

**Memorandum of Understanding
between the
California Institute of Technology
Jet Propulsion Laboratory
and
California Natural Resources Agency, California Environmental
Protection Agency and California Department
of Food and Agriculture**

I. Parties

This Memorandum of Understanding (MOU) is entered into by the following state agencies: California Natural Resources Agency (CNRA) located at 1416 Ninth Street, Suite 1311, Sacramento, CA 95814, California Environmental Protection Agency (CalEPA) located at 1001 I St., Sacramento, CA 95814, and California Department of Food and Agriculture (CDFA) located at 1220 N St., Sacramento, CA 95814 with the California Institute of Technology (Caltech), a nonprofit educational institution incorporated in California, represented through its Jet Propulsion Laboratory (JPL), an operating division of Caltech and a Federally Funded Research and Development Center (FFRDC) located at 4800 Oak Grove Drive, Pasadena, CA 91109.

II. Background and Purpose

The CNRA's mission is to restore, protect and manage California's natural, historical and cultural resources for current and future generations using creative approaches and solutions based on science, collaboration and respect for all the communities and interests involved. The CalEPA's mission is to restore, protect, and enhance the environment, to ensure public health, environmental quality, and economic vitality. The CDFA's mission is to serve the citizens of California by promoting and protecting a safe, healthy food supply, and enhancing local and global agricultural trade, through efficient management, innovation and sound science, with a commitment to environmental stewardship.

California initiatives in support of these missions include:

- Building climate resiliency to reduce the future effects of climate change and make the state resilient to current and ongoing impacts of climate change.
- Reducing emissions of greenhouse gases, including developing and implementing climate actions, setting greenhouse gas reduction targets, and enacting policy that can address climate change.
- Reducing emissions of air pollutants to provide healthful air to all Californians, regardless of where they reside.

- Protecting biodiversity which includes understanding the status of biodiversity in California and finding innovative ways to protect plants and animals well before they are endangered on land and in coastal oceans
- Enhancing California water resiliency to address extreme droughts and floods, rising temperatures, reduced snowpack, reduced chill hours, increased invasive pests, depleted groundwater basins, changing agricultural patterns, aging infrastructure and other challenges magnified by climate change.
- Administering and protecting the drinking water supply for 40 million Californians in a manner that promotes equity and affords fair treatment, accessibility, and protection for all.
- Stewarding California forests which includes taking steps to enhance forest health and resilience and to reduce the threats they face from wildfire, insects, disease, and a changing climate as well as understanding the impact of these hazards.
- Ensuring food security along with agricultural environmental ecosystem services in consideration of climate change impacts
- Providing science-based policy guidance on sea level rise into the planning, design, permitting, construction and other decisions for coastal California
- Enhancing California's preparedness and response to other natural and geologic hazards such as earthquakes and landslides.
- Using new and innovative approaches to more efficiently and effectively monitor the state's environment and natural resources, and to create data management and visualization platforms with data that is sufficient to support resource management, accessible, useful, and used in decision making.

The CNRA, CalEPA and CDFG have an interest in understanding carbon stocks, sources, and carbon sequestration sinks within the state, including fugitive emissions, as part of California's efforts to achieve a 100% clean energy future.

The CNRA, CalEPA and CDFG also have an interest in using observational data, field data, models and science system engineering to enhance decision support around management of California's natural resources and agricultural working lands.

JPL focuses on the interconnected components of the Earth — the atmosphere, hydrosphere, lithosphere, biosphere, and cryosphere — and how these complex, dynamic systems work together as an integrated whole. JPL is studying how Earth is changing to better understand, predict, and respond to natural hazards, weather, sea level rise, geologic hazards, ecosystems, climate, and freshwater availability. To address these challenges, JPL develops space-based and airborne systems enabled by innovative technologies to observe Earth, including natural and anthropogenic processes. In addition to addressing fundamental science questions, JPL can help to develop observation-driven decision support information systems for organizations supporting management of natural

resources. JPL's strategic implementation plan also underscores the importance of furthering understanding of Earth's changing ecosystems and surface landscapes, including the developing capabilities to better monitor land use / land cover and coastal and inland water systems. JPL is also helping lead NASA's effort to design a system of satellites and ground sensors to quantify the exchanges of carbon between land, ocean, and atmosphere, as well as include needs from resource management partners, and other users, into design considerations.

