

ATTACHMENT 1

Identification of Chemicals of Interest and Literature Review of Produced Water Beneficial Reuse in Irrigated Agriculture

SCOPE OF WORK FOR TASKS 1 AND 2

(June 2018)

Groups and Individuals identified in these tasks are as follows:

Permit Holders. The groups that use or supply oilfield produced water for irrigation of crops for human consumption under Waste Discharge Requirements adopted by the Central Valley Regional Water Quality Control Board (Central Valley Water Board) or have submitted Reports of Waste Discharge to use oilfield produced water to irrigate crops for human consumption.

Administrator. The representative of the Permit Holders.

Manager. The representative of the Central Valley Water Board.

Consultant. GSI Environmental Inc. (GSI). The party selected to do the work by the Administrator and approved by the Manager

Scientific Advisor. The scientific advisor to the Central Valley Water Board and under contract to the Central Valley Water Board.

Food Safety Panel. Panel of food safety experts convened by the Central Valley Water Board.

Parties. The Permit Holders and Central Valley Water Board.

Background

Cawelo Water District (Administrator), on behalf of the Permit Holders, is soliciting scientific support in the subject of water recycling and beneficial reuse in irrigated agriculture. Produced water has been identified as a valuable alternative source of irrigation water in California and produced water has been blended with other conventional sources of water and used for irrigation in California. The purpose of this solicitation is to advance the scientific understanding of produced water beneficial reuse in agriculture by identifying chemicals that might be found in produced water, examining those chemicals in the context of irrigated agriculture, and examining current and past produced water beneficial reuse practices in the U.S. and elsewhere by conducting a literature review.

Task 1: Selection of Chemicals of Interest for Further Evaluation

Description and Objective

Task 1 is a preliminary hazard assessment of both naturally occurring crude oil constituents and the chemical additives used during the generation of produced water (collectively referred to as "Chemicals of Interest"), which could be found in produced water used for agricultural irrigation. The lists of oil field production chemical additives provided by the Permit Holders in reports submitted to the Central Valley Water Board will be used to identify potential produced water chemical additives for consideration in Task 1. A list of these chemical additives are found on the Central Valley Water Board's website:

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[https://www.waterboards.ca.gov/centralvalley/water_issues/oil_fields/food_safety/index.html].

Chemicals which are naturally occurring in crude oil will be determined by reviewing the relevant literature and irrigation water sampling results posted on the California Water Board website.

The objective of Task 1 is to identify and create a list of Chemicals of Interest for further evaluation in Task 2. The list of Chemicals of Interest will also identify the chemical additives used by the Permit Holders for which inadequate data are available to make an initial hazard assessment. It may be necessary for future work (not within the scope of Task 1 and Task 2) to conduct hazard assessments for these chemicals when toxicological data are not available and using surrogate chemicals is not appropriate.

This initial assessment will be conducted using scientific information to characterize and rank the Chemicals of Interest for further evaluation in the context of produced water reuse for irrigation purposes. Proposed methods and criteria for selection of Chemicals of Interest are described below. The assessment will use publicly available data and information from reliable government organizations and peer-reviewed scientific journals. The draft list of Chemicals of Interest and associated information (Task 1 deliverables) will be subject to peer-review by Permit Holders, the Central Valley Water Board, the Food Safety Panel, and potentially other experts. The peer-reviewed list and associated peer-reviewed report will be shared publically and one or more presentations will be made to the public during meetings hosted by the Central Valley Water Board.

Approach

Chemical additives and naturally occurring crude oil constituents may be toxic, teratogenic, carcinogenic, or are known to be endocrine disruptors, etc. to mammals, plants, or aquatic organisms. In the context of produced water reuse for agricultural irrigation, these chemicals may also be environmentally persistent (or bioaccumulative) and pose additional hazards or present risk, due to these properties. The physical properties of chemicals may also modify the risks associated with additives or naturally occurring crude oil constituents in irrigation water, and will be investigated. For example, substances that are poorly miscible in water and are highly volatile may have a lower risk because they could significantly evaporate before they encounter the root stock of plants that are being irrigated. Some chemicals may have available screening levels which have been exceeded in previous irrigation water samples; these can be used to identify the Chemicals of Interest for further evaluation, in addition to ranking methods described below.

