

TECHNICAL ASSESSMENT

**GBUAPCD'S FINAL STAFF
REPORT ON THE ORIGIN
AND DEVELOPMENT OF
THE KEELER DUNES**

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AIR SCIENCES INC.

DENVER • PORTLAND

Background

- High-level technical review because of time constraints.
- Focus on the strength of the conclusions, not the quality of the work.
- The District's conclusions are not supported by the evidence.

Seven Research Areas

- Section 4.1: Historical Document Search
- Section 4.2: Comparative Ground-Based Photographs
- Section 4.3: Aerial and Satellite Images
- Section 4.4: Geomorphic Mapping and Analysis
- Section 4.5: Chronology and Stratigraphy
- Section 4.6: Surface Change Assessment
- Section 4.7: Dune Transects and Dune Movement

Section 4.1: Historical Document Search

- This section presents information intended to show when active dune-building began.
- Results were either inconclusive or contradictory.
- The start of dune activity was assigned to several different time periods, all of them recent.

Section 4.1: Historical Document Search

- Inconsistency regarding origin:
 - Part 1 (Historical documents): Acknowledges that dunes existed around Keeler prior to 1902.
 - Part 2 (Survey data): Argues that the Keeler Dunes did not exist at the time of the survey (1885). Inconsistent with age-date results showing that the dunes are more than 1700 years old.

Section 4.1: Historical Document Search

- No evidence was presented to suggest what caused the changes to the dunes.

Section 4.2: Comparative Ground-Based Photographs

- This section documents the changes in the Keeler Dunes over the last 90 years using a series of “before” and “after” photographs.
- The earliest photographs (pre 1920) are too distant and grainy to be helpful in identifying active dunes.

Section 4.2: Comparative Ground Photographs

- Only one set of photographs shows clear changes in the Keeler Dunes (1953).
- None of the photographs show what caused the changes in the dunes.

Section 4.3: Aerial and Satellite Image Analysis

- This section characterizes the changes in the Keeler Dunes starting in the early 1940s.
- Doesn't address whether changes occurred before then.
- States that changes began in the mid to late 1950s, with additional changes in the 1970s and 1980s.

Section 4.3: Aerial and Satellite Image Analysis

- No evidence presented to show how the dunes originated or what caused them to change.
- Adopts the conclusion from Section 4.5 that the changes were caused by sand from the Owens playa.

Section 4.3: Aerial and Satellite Image Analysis

- Unanswered Question:
 - Staff Report states that the Swansea Dunes have remained stable for the last 300-400 years. But if a large volume of sand from the playa caused the changes in the Keeler Dunes, why didn't the same thing happen in the Swansea Dunes, located less than a mile away?
 - The District should have, but did not, investigate whether the changes in the Keeler Dunes were caused by something other than sand from the Owens playa.

Section 4.3: Aerial and Satellite Image Analysis

- Another Question:
 - Staff Report states that even now, 10 years after dust controls were first constructed on the North Sand Sheet, the Keeler Dunes are “not yet in equilibrium with sand supply” and continue to grow in volume.
 - This would suggest that some other source is feeding the Keeler Dunes. District staff should have investigated this possibility but did not.

Section 4.4: Geomorphic Mapping and Analysis

- This section presents detailed maps of the dunes as they appear now, with a description of ancient shorelines around Owens Lake.
- Mapping ignored the presence of the older dune deposits, which are known to exist.
- Nothing presented to show how the dunes originated or what caused them to change.

Section 4.4: Geomorphic Mapping and Analysis

- Identified other natural sand sources around the Keeler Dunes:
 - Ancient shoreline sands above the dunes.
 - Lake plain sands between 3,597' and 3,619'.
 - Beaches exposed by the 1872 earthquake.
 - Portions of the playa that were exposed naturally before the Aqueduct was constructed.
- These natural sources were either not investigated or dismissed elsewhere in the Staff Report.

