Project Information Submittal Form

Project Submitter/Owner: **Borrego Valley Endowment Fund**

Project Name: Augmented Environmental Monitoring to Support Sustainable Groundwater Management

Contact Information

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Project Summary

Please provide a summary of the Project description. Use as much space as you need.

A Program Supporting Water Conservation

This program will provide essential data to the Borrego Watermaster, water management planners, and the affected citizens of the region during the implementation of the Groundwater Management Plan for the Borrego Subbasin. This program focuses on providing two datasets that fill gaps in planning for, and assessing the consequences of, sustainable groundwater management. The first is real time data to monitor the local weather and hydroclimate, including impacts of climate change, on the water economy of the Borrego Subbasin. The second data set is essential to assess the environmental impact of the Watermaster's one unavoidable Management Action—the fallowing of thousands of acres of agricultural lands.

The first data set will be generated by augmenting Borrego's existing hydroclimatic monitoring system with two new stations in the eastern sub-basin that fill the spatial gaps (and therefore data gaps) of the current system. The second data set focuses exclusively on the air quality impacts of fallowing agricultural lands. This data will be generated by a new network of particulate matter (PM2.5/PM10) sensors inside and around the perimeter of the area to be fallowed, and in residential and business areas of the community.

1) **Addressing Hydroclimatic Monitoring Data Gap**

Currently the University of California, Irvine (UCI) manages seven hydroclimate automatic weather stations (HCAWS) located in the western and central portions of the Subbasin. ~~(See Map 1)~~ These stations (See Fig. 1) have continuously operated, except for occasional planned and unplanned maintenance, since 2016. The data collected include precipitation, relative humidity, soil moisture (at 6 levels to 30 cm depth), temperature, wind speed and direction, and, at five of the stations, particulate matter (PM). (See Fig 2) These data have been used in ecosystem

restoration planning, air quality studies, to estimate the surface water budget and evapotranspiration in the Subbasin for the development of the GMP.

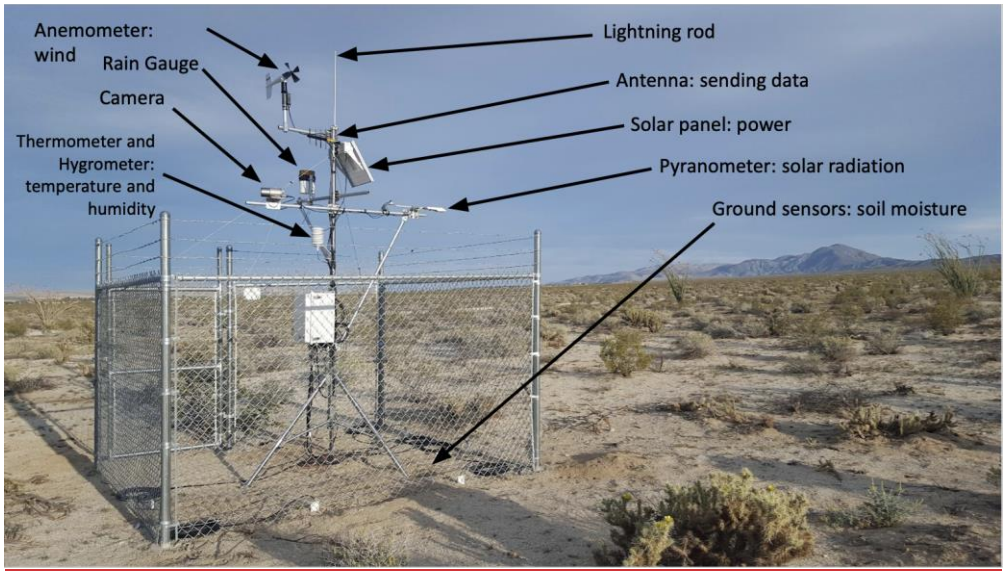
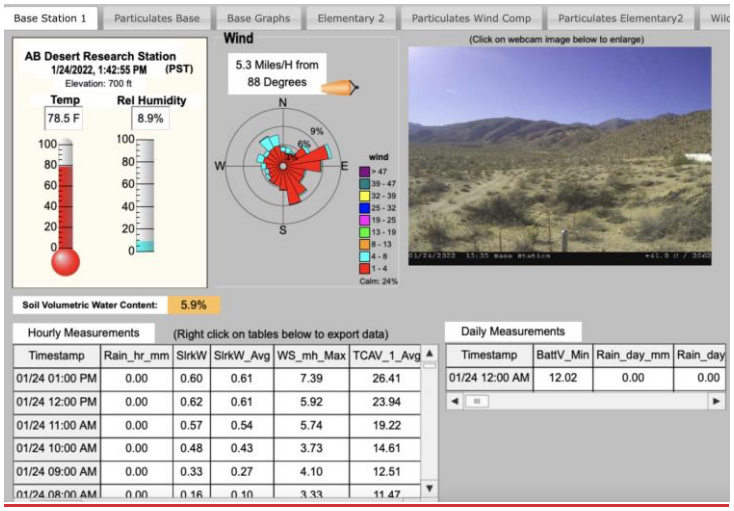


Fig 1. (above) One of existing hydroclimate automatic weather stations (HCAWS) located near Borrego Springs.

Fig. 2. (below) Example screenshot of HCAWS readings.



