Use of Copper and Acrolein to Control Algae and Aquatic Vegetation in Irrigation Facilities

California Environmental Quality Act
Initial Study And
Mitigated Negative Declaration

November 7, 2016

South San Joaquin Irrigation District
P.O. Box 747
Ripon, CA 95366
Contact: Peter Rietkerk
(209) 249-4600

Prepared by:
Blankinship & Associates, Inc.
1590 Drew Avenue, Suite 120
Davis, CA 95618
Contact: Stephen Burkholder
(530) 757-0941

Submitted to:
State Water Resources Control Board
1001 I Street
Sacramento, CA 95814
Contact: Ariana Villanueva
(916) 341-5775

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1 PROJECT DESCRIPTION

1.1 Introduction and Environmental Setting

South San Joaquin Irrigation District (herein referred to as the "District") is located in San Joaquin County. See **Figure 1**. The District's service area is shown in **Figure 2** and encompasses about 72,000 acres. The District is divided into six divisions for which daily management of flow and water delivery in that division is handled by a Division Manager.

The District typically diverts approximately 230,000 AF of water for irrigation purposes, and delivers this water by gravity flow to approximately 54,200 acres of farmland around the cities of Manteca, Ripon, and Escalon. After passing through a number of water storage reservoirs and powerhouses on the Stanislaus River, water is diverted at Goodwin Dam. It then flows through approximately 13 miles of canals, tunnels, and flumes into Woodward Reservoir, a 32,763 acre-foot off-stream storage facility constructed by the District, located just north of the City of Oakdale. Water is released from Woodward Reservoir into the District's 26 mile Main Distribution Canal (MDC) which passes in a southwesterly direction through Oakdale Irrigation District in Stanislaus County for 6 miles before it reaches San Joaquin County at the eastern border of the District. The District has approximately 180 miles of lateral canals, 360 miles of underground pipelines, and 70 miles of drainage ditches.

Due to the gravity delivery nature of the system and if gates are open, there can be operational discharges from the conveyance system that may enter into the San Joaquin River and the Stanislaus River. Within the District, there are numerous drain locations where water can leave District facilities and be discharged into the Lone Tree Creek / Little John Creek system or the French Camp Outlet Canal, both of which discharge into the San Joaquin River. The District also has five locations where water can be released into the Stanislaus River. All potential discharge point locations have "canal gates" which are closed and locked to prevent any scheduled discharges.

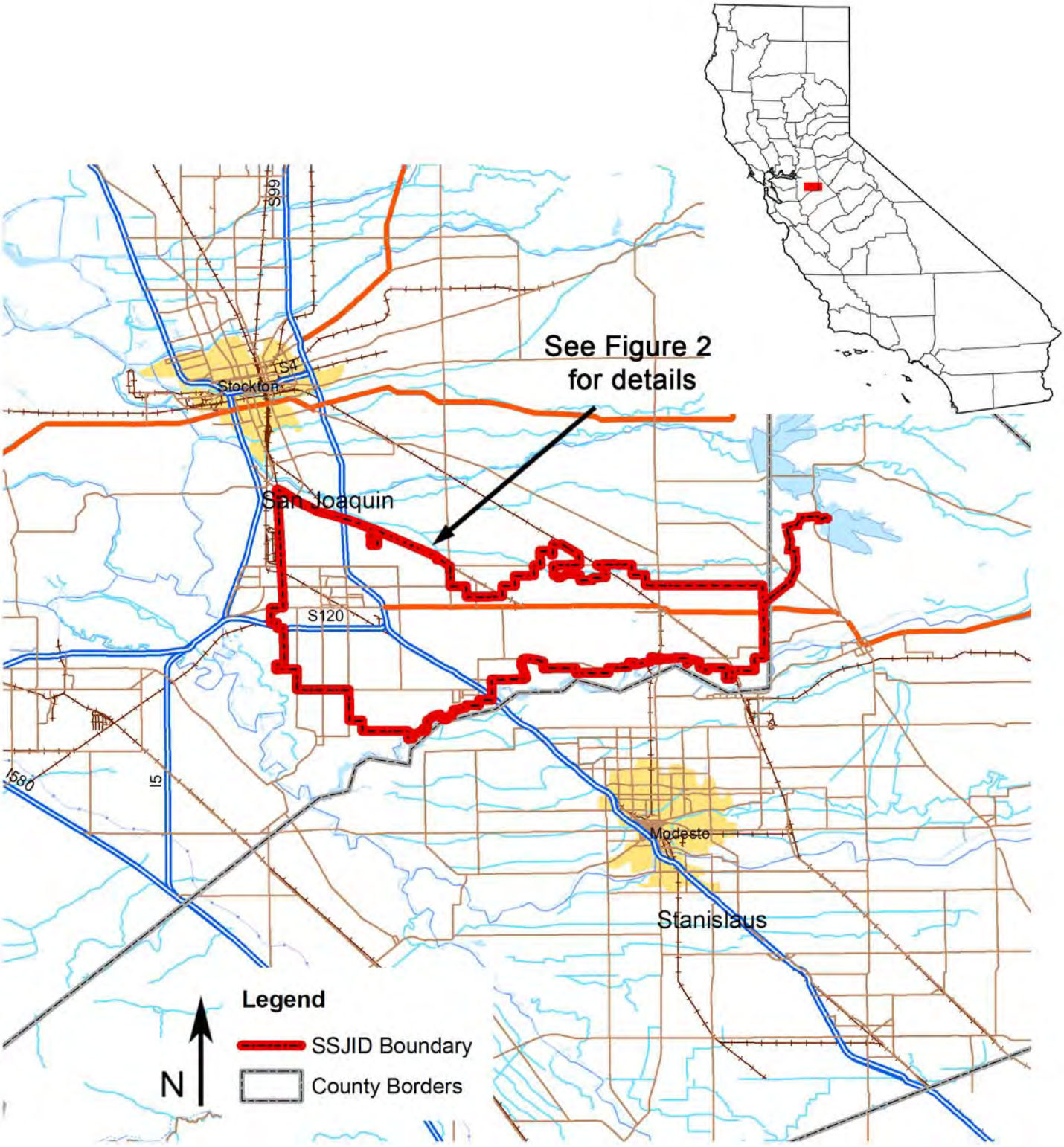
Efficient conveyance of irrigation water is critical to the functions of the District. However, the District's conveyances are prone to infestation by floating and submersed aquatic weeds including American pondweed, sago, watermilfoil, parrot feather, and filamentous and planktonic algae. The presence of algae and/or submersed aquatic vegetation can slow or stop the flow of water in District conveyances, reducing their irrigation and flood control capacity.

To maintain flow rates and water elevation in its irrigation conveyances, the District uses Integrated Pest Management (IPM) techniques. As part of this approach, the District plans to use a variety of algaecides and/or aquatic herbicides including copper and/or acrolein on an "as-needed" basis to achieve algae and aquatic weed control necessary for efficient water conveyance.

Depending on weed or algae presence, type and density, algaecides and/or aquatic herbicides containing copper and/or acrolein may be applied at locations throughout the District's irrigation conveyance system. Applications may be made if the District's IPM thresholds are met, or expected to be met based on the water, weed or algae density, weed growth or predicted growth, water demand, or water level in the system. Some years, algaecides and/or aquatic herbicides may not be used if thresholds are not met. Applications may be made throughout the

irrigation supply conveyance system. The District makes no algaecides and/or aquatic herbicide applications to the San Joaquin River or Stanislaus River.

The “Project” is defined as the District’s application of algaecides and/or aquatic herbicides that contain copper or acrolein to the irrigation conveyance system to control algae and a variety of aquatic vegetation as needed for the efficient delivery of irrigation water.



Blankinship & Associates, Inc.
Agricultural & Environmental
Scientists & Engineers

South San Joaquin Irrigation District Project Location Map

Project	Figure
SSJID IS/MND	1
Date: Jan 8, 2016	

Figure 2: Service Area Map

SOUTH SAN JOAQUIN IRRIGATION DISTRICT

DISTRICT MAP
OF
DISTRIBUTION PIPELINES AND CANALS

LEGEND:

- PUMPS
- DRAIN LINES
- IRRIGATION LINES
- SECTION LINES
- PROJECTED SECTION LINES
- CONTROL STRUCTURES
- DISTRICT BOUNDARY

SCALE
1000 0 1000 2000 3000 4000 5000

THIS MAP IS BASED ON AERIAL PHOTOGRAPHY DATED 4-17-99 AND FIELD SURVEYS CONDUCTED DURING 1998 & 1999.

1.2 Regulatory Setting

The Statewide General National Pollutant Discharge Elimination System (NPDES Permit for Residual Aquatic Pesticide Discharges to Water of the United States from Algae and Aquatic Weed Control Applications ("Permit") was adopted on March 5, 2013 and became available on December 1, 2013 (SWRCB 2013). The Permit requires compliance with the following:

- The Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries in California (aka the State Implementation Plan, or SIP) (SWRCB, 2000)
- The California Toxics Rule (CTR) (CTR, 2000)
- Applicable Regional Water Quality Control Board (RWQCB) Basin Plan Water Quality Objectives (WQOs) (RWQCB, 2016)

The SIP assigns effluent limitations for CTR priority pollutants, including algaecides and/or aquatic herbicides containing copper and acrolein. Further, the SIP prohibits discharges of priority pollutants in excess of applicable water quality criteria outside the mixing zone.[1]

Although the SIP prohibits the discharge of copper and acrolein in excess of applicable water quality criteria into receiving waters, Section 5.3 of the SIP allows for short-term or seasonal exceptions if determined to be necessary to implement control measures either (1) for resource or pest management conducted by public entities to fulfill statutory requirements, or (2) regarding drinking water conducted to fulfill statutory requirements under the federal Safe Drinking Water Act or the California Health and Safety Code. Exceptions may also be granted for draining water supply reservoirs, canals, and pipelines for maintenance, for draining municipal storm water conveyances during cleaning or maintenance, or for draining water treatment facilities during cleaning or maintenance. The District has concluded that it meets one or more of the criteria for gaining a Section 5.3 SIP exception.

Permittees who elect to use a SIP exception must satisfactorily complete several steps, including preparation and submission of an application and California Environmental Quality Act (CEQA) document to SWRCB. Consistent with Section IX.C.1.a. of the Permit, entities may be added to Attachment G of the Permit if they have qualified for a SIP Section 5.3 exception[2]. Accordingly, when the application and CEQA process is complete, and a short-term or seasonal exemption from meeting the receiving water limit for copper and acrolein are granted, Attachment G of the Permit will be revised to list the District's exemption and the District may apply algaecides and/or aquatic herbicides in accordance with the Permit as revised. This document must be submitted to the SWRCB for the permittee to be placed on Attachment G of the Permit, and subsequently be afforded coverage.

[1] Mixing Zone is defined in the SIP as "a limited volume of receiving water that is allocated for mixing with a wastewater discharge where water quality criteria can be exceeded without causing adverse effects to the overall waterbody."

[2] The SWRCB has indicated that the Permit may be re-opened for additional CEQA document submission on an as-needed basis.

1.3 Required Approvals

The SWRCB must approve the District's application for a SIP Section 5.3 exception to the CTR criterion for copper and acrolein. The District will submit the following documents to the SWRCB for acceptance:

a. A detailed description of the proposed action;
b. The proposed method of completing the action;
c. A time schedule;
d. A discharge and receiving water quality monitoring plan (before project initiation, during project implementation, and after project completion, with the appropriate quality assurance and quality control procedures);
e. Contingency plans (if applicable); and
f. CEQA documentation and notification of potentially affected government agencies;

Upon completion of each seasonal or short-term application of algaecides and/or aquatic herbicides that contain copper or acrolein, the District shall provide certification by a qualified biologist that the receiving water beneficial uses have been restored.

1.4 Required Notifications

1.4.1 California Department of Fish and Wildlife

At the beginning of each season, prior to applications of copper or acrolein, the District will send a written notification of intent to use copper or acrolein to the California Department of Fish and Wildlife (CDFW).

1.4.2 NPDES Aquatic Pesticide Permit Notifications

Every calendar year, at least 15 days prior to the first application of copper- or acrolein-containing algaecides and/or aquatic herbicides, the District will send a one-time notification to potentially affected public agencies. The District may also post the notification on its website. The notification must include the following information:

1. A statement of the District's intent to apply algaecide and/or aquatic herbicide(s);
2. Name of algaecide and/or aquatic herbicide(s);
3. Purpose of use;
4. General time period and locations of expected use;
5. Any water use restrictions or precautions during treatment; and
6. A phone number that interested persons may call to obtain additional information from the District.

1.5 Standard Operating Procedures

The District implements an Integrated Pest Management (IPM) program for algae and aquatic weed control. The IPM program involves scouting for algae and aquatic weed presence in the District's irrigation conveyance system to determine if the locations and densities exceed or are

likely to exceed treatment thresholds. If algae or aquatic weeds are present in locations and densities that exceed thresholds above which control is needed, the District may make applications of copper- or acrolein-containing algaecides and/or aquatic herbicides on an "as-needed" basis to achieve the algae and aquatic weed control necessary to efficiently convey irrigation water.

Acrolein Procedures

The approaches outlined above are supplemented by the following components of the District's aquatic vegetation management program, which are be applied before, during and after the use of algaecides and/or aquatic herbicides that contain acrolein:

1. Signs are posted throughout the District that swimming in canals is prohibited.
2. District personnel that make algaecide and/or aquatic herbicide applications are themselves, or under the direct supervision of, a DPR-licensed Qualified Applicator Certificate or License holder (QAC/QAL). Expertise and training used by these personnel mitigate potentially significant impacts.
3. A written recommendation is prepared by a DPR-licensed Pest Control Adviser (PCA). A PCA undergoes no less than 40 hours of training every 2 years on issues including health and safety and prevention of exposure to sensitive receptors. The written recommendation prepared by the PCA must evaluate proximity of occupied buildings and people, and health and environmental hazards and restrictions, and include a certification that alternatives and mitigation measures that substantially lessen any significant adverse impact on the environment have been considered and if feasible, adopted. Refer to **Appendix D** for an example PCA Recommendation form.
4. All District personnel applying algaecides and/or aquatic herbicides review and strictly adhere to the algaecide or aquatic herbicide product label that has clear and specific warnings that alert users to hazards that may exist. Examples of specific product labels are included in **Appendix E**.
5. All District personnel applying algaecides and/or aquatic herbicides review and consult the algaecide or aquatic herbicide Safety Data Sheet (SDS) (examples provided in **Appendix E**), and the DPR Worker Health and Safety Branch Pesticide Safety Information Series (PSIS). The PSIS and the SDS have specific information that describes precautions to be taken during the use of the algaecides and/or aquatic herbicides.
6. District personnel obtain annual training on the safe application and use of acrolein as described in the Magnacide-H Herbicide Application and Safety Manual.
7. District personnel are familiar with and implement the DPR PSIS series that mitigates potentially significant impacts. For example, the PSIS series describes the personal protective equipment (PPE) needed for the safe handling of algaecides and/or aquatic herbicides, including goggles, disposable coveralls, gloves and respirators, as appropriate.
8. The condition of the irrigation conveyance or equalizing reservoir(s) being treated is field-evaluated to ensure that the application is necessary, feasible and can be conducted safely and according to label. This evaluation considers target algae or weed species, level of infestation, water and flow conditions, alternate control methods, and amount of algaecide and/or aquatic herbicide to be applied.
9. After field evaluation, notice is given to the County Agricultural Commissioner (CAC) and CDFW twenty-four (24) hours prior to application. Growers are also notified and given the opportunity to postpone water deliveries to sensitive crops or commodities, such as organic

crops or fish farms. District water operators are not allowed to make adjustments to the turnout gates during the application and until acrolein-treated water is not present in the irrigation system, or the 6-day hold period described by the label for acrolein is met.

10. Prior to an application of acrolein, Division Managers will identify active pipelines to be treated and gates to be closed to prevent the release of treated water from each Division. District Managers will then notify and provide these details to all Division Managers. Notifications are documented on District prepared BMP worksheets.
11. Prior to an application of acrolein, the water operator will seal the last and second-to-last canal gates on active pipelines, and, as necessary, further seal the gates with boards and/or plastic if control structures are leaking.
12. During and after the start of application of acrolein, the District inspects treated conveyances and active pipelines during and following treatment to ensure treated water is irrigated onto fields or held for the label-prescribed 6 days before acrolein treated water is released from the conveyance system. Note that water treated with acrolein is only used for irrigation of fields (crop bearing, fallow, or pasture) where the treated water remains on the field, or held for the label-prescribed period before being released from the conveyance system.
13. District personnel will control small leaks (<1 gallon per minute) that may develop at canal gates with sand bags, leak stop material, plastic sheeting, cat litter, temporary dikes, pumps, by closing gates upstream of the leaking gate, or lowering the level of treated water below the elevation of the leak. All these actions effectively prevent the release of acrolein-treated water from leaving the conveyance system prior to holding time expiration.
14. The location(s) at which applications of acrolein are made is continuously staffed until the application is complete. District staff performing conveyance inspections are in continuous cell phone or radio contact with staff making the application. In the event that a spill or leak is discovered during application, the application can be stopped, if feasible. Water delivery to the pipeline or lateral may be reduced or stopped to increase freeboard, and lessen or stop subsequent leakage. The application is not restarted until after the spill or leak is fixed.

Copper Procedures

The approaches outlined below are supplemented by the following components of the District's aquatic vegetation management program, which would be applied before, during and after the use of algaecides and/or aquatic herbicides that contain copper:

1. District personnel that make algaecide and/or aquatic herbicide applications are themselves, or under the direct supervision of, a DPR-licensed Qualified Applicator Certificate or License holder (QAC/QAL). Expertise and training used by these personnel mitigate potentially significant impacts.
2. A written recommendation is prepared by a DPR-licensed Pest Control Adviser (PCA). A PCA undergoes 40 hours of training every 2 years on issues including health and safety and prevention of exposure to sensitive receptors. The written recommendation prepared by the PCA must evaluate proximity of occupied buildings and people, and health and environmental hazards and restrictions, and include a certification that alternatives and mitigation measures that substantially lessen any significant adverse impact on the environment have been considered and if feasible, adopted. Refer to **Appendix D** for an example PCA Recommendation form.
3. All District personnel applying algaecides and/or aquatic herbicides review and strictly adhere to the product label that has clear and specific warnings that alert users to hazards that may exist. Examples of specific product labels are included in **Appendix E**.
4. All District personnel applying algaecides and/or aquatic herbicides review and consult the product Safety Data Sheet (SDS) (examples provided in **Appendix E**), USEPA Endangered Species Bulletin (if applicable), and the DPR Worker Health and Safety Branch Pesticide Safety Information Series (PSIS). The PSIS and the SDS have specific information that describes precautions to be taken during the use of the algaecides and/or aquatic herbicides.
5. District personnel are familiar with and implement the DPR PSIS series that mitigates potentially significant impacts. For example, the PSIS series describes the personal protective equipment (PPE) needed for the safe handling of algaecides and/or aquatic herbicides, including goggles, disposable coveralls, gloves and respirators, as appropriate.
6. The condition of the irrigation conveyance or equalizing reservoir(s) being treated is field-evaluated to ensure that the application is necessary, feasible and can be conducted safely and according to label. This evaluation considers target algae or weed species, level of infestation, water and flow conditions, alternate control methods, and amount of algaecide and/or aquatic herbicide to be applied.
7. After field evaluation, notice is given to District water operators and growers are given the opportunity to postpone water deliveries in case of sensitive crops or commodities, such as organic crops or fish farms. District water operators are not allowed to make adjustments to the turnout gates during the application and until copper-treated water is not present in the irrigation system.
8. The location(s) at which applications of copper are made is continuously staffed until the application is complete. District staff performing conveyance inspections are in continuous cell phone or radio contact with staff making the application. In the event that a spill or leak is discovered during application, the application can be stopped, if feasible. Water delivery to the pipeline or lateral may be reduced or stopped to

increase freeboard, and lessen or stop subsequent leakage. Generally, the application is not restarted until after the spill or leak is fixed.

These actions are intended to effectively prevent the release of water treated with algaecides and/or aquatic herbicide from leaving the irrigation conveyance system.

2 INITIAL STUDY

This document was prepared in a manner consistent with Section 21064.5 of the California Public Resources Code and Article 6 of the State CEQA Guidelines (14 California Code of Regulations).

This Initial Study, Environmental Checklist, and evaluation of potential environmental effects were completed in accordance with Section 15063 of the *State CEQA Guidelines* to determine if the proposed Project could have any potentially significant effect on the physical environment, and if so, what mitigation measures would be imposed to reduce such impacts to less-than-significant levels.

An explanation is provided for all determinations, including the citation of sources as listed in Section 5. A "No Impact" or a "Less-than-Significant Impact" determination indicates that the proposed Project would not have a significant effect on the physical environment for that specific environmental category.

Mitigation measures will be implemented to reduce the potentially significant impacts to less-than-significant levels.

2.1 CEQA Initial Study & Environmental Check List Form

1. Project Title: Use of Copper and Acrolein to Control Algae and Aquatic Vegetation in Irrigation Facilities

2. Lead Agency Name and Address: South San Joaquin Irrigation District
P.O. Box 747
Ripon, CA 95366

3. Contact Person & Phone Number: Peter Rietkerk, General Manager
(209) 249-4600

4. Project Location: Manteca, Ripon, & Escalon, California

5. Project Sponsor's Name and Address: See #2. Above

6. General Plan Land Use Designation: Agricultural/Industrial/Commercial/Residential

7. Zoning: Agricultural/Industrial/Commercial/Residential

8. Description of Project: See Section 1.0

9. Surrounding Land Uses and Setting: Agricultural/Industrial/Commercial/Residential

10. Other Agencies Whose Approval is Required: See Sections 1.3 and 1.4

2.2 Environmental Factors Potentially Affected

The environmental factor checked below would be potentially affected by the proposed Project, involving at least one impact that is a 'Potentially Significant Impact" as indicated by the checklist on the following pages:

☐ Aesthetics	☐ Agriculture Resources	☐ Air Quality
☒ Biological Resources	☐ Cultural Resources	☐ Geology/Soils
☐ Hazards & Hazardous Materials	☒ Hydrology/Water Quality	☐ Land Use/Planning
☐ Mineral Resources	☐ Noise	☐ Population/Housing
☐ Public Services	☐ Recreation	☐ Transportation/Traffic
☐ Utilities/Service Systems	☒ Mandatory Findings of Significance	

2.3 Determination (To be completed by lead agency)

On the basis of this initial evaluation:

☐ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

☒ I find that although the proposed Project could have a significant effect on the environment, there will not be a significant effect because appropriate mitigation measures are in place. A MITIGATED NEGATIVE DECLARATION will be prepared.

☐ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT (EIR) is required.

☐ I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An EIR is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

Peter M. Rietkerk
Signature

11/14/2016
Date

Peter M. Rietkerk
Printed Name

South San Joaquin Irrigation District
For

3 EVALUATION OF ENVIRONMENTAL IMPACTS

3.1 Aesthetics

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the Project:				
a) Have a substantial adverse effect on a scenic vista?	☐	☐	☐	☒
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☐	☒
c) Substantially degrade the existing visual character or quality of the site and its surrounding?	☐	☐	☐	☒
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☐	☒

Discussion

Items a) & b): ***No Impact.*** There are no designated scenic vistas, state scenic highways, or scenic resources in the vicinity of the Project sites, therefore no impact would occur. The visual quality of the District's irrigation conveyance system would not be negatively impacted by Project activities. To the contrary, the Project would enhance the visual quality of the District's irrigation conveyance system by clearing nuisance algae and weeds.

Item c): ***No Impact.*** The Project involves the short-term or seasonal application of algaecides and/or aquatic herbicides that contain copper or acrolein to the District's irrigation conveyance system to control a variety of algae and/or aquatic vegetation. These algae or aquatic weeds are typically at or below the water surface. Upon control, the removal of these weeds would be unnoticed and would not degrade the visual character of the Project site.

Item d): ***No Impact.*** The Project is generally during the daylight hours, therefore no artificial light sources are needed and no substantial new light or glare is produced.

3.2 Agriculture Resources

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the Project:				
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	☒
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☐	☒
c) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use?	☐	☐	☐	☒

Discussion

Items a) through c): ***No Impact.*** The Project will not convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance to non-agricultural use, conflict with existing zoning or agricultural use, or a Williamson Act contract, or otherwise result in the conversion of Farmland to non-agricultural use.

3.3 Air Quality

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the Project:				
a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☐	☒
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☐	☐	☒
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal and state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?	☐	☐	☐	☒
d) Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☐	☒
e) Create objectionable odors affecting a substantial number of people?	☐	☐	☐	☒

Discussion

Items a) & b): ***No Impact.*** The Project requires the use of pick-up trucks or other service vehicles for purposes of transporting algaecides and/or aquatic herbicides to locations where they are needed. Pick-up trucks are also used for purposes of site reconnaissance before, during, and after application of algaecide and/or aquatic herbicides. Short-term vehicle emissions will be generated during algaecide and/or aquatic herbicide application; however, they will be minor and only be applied on an "as-needed" basis throughout the year. To minimize impacts, all equipment will be properly tuned and muffled and unnecessary idling will be minimized. Generally one or two vehicles are used for the transport and application of the herbicide. As needed, the District may use a small generator or gas-powered pump during the course of application. The District may also use a boat with a small outboard motor in some locations where application from the banks is not feasible. None of the above vehicles or application equipment is expected to conflict with air quality plans or violate air quality standards.

The District is located in the San Joaquin Valley Air Basin, which includes the following counties: San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, Tulare, and Kern. The application of algaecide and/or aquatic herbicides does not conflict with any San Joaquin Valley Air Quality Management Plans, violate any air quality standards, or contribute to an existing or projected violation based on data available from the San Joaquin Valley Air

Quality Management District.

Item c): ***No Impact.*** Levels of ozone (8-hr standard) and suspended matter ($PM_{2.5}$) in the San Joaquin Valley Air Basin have exceeded California Clean Air standards, and therefore the area is considered a "nonattainment" area for these pollutants. Although the San Joaquin Valley Air Basin is nonattainment for both $PM_{2.5}$ and ozone California Clean Air standards, the Project is not expected to contribute to a significant increase in either of these criteria pollutants.

Items d) & e): ***No Impact.*** Algaecide and/or aquatic herbicides containing copper and acrolein will be applied by District personnel. Applications will take place in the District's irrigation conveyance system. Applications are typically brief in duration and made infrequently (i.e. a few times per year). Applications are generally not made near schools, health care facilities, or day care facilities, thereby reducing exposure to these sensitive receptors. Similarly, there will be no objectionable odors that affect a substantial number of people as a result of the application of copper- and acrolein-containing algaecides and/or aquatic herbicides.

3.4 Biological Resources

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the Project:				
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☒	☐	☐
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☐	☐	☒
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☐	☐	☒
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☐	☐	☒
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	☒
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	☒

Discussion

Item a): **Potentially Significant Unless Mitigation Incorporated.** A list of current special status

species was compiled from the California Department of Fish and Wildlife (CDFW) California Natural Diversity Database (CNDDB 2016), and the U.S. Fish and Wildlife Service (USFWS), Sacramento Office Information for Planning and Conservation (IPaC) database (USFWS 2016). Special status species data was obtained for the seven United States Geological Survey (USGS) 7.5 x 7.5 minute quadrangles that the District fell within (i.e. core quads) as well as 18 peripheral quadrangles (i.e. border quads). Data was queried from the CDFW and USFWS databases for these quads and combined into one table. Once this list was compiled, a preliminary assessment of the Project area was performed to characterize the actual habitats present on-site and the likelihood of special status species occurrence.

A summary of the listed species, their conservation status, and whether or not they were considered for evaluation of potential impact is presented in **Table 1.** Species habitat and rationale for removal from further consideration is presented in **Table 1** and more detailed species life history information can be found in **Appendix A.** Physical, chemical and toxicological data on copper and acrolein are presented in **Appendix B.**

Table 1. Species and Habitat Summary

Common Name	Scientific Name	Status	Habitat	Habitat is not Present in Project Area; Species Eliminated from Further Consideration	Habitat is Present in Project Area; Species Eliminated from Further Consideration for Reasons Given (see numbered notes)	Potential Risk maybe Present from Project Activities
AMPHIBIAN						
California tiger salamander	*Ambystoma californiense*	FT, ST, SSC	Herbaceous wetland, temporary pool; Grassland/herbaceous, Savanna, Woodland - Hardwood; benthic, burrowing in or using soil.	X		
foothill yellow-legged frog	*Rana boylii*	SSC	Partly-shaded shallow streams & riffles with a rocky substrate in a variety of habitats; need at least some cobble-sized substrate for egg-laying.	X		
California red-legged frog	*Rana draytonii*	FT, SSC	Lowland foothills in or near permanent sources of deep water with dense, shrubby, or emergent riparian vegetation.	X		
western spadefoot	*Spea hammondii*	SSC	Lowlands to foothills; grasslands, open chaparral, pine-oak woodlands. Prefers shortgrass plains, sandy or gravelly soil. Fossorial. Breeds in temporary rain pools and slow-moving streams.	X		

Common Name	Scientific Name	Status	Habitat	Habitat is not Present in Project Area; Species Eliminated from Further Consideration	Habitat is Present in Project Area; Species Eliminated from Further Consideration for Reasons Given (see numbered notes)	Potential Risk maybe Present from Project Activities
BIRD						
tricolored blackbird	*Agelaius tricolor*	SCT	Freshwater and brackish marshes of cattails, tule, bulrushes and sedges; Cropland/hedgerow, Grassland/herbaceous.		X (1)	
burrowing owl	*Athene cunicularia*	SSC	Agriculture/rangeland, grassland, parks with open ground squirrel burrows.		X (1)	
Swainson's hawk	*Buteo swainsoni*	ST	Cropland/hedgerow, Desert, Grassland/herbaceous, Savanna, Woodland - Mixed.		X (1)	
western yellow-billed cuckoo	*Coccyzus americanus occidentalis*	FT, SE	Open woodland parks, deciduous riparian woodland; requires patches of at least 10 hectares (25 acres) of dense riparian forest with a canopy cover of at least 50 percent in both the understory and overstory.	X		
yellow-breasted chat	*Icteria virens*	SSC	Summer resident; inhabits riparian thickets of willow & other brushy tangles near watercourses; nests in low, dense riparian areas, consisting of willow, blackberry, and wild grape; forages and nests within 10 ft of ground.		X (1)	
California black rail	*Laterallus jamaicensis coturniculus*	ST	Salt or fresh water marshes, wet meadows, shallow margins of saltwater marshes bordering larger bays; areas with water depths of about 1 inch; dense vegetation for nesting habitat.	X		
song sparrow ("Modesto" population)	*Melospiza melodia*	SSC	Fresh-water marshes and riparian thickets.	X		

Common Name	Scientific Name	Status	Habitat	Habitat is not Present in Project Area; Species Eliminated from Further Consideration	Habitat is Present in Project Area; Species Eliminated from Further Consideration for Reasons Given (see numbered notes)	Potential Risk maybe Present from Project Activities
least Bell's vireo	*Vireo bellii pusillus*	FE, SE	Summer resident of Southern California in low riparian in vicinity of water or in dry river bottoms; nests placed along margins of bushes or on twigs projecting into pathways, usually willow, *Baccharis*, mesquite.	X		
yellow-headed blackbird	*Xanthocephalus xanthocephalus*	SSC	Nests in freshwater emergent wetlands with dense vegetation and deep water; often along borders of lakes or ponds.	X		
FISH						
Delta smelt	*Hypomesus transpacificus*	FT, SE	Sacramento-San Joaquin River Delta; seldom found at salinities > 10 ppt.	X		
hardhead	*Mylopharodon conocephalus*	SSC	Low- to mid-elevation streams in the Sacramento-San Joaquin drainage, clear, deep pools with sand-gravel-boulder bottoms and slow water velocity.	X		
steelhead - Central Valley DPS	*Oncorhynchus mykiss irideus*	FT	Sacramento River and San Joaquin Rivers and their tributaries.	X		
longfin smelt	*Spirinchus thaleichthys*	FC, ST, SSC	Found in open waters of estuaries, prefer salinities of 15-30 ppt, but may be found in completely freshwater to almost pure seawater.	X		
INVERTEBRATE						
Conservancy fairy shrimp	*Branchinecta conservatio*	FE	Vernal pools	X		
vernal pool fairy shrimp	*Branchinecta lynchi*	FT	Vernal pools	X		

Common Name	Scientific Name	Status	Habitat	Habitat is not Present in Project Area; Species Eliminated from Further Consideration	Habitat is Present in Project Area; Species Eliminated from Further Consideration for Reasons Given (see numbered notes)	Potential Risk maybe Present from Project Activities
valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*	FT	Occurs in the Central Valley of California; associated with blue elderberry (*Sambucus mexicana*); prefers to lay eggs in elderberries.	X		
vernal pool tadpole shrimp	*Lepidurus packardi*	FE	Vernal pools	X		
MAMMAL						
pallid bat	*Antrozous pallidus*	SSC	Deserts, grasslands, shrublands, woodlands & forests. Most common in open, dry habitats with rocky areas for roosting.	X		
Townsend's big-eared bat	*Corynorhinus townsendii*	SCT, SSC	Mesic habitats, roosts in the open, hanging from walls and ceilings.		X (1)	
western mastiff bat	*Eumops perotis californicus*	SSC	Semi-arid to arid habitats including conifer and deciduous woodlands, coastal scrub, grasslands, & chaparral. Roosts in crevices in cliff faces, high buildings, trees, and tunnels		X (1)	
western red bat	*Lasiurus blossevillii*	SSC	Along riparian and agricultural areas in broadleaf tree communities throughout the Central Valley.		X (1)	
riparian (=San Joaquin Valley) woodrat	*Neotoma fuscipes riparia*	FE, SSC	Riparian areas along the San Joaquin, Stanislaus, & Tuolumne Rivers; need areas with mix of brush & trees	X		
riparian brush rabbit	*Sylvilagus bachmani riparius*	FE, SE	Riparian areas on the San Joaquin River in Northern Stanislaus County; dense thickets of wild rose, willows, and blackberries.	X		
American badger	*Taxidea taxus*	SSC	Most abundant in drier open stages of most shrub, forest, and herbaceous habitats, with friable soils.	X		

Common Name	Scientific Name	Status	Habitat	Habitat is not Present in Project Area; Species Eliminated from Further Consideration	Habitat is Present in Project Area; Species Eliminated from Further Consideration for Reasons Given (see numbered notes)	Potential Risk maybe Present from Project Activities
San Joaquin kit fox	*Vulpes macrotis mutica*	FE, ST	Annual grasslands or grassy open stages with scattered shrubby vegetation; need loose-textured sandy soils for burrowing, and suitable prey base.	X		
PLANT						
large-flowered fiddleneck	*Amsinckia grandiflora*	FE, SE, CNPS-1	Cismontane woodland, valley and foothill grassland.	X		
alkali milk-vetch	*Astragalus tener var. tener*	CNPS-1	Alkali areas of floodplains; vernal pools.	X		
heartscale	*Atriplex cordulata var. cordulata*	CNPS-1	Saline or alkaline soils in chenopod scrub, valley and foothill grassland.	X		
lesser saltscale	*Atriplex minuscula*	CNPS-1	Chenopod scrub, valley and foothill grassland.	X		
subtle orache	*Atriplex subtilis*	CNPS-1	Valley and foothill grassland; alkaline soils.	X		
big tarplant	*Blepharizonia plumosa*	CNPS-1	Valley and foothill grassland; dry hills & plains in annual grassland; clay to clay-loam soils; usually on slopes and often in burned areas.	X		
watershield	*Brasenia schreberi*	CNPS-2	Lakes, ponds and slow-moving streams; 0.5-3 m deep.		X (3) (4)	
round-leaved filaree	*California macrophylla*	CNPS-1	Cismontane woodland, valley; clay soils.	X		
bristly sedge	*Carex comosa*	CNPS-2	Marshes and swamps	X		
Lemmon's jewelflower	*Caulanthus lemmonii*	CNPS-1	Pinyon-juniper woodland, valley and foothill grassland.	X		

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palmate-bracted salty bird's-beak	*Chloropyron palmatum*	FE, SE, CNPS-1	Chenopod scrub, valley and foothill grassland.	X		
slough thistle	*Cirsium crassicaule*	CNPS-1	Chenopod scrub, marshes and swamps, riparian scrub, sloughs, and riverbanks.	X		
beaked clarkia	*Clarkia rostrata*	CNPS-1	Cismontane woodland, valley and foothill grassland.	X		
recurved larkspur	*Delphinium recurvatum*	CNPS-1	Chenopod scrub, valley and foothill grassland, cismontane woodland; on alkaline soils.	X		
Delta button-celery	*Eryngium racemosum*	SE, CNPS-1	Riparian scrub, seasonally inundated floodplain on clay.	X		
diamond-petaled California poppy	*Eschscholzia rhombipetala*	CNPS-1	Valley and foothill grassland; alkaline, clay slopes and flats.	X		
San Joaquin spearscale	*Extriplex joaquinana*	CNPS-1	Chenopod scrub, alkali meadow, playas, valley and foothill grassland.	X		
woolly rose-mallow	*Hibiscus lasiocarpos var. occidentalis*	CNPS-1	Freshwater marsh	X		
Delta tule pea	*Lathyrus jepsonii var. jepsonii*	CNPS-1	Estuarine salt marshes and tidally influenced river banks, slough edges and levees.	X		
legenere	*Legenere limosa*	CNPS-1	Vernal pools	X		
Mt. Hamilton coreopsis	*Leptosyne hamiltonii*	CNPS-1	Cismontane woodland; on steep shale talus with open southwestern exposure.	X		

Common Name	Scientific Name	Status	Habitat	Habitat is not Present in Project Area; Species Eliminated from Further Consideration	Habitat is Present in Project Area; Species Eliminated from Further Consideration for Reasons Given (see numbered notes)	Potential Risk maybe Present from Project Activities
Mason's lilaeopsis	*Lilaeopsis masonii*	CNPS-1	Freshwater and brackish marshes, riparian scrub.	X		
Delta mudwort	*Limosella australis*	CNPS-2	Riparian scrub, freshwater and brackish marshes.	X		
showy golden madia	*Madia radiata*	CNPS-1	Valley and foothill grassland; cismontane woodland; chenopod scrub; mostly on adobe clay in grassland or among shrub.	X		
Hall's bush-mallow	*Malacothamnus hallii*	CNPS-1	Chaparral, coastal scrub; some populations on serpentine.	X		
Colusa grass	*Neostapfia colusana*	FT, SE, CNPS-1	Vernal pools	X		
San Joaquin Valley Orcutt grass	*Orcuttia inaequalis*	FT, SE, CNPS-1	Vernal pools	X		
Mt. Diablo phacelia	*Phacelia phacelioides*	CNPS-1	Chaparral, cismontane woodland; adjacent to trails, on rock outcrops, and talus slopes.	X		
Sanford's arrowhead	*Sagittaria sanfordii*	CNPS-1	Marshes and swamps; shallow, standing fresh water and sluggish waterways (USDOI 2010)		X (2) (3)	
side-flowering skullcap	*Scutellaria lateriflora*	CNPS-2	Meadows and seeps, marshes and swamps	X		
prairie wedge grass	*Sphenopholis obtusata*	CNPS-2	Cismontane woodland, meadows, and seeps; open moist sites, along rivers and springs.	X		
Suisun Marsh aster	*Symphyotrichum lentum*	CNPS-1	Marshes and swamps (brackish and freshwater)	X		

Common Name	Scientific Name	Status	Habitat	Habitat is not Present in Project Area; Species Eliminated from Further Consideration	Habitat is Present in Project Area; Species Eliminated from Further Consideration for Reasons Given (see numbered notes)	Potential Risk maybe Present from Project Activities
Wright's trichocoronis	*Trichocoronis wrightii var. wrightii*	CNPS-2	Marshes and swamps, riparian forest, meadows and seeps, vernal pools.	X		
saline clover	*Trifolium hydrophilum*	CNPS-1	Salt marshes, open areas in alkaline soils, alkaline grassland. (ESCTP 2015)	X		
caper-fruited tropidocarpum	*Tropidocarpum capparideum*	CNPS-1	Valley and foothill grassland; alkaline clay	X		
Greene's tuctoria	*Tuctoria greenei*	FE, CNPS-1	Vernal pools	X		
REPTILE						
western pond turtle	*Emys marmorata*	SSC	Thoroughly aquatic turtle of ponds, marshes, rivers, streams & irrigation ditches, usually with aquatic vegetation.			X
San Joaquin whipsnake	*Masticophis flagellum ruddocki*	SSC	Open, dry habitats with little or no tree cover; found in valley grassland & saltbrush scrub in the San Joaquin Valley.	X		
coast horned lizard	*Phrynosoma blainvillii*	SSC	Most common in lowlands along sandy washes with scattered low bushes; open areas for sunning.	X		
giant garter snake	*Thamnophis gigas*	FT, ST	Prefers freshwater marsh and low gradient streams, has adapted to drainage canals and irrigation ditches.			X

Table 1 Numbered Notes:

(1) Species not likely to have exposure as its diet consists of terrestrial food items.

