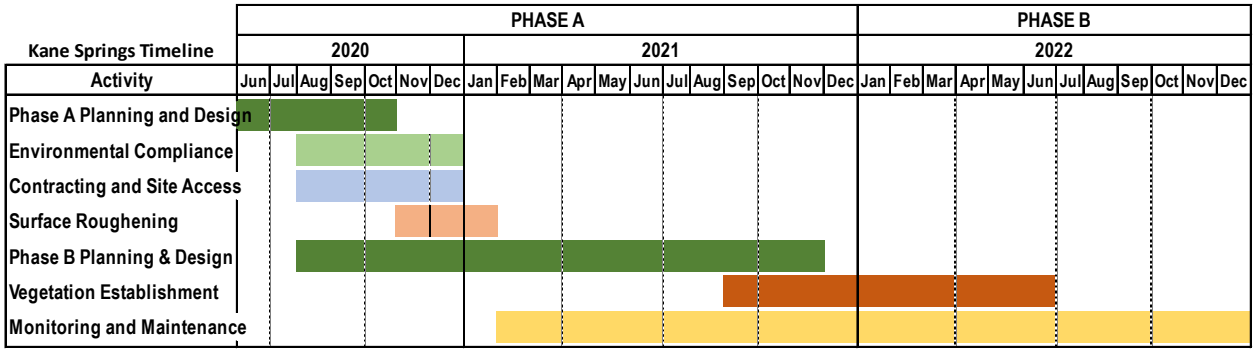
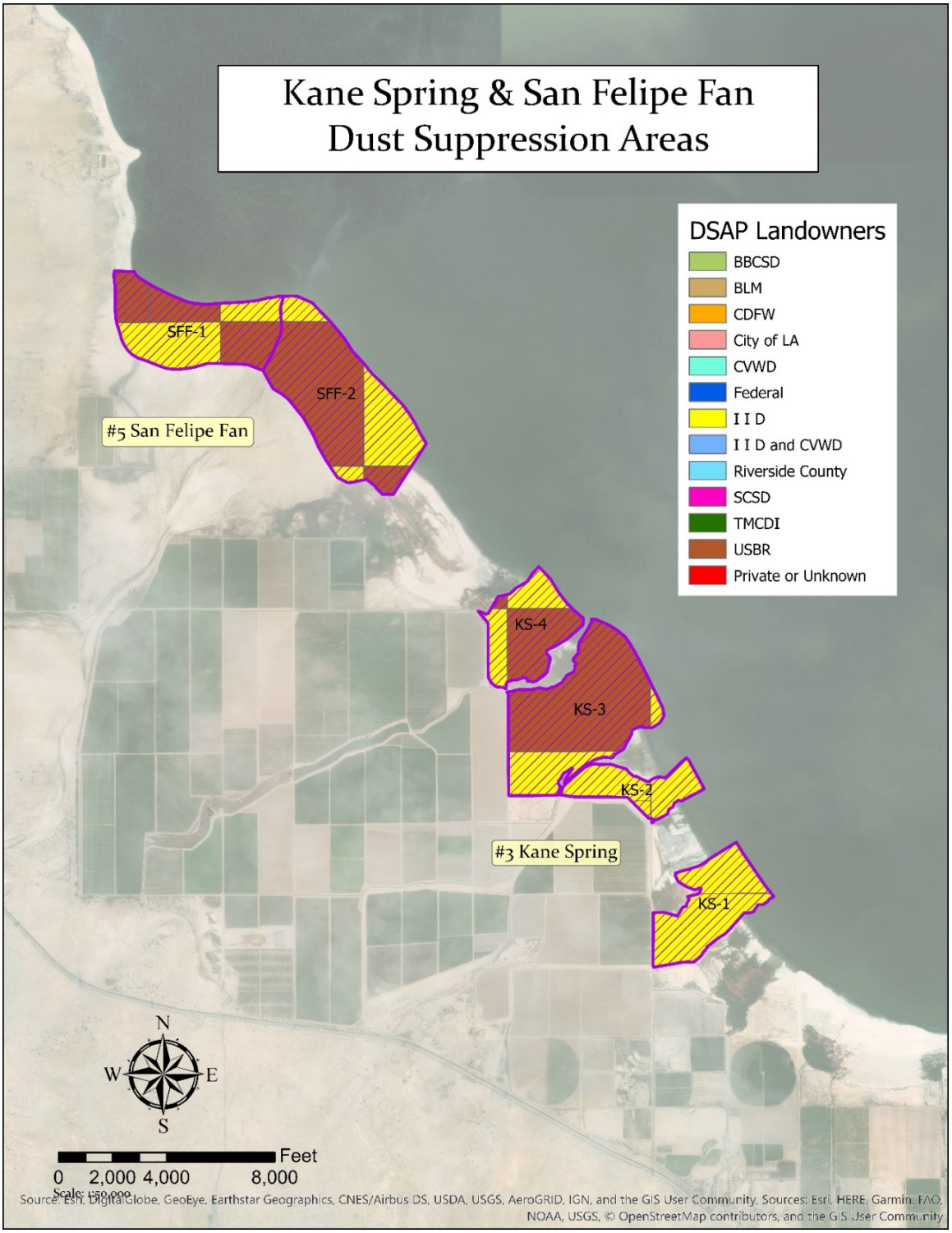


Figure 13. Kane Spring and San Felipe Fan Dust Suppression Areas. Hatched Areas Represent Phase A Projects.



4.4 Bombay Beach

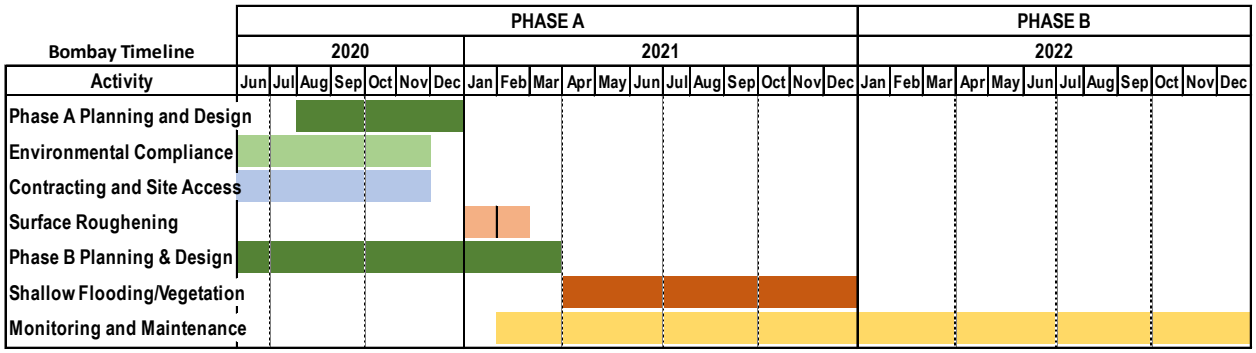
Bombay Beach is an emissive area on the Salton Sea exposed lakebed and is adjacent to the Bombay Beach populated area. Natural springs drain down the area and, at times, create shallow water habitat by pooling behind naturally occurring barnacle berms. Some years, large storms will add to the flow of water draining into the area, which can cause it to blow out the naturally occurring berms and the shallow pool will drain out. This results in exposed lakebed and subsequent dust emissions become an issue. Controlling dust in this area is proposed to be done initially by surface roughening where soils are suitable. The rest of the emissive area will either be vegetated, have a berm created to facilitate shallow habitat creation, or utilize stormwater spreading. **Figure 14** illustrates the preliminary timeline for the Bombay Beach area and the preceding **Figure 11** includes a map of the Bombay Beach dust suppression area.

Acreage: 880 acres

Landowners: IID, USBR, and Private

Dust Control Methods: 400 acres are suitable for temporary surface roughening and are proposed to be constructed as part of Phase A. An additional 555 acres may be vegetated with native vegetation and/or become shallow water habitat, including the area constructed in Phase A. Stormwater spreading is also being considered as a possible dust control method in this area.

Figure 14. Preliminary Timeline for Implementation of the Bombay Beach Dust Suppression Project.



4.5 San Felipe Fan

The San Felipe Fan dust suppression area is at the downstream delta of the San Felipe Creek, which is the largest creek in the west Salton Sea area. The Creek's flow rate is highly dependent on the storm runoff from the watershed, which varies between years. From 1961 to 1990, San Felipe Creek had annual flow volumes ranging from 1,000 acre-ft to 410,000 acre-ft. This project would utilize stormwater from San Felipe Creek by letting it spread to the exposed lakebed to help vegetation establishment. The plan is to construct lateral ditches along the contours so the stormwater can be retained in the ditches and infiltrate to the soil for vegetation uptake. Beside the benefit of helping vegetation growth, the lateral ditches can also serve as surface roughening units that can slow down wind speed to reduce soil emissivity from the project areas. **Figure 15** shows

the preliminary timeline for the San Felipe Fan Dust Suppression Project and the preceding **Figure 13** provides a map of the area.

The 1988 annual peak storm event for the San Felipe Creek watershed was used to evaluate the effectiveness of stormwater spreading. **Figure 16** shows the simulation of stormwater spreading in the project area. As shown in **Figure 16**, the stormwater fills in the lateral ditches sequentially from upstream to downstream when it progresses toward the Salton Sea. The water depth in the spreading system is maintained at 0 to 3 feet. The simulation results indicate that the proposed stormwater spreading system would retain 42% of the 330 acre-feet of stormwater (i.e. 139 acre-ft) during a storm equivalent to a major 1988 storm event. As Salton Sea continues to recede, more ditches may be constructed on the exposed lakebed to further utilize the stormwater for dust suppression.

Acreage: 860 acres

Landowners: IID and USBR

Dust Control Methods: Surface roughening and shallow flooding with vegetation. The DWR team has performed HEC-RAS hydraulic modeling for the stormwater spreading by proposing 38 miles of 20-feet-wide, 3-feet-deep ditches on the San Felipe Fan exposed lakebed. The 38-mile lateral ditches are designed following the contours from -229 feet to -234 feet with an increment of 0.25 ft to 0.5 ft, depending on the topography of the exposed lakebed. Six weirs are proposed along the Creek at different locations to make stormwater fill in the lateral ditches and to maintain the water in ditches to be no more than 3 feet deep.

Figure 15. Preliminary Timeline for Implementation of the San Felipe Fan Area Dust Suppression Project.