Section 4.5: Chronology

- Most important section in terms of origin/changes in the dunes:
 - Age-dating of sands in Keeler, Swansea, and Lizard Tail Dunes, and on Owens playa.
 - Mineralogical assessment of sand sources.
 - Potential sand sources contributing to the dunes (new section).

Section 4.5: Chronology

- Concludes (wrongly) that sediment volume, mineralogical composition, and prevailing wind patterns all point to the Owens playa as the primary source of sand for the Keeler Dunes.

Section 4.5: Chronology

- Wind Vectors:
 - Net vectors only tell part of the story.
 - Final Staff Report did not report the volume of sand transported into the Keeler Dunes.

Section 4.5: Chronology

- Mineralogical Composition:
 - Staff Report states that the sands on the Owens delta are similar to those in the Keeler Dunes.
 - But similarity is not enough; the sand could have arrived thousands of years ago when the lake was naturally dry.

Section 4.5: Chronology

- Sediment Volume:
 1. The District evaluated the available supply from only two sources (Owens playa, older Keeler Dunes) and ignored all the rest.
 2. The District reported the volume of “available” sand on the playa but didn’t estimate the amount that actually made it into the dunes.

Section 4.5: Chronology

- Sediment Volume:
 - The District estimated the contribution from the “older” Keeler Dunes but then dismissed this contribution (40%) because it wasn't large enough to explain all of the sand in the active Keeler Dunes.
 - District appears determined to assign the cause to a single source: the Owens playa.

Section 4.5: Chronology

- The Staff Report notes that flash flood silt deposits have been ponding behind the older Keeler Dunes for 2000 years.
- These highly emissive silts and fine sands are natural in origin, and have contributed to the dust plumes that we now see in the Keeler Dunes. This fact was ignored in the Final Staff Report.

Section 4.6: Surface Change

- This is the only section in the Staff Report that contains estimates of sand movement into the Keeler Dunes.
- But the estimates reported here do not support the claim that a massive amount of sand came from the Owens playa in the last 70 years.
- In fact, the data show the opposite occurred.

Section 4.6: Surface Change

- For the period before 2001, the results show an overall net loss of 0.1 cm/year of sand from the Keeler Dunes.
- This undermines the District's position that the Keeler Dunes were a net accumulator of sand prior to dust control efforts on the North Sand Sheet.