(2) Not a submerged aquatic plant. Therefore, exposure to copper and acrolein treated water is indirect, if any. Exposure will only occur through root uptake of soil water. Algaecide and/or aquatic herbicide concentration in root zone water is not expected to be sufficient to cause impaired growth or cause death.

(3) According to the CalFlora database, no reported occurrences of these species exist within the project area (CalFlora 2016).

(4) District irrigation conveyances and equalizing reservoirs are not suitable habitat for watershield. Watershield habitat requirements include static or slow-moving waterbodies, water depth between 0.5-3 meters, constant water depth, and a thicket sediment substrate (Kim 1996). District reservoirs and a large portion of the above-ground conveyance system are concrete lined, water flow in the conveyance system ranges from approximately 1 to 5 mph, and conveyance water depths change frequently depending on irrigation demand by users. Taken together, these factors prevent the establishment of watershield within the District's conveyance system and equalizing reservoirs.

Table 1 Status Abbreviation:

FE = Federally Listed as Endangered

FT = Federally Listed as Threatened

FD = Federally Delisted

SSC = State Listed Species of Concern

SE = State Listed as Endangered

ST = State Listed as Threatened

CRPR-1 = California Rare Plant Rank 1; includes, Presumed Extinct, or Rare, Threatened, or Endangered in California (and elsewhere)

CRPR-2 = California Rare Plant Rank 2; includes Rare, Threatened, or Endangered in California, but more common elsewhere

(Continued Item a): Discussion)

With two exceptions, no special status species have habitat in within the irrigation conveyance system, or are otherwise expected to be significantly exposed to algaecide and/or aquatic herbicides used for the Project.

The two species that may be present in the project area are the western pond turtle (WPT) and the giant garter snake (GGS). A GGS could move from natural water bodies within and near the District, and enter treated irrigation conveyances or equalizing reservoirs. WPTs may bask on the shore of conveyances, or in slow moving or static parts of irrigation conveyances and equalizing reservoirs; they may enter the water when startled or to forage for prey. Once in a treated conveyance, a WPT or GGS may be exposed to copper or acrolein through contact with treated water, ingestion of treated water, or consumption of prey items that may have had contact with treated water.

Methods for Estimating Risk

For contaminants frequently considered in ecological risk assessments, regulatory agencies, such as USEPA, have developed Toxicity Reference Values (TRVs) for each contaminant. However, published TRVs generally do not exist for pesticides. Therefore, pesticide-specific TRVs were derived as part of this document (USEPA 1999). Endpoints from studies available from the published literature or government reports and databases can be used to establish TRVs. The endpoints used to estimate risk of copper and acrolein to the giant garter snake and western pond turtle were found in USEPA's OPP database. As applications of copper- and acrolein-containing

algaecides and/or aquatic herbicides are sufficiently intermittent, and copper and acrolein are not significantly persistent within the water column, only acute exposures were considered. As such, acute TRVs are derived for purposes of risk estimation.

The USEPA (2004) suggests applying a 20X safety factor to acute median toxicity values (LC50s and LD50s) for aquatic threatened or endangered species and a 10X safety factor for terrestrial threatened or endangered species when deriving TRVs from literature studies. In this analysis, a safety factor of 10X was applied to the endpoint used to derive the TRV for both the giant garter snake and the western pond turtle.

For certain pesticides, no toxicity results were available for various taxonomic groups. For example, database and literature searches for acrolein or copper toxicity testing of reptiles did not yield any useable studies. In this case, avian (bird) toxicity endpoints were used in place of specific toxicity values for reptile species. The uncertainty involved with using avian endpoint data to estimate risk to a reptile species does not require the application of an additional safety factor (USEPA 2004).

Once a TRV has been derived, it may be compared to an exposure estimate to evaluate whether an adverse effect for a given species is likely to occur. Exposures may be estimated using parameters from the Wildlife Exposure Factors Handbook (1993). If an estimated exposure is lower than the derived TRV, the exposure scenario is not considered to pose a risk.

Risk is estimated by comparing the estimated exposure (EE) in milligrams herbicide per kilogram of bodyweight per day (mg/kg-day) with the derived TRV to calculate a risk value (unitless). Risk is present when the EE divided by the TRV is greater than or equal to 1.0. If an estimated exposure is lower than the derived TRV, the resultant risk quotient (RQ) value is less than 1.0, and the exposure is not considered to pose a risk.

$$\text{Risk Quotient} = EE/TRV$$

Where:
EE = Estimated Exposure
TRV = derived Toxicity Reference Value

In this assessment, only oral exposure was considered for wildlife because little or no dermal and inhalation toxicity data exist for ecological receptors. Therefore, the sole exposure pathway that could be evaluated in this assessment was through oral exposure; data used to generate TRVs and EEs are based on the oral exposure pathway.

Acrolein Discussion

Since no published TRVs for acrolein was available for reptiles such as turtles and snakes, the approach used here was to select the most sensitive avian endpoint found in the USEPA's OPP database. The most sensitive acrolein endpoint for birds is 9.1 mg acrolein/kg body weight (USEPA 2016a, 2016b). This endpoint was used for derivation of a reptilian TRV by the recommended 10X safety factor for threatened terrestrial species. The derived reptilian TRV of 0.91 mg acrolein/kg body weight was used to determine if the exposure to acrolein-treated water presents a risk to the giant garter snake or western pond turtle.

Use of a standard water intake factor (multiplier applied to water intake based on metabolic need and body weight), and an estimate of the concentration of acrolein in water the snake might drink or indirectly consume was calculated. The methodology for estimating this value is contained in USEPA's Wildlife Factors Handbook (1993). From this, the amount of acrolein consumed per kg of body weight per day was calculated and compared to the TRV to assess the extent of risk. The derived acrolein TRV for reptiles is 0.91 mg acrolein/kg body weight/day.

The application of acrolein at the maximum label rate (15 mg/L) will cause exposure resulting in a RQ of 1.17. Until the water concentration of acrolein drops below 12.8 mg/L, the giant garter snake and western pond turtle are exposed to a concentration of acrolein that may cause risk (i.e., RQ > 1).

Given the conservatively estimated acrolein half-life in irrigation conveyances (10.2 hours), acrolein applied at a maximum label rate (15 mg/L) can be estimated to degrade to below 12.8 mg/L after approximately 2.5 hours. See the acrolein degradation and dissipation table below for details. Once the concentration in the water is below 12.8 mg/L, the giant garter snake and western pond turtle are not anticipated to be at risk from exposure to treated water.

To reduce the risk to the giant garter snake and western pond turtle from exposure to acrolein-treated water to a less-than-significant amount, the District will not make applications of acrolein to its irrigation conveyance system above 12.7 mg/L. Mitigation measure **BIO-1** sets the maximum application rate of acrolein to a concentration below the concentration at which risk from exposure to treated water is estimated. By reducing the water concentration, the District will reduce risk to the giant garter snake and western pond turtle by keeping the estimated exposure less than the derived TRV, resulting in a RQ of less than 1.0. Therefore, no risk to either species is anticipated as a result of acrolein applications made at concentrations up to 12.7 mg/L.

Table 2. Anticipated Rate of Acrolein degradation and Dissipation

Time (Hours)	Time (Days)	Acrolein Concentration (µg/L)
0	0	15,000
2.5	**0.10**	**12,656**
12	0.5	6,636
24	1	2,936
36	1.5	1,299
24	1	2,936
30	1.25	1,953
36	1.5	1,299
42	1.75	864
48	2	575
60	2.5	254
72	3	113
84	3.5	50
96	4	22

108	4.5	10

In order to reduce risk to the giant garter snake and western pond turtle, the following Mitigation Measure shall be implemented:

BIO-1. Applications of acrolein will not be made above 12.7 mg/L to the District's irrigation conveyance system.

Copper Discussion

Since no published TRVs for copper was available for reptiles such as turtles and snakes, the approach used here was to select the most sensitive avian endpoint found in the USEPA's OPP database. The most sensitive endpoint for birds is 357.9 mg copper/kg body weight (USEPA 2016a, 2016b). This endpoint was used for derivation of a reptilian TRV by applying the recommended 10X safety factor for threatened terrestrial species. The derived reptilian TRV of 35.79 mg copper/kg body weight was used to determine if the exposure to copper-treated water presents a risk to the giant garter snake and western pond turtle.

Use of a standard water intake factor (multiplier used to water intake based on metabolic need and body weight), and an estimate of the concentration of copper in water the snake or turtle might drink or indirectly consume was calculated. The methodology for estimating this value is contained in USEPA's Wildlife Factors Handbook (1993). From this, the amount of copper consumed per kg of body weight per day was calculated and compared to the TRV to assess the extent of risk.

It was estimated that applications of copper at the maximum label application rate (1 mg/L) will not lead to a dietary exposure greater than or equal to the dietary TRV for reptiles of 35.79 mg copper/kg body weight/day. Thus, copper applied to irrigation conveyances for aquatic weed or algae control does not appear to pose risk to the giant garter snake or western pond turtle. In support of this statement, the California Department of Fish and Game (now "Wildlife") conducted a study on the effects of oral and dermal exposure to copper (ethylenediamine complex) on two species of garter snakes and did not observe and acute adverse effects (CDFG, 2004).

Item b): ***No Impact.*** The Project will take place in the District's irrigation conveyances, therefore, will not impact any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service.

Item c): ***No Impact*****.** The Project will take place in the District's irrigation conveyances and, therefore, will not impact any upland habitat or wetlands. However, the assessment of risk for species that live in these areas was considered. Risks to these species are adequately mitigated with **BIO-1**.

Item d): ***No Impact*****.** The Project involves applications of acrolein- and copper-containing herbicides to District irrigation conveyances. Project activities will not adversely influence movement of any native, resident, or migratory birds or fish. Items e) and f): ***No Impact*****.** The Project does not conflict with, and has no impact to any local policies, ordinances, or plans protecting biological resources.

3.5 Cultural Resources

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the Project:				
a) Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?	☐	☐	☐	☒
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?	☐	☐	☐	☒
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	☐	☒
d) Disturb any human remains, including those interred outside of formal cemeteries?	☐	☐	☐	☒

Discussion

Items a) through d): ***No Impact.*** The Project is confined to the District's irrigation conveyance system. No known historical or archaeological resource, unique paleontological resource, unique geologic feature, or human remains in or out of formal cemeteries will be impacted.

3.6 Geology and Soils

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the Project:				
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:	☐	☐	☐	☒
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	☐	☐	☐	☒
ii) Strong seismic-related ground shaking?	☐	☐	☐	☒
iii) Seismic-related ground failure, including liquefaction?	☐	☐	☐	☒
iv) Landslides?	☐	☐	☐	☒
b) Result in substantial soil erosion or the loss of topsoil?	☐	☐	☐	☒
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?	☐	☐	☐	☒
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	☐	☐	☐	☒
e) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?	☐	☐	☐	☒

Discussion

Items a) through e): ***No Impact.*** The Project consists of the application of algaecides and/or

aquatic herbicides that contain copper or acrolein to the District's irrigation conveyance system. The Project does not include any new structures, ground disturbances, or other elements that could expose persons or property to geological hazards. There would be no risk of landslide or erosion of topsoil. The Project would not require installation of septic or other wastewater disposal systems.

3.7 Greenhouse Gas Emissions

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the Project:				
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	☐	☐	☒	☐
b) Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	☐	☐	☒	☐

Discussion

Item a) & b): ***Less Than Significant Impact.*** The Project requires the use of pick-up trucks or other service vehicles for purposes of transporting algaecides and/or aquatic herbicides to locations where they are needed. A flatbed truck is used to make applications of algaecides and/or aquatic herbicides. Pick-up trucks are also used for purposes of site reconnaissance before, during, and after application of algaecides and/or aquatic herbicides. Applications are typically brief in duration (1 to 12 hours) and made infrequently (i.e., a few times per year). Although short-term vehicle emissions will be generated during algaecide and/or aquatic herbicide application; these emissions will be minor and create only a small additional contribution to emissions. As a result, project activities are not expected to be cumulatively considerable. To minimize impacts, all equipment will be properly tuned and muffled, and unnecessary idling will be minimized. Generally, one or two vehicles are used for the transport and application of the algaecide and/or aquatic herbicide. As needed, the District may use a small generator or gas-powered pump during the application. The District may also use a boat with an outboard motor in some locations where application from the banks, road crossing, bridge or drop structure is not feasible.

The use of vehicles and application equipment described above are not expected to conflict with or violate greenhouse gas emission standards. Additionally, greenhouse gas emissions generated by Project-related activities will result in considerably less greenhouse gas emission than other alternative IPM methods such as the mechanical harvesting of aquatic vegetation with heavy equipment (e.g. backhoes, excavators and dump trucks).

3.8 Hazards and Hazardous Materials

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the Project:				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☒	☐
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☐	☒	☐
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☒	☐
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☐	☒
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☒

h)	Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☐	☒

Discussion

Items a & b): **Less Than Significant Impact.** The Project would involve handling algaecides and/or aquatic herbicides which are regulated hazardous materials. Acute exposure to humans of the undiluted, formulated product can cause eye, skin, and respiratory irritation, and can be harmful if swallowed. Refer to the product SDSs presented in **Appendix E**. Use of these material would create a potential for spills that could affect worker safety and the environment. The spills could occur potentially at the District storage facilities, at the point of application, or during transport. District staff handles, stores, and transports algaecides and/or aquatic herbicides and disposes of containers in accordance with federal, state, and county requirements and manufacturer's recommendations.

By following the manufacturer's label and SDS directions, and federal, state and county transportation, handling and disposal requirements, the District will minimize the risk of any spill, upset or accident conditions that would cause a hazard to the public or the release of hazardous materials into the environment.

Copper Procedures

The approaches outlined below are supplemented by the following components of the District's aquatic vegetation management program, which would be applied before, during and after the use of algaecides and/or aquatic herbicides that contain copper:

1. District personnel that make algaecide and/or aquatic herbicide applications are themselves, or under the direct supervision of, a DPR-licensed Qualified Applicator Certificate or License holder (QAC/QAL). Expertise and training used by these personnel mitigate potentially significant impacts.
2. A written recommendation is prepared by a DPR-licensed Pest Control Adviser (PCA). A PCA undergoes no less than 40 hours of training every 2 years on issues including health and safety and prevention of exposure to sensitive receptors. The written recommendation prepared by the PCA must evaluate proximity of occupied buildings and people, and health and environmental hazards and restrictions, and include a certification that alternatives and mitigation measures that substantially lessen any significant adverse impact on the environment have been considered and if feasible, adopted. Refer to **Appendix D** for an example PCA Recommendation form.
3. All District personnel applying algaecides and/or aquatic herbicides review and strictly adhere to the product label that has clear and specific warnings that alert users to hazards that may exist. Examples of specific product labels are included in **Appendix E**.
4. All District personnel applying algaecides and/or aquatic herbicides review and consult the product Safety Data Sheet (SDS) (examples provided in **Appendix E**), USEPA Endangered Species Bulletin (if applicable), and the DPR Worker Health and Safety Branch Pesticide Safety Information Series (PSIS). The PSIS and the SDS have specific information that describes precautions to be taken during the use of the algaecides and/or aquatic herbicides.

5. District personnel are familiar with and implement the DPR PSIS series that mitigates potentially significant impacts. For example, the PSIS series describes the personal protective equipment (PPE) needed for the safe handling of algaecides and/or aquatic herbicides, including goggles, disposable coveralls, gloves and respirators, as appropriate.
6. The condition of the irrigation conveyance or equalizing reservoir(s) being treated is field-evaluated to ensure that the application is necessary, feasible and can be conducted safely and according to label. This evaluation considers target algae or weed species, level of infestation, water and flow conditions, alternate control methods, and amount of algaecide and/or aquatic herbicide to be applied.
7. After field evaluation, notice is given to District water operators and growers are given the opportunity to postpone water deliveries in case of sensitive crops or commodities, such as organic crops or fish farms. District water operators are not allowed to make adjustments to the turnout gates during the application and until copper-treated water is not present in the irrigation system.
8. The location(s) at which applications of copper are made is continuously staffed until the application is complete. District staff performing inspections are in continuous cell phone or radio contact with staff making the application. In the event that a spill or leak is discovered during application, the application can be stopped, as feasible. Water delivery to the pipeline or lateral may be reduced or stopped to reduce flow and lessen subsequent leakage. Generally, the application is not restarted until after the leak is fixed.

Acrolein Procedures

The approaches outlined above are supplemented by the following components of the District's aquatic vegetation management program, which would be applied before, during and after the use of algaecides and/or aquatic herbicides that contain acrolein:

1. Signs are posted throughout the District that swimming in conveyances is prohibited.
2. District personnel that make algaecide and/or aquatic herbicide applications are themselves, or under the direct supervision of, a DPR-licensed Qualified Applicator Certificate or License holder (QAC/QAL). Expertise and training used by these personnel mitigate potentially significant impacts.
3. A written recommendation is prepared by a DPR-licensed Pest Control Adviser (PCA). A PCA undergoes 40 hours of training every 2 years on issues including health and safety and prevention of exposure to sensitive receptors. The written recommendation prepared by the PCA must evaluate proximity of occupied buildings and people, and health and environmental hazards and restrictions, and include a certification that alternatives and mitigation measures that substantially lessen any significant adverse impact on the environment have been considered and if feasible, adopted. Refer to **Appendix D** for an example PCA Recommendation form.
4. All District personnel applying algaecides and/or aquatic herbicides review and strictly adhere to the algaecide or aquatic herbicide product label that has clear and specific warnings that alert users to hazards that may exist. Examples of specific product labels are included in **Appendix E**.
5. All District personnel applying algaecides and/or aquatic herbicides review and consult the algaecide or aquatic herbicide Safety Data Sheet (SDS) (examples provided in **Appendix E**), and the DPR Worker Health and Safety Branch Pesticide Safety Information Series

(PSIS). The PSIS and the SDS have specific information that describes precautions to be taken during the use of the algaecides and/or aquatic herbicides.

6. District personnel obtain annual training on the safe application and use of acrolein as described in the Magnacide-H Herbicide Application and Safety Manual.
7. District personnel are familiar with and implement the DPR PSIS series that mitigates potentially significant impacts. For example, the PSIS series describes the personal protective equipment (PPE) needed for the safe handling of algaecides and/or aquatic herbicides, including goggles, disposable coveralls, gloves and respirators, as appropriate.
8. The condition of the irrigation conveyance or equalizing reservoir(s) being treated is field-evaluated to ensure that the application is necessary, feasible and can be conducted safely and according to label. This evaluation considers target algae or weed species, level of infestation, water and flow conditions, alternate control methods, and amount of algaecide and/or aquatic herbicide to be applied.
9. After field evaluation, notice is given to the County Agricultural Commissioner (CAC) and CDFW twenty-four (24) hours prior to application. Growers are also given the opportunity to postpone water deliveries in case of sensitive crops or commodities, such as organic crops or fish farms. District water operators are not allowed to make adjustments to the turnout gates during the application and until acrolein-treated water is not present in the irrigation system, or the 6-day hold period described by the label for acrolein is met.
10. Prior to an application of acrolein, District managers will identify active pipelines to be treated and gates to be closed to prevent the release of treated water from each Division. District managers will then notify and provide these details to all division managers. Notifications are documented on District prepared BMP worksheets.
11. Prior to an application of acrolein, the water operator will seal the last and second-to-last canal gates on active pipelines, and, as necessary, further seal the gates with boards and/or plastic if control structures are leaking.
12. During and after the start of application of acrolein, the District inspects treated conveyances and active pipelines during and following treatment to ensure treated water is irrigated onto fields or held for the label-prescribed 6 days before acrolein treated water is released from the conveyance system. Note that water treated with acrolein is only used for irrigation of fields (crop bearing, fallow, or pasture) where the treated water remains on the field, or held for the label-prescribed period before being released from the conveyance system.
13. District personnel will control small leaks (<1 gallon per minute) that may develop at canal gates with sand bags, leak stop material, plastic sheeting, cat litter, temporary dikes, pumps, by closing gates upstream of the leaking gate, or lowering the level of treated water below the elevation of the leak. All these actions effectively prevent the release of acrolein-treated water from leaving the conveyance system to a drain or surfacewater prior to holding time expiration.
14. The location(s) at which applications of acrolein are made is continuously staffed until the application is complete. District staff performing conveyance inspections are in continuous cell phone or radio contact with staff making the application. In the event that a spill or leak is discovered during application, the application can be stopped, if feasible. Water delivery to the pipeline or lateral may be reduced or stopped to increase freeboard, and lessen or stop subsequent leakage. Generally, the application is not restarted until after the spill or leak is fixed.

Item c): ***Less Than Significant Impact.*** There may be schools located within ¼ mile of locations

were applications may be made. However, applicators will be present at the application sites and will not let unauthorized people (including students) near application equipment. Project applications do not result in a release of copper to the air so no airborne risk is present. Once copper has been applied to the water, there are no restrictions on contact with the water. When acrolein is introduced into water, small amounts of acrolein may volatilize into the air above the canal water. However, because of its low concentration and rapid dissipation, acrolein does not pose unacceptable risk associated with applications near schools.

Item d): ***No Impact.*** The Project, the area within the District's conveyance system, is not listed on any hazardous waste site lists compiled in Government Code Section 65962.5.

Items e) & f): ***No Impact.*** The Stockton Metropolitan Airport is located within 2 miles of the project location. However, the Project does not result in a safety hazard for people residing or working in or around the airport.

Item g): ***No Impact.*** The Project will not impact emergency evacuation routes because public roadways are not affected by the Project.

Item h): ***No Impact.*** The Project will not increase fire hazards at the Project sites. Truck access and parking near application sites is done in such a manner so as to minimize or eliminate muffler contact with dry grass.

3.9 Hydrology and Water Quality

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the Project:				
a) Violate any water quality standards or waste discharge requirements?	☐	☒	☐	☐
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☐	☒
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?	☐	☐	☐	☒
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on-or off-site?	☐	☐	☐	☒
e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☐	☐	☒
f) Otherwise substantially degrade water quality?	☐	☐	☐	☒
g) Place housing within100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	☒

h)	Place within a 100-year flood hazard area structures which would impede or redirect flood flows?	☐	☐	☐	☒
i)	Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☐	☒
j)	Inundation by seiche, tsunami, or mudflow?	☐	☐	☐	☒

Discussion

The District implements an IPM program for algae and aquatic weed control pursuant to the NPDES aquatic pesticide permit. The IPM program involves the scouting of algae and aquatic weed locations and densities, establishment of thresholds above which control is needed, and making applications of algaecides and/or aquatic herbicides on an "as-needed" basis to achieve the algae and aquatic weed control necessary to convey water.

Depending on algae or aquatic weed presence, algaecides and/or aquatic herbicides containing copper and acrolein may be applied as necessary between the months of April and October. Some years, acrolein- and copper-containing products may not be applied. Treatments may be made throughout the irrigation conveyance system. The District makes no acrolein or copper applications to its drainage channels.

Applications of acrolein- or copper-containing products will be done over a short duration (typically less than approximately 12 hours per location) and not all irrigation conveyances are treated at the same time, for the same length of time, or treated during every application. Depending on weed or algae presence, some irrigation conveyances may not get treated at all while others may require multiple treatments the same season.

For applications of acrolein, water in the irrigation conveyance system is either held in the system for the label-prescribed 6-day hold time or delivered as irrigation water to a grower's field. Copper-based and acrolein-based herbicides will be discussed for checklist item a) above. All other checklist items will be discussed together at the end of this section.

Copper Procedures

The approaches outlined below are supplemented by the following components of the District's aquatic vegetation management program, which would be applied before, during and after the use of algaecides and/or aquatic herbicides that contain copper:

1. District personnel that make algaecide and/or aquatic herbicide applications are themselves, or under the direct supervision of, a DPR-licensed Qualified Applicator Certificate or License holder (QAC/QAL). Expertise and training used by these personnel mitigate potentially significant impacts.
2. A written recommendation is prepared by a DPR-licensed Pest Control Adviser (PCA). A PCA undergoes 40 hours of training every 2 years on issues including health and safety and prevention of exposure to sensitive receptors. The written recommendation prepared by the PCA must evaluate proximity of occupied buildings and people, and health and environmental hazards and restrictions, and include a certification that alternatives and

mitigation measures that substantially lessen any significant adverse impact on the environment have been considered and if feasible, adopted. Refer to **Appendix D** for an example PCA Recommendation form.

3. All District personnel applying algaecides and/or aquatic herbicides review and strictly adhere to the product label that has clear and specific warnings that alert users to hazards that may exist. Examples of specific product labels are included in **Appendix E**.
4. All District personnel applying algaecides and/or aquatic herbicides review and consult the product Safety Data Sheet (SDS) (examples provided in **Appendix E**), USEPA Endangered Species Bulletin (if applicable), and the DPR Worker Health and Safety Branch Pesticide Safety Information Series (PSIS). The PSIS and the SDS have specific information that describes precautions to be taken during the use of the algaecides and/or aquatic herbicides.
5. District personnel are familiar with and implement the DPR PSIS series that mitigates potentially significant impacts. For example, the PSIS series describes the personal protective equipment (PPE) needed for the safe handling of algaecides and/or aquatic herbicides, including goggles, disposable coveralls, gloves and respirators, as appropriate.
6. The condition of the irrigation conveyance or equalizing reservoir(s) being treated is field-evaluated to ensure that the application is necessary, feasible and can be conducted safely and according to label. This evaluation considers target algae or weed species, level of infestation, water and flow conditions, alternate control methods, and amount of algaecide and/or aquatic herbicide to be applied.
7. After field evaluation, notice is given to District water operators and growers are given the opportunity to postpone water deliveries in case of sensitive crops or commodities, such as organic crops or fish farms. District water operators are not allowed to make adjustments to the turnout gates during the application and until copper-treated water is not present in the irrigation system.
8. The location(s) at which applications of copper are made is continuously staffed until the application is complete. District staff performing inspections are in continuous cell phone or radio contact with staff making the application. In the event that a spill or leak is discovered during application, the application can be stopped, as feasible. Water delivery to the pipeline or lateral may be reduced or stopped to reduce flow and lessen subsequent leakage. Generally, the application is not restarted until after the leak is fixed.

Acrolein Procedures

The approaches outlined above are supplemented by the following components of the District's aquatic vegetation management program, which would be applied before, during and after the use of algaecides and/or aquatic herbicides that contain acrolein:

1. Signs are posted throughout the District that swimming in conveyances is prohibited.
2. District personnel that make algaecide and/or aquatic herbicide applications are themselves, or under the direct supervision of, a DPR-licensed Qualified Applicator Certificate or License holder (QAC/QAL). Expertise and training used by these personnel mitigate potentially significant impacts.
3. A written recommendation is prepared by a DPR-licensed Pest Control Adviser (PCA). A PCA undergoes 40 hours of training every 2 years on issues including health and safety and prevention of exposure to sensitive receptors. The written recommendation prepared by the PCA must evaluate proximity of occupied buildings and people, and health and

environmental hazards and restrictions, and include a certification that alternatives and mitigation measures that substantially lessen any significant adverse impact on the environment have been considered and if feasible, adopted. Refer to **Appendix D** for an example PCA Recommendation form.

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6. District personnel obtain annual training on the safe application and use of acrolein as described in the Magnacide-H Herbicide Application and Safety Manual.
7. District personnel are familiar with and implement the DPR PSIS series that mitigates potentially significant impacts. For example, the PSIS series describes the personal protective equipment (PPE) needed for the safe handling of algaecides and/or aquatic herbicides, including goggles, disposable coveralls, gloves and respirators, as appropriate.
8. The condition of the irrigation conveyance or equalizing reservoir(s) being treated is field-evaluated to ensure that the application is necessary, feasible and can be conducted safely and according to label. This evaluation considers target algae or weed species, level of infestation, water and flow conditions, alternate control methods, and amount of algaecide and/or aquatic herbicide to be applied.
9. After field evaluation, notice is given to the County Agricultural Commissioner (CAC) and CDFW twenty-four (24) hours prior to application. Growers are also given the opportunity to postpone water deliveries in case of sensitive crops or commodities, such as organic crops or fish farms. District water operators are not allowed to make adjustments to the turnout gates during the application and until acrolein-treated water is not present in the irrigation system, or the 6-day hold period described by the label for acrolein is met.
10. Prior to an application of acrolein, District managers will identify active pipelines to be treated and gates to be closed to prevent the release of treated water from each Division. District managers will then notify and provide these details to all division managers. Notifications are documented on District prepared BMP worksheets.
11. Prior to an application of acrolein, the water operator will seal the last and second-to-last canal gates on active pipelines, and, as necessary, further seal the gates with boards and/or plastic if control structures are leaking.
12. During and after the start of application of acrolein, the District inspects treated conveyances and active pipelines during and following treatment to ensure treated water is irrigated onto fields or held for the label-prescribed 6 days before acrolein treated water is released from the conveyance system. Note that water treated with acrolein is only used for irrigation of fields (crop bearing, fallow, or pasture) where the treated water remains on the field, or held for the label-prescribed period before being released from the conveyance system.
13. District personnel will control small leaks (<1 gallon per minute) that may develop at canal gates with sand bags, leak stop material, plastic sheeting, cat litter, temporary dikes, pumps, by closing gates upstream of the leaking gate, or lowering the level of treated water below the elevation of the leak. All these actions effectively prevent the release of acrolein-

treated water from leaving the conveyance system to a drain or surfacewater prior to holding time expiration.

14. The location(s) at which applications of acrolein are made is continuously staffed until the application is complete. District staff performing conveyance inspections are in continuous cell phone or radio contact with staff making the application. In the event that a spill or leak is discovered during application, the application can be stopped, if feasible. Water delivery to the pipeline or lateral may be reduced or stopped to increase freeboard, and lessen or stop subsequent leakage. Generally, the application is not restarted until after the spill or leak is fixed.

Item a): **Potentially Significant Unless Mitigation Incorporated**. As presented in Section 1.2, the District intends to obtain coverage under the 2013 General Permit that requires compliance with the SIP and the CTR. The District is also requesting an exception under Section 5.3 of the SIP to allow applications of algaecides and/or aquatic herbicides that contain copper and acrolein that exceed CTR water quality criteria for a short-term or seasonal basis.

Acrolein Discussion

Application of acrolein according to label direction typically results in a concentration of approximately 5,000 ug/L in conveyance water, although applications may be made as high as the maximum label application rate of 15,000 ug/L. Water treated with acrolein is only used for irrigation of fields (crop bearing, fallow, or pasture) where the treated water remains on the field, or is held in the irrigation conveyance for 6 days before being released.

Water quality criteria for acrolein are described in the CTR as 320 ug/L for sources of drinking water and 780 ug/L for “other waters” (CTR 2000); and by Central Valley RWQCB as 110 ug/L for the acrolein taste and odor threshold (RWQCB 2016). The CTR value is based on human health protection for sources of drinking water and fish consumption. The RWQCB value is based on a taste and odor threshold to prevent adverse taste and odors in waters of the State.