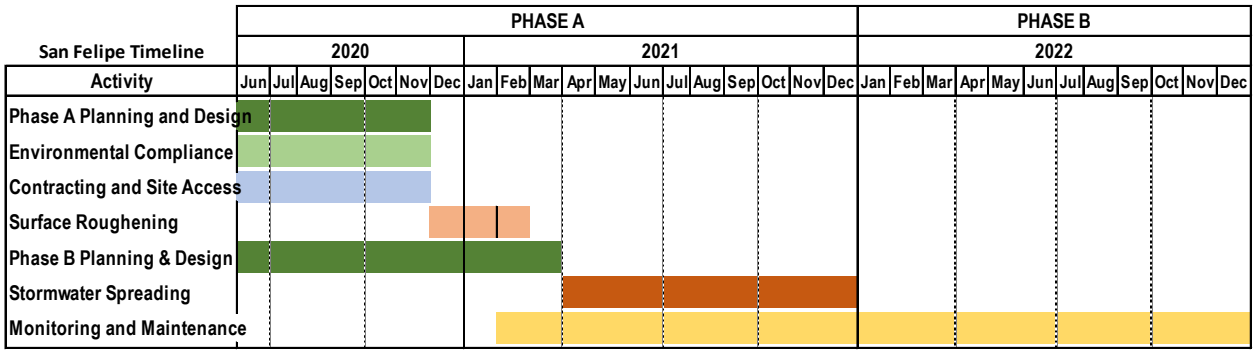
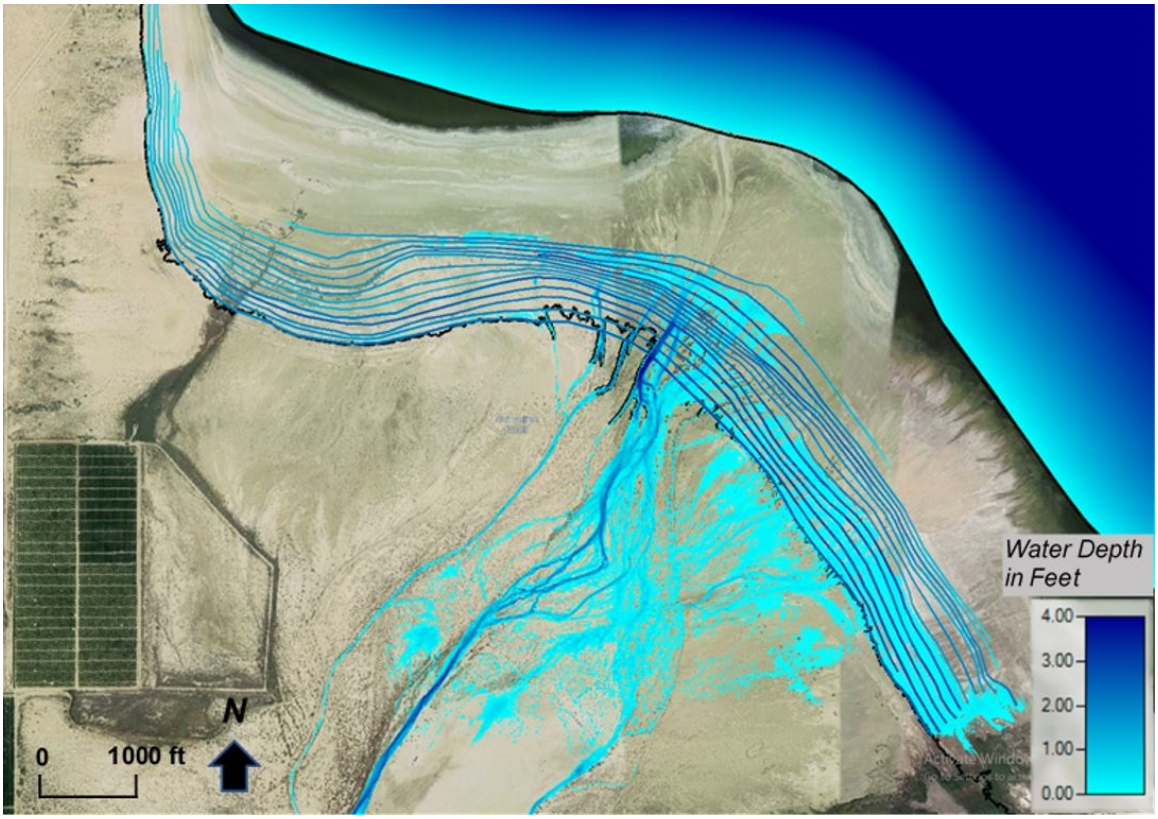


Figure 16. Map of San Felipe Fan Area Dust Suppression Project Showing Simulation of Stormwater Spreading on the San Felipe Fan.



4.6 Tule Wash

The Tule Wash area has high emissivity as a result of prevailing winds, smooth surface and the presence of loose sand on the surface as deposited by ephemeral flows across a broad alluvial fan. The Tule Fan formed by Tule Wash is a broad and shallow sloped landform that extends into the current Salton Sea resulting in significant exposure of lakebed in this area. The soils are variable, although generally coarse, which limits the suitability of surface roughening. This points to the potential use of water for dust suppression. This area is far from any agricultural water supply or perennial water course making water supply challenging. However, the presence and apparent health of natural near-continuous shrubs positioned along contours on the upslope site boundary suggests a potential for stormwater spreading. The presence of these natural hedgerows is likely due to slow stormwater velocities, ponding behind naturally-formed berms, and coarse-textured soils which create a favorable rooting environment during discharge events. Given these uncertainties and opportunities this site is placed in Phase B. A pre-design step is proposed in which stormwater is to be characterized, water supply investigation performed, vegetation establishment techniques vetted, and waterless dust control measures assessed. Once the pre-design step is complete, a design will be generated and then implemented in 2022. **Figure 17** shows the preliminary timeline for the Tule Wash project area and **Figure 18** provides a map of the area.

Acreage: Approximately 1,850 acres – Phase B

Landowners: USBR, IID, Private, and other Federal

Dust Control Methods: To be determined by end of year 2021.

Figure 17. Preliminary Timeline for Implementation of the Tule Wash Area Dust Suppression Project.

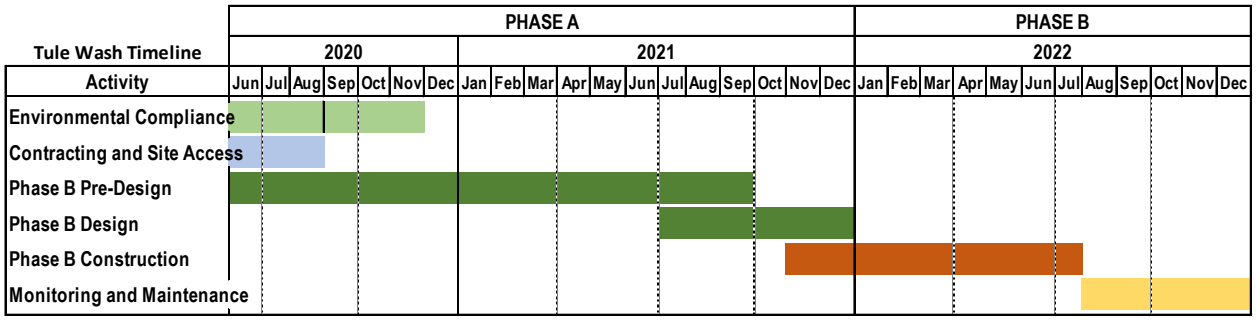
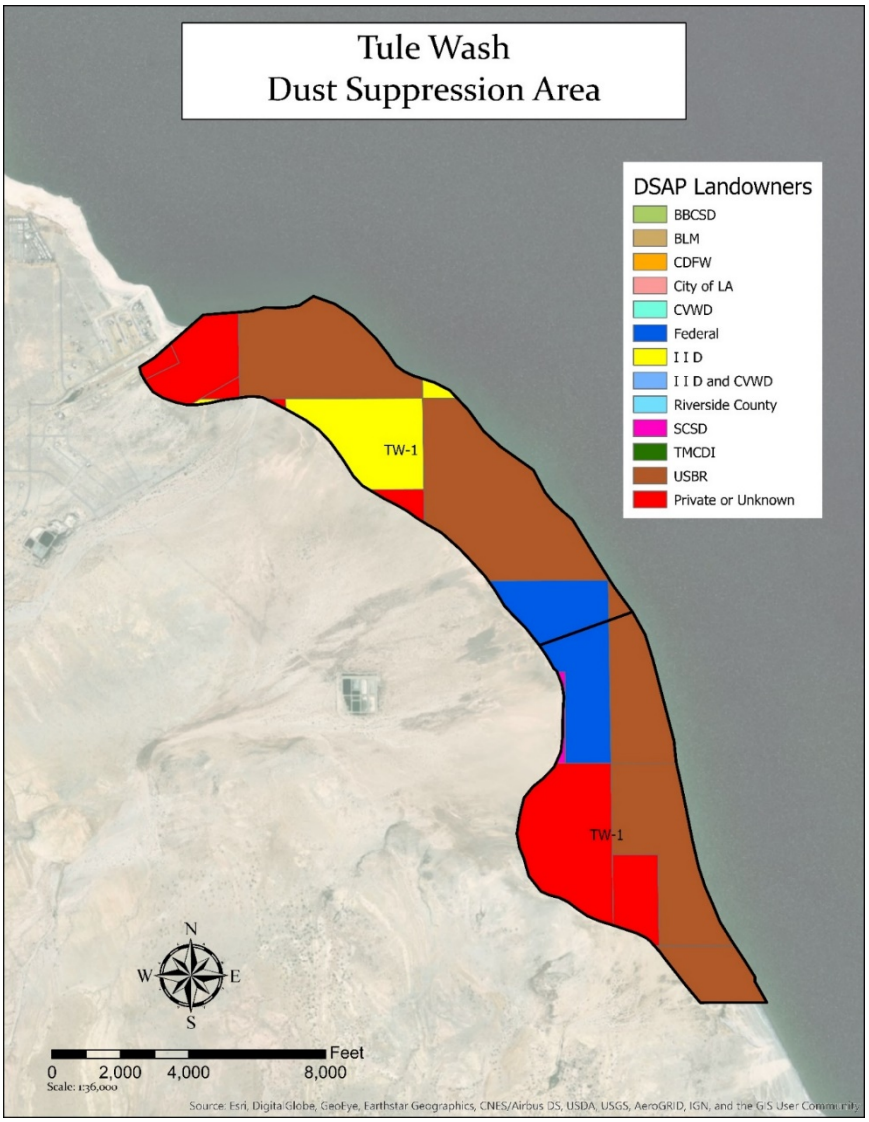


Figure 18. Tule Wash Dust Suppression Area.