Section 4.6: Surface Change

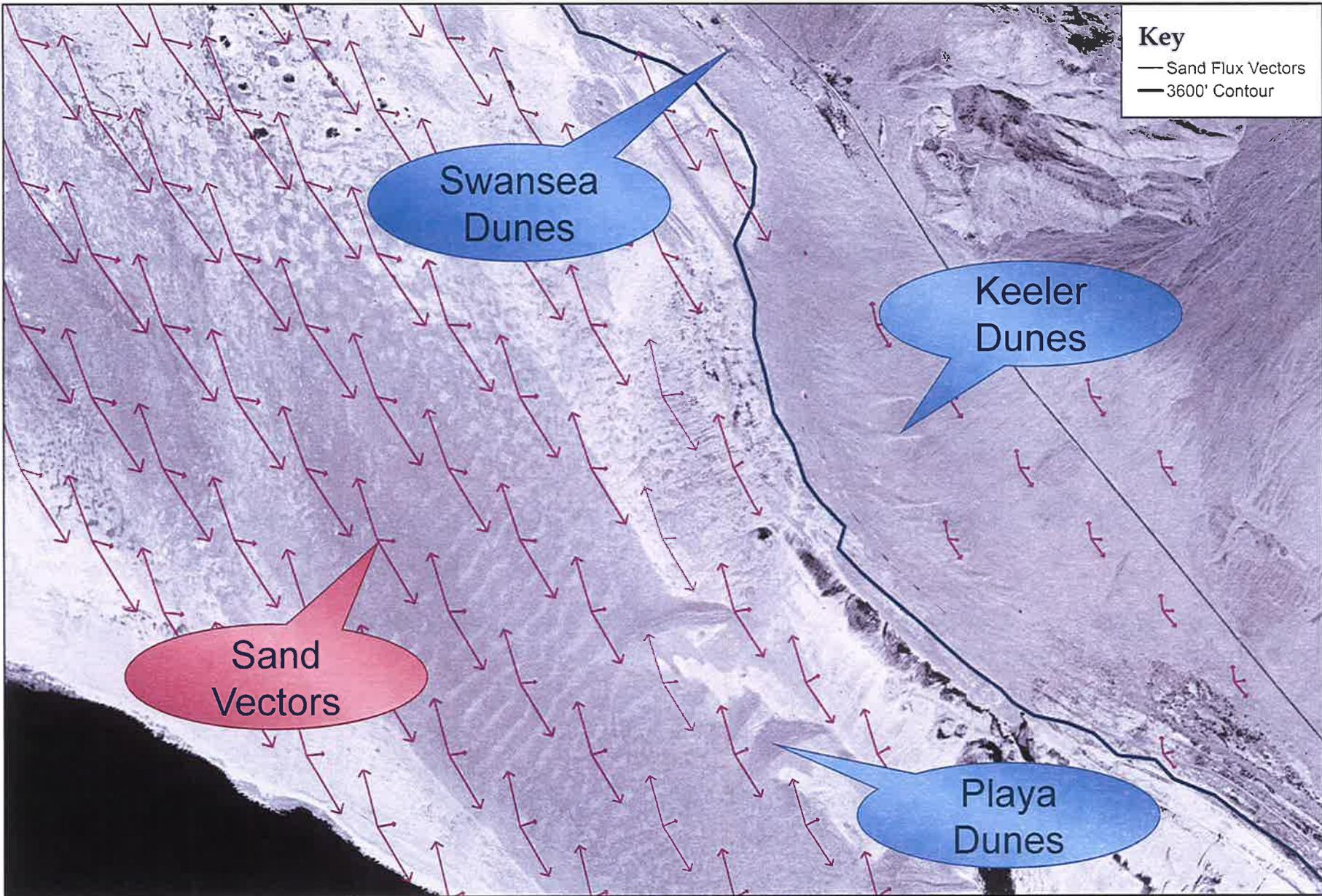
- For the period after 2001, the results are nearly the same: a net loss of 0.13 cm/year for the Keeler Dune area.
- The lack of effect following the construction of dust controls suggests the Owens playa was *not* an important source of sand for the Keeler Dunes.

Section 4.6: Surface Change

- District's data for site 7199: This site had a net deposition of 0.14 cm/year for the pre-dust control period (tiny).
- At this rate, it would take 286 years to deposit 400,000 cubic meters of sand in the Keeler Dunes.

Section 4.6: Surface Change

- Figure 4.6-5 of the Final Staff Report: This figure shows zero sand movement from the playa into the dunes prior to dust control (range -0.005 to 0.005 cm/year).
- At the upper rate, it would take 8,000 years to deposit 400,000 cubic meters of sand in the Keeler Dunes.
- These figures alone prove the District's conclusions are wrong.



0 0.25 0.5 Miles

Version: 12/06/2012 Project No: 300-22

North, South, and Net Sand Flux Vectors
 Initial SWEEP Configuration



Section 4.6: Surface Change

- This section undermines the District's conclusion the Owens playa was the sole source of sand for the Keeler Dunes.
- The low sand fluxes suggest that something else is causing the changes in the Keeler Dunes.

Section 4.7: Dune Transects

- This section contains various details regarding dune shape and migration for the last decade.
- No evidence was presented to show how the dunes originated, or what caused the changes.

Summary

- The studies do not support, and in some cases contradict, the District's conclusions that the activity in the Keeler Dunes was caused solely by sand from the Owens playa.

Summary

- The studies were too narrowly focused on the Owens playa as the sole source and cause.
- District staff ignored evidence that the changes were at least partially caused by other sources (for example, sand from deflating older dunes).

Summary

- The Final Staff Report is seriously flawed and should not be used to assign responsibility for controlling the Keeler Dunes.