The following can be used to determine whether these chemicals should be included on the list for evaluation:

- Oral toxicity information/data (with priority given to chronic mammalian toxicity data);
- Dermal toxicity information/data;
- Carcinogenicity information/data;
- Teratogenicity information/data;
- Environmental persistence/degradation information/data including soil half-life;
- Degradation byproducts of the chemicals and their associated toxicities, carcinogenicity, teratogenicity, endocrine disrupting potential, etc.;

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- Plant uptake information/data;
- Amounts and frequency of use in oil fields;
- Chemicals that are persistent, bioaccumulative, and toxic as defined by the US Environmental Protection Agency [EPA] and other government or scientific organizations;
- Chemicals detected in any water quality analyses of irrigation water with maximum measured irrigation water concentrations above available risk-based water screening levels (for example, EPA drinking water screening levels or California Public Health Goals);
- Ambient, background concentrations in air and water that can result from agricultural practices and human activities unrelated to produced water reuse;
- Whether the chemical is naturally occurring in the environment;
- Other sources of the chemical in the environment and the specificity of the chemical to application of produced water for irrigation;

Previous work has already catalogued many of the chemical that will undergo a hazard assessment outlined here. Datasets resulting from this work have compiled information on/from:

1. Basic physical properties
2. Chemical Usage
3. Animal and eco- toxicological data (LD₅₀, LC₅₀, EC₅₀,)
4. EPA Integrated Risk Information Systems (IRIS) reference concentrations (RfC) and slope factors
5. EPA Human Health Benchmarks for Pesticides (HHBP) Acute and Chronic Population Adjusted Doses
6. EPA Provisional Peer-Reviewed Toxicity Values (PPRTV)
7. Agency for Toxic Substances and Disease Registry (ATSDR) Minimal Risk Level (MRL)
8. Office of Environmental Health Hazard Assessment (OEHHA): unit risks, slope factors, reference levels, and cancer/non-cancer no significant risk levels
9. US EPA Drinking Water Standard regulatory contaminant levels and cancer risks
10. USGS cancer/non-cancer Human Based Screening Levels
11. EPA Health Effects Assessment Summary Tables
12. IARC Carcinogenicity Class
13. US EPA Drinking Water Standards and Health Advisory Cancer Classification
14. Proposition 65 classification
15. National Toxicity Program Report on Carcinogens 14th classification
16. Biodegradability
17. Bio-concentration/bioaccumulation
18. Half-life in water/fugacity
19. Material Safety Data Sheet classification information

Data for 245 of 263 chemicals have already been compiled based on the Additive Constituent List found on the Central Valley Water Board's website; these datasets are currently being updated by other researchers. In addition to the hazard assessment, part of this work will be to identify which chemical additives still need data to be collected regarding the assessment criteria (above). GSI will also need to identify naturally occurring chemicals not included in the additives list. After this, data to conduct a harmonized evaluation of both additive chemicals and naturally occurring chemicals will need to be identified/collected for those chemicals not included in available datasets.

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The nature of the chemicals' and other "real-world" factors will be considered for creating the list of potential Chemicals of Interest for evaluation in Task 2. For example; Is the chemical a petroleum-related compound that has been well characterized in the past or is already being addressed in current water management practices (i.e. monitoring, treatment, etc.)? Is it a common environmental contaminant and/or an inert chemical? Is the toxicity via inhalation exposures and not oral exposures, etc. Screening criteria used in selecting chemicals for further evaluation should focus on actual and expected water use and potential chemical exposure associated with irrigation.

It is anticipated that the outcome of the selection of chemicals of interest will include the following:

- A focused list of Chemicals of Interest;
- A list of chemicals that could not be assessed for potential hazards
- A comprehensive report of findings, methods, and data sources;
- A detailed summary of knowledge gaps;
- An electronic compilation of available quantitative and/or qualitative information on the chemical's toxicological profile (e.g. LD50, ED50, etc.) and physical and chemical properties relevant for fate and transport evaluation (e.g., KOW, bioconcentration, half-life in soil and water, Henry's constant, etc.).

The development of a list of Chemicals of Interest (Task 1) will build on prior work of the Central Valley Water Board and the Food Safety Panel. This included published dataset reports identifying chemicals of interest within narrower evaluative frameworks. It is anticipated that the final list of Chemicals of Interest will include an identification of those chemicals that 1) may be at 'high' or detectable levels in irrigation water, 2) are chronically toxic to humans, 3) are persistent in the environment, and 4) may be taken into edible portions of plants.

GSI recognizes that there may be limited data for many of the chemicals of interest. In the cases of chemicals with missing critical data, it is an accepted practice by the California Department of Toxic Substances Control and other government agencies to consider toxicity and other environmental health data from "surrogate" chemicals to fill data gaps for evaluation of chemical hazards. Therefore, where appropriate and with sufficient justification, GSI will use surrogate chemicals (for instance, structurally similar chemicals with available data) will be identified and used where possible to fill data gaps concerning evaluation of potential Chemicals of Interest. If there is insufficient toxicity information to use surrogates, these chemicals may still be included in the list of Chemicals of Interest if they have been identified as a chemical of interest for cancer or non-cancer outcomes through another agency or regulatory body, while still meeting some basic criteria for human/ecologic exposure potential.