4.7 Clubhouse Area

This area has the highest emissivity of all individual dust control sites on the exposed Salton Sea lakebed and is close to residential populations (Salton City). This is also one of the most challenging dust control sites. This site is comprised of coarse soil textures, high occurrence of barnacle beds, heaved surface crusts, and subject to uncontrolled seasonal flows that make this site unsuitable for surface roughening (IID, 2020c).

There are low-density areas of naturally established vegetation in this area. The most effective dust control opportunity will be to enhance vegetation and create stands and hedgerows of vegetation, planted with salt-tolerant species. Managing surface water run-off is an opportunity being explored to provide a seasonal water source for this area. This will require securing water rights, groundwater regulatory compliance, design, and ongoing application. However, there may be other opportunities for water sources such as reclaiming water from residential areas, creating detention basins (with or without tankage) to store surface flows, using an overland conduit to pump a water source from another location, most likely from the southern part of the Salton Sea, and to continue to explore options using existing groundwater.

Due to these complex factors, the State has identified that this site could benefit from additional studies and data collection to define a method for effective vegetation enhancement. Plot studies on areas of 40 or more-acre plots are currently under consideration. For these reasons, this site is scheduled for implementation in Phase B. **Figure 19** shows the preliminary timeline for the Clubhouse Dust Suppression Project and **Figure 20** provides a map of the area.

Acreage: 780 acres

Landowners: USBR, Torres Martinez Desert Cahuilla Indians, Private, and IID

Dust Control Methods: Due to challenges associated with securing water for implementation, potential methods include: 1) grading to create berms and islands with spots with lower wind exposure suitable for vegetation; 2) creating shallow detention basins to catch seasonal flows to create small islands of wetter areas that could sustain establishing vegetation with limited water needs during the dry season; 3) amending soils with organic matter to enhance establishment of vegetation; 4) gravel cover; 5) vegetation enhancement; and 6) installing physical barriers (e.g. sand fence, straw bales/waddles, boulders, or other barriers that can serve to create a berm/dune and exclude off-road vehicle transit.

Figure 19. Preliminary Timeline for Implementation of the Clubhouse Area Dust Suppression Project.

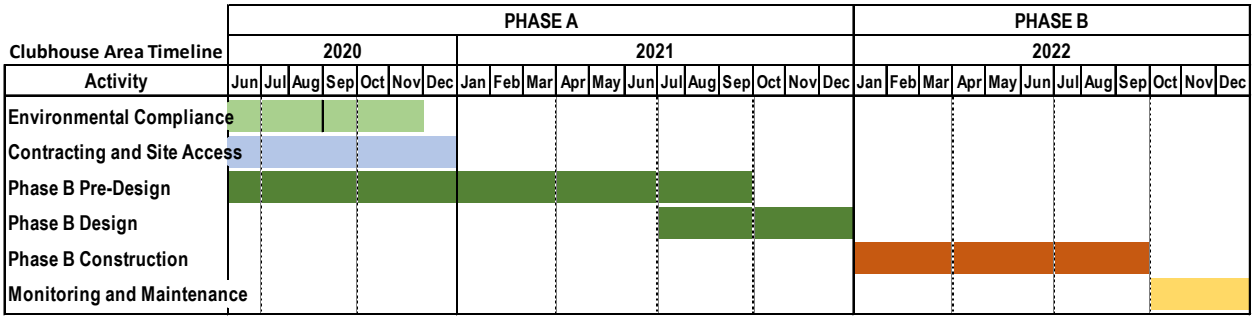
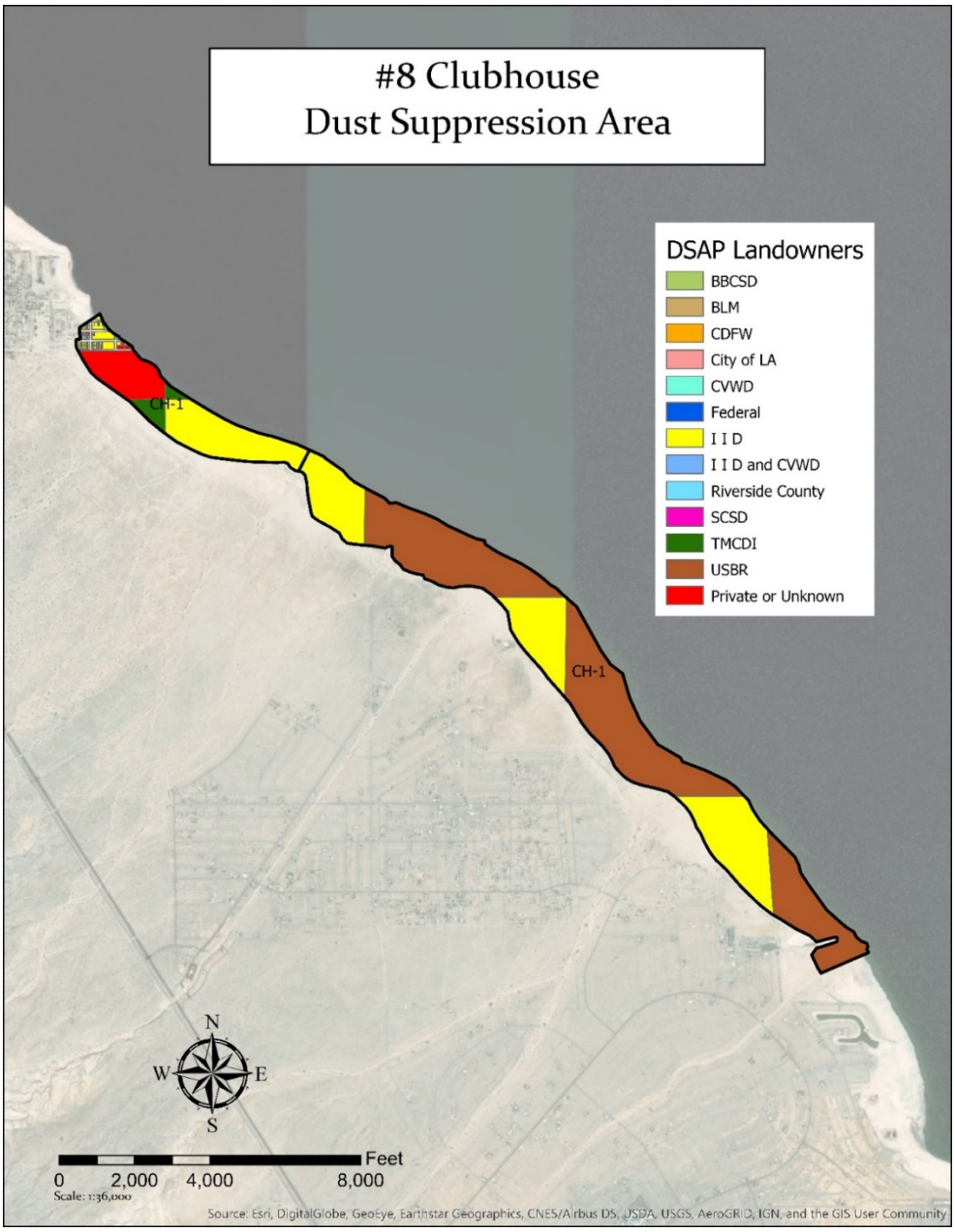


Figure 20. Clubhouse Dust Suppression Area.



4.8 Coachella Exposed Lakebed

Community interest has been expressed for implementation of a project at this site. This area has low emissivity based on IID data (**Table 4**). Concerns have been raised regarding the dust emissions from this area because of its proximity to residential populations. There are some low-density areas of naturally established vegetation in this area. Additional analysis of air quality and wind data, including placement of new air quality monitors, will be used to define the most appropriate approach for this site. On account of the low emissivity in this area, no site disturbance is planned before additional analysis. Vegetation enhancement may be a possible dust control measure. Confirming a water supply may require securing water rights, groundwater regulatory compliance, design, and ongoing performance monitoring. However, due to the proximity to public infrastructure, including CVWD facilities and easements, there may be other opportunities for water supplies at this location that are not available at other project areas. These opportunities include reclaimed wastewater, creating detention basins to store surface flows, and using an overland conduit to pump a water source from a CVWD facility.

Due to uncertainty of the dust suppression approach and the water supply issues, the State has identified that this site could benefit from additional data collection to confirm the most effective method for moving forward. For these reasons, this site is scheduled for implementation in Phase B. **Figure 21** shows the preliminary timeline for the Coachella Exposed Lakebed Dust Suppression Project and **Figure 22** provides a map of the area.

Acreage: 1,340 acres

Landowners: Torres Martinez Desert Cahuilla Indians, IID, CVWD, USBR, and Private

Dust Control Method: Although emissivity data for this area is available, additional information is needed for design or implementation of dust control methods.

Figure 21. Preliminary Timeline for Implementation of the Coachella Exposed Lakebed Dust Suppression Project.

