STATE OF CALIFORNIA
STANDARD AGREEMENT
STD 213 (Rev 05/18)

UC Davis Agreement # A43008

AGREEMENT NUMBER
18-C0043
REGISTRATION NUMBER

1. This Agreement is entered into between the State Agency and the Contractor named below:

STATE AGENCY'S NAME
Department of Pesticide regulation, hereinafter referred to as "State"

CONTRACTOR'S NAME
The Regents of the University of California Davis, hereinafter referred to as "University"

2. The term of this Agreement is: October 22, 2018 through March 31, 2020

3. The maximum amount of this Agreement is: $ 29,920.00

4. The Parties agree to comply with the terms and conditions of the following Exhibits, which by this reference are made a part of the Agreement.

Exhibit A – A7: A–Scope of Work; A1–Deliverables; A2–Key Personnel; A3–Authorized Representatives; A4–Use of Intellectual Property; A5–Resumes/Biosketch; A6–Current & Pending Support; — 15 page(s)

Exhibit B – B–Budget; B1–Budget Justification; B2– Subawardee Budgets (if applicable); B3–Invoice Elements — 3 page(s)

Exhibit C* – University Terms and Conditions — UTC-518

Check mark additional Exhibits below, and attach applicable Exhibits or provide internet link:

- ☐ **Exhibit D** – Additional Requirements Associated with Funding Sources — page(s)
- ☐ **Exhibit E** – Special Conditions for Security of Confidential Information — page(s)
- ☐ **Exhibit F** – Access to State Facilities or Computing Resources — page(s)
- ☒ **Exhibit G** – Negotiated Alternate UTC Terms — 1 page(s)

Items shown with an Asterisk (*) are hereby incorporated by reference and made part of this agreement as if attached hereto.

These documents can be viewed at http://www.dgs.ca.gov/ols/Resources/ModelContractLanguageUniversities.aspx.

IN WITNESS WHEREOF, this Agreement has been executed by the Parties hereto.

CONTRACTOR

CONTRACTOR'S NAME *(if other than an individual, state whether a corporation, partnership, etc.)*
The Regents of the University of California, Davis

BY *(Authorized Signature)* — DATE SIGNED *(Do not type)*: November 9, 2018

PRINTED NAME AND TITLE OF PERSON SIGNING
Steven Kobayashi, Associate Director, Procurement & Contracting Services, UC Davis

ADDRESS
260 Cousteau Place, Ste 150 Davis, CA 95616

STATE OF CALIFORNIA

AGENCY NAME
Department of Pesticide Regulation

BY *(Authorized Signature)* — DATE SIGNED *(Do not type)*: 11.19.18

PRINTED NAME AND TITLE OF PERSON SIGNING
Samantha Wyatt, Business Services Manager

ADDRESS
1001 I Street, Sacramento, CA 95814

California Department of General Services Use Only

☒ Exempt per:
Delegation Letter 74.6

Exhibit A – Scope of Work

Project Summary & Scope of Work

☒ Contract ☐ Grant

PI Name: Ronald Tjeerdema

Project Title: An integrated vegetated treatment system for mitigating imidacloprid and permethrin in agriculture irrigation runoff.

Project Summary/Abstract

Briefly describe the long-term objectives for achieving the stated goals of the project.

The main objective of this project is to utilize an integrated vegetative treatment system (sedimentation, vegetation, and GAC) to reduce imidacloprid and permethrin loading in agricultural run-off.

If Third-Party Confidential Information is to be provided by the State:

☐ Performance of the Scope of Work is anticipated to involve use of third-party Confidential Information and is subject to the terms of this Agreement; ***OR***

☐ A separate CNDA between the University and third-party is required by the third-party and is incorporated in this Agreement as Exhibit A7, Third Party Confidential Information.

Scope of Work

Growers rely on applications of pyrethroid and neonicotinoid pesticides for the control of an array of insect pests in leafy greens. Concerns about the off-site movement of these chemicals in irrigation runoff and impacts to water quality may lead to stricter governmental regulations or the eventual loss of registration of these pesticides for leafy green production. Effective on-farm management practices are needed to eliminate aquatic toxicity of pyrethroid and neonicotinoid pesticides in irrigation run-off.