The Permit identifies receiving water limitations for acrolein as follows: MUN: 320 ug/L; WARM or COLD: 21 ug/L; and Other than MUN, WARM, or COLD: 780 ug/L. “MUN” is not applicable to the District’s irrigation conveyance system; “Other than MUN, WARM, or COLD” is applicable to the remainder of the irrigation conveyance system, and “WARM or COLD” is applicable to receiving waters downstream and outside of the District’s irrigation conveyance system.

The aforementioned water quality criteria are expected to be exceeded within the District’s conveyance system at and downstream of the application site after application, when acrolein is applied at label rates. Accordingly, the District is obtaining a SIP exception.

Acrolein applications are made to moving water exposed to sunlight, generally during the summer months. As such, the combination of dilution, evaporation, and degradation due to exposure to water and sunlight result in relatively fast rates of degradation. Numerous references in scientific literature report half-lives ranging from 3-10.2 hours (Turner 2003; WHO 2002). Given a starting concentration of 15,000 ug/L and a conservatively estimated half-life of 10.2 hours, acrolein can reasonably be expected to dissipate according to **Table 2** as shown in Section 3.4.

As **Table 2** shows, only a short-term acrolein CTR water quality criteria exceedance are expected to occur in District conveyances. The temporary acrolein CTR exceedance is

estimated to return below the 780 ug/L WQO in less than 2 days. It is anticipated that the water concentration will return to below the "WARM or COLD" receiving water limit of 21 ug/L in just over 4 days.

In spite of significant evidence that suggests that when used according to label directions by qualified personnel, impacts of acrolein-containing algaecides and/or aquatic herbicides have no significant impact, the District will implement the following mitigation measures to continue operating without a significant impact and reduce any future potentially significant impacts to less than a significant level: The mitigation measures are:

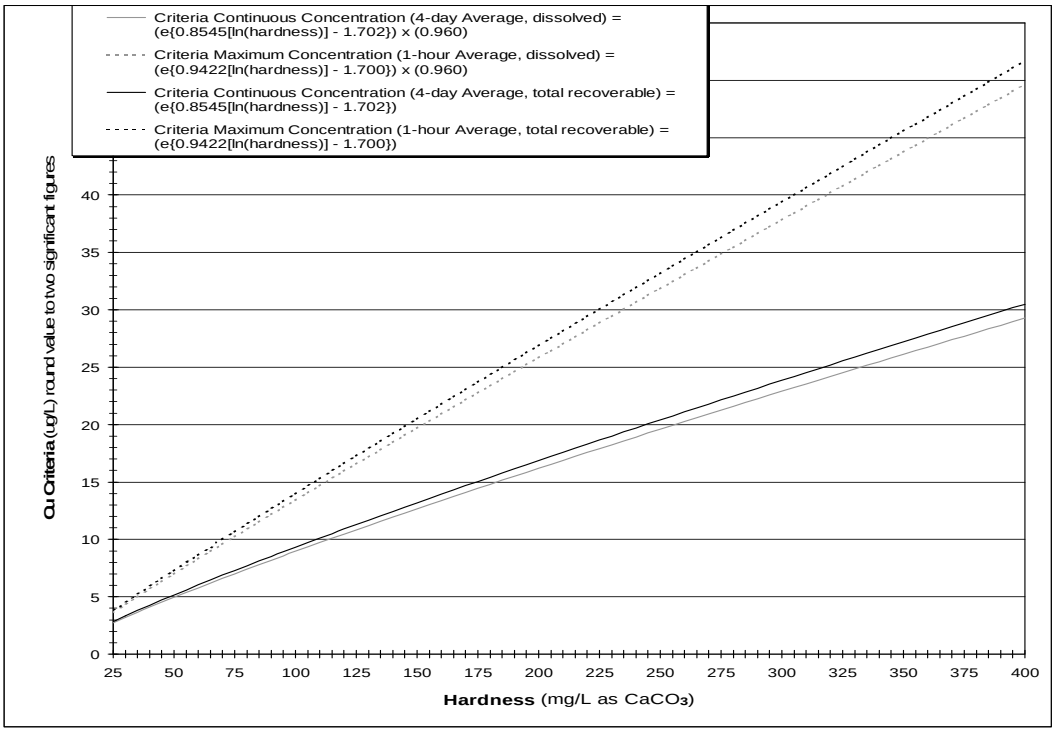
HWQ-1. As required by the SIP and the SWRCB general permit for the application of algaecides and/or aquatic herbicides, the District will conduct monitoring and reporting of applications of copper- and acrolein-containing products consistent with the District's existing Aquatic Pesticide Application Plan (APAP). The APAP calls for surfacewater sampling and analysis before, during, and after Project completion to assess the impact, if any, that the Project may have on beneficial uses of water. Additionally, consistent with SIP exception requirements, a qualified biologist certify that beneficial uses of receiving waters have been restored.

BIO-1. Applications of acrolein will not be made above 12.7 mg/L to the District's irrigation conveyance system.

Copper Discussion

Applications of copper-based algaecides and/or aquatic herbicides according to label direction typically require concentrations of copper between 500 and 1,000 ug/L metallic copper. Water quality criteria for copper as described in the CTR and by the Central Valley RWQCB (CTR 2000; RWQCB 2016) are hardness-dependent. Refer to **Figure 3**. District water varies in hardness throughout the season.

Figure 3. Cu Criteria Dependence on Hardness



Based on the relation of copper criteria to hardness, the Permit defined copper concentration criteria for a continuous dissolved concentration (4 day average) would be:

$$\text{Continuous Dissolved Copper Concentration} = e^{\{0.8545[\ln(\text{hardness})]-1.702\}} \times (0.960)$$

For example, if a conveyance has a hardness of 48 mg $CaCO_3$/L, the continuous dissolved concentration (4 day average) water quality criteria for copper in District conveyances will be the following (City of Manteca, 2013):

Continuous Dissolved Concentration (4 day Average) 4.78 µg/L

These water quality criteria are exceeded at and downstream of the point of algaecide and/or aquatic herbicide introduction into the conveyance. Accordingly, because label application rates likely exceed the CTR water quality criteria, the District is obtaining a SIP exception.

As a result of both dilution and uptake, copper-containing algaecide and/or aquatic herbicides applied in District conveyances rapidly dissipate and/or become permanently insoluble and as a result are not bioavailable shortly after application (CDFA 2002; Trumbo 1997, 1998; WA DOE 2004). When copper is applied according to label direction, its half-life is between 3 and 19 hours due to a combination of precipitation, absorption by biota, adsorption by particulate matter, and adsorption or complexation with organic matter. Refer to **Appendix C.**

Given a starting concentration of 1000 µg/L metallic copper and a conservative half-life of 19 hours, copper can reasonably be expected to dissipate according to **Table 3** below:

Table 3. Anticipated Rate of Copper Dissipation

Time (Hours)	Time (Days)	Copper Concentration (µg/L metallic copper)
0	0	1,000
6	0.25	803
12	0.5	645
24	1	417
48	2	174
72	3	72
96	4	30
120	5	13
144	6	5.2
168	7	2.2
192	8	0.91
216	9	0.38
240	10	0.16
264	11	0.07
288	12	0.03
312	13	0.01

As **Table 3** shows, only a short-term (less than 7 days) copper water quality criteria exceedance is expected to occur in District conveyances.

In addition to using a hardness based approach to quantifying copper water quality criteria, the USEPA suggests the use of another model, described below, to analyze and/or predict toxicity of bioavailable copper in the water column. In the 2007 revision of Aquatic Life Ambient Freshwater Quality Criteria-Copper (USEPA 2007), the USEPA recommended the Biotic Ligand Model (BLM) as a more accurate approach for assessing toxicity and deriving freshwater quality criteria for copper. The BLM supplements USEPA's previously published recommendation of using the hardness-based estimation and better accounts for the reduction in copper bioavailability that results from competitive binding of copper to other molecules in the water column.

The BLM was developed to predict copper toxicity to aquatic organisms in relation to water quality parameters including pH, hardness, alkalinity, and dissolved organic carbon (DOC). According to the BLM, copper bioavailability is strongly influenced by these parameters. The free cupric ion (Cu^{2+}) is the primary driver of copper bioavailability and toxicity in aquatic ecosystems (USEPA 2007).

In order to derive freshwater quality criterion for copper, the BLM uses ten water quality inputs: temperature; pH; dissolved organic carbon (DOC); major cations including calcium (Ca), magnesium (Mg), sodium (Na), potassium (K); major anions including sulfate (SO_4), chloride (Cl); and alkalinity. Copper may be measured for comparison with site-specific criteria, but it is not required as an input to the model to determine copper freshwater quality criteria. The BLM-based water quality criterion for copper may be more or less stringent than the hardness-based

criteria depending on the water quality parameters. However, it is a more accurate than hardness-based criteria because it is based on copper bioavailability to aquatic species.

The BLM may also be used to predict copper toxicity and speciation in varying water conditions. When the model is run in toxicity prediction mode, it predicts the concentration of dissolved copper that produces a particular endpoint (e.g. NOAEL, LOAEL, or LC_{50}) for the selected aquatic species. When run in speciation prediction mode, the model can determine the various forms (e.g. $CuCO_3$, Cu^{2+}, copper bound to DOC) and concentrations of copper in the water when known copper concentration in water is input in the model.

Using the BLM in copper speciation prediction mode, a total of 27 graphs have been generated to illustrate how variations in water quality parameters including pH, hardness, alkalinity, and dissolved organic carbon (DOC) influence the concentration of bioavailable Cu^{2+} (see **Appendix C**). Generally, an increase in one or more of the four water parameters lowers the concentration of the Cu^{2+} species, thereby lowering the bioavailability of copper. Graph 20 and 21 most closely represent copper speciation as predicted by the BLM in District conveyances.

When used according to label directions by qualified personnel, impacts of copper-containing algaecides and/or aquatic herbicides have no significant impact. The District will implement the following mitigation measure for applications of copper to continue operating without a significant impact and reduce any future potentially significant impacts to less than a significant level: These mitigation measures for applications of copper is:

HWQ-1. As required by the SIP and the SWRCB general permit for the application of algaecides and/or aquatic herbicides, the District will conduct monitoring and reporting of applications of copper- and acrolein-containing products consistent with the District's Aquatic Pesticide Application Plan (APAP). The APAP calls for surfacewater sampling and analysis before, during, and after Project completion to assess the impact, if any, that the Project may have on beneficial uses of water. Additionally, consistent with SIP exception requirements, a qualified biologist certify that beneficial uses of receiving waters have been restored.

Item b): ***No Impact.*** The Project will not involve any construction activities or require the use of groundwater and therefore there is no impact on groundwater recharge or supplies.

Items c), d), & e): ***No Impact.*** The Project will not involve construction of any structures that would alter drainage patterns or increase storm water runoff. The Project will not increase erosion or siltation on- or off-site. No streambeds will be altered. No increase in drainage capacity of local storm sewers will be required.

Item f): See response to item a).

Items g), h), i), & j): ***No Impact.*** Since the Project involves no new construction, no housing or other structures will be placed within a designated 100-year floodplain. The Project will not alter the floodplain or have the potential to redirect flood flows. The Project will not be subject to tsunami or inundation due to mudflows. Nor will the Project expose personnel to a substantial risk due to seiche waves or from flooding as a result of a catastrophic levee or dam failure.

3.10 Land Use Planning

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the Project:				
a) Physically divide an established community?	☐	☐	☐	☒
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☐	☒
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☐	☐	☒

Discussion

Item a): ***No Impact.*** The Project will be implemented within the District's existing conveyance system. Nearby housing will not be affected. The Project will not result in any division of an established community.

Item b): ***No Impact.*** The Project will not create any new land uses or alter any existing uses and would not conflict with any applicable land use plan, policy or agency regulation.

Item c): ***No Impact.*** Refer to Section 3.4, item f). The Project does not conflict with any known plans.

3.11 Mineral Resources

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the Project:				
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	☒
b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan other land use plan?	☐	☐	☐	☒

Discussion

Items a) & b): ***No Impact.*** The Project involves the addition of algaecides and/or aquatic herbicides that contain copper or acrolein to the District's irrigation conveyance system and has no impact on the availability of any known mineral resource recovery or locally-important mineral resource recovery site.

3.12 Noise

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the Project result in:				
a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☐	☐	☒
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☐	☒
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☒
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☒
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

Discussion

Items a) through d): ***No Impact.*** Project activity primarily occurs in rural and agriculturally-dominated areas that commonly have machinery operating that include tractors, generators, large groundwater and irrigation pumps and heavy trucks. Project activity in urban areas is consistent with ambient noise from adjacent roads and other typical urban activities. Application equipment includes the use of pick-up and flatbed trucks, and occasionally a small generator and/or an outboard boat motor. The incidental noise and vibration generated

by the use of small engines or trucks is temporary and inconsequential and thus will have no impact.

Items e) & f): ***No Impact.*** Stockton Metropolitan Airport is located within two miles of the District boundaries. However, the Project will not result in excessive noise levels for people working or living within these areas.

3.13 Population and Housing

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the Project:				
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☐	☒
b) Displace substantial numbers of existing housing units, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

Discussion

Items a) through c): ***No Impact.*** No new homes, roads or other infrastructure will be required. No displacement of existing homes or people will occur.

3.14 Public Services

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:	☐	☐	☐	☒
Fire protection?	☐	☐	☐	☒
Police protection?	☐	☐	☐	☒
Schools?	☐	☐	☐	☒
Parks?	☐	☐	☐	☒
Other public facilities?	☐	☐	☐	☒

Discussion

Item a): ***No Impact.*** The Project will not alter or require the construction of new schools, parks, or other public facilities, nor will it increase the need for police and fire services beyond existing conditions.

3.15 Recreation

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	☒
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse effect on the environment?	☐	☐	☐	☒

Discussion

Items a) & b): ***No Impact.*** The Project takes place in the District's irrigation conveyance system. District policy strictly prohibits swimming and fishing in conveyances. Treatment of algae and aquatic vegetation improves the ability of the District to deliver water for irrigation purposes and has no impact on recreational activities.

3.16 Transportation/Traffic

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the Project:				
a) Cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections)?	☐	☐	☐	☒
b) Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways?	☐	☐	☐	☒
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that result in substantial safety risks?	☐	☐	☐	☒
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☐	☒
e) Result in inadequate emergency access?	☐	☐	☐	☒
f) Result in inadequate parking capacity?	☐	☐	☐	☒
g) Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?	☐	☐	☐	☒

Discussion

Items a) & b): ***No Impact.*** The Project involves the use of light duty trucks that will not cause an increase in traffic that is substantial in relation to the existing traffic load and capacity of the county roads in the Project area. Generally, activity related to the Project is limited to one or two vehicles at any given time.

Item c): ***No Impact.*** The Project has no influence on air traffic.

Items d) through g): ***No Impact.*** The Project does not involve changes in road design or encourage incompatible road or highway uses. Further, the Project does not impact emergency access

or parking. Lastly, the Project does not impact or conflict with adopted policies, plans, or programs supporting alternative transportation.

3.17 Utilities and Service Systems

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the Project:				
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☐	☒
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☐	☐	☒
e) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☐	☒
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☐	☒
g) Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☐	☒

Discussion

Items a) & b), and e) through g): ***No Impact.*** The Project will not discharge to a wastewater treatment plant and does not generate any solid waste. All containers used to store and transport algaecides and/or aquatic herbicides are typically returned to the vendor for reuse or recycling.

Item c): ***No Impact.*** The Project will not require the construction of new storm water drainage

facilities or expansion of existing facilities.

Item d): ***No Impact.*** The Project involves the treatment of algae and/or aquatic vegetation in conveyances used to transport irrigation water and has no known influence on the entitlements or resources utilized by the District.

3.18 Mandatory Findings of Significance

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal, or eliminate important examples of the major periods of California history or prehistory?	☐	☒	☐	☐
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?	☐	☐	☒	☐
c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☒	☐

Item a): **Potentially Significant Unless Mitigation Incorporated.** The Project involves the use of acrolein- and copper-based algaecides and/or aquatic herbicides introduced into the District's conveyances at concentrations that temporarily exceed CTR water quality objectives. Significant evidence suggests that, when used according to label directions by qualified personnel, CTR exceedance is short-term and impacts of these algaecides and/or aquatic herbicides are less than significant. Further, the District will implement mitigation measure **HWQ-1** to reduce any potential impacts to water quality to a less than significant level.

To reduce the risk of acrolein applications for the giant garter snake and western pond turtle, the District will implement mitigation measure **BIO-1**.

Although copper- and acrolein-containing algaecides and/or aquatic herbicides are hazardous materials, under the standard operating procedures that will be used by District

personnel, there is a less than a significant potential for impact.

Item b): **Less Than Significant Impact.** The cumulative impacts of continued application of copper-based algaecides and/or herbicides are not precisely known. However, studies examining the relationship between sediment copper concentration and toxicity support the conclusion that sediment-bound copper is not bioavailable. Deaver *et al.* (1996) compared limnetic water and copper-amended sediment toxicity to *Hyalella azteca*, an epibenthic detritivore sentinel species, and found that sediment concentrations were not predictive of copper toxicity across various water and sediment conditions. The limnetic water median lethal concentration (LC_{50}) of the free cupric ion, however, varied by <4% in the sediment-toxicity tests, indicating that the form of copper associated most strongly with toxicity (i.e. the bioavailable fraction) in its aquatic phase rather than sediment-bound copper. These results are corroborated by those of Suedel *et al.* (1996) which showed that copper toxicity to several aquatic organisms, including fish, water fleas, a midge, and an amphipod species, were correlated with overlying (limnetic) water concentration rather than sediment or pore water concentration. As noted in this document and its appendices, copper-containing algaecides and/or aquatic herbicides rapidly dissipate and/or become permanently insoluble, and as a result, are not bioavailable shortly after application (CDFA 2002; Trumbo 1997, 1998; WA DOE 2004).

Toxicity studies have also been conducted using water and sediment samples from copper herbicide application sites. Gallagher et al. (2005) collected water and sediment samples from a 20,234 hectare lake treated for 10 years in some areas with Komeen, a form of chelated copper applied annually at concentrations of 1 mg Cu/L. This rate of application is similar to the rate and application interval to what the District anticipates using. The Gallagher study also looked at untreated areas to assess bioavailability to *Hyalella azteca* and *Ceriodaphnia dubia*. No statistical differences in response of either *H. azteca* or *C. dubia* to treated (16.3-18.0 mg Cu/kg) and untreated (0.3 mg Cu/kg) sediments were observed when compared to control sediments. In a 10-day exposure study by Huggett *et al.* (1999), sediments were collected from Steilacoom Lake (WA) and amended with $CuSO_4$ (800-2,000 mg Cu/kg dry weight) to assess copper bioavailability to *H. azteca, Chironomous tentans,* and *C. dubia*. When comparing the no observable adverse effect concentrations (NOECs) derived under these experimental conditions (906-2,010 mg Cu/kg) with the current concentrations of copper in the lake sediment (180-1,110 mg Cu/kg), it is apparent that the sediment-bound copper in the lake is not bioavailable to the three species.

Acrolein is not persistent within the environment as it degrades rapidly due to its relatively high rate of hydrolysis, indirect photolysis, and both aerobic and anaerobic biodegradation (ATSDR 2007). Direct photolysis also occurs, but this is considered relatively minor compared to the other degradative pathways. Due to its relatively high vapor pressure, volatilization is also expected to be a significant removal process for acrolein from surface waters and soil. Based on its low log K_{ow}, acrolein is also not expected to bioconcentrate in organisms or to adsorb significantly to suspended solids or sediments in water. Due to its high reactivity, rapid degradation, and low potential to bioconcentrate or adsorb to sediment or soils, cumulative impacts continued application of acrolein-based algaecides and aquatic herbicides are not expected.

Mitigation has been incorporated into the Project (**HWQ-1 and BIO-1**). This mitigation reduces the impact to a less than a significant.

Item c): **Less Than Significant Impact.** As a result of implementation of District standard

procedures as described in the Hazards and Hazardous Materials section, hazard/hazardous material impacts to the human beings is reduced to a less than a significant level.

4 MITIGATION MEASURES

4.1 Biological Resources

BIO-1. Applications of acrolein will not be made above 12.7 mg/L to the District's irrigation conveyance system.

4.2 Hydrology & Water Quality

HWQ-1. As required by the SIP and the SWRCB general permit for the application of algaecides and/or aquatic herbicides, the District will conduct monitoring and reporting of applications of copper- and acrolein-containing products consistent with the District's Aquatic Pesticide Application Plan (APAP). The APAP calls for surfacewater sampling and analysis before, during, and after Project completion to assess the impact, if any, that the Project may have on beneficial uses of water. Additionally, consistent with SIP exception requirements, a qualified biologist certify that beneficial uses of receiving waters have been restored.

4.3 Mitigation Monitoring and Reporting Program

Mitigation measure **HWQ-1** will be accomplished by implementation of the District's Aquatic Pesticide Application Plan (APAP) that requires surface water sampling, analysis, visual monitoring, and reporting as a condition of the NPDES Aquatic Permit issuance. Each year acrolein- or copper-containing products are applied to the District's irrigation conveyance system, a qualified biologist will certify that the beneficial uses of the receiving waters have been restored. The APAP requires an annual report be prepared and submitted to the SWRCB annually on March 1 of the year following applications.

Mitigation measure **BIO-1** will be implemented by the District for applications of acrolein, limiting the maximum application rate to 12.7 mg/L.

Implementation of the **HWQ-1** and **BIO-1** mitigate significant environmental effects of the application of acrolein- and copper-containing algaecides and/or aquatic herbicides.

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6 PERSONS AND AGENCIES CONTACTED

1.) Heather Heinks, Outreach and Communications Manager, San Joaquin Valley Air Pollution Control District

7 LIST OF PREPARERS

1.) Michael S. Blankinship, PE, PCA, Blankinship & Associates, Inc.
2.) David Bonnar, Staff Scientist, Blankinship & Associates, Inc.
3.) Stephen Burkholder, Project Scientist, Blankinship & Associates, Inc.
4.) Steve Metzger, Staff Scientist, Blankinship & Associates, Inc.
5.) Steve Emrick, General Counsel, South San Joaquin Irrigation District
6.) Walt Luihn, Environmental Safety Manager, South San Joaquin Irrigation DistrictPeter Rietkerk, General Manager, South San Joaquin Irrigation District

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Appendix A

(Species Descriptions)

Approach

A Habitat Assessment of the South San Joaquin Irrigation District project site was conducted by Blankinship & Associates, Inc. staff to characterize the habitats present on-site and the likelihood of special status species occurring on the project site.

A list of these special species was compiled using a records search of the California Natural Diversity Database (CNDDB 2016), and current species information from the U.S. Fish and Wildlife Service (USFWS), Sacramento Office Information for Planning and Conservation (IPaC) database (USFWS 2016). Location specific species data is available from both of these sources, and organized geographically into 7.5 minute U.S.G.S. quads. The CNDDB database was queried using the boundary map for the District, and selecting the seven quads in which the District is located. In addition, a buffer area made up of the outlying quads adjacent to the original seven quads was selected for the query, resulting in a total of 25 quads. This approach was used to identify species that might be located in the surrounding areas, but not necessarily reported to CNDDB as a sighting event within the District's boundaries.

Habitat requirements of each of the species were reviewed to determine whether habitat existed within the project area that would meet that species' needs. **Table 1** of the Initial Study & Mitigated Negative Declaration (IS/MND) shows a comprehensive list of species' considered, their conservation status, and whether or not they were considered for evaluation of potential impacts. The life history, including breeding and/or foraging habitat(s) of non-plant species, and the habitat requirements of plant species are described below. Based on **Table 1** of the IS/MND text, if a species' potential habitat was present in the project area, a brief summary of that species is presented below.

Amphibians

The District irrigation conveyance system and equalizing reservoirs are not suitable habitat for any of the amphibians found in the CNDDB query. As such, project activities will not adversely impact amphibians.

Birds

Tricolored Blackbird (*Agelaius tricolor*)

Tricolored blackbird was listed as a candidate threatened species (SCT) on December 11, 2015 (ICE 2015). Breeding habitat of tricolored blackbirds includes large marshes (Payne 1969 in Beedy and Hamilton 1999). Nesting colonies are generally in emergent aquatic vegetation, but may also be found in trees along streams, weed patches, and grain and alfalfa fields, mustard, safflower, thistle, along an irrigation ditch, or in trees along a river (Orians 1960, 1961). In the Central Valley of California, breeding colonies were described where nests were placed in cattail-bulrush in dry and irrigated pasture; cattail in dry grassland, along a creek, rice and wheat fields, or dry and irrigated pasture; and in blackberry in dry grassland and along a creek (Crase and DeHaven 1977). Tricolored blackbirds forage in cultivated row crops, orchards, vineyards, and heavily grazed rangelands, but these are considered low-quality forage habitats. High quality forage areas included irrigated pastureland, lightly grazed rangeland, dry seasonal pools, mowed alfalfa fields, feedlots, and dairies (Beedy and Hamilton 1997 in Beedy and Hamilton 1999). In the Central Valley of California, nestling tricolored blackbirds were fed 86% animal matter on a volumetric basis, 11.2% plant matter, and 2.7% grit. The animal matter was primarily insects (79% of total diet) with the majority being beetles (61% of total diet). Plant matter was split

evenly between cultivated grains such as oats, wheat and miscellaneous plant matter (Crase and DeHaven 1977). Since tricolored blackbirds are unlikely to feed directly from the treated irrigation conveyances, they will have minimal to no exposure to acrolein- or copper-containing algaecides and/or aquatic herbicides applied to the irrigation conveyances. Therefore, no risk is anticipated.

Burrowing Owl (*Athene cunicularia*)
Burrowing owls inhabit dry, open, shortgrass, treeless plains, and are often associated with burrowing mammals. They can also be found at golf courses, cemeteries, road allowances within cities, airports, vacant lots in residential areas and university campuses, and fairgrounds. The presence of a nest burrow seems to be a critical requirement for western burrowing owls (Thomsen 1971 in Haug *et al.* 1993, Martin 1973 in Haug *et al.* 1993, Zarn 1974 in Haug *et al.* 1993, Wedgwood 1978 in Haug *et al.* 1993, Haug 1985 in Haug *et al.* 1993). They typically forage in shortgrass, mowed, or overgrazed pastures; golf courses and airports (Thomsen 1971 in Haug *et al.* 1993). They are opportunistic feeders, eating primarily arthropods, small mammals, and birds. Amphibians and reptiles constitute a minor component to the diet and possibly only in Florida (Wesemann and Rowe 1987 in Haug *et al.* 1993). The terrestrial nature of their foraging habitats and prey base will not result in exposure to algaecides and/or aquatic herbicides applied to irrigation conveyances, no risk is anticipated.

Swainson's Hawk (*Buteo swainsoni*)
Swainson's hawks forage in open stands of grass-dominated vegetation, sparse shrublands, and small, open woodlands. They have adapted well to foraging in agricultural areas (e.g., wheat and alfalfa), but cannot forage in most perennial crops or in annual crops that grow much higher than native grasses (Bechard 1982 in England et al. 1997, Estep 1989 in England et al. 1997, Woodbridge 1991 in England et al. 1997). In Central Valley, CA, they forage in row, grain, and hay crop agriculture, particularly during and after harvest, when prey are both numerous and conspicuous. They also are attracted to flood irrigation, primarily in alfalfa fields, when prey take refuge on field margins, and to field burning, which forces prey to evacuate (J.A. Estep per. comm. in England et al. 1997). During breeding season, Swainson's hawks mainly feed on vertebrates, including mammals, birds, and reptiles (Schmutz et al. 1980 in England et al. 1997, Bednarz 1988 in England et al. 1997). Invertebrates (especially grasshoppers and dragonflies) are commonly eaten at other times (McAtee 1935 in England et al. 1997, Sherrod 1978 in England et al. 1997, Jaramillo 1993 in England et al. 1997). Swainson's hawks do not prey on species likely to be exposed to algaecides and/or aquatic herbicides applied to irrigation conveyances. Therefore, no risk is anticipated.

Yellow-breasted Chat (*Icteria virens*)
Yellow-breasted chat inhabit riparian thickets of willow and other brushy tangles near watercourses (CNDDB 2015). They nest in bushes, brier tangles, vines, and low trees, generally in dense vegetation less than 2 meters above ground (NatureServ 2015). Their diet consists mostly of insects gleaned from foliage and, in late summer, they may also eat small fruits. In winter, they glean foliage for insects and spiders and may also seek out fruit. Because their diet consists of terrestrial food items, yellow-breasted chat are not likely to be exposed to copper- or acrolein-containing algaecides and/or aquatic herbicides applied to irrigation conveyances. Therefore, no risk is anticipated.

Fish

South San Joaquin Irrigation District conveyances are not directly connected to natural watercourses. District water is comprised of irrigation water moving through a system of lined

and unlined canals, and pipelines. As such, project activities will not adversely influence movement of any native resident or migratory fish.

Invertebrates

The District irrigation conveyance system and equalizing reservoirs are not suitable habitat for any of the invertebrates found in the CNDDB query (CNDBB 2016). As such, project activities will not adversely impact invertebrates.

Mammals

Pacific Western (Townsend's) Big-Eared Bat (*Corynorhinus* (*Plecotus*) *townsendii townsendii*)

Townsend's big-eared bats live in a variety of communities, including coastal conifer and broadleaf forests, oak and conifer woodlands, arid grasslands and deserts, and high-elevation forests and meadows. Throughout most of its geographic range, it is most common in mesic sites. Known roosting sites in California include limestone caves, lava tubes, mine tunnels, buildings, and other human-made structures. Both sexes hibernate in buildings, caves, and mine tunnels, either singly (males) or in small groups (Williams 1986). They feed on various flying insects near the foliage of trees and shrubs and may feed primarily on moths (NatureServe 2004). Since the feeding habits do not focus on emergent aquatic insects or other aquatic prey items, big-eared bats would not be exposed to copper-containing algaecides and/or aquatic herbicides. Therefore, no risk is anticipated.

Townsend's Big-eared Bat (*Corynorhinus townsendii*)

Townsend's big-eared bats live in a variety of communities, including coastal conifer and broad-leaf forests, oak and conifer woodlands, arid grasslands and deserts, and high-elevation forests and meadows. Throughout most of its geographic range, it is most common in mesic sites (Kunz and Martin 1982 in Williams 1986). Known roosting sites in California include limestone caves, lava tubes, mine tunnels, buildings, and other human-made structures (Dalquest 1947 in Williams 1986, Graham 1966 in Williams 1986, Pearson et al. 1952 in Williams 1986). Both sexes hibernate in buildings, caves, and mine tunnels, either singly (males) or in small groups (Pearson et al., 1952 in Williams 1986). They feed on various flying insects near the foliage of trees and shrubs and may feed primarily on moths (Barbour and Davis 1969 in NatureServe 2004). Because their diet does not focus on emergent insects or other aquatic-based prey items, big-eared bats would not be to be exposed to copper- and acrolein-containing algaecides and/or aquatic herbicides applied to the irrigation conveyances. Therefore, no risk is anticipated.

Greater Western Mastiff-Bat (*Eumops perotis californicus*)

Mastiff bats favor rugged, rocky areas where suitable crevices area available for day-roosts. Characteristically, day-roosts are located in large cracks in exfoliating slabs of granite or sandstone. The crevices must open downward, be at least 5 cm wide and 30 cm deep, and narrow to at least 2.5 cm at their upper end. Mastiff bats also frequently roost in buildings, provided these have sheltering places with conditions similar to those described above. They forage at an estimated height of as much as 200 ft above the ground. They probably forage for considerable distances from their roosting sites (Williams 1986). The foraging height of these bats precludes exposure to copper- and acrolein-containing algaecides and/or aquatic herbicides applied to the irrigation conveyances. Therefore, no risk is anticipated.

Western Red Bat (*Lasiurus blossevillii)*

The western red bat inhabits grasslands, shrublands, open woodlands, and riparian areas. They typically roost in forests or woodlands, showing a preference for edge habitat (NatureServe 2004, Zeiner *et al.* 1988). Western red bats often roost in tree foliage along edge habitat, with preference given to sites with protection from above and below. They feed on moths, crickets, beetles and flying ants (Zeiner *et al.* 1988). Given their diet of terrestrial invertebrates, western red bats would not be to be exposed to copper- and acrolein-containing algaecides and/or aquatic herbicides applied to the irrigation conveyances. Therefore, no risk is anticipated.

Plants

Watershield (*Brasenia schreberi*)

Watershield is a perennial aquatic plant identified by its distinctive thick coating of gelatinous slime covering the underside of the leaves and coating the stems and buds (CalFlora 2015; WSDE 2014). The species is found throughout most of the United States and southern Canada, but is also known to occur in Central America, Cuba, Africa, East Asia, and Australia. Its habitat includes shallow ponds, lakes, and slowing-moving streams where it grows in water typically 0.5-3 m deep (WSDE, 2014). It is included in the CNPS Inventory of Rare and Endangered Plants on list 2B.3 (common elsewhere and not very endangered in CA) (CNPS 2014). According to the CalFlora Database, there are no reported occurrences of this species within the project area (CalFlora 2015). Watershield is a floating aquatic plant that grows in standing water. District irrigation conveyances and equalizing reservoirs are not suitable habitat for watershield. Watershield habitat requirements include static or slow-moving waterbodies, water depth between 0.5-3 meters, constant water depth, and a thick sediment substrate (Kim 1996). District reservoirs and a large portion of the above-ground conveyance system are concrete lined, water flow in the conveyance system ranges from approximately 1 to 5 mph, and conveyance water depths change frequently depending on irrigation demand by users. Taken together, these factors prevent the establishment of watershield within the District's conveyance system and equalizing reservoirs. As such, exposure of watershield to copper- and acrolein-containing algaecides and/or aquatic herbicides is not expected.

Sanford's Arrowhead (*Sagittaria sanfordii*)

Sanford's arrowhead is a rhizomatous monocot that is native and endemic to California (CalFlora 2015). It is an aquatic perennial herb that occurs in freshwater wetlands, marshes, swamps, and other assorted shallow freshwater (CNPS 2012). Sanford's arrowhead is a member of the Water Plantain family; it is an obligate wetland plant. Its habitat includes the margins of wetland areas such as streams, rivers, ponds, drainage channels, or irrigation canals. It is native to California and is endemic (limited) to California alone. It is included in the CNPS Inventory of Rare and Endangered Plants on list 1B.2 (rare, threatened, or endangered in CA and elsewhere). No reported occurrences of Sanford's arrowhead exist within the project area (CalFlora 2015). District reservoirs and a large portion of the above-ground conveyance system are concrete lined, water flow in the conveyance system ranges from approximately 1 to 5 mph, and conveyance water depths change frequently depending on irrigation demand by users, further reducing or eliminating areas of potential suitable habitat for Sanford's Arrowhead. Sanford's arrowhead is not a submerged aquatic plant. Therefore, exposure to acrolein or copper treated water is indirect, if any. Exposure will only occur through root uptake of soil water. The chemical properties of copper- and acrolein-containing herbicides make it unlikely that copper or acrolein will be able to move through soil pore water to the roots of the plant. As such, the copper and acrolein concentration in root zone water is not expected to be sufficient to impair growth or cause injury or death.

Reptiles

Western Pond Turtle (*Emys marmorata*)

The Western Pond Turtle historically existed from Washington to British Columbia to northern Baja California, west of the Cascade-Sierra crest (Ernst et al 1994). They occupy a wide variety of wetland habitats including lakes, ponds, reservoirs, rivers and streams, stock ponds, and sewage treatment lagoons (Holland 1994). Optimal habitat has adequate emergent basking sites, emergent vegetation, refugia in the form of banks, submerged vegetation, mud, rocks, and logs (Holland 1994). Populations are in decline mainly due to habitat destruction. The species diet consists of a variety of food items including algae, various plants, snails, crustaceans, isopods, insects, fish, and frogs (Bury 1986). Their habitat requirements and feeding habits indicate western pond turtle may consume prey items exposed to algaecides and/or aquatic herbicides applied to the irrigation conveyances, as well has have direct exposure to treated water. Refer to **Appendix B** for a summary of exposure and risk analysis for the western pond turtle.