Timestamp	Rain_hr_mm	SlrkW	SlrkW_Avg	WS_mh_Max	TCAV_1_Avg
01/24 01:00 PM	0.00	0.60	0.61	7.39	26.41
01/24 12:00 PM	0.00	0.62	0.61	5.92	23.94
01/24 11:00 AM	0.00	0.57	0.54	5.74	19.22
01/24 10:00 AM	0.00	0.48	0.43	3.73	14.61
01/24 09:00 AM	0.00	0.33	0.27	4.10	12.51
01/24 08:00 AM	0.00	0.16	0.10	3.33	11.47

Timestamp	BattV_Min	Rain_day_mm	Rain_day
01/24 12:00 AM	12.02	0.00	0.00

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Going forward during the implementation of the GMP, the understanding of the water budget of the Subbasin becomes an even more critical factor in determining the speed with which the GMP must be implemented, if we are to avoid undesirable consequences described in the SGMA legislation. For example, if we do not have a sufficient understanding of the entire Subbasin's changing water economy, the implementation of our GMP could be too slow, thereby incurring undesirable consequences such as substantive, unbearable cost increases of potable water to this SDAC community and the destruction of beneficial users of water such as the Groundwater Dependent Ecosystems.

The current HCAWS provide an incomplete understanding of the water economy of the entire Subbasin due to their limited number and clustering in the western and central Subbasin. (See Map 1) This Project would address the data gap in by placing an additional two stations in the eastern Subbasin at locations (e.g., near the Borrego sink) TBD by this project. (See Map 2) The expansion proposed by this Project would help address the spatial gaps (and therefore the data gaps) of the current system and would thereby provide the Watermaster Board with a more complete picture of the water economy in the Subbasin as it iterates the speed and refines the implementation of the GMP against emerging undesirable consequences.

The effects of Climate Change are already measurable in the Subbasin and are likely to impact the rate of implementation of the GMP. Data from the new eastern Subbasin HCAWS sites, combined with reliable and ongoing data from the extant sites, will enable water-use policymakers to discern the trajectories of surface hydroclimate, and discern their influence on the Subbasin's water economy as the Watermaster Board attempts to implement the GMP in a changing environment.

Map 1 (next page): Existing weather station locations take measurements around most of the Borrego Subbasin.

Map 2 (2 pages ahead): Two new HCAWS would be located at two of the three noted sites, to be selected, completing coverage of the Borrego Subbasin.

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Coyote Mountain
3,192 ft
Clark Lake
Viking Ranch
Clark Dry Lake
Anza-Borrego Desert Center Weather Station (Colorado District Office)
Borrego Springs
Borrego Springs Elementary School
Borrego Valley Airport (L08)
Anza-Borrego Desert Center Base Weather Station
Borrego
Borrego Sink
Dry Canyon
Culp Valley (Baker)
Wilcox Well
Map 1
Steele/Burnand Anza-Borrego Desert Research Center
Existing Weather Stations [🌀]