1. Background

Research has demonstrated that integrated vegetative treatment systems (VTS) reduce pesticide loads and associated toxicity in agriculture tailwater runoff. Sedimentation ponds integrated in sequence with vegetated ditches within a VTS can reduce pyrethroid pesticides up to 100% (Anderson et al., 2011), and the addition of compost and granulated activated carbon (GAC) to a grass-lined ditch has been shown to reduce the load of the organophosphate pesticide chlorpyrifos by up to 98% (Phillips et al., 2017). Integrated systems have also been shown to reduce pesticide-associated toxicity to invertebrates in irrigation runoff. While these systems are effective at reducing organophosphate and pyrethroid pesticides, they have not

been evaluated for treating more soluble insecticides, such as the neonicotinoid imidacloprid. Imidacloprid is used in conjunction with pyrethroids on most lettuce crops in the Salinas Valley, and has recently been detected in irrigation runoff in the central coast region.
Because neonicotinoids are water soluble, they can be transported from application sites via surface water runoff and groundwater (Bonmatin et al., 2015). Neonicotinoids are systemic pesticides, so some portion of the applied active ingredient is taken up by the plant (Sevigne-Itoiz et al., 2012; Stamm et al., 2016), and some portion will remain in the soil, where it will be broken down (Zhang et al., 2018). Plant uptake and soil degradation of imidacloprid are fairly well studied. To adequately study these topics further is beyond the scope and budget of this study. Therefore, the focus of the current study is to mitigate imidacloprid, and the pyrethroid permethrin, in surface runoff.

2. Objectives

The goal of this project is to evaluate the efficacy of using an integrated vegetated treatment system to mitigate chemical loading and related toxicity of imidacloprid and the pyrethroid permethrin. The VTS will incorporate a sediment ponding area to remove coarse particulates, a grass-lined ditch with compost swales to remove suspended sediment and insecticides, and a final treatment using GAC to remove residual chemicals not eliminated by the previous steps. Trials will proceed over two field seasons. In Year 1, the VTS will be evaluated using simulated irrigation events that contain spiked concentrations of imidacloprid and permethrin. In Year 2 the effectiveness of the VTS will be evaluated using multiple runoff events from insecticide-treated lettuce grown adjacent to the system. Results of the trials will be extended to growers and industry clientele in a final technical report, field demonstrations, conference presentations and a peer-review journal article during Year 3.

The main objective of this project is to utilize an integrated VTS (sedimentation, vegetation, and GAC) to reduce imidacloprid and permethrin loading in agricultural run-off. Specific objectives are:

1) Objective 1. *Evaluate the efficacy of the system using simulated runoff.* The integrated VTS to be evaluated is located at the USDA-ARS Spence Research Farm, in Salinas CA. Trials will be conducted using simulated run-off spiked with imidacloprid and permethrin at concentrations typically found in agricultural runoff from coastal vegetable fields.

The effectiveness of the VTS will be evaluated by creating simulated irrigation events, and collecting and analyzing water samples at various points in the system. Year 1 irrigation events will be simulated using well water containing the insecticides and suspended particles using a spiking system similar to the experimental design used by Phillips et al. (2017). During each simulated irrigation event water samples will be collected at the inlet and outlet of the sedimentation trap, along the vegetated ditch, and at the output of the system (post-GAC treatment). These samples will be analyzed for the spiked insecticides and tested for toxicity to relevant invertebrate test organisms (the amphipod *Hyalella azteca* and the midge *Chironomus dilutus*). Trials will be replicated five times at a flow rate representative of those measured in field irrigation runoff (50 gallons/minute).

Year 1 experiments will be used to calibrate a model based on the Vegetated Filter Strip Modeling System (VFSMOD). This model will be used to predict the efficacy of the Year 2 experiments, and also be used to predict efficacy under other field conditions.

2) Objective 2. *Evaluate the efficacy of the treatment system with runoff from a lettuce crop.* During the second year of the project, the efficacy of the system will be re-evaluated using multiple irrigation runoff events from a lettuce crop grown adjacent to the VTS.

The effectiveness of the VTS will be further evaluated using irrigation runoff from a lettuce crop grown adjacent to the system. The crop will undergo conventional insecticide applications and standard irrigation events. Runoff water from these events will be directed into the integrated VTS. Three runoff events will be evaluated for chemical concentrations and toxicity as described above.

3) Objective 3. *Extend results.* Results will be communicated through a technical report, extension materials that summarize the key findings of the project, field demonstrations, conference presentations, and a peer-reviewed journal article. The technical report will provide thorough cost estimates for design and construction of the VTS, including the purchase and disposal of the GAC. University will present results of trials during the end of the second year of the project.

3. Tasks

Year 1 - Test performance of integrated VTS (sedimentation, vegetation, compost, and carbon) with two insecticides.
Irrigation - Water source will be well water spiked with suspended sediment, imidacloprid and permethrin. **Events** - Conduct five simulated irrigation trials at 50 gallons/minute. **Samples** - Analyze and test input sample and post-sedimentation, post-compost, and post-carbon samples. **Analyses** - Measure chemical concentration and toxicity to *Hyalella azteca* and *Chironomus dilutus*. **Hydrology** - Inflow and outflow will be metered to determine infiltration and total volume treated.
Year 2 - Test performance of integrated VTS (sedimentation, vegetation, compost, and carbon) using runoff from leafy green crop treated with two insecticides.
Irrigation - Water source will be runoff from lettuce crop. **Events** - Monitor three irrigation events during the crop cycle. **Samples** - Analyze and test input sample and post-sedimentation, post-compost, and post-carbon samples. **Analyses** - Measure chemical concentration and toxicity to *Hyalella azteca* and *Chironomus dilutus*. **Hydrology** - Inflow and outflow will be metered to determine infiltration and total volume treated.