Giant Garter Snake (*Thamnophis gigas*)

Giant garter snakes occur in streams and sloughs, usually with mud bottom (Stebbins 1985 in NatureServe 2004). One of the most aquatic of garter snakes; usually in areas of freshwater marsh and low-gradient streams with emergent vegetation, also drainage canals and irrigation ditches (CDFG 1990 in NatureServe 2004) and ponds and small lakes (USFWS 1993 in NatureServe 2004). Usually in areas of permanent water, sometimes in areas of temporary water such as irrigation/drainage canals and rice fields (Biosystems Analysis, Inc. 1989 in NatureServe 2004, USFWS 1993 in NatureServe 2004). Adult and immature snakes eat small mammals, invertebrates, and fish (NatureServe 2004). Their habitat requirements and feeding habits indicate giant garter snakes may consume prey items exposed to algaecides and/or aquatic herbicides applied to the irrigation conveyances, as well has have direct exposure to treated water. Refer to **Appendix B** for a summary of exposure and risk analysis for the giant garter snake.

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Appendix B

(Copper and Acrolein Species-Specific Risk and Ecological Toxicity Data)

Toxicity Reference Values and Risk

For contaminants frequently considered in ecological risk assessments, regulatory agencies, such as USEPA, have developed Toxicity Reference Values (TRVs) for each contaminant. However, published TRVs generally do not exist for pesticides. Therefore, pesticide-specific TRVs were derived as part of this document (USEPA 1999). Endpoints from studies available from the published literature or government reports and databases can be used to establish TRVs. The endpoints used to estimate risk of copper and acrolein to the giant garter snake and western pond turtle were found in USEPA's OPP database (USEPA 2016a; USEPA 2016b). As applications of copper- and acrolein-containing algaecides and/or aquatic herbicides are sufficiently intermittent, and copper and acrolein are not significantly persistent within the water column, only acute exposures were considered. As such, acute TRVs are derived for purposes of risk estimation.

The USEPA (2004) suggests applying a 20X safety factor to acute median toxicity values (LC50s and LD50s) for aquatic threatened or endangered species and a 10X safety factor for terrestrial threatened or endangered species when deriving TRVs from literature studies. In this analysis, a safety factor of 10X was applied to the endpoint used to derive the TRV for both the giant garter snake and the western pond turtle.

For certain pesticides, no toxicity results were available for various taxonomic groups. For example, database and literature searches for acrolein or copper toxicity testing of reptiles did not yield any useable studies. In this case, avian (bird) toxicity endpoints were used in place of specific toxicity values for reptile species. The uncertainty involved with using avian endpoint data to estimate risk to a reptile species does not require the application of an additional safety factor (USEPA 2004).

Once a TRV has been derived, it may be compared to an exposure estimate to evaluate whether an adverse effect for a given species is likely to occur. Exposures may be estimated using parameters from the Wildlife Exposure Factors Handbook (USEPA 1993). If an estimated exposure is lower than the derived TRV, the exposure scenario is not considered to pose a risk.

Risk is estimated by comparing the estimated exposure (EE) in milligrams herbicide per kilogram of bodyweight per day (mg/kg-day) with the derived TRV to calculate a risk value (unitless). Risk is present when the EE divided by the TRV is greater than or equal to 1.0. If an estimated exposure is lower than the derived TRV, the resultant risk value is less than 1.0, and the exposure is not considered to pose a risk.

Risk = EE/TRV

Where:
EE = Estimated Exposure
TRV = derived Toxicity Reference Value

In this assessment, only oral exposure was considered for wildlife because little or no dermal and inhalation toxicity data exist for ecological receptors. Therefore, the sole exposure pathway that could be evaluated in this assessment was through oral exposure; data used to generate TRVs and EEs are based on the oral exposure pathway.

Acrolein

Since no published TRVs for acrolein was available for reptiles such as turtles and snakes, the approach used here was to select the most sensitive avian endpoint found in the

USEPA's OPP database. The most sensitive acrolein endpoint for birds is 9.1 mg acrolein/kg body weight (USEPA 2016a; USEPA 2016b). This endpoint was used for derivation of a reptilian TRV by the recommended 10X safety factor for threatened terrestrial species. The derived reptilian TRV of 0.91 mg acrolein/kg body weight was used to determine if the exposure to acrolein-treated water presents a risk to the giant garter snake or western pond turtle.

Use of a standard water intake factor (multiplier applied to water intake based on metabolic need and body weight), and an estimate of the concentration of acrolein in water the snake might drink or indirectly consume was calculated. The methodology for estimating this value is contained in USEPA's Wildlife Factors Handbook (USEPA 1993). From this, the amount of acrolein consumed per kg of body weight per day was calculated and compared to the TRV to assess the extent of risk.

It was estimated that applications of acrolein at the maximum label rate (15 mg/L) will cause exposure greater than the derived TRV for reptiles of 0.91 mg acrolein/kg body weight/day with an RQ of 1.17. Until the water concentration of acrolein drops below 12.8 mg/L, the giant garter snake and western pond turtle are exposed to a concentration of acrolein that may cause risk (i.e., RQ > 1).

Given the conservatively estimated acrolein half-life in irrigation conveyances (10.2 hours), acrolein applied at a maximum label rate (15 mg/L) can be estimated to degrade to below 12.8 mg/L after approximately 2.5 hours. See the acrolein degradation and dissipation table below for details. Once the concentration in the water is below 12.8 mg/L, the giant garter snake and western pond turtle are not anticipated to be at risk from exposure to treated water. Alternatively, applications may be made at concentrations lower than the 12.8 mg/L concentration and no risk to western pond turtle or giant garter snake is anticipated.

Time (Hours)	**Time (Days)**	**Acrolein Concentration (µg/L)**
0	0	15,000
2.5	**0.10**	**12,656**
12	0.5	6,636
24	1	2,936
36	1.5	1,299
24	1	2,936
30	1.25	1,953
36	1.5	1,299
42	1.75	864
48	2	575
60	2.5	254
72	3	113
84	3.5	50
96	4	22
108	4.5	10

Acrolein Ecological Toxicity Studies Used to Evaluate Risk

Species (Common Name)	Species (Scientific Name)	Exposure Method	Purity (% A.I.)	Study Duration	Endpoint	Endpoint Estimate	Source
Bobwhite Quail	*Colinus virginianus*	Oral gavage or capsule administration of toxicant	92%	21 day	Oral LD50 (mg/kg-bw)	19	USEPA 2016a,b
Mallard Duck	***Anas platyrhynchos***	**Oral gavage or capsule administration of toxicant**	**92%**	**14 day**	**Oral LD50 (mg/kg-bw)**	**9.11**	USEPA 2016a,b
Mallard Duck	*Anas platyrhynchos*	Oral gavage or capsule administration of toxicant	95.09%	21 day	Oral LD50 (mg/kg-bw)	28	USEPA 2016a,b

General Notes:
The bolded study endpoint estimate was used for derivation of a reptilian TRV.

Abbreviations:
A.I. - Active Ingredient
LD50 - Median Lethal Dose

Copper

Since no published TRVs for copper was available for reptiles such as turtles and snakes, the approach used here was to select the most sensitive avian endpoint found in the USEPA's OPP database. The most sensitive endpoint for birds is 357.9 mg copper/kg body weight (USEPA 2016). This endpoint was used for derivation of a reptilian TRV by applying the recommended 10X safety factor for threatened terrestrial species. The derived reptilian TRV of 35.79 mg copper/kg body weight was used to determine if the exposure to copper-treated water presents a risk to the giant garter snake and western pond turtle.

Use of a standard water intake factor (multiplier used to water intake based on metabolic need and body weight), and an estimate of the concentration of copper in water the snake or turtle might drink or indirectly consume was calculated. The methodology for estimating this value is contained in USEPA's Wildlife Factors Handbook (USEPA 1993). From this, the amount of copper consumed per kg of body weight per day was calculated and compared to the TRV to assess the extent of risk.

It was estimated that applications of copper at the maximum label application rate (1 mg/L) will not lead to a dietary exposure greater than or equal to the dietary TRV for reptiles of 35.79 mg copper/kg body weight/day. Thus, copper applied to irrigation conveyances for aquatic weed or algae control does not appear to pose risk to the giant garter snake or western pond turtle. In support of this statement, the California Department of Fish and Game (now "Wildlife") conducted a study on the effects of oral and dermal exposure to copper (ethylenediamine complex) on two species of garter snakes and did not observe and acute adverse effects (CDFG 2004).

Copper Ecological Toxicity Studies Used to Evaluate Risk

Species (Common Name)	Species (Scientific Name)	Exposure Method	Purity (% A.I.)	Study Duration	Endpoint	Endpoint Estimate	Source
Bobwhite quail	*Colinus virginianus*	Administration of the toxicant ad libitum in the diet	99%	8 day	Oral LC50 (ppm)	>10,000	USEPA 2016a,b
Bobwhite quail	***Colinus virginianus***	**Oral gavage or capsule administration of the toxicant**	**99%**	**14 day**	**Oral LD50 (mg/kg-bw)**	**357.9**	**USEPA 2016a,b**
Bobwhite quail	*Colinus virginianus*	Oral gavage or capsule administration of the toxicant	99%	14 day	Oral LD50 (mg/kg-bw)	368	USEPA 2016
Mallard duck	*Anas platyrhynchos*	Administration of the toxicant ad libitum in the diet	99%	8 day	Oral LC50 (ppm)	>10,000	USEPA 2016a,b
Ring-necked pheasant	*Phasianus colchicus*	Administration of the toxicant ad libitum in the diet	NR	8 day	Oral LC50 (ppm)	>40,000	USEPA 2016a,b

General Notes:
The bolded study endpoint estimate was used for derivation of a reptilian TRV.

Abbreviations:
A.I. - Active Ingredient
LC50 - Median Lethal Concentration
LD50 - Median Lethal Dose
NR - Not Reported

Exposure Assessment

For terrestrial wildlife species, procedures suggested in the U.S. EPA's Wildlife Exposure Factors Handbook (USEPA 1993) were used. Specifically, uptake rates or equations to calculate uptake rates published by the U.S. EPA (USEPA 1999; and USEPA 1993) were used.

Risk Assessment

To determine whether adverse effects were likely, the anticipated exposure was compared to the TRV. Whenever the exposure estimate exceeded the TRV, a potential risk maybe present. For terrestrial animals, exposure to drinking the treated water, and consuming exposed prey items or vegetation were included in the exposure estimate.

ACROLEIN

Persistence:

Hydrolysis – $t_{1/2}$ = 3.5 days at pH 5; 1.5 days at pH 7; 4 hours at pH 10 (Tomlin 2002)
$t_{1/2}$ = 3.8 days at pH 5; 1.5 days at pH 7; 19 hours at pH 9 (Turner and Erickson 2003)
Photodegradation in air – stable (WHO 1991)
Aerobic sediment metabolism – $t_{1/2}$ = 7.6 hr (WHO 2002)
Anaerobic sediment metabolism – $t_{1/2}$ = 10 days (WHO 2002)
Terrestrial Field Dissipation – $t_{1/2}$ in air < 3 hrs (Eisler 1994)
Reactivity-based $t_{1/2}$ in soil = 30 and 100 hours (WHO 2002)
Aquatic Field Dissipation – $t_{1/2}$ = 3 to 7 hours in irrigation canals at pH 7.1 to 7.5 and 16 to 24ºC (WHO 1991)
$t_{1/2}$ = 7.3 – 10.2 hrs in irrigation canals (WHO 2002)
Reactivity in surface water $t_{1/2}$ = 30 – 100 hours (WHO 2002)
$t_{1/2}$ = 50 hours at pH 6.6 and 38 hours at pH 8.6 (Eisler 1994)

Physical Properties

Water Solubility:

208 g/kg at 20ºC (Tomlin 2002)
206 g/L at 20ºC (WHO 1991)
206-208 g/L (Eisler 1994)
206-270 g/L (WHO 2002)

Volatility:

29 kPa at 20ºC and 59 kPa at 38ºC (Tomlin 2002)
29.3 kPa at 20ºC (WHO 1991)
215-220 mm Hg at 20ºC (Eisler 1994)
29.3-36.5 kPa at at 20ºC (WHO 2002)

Octanol/Water Partitioning Coefficient (K_{ow})

logP = 1.08 (Tomlin 2002)
logP = 0.9 (WHO 1991)
logP = 0.01 (Eisler 1994)
logP = -1.1-1.02 (WHO 2002)
(K_{ow} > 100 indicates EPA may require Fish Bioaccumulation Test)

Bioaccumulation

WHO 1991
Because of its high water solubility and low K_{ow}, it would not be expected to bioaccumulate.

Eisler 1994
After 28 days exposure to 13 ppb acrolein, the whole-fish bioconcentration factor in bluegill sunfish (*Lepomis macrochirus*) was 344.

WHO 2002
In the study cited by Eisler, some of the radioactivity measure in the fish tissues may have been in the form of metabolites and not acrolein. An updated BCF is 0.6 along with a log K_{ow} of -0.01.

U.S. EPA 2003
An estimated bioconcentration factor of 3 suggests the potential for bioconcentration in aquatic organisms is low.

Sublethal Effects

WHO 1991
Laboratory rats exposed to acrolein via inhalation at concentrations of 10 to 5000 mg/m^3 for 1 minute showed an increase in blood pressure. The heart rate was increased at concentrations from 50 to 500 mg/m^3. In an acute oral toxicity test with rats, 11.2 mg/kg decreased reflexes, resulted in body sag, caused poor body tone, caused lethargy and stupor, caused tremors, and led to respiratory distress. Acrolein depresses pulmonary host defenses.

Eisler 1994
Most terrestrial crop plants can tolerate acrolein in irrigation water at concentrations up to 25 ppm, and some can tolerate 70-80 ppm.

Folmar 1976
Rainbow trout (*Oncorhynchus mykiss*) fry showed strong avoidance to acrolein at a concentration of 0.1 ppm but not 0.001 or 0.01 ppm in the laboratory.

Folmar 1978
Mayfly nymphs (*Ephemerella walkeri*) showed no avoidance to acrolein at concentrations of 0.001 to 0.1 ppm in the laboratory.

Metabolites

Turner and Erickson 2003
No toxicity data were available for the major hydration product of acrolein, 3-hydroxypropanal.

COPPER

Persistence: Hydrolysis – Not Applicable, Not Available
Photodegradation in water – Not Applicable, Not Available
Photodegradation on soil – Not Applicable, Not Available
Aerobic soil metabolism – Not Applicable, Not Available
Anaerobic aquatic metabolism – Not Applicable, Not Available
Terrestrial Field Dissipation – Not Available

Physical Properties

Water Solubility:	Copper Sulfate: 230.5 g/kg (25ºC) (Tomlin 2002)
Volatility:	Not Volatile (Tomlin 2002)
Octanol/Water Partitioning Coefficient (K_{ow})	Not Available (K_{ow} > 100 indicates EPA may require Fish Bioaccumulation Test)

Bioaccumulation

Edwards *et al.* 1998
The uptake of copper in common nettle (*Urtica dioica*) and earthworms (*Eisenia fetida*) from a contaminated dredge spoil was measured. In the aerial portions of the common nettle, the biological absorption coefficient (concentration in plant tissue ÷ concentration in soil) was 0.072 to 0.265. In root tissue, the biological absorption coefficient was 0.075 to 0.303. To determine the uptake of copper in earthworms, contaminated soil was brought into the laboratory and earthworms introduced for 28 days. Soil copper levels were 16 times higher in the contaminated soil than in control soil, but the concentrations in the earthworms only differed by 2.6 times. The earthworms did absorb copper from the contaminated soils, but not to an extent reflecting the level of contamination.

Gintenreiter *et al.* 1993
Copper concentrations in the tissues of the gypsy moth (*Lymantria dispar*) increased from earlier to later developmental stages, but the trend was not smooth. Fourth instars showed a decrease when compared to 3rd instars, and adults had lower concentrations than pupae. Concentration factors were 2 to 5. Copper concentrations were passed from one generation to the next.

Gomot and Pihan 1997
Bioconcentration of copper was evaluated in two subspecies of land snails, *Helix aspersa aspersa* and *Helix aspersa maxima*. These snails showed a tendency to accumulate copper in excess of the amount available from its diet. The subspecies exhibited different bioconcentration factors for different tissues. For the foot, *H. a. aspersa* had factors ranging from 2.3 to 13.2, whereas *H. a. maxima* had factors ranging from 1.7 to 10.2. For the viscera, *H. a. aspersa* had factors ranging from 2.1 to 9.1, whereas *H. a. maxima* had factors ranging from 1.9 to 9.0. Differences in the bioconcentration factor appear to be more related to the other components of the diet, not the copper concentration in the diet.

Gomot de Vaufleury and Pihan 2000
Copper concentrations were measured in terrestrial snails (*Helix aspersa*). Differences were demonstrated among laboratory and field values. However, no soil or vegetation samples for the laboratory and field sites were analyzed for copper, so it is not possible to determine

whether copper was accumulated at rates above background or whether they reflect some fraction of background levels.

Han *et al.* 1996
Shellfish accumulated copper in natural and aquaculture ponds in Taiwan. The sediments in the aquaculture ponds were finer grain and contained 4X concentrations of copper. Five mollusks were collected, but only purple clams (*Hiatula diphos*) and hard clams (*Meretrix lusoria*) were collected from both environments. The relative accumulation in each environment did not show a consistent pattern for both species indicating that the concentration in the shellfish was not controlled only by total copper concentrations in the sediments.

Haritonidis and Malea 1999
Copper concentrations in green algae (*Ulva rigida*) (2.2 ± 0.2 µg/g dry weight) collected from Thermaikos Gulf, Greece were less than seawater concentrations (1.5 ± 0.08 µg/L) and sediment (2.7 ± 0.5 µg/g dry weight). This suggests that copper will not bioconcentrate in algae.

Harrahy and Clements 1997
Bioaccumulation factors were calculated for the benthic invertebrate, *Chironomus tentans,* to be 16.63 and 12.99 during two uptake tests. Depuration was rapid. Copper concentrations were similar to background within four days. The authors caution that the bioaccumulation factors presented may be related to bioavailability that is driven by sediment characteristics.

Hendriks *et al.* 1998
Bioaccumulation ratios were determined for zebra mussels (*Dreissena polymorpha*) from the Rhine-Meuse Delta in the Netherlands. For copper, the ratio between mussels and suspended solids was 0.31 indicating tissue concentrations did not exceed environmental concentrations and that copper had not bioaccumulated

Janssen and Hogervorst 1993
Concentration factors were calculated for nine arthropod species inhabiting the forest litter layer in a clean reference site and a polluted site in The Netherlands: pseudoscorpion (*Neobisium muscorum*), harvestman (*Paroligolophus agrestis*), carabids (*Notiophilus biguttatus* and *Calathus melanocephalus*), mites (*Pergamasus crassipes*, *P. robustus*, and *Platynothrus peltifer*), dipluran (*Campodea staphylinus*), and collembolan (*Orchesella cincta*). Copper concentration factors for the eight species ranged from 0.85 – 4.08 in the reference site versus 0.40 – 1.62 in the polluted site. Copper was concentrated more when copper leaf litter concentrations were lower.

Khan *et al*. 1989
Bioconcentration factors in grass shrimp (*Palaemonetes pugio*) were determined for two populations, one from an industrialized site and another from a relatively pristine site. Levels of copper measured in shrimp from the industrialized site were greater than from the pristine site, but the industrialized site showed a concentration factor of 0.07, whereas the pristine site showed a concentration factor of 1.1 when compared to sediment concentrations.

Marinussen *et al* 1997a
Earthworms (*Dendrobaena veneta*) were exposed to soils containing various levels of copper. Earthworm tissue concentrations increased proportionally to the soil copper

concentrations up to 150 ppm. Above 150 ppm in the soils, tissue concentrations leveled off at about 60 ppm.

Marinussen *et al* 1997b
Soil, containing 815 ± 117 ppm Cu, was collected from a contaminated site in The Netherlands. Earthworms (*Dendrobaena veneta*) were introduced to the soil in the laboratory. Earthworms appeared to reach equilibrium with the soil exhibiting tissue concentrations of *c.* 60 ppm through 56 days of exposure. At 112 days exposure, the tissue concentrations increased to *c.* 120 ppm. The authors did not have an explanation for this anomaly. After being transferred to uncontaminated soil, the earthworms eliminated the copper according to a two-compartment model with the half-life times being, $t_{1/2\text{-}1}$ = 0.36 d and $t_{1/2\text{-}2}$ = 37 d.

Morgan and Morgan 1990
Earthworms (*Lumbricus rubellus*) were collected from an uncontaminated site and four metalliferous mine sites. Copper concentrations in soil and in tissues were measured. The worms were held under clean conditions to allow eliminate soil from their alimentary canal. The concentrations of copper in earthworm tissues reflected the concentrations in the soil. The authors conclude that there was no evidence that copper was sequestered in earthworms.

Morgan and Morgan 1999
Copper concentrations in earthworm (*Aporrectodea caliginosa* and *Lumbricus rubellus*) tissue were lower than in their ingesta. This suggests that copper does not bioaccumulate in earthworms.

Neuhauser *et al.* 1995
Overall, copper did not bioconcentrate in earthworm in contaminated soil, but showed a slight tendency to bioconcentrate when soil copper concentrations were low.

Pyatt *et al.* 1997
Appreciable concentrations (0.3 – 4.6%) of copper were measured in all tissues of the freshwater snail (*Lymnaea stagnalis*), whereas no measurable quantities of copper were found in food or water. The authors conclude that bioaccumulation occurred.

Svendsen and Weeks 1997a,b
There is an inverse relationship between the bioconcentration factors and soil concentrations under laboratory conditions for the earthworm *Eisenia andrei* and under field conditions for the earthworm *Lumbricus rubellus.* Bioconcentration factors ranged from 4.0 using control soil and 0.30 using soil amended with 339 ppm Cu under laboratory conditions. Bioconcentration factors in the field ranged from 4.1 under control conditions to 0.4 when the soil plots contained 231 ppm Cu.

Fish Dietary Toxicity

Berntssen *et al.* 1999
Laboratory tests were conducted to determine the effects of dietary copper on Atlantic salmon (*Salmo salar*). Dietary concentrations were 0, 35, and 700 mg Cu/kg diet for an experiment lasting 28 days. Addition of the copper supplemented diet did not cause an increase in the water concentrations of copper. Dietary exposure significantly increased

intestinal cell proliferation and apoptosis (degeneration of cells into membrane-bound particles that are then phagocytosed by other cells). The copper exposed groups did not grow during the trial.

Lundebye *et al.* 1999
Laboratory tests were conducted to determine the effects of dietary copper on Atlantic salmon (*Salmo salar*). Dietary concentrations were 0, 35, and 700 mg Cu/kg diet for an experiment lasting 28 days, and 5, 35, 500, 700, 900, and 1750 mg Cu/kg diet in an experiment lasting 12 weeks. Mean weights of fish used in the tests were 72 and 0.9 g in the first and second experiments, respectively. No mortality was observed in the first experiment, and only 2% died in the second experiment. Food consumption was not altered in either experiment at any dietary concentration. Cells of the intestinal lining were damaged in fish at both dietary concentrations in the first experiment. Growth of fish in the second experiment was reduced at dietary concentrations ≥900 mg/kg after 10 weeks and at dietary concentrations ≥700 mg/kg after 12 weeks.

Miller *et al.* 1993
When rainbow trout (*Oncorhynchus mykiss*) were exposed in the laboratory simultaneously to dietary Cu concentrations of up to 684 µg/g dry weight and water concentrations of up to 127 µg/L, no overt signs of toxicity were noted. Fish were fed to satiation three times daily. Dietary exposure was the principal source of tissue Cu, but as water concentrations were increased, uptake from water increased. However, exposure to waterborne Cu was more effective at inducing tolerance to subsequent exposure to toxic concentrations of Cu.

Handy 1993
Rainbow trout (*Oncorhynchus mykiss*) were fed commercial trout chow with and without 10 mg Cu/kg dry weight for 28 days. The water concentrations of Cu remained below 1 ppb. Fish were hand-fed to satiation daily. No outward signs of toxicity were noted and a single mortality occurred in the Cu-treated fish on day 6 of treatment. Despite some regurgitation of diet pellets, no body weight loss was noted. Dietary copper increased tissue concentrations at day 28 to 2.52, 72.66, and 0.636 µg Cu/g weight in the gills, liver and muscle. Concentration in the kidneys were not elevated.

Murai *et al.* 1981
Channel catfish were provided diets containing supplemental copper at concentrations of 0, 2, 4, 8, 16, and 32 mg/kg for 16 weeks. At the end of 4 weeks, average weight gain had been reduced in the group receiving 32 mg/kg in the diet. After 16 weeks, average weight gain was reduced in the group receiving 16 mg/kg also. Weight gain/diet consumed was reduced for catfish receiving ≥ 8 mg/kg dietary Cu after 16 weeks. Packed cell volume in the blood and hemoglobin were not adversely affected, but the number of erythrocytes was reduced in the group receiving 16 mg/kg.

Mount *et al.* 1994
Rainbow trout (*Oncorhynchus mykiss*) were fed brine shrimp (*Artemia* sp.) enriched with Cu, Cd, Pb, and Zn alone or as a mixture along with As for 60 days. The water contained 12 µg/L Cu, 1.1 µg/L Cd, 3.2 µg/L Pb, and 50 µg/L Zn. Cu concentrations in the shrimp were 20, 40, and 80 µg/g fresh weight when trout were exposed to Cu alone. Survival of trout was decreased in the medium and high Cu treatments with 69 and 72% survival, respectively. Weight and length of trout were not impacted by feeding on brine shrimp containing Cu. Cu concentrations in whole fish were elevated as compared to controls either in clean water or

metal-containing water, but the Cu concentrations did not differ among dietary treatment levels. No detrimental impacts were observed in the exposures to multiple metals via the diet. In that exposure scenario, concentrations in the diet were 0.5, 1, 1.5 and 2X the low concentrations from the first scenario.

Farag *et al*. 1994
Rainbow trout were fed invertebrates collected from the Clark Fork River, Montana and from an uncontaminated reference site for 21 days. Juvenile fish received invertebrates containing 1.54 As, 0.10 Cd, 18.57 Cu, 0.86 Pb, 32.09 Zn (all µg/g wet weight). Adult fish received invertebrates containing 3.20 As, 0.24 Cd, 26.13 Cu, 1.77 Pb, 68.99 Zn (all µg/g wet weight). Water was either standard laboratory water or contained metal concentrations based on the U.S. EPA's water-quality criteria with concentrations of 2.2 µg Cd/L, 24 µg Cu/L, 6.4 µg Pb/l and 100 µg Zn/L. Mortality of juveniles was significantly greater in tanks with metal-treated water regardless of whether the dietary invertebrates contained metals. Mortality was slightly increased in juveniles in laboratory water that received invertebrates with metals. No differences in growth were observed in any treatment. No mortality was observed in adult trials. Exposure to metals either in the water or via diet caused scale loss in adults. Juveniles were too small to evaluate scale loss. Physiological condition of fish fed invertebrates containing metals was compromised.

Woodward *et al*. 1995
Rainbow trout (*Oncorhynchus mykiss*) and brown trout (*Salmo trutta*) were held in standard laboratory water or contained metal concentrations based on 50% the U.S. EPA's water-quality criteria with concentrations of 1.1 µg/L Cd, 12 µg/L Cu, 3.2 µg/L Pb, and 50 µg/L Zn from hatching to 88 days of age. Three diets were provided that comprised of benthic invertebrates collected from three locations on the Clark Fork River, Montana. Fish received pelleted invertebrates containing 6.5 As, no Cd, 87 Cu, 6.9 Pb, and 616 Zn (all mg/g dry weight); 19 As, no Cd, 178 Cu, 15 Pb, and 650 Zn (all mg/g dry weight); or 19 As, 0.26 Cd, 174 Cu, 15 Pb, and 648 Zn (all mg/g dry weight). Survival was not affected for either species by any combination of water or diet. Growth of brown trout was reduced in the groups receiving the diets with higher metals concentration and by exposure to metal-containing water from day 26 onward in the test. In rainbow trout, no effects were seen on growth at day 18, but by day 53, growth was reduced in fish exposed to higher metal concentrations in diet or water. However, the rainbow trout exposed to diets with higher metals concentrations had similar growth patterns regardless of whether they were also exposed to metals-containing water. Also, the growth of the rainbow trout exposed to treated water and the diet with low metal concentrations recovered by day 88 and were no longer significantly different from fish in untreated water.

Draves and Fox 1998
In a reach of the Montreal River in northern Ontario contaminated from gold mine tailings, water concentrations were significantly higher for Cu, Cd, and Pb, but not for Zn. Juvenile yellow perch (*Perca flavescens*), a benthic feeding species, had significantly less food in their stomachs in the contaminated reach than perch in an uncontaminated reach. However, body weights of juvenile perch did not differ between the contaminated and uncontaminated reaches. Within the contaminated reach, Cu body burdens were significantly negatively correlated with body weight. Concentrations of Cu in Chironomidae, Hemiptera, Cladocera, Odonata, and Amphipoda were compared between reaches. Concentrations in Chironomidae, Hemiptera, Cladocera, and Amphipoda were greater in the contaminated reach, but Cu concentrations were greater in Odonata in the uncontaminated reach.

Sublethal Effects

Folmar 1976
Rainbow trout (*Oncorhynchus mykiss*) fry showed strong avoidance to copper ($CuSO_4 \cdot 5H_2O$) at concentrations of 0.0001 to 0.01 ppm in the laboratory.

Folmar 1978
Mayfly nymphs (*Ephemerella walkeri*) showed strong avoidance to copper ($CuSO_4 \cdot 5H_2O$) at a concentration of 0.1 ppm but not 0.001 or 0.01 ppm in the laboratory.

Acrolein Ecological Aquatic Toxicity Studies

Test	Scientific Name	Common Name	Category	Test Result	Value (C.I.)	Toxicity Class	Slope	NOEL	Information Source
24-hr Aquatic Plant Toxicity—Photosynthesis inhibition (N.R.)	*Enteromorpha intestinalis*	Algae	Freshwater Algae	EC_{50}	1.8 ppm (N.R.)	N.A.	N.R.	N.R.	WHO 1991
24-hr Aquatic Plant Toxicity—Photosynthesis inhibition (N.R.)	*Cladophora glomerata*	Algae	Freshwater Algae	EC_{50}	1.0 ppm (N.R.)	N.A.	N.R.	N.R.	WHO 1991
24-hr Aquatic Plant Toxicity—Photosynthesis inhibition (N.R.)	*Anabaena*	Algae	Freshwater Algae	EC_{50}	0.69 ppm (N.R.)	N.A.	N.R.	N.R.	WHO 1991
5-day Aquatic Plant Toxicity (95.03%)	*Selenastrum capricornutum*	Green Algae	Freshwater Algae	EC_{50}	0.05 ppm (0.045-0.055)	N.A.	N.R.	0.03 ppm	USEPA 2016b
5-day Aquatic Plant Toxicity (95.03%)	*Anabaena flos-aquae*	Bluegreen Algae	Freshwater Algae	EC_{50}	0.036 ppm (0.036-0.040)	N.A.	3.6	0.012 ppm	USEPA 2016b
5-day Aquatic Plant Toxicity (95.03%)	*Navicula pelliculosa*	Diatom	Freshwater Algae	EC_{50}	0.047 ppm (0.043-0.052)	N.A.	N.R.	0.025 ppm	USEPA 2016b
14-day Aquatic Plant Toxicity (95.03%)	*Lemna gibba*	Duckweed	Aquatic Plant	EC_{50}	0.075 ppm (0.067-0.083)	N.A.	3.5	N.R.	USEPA 2016b
96-hr Acute Aquatic Toxicity (N.R.)	*Xenopus laevis*	African Clawed Frog, tadpoles	Amphibian	LC_{50}	0.007 ppm (0.006-0.008)	N.A.	N.R.	N.R.	Eisler 1994
Acute Oral Toxicity (N.R.)	*Mus* sp.	Mouse	Mammal	LD_{50}	28 mg/kg (N.R.)	Very Highly Toxic	N.A.	N.R.	Eisler 1994
Acute Oral Toxicity (N.R.)	N.R.	Mouse	Mammal	LD_{50}	18 mg/kg (N.R.)	Very Highly Toxic	N.A.	N.R.	USEPA 2003
Acute Oral Toxicity (N.R.)	Wistar	Laboratory Rat	Mammal	LD_{50}	46 mg/kg (39-56)	Very Highly Toxic	N.A.	N.R.	WHO 1991

Test	Scientific Name	Common Name	Category	Test Result	Value (C.I.)	Toxicity Class	Slope	NOEL	Information Source
Acute Oral Toxicity (N.R.)	Sprague-Dawley	Laboratory Rat	Mammal	LD_{50}	29 mg/kg (N.R.)	Very Highly Toxic	N.A.	N.R.	USEPA 2003
Acute Oral Toxicity (97%)	N.R.	Laboratory Rat	Mammal	LD_{50}	10.3 mg/kg (males) 11.8 mg/kg (females) (N.R.)	Very Highly Toxic	N.A.	N.R.	USEPA 2003
10-minute Acute Inhalation Toxicity (N.R.)	Wistar	Laboratory Rat	Mammal	LD_{50}	750 mg/m^3 (N.R.)	Highly Toxic	N.A.	N.R.	WHO 1991
30-minute Acute Inhalation Toxicity (N.R.)	Sprague-Dawley	Laboratory Rat	Mammal	LD_{50}	95-217 mg/m^3 (N.R.)	Very Highly Toxic	N.A.	N.R.	WHO 1991
1-hour Acute Inhalation Toxicity (N.R.)	Sprague-Dawley	Laboratory Rat	Mammal	LD_{50}	65 mg/m^3 (60-68)	Very Highly Toxic	N.A.	N.R.	WHO 1991
4-hour Acute Inhalation Toxicity (N.R.)	Sprague-Dawley	Laboratory Rat	Mammal	LD_{50}	20.8 mg/m^3 (17.5-24.8)	Very Highly Toxic	N.A.	N.R.	WHO 1991
24-hr Drinking Water Toxicity (N.R.)	*Bos* sp.	Cow	Mammal	LD_{50}	N.R.	N.A.c	N.A.	60 ppm	Eisler 1994
Acute Dermal Toxicity (N.R.)	New Zealand White	Rabbit	Mammal	LD_{50}	231 mg/kg (N.R.)	N.A.c	N.A.	60 ppm	USEPA 2003
Acute Oral Toxicity (92%)	*Colinus virginianus*	Northern Bobwhite	Bird	LD_{50}	19 mg/kg (16-22)	Highly Toxic	N.A.	N.R.	USEPA 2016b
Acute Oral Toxicity (92%)	*Anas platyrhynchos*	Mallard	Bird	LD_{50}	9.1 mg/kg (6.3-13.1)	Very Highly Toxic	N.A.	N.R.	Eisler 1994; USEPA 2016b
Acute Oral Toxicity (95.09%)	*Anas platyrhynchos*	Mallard	Bird	LD_{50}	28 mg/kg (18-38)	Highly Toxic	N.A.	< 14.7 mg/kg	USEPA 2016b
Acute Inhalation Toxicity (N.R.)	*Gallus* sp.	Domestic Chicken	Bird	LOEC	50 mg/L (N.A.)	N.A.	N.A.	< 50 mg/L	Eisler 1994
Acute Oral Toxicity (N.R.)	*Phasianus colchicus*	Ring-necked Pheasant	Bird	LD_{50}	> 100 mg/kg (N.R.)	Moderately Toxic	N.A.	N.R.	WHO 1991
48-hr Freshwater Acute Toxicity (N.R.)	*Daphnia magna*	Water flea	Freshwater Crustacea	LC_{50}	0.057 ppm (17.6-32.6)	Very Highly Toxic	N.R.	N.R.	WHO 1991