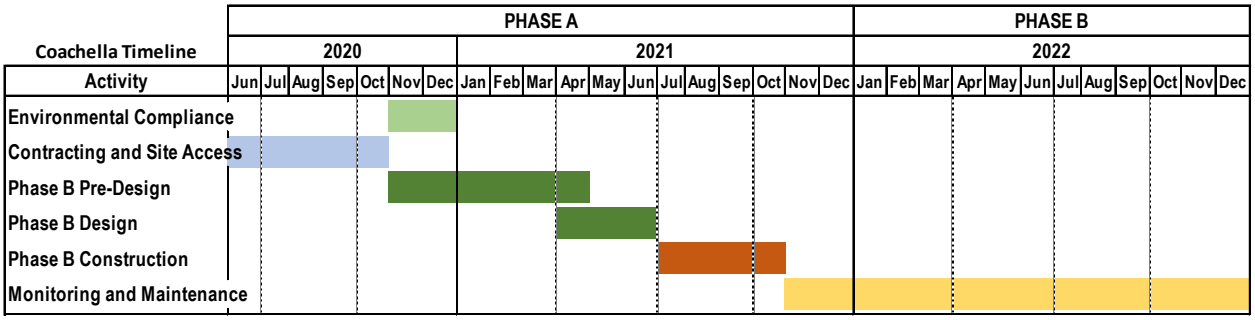
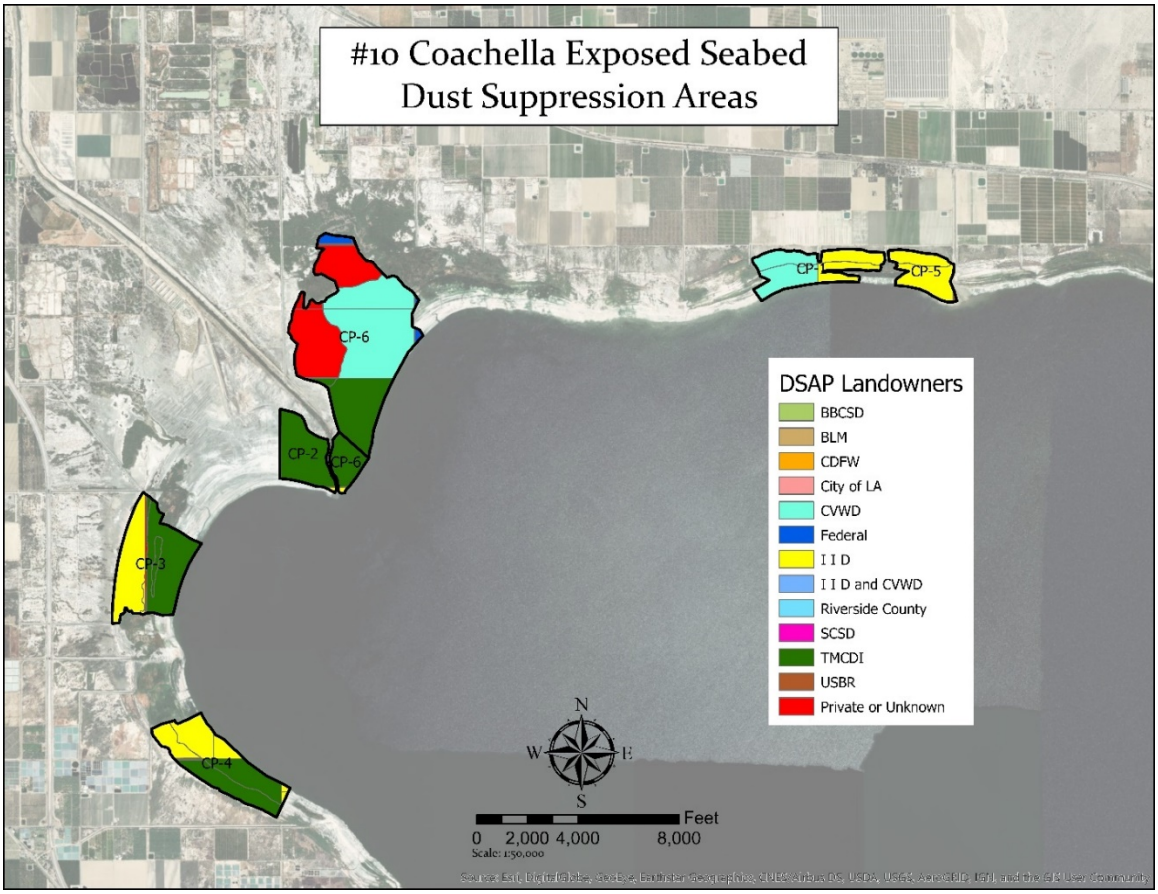


Figure 22. Coachella Exposed Lakebed Dust Suppression Project.



4.9 North Shore Area

Community interest has been expressed for implementation of a project at this site. As with the Coachella Exposed Lakebed, the emissions estimated from this area are low (**Table 4**). Additional data evaluation and/or monitoring will be performed at this location prior to selection of a suitable project design. **Figure 23** shows the preliminary timeline for the North Shore Dust Suppression Project and **Figure 24** provides a map of the area.

Acreage: 93 acres

Landowners: IID, Federal, and Private

Dust Control Methods: There are some low-density areas of naturally established vegetation in this area, and enhancement may be a possibility. Dust control measures will be based on additional evaluation of data at this site.

Figure 23. Preliminary Timeline for Implementation of the North Shore Area Dust Suppression Project.

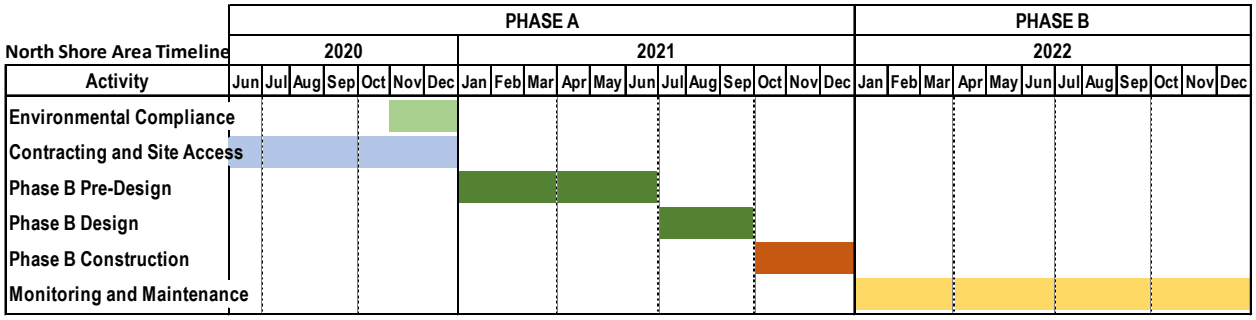
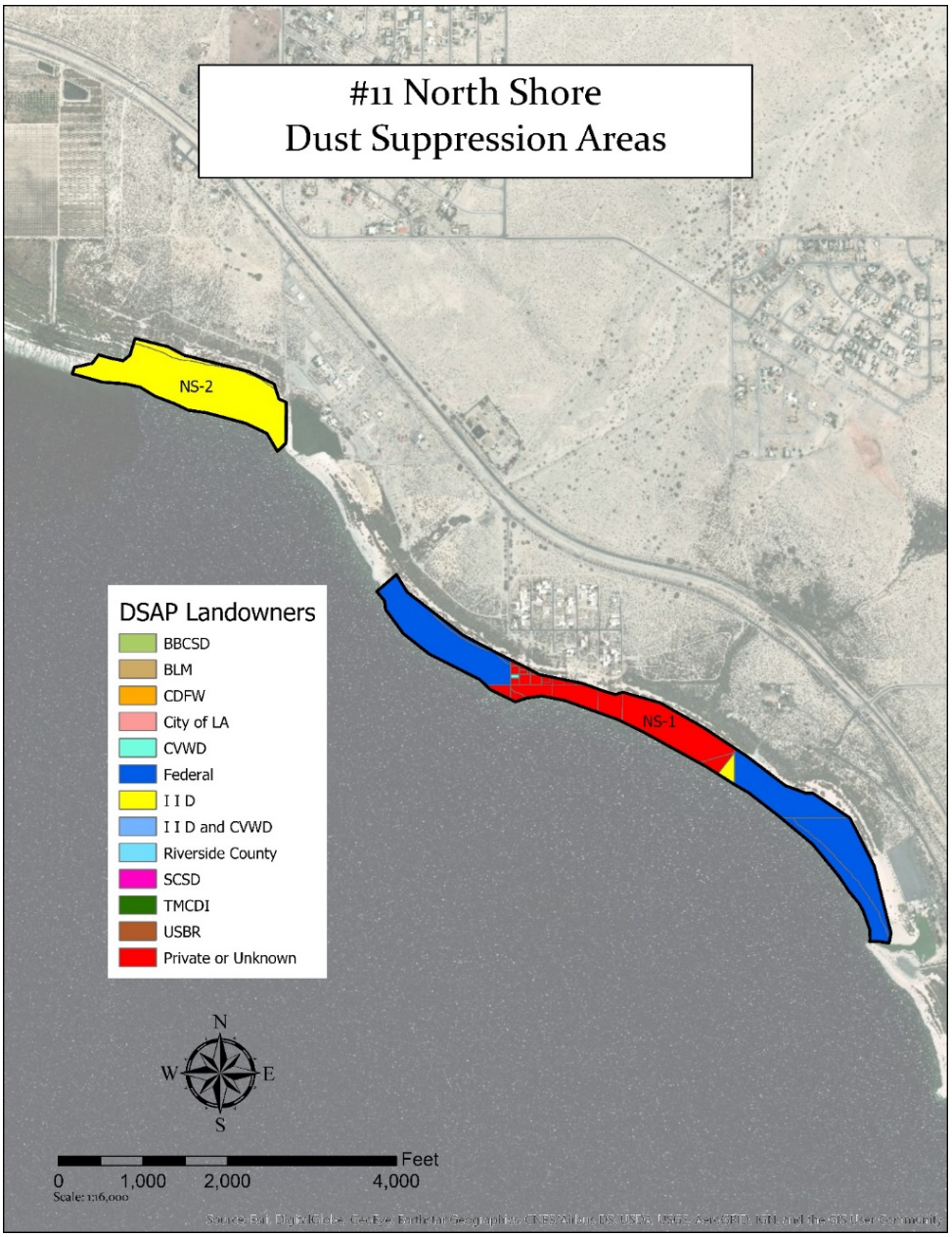


Figure 24. North Shore Dust Suppression Area.



5 Site Characterization and Performance Monitoring

Site characterization and performance monitoring is needed from the early conceptual phases until after the completion of project construction. In the early phases of moving from project concept to design, there is a need for data collection to adequately characterize project sites for implementation with a view to understanding the dust emission potential and the suitability of various dust suppression methods. Some of this work has already been accomplished through the IID activities as described in prior chapters, and the project area selections are based on these foundational data. However site-specific data will need to be collected as projects advance from concept to detailed design.

Similarly, monitoring of air quality in the Salton Sea region has been performed for over a decade (CARB, 2019) and provides a useful baseline for comparison with future conditions. As projects begin construction, there is a need for evaluating and documenting their performance in reducing dust emissions, through additional spatially refined monitoring. These monitoring needs are described briefly in this chapter, although specific requirements will be determined in advance of project implementation by consultation with the ICAPCD and SCAQMD. Monitoring will need to demonstrate quantitatively that the project areas are meeting their regulatory emission reduction targets.

5.1 Air and Water Quality, Soils, and Groundwater Data Collection

The following discussion describes the current IID air and water quality, soils, and groundwater data collection. The State will collaborate with IID on data collection to support studies associated with emissivity and Salton Sea ecosystem health. This work does not include modeling; such modeling will be performed by IID and its contractors and the State Team will collaborate with these modelers to develop supporting information for the planned projects described in the DSAP.