Exhibit A1 - Deliverables

SCHEDULE OF DELIVERABLES

List all items that will be delivered to the State under the proposed Scope of Work. Include all reports, including draft reports for State review, and any other Deliverables, if requested by the State and agreed to by the Parties.

If use of any Deliverable is restricted or is anticipated to contain preexisting Intellectual Property with any restricted use, it will be clearly identified in Exhibit A4, Use of Preexisting Intellectual Property.

Unless otherwise directed by the State, the University Principal Investigator shall submit all Deliverables to the State Contract Project Manager, identified in Exhibit A3, Authorized Representatives.

Deliverable	Description	Due Date
Progress Report 1	Progress report for project activity between start of contract and October 2018	December 31, 2018
Year 1 Report	Report for project activity during first year	March 31, 2019
Progress Report 2	Progress report for project activity between March 31, 2018 and October 31, 2019	October 31, 2019
Final Report	Final Project Report	March 31, 2020
The following Deliverables are subject to Section 19. Copyrights, paragraph B of Exhibit C		

Exhibit A2 – Key Personnel

KEY PERSONNEL

List Key Personnel as defined in the Agreement starting with the PI, by last name, first name followed by Co-PIs. Then list all other Key Personnel in alphabetical order by last name. For each individual listed include his/her name, institutional affiliation, and role on the proposed project. Use additional consecutively numbered pages as necessary.

Last Name, First Name	Institutional Affiliation	Role on Project
PI:		
Tjeerdema, Ronald	*University of California, Davis*	*PI*
Co-PI(s) – if applicable:		
Phillips, Bryn	*University of California, Davis Granite Canyon Laboratory*	*Project Lead*
Last name, First name	*Institutional affiliation*	*Role on the project*
Other Key Personnel (if applicable):		
Last name, First name	*Institutional affiliation*	*Role on the project*
Last name, First name	*Institutional affiliation*	*Role on the project*

Exhibit A3 – Authorized Representatives

AUTHORIZED REPRESENTATIVES AND NOTICES

The following individuals are the authorized representatives for the State and the University under this Agreement. Any official Notices issued under the terms of this Agreement shall be addressed to the Authorized Official identified below, unless otherwise identified in the Agreement.

<table>
<tr><th>State Agency Contacts
Agency Name: Department of Pesticide Regulation</th><th>University Contacts
University Name: The Regents of the University of California Davis</th></tr>
<tr><td>Contract Project Manager (Technical)

Name: Xuyang Zhang
Sr. Environmental Scientist (Specialist)
Address: Environmental Monitoring Branch
1001 I street
Sacramento, CA,95812
Telephone: 650-493-1082
Fax:
Email: xuyang.zhang@cdpr.ca.gov</td><td>Principal Investigator

Name: Ronald Tjeerdema, Associate Dean
Address: Environmental Sciences
UC Davis, One Shields Avenue
Davis, CA 95616
Telephone: (530) 752-6730
Fax:
Email: rstjeerdema@ucdavis.edu

Designees to certify invoices under Section 14 of Exhibit C on behalf of PI:
1. Katie Siegler, Associate Specialist, csiegler@ucdavis.edu
2. Bryn Phillips, Specialist, bmphillips@ucdavis.edu</td></tr>
<tr><td>Authorized Official (contract officer)

Name: Samantha Wyatt
Business Services Office Manager
Address: Department of Pesticide Regulation
1001 I Street, 4th Floor
Sacramento, CA. 95814

Send notices to (if different):

Name: Kim Bateman
Contract Analyst
Address: Department of Pesticide Regulation
1001 I Street, MS 4-A
Sacramento, CA. 95814
Telephone: 916-445-2512
Email: kim.bateman@cdpr.ca.gov</td><td>Authorized Official

Name: Steven Kobayashi
Associate Director
Address: Accounting and Financial Services, Contracting
260 Cousteau Place, Ste 150
Davis, CA 95616</td></tr>
</table>

Administrative Contact Name: Kim Bateman Contract Analyst Address: Department of Pesticide Regulation 1001 I Street, MS 4-A Sacramento, CA. 95814 Telephone: 916-445-2512 Email: kim.bateman@cdpr.ca.gov	***Administrative Contact*** Name: Yevgeniy Gnedash Fiscal Officer Address: Metro Cluster, Environmental Toxicology 1089 Academic Surge, UC Davis Davis, CA 95616 Telephone: (530) 752-4513 Fax: Email: yggnedash@ucdavis.edu
Financial Contact/Accounting Name: Department of Pesticide Regulation Accounts Payable Address: Department of Pesticide Regulation Accounts Payable P.O. Box 4015 Sacramento, CA 95812-4015 Telephone: (916) 445-4149 Email: Accounts_Payable@cdpr.ca.gov	***Authorized Financial Contact/Invoicing*** Name: Kelly Gilmore Associate Director Address: Accounting and Financial Services, Contracting 260 Cousteau Place, Ste 150 Davis, CA 95616 Telephone: (530) 754-1374 Fax: Email: kngilmore@ucdavis.edu Payment Address: Cashier's Office University of California Davis P.O. Box 989062 West Sacramento, CA. 95798-9062