Test	Scientific Name	Common Name	Category	Test Result	Value (C.I.)	Toxicity Class	Slope	NOEL	Information Source
48-hr Freshwater Acute Toxicity (N.R.)	*Daphnia magna*	Water flea	Freshwater Crustacea	LC_{50}	0.083 ppm (17.6-32.6)	Very Highly Toxic	N.R.	N.R.	WHO 1991
48-hr Freshwater Acute Toxicity (N.R.)	*Daphnia magna*	Water flea	Freshwater Crustacea	EC_{50}	0.093 ppm (N.R.)	Very Highly Toxic	N.R.	N.A.	WHO 1991
48-hr Freshwater Acute Toxicity (N.R.)	*Daphnia magna*	Water flea	Freshwater Crustacea	EC_{50}	0.051 ppm (0.043-0.062)	Very Highly Toxic	N.R.	N.R.	Eisler 1994
48-hr Freshwater Acute Toxicity (N.R.)	*Daphnia magna*	Water flea	Freshwater Crustacea	LC_{50}	0.057-0.080 ppm (N.R.)	Very Highly Toxic	N.R.	N.R.	Eisler 1994
Freshwater Acute Toxicity (N.R.)	*Daphnia magna*	Water flea	Freshwater Crustacea	MATC	17-34 ppm (N.R.)	Very Highly Toxic	N.R.	N.R.	Eisler 1994
Freshwater Acute Toxicity (96.4%)	*Daphnia magna*	Water flea	Freshwater Crustacea	LC_{50}	< 0.031 ppm (N.R.)	Very Highly Toxic	N.R.	N.R.	Turner and Erickson 2003
48-hr Freshwater Acute Toxicity (N.R.)	*Physa* sp.	Snail	Freshwater Mollusk	100% mortality	25 ppm (N.R.)	N.A.	N.R.	N.R.	Eisler 1994
48-hr Freshwater Acute Toxicity (N.R.)	*Bulinus truncatus*	Snail	Freshwater Mollusk	100% mortality	20-25 ppm (N.R.)	N.A.	N.R.	N.R.	WHO 1991
3-hr Freshwater Acute Toxicity (N.R.)	*Biomphalaria glabrata*	Snail eggs	Freshwater Mollusk	100% mortality	10 ppm (N.R.)	N.A.	N.R.	N.R.	WHO 1991
24-hr Freshwater Acute Toxicity (N.R.)	*Biomphalaria glabrata*	Snail eggs	Freshwater Mollusk	10% mortality	1.25 ppm (N.R.)	N.A.	N.R.	N.R.	WHO 1991
24-hr Freshwater Acute Toxicity (N.R.)	*Biomphalaria glabrata*	Snail adults	Freshwater Mollusk	98% mortality	10 ppm (N.R.)	N.A.	N.R.	N.R.	WHO 1991
24-hr Freshwater Acute Toxicity (N.R.)	*Biomphalaria glabrata*	Snail adults	Freshwater Mollusk	35% mortality	2.5 ppm (N.R.)	N.A.	N.R.	N.R.	WHO 1991
96-hr Freshwater Acute Toxicity (N.R.)	*Aplexa hypnorum*	Snail	Freshwater Mollusk	< 50% mortality	0.151 ppm (N.R.)	N.A.	N.R.	N.R.	Eisler 1994
24-hr Freshwater Acute Toxicity (N.R.)	*Australorbis glabratus*	Snail adults	Freshwater Mollusk	0% mortality	1.250 ppm (N.R.)	N.A.	N.R.	N.R.	Eisler 1994
24-hr Freshwater Acute Toxicity (N.R.)	*Australorbis glabratus*	Snail embryos	Freshwater Mollusk	10% mortality	1.250 ppm (N.R.)	N.A.	N.R.	N.R.	Eisler 1994
24-hr Freshwater Acute Toxicity (N.R.)	*Australorbis glabratus*	Snail adults	Freshwater Mollusk	35% mortality	2.500 ppm (N.R.)	N.A.	N.R.	N.R.	Eisler 1994

Test	Scientific Name	Common Name	Category	Test Result	Value (C.I.)	Toxicity Class	Slope	NOEL	Information Source
24-hr Freshwater Acute Toxicity (N.R.)	*Australorbis glabratus*	Snail embryos	Freshwater Mollusk	40% mortality	2.500 ppm (N.R.)	N.A.	N.R.	N.R.	Eisler 1994
24-hr Freshwater Acute Toxicity (N.R.)	*Australorbis glabratus*	Snail adults	Freshwater Mollusk	90% mortality	10.000 ppm (N.R.)	N.A.	N.R.	N.R.	Eisler 1994
24-hr Freshwater Acute Toxicity (N.R.)	*Australorbis glabratus*	Snail embryos	Freshwater Mollusk	100% mortality	10.000 ppm (N.R.)	N.A.	N.R.	N.R.	Eisler 1994
Freshwater Acute Toxicity (96.4%)	*Lepomis macrochirus*	Bluegill Sunfish	Freshwater Fish	LC_{50}	0.022 ppm (N.R.)	Very Highly Toxic	N.R.	N.R.	Turner and Erickson 2003
96-hr Freshwater Acute Toxicity (N.R.)	*Lepomis macrochirus*	Bluegill Sunfish	Freshwater Fish	LC_{50}	0.09 ppm (N.R.)	Very Highly Toxic	N.R.	N.R.	WHO 1991
96-hr Freshwater Acute Toxicity (N.R.)	*Lepomis macrochirus*	Bluegill Sunfish	Freshwater Fish	LC_{5}	0.033 ppm (0.027-0.040)	Very Highly Toxic	N.R.	N.R.	Eisler 1994
24-hr Freshwater Acute Toxicity (N.R.)	*Lepomis macrochirus*	Bluegill Sunfish	Freshwater Fish	LC_{50}	0.079 ppm (N.R.)	Very Highly Toxic	N.R.	N.R.	Eisler 1994
96-hr Freshwater Acute Toxicity (N.R.)	*Lepomis macrochirus*	Bluegill Sunfish	Freshwater Fish	LC_{50}	0.090-0.100 ppm (N.R.)	Very Highly Toxic	N.R.	N.R.	Eisler 1994
24-hr Freshwater Acute Toxicity (N.R.)	*Micropterus salmoides*	Largemouth Bass	Freshwater Fish	LC_{50}	0.183 ppm (N.R.)	Highly Toxic	N.R.	N.R.	Eisler 1994
96-hr Freshwater Acute Toxicity (N.R.)	*Micropterus salmoides*	Largemouth Bass	Freshwater Fish	LC_{50}	0.160 ppm (N.R.)	Highly Toxic	N.R.	N.R.	Eisler 1994
96-hr Freshwater Acute Toxicity (Formulation)	*Micropterus salmoides*	Largemouth Bass	Freshwater Fish	LC_{50}	< 0.160 ppm (N.R.)	Highly Toxic	N.R.	N.R.	USEPA 2016b
24-hr Freshwater Acute Toxicity (N.R.)	*Pimephales promelas*	Fathead Minnow	Freshwater Fish	LC_{50}	0.150 ppm (N.R.)	Highly Toxic	N.R.	N.R.	Eisler 1994
48-hr Freshwater Acute Toxicity (N.R.)	*Pimephales promelas*	Fathead Minnow	Freshwater Fish	LC_{50}	0.115 ppm (N.R.)	Highly Toxic	N.R.	N.R.	Eisler 1994
48-hr Freshwater Acute Toxicity (Formulation)	*Pimephales promelas*	Fathead Minnow	Freshwater Fish	LC_{50}	< 0.115 ppm (N.R.)	Highly Toxic	N.R.	N.R.	USEPA 2016b

Test	Scientific Name	Common Name	Category	Test Result	Value (C.I.)	Toxicity Class	Slope	NOEL	Information Source
96-hr Freshwater Acute Toxicity (N.R.)	*Pimephales promelas*	Fathead Minnow	Freshwater Fish	LC_{50}	0.014 ppm (0.008-0.025)	Very Highly Toxic	N.R.	N.R.	Eisler 1994
Freshwater Acute Toxicity (N.R.)	*Pimephales promelas*	Fathead Minnow	Freshwater Fish	MATC	0.011-0.042 ppm (N.R.)	N.A.	N.R.	N.R.	Eisler 1994
144-hr Freshwater Acute Toxicity (N.R.)	*Pimephales promelas*	Fathead Minnow	Freshwater Fish	LC_{50}	0.084 ppm (N.R.)	Very Highly Toxic	N.R.	N.R.	WHO 1991
48-hr Freshwater Acute Toxicity (N.R.)	*Rasbora heteromorpha*	Harlequin Fish	Freshwater Fish	LC_{50}	0.06 ppm (N.R.)	Very Highly Toxic	N.R.	N.R.	WHO 1991
48-hr Freshwater Acute Toxicity (N.R.)	*Rasbora heteromorpha*	Harlequin Fish	Freshwater Fish	LC_{50}	0.130 ppm (N.R.)	Highly Toxic	N.R.	N.R.	Eisler 1991
48-hr Freshwater Acute Toxicity (N.R.)	*Leuciscus idus melanotus*	Golden Orfe	Freshwater Fish	LC_{50}	0.06 ppm (N.R.)	Very Highly Toxic	N.R.	N.R.	WHO 1991
24-hr Freshwater Acute Toxicity (N.R.)	*Carassius auratus*	Goldfish	Freshwater Fish	LC_{50}	< 0.08 ppm (N.R.)	Very Highly Toxic	N.R.	N.R.	WHO 1991
96-hr Freshwater Acute Toxicity (N.R.)	*Catostomus commersoni*	White Sucker	Freshwater Fish	LC_{50}	0.014 ppm (0.008-0.025)	Very Highly Toxic	N.R.	N.R.	Eisler 1994
48-hr Freshwater Acute Toxicity (N.R.)	*Fundulus similis*	Longnose Killifish	Freshwater Fish	LC_{50}	0.240 ppm (N.R.)	Highly Toxic	N.R.	N.R.	Eisler 1994
24-hr Freshwater Acute Toxicity (N.R.)	*Gambusia affinis*	Western Mosquitofish	Freshwater Fish	LC_{50}	0.149 ppm (N.R.)	Highly Toxic	N.R.	N.R.	Eisler 1994
48-hr Freshwater Acute Toxicity (N.R.)	*Gambusia affinis*	Western Mosquitofish	Freshwater Fish	LC_{50}	0.061 ppm (N.R.)	Very Highly Toxic	N.R.	N.R.	Eisler 1994
Freshwater Acute Toxicity (96.4%.)	*Oncorhynchus mykiss*	Rainbow Trout	Freshwater Fish	LC_{50}	< 0.031 ppm (N.R.)	Very Highly Toxic	N.R.	N.R.	Turner and Erickson 2003
96-hr Freshwater Acute Toxicity (N.R.)	*Oncorhynchus mykiss*	Rainbow Trout	Freshwater Fish	LC_{50}	0.016 ppm (0.014-0.019)	Very Highly Toxic	N.R.	N.R.	Eisler 1994
96-hr Freshwater Acute Toxicity (N.R.)	*Oncorhynchus mykiss*	Rainbow Trout	Freshwater Fish	LC_{50}	0.029 ppm (0.022-0.037)	Very Highly Toxic	N.R.	N.R.	Eisler 1994

Test	Scientific Name	Common Name	Category	Test Result	Value (C.I.)	Toxicity Class	Slope	NOEL	Information Source
24-hr Freshwater Acute Toxicity (N.R.)	*Oncorhynchus tshawytscha*	Chinook Salmon	Freshwater Fish	LC_{50}	0.080 ppm (N.R.)	Very Highly Toxic	N.R.	N.R.	Eisler 1994
96-hr Freshwater Acute Toxicity (N.R.)	*Oncorhynchus kisutch*	Coho Salmon	Freshwater Fish	LC_{50}	0.068 ppm (N.R.)	Very Highly Toxic	N.R.	N.R.	WHO 1991
24-hr Freshwater Acute Toxicity (N.R.)	*Salmo trutta*	Brown Trout	Freshwater Fish	LC_{50}	0.046 ppm (215-293)	Very Highly Toxic	N.R.	N.R.	Eisler 1994
48-hr Acute Toxicology (N.R.)	*Tanytarsus dissimilis*	Midge	Insect	< 50% mortality	0.151 ppm (N.R.)	N.A.	N.R.	N.R.	Eisler 1994

Copper Ecological Aquatic Toxicity Studies

Chemical	Species Name	Common Name	FW or SW?	Study Duration (days)	Effect Type	Response Measurement	>,<	Response Value	Response Unit	Reference
Copper ethanolamine complex	*Egeria densa*	Brazilian waterweed	FW	1	Biochemical	LOEL	None	1000	ug/L	USEPA, 2016b
Copper ethanolamine complex	*Egeria densa*	Brazilian waterweed	FW	1	Biochemical	NOEL	None	1000	ug/L	USEPA, 2016b
Copper ethanolamine complex	*Lepomis macrochirus*	Bluegill sunfish	FW	4	Mortality	NOEL	None	2000	ug/L	USEPA, 2016b
Copper ethanolamine complex	*Lepomis macrochirus*	Bluegill sunfish	FW	4	Mortality	LC50	None	42000	ug/L	USEPA, 2016b
Copper ethanolamine complex	*Oncorhynchus mykiss*	Rainbow Trout	FW	4	Mortality	LC50	None	1500	ug/L	USEPA, 2016b

Chemical	Species Name	Common Name	FW or SW?	Study Duration (days)	Effect Type	Response Measurement	>,<	Response Value	Response Unit	Reference
Copper ethylenediamine complex	*Landoltia punctata*	Duckweed	FW	2	Biochemical	NOEL	None	100	ug/L	USEPA, 2016b
Copper ethylenediamine complex	*Landoltia punctata*	Duckweed	FW	2	Biochemical	NOEL	None	100	ug/L	USEPA, 2016b
Copper triethanolamine complex	*Landoltia punctata*	Duckweed	FW	2	Biochemical	NOEL	None	100	ug/L	USEPA, 2016b
Copper triethanolamine complex	*Landoltia punctata*	Duckweed	FW	2	Biochemical	NOEL	None	100	ug/L	USEPA, 2016b
Copper triethanolamine complex	*Anas platyrhynchos*	Mallard Duck	NA	9	Mortality	NOEL	>	5000	mg/kg	USEPA, 2016b
Copper triethanolamine complex	*Anas platyrhynchos*	Mallard Duck	NA	9	Mortality	LC50	>	5000	mg/kg	USEPA, 2016b
Copper triethanolamine complex	*Colinus virginianus*	Northern Bobwhite Quail	NA	8	Mortality	LC50	>	5000	mg/kg	USEPA, 2016b
Copper triethanolamine complex	*Lepomis macrochirus*	Bluegill sunfish	FW	4	Mortality	LC50	None	17600	ug/L	USEPA, 2016b
Copper triethanolamine complex	*Lepomis macrochirus*	Bluegill sunfish	FW	4	Mortality	NOEL	None	18500	ug/L	USEPA, 2016b
Copper triethanolamine complex	*Lepomis macrochirus*	Bluegill sunfish	FW	4	Mortality	LC50	None	51000	ug/L	USEPA, 2016b

Chemical	Species Name	Common Name	FW or SW?	Study Duration (days)	Effect Type	Response Measurement	>,<	Response Value	Response Unit	Reference
Copper triethanolamine complex	*Lepomis macrochirus*	Bluegill sunfish	FW	4	Mortality	LC50	None	57000	ug/L	USEPA, 2016b
Copper triethanolamine complex	*Lepomis cyanellus*	Green sunfish	FW	4	Mortality	LC50	None	1300	ug/L	USEPA, 2016b
Copper triethanolamine complex	*Oncorhynchus mykiss*	Rainbow Trout	FW	4	Mortality	LC50	None	840	ug/L	USEPA, 2016b
Copper triethanolamine complex	*Oncorhynchus mykiss*	Rainbow Trout	FW	4	Mortality	NOEL	None	100	ug/L	USEPA, 2016b
Copper triethanolamine complex	*Oncorhynchus mykiss*	Rainbow Trout	FW	2	Mortality	LC50	None	790	ug/L	USEPA, 2016b
Copper triethanolamine complex	*Oncorhynchus mykiss*	Rainbow Trout	FW	4	Mortality	LC50	None	26	ug/L	USEPA, 2016b
Copper sulfate pentahydrate	*Anabaena flos-aquae*	bluegreen algae	FW	5	Population	NOEL	None	20	ug/L	USEPA, 2016b
Copper sulfate pentahydrate	*Selenastrum capricornutum*	Green algae	FW	5	Population	NOEL	None	2	ug/L	USEPA, 2016b
Copper sulfate pentahydrate	*Lemna minor*	Duckweed	FW	5	Growth	NOEL	None	100	ug/L	USEPA, 2016b
Copper sulfate pentahydrate	*Lemna minor*	Duckweed	FW	5	Growth	EC50	None	2300	ug/L	USEPA, 2016b
Copper sulfate pentahydrate	*Colinus virginianus*	Northern Bobwhite Quail	NA	14	Mortality	LC50	None	368	mg/kg b.w.	USEPA, 2016b

Chemical	Species Name	Common Name	FW or SW?	Study Duration (days)	Effect Type	Response Measurement	>,<	Response Value	Response Unit	Reference
Copper sulfate pentahydrate	*Colinus virginianus*	Northern Bobwhite Quail	NA	14	Mortality	LC50	None	357.9	mg/kg b.w.	USEPA, 2016b
Copper sulfate pentahydrate	*Colinus virginianus*	Northern Bobwhite Quail	NA	14	Mortality	NOEL	<	120	mg/kg b.w.	USEPA, 2016b
Copper sulfate pentahydrate	*Lepomis macrochirus*	Bluegill sunfish	FW	4	Mortality	LC50	None	2870	ug/L	USEPA, 2016b
Copper sulfate pentahydrate	*Lepomis macrochirus*	Bluegill sunfish	FW	4	Mortality	LC50	None	1300	ug/L	USEPA, 2016b
Copper sulfate pentahydrate	*Lepomis macrochirus*	Bluegill sunfish	FW	4	Mortality	NOEL	None	650	ug/L	USEPA, 2016b
Copper sulfate pentahydrate	*Lepomis macrochirus*	Bluegill sunfish	FW	4	Mortality	NOEL	None	1000	ug/L	USEPA, 2016b
Copper sulfate pentahydrate	*Oncorhynchus mykiss*	Rainbow Trout	FW	4	Mortality	NOEL	None	1960	ug/L	USEPA, 2016b
Copper sulfate pentahydrate	*Oncorhynchus mykiss*	Rainbow Trout	FW	4	Mortality	LC50	None	3580	ug/L	USEPA, 2016b
Copper sulfate pentahydrate	*Oncorhynchus mykiss*	Rainbow Trout	FW	4	Mortality	NOEL	None	56	ug/L	USEPA, 2016b
Copper sulfate pentahydrate	*Oncorhynchus mykiss*	Rainbow Trout	FW	4	Mortality	LC50	None	130	ug/L	USEPA, 2016b
Copper (II) sulfate	*Microcystis aeruginosa*	bluegreen algae	FW	1	Biochemical	NOEC	None	250	ug/L	USEPA, 2016b
Copper (II) sulfate	*Euglenophyceae*	Euglenoid Class	FW	27	Population	NOEL	None	65.3	ug/L	USEPA, 2016b
Copper (II) sulfate	*Chlorella sp.*	Green Algae	FW	3	Population	NOEC	None	2.3	ug/L	USEPA, 2016b

Chemical	Species Name	Common Name	FW or SW?	Study Duration (days)	Effect Type	Response Measurement	>,<	Response Value	Response Unit	Reference
Copper (II) sulfate	*Chlorella sp.*	Green Algae	FW	3	Population	LOEC	None	7.9	ug/L	USEPA, 2016b
Copper (II) sulfate	*Pseudokirchneriella subcapitata*	Green Algae	FW	3	Population	NOEC	None	4.2	ug/L	USEPA, 2016b
Copper (II) sulfate	*Chlorella sp.*	Green Algae	FW	2	Population	LOEL	None	0.4	ug/L	USEPA, 2016b
Copper (II) sulfate	*Xenopus laevis*	African Clawed Frog	FW	4	Mortality	LC50	None	1370	ug/L	USEPA, 2016b
Copper (II) sulfate	*Xenopus laevis*	African Clawed Frog	FW	4	Growth	NOEC	None	100	ug/L	USEPA, 2016b
Copper (II) sulfate	*Bufo boreas*	Boreal Toad	FW	4	Mortality	LC50	None	120	ug/L	USEPA, 2016b
Copper (II) sulfate	*Epidalea calamita*	Natterjack toad	FW	4	Mortality	LC50	None	80	ug/L	USEPA, 2016b
Copper (II) sulfate	*Epidalea calamita*	Natterjack toad	FW	4	Growth	NOEC	None	100	ug/L	USEPA, 2016b
Copper (II) sulfate	*Epidalea calamita*	Natterjack toad	FW	4	Growth	LOEC	None	50	ug/L	USEPA, 2016b
Copper (II) sulfate	*Gammarus balcanicus*	Amphipod	FW	4	Biochemical	NOEL	None	10000	ug/L	USEPA, 2016b
Copper (II) sulfate	*Tetrahymena sp.*	Ciliate Protozoan	FW	1	Mortality	LC50	None	3300	ug/L	USEPA, 2016b
Copper (II) sulfate	*Mesocyclops pehpeiensis*	Copepod	FW	2	Mortality	LC50	None	75	ug/L	USEPA, 2016b
Copper (II) sulfate	*Mesocyclops pehpeiensis*	Copepod	FW	9	Growth	EC50	None	25	ug/L	USEPA, 2016b

Chemical	Species Name	Common Name	FW or SW?	Study Duration (days)	Effect Type	Response Measurement	>,<	Response Value	Response Unit	Reference
Copper (II) sulfate	*Barytelphusa cunicularis*	Crab	FW	4	Mortality	LC50	None	215000	ug/L	USEPA, 2016b
Copper (II) sulfate	*Cherax destructor*	Crayfish	FW	4	Mortality	LC50	None	379	ug/L	USEPA, 2016b
Copper (II) sulfate	*Cherax destructor*	Crayfish	FW	4	Mortality	LC50	None	379	ug/L	USEPA, 2016b
Copper (II) sulfate	*Astacus leptodactylus*	Crayfish	FW	14	Biochemical	LOEL	None	10	ug/L	USEPA, 2016b
Copper (II) sulfate	*Orconectes immunis*	Crayfish	FW	5	Physiology	LOEL	None	160	ug/L	USEPA, 2016b
Copper (II) sulfate	*Astacus leptodactylus*	Crayfish	FW	14	Biochemical	NOEL	None	10	ug/L	USEPA, 2016b
Copper (II) sulfate	*Cherax destructor*	Crayfish	FW	3	Mortality	LC50	None	509	ug/L	USEPA, 2016b
Copper (II) sulfate	*Orconectes immunis*	Crayfish	FW	5	Mortality	LC50	None	20000	ug/L	USEPA, 2016b
Copper (II) sulfate	*Spiralothelphusa hydrodroma*	Freshwater Field Crab	FW	15	Biochemical	LOEC	None	25460	ug/L	USEPA, 2016b
Copper (II) sulfate	*Macrobrachium dayanum*	Freshwater Prawn	FW	2	Cellular	NOEC	None	418	ug/L	USEPA, 2016b
Copper (II) sulfate	*Macrobrachium dayanum*	Freshwater Prawn	FW	4	Mortality	LC50	None	418	ug/L	USEPA, 2016b
Copper (II) sulfate	*Macrobrachium dayanum*	Freshwater Prawn	FW	1	Cellular	LOEC	None	418	ug/L	USEPA, 2016b
Copper (II) sulfate	*Macrobrachium rosenbergii*	Giant River Prawn	FW	7	Biochemical	NOEC	None	10	ug/L	USEPA, 2016b

Chemical	Species Name	Common Name	FW or SW?	Study Duration (days)	Effect Type	Response Measurement	>,<	Response Value	Response Unit	Reference
Copper (II) sulfate	*Macrobrachium rosenbergii*	Giant River Prawn	FW	7	Biochemical	LOEC	None	50	ug/L	USEPA, 2016b
Copper (II) sulfate	*Macrobrachium rosenbergii*	Giant River Prawn	FW	4	Mortality	LC50	None	452	ug/L	USEPA, 2016b
Copper (II) sulfate	*Hydra viridissima*	Hydra	FW	4	Mortality	LC50	None	28	ug/L	USEPA, 2016b
Copper (II) sulfate	*Chasmagnathus granulata*	Neohelice Crab	FW	14	Growth	NOEL	None	100	ug/L	USEPA, 2016b
Copper (II) sulfate	*Hyalella sp.*	Scud	FW	4	Mortality	LC50	None	170	ug/L	USEPA, 2016b
Copper (II) sulfate	*Typha latifolia*	Cattail	FW	8	Biochemical	NOEC	None	500	ug/L	USEPA, 2016b
Copper (II) sulfate	*Typha latifolia*	Cattail	FW	4	Biochemical	NOEC	None	500	ug/L	USEPA, 2016b
Copper (II) sulfate	*Typha latifolia*	Cattail	FW	8	Biochemical	LOEC	None	500	ug/L	USEPA, 2016b
Copper (II) sulfate	*Typha latifolia*	Cattail	FW	4	Biochemical	LOEC	None	1000	ug/L	USEPA, 2016b
Copper (II) sulfate	*Typha latifolia*	Cattail	FW	2	Biochemical	LOEC	None	5000	ug/L	USEPA, 2016b
Copper (II) sulfate	*Ceratophyllum demersum*	Coontail	FW	1	Physiology	LOEC	>	2500	ug/L	USEPA, 2016b
Copper (II) sulfate	*Ceratophyllum demersum*	Coontail	FW	1	Physiology	LOEC	>	100	ug/L	USEPA, 2016b
Copper (II) sulfate	*Lemna gibba*	Duckweed	FW	14	Growth	NOEC	None	100	ug/L	USEPA, 2016b

Chemical	Species Name	Common Name	FW or SW?	Study Duration (days)	Effect Type	Response Measurement	>,<	Response Value	Response Unit	Reference
Copper (II) sulfate	*Lemna gibba*	Duckweed	FW	14	Growth	LOEC	None	250	ug/L	USEPA, 2016b
Copper (II) sulfate	*Lemna minor*	Duckweed	FW	10	Growth	EC50	None	470	ug/L	USEPA, 2016b
Copper (II) sulfate	*Lemna minor*	Duckweed	FW	4	Biochemical	LOEC	None	5000	ug/L	USEPA, 2016b
Copper (II) sulfate	*Lemna minor*	Duckweed	FW	4	Biochemical	NOEC	None	500	ug/L	USEPA, 2016b
Copper (II) sulfate	*Lemna minor*	Duckweed	FW	4	Biochemical	LOEC	None	500	ug/L	USEPA, 2016b
Copper (II) sulfate	*Lemna minor*	Duckweed	FW	4	Biochemical	NOEC	None	50	ug/L	USEPA, 2016b
Copper (II) sulfate	*Lemna minor*	Duckweed	FW	4	Biochemical	NOEC	None	50	ug/L	USEPA, 2016b
Copper (II) sulfate	*Cabomba aquatica*	Fanwort	FW	4	Physiology	LOEC	None	12	ug/L	USEPA, 2016b
Copper (II) sulfate	*Elodea canadensis*	Pondweed	FW	4	Physiology	LOEC	None	12	ug/L	USEPA, 2016b
Copper (II) sulfate	*Eichhornia crassipes*	Water Hyacinth	FW	14	Biochemical	NOEC	None	500	ug/L	USEPA, 2016b
Copper (II) sulfate	*Eichhornia crassipes*	Water Hyacinth	FW	14	Biochemical	LOEC	None	1000	ug/L	USEPA, 2016b
Copper (II) sulfate	*Gallus domesticus*	Domestic Chicken	NA	12	Growth	NOEC	None	2	mg/kg	USEPA, 2016b
Copper (II) sulfate	*Gallus domesticus*	Domestic Chicken	NA	15	Biochemical	LOEL	None	20	mg/kg	USEPA, 2016b

Chemical	Species Name	Common Name	FW or SW?	Study Duration (days)	Effect Type	Response Measurement	>,<	Response Value	Response Unit	Reference
Copper (II) sulfate	*Lepomis macrochirus*	Bluegill sunfish	FW	4	Mortality	LC50	None	2640	ug/L	USEPA, 2016b
Copper (II) sulfate	*Ictalurus punctatus*	Channel catfish	FW	4	Mortality	LC50	None	710	ug/L	USEPA, 2016b
Copper (II) sulfate	*Pimephales promelas*	Fathead Minnow	FW	2	Mortality	LC50	None	7.2	ug/L	USEPA, 2016b
Copper (II) sulfate	*Pimephales promelas*	Fathead Minnow	FW	2	Mortality	LC50	None	5.9	ug/L	USEPA, 2016b
Copper (II) sulfate	*Pimephales promelas*	Fathead Minnow	FW	4	Mortality	LC50	None	96.6	ug/L	USEPA, 2016b
Copper (II) sulfate	*Gambusia affinis*	Mosquitofish	FW	4	Mortality	LC50	None	250	ug/L	USEPA, 2016b
Copper (II) sulfate	*Oncorhynchus mykiss*	Rainbow Trout	FW	4	Mortality	LC50	None	94	ug/L	USEPA, 2016b
Copper (II) sulfate	*Oncorhynchus mykiss*	Rainbow Trout	FW	7	Biochemical	NOEC	None	41.06	ug/L	USEPA, 2016b
Copper (II) sulfate	*Oncorhynchus mykiss*	Rainbow Trout	FW	4	Mortality	LC50	None	80	ug/L	USEPA, 2016b
Copper (II) sulfate	*Pelodiscus sinensis*	Chinese Softshell Turtle	FW	112	Growth	NOEC	None	10.9	mg/kg	USEPA, 2016b
Copper (II) sulfate	*Pelodiscus sinensis*	Chinese Softshell Turtle	FW	112	Growth	LOEC	None	20.4	mg/kg	USEPA, 2016b
Copper (II) sulfate	*Pelodiscus sinensis*	Chinese Softshell Turtle	FW	112	Biochemical	NOEC	None	41.8	mg/kg	USEPA, 2016b

Chemical	Species Name	Common Name	FW or SW?	Study Duration (days)	Effect Type	Response Measurement	>,<	Response Value	Response Unit	Reference
Copper (II) sulfate	*Pelodiscus sinensis*	Chinese Softshell Turtle	FW	112	Biochemical	LOEC	None	78.6	mg/kg	USEPA, 2016b

Notes:
EC50 - Effective concentration for 50% of the population
FW - Freshwater
LC50 - Lethal concentration for 50% of the population
LD50 - Lethal dose for 50% of the population
LOEC - Lowest Observable Effect Concentration
LOEL - Lowest Observable Effect Level
NA - Not Applicable
NOEC - No Observable Effect Concentration
NOEL - No Observable Effect Level
SW - Saltwater
Biochemical - Measurement of biotransformation or metabolism of chemical compounds, modes of toxic action, and biochemical responses in plants and animals. Examples of biochemical effects include changes in enzyme or hormonal activity.
Behavior - Overt activity measurement of an organism including but not limited to avoidance, aggression, and feeding behavior.
Cellular - Measurements regarding changes in structure and chemical composition of cells and tissues of plants or animals as related to their functions.
Growth - Measurements that include changes in body weight, morphology, and development.
Mortality - Measurements where the cause of death can be attributed to the chemical.
Physiology - Measurement regarding basic activity within tissues and cells of plants or animals. Effects include physiological responses such as injury, immunity, and intoxication.
Population - Measurements related to changes in a group of organisms of the same species occupying the same area at a given time.

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Appendix C

(Copper Speciation Graphs from the Biotic Ligand Model)

Biotic Ligand Model Copper Speciation Graphs for Varying Water Parameters

In addition to using a hardness based approach to quantifying copper water quality criteria, the USEPA suggests the use of another model, described below, to analyze and/or predict toxicity of bioavailable copper in the water column. In the 2007 revision of Aquatic Life Ambient Freshwater Quality Criteria-Copper (USEPA 2007), the USEPA recommended the Biotic Ligand Model (BLM) as a more accurate approach for assessing toxicity and deriving freshwater quality criteria for copper. The BLM supplements USEPA's previously published recommendation of using the hardness-based estimation and better accounts for the reduction in copper bioavailability that results from competitive binding of copper to other molecules in the water column.

The BLM was developed to predict copper toxicity to aquatic organisms in relation to water quality parameters including pH, hardness, alkalinity, and dissolved organic carbon (DOC). According to the BLM, copper bioavailability is strongly influenced by these parameters. The free cupric ion (Cu^{2+}) is the primary driver of copper bioavailability and toxicity in aquatic ecosystems (USEPA 2007).

In order to derive freshwater quality criterion for copper, the BLM uses ten water quality inputs: temperature; pH; dissolved organic carbon (DOC); major cations including calcium (Ca), magnesium (Mg), sodium (Na), potassium (K); major anions including sulfate (SO_4), chloride (Cl); and alkalinity. Copper may be measured for comparison with site-specific criteria, but it is not required as an input to the model to determine copper freshwater quality criteria. The BLM-based water quality criterion for copper may be more or less stringent than the hardness-based criteria depending on the water quality parameters. However, it is more accurate than hardness-based criteria because it is based on copper bioavailability to aquatic species.

The BLM may also be used to predict copper toxicity and speciation in varying water conditions. When the model is run in toxicity prediction mode, it predicts the concentration of dissolved copper that produces a particular endpoint (e.g. NOAEL, LOAEL, or LC_{50}) for the selected aquatic species. When run in speciation prediction mode, the model can determine the various forms (e.g. $CuCO_3$, Cu^{2+}, copper bound to DOC) and concentrations of copper in the water when known copper concentration in water is input in the model.

Using the Biotic Ligand Model in copper speciation prediction mode, a total of 27 graphs have been generated to illustrate how variations in water quality parameters including pH, hardness, alkalinity, and dissolved organic carbon (DOC) influence the concentration of bioavailable Cu^{2+}. See the tables and graphs below. Generally, an increase in one or more of the four water parameters lowers the concentration of the Cu^{2+} species, thereby lowering the bioavailability of copper. **Graph 20** and **Graph 21** demonstrate how increased pH causes a lower free cupric ion concentration, and an increase in DOC-bound (bio-unavailable) copper concentrations; these most closely represent conditions seen in the District's irrigation conveyance systems.