GSI will develop a scoring system to rank chemicals based on the range of parameters identified above. As there are likely to be many cases where incomplete data are available for the potential chemicals of interest, GSI will attempt an analysis of the distribution of scores to ascertain whether these chemicals can be classified into broader categories, i.e., of definite concern, most likely concern, little concern, no concern, etc. These broader categories will help determine whether a "cutoff" score is an appropriate means of delineating the list of Chemical of Interest, which will be further investigated in Task 2. If a definitive cutoff is not apparent, GSI

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scientists will use expert judgement to identify the 'cutoff' that delineates the list for the Chemicals of Interest.

This scoring approach will be guided by the approach used for the EPA's Contaminant Candidate List (CCL) for drinking water. The EPA's process follows:

- 1) Building a broad CCL Universe of potential drinking water contaminants for consideration (see "Final Contaminant Candidate List 3 Chemicals: Identifying the Universe");
- 2) Using straightforward screening criteria related to a contaminant's potential to occur in drinking water and potential for public health concern to narrow the Universe to a Preliminary CCL (PCCL), and;
- 3) Using a structured classification approach (e.g., a classification model) as a tool, along with expert judgment, to develop a proposed CCL from the PCCL (see "Final Contaminant Candidate List 3 Chemicals: Classification of the PCCL to the CCL").

The first step here, 'Identifying the universe' of chemicals has been partially completed with the list of chemical additives, however, the list of naturally occurring substances to be evaluated still needs to be completed. The second step has been delineated by the criteria and datasets discussed above. The third step will be to integrate these data into a structured tool to score each of the chemicals. GSI is proposing a multi-criteria decision analysis approach which will be able to integrate both continuous measures (i.e., cancer slope factors, LD₅₀, bio-concentration factor, etc.) and categorical data (i.e., IARC classification) into the scoring measure.

The overarching objective in determining if a chemical is included in the CCL list is to identify chemicals that may have an adverse effect on health; and if a chemical is known to occur, or there is a substantial likelihood that the contaminant will occur in public water systems with a frequency and at levels of public health concern.

While these goals are of interest in Task 1, they do not encompass the full scope of impact assessed. However, the basic CCL list framework can easily integrate exposure contexts to include ecologic factors, such as bioaccumulation and environmental persistence, so that a more holistic hazard assessment of chemicals in produced water used for agricultural irrigation can be conducted.

Deliverables Task 1

Draft list of Chemicals of Interest, including naturally occurring chemicals and chemical additives that meet reasonable criteria for potential hazard in the context of beneficial reuse in irrigated agriculture. Draft report describing selection criteria for inclusion on list, methods, and data sources. Final list and associated report incorporating and responding to comments from Permit Holders, the Central Valley Water Board, the Food Safety Panel, and potentially other experts. Presentations or attendance, by phone or in person, at meetings organized by the Central Valley Water Board.

Timetable and Budget

Budget should not exceed \$170,000 for Task 1.

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Deliverable Task 1	Suggested Timetable
Draft list of Chemicals of Interest	Five months after approval of statement of work
Draft list of chemicals that could not be sufficiently evaluated, and justification for the inability to evaluate	Five months after approval of statement of work
Draft report describing selection criteria for inclusion on list, methods, and data sources	Four months after approval of statement of work
Final list and associated report incorporating and responding to comments from Permit Holders, the Central Valley Water Board, the Food Safety Panel, and potentially other experts	Two months after receipt of formal reviewer comments from Permit Holders, the Central Valley Water Board, and the Food Safety Panel.
Presentations or attendance at Central Valley Water Board organized meetings	Up to one meeting per month on average over duration of project
Completion of all task deliverables	Within one year of approval of statement of work

Task 2: Literature Review for Produced Water Reuse in Agriculture

Description and Objective

The purpose of this task is to conduct a rigorous and thorough review of the available literature on produced water reuse in agriculture and the potential occurrence of chemical additives and petroleum-associated contaminants in food crops, in the context of irrigation with produced water. The literature review will include an evaluation of the Chemicals of Interest identified in Task 1, which may include both petroleum production chemical additives as well as known, naturally occurring constituents (e.g. heavy metals, aromatic hydrocarbons). The literature review will focus on the Chemicals of Interest from Task 1 in the context of actual water use in the Central Valley of California and expected potential chemical exposure associated with irrigation. The literature review will provide a comprehensive summary of the state of knowledge for the chemicals potentially present in blended produced water used for irrigation. This will include a discussion of the strengths and limitations of the existing knowledge and a summary of the knowledge gaps that exist.