Exhibit A4 – Use of Intellectual Property

USE OF INTELLECTUAL PROPERTY

If either Party will be using any third-party or pre-existing intellectual property (including, but not limited to data, copyrighted works, known patents, trademarks, service marks and trade secrets) "IP" with restrictions on use, then list all such IP and the nature of the restriction below. If no third-party or pre-existing IP will be used, check "none" in this section.

A. State: Preexisting IP to be provided to the University from the State or a third party for use in the performance in the Scope of Work.

☒ None or ☐ List:

Owner (Name of State Agency or 3rd Party)	Description	Nature of restriction:

B. University: Restrictions in Preexisting IP included in Deliverables identified in Exhibit A1, Deliverables.

☒ None or ☐ List:

Owner (Name of University or 3rd Party)	Description	Nature of restriction:

C. Anticipated restrictions on use of Project Data.

If the University PI anticipates that any of the Project Data generated during the performance of the Scope of Work will have a restriction on use (such as subject identifying information in a data set) then list all such anticipated restrictions below. If there are no restrictions anticipated in the Project Data, then check "None" in this section.

☒ None or ☐ List:

Owner (University or 3rd Party)	Description	Nature of Restriction:

Exhibit A5 - RÉSUMÉ/BIOSKETCH

RÉSUMÉ/BIOSKETCH

Attach 2-3 page Resume/Biosketch for the PI and other Key Personnel listed in Exhibit A2, Key Personnel.

Cumulative Bio-Bibliography
University of California, Davis
February 6, 2018

Ronald Scott Tjeerdema

Professor of Environmental Toxicology

Home Address: 310 Country Club Lane
Napa, CA 94558
(707) 224-6597
Phone: (530) 754-5192
Fax: (530) 752-3394
Email: rstjeerdema@ucdavis.edu

EDUCATION

1987	PhD	Pharmacology & Toxicology, University of California, Davis
1983	MA	Pharmacology & Toxicology, University of California, Santa Barbara
1980	BS	Wildlife Management, Humboldt State University, Arcata, CA
1980	BS	Natural Resource Planning & Interpretation, Humboldt State University, Arcata, CA

ACADEMIC EXPERIENCE

2017–present	Distinguished Professor, Department of Environmental Toxicology, College of Agricultural & Environmental Sciences, UC Davis
2014–present	Associate Dean of Environmental Sciences, College of Agricultural & Environmental Sciences, UC Davis
2014–present	Affiliate, Coastal & Marine Science Institute, UC Davis
2011–2015	Director, USDA IR-4 Minor-Use Pesticide Project, Western Region, UC Davis
2007–present	Affiliate, John Muir Institute of the Environment, UC Davis
2003–2014	Chair, Department of Environmental Toxicology, College of Agricultural & Environmental Sciences, UC Davis
1999–2017	Professor, Department of Environmental Toxicology, College of Agricultural & Environmental Sciences, UC Davis
1999–present	Environmental Chemist, Agricultural Experiment Station, College of Agricultural & Environmental Sciences, UC Davis
1999–present	Affiliate, Graduate Groups in Agricultural & Environmental Chemistry, Pharmacology & Toxicology, Forensic Science and Ecology, UC Davis
1998–1999	Professor, Department of Chemistry & Biochemistry, and Fellow, Crown College, UC Santa Cruz
1994–1998	Associate Professor, Department of Chemistry & Biochemistry, and Fellow, Crown College, UC Santa Cruz
1994–1999	Affiliate, Biochemistry & Molecular Biology Program, UC Santa Cruz
1992–1999	Affiliate, Departments of Biology, Environmental Studies, and Ocean Sciences, UC Santa Cruz
1992–1999	Affiliate, Institute of Marine Sciences, UC Santa Cruz
1992–1994	Assistant Professor, Department of Chemistry & Biochemistry, and Fellow, Crown College, UC Santa Cruz
1987–1992	Lecturer and Assistant Research Toxicologist (research faculty), Department of Ocean Sciences and Institute of Marine Sciences, UC Santa Cruz

1983–1987 NIEHS Predoctoral Fellow, Graduate Group in Pharmacology & Toxicology and Department of Environmental Toxicology, UC Davis
1982 Visitation, Scripps Institution of Oceanography, UC San Diego
1981 Visitation, Department of Pharmacology & Toxicology, University of Arizona
1980–1983 Graduate Research Assistant, Pharmacology Research & Teaching Program, UC Santa Barbara

PROFESSIONAL CERTIFICATION

1994–present Diplomate in General Toxicology, American Board of Toxicology (DABT)

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Society of Toxicology (SOT; Mechanisms Section)
Society of Environmental Toxicology & Chemistry (SETAC)
American Chemical Society (ACS; Agrochemicals Division)
American Society of Pharmacology and Experimental Therapeutics (ASPET)

SELECTED PUBLICATIONS (of 240)

Tjeerdema, R. S., R. J. Kauten and D. G. Crosby, 1991. Interactive effects of pentachlorophenol and hypoxia in the abalone (*Haliotis rufescens*) as measured by in vivo ^{31}P NMR spectroscopy. *Aquat. Toxicol.* 21, 279–294.