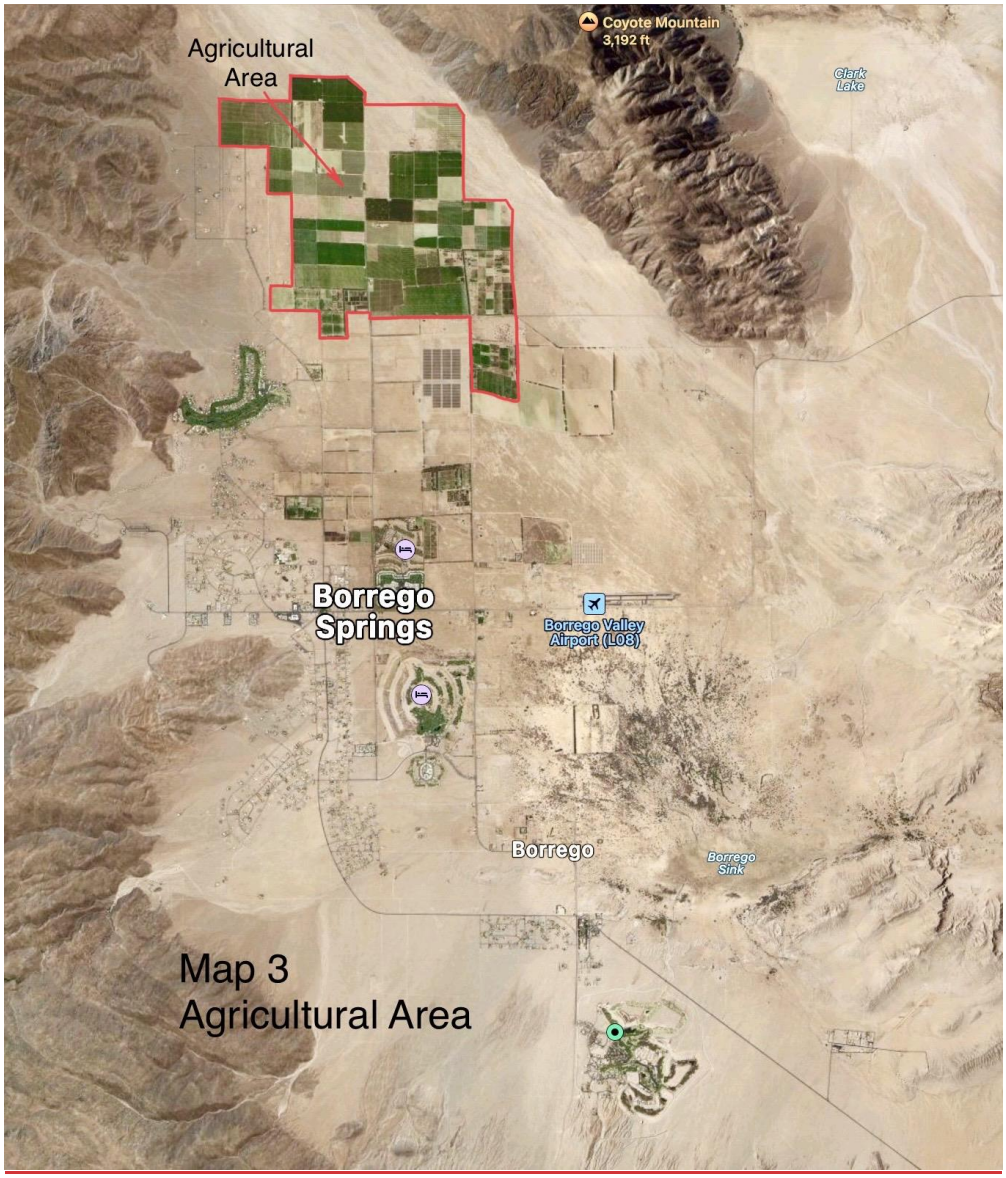

Coyote Mountain
3,192 ft
Clark Lake
Viking Ranch
Clark Dry Lake
Anza-Borrego Desert Center Weather Station (Colorado District Office)
Borrego Springs
Borrego Springs Elementary School
Borrego Valley Airport (L08)
Anza-Borrego Desert Center Base Weather Station
Potential Site 1
Borrego
Borrego Sink
Dry Canyon
Culp Valley (Baker)
Wilcox Well
Potential Site 2
Potential Site 3
Map 2
Three potential sites for two new Hydroclimate Automatic Weather Stations [ ]

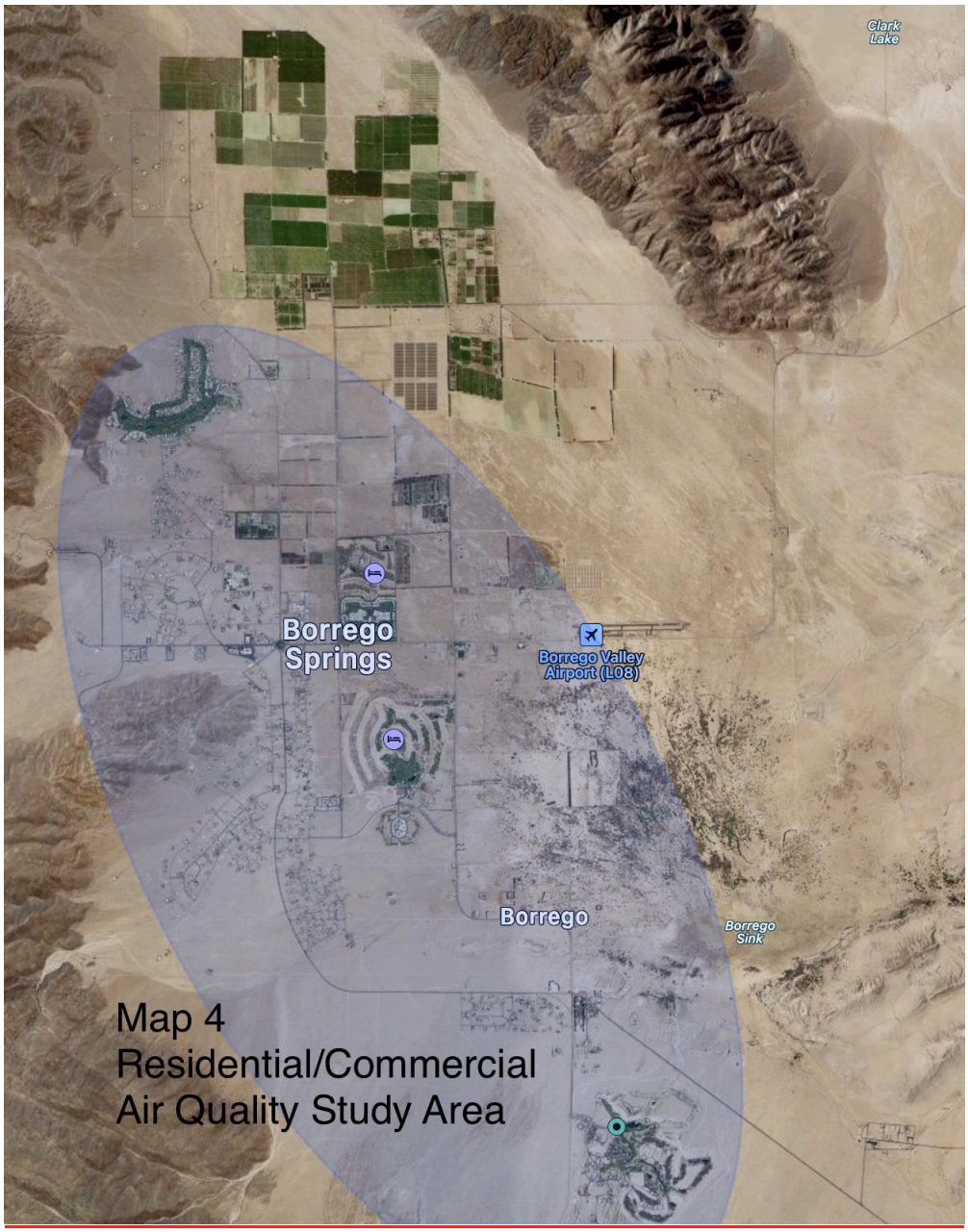
2) Addressing Data Gap of the Environmental Impact of Fallowing

The second data set created by this Project will fill an existing data gap and will thereby enable the Watermaster to objectively assess/measure the environmental impact of its one Management Action that is the only pathway to sustainable yield—the fallowing of thousands of acres of agricultural land. This dataset focuses on the air quality impacts of fallowing agricultural lands. These data will be measured by two new, complementary networks of Particulate Matter (PM) monitors, comprised of accurate yet relatively inexpensive off-the-shelf commercial sensors (nephelometers) manufactured by PurpleAir.com.