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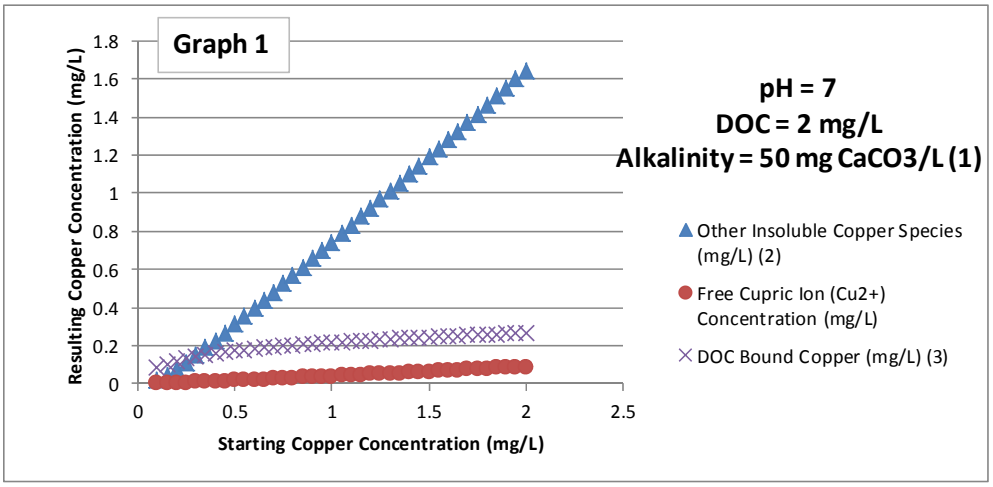
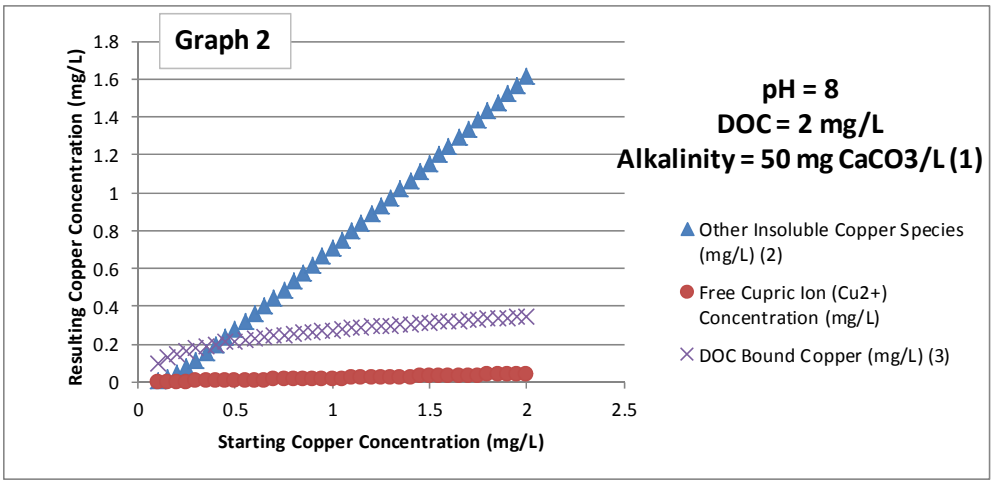
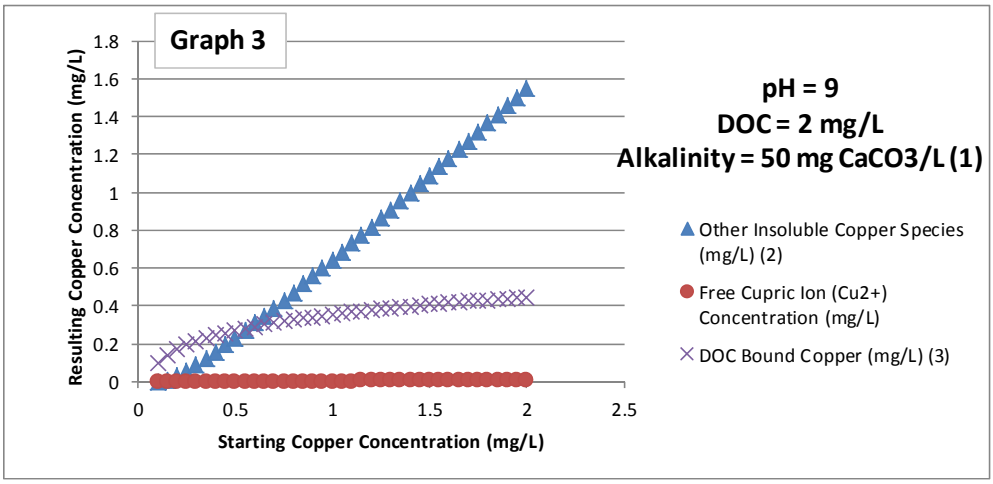
Graph #	Dissolved Organic Carbon (mg/L)	pH (unitless)	Alkalinity & Hardness (mg CaCO3/L)
1	2	7	50
2	2	8	50
3	2	9	50
4	2	7	100
5	2	8	100
6	2	9	100
7	2	7	200
8	2	8	200
9	2	9	200
10	4	7	50
11	4	8	50
12	4	9	50
13	4	7	100
14	4	8	100
15	4	9	100
16	4	7	200
17	4	8	200
18	4	9	200
19	6	7	50
20	**6**	**8**	**50**
21	**6**	**9**	**50**
22	6	7	100
23	6	8	100
24	6	9	100
25	6	7	200
26	6	8	200
27	6	9	200





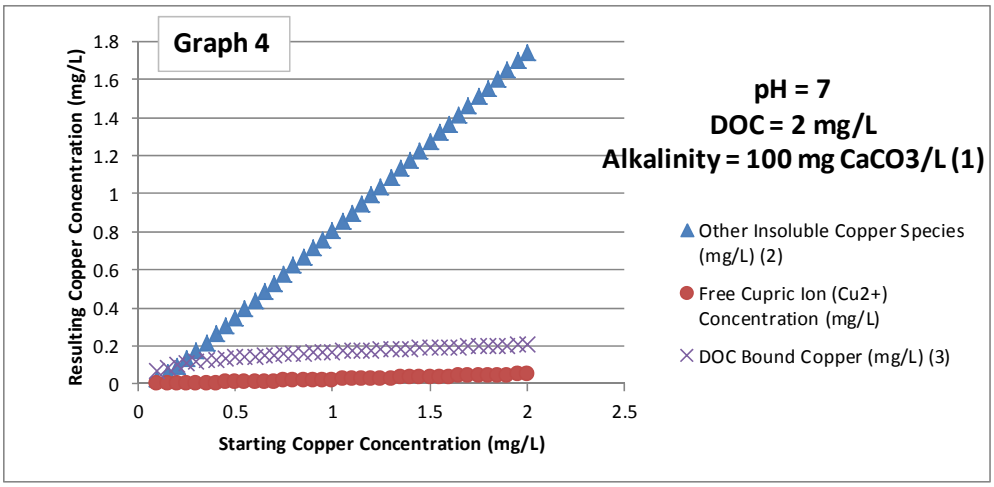


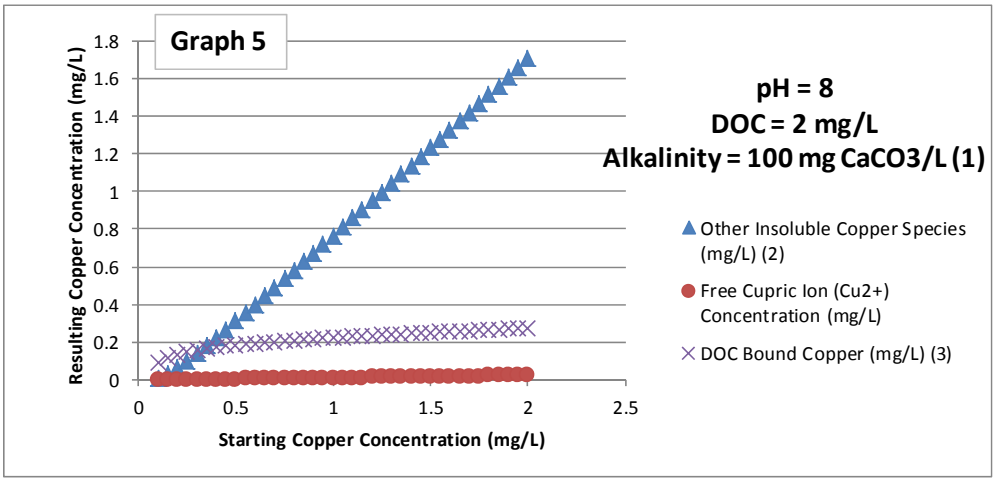
Notes:

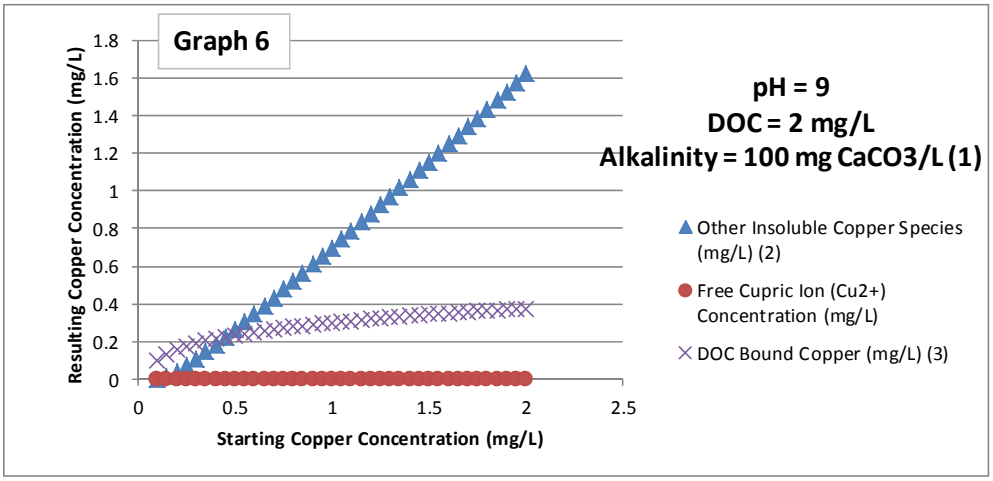
(1) Hardness and Alkalinity are both expressed as CaCO3 and are assumed equal.

(2) "Other Insoluble Copper Species" is the copper not accounted for by "Free Cupric Ion" and "DOC Bound Copper" species. It exists as various copper-ligands and/or copper salts, including but not limited to: CuCO3, CuHCO3+, and Cu(OH)2.

(3) DOC is the dissolved organic carbon content capable of complexing with copper cations, rendering them non-bioavailable. The humic acid content of the DOC was assumed to be 10%.







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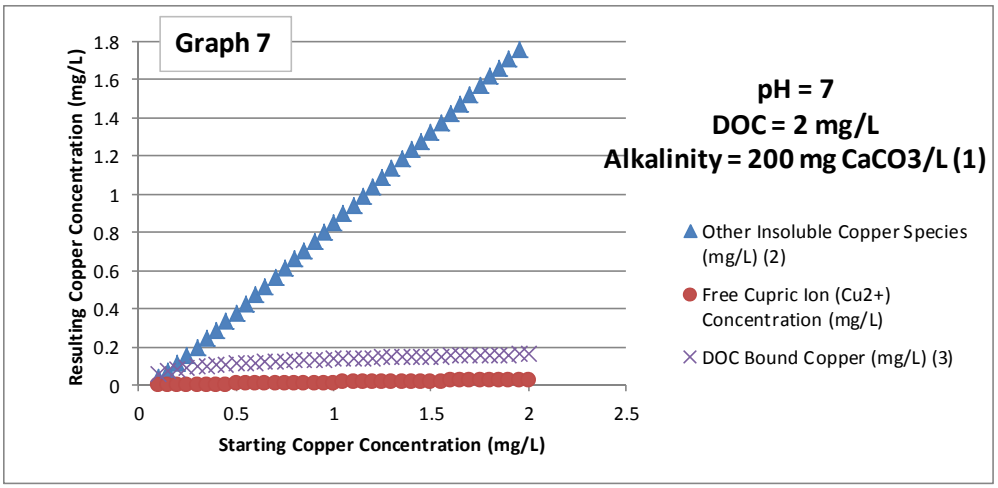

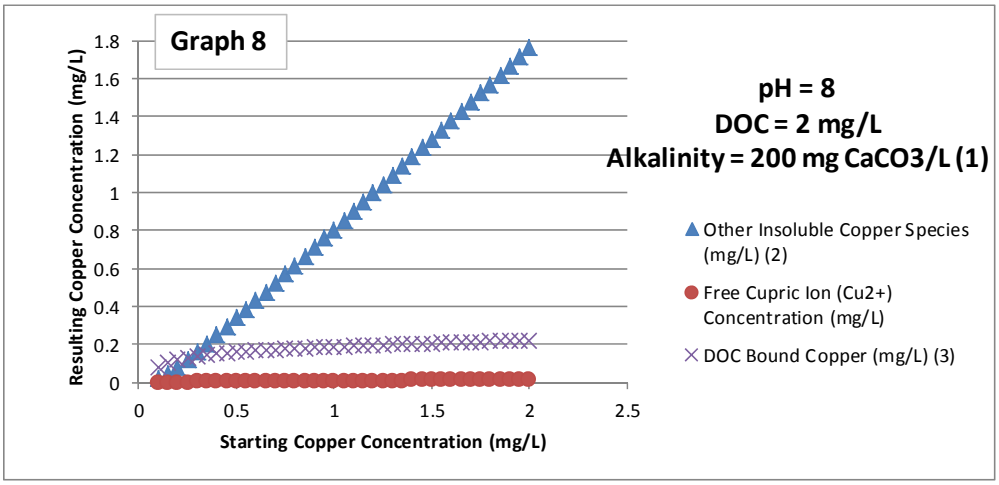

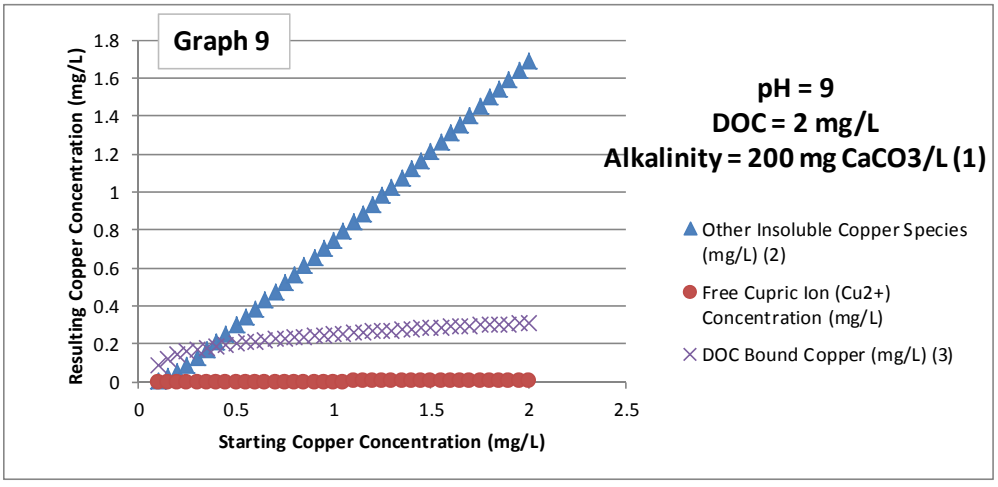

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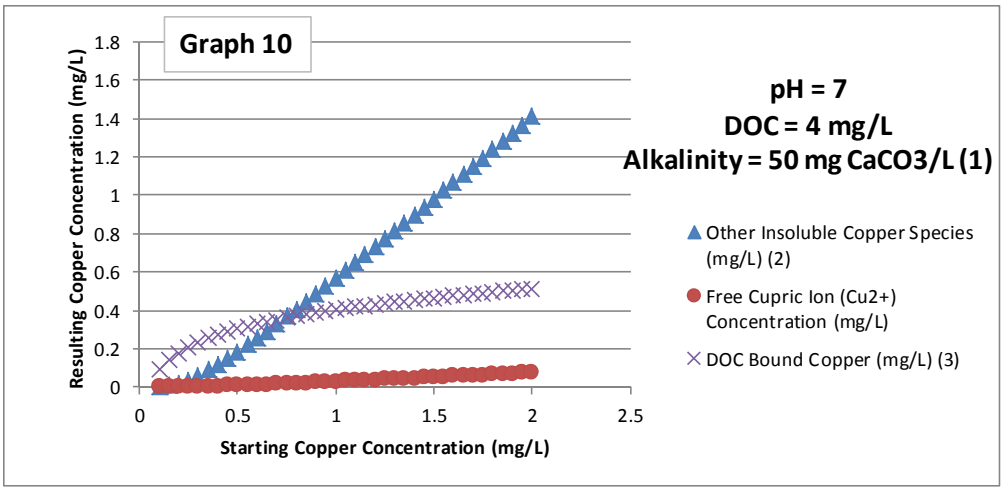

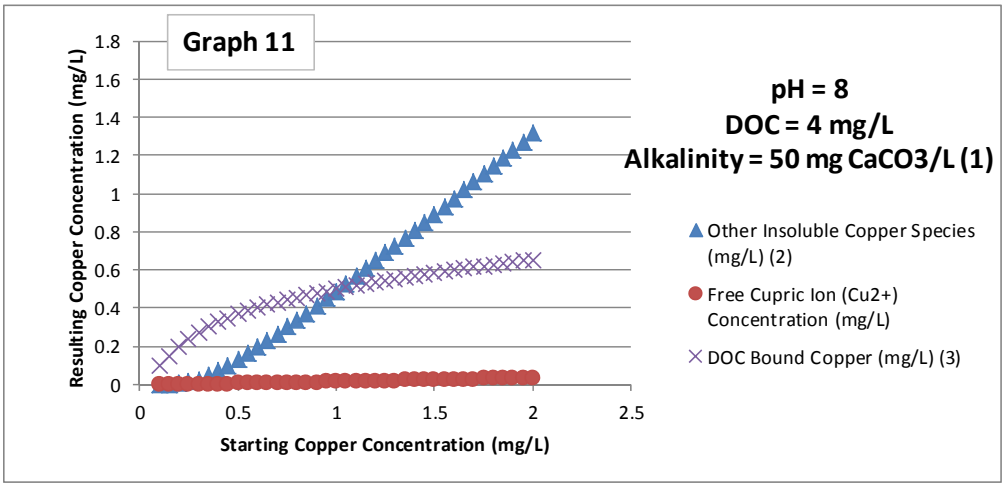

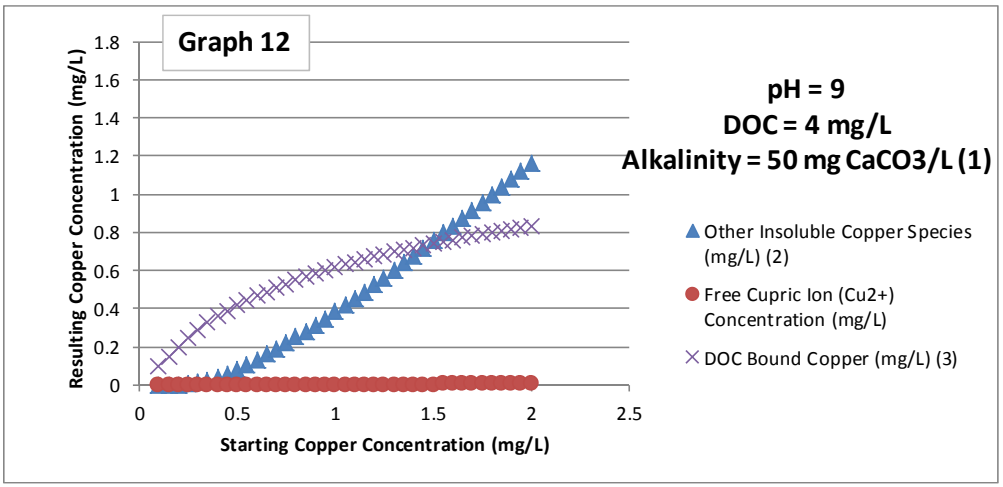

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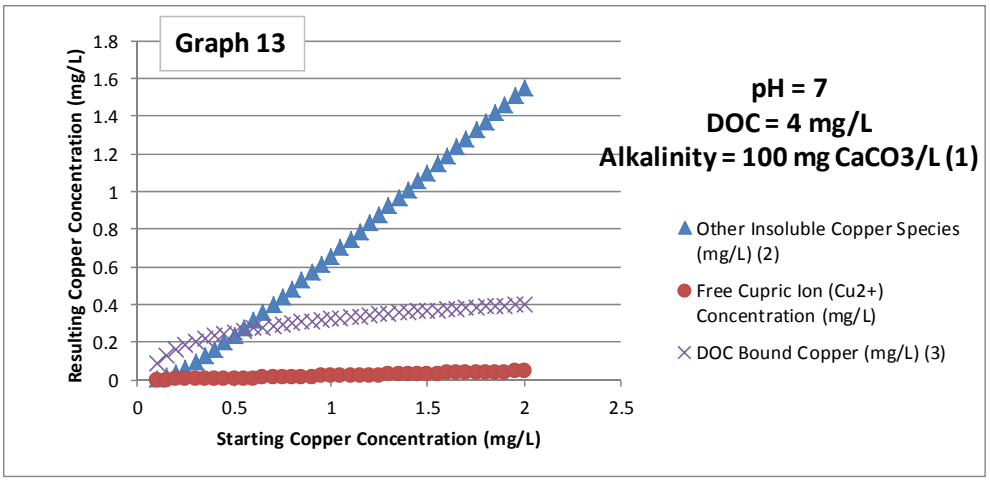

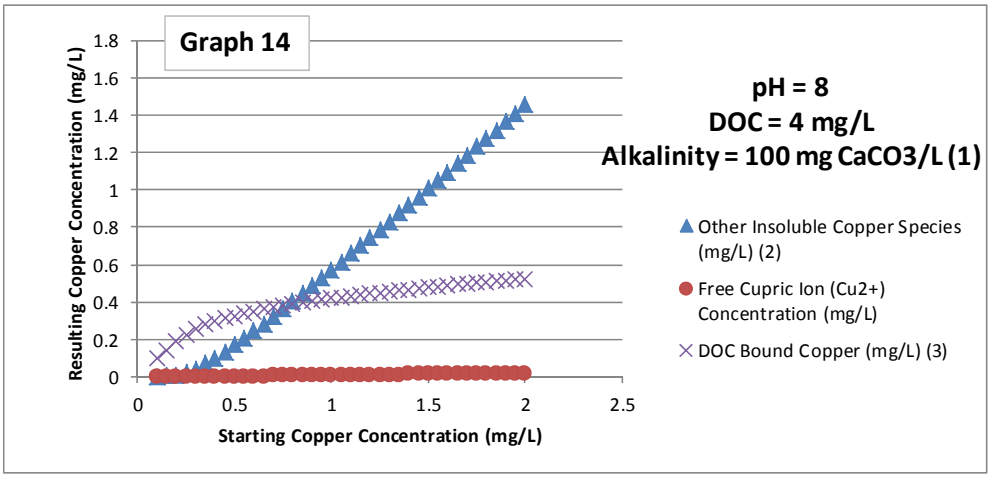

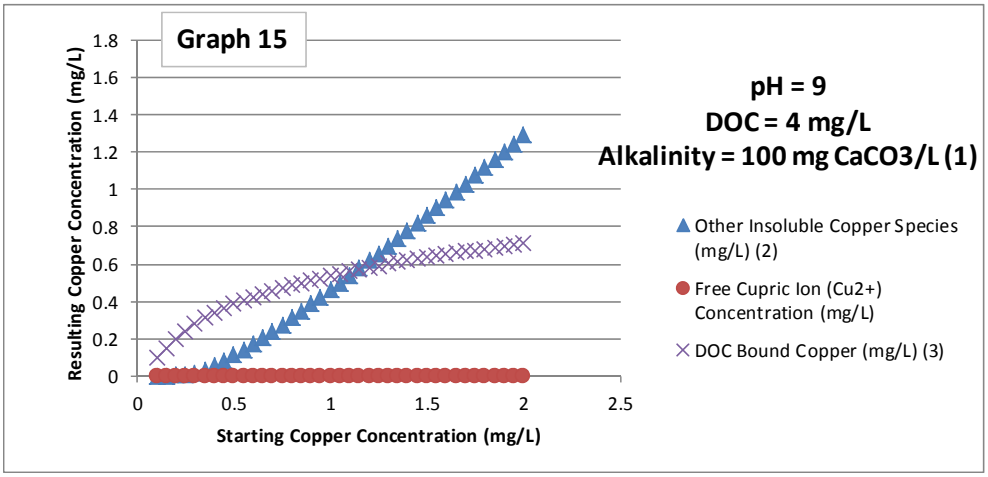

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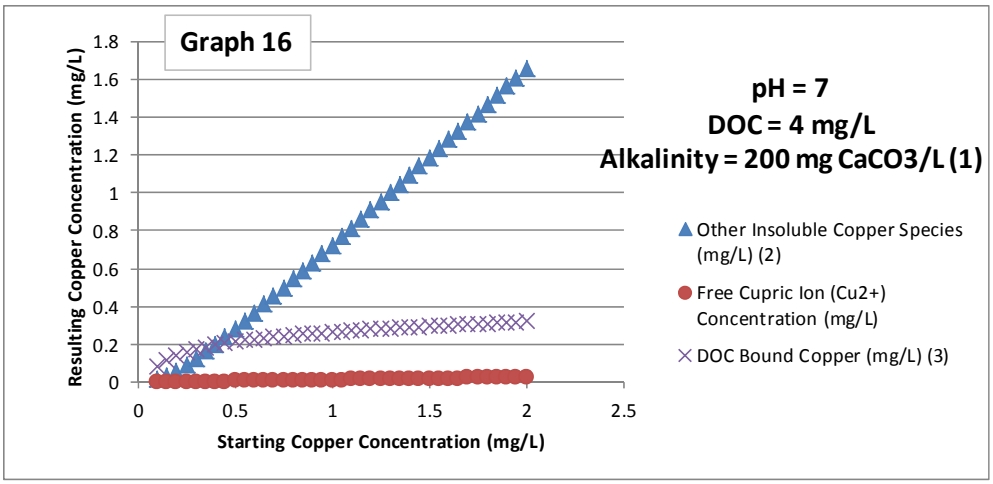

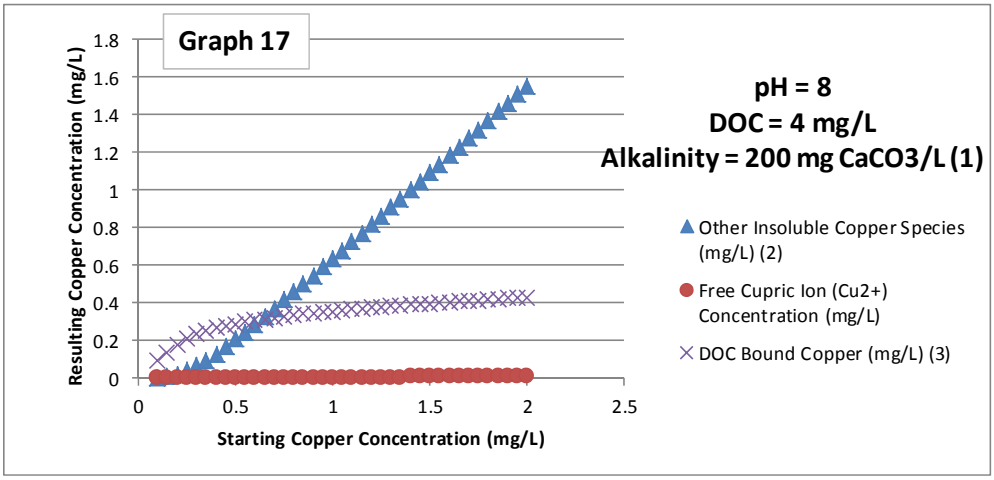

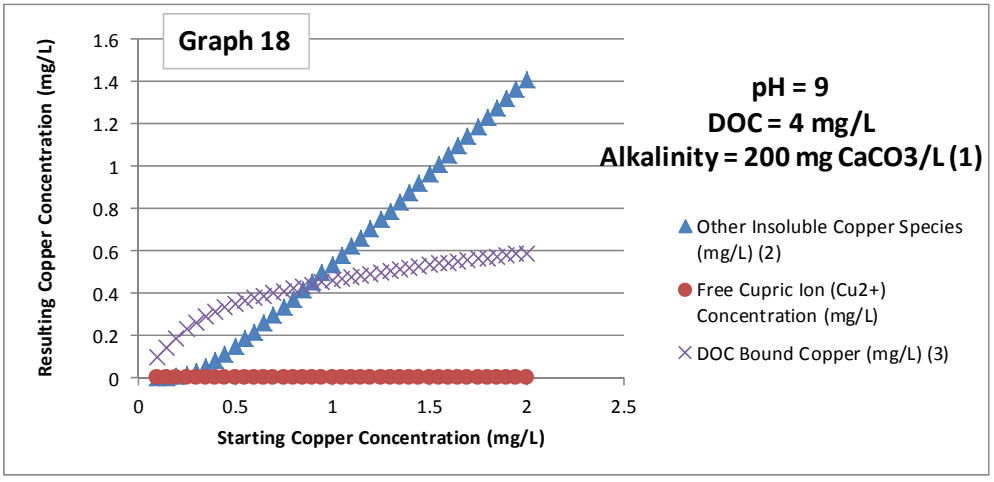

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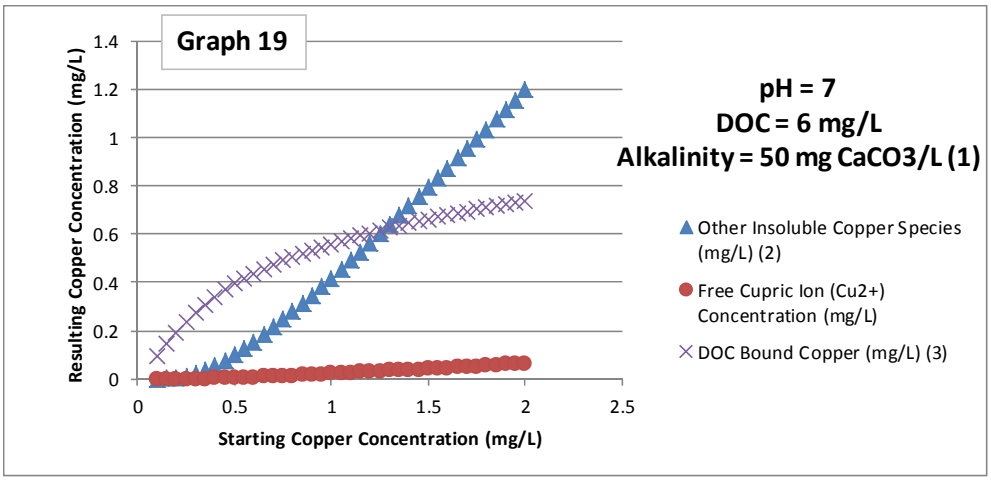

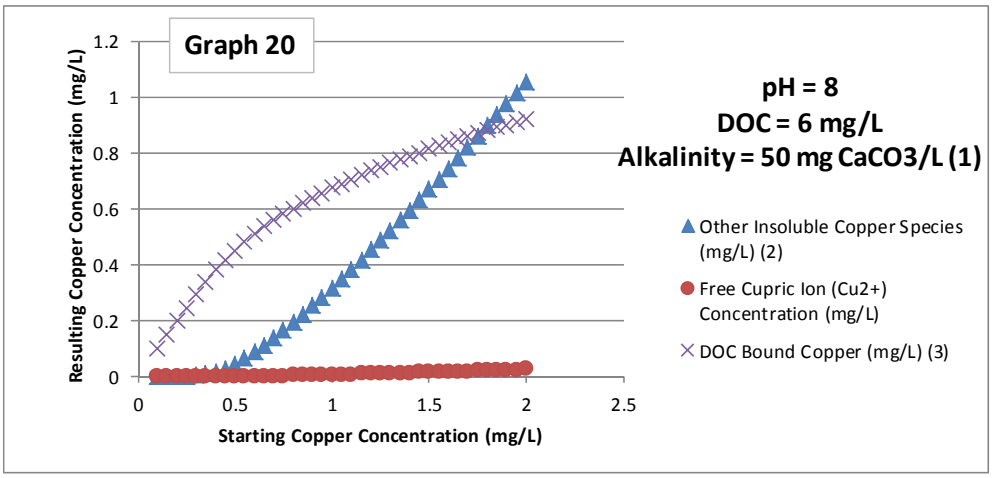

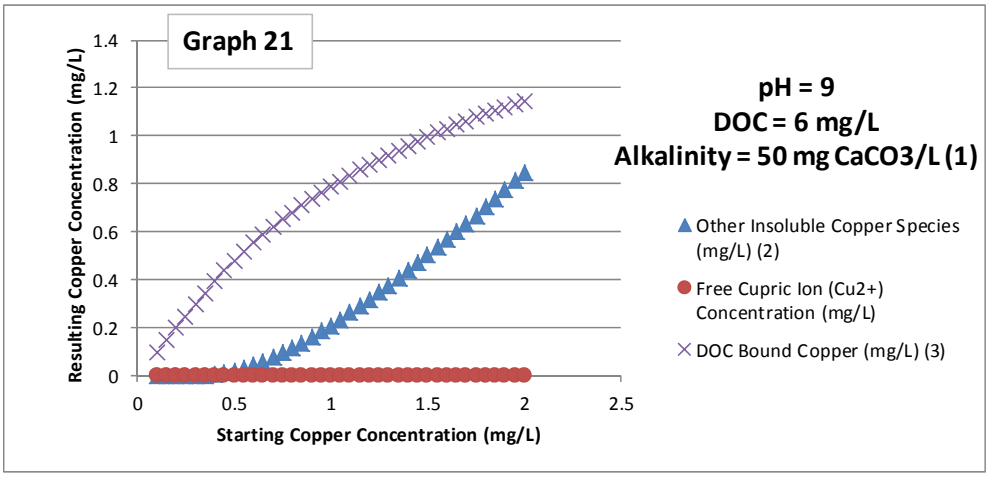

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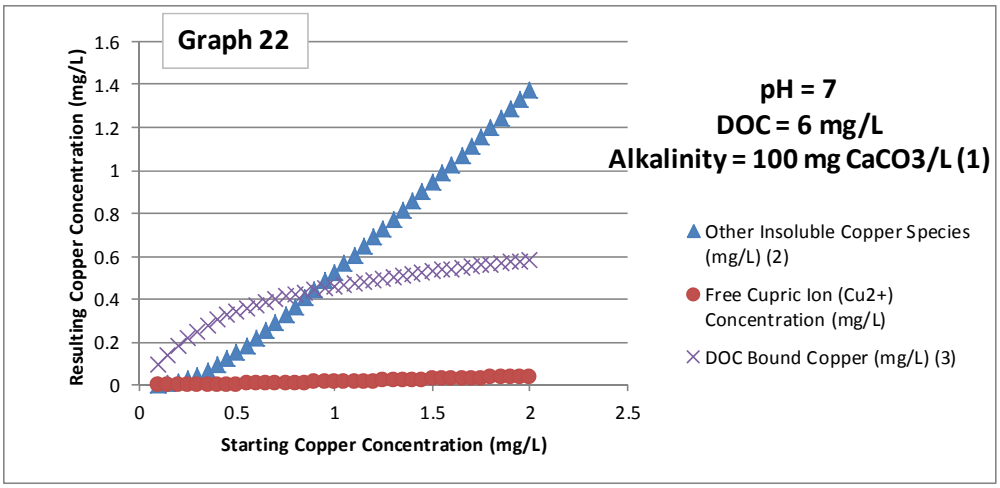

