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March 22, 2010

Board of Directors
Air Pollution Control District
County of San Luis Obispo
c/o The Clerk of the District
1055 Monterey Street, Suite D120
San Luis Obispo, California 93408

Mr. Larry R. Allen
Air Pollution Control Officer
San Luis Obispo County Air Pollution Control District
3433 Roberto Court
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Subject: March 24, 2010, Meeting Agenda item C-1; Presentation of final report on the South County Phase 2 Particulate Phase Study - Comments and Objections of California State Parks

Dear: Honorable Members of the Board of Directors of the San Luis Obispo County Air Pollution Control District.
Mr. Larry R. Allen, Air Pollution Control Officer

By this letter, California State Parks (CSP) submits its preliminary comments on the South County Phase 2 Particulate Study (Phase 2 report")[1] and expresses its concerns over and objections to the conclusions reached.[2] CSP owns and operates Oceano Dunes State Vehicular Recreation Area (Oceano Dunes SVRA) and other public lands in the vicinity which are the subject of the Phase 2 report.

[1] The Phase 2 report is a follow up to the original Phase 1 report of airborne particulate matter in the Nipomo Mesa area which showed that air quality on the Nipomo Mesa exceeds the state 24-hour PM10 health standard at one or more monitoring locations on over one quarter of the sample days. In March of 2007, the SLOAPCD Board directed staff to design and conduct a follow-up Phase 2 report with the primary goal of determining if OHV activity on the Oceano Dunes State Vehicular Recreation Area played a role in the high particulate levels measured on the Nipomo Mesa.

[2] CSP staff preliminary review has been assisted by experts in geological sciences and in air quality (Attachment A: Memorandum to Daphne Greene, Deputy Director, California State Parks, From Will J. Harris and Trinda Bedrossian, California Geological Survey, March 18, 2010, Subject: "Evaluation of the San Luis Obispo County Air Pollution Control District report, 'South County Phase 2 Particulate Phase 2 report" (CGS Evaluation); and Attachment B: Memorandum to Paula Hartman, TRA, From James A. Reyff and Bill Popenuck, March 19, 2010, "Meteorological Data Used for the South County Phase 2 Particulate Phase 2 report" (I&R Meteorological Memorandum) – incorporated herein as part of CSP's comments).

CSP was first able to review the Phase 2 report on February 22, 2010, when the San Luis Obispo County Air Pollution Control District (SLOAPCD) posted the report to its website. Due to the short time since the Phase 2 report was released, CSP staff has not had the opportunity to conduct a thorough review of the report. Thus, CSP may have additional observations and comments as the SLOAPCD and the Board of Directors proceed with efforts to address the questions of elevated PM10 at the Nipomo Mesa.

We wish and offer to work collaboratively with the SLOAPCD further on these issues. However, as discussed below, and in the technical memoranda incorporated as Attachments A and B, CSP provides our principle observations, concerns, and objections with the Phase 2 report. The Phase 2 report contains significant and substantial limitations that lead CSP to conclude the Phase 2 report is insufficient to support moving forward with identifying solutions that are within the responsibility of Oceano Dunes SVRA. The data in the Phase 2 report do not determine the PM levels on the Nipomo Mesa are due all or in part to off-highway vehicle (OHV) activity within Oceano Dunes SVRA. In fact the data support the conclusion that the PM conditions are due to naturally occurring geologic and climate conditions and may not be attributed to or held to be the responsibility of the OHV activity at Oceano Dunes SVRA. For these reasons, we do not believe the report is ready to be received and filed by the Board.

DISCUSSION

A. The Phase 2 report fails to adequately differentiate and evaluate potential PM10 sources because, most basically, it fails to address the geologic setting and natural processes that created the massive dune sheets in the southern San Luis Obispo County and northern Santa Barbara County.