This MOU is for the purpose of facilitating cooperation between JPL and CNRA, CalEPA and CDFA by identifying study and development projects of mutual interest. This MOU is a voluntary initiative. It does not create any legally binding rights or obligations and creates no legally cognizable or enforceable rights or remedies, legal or equitable, in any forum whatsoever. In addition, the pledges in this MOU are not conditioned upon reciprocal actions by other Participants; each Participant retains full discretion over implementation of its pledges in light of the Participant's individual circumstances, laws, and policies; and each Participant is free to withdraw from the Memorandum.

III. Costs and Resources

Participants bear all costs and expenses incurred by it in voluntarily performing any work or services associated with this MOU. There is no exchange of consideration. Each party provides its own equipment and facilities as necessary to implement the efforts described herein. Resources, including property, cannot be loaned or exchanged under this MOU.

The activities of JPL under this MOU are funded and are to be performed under Caltech's Prime Contract with NASA, Contract 80NM0018D0004. At this time, the Task Orders which support this effort include No. 80NM0018F0644 "*NASA Western Water Applications Office (WWAO)*", and 80NM0020F0044 "*Production System Satellite Needs Working Group (SNWG)*". If needed, this MOU may be supported by other appropriate sources in the future.

This MOU does not constitute a binding or exclusive obligation on any party to perform work or services of any kind for any other party to the MOU. Nothing in this MOU will be construed as consent by any party to enter into a contract, subcontract or other business relationship.

IV. Description of Activities

JPL and CNRA, CalEPA, and CDFA desire to conduct various activities, including technical interchange meetings, to identify common questions of interest. Areas may include:

- Identifying existing tools and data sources that could potentially be used to support ongoing CNRA, CalEPA and CDFA decision support priorities.
- Identify the potential for new monitoring tools and data sources to reduce uncertainties in decision support for natural resources, environmental protection, working lands, and food and agriculture.
- Explore opportunities to utilize remote sensing data (e.g., radar, imaging spectroscopy, solar and infrared, lidar) and in situ, ground based observations to understand the state of biodiversity and invasive pests and other species in California, and how and where biodiversity is changing to inform potential responses. Also, utilize remote sensing data to better understand how and where threats to agriculture and the natural environment are increasing.
- Explore opportunities to utilize remote sensing data, field measurements and models to improve California's resiliency to extreme droughts and floods, rising temperatures, reduced snowpack, rising sea levels, severe storms, depleted groundwater basins, and other challenges magnified by climate change.
- Explore opportunities to utilize remote sensing data, tools and observations to aid in planning, preparedness and real time operations for natural disasters.
- Explore opportunities to utilize remote sensing data (e.g., radar, imaging spectroscopy, solar and infrared, lidar) and in situ observations to understand air pollutant and greenhouse gas emissions in California.
- Explore opportunities to apply observations and models to inform climate change impacts to agriculture and food security including crop pattern changes and predict future vulnerabilities to the agricultural food production system in California.
- Identifying existing and new tools and data sources that could potentially be used to support ongoing CNRA, CalEPA and CDFA decision support priorities.
- Explore opportunities to utilize observations and models to assess the impacts of land surface change related to earthquakes, subsidence, fires and other natural hazards to guide decision support.
- Explore opportunities to apply remote sensing and ground based observations and models to inform California forestry stewardship which includes taking steps to enhance forest health and resilience, and to reduce the threats faced from wildfire, pests, disease, and a changing climate.

- Explore opportunities to apply observations and models to inform California coastal resource stewardship, such as steps to improve understanding of harmful algal blooms, marine heat waves, sea level rise, coastal wetlands, ocean acidification, plastic pollution fate and transport, and water quality.
- Identify observational data and models that can help assess carbon emissions, stocks and sinks. Explore approaches to short- and long-term monitoring that will help assess the impact of policy decisions.
- Explore opportunities to utilize observations and models to assess the impacts of land surface change related to earthquakes, landslides, uplift, subsidence, groundwater depletion, fires and other natural hazards to guide decision support.
- Explore opportunities to develop management approaches for natural resource and environmental quality data that are open, modern, and innovative.
- Explore opportunities to operationalize JPL science and technology to assist the state in developing and applying observations and models in big data and artificial intelligence solutions to further the goals identified in this MOU.

JPL will carry out the aforementioned activities on an as-available, best efforts basis, without warranties, without consideration and subject to the requirements of 80NM0018D0004, the prime contract between Caltech and NASA, and at no charge to CNRA, CalEPA and CDFG.

The CNRA, CalEPA and CDFG will carry out the aforementioned activities on an as-available, best efforts basis, without warranties, without consideration and at no charge to JPL.

V. Compliance with Applicable Laws

All activities undertaken pursuant to this MOU, and all personnel designated by the Participants for the execution of those activities undertaken pursuant to this MOU are subject to all applicable laws, including all laws applicable in the jurisdiction where the activities are performed.