The remote network will be arranged around and inside the perimeter of the area to be fallowed. (See Map 3) Each of the ~20 stations will include a PA-II-SD sensor with an SD card to record data, mounted on a mast with solar-powered batteries. Data from this network will reveal the emissions of fine and coarse mode dust emitted from the region, and any changes in emission spatiotemporal patterns and amounts before, during, and after the fallowing to reduce groundwater withdrawal. The neighborhood network (See Map 4) will be installed at local residences and businesses volunteered by their owners, sited as feasible to optimize coverage of where residents live and work. Each of these ~30 stations will comprise a PA-II sensors connected to the Internet via built-in WiFi. This network will measure the exposure of inhabitants to PM.

Map 3 (next page): Area to be monitored by agricultural network.
Map 4 (2 pages ahead): Residential/Commercial area to be monitored by neighborhood network.


Agricultural Area
Coyote Mountain
3,192 ft
Clark Lake
Borrego Springs
Borrego Valley Airport (L08)
Borrego
Borrego Sink
Map 3
Agricultural Area


Clark Lake
Borrego Springs
Borrego Valley Airport (L08)
Borrego
Borrego Sink
Map 4
Residential/Commercial
Air Quality Study Area

The following are examples of existing data gaps. There are currently no data to suggest which parcels of land, when fallowed, will be more or less impactful on PM Air Quality (PMAQ) in the Subbasin. There are currently no data upon which to predict the impact on PMAQ of fallowing 40 acres vs 400. There are currently no data available to assess the impact on PMAQ of efforts to rehabilitate fallowed land, or any such mitigation efforts. Without such data the Watermaster Board would essentially be flying blind in terms of assessing or mitigating the largest environmental impact their unavoidable water conservation efforts will produce in the Subbasin.

Filling these data gaps requires expanding the current research-level Air Quality Monitoring Program 1) to focus in and around the areas that will be fallowed, and 2) to provide a more robust and granular assessment capability of the air breathed by Borrego Springs residents and visitors. This expansion of the existing nascent program will be accomplished by the installation of~~surrounding the current agricultural lands with~~ ~50 off-the-shelf PurpleAir sensors expected to cost in total less than one-third of the cost of the two new HCAWS stations. Approximately 20 of these sensors will be around the current agricultural area and 30 will be dispersed in residential and business areas.

The data from these new PM networks will be combined with the data from the five extant and two new research grade PM sensors at the HCAWS stations. The data will be analyzed by the UCI scientists who constructed the current Program. Armed with such data, the Watermaster Board will be able to "see" the environmental impact of their one essential Management Action: fallowing. They will, with the development of the Program over time, be able to make predictions as to the impact on Air Quality that fallowing a specific number of acres in a specific location might have. And they will have the tools to assess the success, or lack thereof, of mitigation efforts that will be necessary to ensure the Air Quality in the Subbasin stays within allowable state and federal clean air standards.

Data Sharing

Filling the data gaps described above will generate streams of real time, continuous data that will be shared with the Water Data Library. There are currently no continuous data streams from southern California, making these data the first.

In addition to making the data available to the Water Data Library, this project will engage the wider Borrego Community during annual presentations/discussions of ongoing results. These annual meetings will be hosted by/at the SBABDRC and will center on educating interested citizens on the relationships among sustainability, hydroclimate, and local air quality. These annual meetings will be extended to include age-appropriate presentations to local K-12 students. Additionally, there will be ongoing outreach to the community in the form of monthly, remote Q&A meetings focused on current trajectories of subbasin hydroclimate and air quality.

Describe the project location, current conditions, and the benefitting areas. Please attach, separately, a regional and Project map depicting the site(s) location, current conditions, and benefitting areas.

The entire Subbasin benefits from filling the data gaps that will allow more informed implementation of the GMP, both in terms of the rate of implementation depending upon changes in the Subbasin's water economy and in terms of the environmental impact of the one necessary Management Action–fallowing.

The Project locations are indicated in: Map 2, areas for location of two HCAWS; Map 3, the perimeter of agricultural lands along which will be located 20 PM monitors; and Map 4, locations of businesses and residences where 30 PM monitors will be installed.

What is the nexus of the Project to the Sustainability Goal of the Borrego Springs Subbasin Groundwater Management Plan (GMP)? Is the Project listed in the GMP? How does the Project help achieve the goals of the GMP?

Hydroclimatic Data Gap

This project provides data that will allow the WM to make expeditious and informed, annual iterative changes to the implementation of the GMP through a more complete understanding of the water economy of the Subbasin.

~~**One of the two existential water threats in the Borrego Subbasin is that the GMP is not implemented quickly enough to avoid the undesirable outcome of depleting the upper aquifer such that the only remaining water comes from the middle or lower aquifer. Water from these lower strata would have to be treated at a cost that would be difficult to bear for this SDAC. Filling a data gap that allows for more accurate assessments of the Subbasin's water economy will enable to Watermaster to be better informed as it makes its iterative decision each year about the rate at which water reductions are required of pumpers.**~~ **The current rampdown rate of 5% per year for the first 10 years was an arbitrary estimate consistent with the time frame required by SGMA. It was not based on precise data about the Borrego Subbasin. This circumstance~~fact~~ makes it critically important that the Borrego Watermaster have the data~~tools~~ to make the best assessment it can as to the changing water economy of the Subbasin during the remaining 18 years of water consumption rampdown. Filling the data gap of the existing hydroclimate monitoring capability provides the Watermaster a better tool to make those determinations.**