Tjeerdema, R. S., R. J. Kauten and D. G. Crosby, 1991. Sublethal effects of hypoxia in the abalone (*Haliotis rufescens*) as measured by in vivo ^{31}P NMR spectroscopy. *Comp. Biochem. Physiol.* 100B, 653–659.

Tjeerdema, R. S. and D. G. Crosby, 1992. Disposition and biotransformation of pentachlorophenol in the red abalone (*Haliotis rufescens*). *Xenobiotica* 22, 681–690.

Singer, M. M., S. George, D. Benner, S. Jacobson, **R. S. Tjeerdema** and M. L. Sowby, 1993. Comparative toxicity of two oil dispersants to the early life stages of two marine species. *Environ. Toxicol. Chem.* 12, 1855–1863.

Tjeerdema, R. S., R. J. Kauten and D. G. Crosby, 1993. Interactive effects of pentachlorophenol and temperature in the abalone (*Haliotis rufescens*) as measured by in vivo ^{31}P NMR spectroscopy. *Aquat. Toxicol.* 26, 117–132.

Shofer, S. L., J. A. Willis and **R. S. Tjeerdema,** 1996. Sublethal effects of pentachlorophenol and hypoxia on rates of arginine kinase flux in red abalone (*Haliotis rufescens*) as measured by ^{31}P magnetization saturation transfer NMR. *Mar. Environ. Res.* 42, 363–367.

Tjeerdema, R. S., W. S. Smith, L. B. Martello, R. J. Kauten and D. G. Crosby, 1996. Interactions of chemical and natural stresses in the abalone (*Haliotis rufescens*) as measured by surface-probe localized ^{31}P NMR. *Mar. Environ. Res.* 42, 369–374.

Shofer, S. L., J. A. Willis and **R. S. Tjeerdema,** 1997. Effects of hypoxia and toxicant exposure on arginine kinase function as measured by ^{31}P-NMR magnetization transfer in living abalone. *Comp. Biochem. Physiol.* 117C, 283–289.

Martello, L. B., **R. S. Tjeerdema,** W. S. Smith, R. J. Kauten and D. G. Crosby, 1998. Influence of salinity on the actions of pentachlorophenol in *Haliotis* as measured by in vivo ^{31}P NMR spectroscopy. *Aquat. Toxicol.* 41, 229–250.

Martello, L. B., C. Friedman and **R. S. Tjeerdema,** 2000. Combined effects of pentachlorophenol and salinity stress on phagocytic and chemotactic function in two species of abalone. *Aquat. Toxicol.* 49, 213–225.

Viant, M. R., J. H. Walton, P. L. TenBrook and **R. S. Tjeerdema,** 2002. Sublethal actions of copper in abalone (*Haliotis rufescens*) as characterized by in vivo ^{31}P-NMR. *Aquat. Toxicol.* 57, 139–151.

Shofer, S. L. and **R. S. Tjeerdema,** 2002. Sublethal actions of pentachlorophenol in abalone (*Haliotis rufescens*) veliger larvae as measured by ^{31}P NMR. *Ecotoxicol. Environ. Saf.* 51, 155–160.

TenBrook, P. L., S. M. Kendall and **R. S. Tjeerdema,** 2003. Toxicokinetics and biotransformation of *p*-nitrophenol in the red abalone (*Haliotis rufescens*). *Aquat. Toxicol.* 62, 329–336.

Schmelzer, K. R., C. S. Johnson, P. L. TenBrook, M. R. Viant, J. F. Williams and **R. S. Tjeerdema,** 2005. Influence of organic carbon on the reductive dechlorination of thiobencarb (Bolero) in California rice field soils. *Pest Manage. Sci.* 61, 68–74.

Mielbrecht, E. E., M. F. Wolfe, **R. S. Tjeerdema** and M. L. Sowby, 2005. Influence of a dispersant on the bioaccumulation of phenanthrene by topsmelt (*Atherinops affinis*). *Ecotoxicol. Environ. Saf.* 61, 44–52.

Braid, B. A., J. D. Moore, T. T. Robbins, R. P. Hedrick, **R. S. Tjeerdema,** and C. S. Friedman, 2005. Health and survival of red abalone, *Haliotis rufescens,* under varying temperature, food supply, and exposure to the agent of withering syndrome. *J. Invert. Pathol.* 89, 219–231.