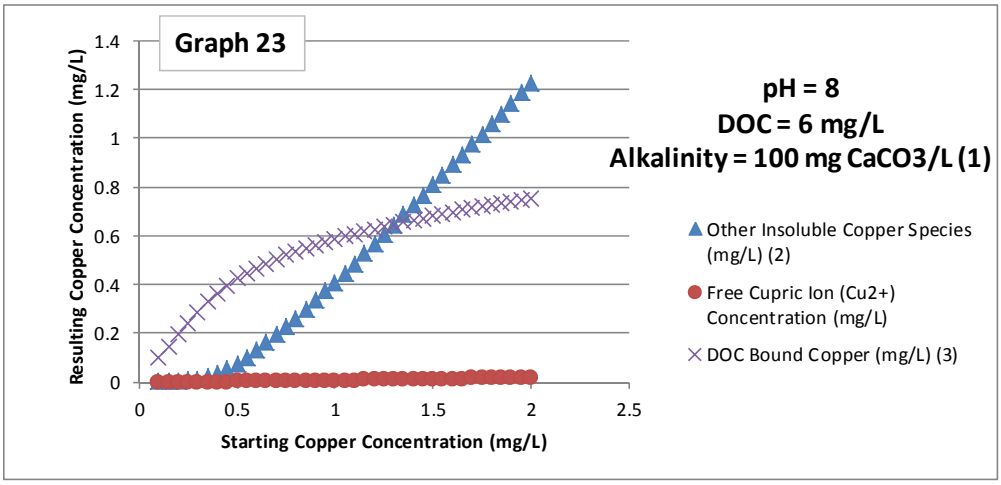

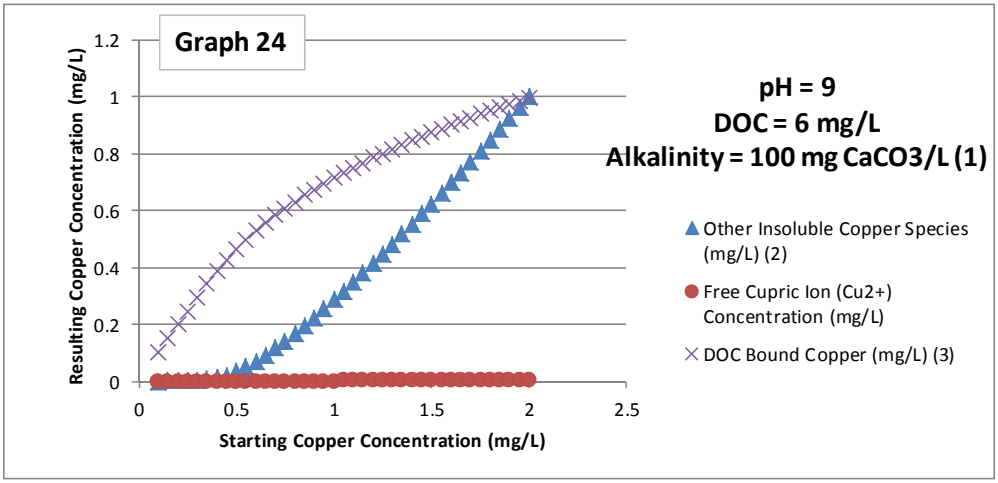

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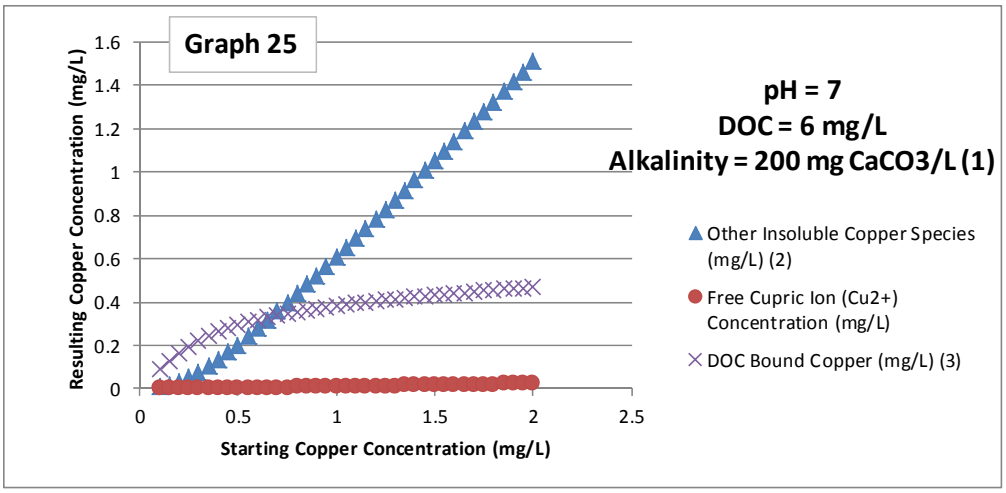

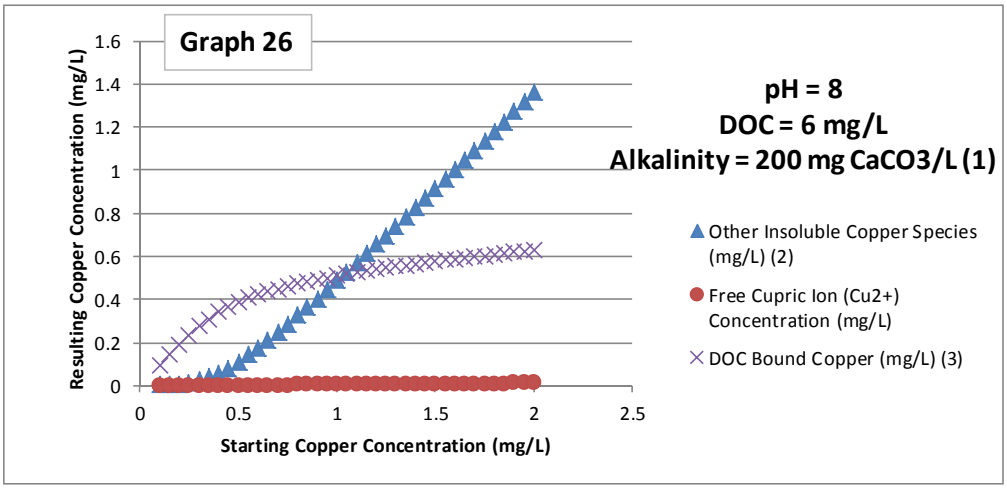

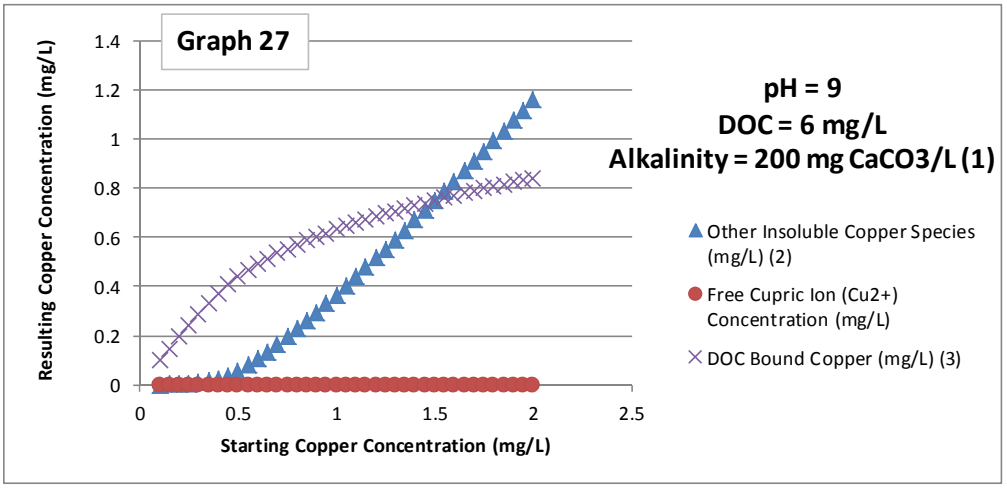

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Appendix D

(DPR PCA Recommendation Form)

Pest Control Recommendation

1. Operator of the Property.			2.Recommendation Expiration Date
Address	City	County	
3. Location to be Treated			
4. Commodity to be Treated			5. Acres or Units to be Treated
6. Method of Application: ☐ Air ☐ Ground ☐ Fumigation ☐ Other _____			7. Pest(s) to be Controlled
8. Name of Pesticide(s)	Rate per Acre or Unit	Dilution Rate	Volume per Acre or Unit

9. Hazards and/or Restrictions: ☐ 1. Highly toxic to bees. ☐ 2. Toxic to birds, fish and wildlife. ☐ 3. Do not apply when irrigation or run-off is likely to occur. ☐ 4. Do not apply near desirable plants. ☐ 5. Do not allow to drift onto humans, animals, or desirable plants. ☐ 6. Keep out of lakes, streams, and ponds. ☐ 7. Birds feeding on treated area may be killed. ☐ 8. Do not apply when foliage is wet (dew, rain, etc.). ☐ 9. May cause allergic reaction to some people. ☐10. This product is corrosive and reacts with certain materials (see label). ☐11. Closed system required. ☐12. Restricted use pesticide (California and/or EPA). ☐13. Hazardous area involved (see map and warnings) ☐14. Other (see attachment)	10. Schedule, Time or Conditions 11. Surrounding Crop Hazards 12. Proximity of Occupied Dwellings, People, Pets, or Livestock 13. Non-Pesticide Pest Control, Warnings and Other Remarks 14. Criteria Used for Determining Need for Pest Control Treatment: ☐ Sweep Net Counts ☐ Leaf or Fruit Counts ☐ Preventative ☐ Field Observation ☐ Pheromone or Other Trap ☐ Soil Sampling ☐ Other

15. Crop and Site Restrictions: ☐ 1. Worker reentry interval _____ days. ☐ 2. Do not use within _____ days of harvest/slaughter. ☐ 3. Posting required? ☐ Yes ☐ No ☐ 4. Do not irrigate for at least _____ days after application. ☐ 6. Do not feed treated foliage or straw to livestock. ☐ 7. Plantback restrictions (see label) ☐ 8. Other (see attachment)		N	
16. I certify that I have considered alternatives and mitigation measures that would substantially lessen any significant impact on the environment, and have adopted those feasible. Adviser Signature Date	W		E
Adviser License Number Employer Employer's Address		S	

Appendix E

(Example Product Labels and SDS Sheets)

SPECIMEN LABEL

CUTRINE®-PLUS

ALGAECIDE and HERBICIDE

FOR USE IN: LAKES; POTABLE WATER RESERVOIRS; PONDS; FISH HATCHERIES AND RACEWAYS; CROP AND NON-CROP IRRIGATION CONVEYANCE SYSTEMS (DITCHES, CANALS AND LATERALS)

ACTIVE INGREDIENTS:
Copper Ethanolamine Complex, Mixed (Mono CAS# 14215-52-2 and Tri CAS# 82027-59-6)*.....27.9%
OTHER INGREDIENTS.....72.1%
TOTAL.....100.0%

*Metallic copper equivalent, 9%.
Contains 0.909 lbs. of elemental copper per gallon.

KEEP OUT OF REACH OF CHILDREN

CAUTION

Si usted no entiende la etiqueta busque a alguien para que se la explique a usted en detalle. (If you do not understand the label, find someone to explain it to you in detail.)

See additional precautions on Back Panel

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EPA Est. No. 42291-GA-1

GENERAL INFORMATION

This product is a liquid copper-based formulation containing ethanolamine chelating agents to prevent the precipitation of copper with carbonates and bicarbonates in the water. This product effectively controls a broad range of algae including: Planktonic (suspended) forms such as the Cyanobacteria (Microcystis, Anabaena & Aphanizomenon), Green algae (Raphidocelis & Cosmarium) Golden algae (*Prymnesium parvum*) and diatoms (Navicula & Fragilaria); Filamentous (mat-forming) forms such as the Green Algae (Spirogyra, Cladophora, Ulothrix & Rhizoclonium) and Benthic (bottom-growing) forms such as Chara and Nitella. This product has also been proven effective in controlling the rooted aquatic plant, *Hydrilla verticillata*. Waters treated with This product may be used for swimming, fishing, further potable water treatment, livestock watering or irrigating turf, ornamental plants or crops after treatment.

DIRECTIONS FOR USE

It is a violation of Federal Law to use this product in a manner inconsistent with its labeling. For applications in waters destined for use as drinking water, those waters must receive additional and separate potable water treatment. Do not apply more than 1.0 ppm as metallic copper in these waters. Read entire label and use strictly in accordance with precautionary statements and directions.

GENERAL APPLICATION RESTRICTIONS:

(For end-use products in containers ≥ 5 gallons or ≥ 50 pounds.)
Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your State or Tribe, consult the State or Tribe agency responsible for pesticide regulation.
(For end-use consumer products in containers less than 5 gallons or less than 50 pounds)
Do not apply this product in a way that will contact adults, children, or pets, either directly or through drift. Some states may require permits for the application of this product to public waters. Check with your local authorities.
(For all sizes) Do not enter or allow others to enter until application of product has been completed.

PRE-TREATMENT CONSIDERATIONS:

(For end-use products in containers ≥ 5 gallons or ≥ 50 pounds.)
In Potable Water Reservoirs, Lakes, Industrial Ponds & Wastewater or other monitored water systems, initial treatment with this product must be considered at the onset of nuisance bloom conditions as evidenced by initial taste and odor complaints; high cell counts or chlorophyll *a* concentrations; high MIB or geosmin concentrations; visible surface scum formations; low Secchi disk readings; significant daily fluctuations in dissolved oxygen; and/or sudden increases in pH. Monitoring of several of these parameters on a regular basis will assist in optimizing the timing of treatments and reducing the amounts of this product needed for seasonal control. Identification of primary nuisance species or genera may also be helpful in determining and refining dosage rates.
(For end-use consumer products in containers less than 5 gallons or less than 50 pounds)
In Ponds (Farm, Fire, Fish, Golf Course, Irrigation, Ornamental, Stormwater Retention, Swimming), Small Lakes, Fish Hatcheries, Aquaculture Facilities, treatment with this product should be started when visible, actively growing algae and susceptible plants appear in spring, preferably before significant surface accumulations occur. Aeration and/or fountain system, where available, should be in operation at the time of treatment.

Spray Drift Management

A variety of factors including weather conditions (e.g., wind direction, wind speed, temperature, relative humidity) and the method of application (e.g., ground, aerial, airblast, chemigation) can influence pesticide drift. The applicator must evaluate all factors and make appropriate adjustments when applying this product.

Droplet Size

Apply only as a medium or coarser spray (ASAE standard 572) or a volume mean diameter of 300 microns or greater for spinning atomizer nozzles.

Wind Speed

Do not apply at wind speeds greater than 15 mph. Only apply this product if the wind direction favors on-target deposition (approximately 3 to 10 mph), and there are no sensitive areas within 250 feet down wind.

Temperature Inversions

If applying at wind speeds less than 3 mph, the applicator must determine if a) conditions of temperature inversion exist, or b) stable atmospheric conditions exist at or below nozzle height. Do not make applications into areas of temperature inversions or stable atmospheric conditions.

Other State and Local Requirements

Applicators must follow all state and local pesticide drift requirements regarding application of copper compounds. Where states have more stringent regulations, they must be observed.

Equipment

All ground application equipment must be properly maintained and calibrated using appropriate carriers or surrogates.

SURFACE SPRAY / INJECTION
SLOW-FLOWING OR QUIESCENT WATER BODIES
ALGAECIDE APPLICATION

For effective control, proper chemical concentration must be maintained for a minimum of three hours contact time. The application rates in the chart are based on static or minimal flow situations. Where significant dilution or loss of water from unregulated inflows or outflows occur (raceways) within a three hour period, chemical may have to be metered in.

1. Identify the form of algae growth present as one of the following types: Planktonic (suspended), Filamentous (mat forming), or Benthic (Chara/Nitella) and estimate the density of growth (Low, Medium, High). Use **Table 1 - Copper Concentration** to select the desired PPM (Parts per Million) **Copper** needed, based upon the algal form and density.

Table 1 - Copper Concentration

Form of Algal Growth	Density of Growth		
	Low	Medium	High
Planktonic	0.2	0.4	0.6
Filamentous	0.2	0.6	0.8
Benthic	0.4	0.7	1.0

2. Refer to the **Table 2 – Product Application Rate** and determine gallons of product needed per Acre-foot corresponding to the desired PPM concentration determined in Step #1.

Table 2 - Product Application Rate (Gallons)

PPM Copper	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
Gallon per Acre-ft	0.6	0.9	1.2	1.5	1.8	2.1	2.4	2.7	3.0

3. Determine acre-feet within the intended treatment area (area of infestation) by measuring length, width plus averaging several depth readings within the treatment area. Use the formula:

$$\frac{\text{Length (ft.) x Width (ft.) X Avg. Depth (ft.)}}{43{,}560} = \text{Acre-Feet}$$

4. Multiply Acre-Feet calculated in Step #3 times the gallons of this product determined in Step #2 to determine number of gallons of this product required for the intended treatment area.
5. Before applying, dilute the required amount of this product with enough water to ensure even distribution with the type of equipment being used. Typical dilution range is 9:1 when using backpack-type sprayer or up to 50:1 when using water pump equipment or large tank sprayers.
6. Break up floating algae mats manually before spraying or with force of power sprayer if one is used. Use hand or power sprayer adjusted to rain-sized droplets to cover area evenly taking water depth into consideration. If using underwater injection systems such as drop hoses or booms with weighted drop hoses, ensure boat pattern is uniform throughout treatment area. Spray shoreline areas first to avoid trapping fish.
7. Clean spray equipment by flushing with clean water after treatment and follow STORAGE AND DISPOSAL instructions on the label for empty or remaining partial containers.
8. Under conditions of heavy infestation, treat only ⅓ to ½ of the water body at a time to avoid fish suffocation caused by oxygen depletion from decaying algae. (see additional Environmental Hazards).

OTHER TREATMENT FACTORS AND CONSIDERATIONS

- Calm and sunny conditions when water temperature is at least 60ºF will usually expedite control results.
- Effective control of algae requires direct contact with all cells throughout the water column, since these plants do not have vascular systems to transport copper from cell to cell.
- Visible reduction in algae growth should be observed in 24 to 48 hours following application with full infestation and water temperatures.
- Re-treat areas if re-growth or new growth begins to appear and seasonal control is desired. Identify new growth to re-check required copper concentration that may be needed for control. Apply treatment along the shore and proceed outwards in bands to allow fish to move into untreated areas.
- No more than ½ of the water body may be treated at one time. (refer to Environmental Hazards for additional guidance)
- The minimum retreatment interval between consecutive treatments is 14 days.

CUTRINE-PLUS Granular Algaecide may be used as an alternative in low volume flow situations, spot treatments or treatment of bottom-growing algae in deep water.

Permits: Some states may require permits for the application of this product to public waters. Check with your local authorities.

HERBICIDE APPLICATION (For Hydrilla Control)

CUTRINE-PLUS®: Control of *Hydrilla verticillata* can be obtained from copper concentrations of 0.4 to 1.0 ppm resulting from product treatment. Choose the application rate based upon stage and density of Hydrilla growth and respective water depth from the chart below.

CUTRINE-PLUS : HARVESTER® TANK MIX

On waters where enforcement of use restrictions for recreational, domestic and irrigation uses are acceptable, the following mixture can be used as an alternative Hydrilla control method.

Tank mix 3 gallons of CUTRINE-PLUS with 2 gallons of HARVESTER. Apply mixture at the rate of 5 gallons per surface acre. Dilute with at least 9 parts water and apply as a surface spray or underwater injection. Observe all cautions and restrictions on the labels of both products used in this mixture.

Application Rates
Gallons/Surface Acre*

Growth/Stage Relative Density	PPM copper	Average Depth (in feet)*					
		1	2	3	4	5	6
Early Season Low Density	0.4	1.2	2.4	3.6	4.8	6.0	7.2
	0.5	1.5	3.0	4.5	6.0	7.5	9.0
	0.6	1.8	3.6	5.4	7.2	9.0	10.8
Mid-Season Moderate Density	0.7	2.1	4.2	6.3	8.4	10.5	12.6
	0.8	2.4	4.8	7.3	9.6	12.0	14.4
Late Season High Density	0.9	2.7	5.4	8.1	10.8	13.5	16.2
	1.0	3.0	6.0	9.0	12.0	15.0	18.0

*Application rates for depths greater than six feet may be obtained by adding the rates given for the appropriate combination of depths. Application rates should not result in excess of 1.0 ppm copper concentration within treated water.

FLOWING WATER
DRIP SYSTEM APPLICATION -
FOR USE IN POTABLE WATER AND IRRIGATION CONVEYANCE SYSTEMS

PRE-TREATMENT CONSIDERATIONS

In Crop and Non-Crop Irrigation Conveyance Systems: Ditches Canals & Laterals, product treatments must be applied as soon as algae or aquatic vascular plants begin to interfere noticeably with normal delivery of water (clogging of lateral headgates, suction screens, weed screens and siphon tubes). Delaying treatment could perpetuate the problem causing massing and compacting of plants. Heavy infestations and low flow conditions may require increasing water flow rate during application.

Accurately determine water flow rates. In the absence of weirs, orifices, or similar devices which give accurate water flow measurements, volume of flow may be estimated by the following formula:

Average Width (feet) x Average Depth (feet) x Velocity* (feet/second) x 0.9
= Cubic Feet per Second (C.F.S.)

*Velocity is the time it takes a floating object to travel a given distance. Dividing the distance traveled (feet) by the time (seconds) will yield velocity (feet/second). Repeat this measurement at least three times at the intended application site then averaged.

- After accurately determining the water flow rate in C.F.S. or gallons/minute, find the corresponding product drip rate on the chart below.
- Calculate the amount of this product needed to maintain the drip rate for a period of 3 hours by multiplying Qts./Hr. x 3; ml/Min. x 180; or Fl. Oz./Min. x 180. Dosage will maintain 1.0 ppm Copper concentration in the treated water for the 3 hour period. Introduction of the chemical should be made in the channel at weirs or other turbulence-creating structures to promote the dispersion of chemical.

WATER FLOW RATE		PRODUCT DRIP RATE*		
C.F.S.	Gal./Min.	Qts./Hr.	Ml/Min.	Fl.Oz./Min.
1	450	1	16	0.5
2	900	2	32	1.1
3	1350	3	47	1.6
4	1800	4	63	2.1
5	2250	5	79	2.7

- Pour the required amount of this product into a drum or tank equipped with a brass needle valve and constructed to maintain a constant drip rate. Use a stop watch and appropriate measuring container to set the desired drip rate. Readjust accordingly if flow rate changes during the 3 hour treatment period.
- Distance of control obtained down the waterway will vary depending upon density of vegetation growth. Treatment period may have to be extended up to 6 hours in areas where control may be difficult due to high flows or significant growth. Periodic maintenance treatments may be required to maintain seasonal control.

Chemigation System Application

This product may be applied for the maintenance of chemigation systems. To control algae in chemigation systems this product should be applied continuously during water application. For continuous addition application apply 0.60 – 3.0 gallons of this product per 1,000,000 (one million) gallons of water (1.80 - 9.0 gallons of this product per acre-foot of water). The copper concentration range is 0.20 to 1.0 ppm. Do not exceed 1.0 ppm of copper or 2.75 gallons of this product per 100,000 gallons of water. For additional guidance regarding specific calibrations or application techniques contact application equipment manufacturer, supplier, or pest control advisor. It is not necessary to agitate or dilute this product in the supply tank before application to chemigation systems.

Application Rates for Chemigation Systems	
Copper Concentration (ppm)	Amount of This Product Per Acre-Foot
	Gallons
0.2	0.60
0.3	0.90
0.4	1.20
0.5	1.50
0.6	1.80
0.7	2.10
0.8	2.40
0.9	2.70
1.0	3.00

CHEMIGATION SYSTEM APPLICATION

- Apply product only through sprinkler and drip irrigation systems including: center pivot, lateral move, end tow, side (wheel) roll, traveler, big gun, solid set, or hand move; flood (basin), furrow, border or drip systems.
- Crop injury, lack of effectiveness, or illegal pesticide residues in the crop can result from non-uniform distribution of treated water.
- If you have questions about calibration, contact Applied Biochemists, State Extension Service, equipment manufacturer, or other experts.
- Do not connect an irrigation system (including greenhouse systems) used for pesticide application to a public water system unless the pesticide label-prescribed safety devices for public water systems are in place (refer to the Chemigation Systems Connected to a Public Water Supply section of this label).
- Trained personnel, knowledgeable of the Chemigation system and responsible for its operation or under the supervision of the responsible person, shall shut the system down and make necessary adjustments should the need arise. The system should be inspected, calibrated, and maintained before product application begins.

Chemigation Systems Connected to a Public Water Supply

- Public water system is a system for the provision to the public of piped water for human consumption if such system has at least 15 service connections or regularly serves an average of at least 25 individuals daily at least 60 days out of the year.
- Chemigation systems connected to public water systems must contain a functional, reduced-pressure zone, back flow preventer (RPZ) or the functional equivalent in the water supply line upstream from the point of pesticide introduction. There shall be a complete physical break (air gap) between the flow outlet end of the fill pipe and the top or overflow rim of the reservoir tank of at least twice the inside diameter of the fill pipe.
- The pesticide injection pipeline must contain a functional, automatic, quick-closing check valve to prevent the backflow of solution toward the injection.
- The pesticide injection pipeline must contain a functional, normally closed, solenoid operated valve located on the intake side of the injection pump and connected to the system interlock to prevent fluid from being withdrawn from the supply tank when the irrigation system is either automatically or manually shut down.
- The system must contain functional interlocking controls to automatically shut off the pesticide injection pump when the water pump motor stops or in cases where there is no water pump, when the water pressure decreases to the point where pesticide distribution is adversely affected.
- Systems must use a metering pump, such as a positive displacement injection pump (e.g.,diaphragm pump) effectively designed and constructed of materials that are compatible with pesticides in use and capable of being fitted with a system interlock.
- Inspect, calibrate and maintain the system before product application.

Sprinkler Chemigation Requirements

- The system must contain a functional check valve, vacuum relief valve, and low pressure drain appropriately located on the irrigation pipeline to prevent water source contamination from back flow.
- The pesticide injection pipeline must contain a functional, automatic, quick-closing check valve to prevent the backflow of solution toward the injection pump.
- The pesticide injection pipeline must also contain a functional, normally closed, solenoid operated valve located on the intake side of the injection pump and connected to the system interlock to prevent fluid from being withdrawn from the supply tank when the irrigation system is either automatically or manually shut down.
- The system must contain functional interlocking controls to automatically shut off the pesticide injection pump when the water pump motor stops.
- The irrigation line or water pump must include a functional pressure switch which will stop the water pump motor when the water pressure decreases to the point where pesticide distribution is adversely affected.
- Systems must use a metering pump, such as a positive displacement injection pump (e.g. diaphragm pump) effectively designed and constructed of materials that are compatible with pesticides and capable of being fitted with a system interlock.
- Do not apply when drift would extend beyond the area intended for treatment.

Floor (Basin). Furrow and Border Chemigation Requirements

- Gravity Flow Systems pesticide dispensing system must meter the pesticide into the water at the head of the field and downstream of a hydraulic discontinuity such as a drop structure or weir box to decrease potential for water source contamination from back flow if water flow stops.
- Pressurized water systems with a pesticide injection system must meet the following requirements:
  - The system must contain a functional check valve, vacuum relief valve, and low pressure drain appropriately located on the irrigation pipeline to prevent water source contamination from back flow.
  - The pesticide injection pipeline must contain a functional, automatic, quick-closing check valve to prevent the backflow of solution toward the injection pump.
  - The pesticide injection pipeline must also contain a functional, normally closed,solenoid-operated valve located on the intake side of the injection pump and connected to the system interlock to prevent fluid from being withdrawn from the supply tank when the irrigation system is either automatically or manually shut down.
  - The system must contain functional interlocking controls to automatically shut off the pesticide injection pump when the water pump motor stops.
  - The irrigation line or water pump must include a functional pressure switch which will stop the water pump motor when the water pressure decreases to the point where pesticide distribution is adversely affected.
  - Systems must use a metering pump, such as a positive displacement injection pump (e.g., diaphragm pump) effectively designed and constructed of materials that are compatible with pesticides and capable of being fitted with a system interlock.

Drip Chemigation Requirements

- The system must contain a functional check valve, vacuum relief valve, and low pressure drain appropriately located on the irrigation pipeline to prevent water source contamination from back flow.
- The pesticide injection pipeline must contain a functional, automatic, quick-closing check valve to prevent the backflow of solution toward the injection pump.
- The pesticide injection pipeline must also contain a functional, normally closed, solenoid operated valve located on the intake side of the injection pump and connected to the system interlock to prevent fluid from being withdrawn from the supply tank when the irrigation system is either automatically or manually shut down.
- The system must contain functional interlocking controls to automatically shut off the pesticide injection pump when the water pump motor stops.
- The irrigation line or water pump must include a functional pressure switch which will stop the water pump motor when the water pressure decreases to the point where pesticide distribution is adversely affected.
- Systems must use a metering pump, such as a positive displacement injection pump (e.g.. diaphragm pump) effectively designed and constructed of materials that are compatible with pesticides and capable of being fitted with a system interlock.

Submersed Plant Control Applications

This product can be applied to control hydrilla (*Hydrilla verticillata*), egeria (*Egeria densa*), and other aquatic weeds susceptible to copper treatment. Apply at a rate to achieve 0.70 to 1.0 ppm copper (3.72 to 5.32 Gallons/Acre foot). In heavily infested areas, a second application after the 14 day retreatment interval may be necessary.

Tank Mix Applications

This product can be tank mixed with other herbicides to improve efficacy; and to control algae in areas where heavy algae growth may cover target submersed plant species and interfere with herbicide exposure. Do not mix concentrates in tank without first adding water. To ensure compatibility, conduct a jar test before application. This product must not be mixed with any product containing a label prohibition against such mixing and must be used in accordance with the most restrictive label limitations and precautions. Label dosage rates must not be exceeded.

FIRST AID

If on skin or clothing:
- Take off contaminated clothing.
- Rinse skin immediately with plenty of water for 15-20 minutes.
- Call a Poison Control Center or doctor for treatment advice .

If swallowed:
- Call a Poison Control Center or doctor immediately for treatment advice.
- Have person sip a glass of water if able to swallow.
- Do not induce vomiting unless told to do so by a Poison Control Center or doctor.
- Do not give anything by mouth to an unconscious person.

If in eyes:
- Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye.
- Call a Poison Control Center or doctor for treatment advice.

If inhaled:
- Move person to fresh air.
- If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible.
- Call a Poison Control Center or doctor for further treatment advice.

Have the product container or label with you when calling a Poison Control Center or doctor, or going for treatment.

In case of emergency call 1-800-654-6911

PRECAUTIONARY STATEMENTS

HAZARDS TO HUMANS AND DOMESTIC ANIMALS

CAUTION. Harmful if swallowed or absorbed through skin. Causes moderate eye irritation. Avoid contact with skin, eyes or clothing.

Personal Protective Equipment (PPE)

Mixers, loaders, applicators, and other handlers must wear the following:
- Coveralls over long-sleeved shirt and long pants,
- Chemical-resistant footwear plus socks,
- Protective eyewear (such as goggles, safety glasses or face shield)
- Chemical-resistant gloves made of any waterproof material, and a chemical-resistant apron when mixing, loading, or cleaning equipment.

USER SAFETY REQUIREMENTS

Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables exist, use detergent and hot water. Keep and wash PPE separately from other laundry. Discard clothing and other absorbent material that have been drenched or heavily contaminated with the product's concentrate. Do not reuse them. Users must wash hands before eating, drinking, chewing gum, using tobacco or using the toilet. Remove clothing/PPE immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing. Remove PPE immediately after handling this product. As soon as possible, wash thoroughly and change into clean clothing. Wash outside of gloves before removing.

Potable water sources treated with this copper product may be used as drinking water only after proper additional potable water treatments.

ENVIRONMENTAL HAZARDS:

Do not use in waters containing Koi and hybrid goldfish. Not intended for use in small volume, garden pond systems.

FISH AND AQUATIC ORGANISMS:

Waters treated with this product may be hazardous to aquatic organisms. Treatment of aquatic weeds and algae can result in oxygen loss from decomposition of dead algae and weeds. This oxygen loss can cause fish and invertebrate suffocation. To minimize hazard, do not treat more than ½ of the water body to avoid depletion of oxygen due to decaying vegetation. Wait at least 10 to 14 days between treatments. Begin treatment along the shore and proceed outwards in bands to allow fish to move into untreated areas. In regions where ponds freeze in winter, treatment should be done 6 to 8 weeks before expected freeze time to prevent masses of decaying algae under an ice cover. Consult with the State or local agency with primary responsibility for regulating pesticides before applying to public waters, to determine if a permit is required. This pesticide is toxic to some fish and aquatic invertebrates and may contaminate water through runoff. This product has a potential for runoff for several months or more after application. Poorly draining soils and soils with shallow water tables are more prone to produce runoff that contains this product. Do not contaminate water when disposing of equipment wash-waters or rinsate.

Certain water conditions including low pH (6.5) low dissolved organic carbon (DOC) levels (3.0 mg/L or lower), and "soft" waters (i.e., alkalinity less than 50 mg/L), increases the potential acute toxicity to non-target aquatic organism. Potable water sources treated with copper products may be used as drinking water only after proper additional potable water treatments. Trout and other species of fish may be killed at application rates recommended on the label, especially in soft or acidic waters as described above. Do not contaminate water when disposing of equipment wash-waters or rinsate.

To protect listed species in California, contact your County Agricultural Commissioner or refer to the Department of Pesticide Regulation's PRESCRIBE Internet Database: http://www.cdpr.ca.gov/docs/endspec/prescint

STORAGE & DISPOSAL:

Do not contaminate water, food or feed by storage or disposal. Open dumping is prohibited.

PESTICIDE STORAGE:

Keep container closed when not in use. Keep pesticide in original container. Do not put concentrate or dilute into food or drink containers. Do not reuse or refill container. Do not contaminate feed, feedstuffs, or drinking water. Do not store or transport near feed or food.

PESTICIDE DISPOSAL:

Wastes resulting from the use of this product must be disposed of on site or at an approved waste disposal facility.

CONTAINER DISPOSAL:

(For ≤5 gallon non-refillable containers only):

Nonrefillable container. Do not reuse container. Triple rinse as follows: Empty the remaining contents into application equipment or a mix tank. Fill the container ¼ full with water and recap. Shake for 10 seconds. Pour rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Drain for 10 seconds after the flow begins to drip. Repeat this procedure two more times. Then offer for recycling or reconditioning if available or puncture and dispose of in approved landfill, or incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke. Consult Federal, State or local authorities for approved alternative procedures.

(For >5 gallon non-refillable containers only):

Nonrefillable container. Do not reuse container. Triple rinse as follows: Empty the remaining contents into application equipment or a mix tank. Fill the container ¼ with water and recap. Replace and tighten closures. Tip container on its side and roll it back and forth, ensuring at least one complete revolution, for 30 seconds. Stand container on its end and tip it back and forth several times. Empty the rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Repeat this procedure two more times. Then offer for recycling or reconditioning if available or puncture and dispose of in approved landfill, or incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke. Consult Federal, State or local authorities for approved alternative procedures.

(For 275 Gallon refillable container only): Refillable container. Cleaning the container before final disposal is the responsibility of the person disposing of the container. Cleaning before refilling is the responsibility of the refiller. To clean the container before final disposal, empty the remaining contents from this container into application equipment or mix tank. Fill container about 10 percent full with water. Agitate vigorously or recirculate water with pump for 2 minutes. Pour or pump rinsate into application equipment or rinsate collection system. Repeat rinsing procedure two more times. Then offer for recycling or reconditioning if available or puncture and dispose of in approved landfill, or incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke. Consult Federal, State or local authorities for approved alternative procedures.

WARRANTY

To the extent consistent with applicable law neither the manufacturer nor the seller makes any warranty, expressed or implied concerning the use of this product other than indicated on the label. To the extent consistent with applicable law buyer assumes risk of use of this material when such use is contrary to label instructions. Read and follow the label directions.

SAFETY DATA SHEET

FOR ANY EMERGENCY, 24 HOURS / 7 DAYS, CALL:	1-800-654-6911 (OUTSIDE USA: 1-423-780-2970)
FOR ALL TRANSPORTATION ACCIDENTS, CALL CHEMTREC®:	1-800-424-9300 (OUTSIDE USA: 1-703-527-3887)
FOR ALL SDS QUESTIONS & REQUESTS, CALL:	1-800-511-MSDS (OUTSIDE USA: 1-423-780-2347)

PRODUCT NAME: **AB CUTRINE-PLUS**

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Supplier
Applied Biochemists (WI)
W175 N11163 Stonewood Drive , Suite 234
Germantown, WI, 53022
USA

Telephone: +12622554449
Telefax: +12622554449
Web: www.appliedbiochemists.com

Manufacturer
Advantis Technologies
1200 Bluegrass Lakes Parkway
Alpharetta, GA 30004
United States of America

REVISION DATE:	05/27/2015
SUPERCEDES:	02/19/2010
MSDS Number:	000000024433
SYNONYMS:	
CHEMICAL FAMILY:	None
DESCRIPTION / USE	None established
FORMULA:	None established

SECTION 2. HAZARDS IDENTIFICATION

GHS Classification

Flammable liquids	:	Category 4
Eye irritation	:	Category 2B
Specific target organ toxicity - single exposure	:	Category 3 (Respiratory system)

GHS Label element

Hazard pictograms :

Signal word : Warning

Hazard statements : H227 Combustible liquid.
H320 Causes eye irritation.
H335 May cause respiratory irritation.

