August 15, 2022

Memo: SAG Review of CDPR "DRAFT 2022 Annual Report and Work Plan" (dated August 1, 2022)

From: Scientific Advisory Group (SAG)

To: Gary Willey, San Luis Obispo Air Pollution Control District (SLOAPCD)
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Summary statement

The Scientific Advisory Group (SAG) is generally pleased with this draft 2022 Annual Report and Work Plan (ARWP). The SAG appreciates the thoughtfulness, coordination, and attention to detail that CDPR has put into preparing this ARWP, which reflects impressive efforts undertaken at the Oceano Dunes State Vehicular Recreation Area (ODSVRA) to install, maintain, and monitor dust control measures. This ARWP demonstrates continuing progress on dust mitigation projects during the 2021-22 work year and associated reductions in PM_{10} emissions. The ARWP also directly reflects many of the SAG's recommendations from its February 2022 memo regarding the SOA target for PM_{10} emissions reductions and procedures for modeling the effectiveness of dust controls. Overall, this draft 2022 ARWP is technically consistent with the SAG's recommendations, and it charts out efforts in 2022-23 to further monitor and adaptively manage dust mitigation projects to sustain progress toward improving ambient PM_{10} air quality.

A notable feature of this ARWP is that it proposes no new dust mitigation treatment areas in 2022-23 (though certain existing mitigation areas are proposed for conversion and supplemental planting). The decision not to pursue new treatment areas is based on adoption of SAG's proposed 40.7% PM_{10} emissions reduction target, and it is also based on modeling that assumes substantial PM_{10} emissions reduction impact from the new plover exclosure area and other treatments. Though these choices are scientifically informed, they depend on a specific management goal, i.e., using the 1939 pre-disturbance scenario as the target for PM_{10} emissions reductions. They also rest on somewhat aggressive assumptions about the effectiveness of dust mitigation treatments, which will be further refined as new data are collected in 2022-23. Whether the SLOAPCD is willing to agree to CDPR's proposal for no new dust mitigation treatment areas depends on its willingness to accept this specific management goal and these modeling uncertainties. The SAG's advice can help to inform this decision, but the decision must ultimately be guided by management priorities that reflect value judgments and competing interests. In the end, this is a policy decision that extends beyond the SAG's scientific role. Regardless of what is decided for the coming year, the SAG urges continued data collection and monitoring to inform long-term adaptive management decisions based on multiple indicators of progress toward improving ambient PM_{10} air quality toward satisfactory levels.

With these considerations in mind, the SAG is supportive of the draft 2022 ARWP as currently written. However, to contextualize and further improve this ARWP, the SAG offers general comments below. Additional comments are provided in the Appendix.

SAG general comments

1. PM_{10} emissions reduction target. The current draft 2022 ARWP is designed to achieve PM_{10} emissions reductions consistent with a 40.7% mass emissions reduction relative to the 2013 baseline. This PM_{10} reduction target is based on the SAG's recent recommendation of a potential refinement to the initial SOA emissions reduction target, currently set as a 50% reduction relative to the 2013 baseline. Because the SAG's recommendation is being used to guide plans to install no new dust mitigation areas in 2022-23, the SAG wishes to clarify some important considerations:

- First, the 40.7% recommendation is contingent on a specific management approach, in which the goal is to reduce PM_{10} emissions to a level commensurate with "pre-disturbance" conditions, as estimated for a 1939 scenario.
- Second, while modeling of the pre-disturbance scenario is based on the best available science regarding the condition of the ODSVRA in 1939, there are unquantifiable uncertainties associated with determining the representativeness of 1939 as a pre-disturbance scenario, given limited information about conditions during and prior to that time.
- Third, the SAG notes that the current SOA calls for achieving state and federal ambient PM_{10} air quality standards (provision 2b), a goal which the SAG has identified as requiring PM_{10} emissions reductions that would go significantly beyond the 40.7% reduction target or even a 50% reduction target.

Ultimately, the decision about the extent of required dust controls must be a policy decision that weighs competing factors and interests, and which acknowledges the inherent uncertainty of setting specific targets. Scientific analyses provided by the SAG can inform this debate, but the ultimate decisions must depend on value judgments and legal imperatives. The SAG notes that the current SOA (provision 2d) accommodates the possibility of changing the PM_{10} emissions reduction target, but the SOA also describes such a target as "initial." The SAG views the PM_{10} emissions reduction target as a useful guide to identifying the extent of needed dust controls, but the ultimate success of these mitigations should be guided by long-term monitoring of air quality changes, and adaptive management as needed, until ambient PM_{10} air quality achieves a satisfactory level.