Rosenblum, E. S., M. R. Viant, B. M. Braid, J. D. Moore, C. S. Friedman and **R. S. Tjeerdema,** 2005. Investigating the effects of pathogen, elevated temperature and starvation on the metabolic profiles of California red abalone, *Haliotis rufescens. Metabolomics* 1, 199–209.

Rosenblum, E. S., M. R. Viant and **R. S. Tjeerdema,** 2006. Effects of the local environment on host-pathogen-drug interactions in red abalone determined by ^{1}H NMR metabolomics. *Environ. Sci. Technol.* 40, 7077–7084.

Rosenblum, E. S., T. T, Robbins, B. B. Scott, S. Nelson, C. Juhasz, A. L. Craigmill, **R. S. Tjeerdema,** J. D. Moore and C. S. Friedman, 2008. Efficacy, tissue distribution, and residue depletion of oxytetracycline in WS-RLP infected California red abalone *Haliotis rufescens. Aquaculture* 277, 138–148.

TenBrook, P. L., A. J. Palumbo, T. L. Fojut, P. Hann, J. Karkoski and **R. S. Tjeerdema,** 2010. The University of California – Davis methodology for deriving aqatic life pesticide water quality criteria. *Rev. Environ. Contam. Toxicol.* 209, 1–155.

Mulligan, R. A., P. L. Tomco, M. Howard, T. Howard, D. Stewart, S. Phillip, D. Ball and **R. S. Tjeerdema,** 2016. Aerobic versus anaerobic microbial degradation of clothianidin under simulated California rice field conditions. *J. Agric. Food Chem.* 64, 7059–7067.

CURRICULUM VITAE - Bryn M. Phillips

Specialist - Marine Pollution Studies Laboratory
Department of Environmental Toxicology - University of California Davis
34500 Highway One, Monterey, CA 93940
bmphillips@ucdavis.edu

Education

1989 B.S. Zoological Sciences, California State University, Long Beach
1995 M.S. Marine Sciences, San Jose State University, Moss Landing Marine Laboratories

Current Position

Assist in designing and conducting research projects to assess ambient water and sediment quality in marine, estuarine, and freshwater environments. Identify sources and causes of toxicity through watershed assessments and toxicity identification evaluations. Integrate and interpret synoptic data from chemical and toxicological analyses conducted at cooperating laboratories. Develop toxicity assessment techniques. Evaluate acute and chronic effects of pollutants. Coordinate and conduct aquatic and sediment toxicity tests and research projects, manage data, and administer quality control.

Applicable Research Experience

Research the efficacy of vegetated treatment systems and constructed wetlands for reducing toxicity associated with pesticide runoff. Grant research for the State Water Resources Control Board and the Central Coast Regional Water Quality Control Board.

Monitoring studies of pesticide runoff associated with ambient toxicity in the Salinas River and associated drainages. Grant research for California State Water Resources Control Board.

Selected Peer-Reviewed Publications

Hunt JW, Anderson BS, **Phillips BM**, de Vlaming V. 1999. Patterns of aquatic toxicity in an agriculturally dominated coastal watershed of California. *Agricul. Ecosyst. Environ.* 75: 75-91.

Hunt JW, Anderson BS, **BM Phillips**, Nicely PA, Tjeerdema RS, Puckett HM, Stephenson M, Worcester K, de Vlaming V. 2003. Ambient toxicity due to chlorpyrifos and diazinon in a central California coastal watershed. *Environ Monitor Assess* 82: 83-112.

Anderson BS, Hunt JW, **Phillips BM**, Nicely PA, de Vlaming V, Connor V, Richard N, Tjeerdema R. 2003. Ecotoxicologic impacts of agriculture drainwater in the Salinas River (California, USA). *Environ Toxicol Chem* 22: 2375-2384.

Phillips BM, Anderson BS, Hunt JW, Nicely PA, Kosaka RA, Tjeerdema R. 2004. In situ water and sediment toxicity in an agricultural watershed. *Environ Toxicol Chem* 23: 435-442.

Anderson BS, **Phillips BM**, Hunt JW, Huntley SA, Worcester K, Richard N, Tjeerdema RS. 2004. Evidence of pesticide impacts in the Santa Maria River watershed (California, USA). *Environ Toxicol Chem* 25: 1160-1170.

Wheelock C, Miller JL, Miller MJ, Phillips BM, Huntley SA, Gee SJ, Tjeerdema RS, Hammock BD. 2005. Use of carboxylesterase activity to remove pyrethroid-associated toxicity to Ceriodaphnia dubia and Hyalella azteca in toxicity identification evaluations (TIEs). *Environ Toxicol Chem* 25: 973-984.

Anderson BA, **Phillips BM**, Hunt JW, Connor V, Richard N, Tjeerdema RS. Dose Response Identifying primary stressors impacting macroinvertebrates in the Salinas River (California, USA): relative effects of pesticides and suspended particles. 2006. *Environ Poll* 141: 402-408.