The toxicity and hazard data compiled in Task 1, will be interpreted in the context of beneficial reuse in agriculture in Task 2. Although the literature review is not expected to be a comprehensive risk assessment, the literature review is expected to provide risk context for the potential hazards identified in Task 1. The literature review will identify other potential sources of Chemicals of Interest in the environment other than produced water reuse and identify background levels for chemicals in the environment, as possible. Use of Chemicals of Interest in applications of herbicides, pesticides, fungicides and/or aquatic treatments (algae/fertilizers) will be considered in the review. The literature review will discuss the importance of the chemical in irrigation water in the context of the different potential sources of the chemical. The literature review will include, when possible, a review of the transport and fate of Chemicals of Interest in the environment in the context of beneficial reuse in agriculture.

Proposed Procedure

This literature review will be guided by the approach of a Cochrane style review. This method of literature review takes a systematic approach following the steps below:

1. Define a question and agree on objective methods
2. Search for the relevant data
3. Extract the relevant data: this can include how the research was done; how it was paid for (if available, especially important with non-peer reviewed reports); and what happened
4. Assess the quality of the data based on objectives identified in (1)
5. Analyze and combine the data (if possible)

In addressing part of the first step, the question can be posed as, “*What do we know about the hazards and risk associated with the Chemicals of Interest in produced water and the potential occurrence of these Chemicals of Interest in food crops from using produced water for agricultural irrigation?*”

To address this question, the literature review will include—at a minimum—the following components:

- A review of scientific literature, including government reports and peer-reviewed technical documents concerning the use of produced water in agricultural irrigation;

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- A list of chemicals of potential concern likely to occur in produced water used for irrigation;
- A compilation of information on sources of these chemicals in the environment, including other uses in agriculture not associated with produced water reuse;
- A compilation of available information on ambient concentrations in soils, air and water;
- A compilation of available data on potential natural sources of the chemicals (e.g. chemical products synthesized by plants, mold and animals);
- A compilation of information on occurrence of these chemicals in foodstuffs, including information on normal and low-risk levels in foods;
- A compilation of available chronic oral toxicity data for each of the chemicals of potential concern, focusing, where possible, on studies relevant to human health;
- A compilation of available quantitative and/or qualitative information on the chemical's persistence and degradation in the environment;
- A compilation of available quantitative and/or qualitative information on chemical plant uptake properties, ideally for the specific food crops grown in the areas that receive irrigation water blended with oilfield produced water;
- A summary of knowledge gaps;
- An annotated citation list and/or annotated citation table that organizes the literature by subject area, finds and importance to understanding potential risks associated with produced water for agricultural irrigation.

It is expected that there may be reports and literature available on some of the Chemicals of Interests that are outside of the academic peer-reviewed literature. These may include non-peer reviewed materials from industry sources. This kind of outside research will be explicitly identified and undergo additional evaluation as to the strengths/weaknesses of the methods and conclusions that can be drawn from the results. Evaluation of these materials will be coordinated with the Water Board and their scientific advisors.

The literature review will also include a review and discussion of other uses of the Chemicals of Interest, especially concerning their use during the drilling of domestic and/or agricultural water supply wells; maintenance of water systems; their uses related to agricultural horticultural sprays (fertilizer, herbicide, fungicide, pesticide, etc.); and other land application practices that could result environmental releases. In addition, the literature review may include an evaluation of relevant epidemiological investigations, as appropriate.

Deliverables Task 2

Coordination with Task 1 activities. Interim Report identifying and listing sources of literature and references. Second Interim Report identifying and listing sources of literature and references. Draft Final Literature Review Report. Final Literature Review Report incorporating and responding to comments from Permit Holders, the Central Valley Water Board, the Food Safety Panel, and potentially other experts. Presentations or attendance, by phone or in person, at meetings organized by the Central Valley Water Board.

Timetable and Budget

Budget should not exceed \$245,000 for Task 2.

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Deliverable Task 2	Suggested Timetable
Coordination with Task 1 activities.	On-going for first six months of contract (minimum)
Short Report outlining methods for the systematic review; including selection criteria, literature evaluation methods, and analysis methods (if applicable)	Four months after approval of statement of work
Interim Report (Literature Review) identifying and listing sources of literature and references	Two months after receipt of Final list of Chemicals of Interest from Task 1
Draft Final Literature Review Report.	Four months after receipt of Final list of Chemicals of Interest from Task 1
Final Literature Review Report incorporating and responding to comments from Permit Holders, the Central Valley Water Board, the Food Safety Panel	Three months after receipt of formal reviewer comments from Permit Holders, the Central Valley Water Board, and the Food Safety Panel.
Presentation or attendance at Central Valley Water Board organized meetings	Up to one meeting per month on average over duration of project
Completion of all task deliverables	Within one year and six months of approval of statement of work