Management Action (Fallowing) Impact Data Gap

Filling the looming data gaps in the current Air Quality Monitoring Program supports the essential water conservation Management Action in the Borrego Subbasin. Water conservation is the only pathway for the Borrego Subbasin to achieve sustainable yield. Sufficient water conservation in the Borrego Subbasin can only be achieved through the fallowing vast swaths of

agricultural lands. ***This fact is demonstrated by the fact that elimination of all municipal water use and all recreational water use would not get the Borrego Subbasin even halfway to the SGMA-mandated 75% reduction in water consumption in the Subbasin.*** **Whereas, if all agricultural lands in the Borrego Subbasin were fallowed today, we would be at, or very near to, sustainable yield.**

The largest environmental impact, and community health impact, of fallowing agricultural lands in a desert environment is the effect itthat such a Management Action will have on Air Quality. Fallowed agricultural land is highly erodible and vulnerable to the frequent high-wind events of the desert. It would be ironic indeed if the Borrego Subbasin were to reach sustainable water yield only to find it had become uninhabitable due to degradation of its Air Quality.

In keeping with the goal of SGMA, the goal of the Borrego GMP is to have a healthy, viable, sustainable community at the end of the water reduction period, not a ghost town that has achieved sustainable yield through Management Actions not commensurate with maintaining a healthy community. This Project provides the Watermaster with the datatools to assess, manage, and mitigate the largest environmental impacts resulting from its one unavoidable water conservation Management Action —the fallowing of agricultural land.

What are the specific goals and needs for the Project, and how will the project achieve the goals and meet the needs?

The goals of this Project are two-fold. First, to ensure that the Watermaster has the best data available as it makes the iterative, annual decisions about the rate at which the GMP is implemented so as to avoid undesirable outcomes. This goal will be accomplished by filling the data gaps of the existing hydroclimate monitoring system as described above.

The second goal is to ensure that achieving sustainable yield is not accomplished at the cost of Air Quality degredationdegradation in a Severely Disadvantaged Community. This goal will be accomplished by capturing datareating a tool that will be used by the Waterboard to assess, manage, and mitigate the environmental impacts of its most significant Management Action. In order to fill the current data gaps, the Project will deploy an array of Air Monitoring devices around the agricultural area and throughout the community of Borrego Springs. The resulting data will be collected and analyzed by scientists at the University of California, Irvine. The results of this analysis will then be made available to the decision makers at the Borrego Watermaster Board.

What are the quantifiable benefits of the Project (e.g., protect or enhance water quality, water conservation, enhanced understanding of the groundwater basin, etc.)? How will those benefits be quantified and evaluated?

The quantifiable benefits of this Project are two-fold: first the filling of the hydroclimate data gaps will enhance the understanding of the water economy of the Subbasin, which is the critical driver of determining the rate of the water consumption rampdown, i.e. water conservation, under the GMP. This benefit will be quantified by the use of the data in making estimates of

evapotranspiration across the Subbasin–a critical aspect of understanding the water economy of the Subbasin.

Second, the filling of data gaps associated with water conservation achieved by fallowing will enable this essential Management Action to proceed in a manner consistent with the SGMA goal of retaining a healthy, thriving community throughout the rampdown process. This benefit will be quantified in regularly published Air Quality reports and through specific information gleaned about the fallowing process's impact on Air Quality and about the effectiveness, or lack thereof, of specific mitigation efforts pursued as a result of fallowing. All of these benefits will be reported in terms of Clean Air Standards as promulgated by the US Environmental Protection Agency.

As an example of quantifiable benefits of the Project, please see ~~Figure 3~~Table 1 for comparison of PM monitoring from Borrego's existing Air Quality Monitoring Program to National Ambient Air Quality Standards (NAAQS) and California Ambient Air Quality Monitoring Standards (CAAQS) for years 2016—2020.

Table 1. Particulate measurement data compilation for five existing stations during 2016 - 2021, as compared to National and California standards.

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Table 1. NAAQS and CAAQS in comparison to Borrego Springs, CA particulate matter data.

Station (Reporting period)	Particle size	Timescale	NAAQS/ CAAQS	Standards	Target		Borrego Station
Anza-Borrego Desert Research Station (3/31/2016–11/19/2020)	PM2.5	24-hr	National	98th percentile, averaged over 3 years		35 µg/m^3	18.7 µg/m^3 (3-year)
		Annual	National	Annual mean, averaged over 3 years	Primary	12 µg/m^3	4.7 µg/m^3 (3-year)
					Secondary	15 µg/m^3	
			Californian	Annual mean		12 µg/m^3	5.2 µg/m^3 (2020)
Elementary School (4/18/2016–11/19/2020)	PM2.5	24-hr	National	98th percentile, averaged over 3 years		35 µg/m^3	17.8 µg/m^3 (3-year)
		Annual	National	Annual mean, averaged over 3 years	Primary	12 µg/m^3	6.3 µg/m^3 (3-year)
					Secondary	15 µg/m^3	
			Californian	Annual mean		12 µg/m^3	7.6 µg/m^3 (2020)
Clark Dry Lake (8/22/2016–11/19/2020)	PM10	24-hr	National	Daily average not to be exceeded 150 µg/m^3 more than one day per year on average over 3 years		1 day	1–4.3 days (3-year)
			Californian	Daily mean		50 µg/m^3	1–11 days (2020)
		Annual	Californian	Annual mean		20µg/m^3	10.8–21.6 µg/m^3 (2020)
Viking Ranch (4/25/2016–11/19/2020)	PM10	24-hr	National	Daily average not to be exceeded 150 µg/m^3 more than one day per year on average over 3 years		1 day	0–2 days (3-year)
			Californian	Daily mean		50 µg/m^3	10–47 days (2020)
		Annual	Californian	Annual mean		20µg/m^3	16.0–32.0 µg/m^3 (2020)
Wilcox Well (4/15/2016–11/19/2020)	PM10	24-hr	National	Daily average not to be exceeded 150 µg/m^3 more than one day per year on average over 3 years		1 day	1.3–2.7 days (3-year)
			Californian	Daily mean		50 µg/m^3	9–45 days (2020)
		Annual	Californian	Annual mean		20µg/m^3	17.2–34.4 µg/m^3 (2020)

Please describe the communities served by the Project. Will the Project benefit an Underrepresented Community, a Disadvantaged Community (DAC), and/or a Severely Disadvantaged Community (SDAC)? If so, please provide a map.