The geologic setting of the coastal dune environment that naturally produces sand movement by wind events is not addressed in the Phase 2 report, thus resulting in mischaracterization of natural layers of sand (“dune laminae”) as “dune crust.”
The Phase 2 report describes airborne fine particulate (PM2.5 and PM10) conditions that are the result of the natural coastal dune setting. The Phase 2 report fails to adequately differentiate and evaluate potential PM10 sources because, most basically, it fails to address the geologic setting and natural processes that created the massive dunes sheets in southern San Luis Obispo County and northern Santa Barbara County. This oversight led to a mistaken comparison of Oceano Dunes SVRA and its coastal dune surroundings to a high desert dry lake bed in Owens Valley, California.

1. **Geology of the coastal dune system is not correctly described.**

   The Phase 2 report does not take into account the complexity of the dune formation within a dynamic, open-ocean depositional dune system. The development of these dunes and other dune systems along California's coast is well documented in the geological literature (CGS, 2007; Cooper, 1967; Hunt, 1993; Orme and Tchakerian, 1986). In August 2007, the California Geological Survey (CGS) prepared a report specifically addressing the vegetation islands within Oceano Dunes SVRA (CGS, 2007). This report summarizes the geologic history of Oceano Dunes SVRA and surrounding dune systems, provides an analysis of sand movement across the dunes, and summarizes vegetation changes within Oceano Dunes SVRA over the past 100 years based on aerial photo interpretation, published historical documents, and CSP records.

   Unlike Owens Lake, which was formed by an enclosed inland, dry lakebed comprised of fine clay and evaporite, the source of the sand along the coast of southern San Luis Obispo County is constantly renewed from offshore sources. Recent studies by the United States Geological Survey (USGS) (USGS, 2005, as cited in CGS, 2007) indicate 115,000 cubic yards of sand are deposited and blown inland each year along the 55-mile coastline from Pismo Beach to Point Arguello.

   Sediment from river systems located north, south, and within Oceano Dunes SVRA is deposited into the ocean, moved along the coast by offshore oceanic currents and deposited onshore as sand by wave action. The sand is then blown inland by the wind. For the past 25,000 years, sand blown inland has formed a series of irregular dune sheets varying in shape, size and topographic elevation from sea level to over 100 feet or more (Hunt, 1993; [see the CGS Evaluation, Figure 2 for an illustration]). Nipomo Mesa lies within the older, more stabilized inland Nipomo Mesa Dune Sheet; Oceano Dunes SVRA lies within the westernmost and most active portion of the most recent Callender Dune Sheet. Sand and sediment movement from the Oceano Dunes SVRA area to inland sites by wind activity is a natural, ongoing process.

2. **The hypothetical protective crust is not a valid explanation for purported differences in wind erosion potential.**

   Reliance on conditions and research at Owens Lake is not appropriate in the sand dune environment at Oceano Dunes SVRA. The Phase 2 report suggests that a natural dune crust, similar to the mineral-rich, salt flat crust found at the dry lakebed of Owens Lake, is formed in the coastal dunes adjacent to Oceano Dunes SVRA. The Phase 2 report states several times that such a crust is found in the coastal dune setting (p. 5-3, 6-3, 6-4). To the contrary, a crust similar to that formed by evaporites at Owens Lake is unlikely to ever form.

The soil conditions and terrain at Owens Lake are completely different from the dunes environment, making sand flux measurements based on procedures used at the Owens Lake suspect. Physically, the two sites are not the same and conclusions drawn from one environment will not necessarily apply to the other. Instead, what was described in the Phase 2 report as an “ephemeral dune or soil crust” (p. 5-3, C-5) is actually the stratification or laminar structures (laminae) in the dune deposits due to the natural sorting of the sand particles by the natural wind action. These structures have been studied by numerous researchers (Bagnold, 1965; Kocurek, 1981 and 1986; Rubin and Hunter, 1982; and Tsoar, 1982).

