United States Department of the Interior
U.S. Geological Survey
Office of the Director
Reston, Virginia 20192

Memorandum

Date: October 31, 2022

To: Tracy Stone-Manning
Director, Bureau of Land Management

From: David Applegate
Director

JAMES D. APPLEGATE Digitally signed by JAMES D. APPLEGATE Date: 2022.10.31 18:45:30 -04'00'

Subject: National Aeronautics and Space Administration's Railroad Valley Playa Calibration Site Withdrawal Request

The U.S. Geological Survey (USGS) would like to submit the following memorandum in response to the Notice of Application for Withdrawal Nye County, Nevada ([FR Doc. 2021-08881) submitted by the National Aeronautics and Space Administration (NASA) requesting the Secretary of the Interior to withdraw and reserve lands at the Railroad Valley Playa (RRV) Calibration Site in Nye County, Nevada, from operation of public land laws, including the mining, mineral leasing, and geothermal leasing laws to preserve the surface integrity of the playa for NASA's satellite calibration purposes. This memorandum provides information about the uses of the site for remote sensing calibration and validation and a summary of USGS knowledge of lithium and other geologic resources at the site.

The USGS National Land Imaging (NLI) Program supports remote-sensing science needs within the USGS, the DOI, and the nation. NLI builds international Earth observation partnerships; interacts with the aerospace and remote sensing industries; coordinates satellite imagery requirements and acquisitions across the Federal Government; and develops and maintains bilateral agreements with foreign countries in the development and operation of world-wide remote-sensing capabilities. NLI sets the programmatic requirements for the management and operation of Landsat 7, 8, and 9 and the development of future Landsat satellites and other systems.

The RRV Calibration Site in Nye County, Nevada, is one of only five international sites endorsed by the Committee on Earth Observation Satellites (CEOS) Radiometric Calibration Network. The RRV is the only site in the U.S. that satisfies all the requirements for a natural calibration target. It is located within the continental U.S. and therefore offers security not found at international sites. It is homogeneous (color, texture, and flatness) over a large enough area to accommodate large-footprint sensors. This heavily instrumented, well-characterized site has been used for decades by civil, commercial, and international Earth observation satellite missions. University of Arizona personnel, funded by NASA and the USGS, have continually

performed field campaigns at the RRV for more than two decades, enabling a full characterization of the playa's surface and the atmosphere above it in all types of weather and seasonal change. The geomorphological characteristics and the two decades of continuous site characterization have resulted in a unique calibration site. The USGS has invested more than $4 million over this timeframe and expends several hundred thousand dollars a year to sustain it. The information collected at the site is provided to the public for free and helps all satellite operators, whether government or non-government, domestic or international, assess sensor performance against a known standard and allows satellite operators to update their image-processing systems to correct for space-based instrument degradation. Current users of the RRV include the USGS, NASA, National Oceanic and Atmospheric Administration (NOAA), and European, Japanese, Indian, Chinese, Brazilian, and commercial Earth observation satellite missions.

The site is important in the current validation and scientific traceability of the USGS Landsat Program (Landsat 8 and 9) as there is no other location in the U.S that serves in this capacity. The site will also be useful to future NASA/USGS Sustainable Land Imaging (SLI) satellites, such as Landsat Next, the replacement to Landsat 8, now under development. Disturbance to the pristine surface of RRV could negatively impact the viability of the site as a calibration reference by introducing discontinuities in the previously homogeneous surface that would change its spectral reflectance. This would result in nullifying the historically derived spectral response of the site and require additional surveying or potentially abandonment of the site, impacting the ability to validate the scientific quality of data from Landsat and other satellite missions.
The following table lists current and planned space missions using the RRV along with the spatial resolution "footprint" of each mission sensor and the corresponding area of land required at the RRV site to viably conduct calibration.

Satellite instrument	Nominal Ground Footprint (bands < 2 µm)	Vicarious Calibration area needed (3 x 3 pixel) *single pixel area	
		km^2	acres
GOSAT	13.2 km (at RRV)	175*	43,000*
GeoCarb	7.0 km x 4.5 km (at RRV)	32*	7,780*
OCO-2, OCO-3	1.3 km x 2.25 km	27	6,670
MODIS-Terra, Aqua	1 km	9	2,230
GOES	1 km	9	2,230
VIIRS	750 m	5	1,250
MISR	250 m (nadir) 1.1 km (off nadir)	0.7 10	170 2,480
Landsat	30 m	0.008	2
Commercial & Defense	<15 m	0.002	0.5

Table 1: Space Missions Using the RRV with Resolutions and Areas (Source: NASA)

The USGS Mineral Resources Program and Energy Resources Program study mineral and energy resources across the Nation, including in the RRV and the surrounding area, in part based on use of the Airborne Visible/Infrared Imaging Spectrometer (AVIRIS) that is also used at the RRV to provide calibration data for GOSAT. The RRV is the site of the first (1954) and most productive (more than 48 million barrels extracted to date) oil fields in Nevada. Annual production has declined from a peak of more than 3 million barrels of oil per year in the late 1980s and early 1990s, to approximately 183,000 barrels in 2020, of which approximately 1,160 barrels were produced from Sans Spring, the one active field in the withdrawal application area. It is not known how changing market conditions could alter the rate of production or what undiscovered resources may be present, but the existing fields have been depleted from years of production.

Geothermal energy resources with an average temperature of approximately 135ºC have been identified on a roughly east-west trend through the withdrawal application area from observations in oil wells. Although there is significant porosity and permeability, the potential for electric power generation is limited by the relatively low reservoir temperature. USGS estimates of the RRV geothermal production potential give a mean value of approximately 18 MW-electric, which represents less than 2% of identified geothermal resource potential for the state of Nevada.

Finally, under a portion of the RRV site, exploration firms have identified both solid salt deposits and associated brines in the subsurface sediments at depths between 1000’ and 3000’. High lithium concentrations have not been reported in the public domain for the brines or associated solid salt deposits. The USGS does not have a comprehensive national assessment of lithium resources at this time. Traditionally, lithium recovery from brine employs large ponds on the land surface to concentrate lithium through evapotranspiration. For example, lithium brine evaporation ponds at Clayton Valley, Nevada, the only currently active lithium brine operation in the U.S., covers approximately 4,150 acres and can hold several billion barrels of brine. Industry has been developing direct lithium extraction (DLE) technology, which removes lithium from brine without evaporation and allows reinjection of the brine without loss to evaporation, but DLE has not yet been employed on a commercial basis. Until DLE is proven commercially, new lithium brine operations will likely involve evaporation ponds and net withdrawal of brine from underground, leading to subsidence of the land surface.

The USGS is providing this additional information on the remote sensing uses of the RRV, potential impacts to DOI/USGS Satellite Operations, and current level of knowledge of geologic and lithium assessments to support BLM’s analysis of the withdrawal request. The USGS is open to providing additional information or engaging in further discussion if needed.

CC:
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Tanya Trujillo, DOI Assistant Secretary, Water and Science, Department of the Interior
Jon K. Raby, Nevada State Director, Bureau of Land Management, Department of the Interior
Karen St. Germain, Earth Science Division Director, National Aeronautics and Space Administration