The Parties have agreed upon this Scope of Work as evidenced by the following signatures of authorized representatives of the Parties:

FOR THE CENTRAL VALLEY WATER QUALITY CONTROL BOARD

Date: _____ By: _____
Patrick Pulupa, Executive Officer

FOR North Kern Water Storage District:

Date: _____ By: _____
Richard A. Diamond, General Manager

FOR California Resources Production Corporation:

Date: _____ By: _____
Chad Jones, Vice President of Operations

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FOR Kern Tulare Water District:

Date: _____

By: _____

Steven C. Dalke, General Manager

FOR Cawelo Water District:

Date: _____

By: _____

David Ansolabehere, General Manager

FOR Chevron U.S.A. Inc.:

Date: _____

By: _____

Carla Musser, Attorney-in-Fact

FOR Jasmin Ranchos Mutual Water Company:

Date: _____

By: _____

Shae Lehr, Secretary/Treasurer

FOR Hathaway, LLC:

Date: _____

By: _____

Chad Hathaway, President/Chief Executive Officer

FOR Sherwood Hills, LLC:

Date: _____

By: _____

Jeffery Yurosek, Managing Member

FOR E & B Natural Resources Management Corporation:

Date: _____

By: _____

Frank J. Ronkese, Senior Vice President

ATTACHMENT 2

SCOPE OF WORK FOR TASK THREE

(June 2018)

Task Three: Food Crop Sampling and Analysis

Groups and Individuals identified in this task are as follows:

Permit Holders. The groups that are using or supply oilfield produced water for irrigation of crops for human consumption under Waste Discharge Requirements adopted by the Central Valley Regional Water Quality Control Board (Central Valley Water Board) or have submitted Reports of Waste Discharge to use oilfield produced water or irrigation of crops for human consumption,

Administrator. The representative of the Permit Holders.

Manager. The representative of the Central Valley Water Board.

Consultant. GSI Environmental Inc. (GSI). The party selected to do the work by the Administrator and approved by the Manager

Sampler. A third party selected to do the sampling as selected by the Administrator and approved by the Manager.

Scientific Advisor. The scientific advisor to the Central Valley Water Board and under contract to the Central Valley Water Board.

Food Safety Panel. Panel of food safety experts convened by the Central Valley Water Board.

Parties. The Permit Holders and the Central Valley Water Board.

Description and Objectives

Oil field produced water (produced water) is known to contain trace constituents from oil production processes, as documented by analytical results found in reports submitted to the Central Valley Water Board. These constituents are typically detected below primary maximum contamination levels (MCLs) for drinking water. Certain produced water from the general region of the Kern River Field and Kern Front Field is treated and then blended with agricultural water supplies and used to irrigate certain crops.

Beginning in September of 2015, samples of crops irrigated with this produced water have been analyzed for oilfield waste constituents, as compared to the same crops grown in nearby areas that have not been irrigated with produced water. This has been done to provide data to assess the safety of consuming products grown with produced water for human consumption. This food safety testing program (Food Safety Study), initially undertaken and administered voluntarily by the Cawelo Water District, and later with Central Valley Water Board oversight, has evolved with input from the Food Safety Panel and collaboration with the Central Valley Water Board and its Scientific Advisor. To date, there have been 20 different sampling events generally occurring over the past three years, analyzing the quality of almonds, carrots, citrus,

garlic, grapes, pistachios, and potatoes.

Regardless of the current oversight, the Central Valley Water Board is concerned about a potential perceived bias that could affect the objectivity of the current Food Safety Study. The Central Valley Water Board will control and operate the Food Safety Study and the Permit Holders will fund the study.

The objective of Task Three is to collect food crop samples of the same type as the 2017 Food Safety Study (if available) from both test and control fields¹, deliver the samples to an analytical laboratory, review laboratory results, and provide a written report regarding the results using the same procedures and methods as the latest round of sampling events and reports. The report will discuss, among other matters, if Chemicals of Interest identified in the attached Crop Sampling and Analysis Plans (SAP), are detected in the edible portions of food crops obtained from test fields are in concentrations significantly different from food crops that are obtained from the control fields (herein referred to as the objective of Task Three). The list of Chemicals of Interest may change as information becomes available about potential health risks and potential presence in produced water. In the event of the need to test for additional chemicals, the Manager and Administrator shall first meet and confer. Crop Sampling and Analysis Plans (SAPs) can only be modified with prior written consent as described in this Task Three. The food crop samples collected shall be analyzed for the Chemicals of Interest listed in the applicable SAP using standard industry test protocols for the particular chemical analyzed. It should be noted that the results of Task Three and associated laboratory reports will be provided to the Food Safety Panel by way of Central Valley Water Board staff.