As discussed in the attached CGS Evaluation, dune laminae are ephemeral, forming and obliterating as dunes form and migrate, and are present throughout a dune. All deposits of windblown sand (not soil) consist of thin layers or laminae, a few millimeters thick, in which the grading varies very slightly as the result of the proportion of fine material present. In some dunes, such as the coastal dune complex surrounding Oceano Dunes SVRA, this layering may be undetected by the human eye, or it may collapse rapidly when disturbed by animals, foot traffic and even naturally during high wind conditions. The Phase 2 report does not describe how laminae are formed, how they may limit wind erosion, not how vehicular use may affect erosion in this naturally occurring condition.

3. A conclusion regarding the ability of the dunes to increase vegetation is improper.

There is no historical or other discussion or analysis of the complex processes and conditions by which sand and vegetation may change over time. Neither is there recognition of the existing revegetation program at Oceano Dunes SVRA or of the presence of exotic plant species that were planted by early users of the dunes. Despite this lack of supporting analysis, the Phase 2 report suggests that increasing vegetation at the dunes is a possible measure to reduce downwind PM.

A useful analysis of vegetative changes within and adjacent to Oceano Dunes SVRA is presented in CGS (2007, Appendix D). A chronology of historical changes within the Callender Dune Sheet is also present in CGS (2007, Appendix C). Since 1983, when Oceano Dunes SVRA was established under the Off-Highway Motor Vehicle Recreation Division of CSP, vegetation has increased in some areas and decreased in others. However, the overall number of vegetated acres has increased. None of this information has been discussed, nor information developed in the Phase 2 report, to address the complex question as to how vegetation naturally occurs or might be successfully added in the dunes.

B. Conclusions comparing sand movement due to differing wind velocities are insufficiently supported, because the wind speeds in the analysis were not measured directly at the same locations where the sand flux measurements were made.

Wind velocities measured 2.5 miles inland do not represent wind speeds at the beach dunes. Wind velocities used in a calculation to determine when sands move within the beach dunes of Oceano Dunes SVRA were taken from an instrument positioned at the CDF site 2.5 miles from the beach. As discussed in the CGS Evaluation (Attachment A) and expanded upon in the attached I&R Meteorological Memorandum (Attachment B), this limitation of the Phase 2 report introduces significant potential for error.

1. **Estimates of sand transport are based on incomplete wind speed data.**
   The conclusion that sand in the vehicle use area is more prone to erosion is not supported. The Phase 2 report found very high movement of sand at the undisturbed Oso control site and attributes the difference to correspondingly higher wind speeds. However, the wind speeds in the analysis were not measured directly at the same locations where the sand flux measurements were made. Nevertheless, based upon these reported results, the report reached the unsupported conclusion that saltation (sand transport) occurs at much lower wind speeds in the vehicular use area than in other areas, thus concluding that sand in the vehicular use area is much more prone to erosion. This conclusion is not supported, because the estimated threshold wind speed for sand flux in the Oceano Dunes SVRA based on winds measured 2.5 miles inland is not comparable to observations at the undisturbed Oso control site.

   The measurement of wind velocities used for the findings was not adequate, because measurement sites were not consistent (height and location) as between the non-disturbed Oso control and riding areas in Oceano Dunes SVRA nor selected with regard to the effects of the dune morphology on wind flows. Corrections for differences in measurement sites may have introduced significant error (Attachment B).

C. Importantly, the Phase 2 report concludes that there is no causal relationship between visitation at Oceano Dunes SVRA and the high PM10 levels measured downwind.

The Phase 2 report concludes that there is no effect found from visitation at Oceano Dunes SVRA on PM10 levels measured downwind. This analysis of all the available data is an important result. While correlation does not necessarily imply causation, the converse is true: lack of correlation strongly suggests lack of causation. Even when the data are handpicked to compare blocks of high use with blocks of low use, the results are inconclusive and statistically insignificant.