5.1.1 Meteorological Data and Air Emissions

As described in this plan, IID has been collecting scientific data to inform the methods and locations for implementation of dust control projects. In addition, ICAPCD, SCAQMD, and CARB also perform air quality monitoring within the region (Withycombe, 2019b). This extensive data collection effort continues to support development of joint IID/State projects and assist in improving the performance of existing dust control projects. This data collection effort has created a statistically valid dataset, where the large sample size shows calibration, quality control and assurance, key factors for the State to accept and use as the foundation for the DSAP. This robust dataset includes data collected by the following monitoring systems:

- Meteorological stations that track wind speed, wind direction, temperature, and relative humidity;
- Visual surveillance 360-degree camera that document the development and direction of dust emissions and captures dust movement during extreme events;
- Sand motion monitoring, collected using ground-based monitors; and
- Saltation flux mapping using remote sensing and process-based modelling (IID, 2020).

5.1.2 Regional Air Quality Monitoring

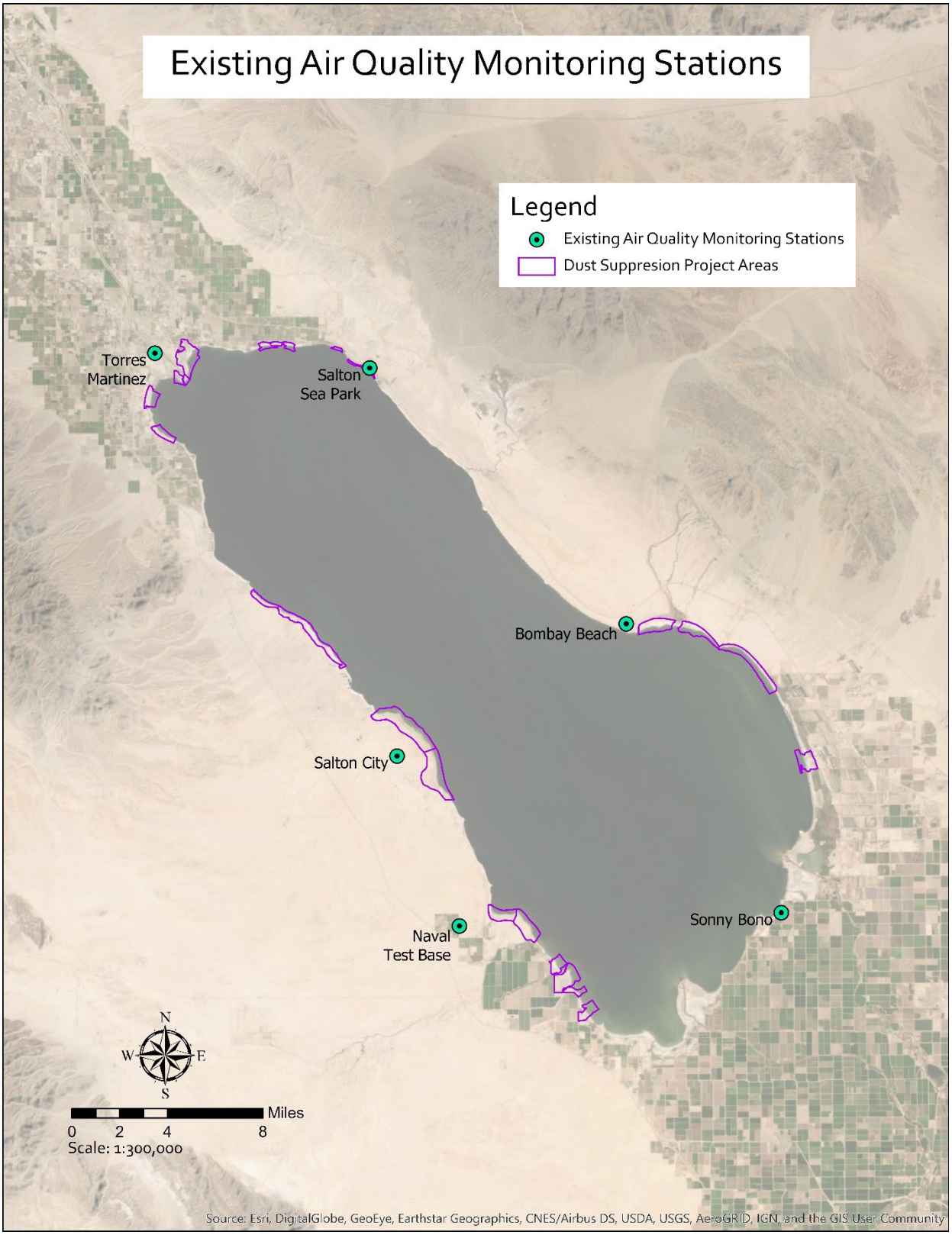
The Quantification Settlement Agreement Joint Powers Authority has funded the construction in 2010 and continuous operation of a network of six shoreline air quality monitoring stations at the Salton Sea. These stations continuously monitor concentrations of PM_{10}, $PM_{2.5}$, and meteorological parameters. The locations of these monitoring stations are shown in **Figure 25**.

These stations were sited as close to the shoreline as practicable in order to (1) maximize measurement of dust emissions from exposed lakebed, and (2) serve as early warning systems for dust emission increases that would impact near-shore communities. The stations were distributed so that pairs of stations were located on the north shore, central shore, and south shore of the Sea. Moreover, sites were chosen so that equal numbers of stations were located on the western and eastern shores. In conformance with air quality mitigation measure 2.e., three stations were located adjacent to or near populated areas on the western, northern, and eastern shores, and three were sited near areas of extensive future exposed lakebed on the south and north shores.

Operation of these stations since February 2010 has revealed several important findings:

- Levels of PM_{10}, the pollutant most closely associated with dust emissions, are low during most hours of the year, but increase to very high levels during high wind events.
- During high wind events, wind at the Salton City, Naval Test Base, and Sonny Bono stations blow almost exclusively from the west-southwest over the Peninsular Range and across the Imperial Valley. High winds at the Torres Martinez and Salton Sea Park stations blow primarily from the north-northeast down the Coachella Valley with secondary flows from west. At the Bombay Beach station, high winds approach primarily from the west-southwest and secondarily from the northeast.

Figure 25. Existing Air Quality Monitoring Stations and Proposed Dust Suppression Project Areas.



- Based on predominant wind directions analysis, many dust sources in addition to exposed lakebed contribute to high PM_{10} concentrations at shoreline stations with the exception of Bombay Beach. These major sources include disturbed desert soils, desert soils downwind of sand dunes and sand sheets, unpaved roads, and freshly tilled agricultural fields.

5.1.3 Associated Environmental Characterization

In addition to air quality effects, there are a suite of environmental components that could beneficially or adversely affect project areas. Currently surficial soils characterization and fine scale meteorological monitoring are ongoing. In an effort to reduce the risk of damage and to quantify site-specific opportunities, additional complementary environmental characterization is proposed. This includes characterization of stormwater, near-surface-groundwater, soil-water, and vegetation cover.

Stormwater considerations will need to be made for most project areas. Stormwater can both act against and in favor of the objective of these projects. Negative impacts might include the washing out of infrastructure and the fluvial deposition of sediment on top of control measures. Positive impacts might include a natural wetting of the soil profile and localized groundwater recharge. Currently there are very few direct observations of discharge and fluvial sedimentation where projects have been prioritized. This is punctuated by the need for observations at the base of alluvial fans and the end of ephemeral dry washes. A coupled monitoring network and modeling exercise is recommended in order to quantify the uncertainty in these stormwater components.

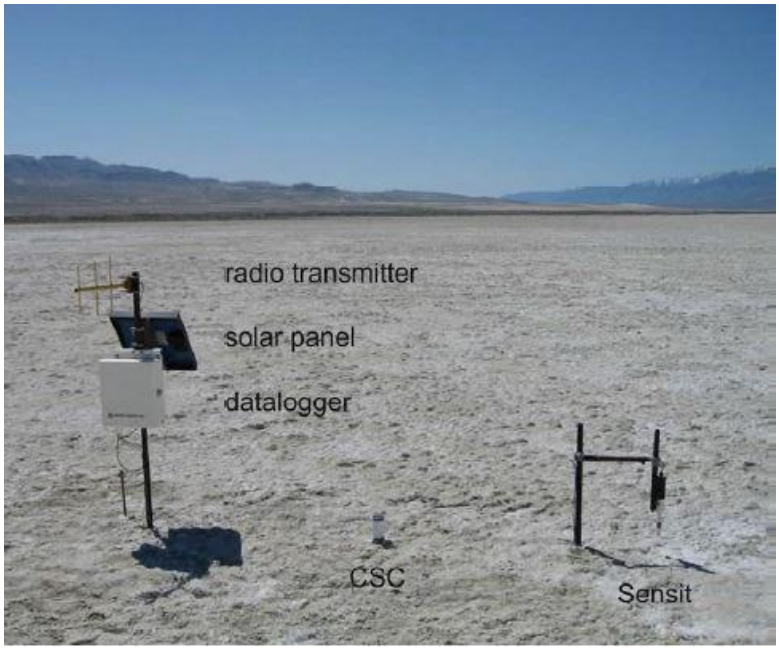
Near-surface groundwater refers to the aquifer closest to the ground surface; this is the aquifer that plants can potentially access. If this aquifer changes dramatically it can affect the plants that depend on it. Early data suggests that there is substantial spatial variability in groundwater conditions around the Salton Sea. To be able to monitor the spatial variability and temporal change of groundwater depth and salinity of the near-surface aquifer, a network of near-surface wells is proposed for installation construction in 2020.

Soil-water refers to the unsaturated water in the pore spaces between the ground surface and the capillary fringe just above the groundwater table. This soil-water provides a volume of water for plants to use. The intent of typical irrigation infrastructure is to manage both the water content and potential in the root zone. Additionally, soil-water near the surface can aid in soil particles resisting applied wind shear forces. A network of continuous soil-water content and potential sensors would provide valuable data for irrigation management and emissions estimation and is recommended for this plan.

Vegetation acts as living roughness elements. Even sparse upland vegetation adds structural complexity to barren areas, which can also provide some minor habitat value. A major advantage of certain plant species that can handle minor burial is that they can store substantial volumes of wind-transported sediment. These barriers are living, and there is a risk is that they can die. To reduce this risk, routine field visits, tissue sampling, root distribution observations, and leaf water potential measurements are

recommended. These data will be utilized to diagnose issues of poor plant health and can aid in ensuring long-term vegetation barrier performance.