The confidentiality of land ownership and crop testing locations are of the highest priority in the work to be performed under this Task Three, and all reasonable and best efforts shall be employed by Consultants, their employees, agents, subcontractors, and any others performing work under this Task Three to maintain such confidentiality.

Procedure

An independent third party sampler or sampling company (Sampler) with proficient experience in crop sampling will be chosen by the Permit Holders (through its Administrator), with approval by the Central Valley Water Board (through its Manager). The Sampler shall implement and be familiar with the techniques for project quality assurance and quality control. Central Valley Water Board staff will be notified two weeks prior to sampling events and will attend the event. Central Valley Water Board will coordinate sampling with the Permit Holders' Administrator, and the Sampler. The Sampler shall direct all technical issues through Central Valley Water Board staff and shall have direct communications with the Permit Holders only on administrative issues (i.e., contracting clarification, payment of invoices, etc.).

¹ Test fields are fields irrigated with produced water (blended with other supplies, or not). Control fields are fields growing similar crops as the test fields in the same general geographic area, but which are not and have not been irrigated with produced water.

An independent consultant (Consultant), with appropriate qualifications, will be selected by the Permit Holders (through its Administrator), with approval by the Central Valley Water Board (through its Manager). Pursuant to this Task Three, but under the direction of the Central Valley Water Board Manager, the Consultant will coordinate and direct this Food Safety Study and provide completed reports as described in this Task Three.

An independent analytical laboratory (lab or laboratory) with proficient experience in analyzing edible crop samples for constituents of concern will be selected by the Permit Holders (through the Administrator), with approval of the Central Valley Water Board (through the Manager).

Generally, sample collection and analysis will be conducted in the same manner as the Food Safety Study was conducted in the year 2017. Modifications to the procedures or protocols will need to be approved prior to any implementation; such approval being obtained by the Consultant, the Manager, and the Permit Holders' Administrator. Additionally, a Central Valley Water Board representative and a Permit Holders' representative are required to be present at all crop sampling events, but they shall not participate in sample collection, shall not obtain additional independent samples, shall not take or obtain any other item or matter (including soil, water, or plant material), nor shall they record the location. Any questions by the Sampler will be directed to the Consultant and the Central Valley Water Board's Manager.

Before initiating sampling activities, Sampler personnel will become familiar with an appropriate site specific health and safety plan and emergency response plan developed or approved by the Consultant. It is the responsibility of the Consultant to ensure that personnel are familiar with the plan and follow it accordingly.

Sampling Locations and Coordination

All parties will abide by all local laws and regulations. Crop samples will be acquired from private farming operations and private land. No one associated with this Task Three, including but not limited to personnel, staff, or representatives, will enter private property or collect crop samples without proper authorization from the landowner or their authorized representative (and lessee, if there is a lessee of the property). This Scope of Work for Task Three does not authorize unlawful entry onto or into property or unlawful collection, removal or transportation of property and such action immediately terminates this Scope of Work and halts all associated activities. Permission must be obtained from appropriate landowners (and lessee, if there is a lessee of the property) to enter property and collect crop samples for the purposes of implementing this Scope of Work for Task Three.

Fields from which crop samples were obtained during the year 2017 will be utilized for this Scope of Work for Task Three. Consultant shall determine the area within the field to have samples collected, provided however that the actual sample locations are not in the vicinity of

other external potential sources of contamination such as combustion engines, chemical storage facilities, or other likely sources of contamination. Any changes to sample field locations must first be approved by the Consultant, the Manager, and the Permit Holder's Administrator, and use of such other locations will be dependent on obtaining proper permissions.

Sampling locations, permissions, and collection schedules shall be coordinated with the Manager who will work with the Administrator and such coordination must be done at least 2 weeks prior to each actual sampling event, except as otherwise agreed. The Administrator does not guarantee access to private property or to crop samples, nor does the Administrator have the authority to require such access. Crops are seasonal and are not available at all times. Coordination of sample collection needs to consider seasonal availability and maturation level of the crop.

Sampling Techniques

Crop Sampling and Analysis Plans (SAPs) were developed and implemented for the prior food safety study in year 2017 and describe sampling methods and associated activities for collecting food crop samples. Crop sampling and chain of custody procedures used for this Task Three must follow the latest SAPs available for the type of crop being sampled. Any proposed alteration to the corresponding SAPs must be supported by good scientific reasoning, and must first be approved by the Consultant, the Manager, and the Administrator prior to implementation. The 2017 SAPs are attached as Exhibit A. Any written modifications to the SAP must be provided with track changes used to identify all changes.