As part of the data used in the Phase 2 report, CSP provided 14 months of daily visitor use statistics for Oceano Dunes SVRA. Visitor activity varies by season and by day of the week. From season to season, monthly total visitor use can be three times higher in summer months than in winter months. In summer, weekend use is roughly double weekday use; during the rest of the year, weekend high use is roughly five times weekday low use. If Oceano Dunes SVRA is a significant direct source of particulate, such large variation in Oceano Dunes SVRA activity should be reflected by equal variation in downwind air quality. Despite high variability in visitation at Oceano Dunes SVRA, however, there is no such effect.

The Phase 2 report found zero correlation between daily visitation statistics and observed particulate matter at stations downwind. Section “ODSVRA Attendance Analysis” beginning on page 3-51 presents Figure 3.64 – “PM10 Concentration as Compared to Number of Vehicles in the ODSVRA” which shows a flat-line plot (no correlation) and practically zero coefficient of determination, meaning that none of the variation in PM10 levels is explained by variation in visitation reported at Oceano Dunes SVRA.

D. The Phase 2 report contains no supporting data for the proposition that more PM10 is produced from the riding area as contrasted with the undisturbed dune area sampled.

By speculating that higher wind speeds are the cause of more sand, but not PM10, at the undisturbed Oso site, the Phase 2 report ignores other potential factors. The smaller surface area of the Oso site, the effect of the dune laminae process on wind velocity and saltation, and the previously discussed lack of appropriate wind measurements at the sand flux test locations are among the factors not taken into consideration.

Finding no relationship between Oceano Dunes SVRA visitation and PM concentrations on the Mesa, the Phase 2 report reasons that secondary or possible indirect effects may be present as a result of Oceano Dunes SVRA activity that disturbs sand and thereby increases windblown dust. Even this indirect effect would be expected to bear proportionality to Oceano Dunes SVRA visitation, but none is found.

The key to this conclusion is a comparison between areas open to vehicular use and areas closed to vehicular use. Even here, the raw data do not show a clear distinction; indeed, the Phase 2 report found more windblown sand collected in the undisturbed Oso control area than in the active Oceano Dunes SVRA areas. But the analysis modifies data on sand transport and wind speed to produce a partial distinction. As explained in the expert comments (Attachments A and B), the inconsistent collection of wind velocity measurements raises significant questions about the appropriateness of the way the meteorological data were modified which prevents reliance on the conclusion.

E. The Phase 2 report fails to establish that the particulate emissions from the riding areas at Oceano Dunes SVRA are greater than is produced in non-riding dune areas such as the Oso and Ten Commandment sites.

The Phase 2 report fails to provide a scientifically adequate calculation of any contribution Oceano Dunes SVRA makes to PM levels over and above naturally occurring windblown sand.

It is important to emphasize that the Phase 2 report concludes that the composition of the sand in the riding areas of the dunes and elsewhere within the coastal dune environment is similar. However, the Phase 2 report is unable to draw a quantitative conclusion about how vehicular activity increases emissions or how much vehicular activity contributes to elevated particulate.

1. **The Phase 2 report does not adequately characterize the source of the airborne particulate matter impacting the region on high episode days.**
   The Phase 2 report does not characterize the potential offshore source of materials, because the Phase 2 report did not sample offshore sources of earth materials or possible sources of particulate immediately adjacent to the ocean within Oceano Dunes SVRA.

   Despite this lack of sample data, the Phase 2 report concludes that the particulate matter does not originate from an offshore source. If wind erosion of open sand areas releases fine particulate, then particulate levels downwind will be proportionate to the extent of open sand. The Phase 2 report tests samples of the eroding sand and finds an extremely low percentage of fine material. With constant transport of fine material downwind, there must be a source of new fines to replenish the source. Despite this phenomenon, the Phase 2 report does not consider onshore transport of mineral fine material as a source.

   Nor does the report clearly define the presence of salt. There is apparently no discount for the presence of salt during the intensive test period selected for the Phase 2 report. The salt analysis was in the Jan-Feb time period, whereas the intensive test period was April-May.