Hunt JW, Anderson BS, **Phillips BM**, Tjeerdema RS, Richard N, Connor V, Worcester K, Angelo M, Bern A, Fulfrost B, Mulvaney D. 2006. Spatial relationships between water quality and pesticide applications in agricultural watersheds. *Environ Monit Assess*

Phillips BM, Anderson BS, Hunt JW, Huntley SA, Tjeerdema RS, Richard N, Worcester K. Solid-phase Sediment Toxicity Identification Evaluation in an Agricultural Stream. 2006. *Environ Toxicol Chem* 25: 1671-1676.

Phillips BM, Anderson BS, Hunt JW, Tjeerdema RS, Carpio-Obeso M, Connor V. 2007. Causes of Water Column Toxicity to *Hyalella azteca* in the New River, California (USA). *Environ Toxicol Chem* 26: 1074-1079.

Anderson BS, **Phillips BM**, Hunt JW, Voorhees J, Clark S, Tjeerdema RS. 2008. Recent advances in sediment toxicity identification evaluation methods emphasizing pyrethroid pesticides. In: Gan J-G, Hendley P, Spurlock F, Weston D. (eds), Synthetic Pyrethroids: Occurrence and Behavior in Aquatic Environments. American Chemical Society Books, Washington, DC (invited).

Hunt JW, Anderson BS, **Phillips BM**, Tjeerdema RS, Largay B, Hanson E, Beretti M, Bern A. 2008. Use of toxicity identification evaluations in determining the pesticide mitigation effectiveness of on-farm vegetated treatment systems. *Environ Poll.* 156: 348-358.

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Anderson BS, **Phillips BM**, Hunt JW, Largay B, Shihadeh R, Tjeerdema RS. 2011. Pesticide and toxicity reduction using an integrated vegetated treatment system. *Environ Toxicol Chem.* 30: 1036-1043.

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Exhibit A6 – Current & Pending Support

CURRENT & PENDING SUPPORT

University will provide current & pending support information for Key Personnel identified in Exhibit A2 at time of proposal and upon request from State agency. The "Proposed Project" is this application that is submitted to the State. Add pages as needed.

Co-PI Project Lead: Bryn Phillips

Status	Award #	Source	Project Title	Start Date	End Date
Proposed Project	18-C0043	CA Department of Pesticide Regulation	An integrated vegetated treatment system for mitigating imidacloprid and permethrin in agriculture irrigation runoff	10/22/2018	3/31/2020
CURRENT		CA State Water Resources Control Board	Stream Pollution Trends Program	1/1/2018	3/31/2020
CURRENT					
PENDING					

NAME OF INDIVIDUAL

Status	Award #	Source	Project Title	Start Date	End Date
Proposed Project					
CURRENT					
CURRENT					
PENDING					

NAME OF INDIVIDUAL

Status	Award #	Source	Project Title	Start Date	End Date
Proposed Project					
CURRENT					
CURRENT					
PENDING					

NAME OF INDIVIDUAL

Status	Award #	Source	Project Title	Start Date	End Date
Proposed Project					
CURRENT					
CURRENT					
PENDING					

Exhibit B - Budget

Budget for Project Period

Principal Investigator (Last, First): Tjeerdema, Ron

COMPOSITE BUDGET FOR ENTIRE PROPOSED PROJECT PERIOD
10/22/2018 to 03/31/2020

Project Budget

	From	**10/22/2018**	**7/1/2019**
	To	**6/30/2019**	**3/31/2020**
Approved Hourly Rates		**Year 1**	**Year 2**
UCD-GC Specialist V ($114)		$912	$908
UCD-GC SRA III ($61)		$610	$610
	Sub Total	**$1,522**	**$1,518**
Water Sample Analysis			
Hyalella 4-day ($665 *16)		$5,320	$5,320
Chironomus 10-d ($1160 * 14)		$9,280	$6,960
	Sub Total	**$14,600**	**$12,280**
	Total Costs	**$16,122**	**$13,798**
TOTAL FOR TWO YEARS			**$29,920**

Exhibit B1

Budget Justification

Personnel

Name. *Starting with the Principal Investigator list the names of all known personnel who will be involved on the project for each year of the proposed project period. Include all collaborating investigators, individuals in training, technical and support staff or include as "to be determined" (TBD).*

Ronald Tjeerdema, Principal Investigator, has an advisory role only, with no funding through this contract.
Bryn Phillips, Project Lead (Specialist V)
Jennifer Voorhees, Lab Supervisor (SRA III)

Role on Project. *For all personnel by name, position, function, and a percentage level of effort (as appropriate), including "to-be-determined" positions.*

Bryn Phillips, Project Manager, Supervisory, 0.16 FTE
Jennifer Voorhees, Lab Analyst, 0.03 FTE

Fringe Benefits.

In accordance with University policy, explain the costs included in the budgeted fringe benefit percentages used, which could include tuition/fee remission for qualifying personnel to the extent that such costs are provided for by University policy, to estimate the fringe benefit expenses on Exhibit B.