Before sample collection, proper access permission from the landowner and lessee (if there is a lessee) is required to enter any property. No entry shall take place on any land without the landowner's (and lessee's, if there is a lessee of the property) informed consent, and no crops shall be taken without the landowner's (and lessee's, if there is a lessee of the property) informed consent. Landowners and lessees shall NOT be identified as part of any sampling event. Information regarding farmers, distributors, landowners, and/or lessees will not be shared with or disclosed to the general public, nor shall such information be disclosed to any third person.

The locality of each sample field shall be identified generally with an aerial photo. All records will be kept in a manner that does not identify property owners or lessees, nor shall it be kept or maintained in any manner that will allow identification of property ownership. Sampling locations, elevations, and sample type (Test or Control) will be recorded in a field logbook which shall remain confidential and shall not be shared with or disclosed to the general public, nor shall such information be disclosed to any third person. Photo-documentation of sampling events should be taken and provided as part of the sampling record. Electronic copies of lab notes, photographs, and other field documentation should be maintained as part of the report;

provided however, no information shall be provided to the extent that it could be used to determine the specific location or property ownership of test crop locations, or the lessees/tenants of such locations.

Quality Control

Field duplicate samples will be collected for quality control and as described in the SAP.

Sample Transfer

Emphasis must be placed on careful documentation of sample collection, sample packaging, and sample transfer. Samples will be hand-delivered to the laboratories within 24 hours of sample collection or shipped by 24-hour air courier (e.g., Federal Express) following all Department of Transportation (DOT) regulations. Sample custody shall be maintained by a chain of custody record. The chain of custody record will be completed by the individual collecting the sample. When transferring possession of the samples, the individual relinquishing and receiving the samples will sign, date, and note the time on the chain of custody record.

The relinquishing individual will record specific shipping data on the original and duplicate chain of custody forms. If samples are sent by mail, the package will be sent by registered mail with a return receipt requested. If samples are sent by common carrier, a bill of lading will be retained as part of the permanent documentation. The relinquishing individual will retain a copy of the chain of custody record.

Constituent Analysis

The analysis shall be completed by a laboratory certified by the State of California's Environmental Laboratory Accreditation Program (ELAP). The chosen laboratory must have experience in analyzing food products. Samples will be sealed at the sampling locations and all chain of custody procedures will be followed.

Samples shall be labeled in a manner that does not identify to the analytical laboratory which samples are Test and which samples are Control. Samples should be peeled or shelled by the analytical laboratory so that only the edible portion of the food crop is analyzed. The analytical laboratory shall use best management practices to avoid any cross-contamination.

Samples shall be analyzed for all of the chemicals as referenced in the applicable SAPs for which certified analyses are available. If there are Chemicals of Interest for which there are no certified analytical methods for food crops (or a specific crop) available, research laboratories can be retained for the desired analysis, as approved by the Manager and concurred with by the Administrator prior to implementation.

Laboratory analytical reports are to include all laboratory analyses including quality assurance/quality control (QA/QC) data. All analytical data are to be provided electronically in a

format compatible with Excel or other software acceptable to the Manager. Laboratory data are to be available within 21 days of receipt by the samples by the laboratory.

SAP Deviations

As conditions may vary, it may become necessary to implement minor deviations from the SAP. Field personnel will notify the Manager when deviations from the SAP are necessary. Verbal approvals from the Manager shall be obtained regarding the deviations after the Manager obtains concurrence from the Administrator. The Manager will inform the Administrator of the need to implement the deviation and fiscal impacts of the deviation are to be approved by the Administrator prior to implementation. Deviations from the SAP will be fully documented in the field logbook and in the reports. It is the responsibility of the Consultant and Sampler to keep a written record of SAP deviations and approvals.

Data Compilation and Electronic Data Delivery

All analytical results received from the lab will be provided to the Consultant and the Manager simultaneously. Once analytical results are received, the Manager will forward analytical results to the Administrator. Once analytical results have been received from the laboratory, the Consultant will compile the data in an electronic format (Excel spreadsheet or equivalent) and distribute the data to the Central Valley Board's Manager, together with electronic copies (e.g. PDF, JPG, etc.) of all field notes, analytical reports, photographs, and any other associated relevant materials, provided however, no information shall be provided to the extent that it could be used to determine the specific location and/or property ownership of test crop locations and/or the lessee/tenants of such locations. The Manager will forward this additional information to the Administrator following receipt.

Data Analysis and Sampling Reports

The Consultant will prepare reports describing sampling events, a discussion on results, and the relative safety of the test samples as compared to the control samples, including whether there is a significant difference between food crops grown with produced water and food crops grown without produced water. The reports will include a complete set of data using appropriate statistical analysis to determine if a significant difference occurs between the Test and Control samples. The Consultant shall document the reasons for using any statistical methods. Draft reports will be submitted to the Central Valley Water Board Manager for review and comment. Following receipt of such draft report(s), the Manager will provide a copy of the draft report to the Administrator for review and comment. The Administrator will send all comments to the Manager and the Manager will include comments, as appropriate, in comments from the Manager to the Consultant. Final reports shall be submitted to the Central Valley Water Board Manager and the Permit Holder Administrator.