2. DRI model refinements. The SAG is pleased to see that its recommended refinements to PM_{10} emissions modeling have been incorporated within this ARWP. The SAG also appreciates that the ARWP acknowledges the need to collect additional data to further refine the modeling of specific dust mitigation treatments, including the plover exclosure and the foredunes. In addition to those factors described in the ARWP, the SAG notes that the choice of PI-SWERL years (i.e., 2013 versus 2019) appears to drive a significant change in PM_{10} emissions. It is not yet clear whether this change is due to long-term trends or statistical noise; hopefully, the addition of new PI-SWERL data in 2022 will help to constrain this variability. The SAG recommends that further analysis of the available PI-SWERL data from 2013 through 2022 be carried out to provide information on the annual variability of emissivity to further constrain the uncertainty bounds

when comparing between years. Furthermore, the current modeling assumes that mitigation treatments are mature, whereas many treatment areas (such as the foredune and plover exclosure) are still in early stages of development. Based on these considerations, the SAG highlights that considerable uncertainty remains within model estimates of PM_{10} emissions. Taken together, it is likely that the emissions reductions modeled both for the current model framework (40.8% reduction relative to 2013) and for the refined model framework (43.1% reduction relative to 2013) overestimate the actual emissions reductions. Therefore, any decision regarding the adequacy of the existing dust mitigation treatments should recognize this uncertainty, and it should acknowledge that model refinements, as well as other long-term PM_{10} monitoring efforts, may reveal the need for deployment of additional dust mitigation treatments in the future.

Respectfully,
The Scientific Advisory Group

Dr. Raleigh Martin (Chair of SAG); Dr. William Nickling; Dr. Ian Walker; Ms. Carla Scheidlinger; Mr. Earl Withycombe; Mr. Mike Bush, Dr. John A. Gillies

Appendix: Additional comments on the Draft 2022 ARWP

Table of Contents. Page references will need to be updated for the final draft. They are currently off by several pages.

SAG Recommended Changes to DRI Model Assumptions (Sec. 2.2.1.3): Updated PI-SWERL grid (item 1). The thorough discussion of implementation of model changes in response to SAG recommendations, including areas for continuing consultation and refinement, are appreciated. Regarding the updated PI-SWERL grid, it seems that the shift from using 2013 to 2019 values caused a substantial change in modeled PM_{10} emissions, though the specific effect of this change is not clear (see comment below on Tables 2-9 and 2-10). This raises the possibility that changes in PM_{10} emissivity from 2013-2019 reflect not only long-term changes in the dune system, but also statistical noise associated with specific conditions at the time of the PI-SWERL campaigns. In addition to the other further model refinements already planned, the SAG recommends that data from the 2022 PI-SWERL campaign, as well as other PI-SWERL surveys in previous years, be further analyzed in the coming months to better constrain the actual long-term trends in emissivity across the ODSVRA. If necessary, these analyses would then be used to inform further refinements to modeling of PM_{10} emissions reductions.

SAG Recommended Changes to DRI Model Assumptions (Sec. 2.2.1.3): Decreased PM_{10} emissions in foredune beach and corridors (item 6). The proposed modeling change for the foredune beach and corridors is reasonable, though the SAG appreciates the opportunity for further consultation before such a change is implemented within the model.

Comparison of Key Assumptions in the Current and Revised DRI Models (Table 2-8). Please clarify whether the areas designated within the revised DRI model as "Mean Emissivity of All Non-riding Areas" are indeed averaging over *all* non-riding areas, or if zonal means for adjacent non-riding areas (i.e., north, central, or south) are being used. The SAG's understanding is that zonal means have been used to reflect the natural north-south gradient in emissivity.

Current / Revised DRI Model PM_{10} Mass Emissions at ODSVRA through July 31, 2022 (Tables 2-9 and 2-10). Comparison of these two tables allows for an overall understanding of the differences in modeled PM_{10} mass emissions for the current and revised DRI model. Figure 2-14 suggests that use of the 2019 PI-SWERL grid is the main driver of changes in PM_{10} emissions estimates between the current and revised model. However, it is difficult at present to infer how each of the specific model revisions affects the overall estimate of PM_{10} mass emissions. Some of these changes may be inferred from Attachment 04, but these slides are difficult to interpret. It would be very helpful to include an additional table showing the incremental effect of each specific model change (e.g., change from 2013 to 2019 PI-SWERL grid for untreated areas, CFD modeling of foredune shadow zone, etc.) on modeled PM_{10} emissions. This comparison need not extend to all years but could simply focus on quantifying the incremental effects of specific model changes on modeled 2022 PM_{10} emissions.

Revised DRI Model 24-hour Average PM_{10} Concentrations at CDF / Mesa2 (Tables 2-12 and 2-14; Figures 2-15 and 2-16, Evaluation Metrics C and D). It should be explained why the PM_{10} concentration values are not available for the italicized scenarios (Tables 2-12 and

2-14) and previous years (Figs. 2-15, 2-16, and Evaluation Metrics). Presumably, this is because obtaining such values would require re-running the (computationally-expensive) dispersion component of the DRI model for prior years under the revised dust control assumptions. The decision not to re-run this model for past years is reasonable, but this should be explained.