Tillage Compliance Monitoring (Photo Credit: CARB)



5.2 Dry Dust Suppression Projects

5.2.1 Monitoring for Surface Roughening

Surface roughening is proposed for Phase A projects. CARB has provided guidance for evaluating the dust suppression performance of surface roughening areas (Withycombe 2019a). It is recommended in this guidance to measure sand flux and PM_{10} concentrations upwind and downwind of the project area. If the sand flux and PM_{10} concentrations measured in the downwind area show no significant changes compared to the upwind area, it indicates that the wind speed has been slowed down enough to reduce sand movement and dust emissions in the project area. IID has successfully used this methodology to confirm the effectiveness of surface roughening in pilot studies at the Salton Sea (IID, 2019f).

For the DSAP Phase A projects, Sensits and a Cox Sand Catchers (CSC), or SANTRIs (for Standalone AeoliaN Transport Real-time Instrument), will be installed to measure sand flux. MetOne Particulate Profilers will be installed to measure PM_{10} concentrations. The Sensit quantifies saltation in terms of kinetic energy and particle count while the CSC captures windblown, sand-sized particles. MetOne Particulate Profiler samples PM_{10} on a real time basis with telemetering capability.

The dust control effectiveness in a surface roughening area can decrease over time due to wind erosion of the furrowed surface. Maintenance of ridge height (RH) and ridge spacing (RS) is important as the change of RH/RS ratio will affect aerodynamic parameters such as surface roughness and threshold friction speed in the furrowed surface. A reduction in threshold friction speed will allow sand movement and increase of dust emissions at lower wind speeds. For each Phase A project, a raster digital elevation model (DEM) and digital aerial images will be constructed based on high resolution surveying using unmanned aerial vehicles (UAVs) or drones. The survey will be performed annually. The results will inform the need for maintenance of the surface roughening sites.

Data collected using the above tools will be uploaded online and made available publicly through a dedicated website on a regular basis.

5.2.2 Vegetated Dust Suppression Projects

Vegetated dust suppression projects include establishment of hedgerows and sand stabilization. Vegetated dust suppression projects will be monitored for plant establishment, water use, and ability to reduce emissions. Monitoring of plant establishment within hedgerows will be based on plant percent cover and can be determined using aerial light detection and ranging (LiDAR) methods, unmanned aerial vehicle- or field-based surveys. Hedgerows will be dense enough that they are effective at slowing down wind speeds at the ground surface, but not so dense that the plants compete for resources and compromise plant development. Plantings intended for sand stabilization will be studied to determine appropriate plant densities and monitoring needs. Vegetated projects will also be monitored for dust control effectiveness similarly to dry dust suppression projects.

5.2.3 Water Supply for Vegetation

Water supplies are needed to establish long-term vegetation. Flowmeters will be used to measure the amount of water applied in each supply system. Hedgerows and sand stabilization plantings use water to germinate seeds for successful establishment. Once established, alternative water supplies will be evaluated.

5.3 Site Maintenance

Maintenance of dust suppression projects will include monitoring of dust control effectiveness at project sites and redesign of methods for areas failing to meet dust control standards. IID is currently designing dust suppression projects using surface roughening to meet an estimated 95 percent reduction in sand motion. The State will also apply this design approach to DSAP projects, in consultation with ICAPCD and SCAQMD. IID is using multiple monitoring techniques to identify when project sites require dust control maintenance activities (augmentation or replacement). Monitoring includes aerial LiDAR, high wind event upwind/downwind PM_{10} monitoring, targeted sand motion monitoring, and visual (video camera) evidence. Such monitoring will assist in the determination of required maintenance.

5.4 Groundwater Monitoring

Monitoring is needed to determine whether groundwater salinity and depth are adequate to support vegetation growth. Groundwater monitoring wells will be constructed in the dust suppression areas where vegetation establishment is proposed. As the Salton Sea continues to recede, groundwater conditions will change. Groundwater monitoring can provide information on the long-term trend of the groundwater conditions, which is essential for dust suppression planning in future phases.

Dust suppression areas that need groundwater monitoring include Tule Wash, Club House, Bombay Beach, Wister-Frink, San Felipe Fan and Kane Spring. Monitoring wells will be constructed at the upstream boundary for these areas, which is the 2003 shoreline. The downstream boundary for these areas is the 2019 shoreline, in which the groundwater elevation and salinity can be approximated by water surface elevation and salinity in the Salton Sea. The groundwater elevation and salinity within the dust

suppression area can be estimated based on data from the monitoring wells and Salton Sea, and other known hydraulic stresses in the area such as groundwater recharge from stormwater runoff or groundwater depletion from nearby production wells.

A total of eleven monitoring wells are proposed along the 2003 shoreline within proposed dust suppression areas as shown in **Figure 26**. The distances between wells are about 2 to 3 miles in order to characterize the spatial variation of groundwater conditions. Since the horizontal distance from the 2003 shoreline to 2019 shoreline is approximately one mile, there is no need for additional monitoring wells between the shorelines since groundwater conditions are not expected to change significantly within a one mile transect. However, when the Salton Sea recedes further, additional wells may be needed and will be proposed accordingly in the future.

Figure 26 also shows the locations of IID's existing wells in which the wells are installed along transect lines perpendicular to the shoreline. The well data can be found on IID's website at www.saltonseaprogram.com. Based on IID's data from 2016 to 2018, the groundwater elevations around the Salton Sea decreased about 2 to 5 feet, depending on the locations, within this three-year period. IID plans to add more monitoring wells to support its test plots studied in the exposed lakebed (IID, 2019).

Boreholes will be drilled at eleven well sites using appropriate drilling methods and monitoring wells will be constructed to a depth of approximately 50 feet within the shallow aquifer. Soil samples will be collected from the boreholes at different depths and sent to qualified laboratories to analyze physical and chemical characteristics such as soil texture, mineral content, salinity, and metals that can affect vegetation's ability to utilize groundwater. A 4-inch PVC well casing and screen will be installed in the borehole with filter pack placed around the PVC well screen. A sanitary well seal will be placed above the filter pack up to the ground surface to prevent stormwater infiltration, which can affect the groundwater levels and quality. Well development will follow installation of well casing, filter pack, and sanitary seal placement to ensure proper communication between the aquifer and the well has been established.

DWR will coordinate groundwater data collection for the eleven monitoring wells. DWR will conduct data analysis to evaluate the suitability of groundwater conditions for vegetation growth and also to predict the seasonal and long-term trends of groundwater conditions.

In addition to monitoring groundwater depth and salinity in the shallow aquifer, DWR will also drill and construct three test production wells to investigate the productivity and water quality available in the deep aquifer at depth between 50 feet to 800 feet. The three groundwater test production wells will be constructed near the locations of wells #4, #7 and #9 as shown in **Figure 26**.

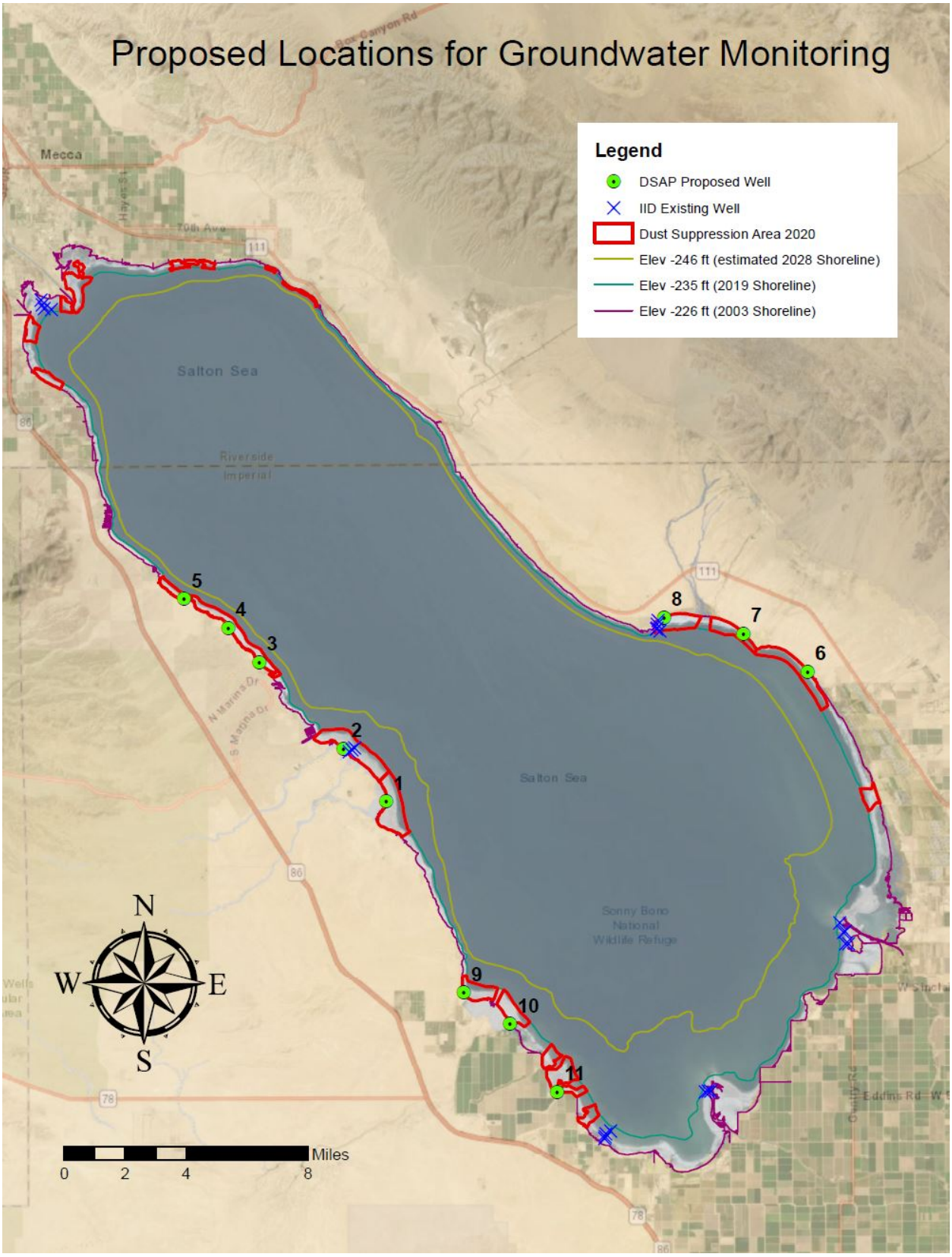
5.5 Test Plot Studies

The efficacy of some dust suppression methods is best evaluated under site-specific soil and meteorological conditions. Instead of constructing a full-scale project, it is more efficacious in these cases to implement a smaller test plot to evaluate different methods.