The final report must include:

- The sampling logbook (original or copies);

- A general description of sampling activities;
- Sample location maps and/or aerial photos showing general sample locations (that do not allow individual specific location or ownership determination);
- Photos from sampling events (that do not allow individual specific location or ownership determination);
- Laboratory reports including QA/QC data and chain of custody forms (original or copies);
- Tables showing analytical results and comparisons between test and control samples;
- A discussion of the statistical analysis and why a specific analysis was chosen;
- Results of any statistical analysis of the data;
- If a Chemical of Interest is detected in test samples in concentrations significantly higher than control samples, a determination of whether or not the Chemical of Interest has been detected in previous water monitoring reports submitted to the Central Valley Water Board, and whether such Chemical of Interest was detected in water monitoring reports and whether those detected concentrations exceed Maximum Contaminant Levels for drinking water;
- If a Chemical of Interest is detected in test samples in concentrations significantly higher than control samples, a determination of whether or not the Chemical of Interest is naturally occurring or has been utilized for construction, maintenance, or operations of municipal/industrial/drinking/agricultural water wells;
- If a Chemical of Interest is detected in test samples in concentrations significantly higher than control samples, a determination of whether or not the Chemical of Interest is identified in the County of Kern Agricultural and Measurement Standards Department's Agricultural Materials MSDS Reference materials as an applied chemical.
- An interpretation and discussion of the results, as they relate to the objective of Task Three; and
- If a Chemical of Interest is detected in test samples in concentrations significantly higher than control samples, a determination of the safety of the test samples, as compared to the control samples and other typical consumer food products.

Deliverables

After each sampling event, the Consultant shall submit the data and final reports (as described above) to the Central Valley Water Board, addressed to the Manager. The Consultant will provide the draft report no later than 90 days from the time the last sampling event laboratory report was provided to the Consultant. The Manager, in consultation with the Scientific Advisor and the Food Safety Panel, will review and comment on the draft report. Upon receipt

of such draft report(s), the Manager will provide a copy of the draft report to the Administrator for review and comment. The Manager and Administrator shall use their best efforts to make such review and provide comments within 60 days of receipt. Appropriate comments from the Administrator will be included in comments from the Manager and provided to the Consultant. The final report is to address comments from the Manager and provided to the Manager within 60 days from receipt of written comments. The Manager will share the reports with the Administrator. All comments regarding the technical contents of the report are to be directed to the Manager and the Manager will provide them to the Consultant as appropriate. The Administrator will not submit comments directly to the Consultant. Report findings may also be conveyed to the general public in a presentation given during a public meeting.

Task Dates and Termination

This Scope of Work, described as Task Three, is only effective for and applies to crops sampled during the 2018 calendar year. The last and final report is due 60 days after receiving comments from the Manager. No additional crop samples will be collected beyond 31 December 2018.

The parties to this agreement for Task Three (Consultant and Permit Holders (through its Administrator)) have the authorization to terminate this Scope of Work under this Task Three at any time for any reason, upon a 30-day written notice to all remaining parties.

Cost

The cost of Task Three shall not exceed two hundred thousand dollars (\$200,000.00). Any additional costs shall be approved by the Permit Holders' Administrator prior to implementation.

The Parties have agreed upon this Scope of Work as evidenced by the following signatures of authorized representatives of the Parties:

FOR THE CENTRAL VALLEY WATER QUALITY CONTROL BOARD

Date: _____ By: _____
Patrick Pulupa, Executive Officer

FOR North Kern Water Storage District:

Date: _____ By: _____
Richard A. Diamond, General Manager

FOR California Resources Production Corporation:

Date: _____ By: _____
Chad Jones, Vice President of Operations

FOR Kern Tulare Water District:

Date: _____ By: _____
Steven C. Dalke, General Manager

FOR Cawelo Water District:

Date: _____ By: _____
David Ansolabehere, General Manager

FOR Chevron U.S.A. Inc.:

Date: _____ By: _____
Carla Musser, Attorney-in-Fact

FOR Jasmin Ranchos Mutual Water Company:

Date: _____

By: _____
Shae Lehr, Secretary/Treasurer

FOR Hathaway, LLC:

Date: _____

By: _____
Chad Hathaway, President/Chief Executive Officer

FOR Sherwood Hills, LLC:

Date: _____

By: _____
Jeffery Yurosek, Managing Member