~~**My recollection is that DWR determined Borrego Springs to be an SDAC in 2017.**~~**Borrego Springs has been designated to be an** ~~**It is no secret that DAC's and**~~ **SDAC. (See Map 5) Unfortunately, SDAC's**~~**'s**~~ **have born the brunt of degraded air quality throughout California. If we do not develop the ability to measure, and therefore manage, the impacts of the one Management Action that will get Borrego Springs to sustainable yield, i.e. fallowing, Borrego Springs is at risk** ~~**in danger**~~ **of**

becoming another~~just one more~~ SDAC whose air quality was allowed to degrade through inattention and/or neglect.~~sacrificed to "progress."~~

Will the Project or Component positively impact issues associated with small water systems or private shallow domestic wells (e.g., groundwater contamination vulnerability, drawdown, etc.)? If so, please provide justification such as water system maps or domestic well census results.

Small water systems and private shallow domestic wells will be maximally protected by Management Actions that bring the Borrego Subbasin to Sustainable Yield efficiently and expeditiously. This project provides tools and data that further the WM's ability to proceed toward Sustainable Yield in such a manner.

~~**No known nexus.**~~

Does the Project address the needs of the State Water Board's SAFER Program, designed to ensure Californians who lack safe, adequate, and affordable drinking water receive it as quickly as possible, and that the water systems serving them establish sustainable solutions?

No known nexus.

How does the Project address the Human Right to Water (AB 685 Section 106.3) which states that every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes?

No known nexus.

Please describe how the project contributes to addressing the risks in the region to water supply and water infrastructure arising from climate change. If possible, please provide the amount of greenhouse gas emissions reduced and carbon sequestered resulting from the project.

The only water supply, present and future, is the aquifer in the Borrego Subbasin. The goal of the GMP is to reduce current water consumption to conserve that water supply for today and for future generations. If our rampdown is not fast enough and we begin drawing water from the Middle and Lower Aquifer, that water will have to be treated at a cost that is beyond what this SDAC is capable of. Now, at the beginning of the process of ramping down water consumption, the speed of the rampdown is an arbitrary assumption. We do not know how close we are to drawing water from the Middle Aquifer. Thus, the crucial importance of monitoring as closely as possible the water economy of the entire Subbasin. If, through filling the data gaps in the hydroclimatic monitoring and the improved understanding of the water economy that this provides, the Watermaster has a better understanding of "where we are" in the decline of the aquifer, it can adjust the speed with which water conservation occurs.

Climate Change makes the iterative decisions of the Watermaster described above more difficult and more uncertain. Climate change is already nipping at the heels of the Borrego Subbasin as evidenced by increased record high temperatures and changes in average annual rainfall. More distressingly, a 2021 study from the Huxman lab at the University of California, Irvine has documented a 40% decrease in desert vegetation over the last 34 years due to a warming climate. These environmental changes support the aggressive timetable established by the GMP/Stipulated Agreement for reducing water consumption in the Subbasin by 50% over the next 8 years. This Project supports this aggressive timetable by giving the Watermaster Board the real time data~~tools~~ it needs to monitor and mitigate the Management Actions that it must take in the immediate future and that are complicated by the uncertainty introduced by Climate Change.

Work Plan

The Work Plan must contain descriptions of the anticipated tasks necessary to complete the project. Tasks should be organized by the five budget categories, as applicable: (a) Project Administration, (b) Planning/Design/Environmental, (c) Construction/Implementation, (d) Monitoring/Assessment, and (e) Interested Parties Outreach/Education. The Work Plan should also identify the anticipated deliverables for each task.

Add additional tasks and subtasks as needed to provide a detailed work plan. Some examples and suggested language have been provided.

Budget Category (a): Project Administration

Task a1 – Overall Project Management

Manage grant agreement including compliance with grant requirements, and preparation and submission of supporting grant documents and coordination with the Grantee, Borrego Water District. Prepare invoices including relevant supporting documentation for submittal to DWR via Borrego Water District. This task also includes administrative responsibilities associated with the project such as coordinating with partnering agencies and managing consultants/contractors.

Deliverables: Invoices and necessary documentation

Task a2 – Supervise Environmental Monitoring and Assessment

Recruit, hire, and mentor Project Scientist at UC Irvine who will perform ongoing, day-to-day analysis and evaluation of hydroclimate and air quality datasets. Liaise with management at UC Steele-Burnand Anza Borrego Desert Research Center (SBABDRC) to prioritize efforts of SBABDRC staff. Liaise with BVEF to plan annual outreach days to discuss results of environmental monitoring with interested residents. Supervise data quality evaluation and assessment and attribution of primary contributors to particulate air quality degradation and exposure.