   Additionally, there is no explanation of how the size of the sand dune sheets may contribute to higher or lower levels of PM experienced. The Oso sand sheet, for example, we estimate to be about a tenth the size of the Oceano Dunes SVRA site, but produced, by the limited data available, nearly one-half the level of PM claimed to be attributable to Oceano Dunes SVRA.

The Phase 2 report does not establish that the Oceano Dunes SVRA site actually produces more blowing sand or PM than at the control site. Furthermore, the Oso data indicate that PM is generated at non-attainment levels and that more sand was captured in the test equipment in front of the Oso site than at the Oceano Dunes SVRA sites. The Phase 2 report authors speculate that this is due to higher velocity winds than measured at the CDF test station; but, again, no data is presented to support this speculation, and use of the CDF wind data is inappropriate for analyzing the sand flux in the dunes within the Oceano Dunes SVRA riding area. Nor are any scientific calculations produced that demonstrate that Oceano Dunes SVRA contributes more sand or PM than any other site, or than would be naturally occurring.

F. The Phase 2 report design and equipment problems result in the Phase 2 report being insufficient with which to attribute PM10 levels to the OHV activities at Oceano Dunes SVRA.

In addition to the lack of adequate wind velocity measurements discussed previously, equipment problems, inconsistent methodologies, and poorly synchronized observations were documented throughout the Phase 2 report that significantly limit the validity of comparison between sites. During the 17 day “intensive” phase from April 26 to May 12, 2008, none of the 11 sites were measured consistently, i.e. by all three investigators, using identical equipment, and much of the data collected required “adjustments” or was invalidated. Only one day of data was acceptable at the Oso site, for example. Only three sites were measured between March 2008 and March 2009 using the same type of continuous PM10 air sampler (TEOM). The use of a continuous TEOM PM10 air sampler was not used for measurements at the Oso site. Instead, because electrical power was not available at the Oso site, an instrument called an EBAM was used. But measurements taken at the Oso site were determined to be biased midway through the Phase 2 report period, so that the entire temperature dataset at the Oso site was invalidated. Problems with the EBAM equipment were encountered that required returning the equipment to the factory for recalibration and testing. Notably, also, the Phase 2 report failed to establish control testing similar to the testing at Oceano Dunes SVRA on a site more comparable to Oceano Dunes SVRA. To supplement the Oso site, the Ten Commandments site is an undisturbed natural dune site most analogous to the Oceano Dunes SVRA open sand sheet dune. Yet, despite the fact that the Ten Commandments site is most analogous to Oceano Dunes SVRA, only one test site was established and no data were obtained due to equipment failure that is unexplained in the Phase 2 report.[3]

[3] The response to question 13 presented at the March 2, 2010, SLOAPCD workshop indicates the sampler at the Ten Commandments site failed quality control tests and was buried by sand (Page C-1 10, SLOAPCD Staff Report dated March 24, 2010).

CONCLUSION

Although admirable effort went into the data collection for the Phase 2 report, the findings of the Phase 2 report are not supported by the facts, which merely support the conclusion that the PM levels reported on are due to naturally occurring geological and climate conditions that are not within the control or responsibility of CSP. As such, CSP objects to the Board receiving and filing the Phase 2 report as a final determination of this extremely complex phenomenon.

CSP looks forward to continued dialogue and ongoing refinement of the complex questions that will in turn contribute to better understanding of the natural effects of the dunes on regional air quality. CSP is a committed steward of the state's land and will participate collaboratively with the SLOAPCD and other stakeholders to better understand and quantify the natural PM at the Nipomo Mesa.

As always, please do not hesitate to contact me with questions, requests to share information, or ways to facilitate ongoing collaboration on this important and complex issue.

Sincerely,

Original signed by District Superintendent

Andrew Zilke, District Superintendent
Oceano Dunes District

Attachments

References cited:

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