5. Site Characterization and Performance Monitoring

In cooperation with IID, the State plans to design and construct a series of plot-scale (smaller study area) studies to test methods for controlling sand migration on the west shore. Plot studies will evaluate dust control options designed to remediate exposed lakebed and reduce dust emissions, protect or reinforce existing vegetated sand dunes and linear vegetated beach ridges. These plot studies are intended to inform the types of projects feasible at larger scales.

Figure 26. Proposed Locations of Groundwater Monitoring Wells in Proximity to Proposed Dust Suppression Areas.



6 Operations and Maintenance

Operations and maintenance encompass a broad spectrum of services, processes, and tools required to assure the built environment will perform the functions for which the facilities were designed and constructed (WBDG, 2016). The built environment of large-scale dust control consists of several site-scale dust control measures and associated infrastructure. Initially, preventative maintenance strategies are proposed for associated infrastructure that are critical for conveying equipment, water and materials. Subsequently, predictive maintenance strategies are proposed for site-scale dust control measures in which performance monitoring data will be used to determine when and where maintenance is scheduled. The State Team will also make field data readily available online to evaluate dust control performance; these may be accessed by regulators to track compliance and other interested stakeholders. Access to these data may be through the CDFW website or an alternate portal, to be determined as the monitoring requirements and field equipment are identified. This information will be described in the SSMP Monitoring Implementation Plan, introduced in Section 5.1.2.

An annual performance report is proposed for release shortly after the end of the dust season, near the end of the second calendar quarter. This report will compile the performance data from the most recent dust season and make recommendations as to where dust control measure maintenance should occur prior to the next dust season. Due to the high level of effort of dust control project maintenance, a straightforward maintenance plan design and implementation approach is proposed. The target pace to progress through this process is that maintenance activities are anticipated to be completed prior to the subsequent dust season, near mid-first calendar quarter, while accounting for seasonal variability that can affect the timing to safely deploy crews and equipment (**Table 5**). Maintenance of dust control measures may consist of repeating the same treatment or applying an alternative method to the same area. Entire sites or portions therein may be identified and scheduled for maintenance. Annual reporting will be continued over the time frame of the SSMP and other reporting requirements by regional air quality regulatory agencies.

Table 5. Preliminary Annual Maintenance Timeline

Quarter of Year	Q1			Q2			Q3			Q4		
Month	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
DCM Performance Data Analysis					X							
DCM Annual Performance Report						X						
DCM Maintenance Plans							X					
DCM Maintenance Window	X	X						X	X	X	X	X
Associated Infrastructure Maintenance		X			X			X			X	

Associated infrastructure such as access routes, water conveyance, pump stations, etc., will also require operation and maintenance. Each of these infrastructure components is made up of multiple sub-components, which might require specific maintenance tasks on varying time intervals. The environmental setting on the lakebed is extremely harsh as characterized by intense direct shortwave radiation, large diurnal temperature swings, frequent seismic activity, and high salt concentrations, which can increase the rate of oxidation and corrosion of metals. This harsh setting points to the need for a strong commitment to maintenance. As we progress into developing and maintaining these facilities a detailed and annual operations and maintenance plan that will be subject to revision is proposed. Initially a preventative strategy with conservative maintenance intervals is proposed. An example shortlist can be found in **Table 6**. As the operations and maintenance personnel gain knowledge working in this environment, setting up inspection protocols, and deploying in-situ sensors to better characterize the environment and evaluate performance metrics, the team will be able to adopt predictive maintenance strategies and/or more accurate maintenance intervals.

Example of LiDAR Image of Tillage Area (Photo Credit: Tetra Tech)

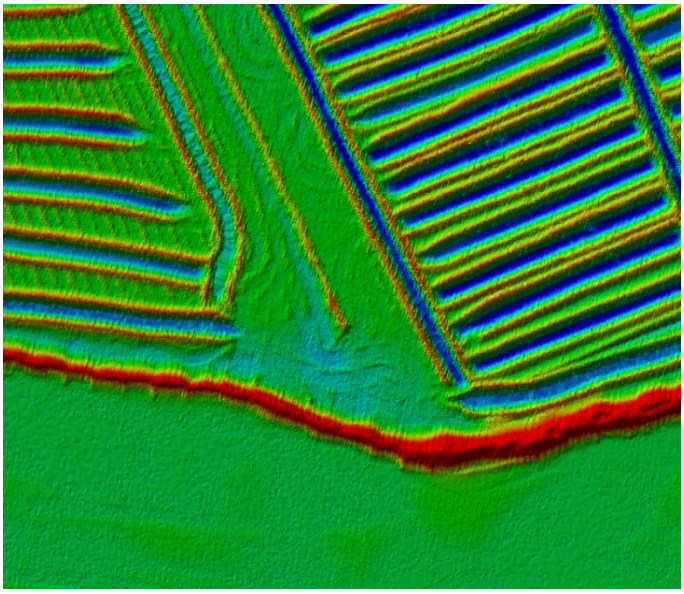


Table 6. Example Maintenance Schedule for Associated Infrastructure

Feature	Maintenance Item	Initial Maintenance Strategy	Initial Inspection or Maintenance Interval
Access Route	Regrade	Preventative	Annually
	Dust suppressants	Preventative	Annually
	Water crossings	Preventative	Annually
Water Conveyance	Vegetation management	Preventative	Bi-annual
	Sedimentation	Preventative	Annually
	Pressurized connections	Preventative	Quarterly
	Thrust blocking	Preventative	Annually
Pump Stations	Filters	Preventative	Quarterly
	Power supply	Preventative	Quarterly
	Pressurized connections	Preventative	Quarterly

7 Summary and Future Steps

7.1 Highlights of Plan

The DSAP has evaluated available data on dust emissions and dust suppression methodologies to prioritize a set of projects around the Salton Sea, with the goal of completing projects within the 9,800-acre planning area from 2020 to 2022. These project concepts include actions primarily for dust suppression and concepts that involve wetted areas (ponds, shallow habitat, and vegetation) that have the dual benefit of dust suppression and habitat creation. Toward this goal, this plan has identified discrete project areas and subareas, with information on landownership and environmental permits for implementation. Timeframes for these early steps are estimated based on the State Team's experience with other projects. Many of the tasks in individual project areas can be initiated concurrently, allowing the overall program to proceed in the most expeditious manner possible.

Project concepts are envisioned using a variety of dust suppression methods, including some that use water and some that do not. This diverse portfolio of approaches allows for exploring different methods that are best suited to different parts of the exposed lakebed. The DSAP is envisioned as a flexible working plan to outline the actions the SSMP proposes to take to meet the time-critical needs of implementing the acreage requirements of State Board Order WR 2017-0134 and the broader SSMP goal of protecting local communities from the adverse effects of lakebed exposure in the coming years.

7.2 Adaptive Management

Adaptive management is a structured process for taking action under uncertain conditions based on the best available science, and re-evaluating and adjusting decisions based on additional information as it is acquired (Ballard et al., 2014). Despite the availability of data on dust emission processes in the Salton Sea region and information on dust suppression approaches in the region and elsewhere, the implementation and subsequent success of a large-scale program in controlling dust emissions over time is not a certainty. To acknowledge this uncertainty, an adaptive management framework has been proposed throughout this plan as noted in prior chapters. The DSAP is a living

document that will be updated over time. In summary, the following adaptive approaches are incorporated in this plan:

Adaptation for site selection: The project areas proposed in this document are based on the best available current data and assumptions of the ability to secure access and permits for construction. Should additional work identify that any of these assumptions are not entirely valid, project areas and boundaries can be modified to meet conditions on the ground.

Adaptation for project design: Upon additional analysis, each project area may reveal variations in soil conditions, wind speeds, local meteorological characteristics, water flows and availability that will influence the performance of dust suppression measures. Additional data may also be obtained from experimental test plots. With the availability of this additional information, project designs will be altered to best meet the dust suppression needs in a cost effective and sustainable manner. Several sites in the DSAP focus on Phase A projects with temporary surface roughening to be transitioned to projects using water and restoring habitat as part of Phase B. Depending on the time needed for implementation of temporary roughening, it may be more appropriate to directly develop Phase B projects, or to create designs that are directly amenable to being converted to Phase B projects.

Adaptation in dust suppression program: With the development of the DSAP projects over time, there will be an increase in the availability of data and performance evaluation of larger scale projects. This will lead to a better understanding of project performance in controlling dust emissions under a range of wind conditions and over an extended period of time. Other factors, such as lessons learned from construction, project maintenance requirements, and community feedback will serve as the basis for adaptive changes to new project designs in future phases of the DSAP.

7.3 Future DSAP Updates and Outreach

The DSAP is a living document, an iterative plan, that will be updated on an annual basis as more information and data are gathered to ensure the Plan uses the best information available. To complement the information gleaned from the project implementation, new studies, data collection, and public meetings will be held at least once a year to provide updates on the status of work, share information, and receive feedback and input from the public, stakeholders, and collaborating agencies. Throughout the year, the State will provide updates on the progress of DSAP work through the *CNRA Salton Sea Management Program Update* monthly eNewsletter, the CNRA Salton Sea website (www.saltonsea.ca.gov), social media, and coordination with the SSMP Community Engagement Committee.

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Appendix A Outreach and Engagement

SSMP Community Engagement Committee

In November 2019, the State Team called on the SSMP Community Engagement Committee to work with the State to determine how to best structure and carry out public meetings to convey information and encourage community member participation. The Community Engagement Committee is one of the six SSMP Advisory Committees. Its charge is to "advise the State in engaging local communities to inform them and solicit meaningful input regarding health, air quality, and social aspects of SSMP projects, for the State to integrate into the 10-year/Phase 1 and long-range planning for the Salton Sea." The Committee made specific recommendations regarding the locations, times, and format of the DSAP community meetings. Additionally, many local NGOs and community members assisted in the promotion of the meetings by sharing information on their social media, distributing flyers, and door-to-door canvasing. One group local NGO brought snacks to the first meeting in Mecca, and another provided food and drinks to all five meetings.

Public Meetings

This summary details the methodology, approach and outreach efforts conducted for the DSAP meetings.

The State Team incorporated input received by the SSMP Community Engagement Committee and other community groups into planning the public meetings. The State's goal was to encourage public participation in a welcoming environment. For these reasons, meetings were held in the evening, in community-based venues such as schools and community centers, translation service was provided, refreshments were sponsored by a local non-profit organization, and coloring books were provided to children to encourage parent participation. The meetings were structured to be engaging with multiple ways to provide feedback, comments, and questions.