Budget Category (b): Planning/Design/Environmental

Task b1 – Planning/design of New Hydroclimate Automatic Weather Stations (HCAWS)

Identify two logical and feasible sites for new HCAWS that fill spatial data-gaps in eastern Borrego Springs subbasin. Negotiate and obtain required permits from landowners/authorities (BWD, ABDSP, etc.). Evaluate necessity of concrete base or fencing to protect planned sites from erosion/vandalism. Obtain quotes for two new HCAWS substantially equivalent to existing HCAWS.

Deliverables: Siting permits, assembly plans, and equipment quotes for two new HCAWS.

Task b2. – Planning/design of New Particulate Matter Network

Identify sites for new PM network comprising a remote (solar-powered) network in and around land to be fallowed and a wired (utility-powered) network in residential and business areas of Borrego Springs. Optimize siting to sample PM at least every 30 degrees around fallowing perimeter (remote

network, PurpleAir PA-II-SD sensors), and to monitor neighborhood-level exposure to PM (wired network, PurpleAir PA-II sensors). Prototype remote network sensor (mast, panel, batter, PA-II-SD, optional anemometer). Negotiate and obtain required permits from landowners/authorities (BWD, ABDSP, etc) for remote network sites. Develop application for sub-contracted installation of wired sensors in residential/business locations. Solicit quotes from local licensed/bonded electricians to install wired PM network.

Deliverables: Siting permits, prototype installation plans, and equipment quotes for ~20 remote PM monitoring site/sensors and ~30 wired PM monitoring sites/sensors. Quotes from potential suppliers on volume-discount purchase of masts, panels, PA-II sensors and optional anemometer). Quotes from electrical sub-contractors for per-residence installation of wired PM sensors.

Task n. – CEQA

[Description]

Deliverables: [ex: Notice of Determination]

Budget Category (c): Construction/Implementation

Task c1. – Install two new HCAWS stations

Order, receive, assemble, test, install, and re-test two new HCAWS stations **in the eastern Borrego subbasin.** Components include rain gauge, soil moisture sensors, pressure/temperature/RH seasons, PM2.5/10/TSP monitor, solar panel, and spare parts to ensure uninterrupted operation over 3 years.

Deliverables: Real-time data hydroclimate data received from two new HCAWS stations

Task c2. – Install remote PM network

Order, receive, assemble, test, install and re-test up to 20 (off-the-shelf) PurpleAir PA-II-SD PM monitors in the region to be fallowed. With no local power lines, these monitors will be mast-mounted, powered by a battery linked to a solar panel on the mast with the monitor.

Deliverables: Near real-time PM data (up to two week delay) retrieved from SD cards on 12-20 remote PM sensors

Task c3. – Install wired PM network

Order, receive, install and test up to 30 (off-the-shelf) PurpleAir PA-II PM monitors in residential/business sites volunteered by owners. These monitors will be installed by sub-contracted electrician

Deliverables: Real-time PM data received from 20-30 neighborhood sensors.

Budget Category (d): Monitoring/Assessment

Task d1. – Assess/Evaluate Hydroclimate Automatic Weather Station Data

Review and organize existing and augmented HCAWS data and incorporate into DWR's Water Data Library and UCI's high-speed server http://sbabdrc.ess.uci.edu. Establish hydroclimate baselines (means and variability) for precipitation, soil moisture, RH, evaporation, winds, and dust concentration at existing and augmented sites. Compare ongoing measurements to climate and pre-fallowing norms and assess for statistically significant changes. Analyze data from new PM network to infer dust emissions from fallowed area, and quantify neighborhood-level spatio-temporal patterns of citizen exposure to PM. Quality control data by inspection for anomalies and instrument drift. Schedule sensors for periodic re-calibration (at the manufacturer) and intercalibration (in the field) against traceable standards. Improve user-friendliness of remotely accessible data, and respond to requests for hydroclimate data from other participants in SGMA implementation and from the broader community. Learn and improve hydroclimate modeling techniques necessary to estimate surface water budgets and attribute PM sources in future climate scenarios in support of SGM planning and implementation.

Deliverables: Real-time data and regularly updated, quality-controlled, environmental data from 7 HCAWS stations and new PM network publicly available via UCI server, PurpleAir.com map, and archived at Water Data Library. Summary reports on derived statistics including climate signals and attainment of EPA standards.

Task d2. – Inspect/Maintain Stations/Sensors, Collect Remote PM Network Data

Inspect 9 HCAWS stations and remote PM network at least monthly to identify maintenance needs and retrieve PM data from remote network SD cards. Upload SD data to UCI and PurpleAir servers. Refurbish parts as necessary and replace degraded batteries in Year 3.

Deliverable: Real time and near-real time data with fewest possible temporal gaps

Budget Category (e): Interested Parties Outreach/Education

Task e1. – Annual Outreach Workshops and Monthly Office Hours

Engage wider Borrego community in the project during annual presentations/discussions of ongoing results hosted by/at SBABDRC. Educate interested citizens on the relationships among sustainability, hydroclimate, and local air quality. Offer age-appropriate annual presentations to local K-12 schools. Host monthly remote Q&A "office hours" on recent trajectories of subbasin hydroclimate and air quality.

Deliverables: Monthly remote and annual in-person face-time Q&A with UCI scientists monitoring and evaluating subbasin hydroclimate and air quality.

Budget

DWR required budget categories have been included below. Add tasks as applicable; additional rows must be added under the applicable categories to present the cost of each task described in the Work Plan.