Bryn Phillips has a benefit rate of 38.9%.
Jennifer Voorhees has a benefit rate of 51%.

Travel

Itemize all travel requests separately by trip and justify in Exhibit B1, in accordance with University travel guidelines. Provide the purpose, destination, travelers (name or position/role), and duration of each trip. Include detail on airfare, lodging and mileage expenses, if applicable. Should the application include a request for travel outside of the state of California, justify the need for those out-of-state trips separately and completely.

N/A

Materials and Supplies

Itemize materials supplies in separate categories. Include a complete justification of the project's need for these items. Theft sensitive equipment (under $5,000) must be justified and tracked separately in accordance with State Contracting Manual Section 7.29.

Supplies will mostly be provided by contractor, but the supply budget will offset costs of organisms for tests.

Equipment

List each item of equipment (greater than or equal to $5,000 with a useful life of more than one year) with amount requested separately and justify each.

N/A

Consultant Costs

Consultants are individuals/organizations who provide expert advisory or other services for brief or limited periods and do not provide a percentage of effort to the project or program. Consultants are not involved in the scientific or technical direction of the project as a whole. Provide the names and organizational affiliations of all consultants. Describe the services to be performed, and include the number of days of anticipated consultation, the expected rate of compensation, travel, per diem, and other related costs.

N/A

Subawardee (Consortium/Subrecipient) Costs

Each participating consortium organization must submit a separate detailed budget for every year in the project period in Exhibit B2 Subcontracts. Include a complete justification for the need for any subawardee listed in the application.

N/A

Other Direct Costs

Itemize any other expenses by category and cost. Specifically justify costs that may typically be treated as indirect costs. For example, if insurance, telecommunication, or IT costs are charged as a direct expense, explain reason and methodology.

N/A

Rent

If the Scope of Work will be performed in an off-campus facility rented from a third party for a specific project or projects, then rent may be charged as a direct expense to the award.

N/A

Indirect (F&A) Costs

Indirect costs are calculated in accordance with the budgeted indirect cost rate in Exhibit B.

N/A

Exhibit B3 – Invoice Elements

Invoice and Detailed Transaction Ledger Elements

In accordance with Section 14 of Exhibit C – Payment and Invoicing, the invoice, summary report and/or transaction/payroll ledger shall be certified by the University's Financial Contact and the PI (or their respective designees).

Summary Invoice – includes either on the invoice or in a separate summary document – by approved budget category (Exhibit B) – expenditures for the invoice period, approved budget, cumulative expenditures and budget balance available[1]

- Personnel
- Equipment
- Travel
- Subawardee – Consultants
- Subawardee – Subcontract/Subrecipients
- Materials & Supplies
- Other Direct Costs
    - TOTAL DIRECT COSTS (if available from system)
- Indirect Costs
    - TOTAL

Detailed transaction ledger and/or payroll ledger for the invoice period [2]

- Univ Fund OR Agency Award # (to connect to invoice summary)
- Invoice/Report Period (matching invoice summary)
- GL Account/Object Code
- Doc Type (or subledger reference)
- Transaction Reference#
- Transaction Description, Vendor and/or Employee Name
- Transaction Posting Date
- Time Worked
- Transaction Amount

[1] If this information is not on the invoice or summary attachment, it may be included in a detailed transaction ledger.

[2] For salaries and wages, these elements are anticipated to be included in the detailed transaction ledger. If all elements are not contained in the transaction ledger, then a separate payroll ledger may be provided with the required elements.

Exhibit G – Negotiated Alternate UTC Terms (if applicable)

An alternate provision in Exhibit G must clearly identify whether it is replacing, deleting or modifying a provision of Exhibit C. The Order of Precedence incorporated in Exhibit C clearly identifies that the provisions on Exhibit G take precedence over those in Exhibit C.

*While every effort has been made to keep the UTC as universal in its application as possible, there may be unique projects where a given term in the UTC may be inappropriate or inadequate. California Education Code §67327(b) allows for those terms to be changed, but only through the mutual agreement and negotiation of the State agency and the University campus. If a given term in the UTC is to be changed, the change should **not** be noted in Exhibit C, but rather noted separately in Exhibit G.*

1. Harassment Free Workplace

The Department of Pesticide Regulation (DPR) is committed to providing a safe, secure environment, free from sexual misconduct. It is policy of the Department that employees have the right to work in an environment that is free from all forms of discrimination, including sexual harassment. This policy specifically speaks to freedom from a sexually harassing act that results in the creation of an intimidating, hostile or offensive work environment or that otherwise interferes with an individual's employment or work performance. As a Contractor with DPR, you and your staff are expected to comply with a standard of conduct that is respectful and courteous to DPR employees and all other persons contacted during the performance of this Agreement. Sexual harassment is unacceptable, will not be tolerated; and may be cause for prohibiting some or all of the Contractor's staff from performing work under this Agreement.