The meetings began with an informal open house format that included poster exhibits with DSAP team members engaging participants to provide information and help answer questions. This was followed by an informational presentation for all meeting participants. This formal large group presentation time was minimized, and greater emphasis was placed on subsequent small group break-out discussions that included a dedicated presenter, note taker and translator. By breaking into smaller groups, community members were provided a more direct and intimate opportunity to ask questions and engage in a dialogue with the DSAP team. The State Team used a questionnaire and large poster notes to help gather specific feedback in the small groups. Most of the meetings were concluded with an open forum question and answer period.

After each meeting, the DSAP team reviewed the meeting format and made adjustments to the presentation of the elements of the plan to improve communications with community members to ensure clear delivery of meeting purpose and objectives.

Meeting dates and locations

- Mecca: December 17, 2019
  5:30 p.m. to 7:30 p.m.
  Saul Martinez Elementary School Cafeteria
  Approximately 80 attendees
- Salton City: December 18, 2019
  5:30 p.m. to 7:30 p.m.
  West Shores Senior Citizens Club
  Approximately 70 attendees
- Westmorland: February 25, 2020
  6:00 p.m. to 8:00 p.m.
  Westmorland Youth Hall
  Approximately 30 attendees
- Bombay Beach: February 26, 2020
  6:00 p.m. to 8:00 p.m.
  Bombay Beach Community Center
  Approximately 45 attendees
- Torres Martinez Desert Cahuilla Indians Reservation (Thermal): March 4, 2020
  6:00 p.m. to 8:00 p.m.
  Tameka Gym
  Approximately 40 attendees

The SSMP team utilized a variety of methods to engage the community and promote the DSAP meetings that included:

- CNRA Salton Sea Management Program Update monthly eNewsletter
- Social media promotion
- Bilingual posts and event pages were created for each meeting and shared on multiple social media outlets
- Involvement with the SSMP Community Engagement Committee and community groups
- Partners shared social media-based meeting announcements through their networks to increase distribution
- Partners assisted with the distribution of hard copy flyers and canvasing in communities adjacent to the Salton Sea
- Flyer distribution at major points of interest in the community (i.e., public libraries, grocery stores, post offices, community centers, community bulletin boards, City Hall, select major businesses, places of worship)
- Flyer distribution to schools (provided to all students, teachers, and staff)

- Saul Martinez Elementary, Mecca Elementary, Oasis Elementary, Toro Canyon Middle School, Desert Mirage High School, Las Palmitas Elementary School, West Shores High School, Seaview Elementary, Westmorland Union Elementary, Calipatria High School, Bill E. Young Jr. Middle School, Grace Smith Elementary
- Flyer canvassing
- Included flyer distribution to the building manager and laundry rooms of apartment buildings, resort communities, mobile home parks and select neighborhoods. In addition, copies of flyers were provided to community members to distribute (example is the Veterans of Foreign Wars canvassing of the Slab City near Bombay Beach)
- Robocall (only for Saul Martinez Elementary meeting to all parents)
- Water bill insert of flyer (only for Westmorland meeting using City water bill)
- Outreach to elected officials, counties, cities, public agencies, health agencies, Chambers of Commerce, academic, religious, non-profit organizations and other organizations to share information

Communications Materials and Services

To ensure delivery of a consistent message and to present the DSAP information to the public, the public meetings provided the following materials and services:

- Meeting Agenda (bilingual)
- Questionnaire (bilingual)
- Poster Exhibits (some bilingual)
- Comment Cards & Sign-in Sheets (bilingual)
- Spanish Translation (headsets, small group facilitators, presentation of some material in both languages)
- Complimentary food and beverages (provided by Comite Civico del Valle)
- DSAP informational handout (bilingual - 2020 Meetings only)
- Copies of draft DSAP Plan (2020 Meetings only)
- Local Resources handout prepared by Salton Sea Community Outreach, Education & Engagement Program (2020 Meetings only)

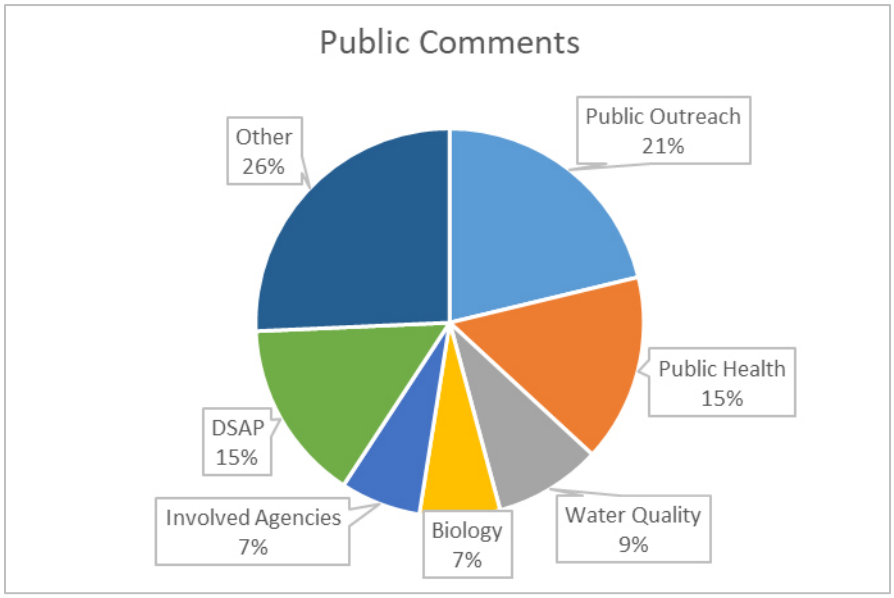
Appendix B Draft DSAP Comments

Public Draft Review

Public comments on the draft DSAP (dated February 2020) were received from the public meetings, described in Appendix A, as well as submitted through the CNRA website. A compilation of all public comments received is provided electronically in Appendix B-1. These comments were categorized into the following categories and the percent of comments in each category is shown in **Figure 27**. This represents all comments from all 5 public meetings, including written comments and verbal comments that were transcribed by the DSAP team. A total of 179 public comments were received.

- Biology
- DSAP
- Involved Agencies
- Public Health
- Public Outreach
- Water Quality
- Other

Figure 27. Percent of Public Comments in Each Category, Based on 179 Written and Verbal Comments at Five Public Meetings



Comprehensive responses to public comments are provided by category below.

DSAP
Comments received in the DSAP category were specific comments on the document and/or dust suppression. The majority of these were questions related to why and how surface roughening will be used, selection of sites for dust suppression, and the schedule and cost for the dust suppression projects. These comments were considered and are largely addressed in the revised DSAP. Information about costs and funding for dust suppression is provided in the 2020 Annual Report on the Salton Sea Management Plan and will also be included in future annual reports.

Involved Agencies
Comments received in the Involved Agencies category were related to concerns about whether and how different agencies are working together. Throughout the DSAP process, the State has and will continue to coordinate with ICAPCD, IID, CARB, and SCAQMD and engage with community residents, academic researchers, and tribal governments. Coordination and outreach efforts are described in Section 1.5 and elsewhere throughout this document

Public Health
Comments related to Public Health are outside the purview of the agencies responsible for developing and implementing the DSAP. More information about public health is found on the CARB website: https://ww2.arb.ca.gov/about.

Public Outreach
Comments received in the Public Outreach category were related to the public outreach process for the DSAP and other Salton Sea Programs. More information about outreach related to the DSAP is provided in Appendix A. The comments included suggestions on how meetings should be advertised and the presentation of the materials at the meetings, the availability of documents, and the schedule for upcoming meetings. The State will take these comments into consideration when scheduling and preparing for upcoming community meetings and outreach. All information related to future meetings will be posted on the Salton Sea program website (www.saltonsea.ca.gov).

Biology, Water Quality, and Other
Comments categorized as Biology, Water Quality and Other are generally outside the scope of the DSAP. Biology questions were related to the types of vegetation to be used and the status of other species populations. The revised DSAP discusses proposed vegetation as part of dust suppression activities in Section 2 and 4. Other biology comments are outside the scope of the DSAP. Water quality comments included questions about the water quality of the Salton Sea and about importing water to restore the Salton Sea. Other comments related to the Salton Sea program in general. Information about these subjects can be found in the Salton Sea Management Plan and other resources available on the Salton Sea program website (www.saltonsea.ca.gov).

In addition to the above responses, the program website also contains a list of answers to **Frequently Asked Questions** or FAQs, that put the DSAP within the larger context of Salton Sea restoration.

Collaborating Agency Comments

In addition to public comments received during the public meetings, several public and collaborating agency comments were received through the CNRA Salton Sea website (www.saltonsea.ca.gov) in response to the close of public comments on March 27, 2020. These comment letters were summarized into a table and responses to each comment were provided, as well as where in the revised report the comment was incorporated, if applicable. Both the original comments and summary table are provided in electronic appendices.

Administrative Draft Review

Comments on the first Administrative Draft (dated June 4, 2020) were received from agencies that would be involved in permitting and regulating the proposed dust control projects. These included: ICAPCD, IID, SCAQMD, USACE, and the BOR. Full copies of these comments are included in the electronic appendices. This revision of the DSAP addresses these comments.

Electronic Appendices

Electronic appendices available on the Salton Sea website (www.saltonsea.ca.gov) contain supporting materials as follows:

Appendix B-1: Table of Public Comments

Appendix B-2: Original Comments Submitted Electronically to CNRA

Appendix B-3: Table of Summarized CNRA Comments and Responses

Appendix B-4: Administrative Draft and comments received from agencies involved in permitting and regulating projects

Appendix B-5: Administrative Draft Comment Letters

Appendix C Planned Project Schedules

In this section we present two schedules, for Phase A and for Phase B project activities, representing our best current understanding of the actions to be taken to implement these projects. These schedules are subject to revision as more up-to-date information becomes available. The Phase B schedules allow time for preparation of environmental and planning documents as an activity for different planning areas. This typically includes the following elements: CEQA Addendum, Lake and Streambed Alteration Agreements (1600 Permits), USACE Approved Jurisdictional Determinations, Stormwater Pollution Prevention Plans, survey and monitoring plans for biological, cultural, and paleontological resources, Native American Tribal consultation and cultural resource record searches, and Archaeological Resources Protection Act permits for cultural and paleontological resources on federal lands.

Table 7. Phase A Dust Control Program Implementation Schedule

Table 8. Phase B Dust Control Program Implementation Schedule

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