VI. No Legal Rights or Remedies

Nothing in this MOU creates any legally cognizable or enforceable rights or remedies as to any Participant. In no event will any disagreement arising under

this MOU—including, but not limited to, any alleged breach of, or nonperformance under, this Memorandum of Understanding—give rise to any cause of action, or any legal or equitable remedy, in any forum whatsoever. Nothing in this MOU waives any sovereign immunity, or any other applicable immunity, that any Participant may otherwise enjoy.

VII. Publicity / Publication

- This MOU provides for no rights for CNRA, CalEPA and CDFA to use the name or logos of the "California Institute of Technology," "Caltech," "Jet Propulsion Laboratory," "JPL," "National Aeronautics and Space Administration," or "NASA" in any advertising or publicity material, or make any form of representation or statement in relation to work performed under this MOU that would constitute an express or implied endorsement by Caltech, JPL or NASA of any commercial product, without written approval. Requests for written approval to use Caltech or JPL's name(s) or logo(s) under this MOU should be directed to the Manager of the Institutional Communications Office at JPL. Requests for written approval to use NASA's name or logo should be sent to NASA directly.
- This MOU provides for no rights for JPL to use the name or logos of the CNRA, CalEPA and/or CDFA in any advertising or publicity material, or make any form of representation or statement in relation to work performed under this MOU that would constitute an express or implied endorsement by Caltech, JPL or NASA of any commercial product, without written approval. Requests for written approval to use CNRA, CalEPA and/or CDFA name(s) or logo(s) under this MOU should be directed to Mark Gold, Lauren Sanchez, and Amrith Gunasekara at CNRA, CalEPA and CDFA respectively.
- JPL, CNRA, CalEPA and CDFA may, consistent or as required by Federal and/or State law and the goals of this MOU, release general information regarding its own participation in this MOU. JPL, CNRA, Cal-EPA and CDFA will confer and consult prior to the publication of unclassified information to ensure that no proprietary information or other controlled information is released and that patent rights are not jeopardized. Prior to submitting a manuscript for review that contains the results of research under this MOU, or prior to publication if no such review is made, each party will be offered thirty (30) days to review such proposed publication.

VIII. Period of Activities and Cessation of Activities

This MOU continues from the latest date signed as indicated on the signature page through June 30, 2022, the date Task Order No. 80NM0018F0644 to Contract 80NM0018D0004 expires, and any extension or replacement thereof, unless sooner terminated in writing, by either party. This MOU may be extended by a written modification signed by both parties. As this MOU includes no binding

obligations on either party, either party may cease activities specified in this MOU without notice at any time. However, each party will, as a courtesy, endeavor to provide 10 days' prior written notice to the other party. Such cessation of activities will incur no liability to either party.

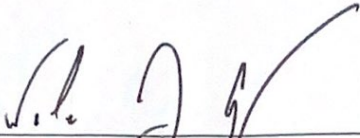
IX. Points of Contact

Correspondence concerning this MOU will be directed to the following representatives:

For CNRA:	For JPL:
Mark Gold	Michael Jameson
Deputy Secretary of Oceans and Coastal Policy	Contracts Manager
1416 9 th Street. Sacramento, CA 95814 Suite 1311	4800 Oak Grove Drive Pasadena, CA 91109
For CalEPA:	For CDFG:
Lauren Sanchez	Amrith Gunasekara
Deputy Secretary for Climate Policy and Intergovernmental Relations	Science Advisor to the Secretary
1001 I Street, Sacramento, CA 95814	1220 N Street, Suite 400 Sacramento, CA 95814

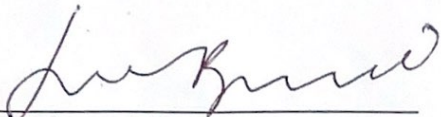
X. Amendments / Modifications

Any changes to this document will be in writing.



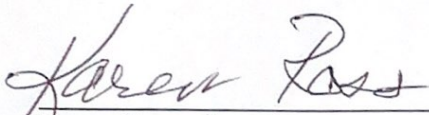
Wade Crowfoot, Secretary
California Natural Resources Agency

Date: 11-06-20



Jared Blumenfeld, Secretary
California Environmental Protection Agency

Date: 11.06.20



Karen Ross, Secretary
California Department of Food and Agriculture

Date 11-6-2020



James E. Graf
Director, Earth Science and Technology
California Institute of Technology
Jet Propulsion Laboratory

Date: 11-06-2020