Category		(a) Requested Grant Amount	(b) Local Cost Share: Non-State Fund Source*	(c) Total Cost	(d) % Local Cost Share (Col(b))/(Col(c))
(a)	**Project Administration**				
	Task a1. Project Management	2644200	0	2644200	0
	Task a2. Supervise Environ. Monitoring/Assessment	5025000	0	5025000	0
(b)	**Planning/Design/Environmental**				
	Task b1. Plan/Design HCAWS	25000	0	25000	0
	Task b2. Plan/Design PM networks	25000	0	25000	0
(c)	**Construction/Implementation**				
	Task c1. Install two HCAWS	105000	0	105000	0
	Task c2. Install remote PM network	15000	0	15000	0
	Task c3. Install wired PM network	20000	0	20000	0
(d)	**Monitoring/Assessment**				
	Task d1. Assess/evaluate HCAWS+PM data	3305000	0	3305000	0
	Task d2. Ongoing inspection, maintenance, remote data retrieval	80000	0	80000	0

(e)	**Interested Parties Outreach/Public Education**	5000	0	5000	0
	Task e1. Annual outreach workshop, monthly office hours				
(f)	**Grand Total (Sum rows (a) through (d) for each column)**	6864292~~92~~00	0	6864292~~92~~00	0

* List sources of Local Cost Share funding:

Schedule

The Schedule must be organized in a manner that is consistent with the Work Plan and Budget that will be contained in the Grant Agreement. The Schedule Table presented below is a template that must be completed for each project in the proposal. The required budget categories have been included below. Add additional rows for each task as described in the Work Plan and Budget.

	Categories	Start Date (Earliest Start Date)	End Date (Latest End Date)
(a)	**Project Administration**	**01/01/2023**	**12/31/2025**
	Task a1. Project Management	01/01/2023	12/31/2025
	Task a2. Supervise Environ. Monitoring/Assessment	01/01/2023	12/31/2025
(b)	**Planning/Design/Environmental**	**01/01/2023**	**06/30/2023**
	Task b1. Plan/Design new HCAWS stations	01/01/2023	06/30/2023
	Task b2. Plan/Design new PM networks	01/01/2023	06/30/2023
(c)	**Construction/Implementation**	**07/01/2023**	**12/31/2023**
	Task c1. Install two HCAWS stations	07/01/2023	12/31/2023
	Task c2. Install remote PM network	07/01/2023	12/31/2023
	Task c3. Install wired PM network	07/01/2023	12/31/2023
(d)	**Monitoring/Assessment**	**01/01/2023**	**12/31/2025**
	Task d1. Assess/evaluate HCAWS+PM data	01/01/2023	12/31/2025
	Task d2. Ongoing inspection, maintenance, remote data retrieval	07/01/2023	12/31/2025
(e)	**Interested Parties Outreach/Public Education**	**07/01/2023**	**09/30/2025**
	Task e1. Annual outreach workshop, monthly office hours	07/01/2023	09/30/2025

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Ecology and Evolutionary Biology
University of California
Irvine, CA 92679

January 28, 2022

Dr. David Garmon, President
Tubb Canyon Desert Conservancy
230 West Palm Street
San Diego, CA 92103

Dear Dr. Garmon,

I am writing to you in my capacity as a scholar and as the Faculty Director of the Steele/Burnand Anza-Borrego Desert Research Center of the University of California, Irvine to show my support for your proposed project expand Borrego's Air Quality Monitoring System in the Subbasin. There are a number of critical issues facing the region that demand reliable, spatially appropriate micrometeorological data. Your project will enhance the infrastructure in the region and provide much more robust understanding to support decision-making.

Your proposed project will leverage the current array of air quality and ecohydrological monitoring stations that we established through a grant from the National Science Foundation in 2015. This array is maintained by the staff at the SBAB Desert Research Center, and data are publicly accessible through a number of portals associated with the University of California outreach programs. Your proposed enhancement of the array will allow us to better support water conservation measures in the Subbasin, such as the fallowing of agricultural lands, in order to reach sustainable yield as defined and required by SGMA.

I have worked collaboratively with your organization over the past decade on several important projects in the region, including a comprehensive approach to understanding the invasion of the non-native Sahara mustard in the US and working to develop a community engaged approach to strategic planning around important environmental and societal challenges. I have always been extremely impressed with the success / outcomes of these projects, the science produced, the decision-making outcomes, and importantly for my role, the professional development associated with trainees at UCI.

Please do not hesitate to contact me if I may provide you with additional assistance in this project.

Best regards,

Travis E. Huxman
Director Advisor, Steele/Burnand Anza-Borrego Desert Research Center
Professor and Chair, Ecology and Evolutionary Biology
University of California, Irvine

(949) 677-9929; thuxman@uci.edu; www.faculty.sites.uci.edu/huxman

Monday, January 24, 2022

To whom it may concern,

The Borrego Village Association (BVA), a non-profit citizen stakeholder organization, is working to create and sustain a thriving and attractive community, surrounded by Anza-Borrego Desert State Park.

The BVA is implementing a sustainable tourism program for Borrego Springs utilizing a community stakeholder engagement process designed to develop and strengthen destination partnerships to support economic development, celebrate local culture, sustain natural and cultural assets, and enhance the well-being of residents through sustainable tourism management and marketing.

The BVA is acutely aware of the importance of clean air on the tourism-driven economy of Borrego Springs and the region. For this reason, the BVA is deeply concerned with the potential environmental impacts—primarily air quality—of fallowing thousands of acres of agricultural land at the north end of our community.

The BVA therefore strongly supports this Air Quality Monitoring Program because without it there would be no tool available to assist the Watermaster in assessing the environmental impact of its primary Management Action—fallowing—and no way of objectively assessing the success, or lack thereof, of attempts at restoring fallowed land.

Best Regards,

James Dion
Executive Director
Borrego Village Association

Direct: (202) 604-2847
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BorregoExperience.com
BorregoVillageAssociation.org