Sec. 2.3. Remove typo ("CDF") from the opening paragraph.

Saltation Monitoring (Sec. 2.3.2). Please clarify the statement regarding the identification of a single mean threshold wind speed across the ODSVRA. How is this threshold affected by variations across the ODSVRA, such as the increasing grain size and threshold wind speed from north to south?

Uncrewed Aerial System (UAS) Surveys (Sec. 2.3.3). Please slightly modify the last sentence, "State Parks will report on the results of the UCSB analyses following review of these reports, which is anticipated to be complete IN fall 2022." UCSB is still awaiting comments from a second round of peer review on the manuscript.

Vegetation Monitoring (Sec. 2.3.6 and Table 2-17). Relative to the previous version reviewed by the SAG, this is a much improved explanation of Parks' methods and comparison to the UAS-based and historical aerial photographic results in the UCSB/ASU reports. However, the comparison between Parks and UAS-derived percentage cover results in Table 2-17 is confusing. In particular, why does this not include comparison to the UAS results after Feb. 2020? Feb. 2020 was the treatment installation date, so technically these results do not reflect plant cover changes following restoration. The presentation of the Parks 2021 line-intersect results on their own, without comparison to the UAS results of the same year, conveys an incomplete picture. Why are the 2021 (and 2022) UAS results, and more recent 2022 (if they exist) line intersect results not presented in this table? Update accordingly. 2021 UAS results (Feb. and Oct. 2021) are available in the UAS foredune restoration report (Hilgendorf et al.) and the draft manuscript that was submitted to Parks in Dec. 2021 for their review (and approved, paper still in peer review). Otherwise, the vegetation section is fine.

Evaluation Metrics (Sec. 2.3.7 and Attachment 02). The presentation of results from both the current and revised model, as well as the addition of Figures 2-13 to 2-16, is very clear and much appreciated. However, a few details require further attention:

- In Fig. 2-13, please address the following: (1) For Backdunes Acres (Riding Area), the plot is inconsistent with Attachment 02 for 2022. This should only include acreage of active treatments but exclude the plover exclosure. The plover exclosure could be plotted as a separate line, if desired. (2) Remove the unspecified item in the legend.
- In Attachment 02, the decision to mark 2023 values as "N/A" needs to be explained. If no new treatment acreage is proposed, then the values for dust mitigation treatments (A1-A5) should simply carry over from 2022 to 2023. In addition, certain existing treatment areas are planned for conversion from temporary to vegetation treatments (i.e., as described in Sec. 3.1.1). This should cause some change in modeled PM_{10} mass emissions (B1-B2) and PM_{10} concentrations (C-D) from 2022 to 2023, because of the greater modeled dust control efficacy of vegetation treatments relative to temporary treatments. Such changes should be noted within the Evaluation Metrics table.

SAG Responses to Studies (Sec. 2.4.1 and Attachment 06). The SAG appreciates that the full provenance of studies (including preliminary versions, SAG reviews, and final versions) are provided within Attachment 06. In addition, these studies are referenced at multiple points across the ARWP. However, there is a risk that the reader, when referred to specific reports within Attachment 06, may unknowingly end up reading the preliminary version (which appears first) rather than the final version. Therefore, it may be beneficial to add a "table of contents" page at the beginning of each sub-attachment (i.e., Attachment 06-01, Attachment 06-02, etc.).

PM_{10} Speciation Sampling (Sec. 2.4.4.1 and Sec. 3.3.1). The SAG is disappointed that SLOAPCD has not yet completed analyses from the speciation sampling. The SAG urges timely completion of these analyses to help address lingering concerns regarding the Scripps study.

PI-SWERL Surveys (Sec. 3.1.6.2) and Refine Approach to Dust Control Program Success (Sec. 3.1.7.1). As noted above ("SAG Recommended Changes to DRI Model Assumptions (Sec. 2.2.1.3): Updated PI-SWERL grid (item 1)"), the SAG recommends that data from the 2022 PI-SWERL campaign, as well as other PI-SWERL surveys in previous years, be further analyzed in the coming months to better constrain the actual long-term trends in emissivity across the ODSVRA. If necessary, these analyses would then be used to inform further refinements to modeling of PM_{10} emissions reductions. Other model refinements to consider in Sec. 3.1.7.1 include PM_{10} emissions from the plover exclosure and PM_{10} emissions from the foredune beach and corridors.

Modeled PM_{10} Mass Emissions and Concentration Reductions (Sec. 3.2). As noted above ("Evaluation Metrics (Sec. 2.3.7 and Attachment 02)"), certain existing treatment areas are planned for conversion from temporary to vegetation treatments in 2022-23. This should cause some change in modeled PM_{10} mass emissions (B1-B2) and PM_{10} concentrations (C-D) from 2022 to 2023, because of the greater modeled dust control efficacy of vegetation treatments relative to temporary treatments. Such changes should be noted.