Precautionary statements : **Prevention:**
P210 Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P261 Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P264 Wash skin thoroughly after handling.
P271 Use only outdoors or in a well-ventilated area.
P280 Wear protective gloves/ eye protection/ face protection.
Response:
P304 + P340 + P312 IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER or doctor/ physician if you feel unwell.
P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P312 Call a POISON CENTER or doctor/ physician if you feel unwell.
P337 + P313 If eye irritation persists: Get medical advice/ attention.
P370 + P378 In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
Storage:
P403 + P233 Store in a well-ventilated place. Keep container tightly closed.
P403 + P235 Store in a well-ventilated place. Keep cool.
P405 Store locked up.
Disposal:
P501 Dispose of contents/ container to an approved waste disposal plant.

Other hazards

None known.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

CAS OR CHEMICAL NAME	CAS #	% RANGE
Triethanolamine	102-71-6	19 - 29
Ethanolamine	141-43-5	15 - 25

SECTION 4. FIRST AID MEASURES

General Advice: Call a poison control center or doctor for treatment advice. For 24-hour emergency medical assistance, call Arch Chemical Emergency Action Network at 1-800-654-6911. Have the product container or label with you when calling a poison control center or doctor, or going for treatment.

Inhalation: IF INHALED: Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible. Call a poison control center or doctor for further treatment advice.

Skin Contact: IF ON SKIN OR CLOTHING: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice.

Eye Contact: IF IN EYES: Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a poison control center or doctor for treatment advice.

Ingestion: IF SWALLOWED: Call a poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by a poison control center or doctor. Do not give anything by mouth to an unconscious person.

SECTION 5. FIREFIGHTING MEASURES

Flammability Summary (OSHA): The product is not flammable., Not combustible., Not explosive, The substance or mixture is not classified as pyrophoric.

Flammable Properties

Fire / Explosion Hazards: 0 - Will not burn

Extinguishing Media: Carbon dioxide (CO2) Dry chemical Foam

Fire Fighting Instructions: Use water spray to cool unopened containers. In case of fire, use normal fire-fighting equipment and the personal protective equipment recommended in Section 8 to include a NIOSH approved self-contained breathing apparatus.

Hazardous Combustion Products: During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal Protection for Emergency Situations:	Use the personal protective equipment recommended in Section 8 and a NIOSH approved self-contained breathing apparatus.

Spill Mitigation Procedures

Air Release:	Keep people away from and upwind of spill/leak.
Water Release:	If the product contaminates rivers and lakes or drains inform respective authorities.
Land Release:	Contain spillage, soak up with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and transfer to a container for disposal according to local / national regulations (see section 13).The product should not be allowed to enter drains, water courses or the soil.
Additional Spill Information :	Prevent further leakage or spillage if safe to do so. Evacuate personnel to safe areas. Use personal protective equipment as required.

SECTION 7. HANDLING AND STORAGE

Handling:	Do not take internally. Avoid contact with skin, eyes and clothing. Upon contact with skin or eyes, wash off with water. Avoid breathing mist or vapor.
Storage:	Store in a cool, dry and well ventilated place. Isolate from incompatible materials.
Incompatible Materials for Storage:	Refer to Section 10, "Incompatible Materials."

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Ventilation:	Local exhaust ventilation or other engineering controls are normally required when handling or using this product to keep airborne exposures below the TLV, PEL or other recommended exposure limit.

Protective Equipment for Routine Use of Product

Respiratory Protection :	Wear a NIOSH approved respirator if levels above the exposure limits are possible., A NIOSH approved air purifying respirator with organic vapor cartridge and N95 particulate filter. Air purifying respirators should not be used in oxygen deficient or IDLH atmospheres or if exposure concentrations exceed ten (10) times the published limit.
Skin Protection :	Avoid contact with skin. Impervious gloves
Eye Protection:	Safety glasses with side-shields
Protective Clothing Type:	impervious clothing
General Protective Measures:	Emergency eyewash should be provided in the immediate work area.

Components with workplace control parameters

Components (CAS-No.)	Value	Control parameters	Basis (Update)

Triethanolamine (102-71-6)	TWA	5 mg/m3	ACGIH (02 2014)
Ethanolamine (141-43-5)	TWA	3 ppm	ACGIH (02 2014)
	STEL	6 ppm	ACGIH (02 2014)
BASIC COPPER CARBONATE (12069-69-1)	Conc	100 mg/m3	NIOSH/GUIDE (2005)

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	liquid
Form	No data.
Color:	No data.
Odor:	No data.
Molecular Weight:	None established
pH :	10.3 - 10.5 ()
Boiling Point:	no data available
Melting point/freezing point	No data
Density	Not applicable
Bulk Density:	() no data available
Vapor Pressure:	no data available
Vapor Density:	> 1 (Air = 1.0)
Viscosity:	no data available no data available
Solubility in Water:	completely miscible
Partition coefficient n-octanol/water:	No data.
Evaporation Rate:	no data available
Oxidizing:	None established
Volatiles, % by vol.:	no data available
VOC Content	no data available This product does not contain any chemicals listed under the U.S. Clean Air Act Section 111 SOCMI Intermediate or Final VOC's (40 CFR 60.489). This product does not contain any VOC exemptions listed under the U.S. Clean Air Act Section 450.
HAP Content	Not applicable

SECTION 10. STABILITY AND REACTIVITY

Stability and Reactivity Summary:	Stable under normal conditions.
Conditions to Avoid:	High temperatures
Chemical Incompatibility:	Strong acids, Nitrates
Hazardous Decomposition Products:	Carbon oxides, Nitrogen oxides (NOx)

Decomposition Temperature: No data

SECTION 11. TOXICOLOGICAL INFORMATION

Component Animal Toxicology
Oral LD50 value:

Triethanolamine	LD50	=	7,390 mg/kg	Rat
Ethanolamine	LD50	=	1,700 mg/kg	Rat
BASIC COPPER CARBONATE	LD50	=	1,350 mg/kg	Rat

Component Animal Toxicology
Dermal LD50 value:

Triethanolamine	LD50	>	2,000 mg/kg	Rabbit
Ethanolamine	LD50	Approximately	1,000 mg/kg	Rabbit
BASIC COPPER CARBONATE	no data available			

Component Animal Toxicology
Inhalation LC50 value:

Triethanolamine	A saturated vapor concentration for 8 hours (rats) did not produce any deaths.			
Ethanolamine	LC50 1 h	>	2.42 mg/l	Mouse
	LC50 4 h	>	970 ppm	Mouse
BASIC COPPER CARBONATE	no data available			

Product Animal Toxicity

Oral LD50 value:	LD50	Believed to be approximately	3,790 mg/kg	Rat
Dermal LD50 value:	LD50	Believed to be >	2,000 mg/kg	Rabbit
Inhalation LC50 value:	no data available			

Skin Irritation: Not expected to be irritating to the skin.
Eye Irritation: slight irritation
Skin Sensitization: This material is not known or reported to be a skin or respiratory sensitizer.

Triethanolamine	This material tested negative for skin sensitization in animals.
Ethanolamine	This material tested negative for skin sensitization in animals.

Acute Toxicity: May cause mild eye irritation. Ingestion may cause mild gastrointestinal discomfort.Inhalation of mist or vapor may cause irritation to the mucous

membranes of the respiratory tract.

Subchronic / Chronic Toxicity: Not known or reported to cause subchronic or chronic toxicity.

Triethanolamine	Animal studies suggest that chronic (repeated) overexposure may result in damage to the liver and kidney.

Reproductive and Developmental Toxicity: Not known or reported to cause reproductive or developmental toxicity.

Triethanolamine	This product has been tested and was shown not to produce any adverse effects on reproductive function or fetal development when administered to laboratory animals.
Ethanolamine	This chemical has been tested in laboratory animals and no evidence of teratogenicity, embryotoxicity or fetotoxicity was seen.

Mutagenicity: Not known or reported to be mutagenic.

Triethanolamine	This chemical has been shown to be non-mutagenic based on a battery of assays.
Ethanolamine	This chemical has been tested in a battery of mutagenicity/genotoxicity assays and the results were negative.

Carcinogenicity: This product is not known or reported to be carcinogenic by any reference source including IARC, OSHA, NTP or EPA.

Triethanolamine	The International Agency for Research on Cancer (IARC) has classified this product or a component of this product as a Group 3 substance, Unclassifiable as to Its Carcinogenicity to Humans.
Ethanolamine	This product is not known or reported to be carcinogenic by any reference source including IARC, OSHA, NTP or EPA. Chemicals of similar structure have been shown not to cause cancer in laboratory animals.

SECTION 12. ECOLOGICAL INFORMATION

Overview: Toxic to fish and other aquatic organisms.

Ecological Toxicity Values for: Triethanolamine

Pimephales promelas (fathead minnow)	-	(measured, flow-through) 96 h LC50 = 11,800 mg/l
Daphnia magna,	-	(nominal, static). 24 h EC50= 1,850 mg/l
Common shrimp (Crangon crangon)	-	(nominal, renewal). 48 h LC50> 100 mg/l

Green algae (Scenedesmus subspicatus)	-	(nominal, static). 48 h EC50 = 750 mg/l

Ecological Toxicity Values for: Ethanolamine

Rainbow trout (Oncorhynchus mykiss)	-	(nominal, static). 96 h LC50 = 150 mg/l
Mosquito fish	-	(nominal, static). 96 h LC50 = 337.5 mg/l
Bluegill	-	(nominal, static). 96 h LC50 = 329.16 mg/l
Pimephales promelas (fathead minnow)	-	(measured, flow-through) 96 h LC50 = 2,070 mg/l
Goldfish	-	(measured, static) 96 h LC50 = 170 mg/l
Daphnia magna (Water flea)	-	(nominal, static). 24 h LC50= 140 mg/l
Crangon crangon (shrimp)	-	(nominal, renewal). 48 h LC50> 100 mg/l
Brine shrimp	-	48 h LC50= 7,100 mg/l
Daphnia magna (Water flea)	-	48 h EC50= 65 mg/l

SECTION 13. DISPOSAL CONSIDERATIONS

CARE MUST BE TAKEN TO PREVENT ENVIRONMENTAL CONTAMINATION FROM THE USE OF THE MATERIAL. THE USER OF THE MATERIAL HAS THE RESPONSIBILITY TO DISPOSE OF UNUSED MATERIAL, RESIDUES AND CONTAINERS IN COMPLIANCE WITH ALL RELEVANT LOCAL, STATE AND FEDERAL LAWS AND REGULATIONS REGARDING TREATMENT, STORAGE AND DISPOSAL FOR HAZARDOUS AND NONHAZARDOUS WASTES.

Waste Disposal Summary :	If this product becomes a waste, it DOES NOT meet the criteria of a hazardous waste as defined under 40 CFR 261, in that it does not exhibit the characteristics of hazardous waste of Subpart C, nor is it listed as a hazardous waste under Subpart D.
Disposal Methods :	As a nonhazardous liquid waste, it should be disposed of in accordance with local, state and federal regulations.

SECTION 14. TRANSPORT INFORMATION

DOT
Not dangerous goods

TDG
Not dangerous goods

IATA
Not dangerous goods

IMDG-CODE
Not dangerous goods

SECTION 15. REGULATORY INFORMATION

This chemical is a pesticide product registered by the United States Environmental Protection Agency and is subject to certain labeling requirements under federal pesticide law. These requirements differ from the classification criteria and hazard information required for safety data sheets (SDS), and for workplace labels of non-pesticide chemicals.

Signal word : CAUTION!
Hazard statements : Harmful if swallowed.
Harmful if absorbed through skin.
Causes moderate eye irritation.

EPCRA - Emergency Planning and Community Right-to-Know Act

CERCLA Reportable Quantity

Components	CAS-No.	Component RQ (lbs)	Calculated product RQ (lbs)
2,2'-Iminodiethanol	111-42-2	100	

SARA 302

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313

The following components are subject to reporting levels established by SARA Title III, Section 313:

copper carbonate 12069-69-1

Clean Air Act

This product does not contain any hazardous air pollutants (HAP), as defined by the U.S. Clean Air Act Section 12 (40 CFR 61).

This product does not contain any chemicals listed under the U.S. Clean Air Act Section 112(r) for Accidental Release Prevention (40 CFR 68.130, Subpart F).

This product does not contain any chemicals listed under the U.S. Clean Air Act Section 111 SOCMI Intermediate or Final VOC's (40 CFR 60.489).

Clean Water Act

This product does not contain any Hazardous Substances listed under the U.S. CleanWater Act, Section 311, Table 116.4A.

This product does not contain any Hazardous Chemicals listed under the U.S. CleanWater Act, Section 311, Table 117.3.

This product contains the following toxic pollutants listed under the U.S. Clean Water Act Section 307

copper carbonate	12069-69-1	16.55 %

US State Regulations

Massachusetts Right To Know

2,2',2''-Nitrilotriethanol	102-71-6
2-Aminoethanol	141-43-5

Pennsylvania Right To Know

2,2',2''-Nitrilotriethanol	102-71-6
2-Aminoethanol	141-43-5
copper carbonate	12069-69-1

New Jersey Right To Know

2,2',2''-Nitrilotriethanol	102-71-6
2-Aminoethanol	141-43-5
copper carbonate	12069-69-1

California Prop 65

WARNING! This product contains a chemical known to the State of California to cause cancer.

2,2'-Iminodiethanol	111-42-2

The components of this product are reported in the following inventories:

TSCA : This product is regulated under the Federal Insecticide, Fungicide and Rodenticide Act. It must be used for purposes consistent with its labeling.

Inventories

AICS (Australia), DSL (Canada), IECSC (China), REACH (European Union), ENCS (Japan), ISHL (Japan), KECI (Korea), NZIoC (New Zealand), PICCS (Philippines), TSCA (USA)

SECTION 16. OTHER INFORMATION

SECTIONS REVISED: First formulated version in SAP.
Major References : Available upon request.

THIS MATERIAL SAFETY DATA SHEET (MSDS) HAS BEEN PREPARED IN COMPLIANCE WITH THE FEDERAL OSHA HAZARD COMMUNICATION STANDARD, 29 CFR 1910.1200. THE INFORMATION IN THIS MSDS SHOULD BE PROVIDED TO ALL WHO WILL USE, HANDLE, STORE, TRANSPORT, OR OTHERWISE BE EXPOSED TO THIS PRODUCT. THIS INFORMATION HAS BEEN PREPARED FOR THE GUIDANCE OF PLANT ENGINEERING, OPERATIONS AND MANAGEMENT AND FOR PERSONS WORKING WITH OR HANDLING THIS PRODUCT. ARCH CHEMICALS BELIEVES THIS INFORMATION TO BE RELIABLE AND UP TO DATE AS OF THE DATE OF PUBLICATION BUT, MAKES NO WARRANTY THAT IT IS. ADDITIONALLY, IF THIS MSDS IS MORE THAN THREE YEARS OLD, YOU SHOULD CONTACT ARCH CHEMICALS MSDS CONTROL AT THE PHONE NUMBER ON THE FRONT PAGE TO MAKE CERTAIN THAT THIS DOCUMENT IS CURRENT. .

Baker Petrolite

Emergency Telephone Numbers:
CHEMTREC: 1-800-424-9300 CHEMTREC Intl: 01-703-527-3887

Baker Petrolite LLC: 1-800-231-3606
Telephone Number for Information (001) 281-276-5400

PRECAUTIONARY STATEMENTS
HAZARDS TO HUMANS AND DOMESTIC ANIMALS

DANGER

Extremely flammable and irritating vapor and liquid. Fatal if swallowed. Fatal if inhaled. Do not breathe vapors or spray mist. Corrosive. Causes irreversible eye damage. May be fatal if absorbed through skin. Do not get in eyes, on skin, or on clothing. Prolonged or frequently repeated skin contact may cause allergic reactions in some individuals. Keep away from fire, sparks, and heated surfaces.

PESTICIDE PROTECTION EQUIPMENT (PPE) REQUIREMENTS

All certified applicators participating in the application during setting up and breaking down of application equipment and during visual inspection must wear:

- Coveralls over long-sleeved shirt and long pants,
- Shoes and socks,
- Chemical resistant gloves made of butyl rubber, and
- A NIOSH-approved full face respirator with either
  - Organic-vapor removing cartridges with a prefilter approved for pesticides (MSHA/NIOSH approval number prefix TC-23C), or
  - A canister approved for pesticides (MSHA/NIOSH approval number prefix TC-14G).

Respirator fit testing, training and medical qualification:
Employers must ensure that all **MAGNACIDE™ H Herbicide** handlers are:

- Fit-tested and fit-checked using a program that conforms to OSHA's requirements (see 29CFR part 1910.134)
- Trained using a program that conforms to OSHA's requirements (see 29CFR part 1910.134).
- Examined by a qualified medical practitioner to ensure physical ability to wear the style of respirator to be worn. A qualified medical practitioner is a physician or other licensed health care professional who will evaluate the ability of a worker to wear a respirator. The initial evaluation consists of a questionnaire that asks about medical conditions (such as heart condition) that would be problematic for respirator use. If concerns are identified, then additional evaluations, such as a physical exam, might be necessary. The initial evaluation must be done before respirator use begins. Handlers must be reexamined by a qualified medical practitioner if their health status or respirator style or use-conditions change.

USER SAFETY REQUIREMENTS

If **MAGNACIDE™ H Herbicide** is spilled or leaked on clothing, gloves, or shoes, immediately remove them and wash thoroughly with soap and water.

Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables exist, use detergent and hot water. Keep and wash PPE separately from other laundry.

Discard clothing, gloves, shoes, and other absorbent materials that have come into contact with **MAGNACIDE™ H Herbicide**. Do not reuse them.

ENGINEERING CONTROLS

Handlers must use a closed system that is designed by the manufacturer to prevent dermal and inhalation exposures by removing the product from the container and applying the product below the water's surface. At any disconnect point, the system must be equipped with a dry disconnect or dry couple shut-off device that will limit drippage to no more than 2 ml per disconnect. The closed system must function properly and be used and maintained in accordance with the manufacturer's written operating instructions. Handlers must wear the personal protective equipment required on this labeling.

USER SAFETY RECOMMENDATIONS

Users should wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet.

Users should remove PPE immediately after handling this product. Wash the outside of the gloves before removing. As soon as possible, wash thoroughly and change into clean clothing.

ENVIRONMENTAL HAZARDS

This pesticide is extremely toxic to fish and wildlife. Do not discharge effluent containing this product into lakes, streams, ponds, estuaries, oceans or other waters unless in accordance with the requirements of a National Pollutant Discharge Elimination System (NPDES) permit and the permitting authority has been notified in writing prior to discharge. Do not discharge this product to sewer systems without previously notifying the local sewage treatment authority. For guidance contact your State Water Board or Regional Office of the EPA. Do not contaminate water when disposing of equipment washwaters.

PHYSICAL AND CHEMICAL HAZARDS

DANGER: Extremely flammable. Contents under pressure. Keep away from fire, sparks, and heated surfaces. Do not puncture or incinerate container. Acrolein, the active ingredient in **MAGNACIDE™ H Herbicide**, is highly reactive chemically and readily forms polymers. If alkalies (such as ammonia and caustic) or strong acids are brought in contact with **MAGNACIDE™ H Herbicide** in a closed system, the herbicide can polymerize with sufficient violence to rupture the container. Do not apply with equipment used for acids and alkalies. Contamination of **MAGNACIDE™ H Herbicide** with any foreign matter must be avoided.

A supply of sodium carbonate (soda ash) and water should be readily available for deactivating spilled **MAGNACIDE™ H Herbicide**. All spills should be confined and deactivated before disposal. See the **MAGNACIDE™ H Herbicide** Application and Safety Manual for additional information.

NET WEIGHT: _____lbs

☐ Cylinder-370 lbs. ☐ Skid Tank-2450 lbs.

RESTRICTED USE PESTICIDE
DUE TO A HIGH ACUTE TOXICITY
For retail sale to and use by Certified Applicators and only for those uses covered by the Certified Applicator's certification.

THIS PRODUCT MUST BE ACCOMPANIED BY AN EPA-APPROVED PRODUCT LABEL AND THE EPA-APPROVED *'MAGNACIDE™ H Herbicide Application and Safety Manual.'* THE *MAGNACIDE™ H Herbicide Application and Safety Manual* IS LABELING. READ AND UNDERSTAND THE ENTIRE LABELING AND MANUAL PRIOR TO USE. ALL PARTS OF THE LABELING AND MANUAL ARE EQUALLY IMPORTANT FOR SAFE AND EFFECTIVE USE OF THIS PRODUCT.

MAGNACIDE™ H HERBICIDE

(Acrolein, Stabilized)

CONTENTS UNDER PRESSURE

ACTIVE INGREDIENT:	
Acrolein	95.0%
OTHER INGREDIENTS:	5.0%
TOTAL:	100.0%

This product contains the toxic inert ingredient hydroquinone.

(**MAGNACIDE™ H Herbicide** contains 6.7 pounds of active ingredients per gallon)

KEEP OUT OF REACH OF CHILDREN

DANGER/PELIGRO

FIRST AID

Call poison control center or doctor immediately for treatment advice.
Have the product container or label with you when calling a poison control center doctor, or going for treatment.

IF INHALED	▪ Move person to fresh air. ▪ If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably by mouth-to-mouth, if possible.
IF ON SKIN OR CLOTHING	▪ Take off contaminated clothing. ▪ Rinse skin immediately with plenty of water for 15-20 minutes.
IF IN EYES	▪ Hold eyes open and rinse slowly and gently with water for 15-20 minutes. ▪ Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eyes.
IF SWALLOWED	▪ Call a poison control center or doctor immediately for treatment advice. ▪ Have person sip a glass of water if able to swallow. ▪ Do not induce vomiting unless told to do so by the poison control center or doctor. ▪ Do not give anything by mouth to an unconscious person.

NOTE TO PHYSICIAN: Probable mucosal damage may contraindicate the use of gastric lavage. Measures against circulatory shock, respiratory depression and convulsion may be needed.

WARNING SIGNS AND SYMPTOMS: Liquid **MAGNACIDE™ H Herbicide** is absorbed by the skin and is particularly irritating to any lesion and to the eyes. The vapors act principally on the mucous membrane of the eyes and respiratory tract. Because of the extreme lachrymatory warning effect, the concentration tolerable by man is far below the minimum lethal concentration.

TREATMENT: Treat exposed area as a chemical burn. Thoroughly flush eyes with water and treat symptomatically. Persons exposed to **MAGNACIDE™ H Herbicide** vapors may have a delayed reaction and experience irritation of the respiratory tract. In severe cases, this may progress to pulmonary edema. Therefore, it is advisable to keep persons exposed to **MAGNACIDE™ H Herbicide** under observation for 24 hours following exposure.

EPA Registration Number 10707-9 EPA Establishment Number 080636-CA-001

MANUFACTURED BY:
BAKER PETROLITE LLC
12645 WEST AIRPORT BLVD.
SUGAR LAND, TX 77478

EMERGENCY CONTACT (24 HOURS PER DAY) 800-231-3606

DANGER **POISON**

DIRECTIONS FOR USE
Restricted Use Pesticide

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

Refer to **MAGNACIDE™ H Herbicide** manual for directions for use.

MAGNACIDE™ H Herbicide is a water soluble material for the control of submersed and floating weeds and algae in irrigation canals. This material must be applied in accordance with directions in the **MAGNACIDE™ H Herbicide** Application and Safety Manual by a certified applicator or under a certified applicator's supervision. Do not permit dairy animals to drink treated water. Do not use where waters will flow into potential sources of drinking water. Water treated with **MAGNACIDE™ H Herbicide** must be used for irrigation of fields, either crop bearing, fallow or pasture, where the treated water remains on the field OR held for 6 days before being released into fish bearing waters or where it will drain into them.

At least one certified applicator must be at the application site during the application. The applicator is to contact a member of their organization no less than every two hours during the course of an application. No handlers are allowed to participate in the application unless they are state certified (licensed) applicators and have completed the registrant's training program within the last 12 months.

All applications must be made during daylight hours.

Maximum number of applications: 8 applications per year.

Minimum retreatment interval: 2 weeks

MAGNACIDE™ H Herbicide use will be restricted to eight (8) applications per application point per calendar year. An individual application point, as defined, may consist of multiple treatments/ releases within a contiguous irrigation canal, to ensure aquatic weed control throughout the entire irrigation canal or portion thereof.

POSTING OF APPLICATION EQUIPMENT AREA

The Certified Applicator in charge of the application must post signs around the perimeter of the application equipment area (truck, hoses and skids). Signs must be no more than 15 feet apart and contain the following information:

- Skull and crossbones symbol
- DANGER/PELIGRO
- DO NOT ENTER/NO ENTRE: Pesticide Application/Aplicacion de Pesticidas
- The name of the product being applied
- The start date and time of application
- The end date and time of application
- The name, address and telephone number of the Certified Applicator in charge of the application

Signs must remain legible during the entire posting period and must be removed once the application is completed and no later than 3 days after treatment.

Applications with **MAGNACIDE™ H Herbicide** may only be made in canals with posted no swimming signs. Contact the local irrigation district if the signs are not posted.

STORAGE AND DISPOSAL

Do not contaminate water, food or feed by storage and disposal.

PESTICIDE STORAGE

All containers of **MAGNACIDE™ H Herbicide** should be stored in a secured, well-ventilated area, away from all other chemicals at a temperature range between -40°C to 60°C. No alkalies or oxidizing materials should be near. Any electrical equipment should be Class 1 – Division 2 and properly grounded.

PESTICIDE DISPOSAL

Pesticide wastes are acutely hazardous. Improper disposal of excess pesticide, spray mixture, or rinsate is a violation of Federal law. If these wastes cannot be disposed of by use of according to label instructions, contact your State Pesticide or Environmental Control Agency, or the Hazardous Waste representative at the nearest EPA Regional Office for guidance.

CONTAINER DISPOSAL

Refillable container. Refill this container with **MAGNACIDE™ H Herbicide** only. Do not reuse this container for any other purpose. Return empty containers to Taft Manufacturing Company. Cleaning the container before final disposal is the responsibility of the person disposing of the container. Cleaning before refilling is the responsibility of the refiller. For cleaning and residue removal of cylinders, follow the Standard Operating Procedure: TMC-140. For cleaning and residue removal of skids, follow the Standard Operating Procedure: TMC-141.

NOTICE OF WARRANTY

To the extent consistent with applicable law, BAKER PETROLITE CORPORATION MAKES NO WARRANTY OF MERCHANTABILITY FITNESS FOR ANY PURPOSE, OR OTHERWISE, EXPRESSED OR IMPLIED concerning this product or its uses which extend beyond the use of the product under normal conditions in accord with the statements made on this label.

Rev. 07/14BPC02/15

UN1092

Acrolein, Stabilized, 6.1,(3), PG I, Poison-Inhalation Hazard, Zone A, Marine Pollutant, RQ

SAFETY DATA SHEET

Section 1. Identification

Product name : MAGNACIDE™ H HERBICIDE

Product code : XCH

Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Herbicide

Print date : 3/20/2015.

Validation date : 3/20/2015.

Version : 1

Supplier's details : Baker Petrolite
A Baker Hughes Company
12645 W. Airport Blvd.
Sugar Land, TX 77478
For Product Information/SDSs Call: 800-231-3606
(8:00 a.m. - 5:00 p.m. cst, Monday - Friday) 281-276-5400

Emergency telephone number (with hours of operation) : CHEMTREC: 800-424-9300 (U.S. 24 hour)
Baker Petrolite: 800-231-3606
(001)281-276-5400
CANUTEC: 613-996-6666 (Canada 24 hours)
CHEMTREC Int'l 01-703-527-3887 (International 24 hour)

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : FLAMMABLE LIQUIDS - Category 2
ACUTE TOXICITY: ORAL - Category 2
ACUTE TOXICITY: SKIN - Category 3
ACUTE TOXICITY: INHALATION - Category 1
SKIN CORROSION/IRRITATION - Category 2
SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 2
SKIN SENSITIZATION - Category 1
AQUATIC HAZARD (ACUTE) - Category 1
AQUATIC HAZARD (LONG-TERM) - Category 3

GHS label elements

Hazard pictograms :

Signal word : Danger

Section 2. Hazards identification

Hazard statements : Highly flammable liquid and vapor.
Fatal if swallowed or if inhaled.
Toxic in contact with skin.
Causes serious eye irritation.
Causes skin irritation.
May cause an allergic skin reaction.
Very toxic to aquatic life.
Harmful to aquatic life with long lasting effects.

Precautionary statements

Prevention : Wear protective gloves. Wear eye or face protection. Wear respiratory protection. Keep away from heat, sparks, open flames and hot surfaces. - No smoking. Use explosion-proof electrical, ventilating, lighting and all material-handling equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Keep container tightly closed. Use only outdoors or in a well-ventilated area. Avoid release to the environment. Do not breathe vapor. Do not eat, drink or smoke when using this product. Wash hands thoroughly after handling. Contaminated work clothing should not be allowed out of the workplace.

Response : Collect spillage. IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or physician. IF SWALLOWED: Immediately call a POISON CENTER or physician. Rinse mouth. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. IF ON SKIN: Wash with plenty of soap and water. Call a POISON CENTER or physician if you feel unwell. Take off contaminated clothing. If skin irritation or rash occurs: Get medical attention. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical attention.

Storage : Store locked up. Store in a well-ventilated place. Keep cool.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Hazards not otherwise classified : None known.

Additional information

Overexposure to vapors may be fatal. Inhalation exposure studies have determined the rat LC50 to be 26 ppm at one hour exposure and at four hour exposure to be 8.3 ppm. The NIOSH IDLH (Immediately Dangerous to Life and Health) value is 2 ppm. The primary route of exposure is inhalation; acute exposure may result in lacrimation, tracheobronchitis, pneumonia, and lung injury (at 20 ppm). The low odor detection (0.03 – 0.21 ppm) and irritation threshold (0.25 - 0.5 ppm) and acutely irritating effects of acrolein usually prevent chronic toxicity effects. Splashes to the eye may result in blepharoconjunctivitis (bloodshot eyes), lid edema, fibrinous or pustular discharge, and deep or long-lasting corneal injury. See Section 11 for additional information.

Section 3. Composition/information on ingredients

Substance/mixture : Mixture

Ingredient name	%	CAS number
Acrolein	95	107-02-8
Hydroquinone	0.1 - 1	123-31-9

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Immediately flush the eye(s) continuously with lukewarm, gently flowing water for at least 15-20 minutes while holding the eyelid(s) open. Remove contact lenses. Get medical attention immediately.

Inhalation : Remove to fresh air. Oxygen may be administered if breathing is difficult. If not breathing, administer artificial respiration and seek medical attention immediately.

Skin contact : Remove contaminated clothing and shoes immediately. Wash affected area with soap and mild detergent and large amounts of lukewarm, gently flowing water until no evidence of chemical remains (for atleast15-20 minutes). Get medical attention.

Ingestion : Get medical attention immediately. If swallowed, do not induce vomiting unless directed to do so by medical personnel. Wash out mouth with water if person is conscious. If fully conscious promptly drink one to two glasses water. Never induce vomiting or give anything by mouth to a victim who is unconscious or having convulsions.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : Causes serious eye irritation.

Inhalation : Fatal if inhaled.

Skin contact : Toxic in contact with skin. Causes skin irritation. May cause an allergic skin reaction.

Ingestion : Fatal if swallowed. Irritating to mouth, throat and stomach.

Over-exposure signs/symptoms

Eye contact : pain or irritation,watering,redness

Inhalation : No specific data.

Skin contact : irritation,redness

Ingestion : No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : Treatment of the irritative effects of acrolein should be symptomatic and supportive. Following inhalation of acrolein, signs of respiratory dysfunction should be sought and hypoxia corrected. Specific treatment for bronchospasm and non-cardiogenic pulmonary edema may be necessary. Hypoxia may also occur following the ingestion of acrolein if there is pulmonary aspiration and/or laryngeal edema. The extent and severity of the corrosive effects on the upper gastrointestinal mucosa should be determined, for example, by endoscopy, and advice should be sought regarding the need for surgical intervention. Probable mucosal damage may contraindicate the use of gastric lavage.

Specific treatments : Treat exposed area as chemical burn.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

See toxicological information (Section 11)

Additional information

Persons exposed to vapors may have a delayed reaction and experience severe irritation of the respiratory tract and delayed pulmonary edema. Therefore, it is advisable to keep person exposed to high concentrations of vapor under observation for 24 hours following exposure If fully conscious promptly drink one to two glasses of water. Get immediate medical attention. Probable mucosal damage may contraindicate the use of gastric lavage. Measures against circulatory shock, respiratory depression, and convulsion may be needed.

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : In case of fire, use alcohol-resistant foam, dry chemicals, or CO2 fire extinguishers. Evacuate area and fight fire from a safe distance. Water spray may be used to keep fire-exposed containers cool. Keep water run off out of sewers and public waterways. Note that flammable vapors may form an ignitable mixture with air. Vapors may travel considerable distances and flash back if ignited.

Unsuitable extinguishing media : Do not use water jet.

Specific hazards arising from the chemical : Highly flammable liquid and vapor. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. The vapor/gas is heavier than air and will spread along the ground. Vapors may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back. Runoff to sewer may create fire or explosion hazard. This material is very toxic to aquatic life. This material is harmful to aquatic life with long lasting effects. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.

Hazardous thermal decomposition products : carbon dioxide,carbon monoxide, peroxides

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Remark : Toxic gases and vapors (such as carbon monoxide and peroxides) may be released in a fire involving acrolein. In the presence of sufficient oxygen and complete combustion, the combustion products further breakdown to carbon dioxide and water.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : Evacuate all personnel to an upwind area and determine medical treatment needs. If qualified to do so through appropriate training contain or mitigate the spill as outlined below. Put on appropriate personal protective equipment. See Section 8 for information on use of respiratory protection appropriate for dealing with small spills. For large spills, wear fully encapsulating, vapor protective clothing (Level A Suit) and seek assistance from local fire department hazardous materials response team. Keep personnel removed and upwind of spill. Shut off all ignition sources; no flares, smoking, or flames in spill area. Approach release from upwind. Ventilate the release area.

For emergency responders : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). Water polluting material. May be harmful to the environment if released in large quantities. Collect spillage.

Methods and materials for containment and cleaning up

Section 6. Accidental release measures

Small spill : Cover release with sodium carbonate (soda ash) and mix into spill with water. The soda ash and acrolein will form a solid by-product after addition of water. Alternately, absorb with paper towel, dry sand or other absorbent. For ground or surface contamination, remove contaminated media and dispose of properly. Contain all water for proper disposal. Waste must be disposed of in accordance with federal, provincial and local environmental control regulations.

Large spill : Vapor suppression: if available, blanket spill area with alcohol-resistant foam at 6% to reduce the vapor concentration. Reapply foam as needed to counteract the rapid breakdown of the foam blanket. Pump bulk fluid to appropriate storage containers for proper disposal. After recovery of the bulk fluid, neutralization of any remaining material can be accomplished by covering with sodium carbonate (soda ash) and mixing with water. Ratio is 20 pounds of soda ash to each gallon of acrolein followed by 5 gallons of water per gallon of acrolein. The soda ash and acrolein will form a solid by-product after addition of water. When reactivation is ccomplete scoop the solid material into properly marked containers for disposal. Contain all water for proper disposal. Prevent runoff from entering drains, sewers or waterways.

If RQ (Reportable Quantity) is exceeded, report to National Spill Response Office at 1-800-424-8802.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment. Avoid contact with eyes, skin and clothing. Avoid breathing vapors or spray mists. Use only with adequate ventilation. Store in a secure and well ventilated area. Keep away from heat, sparks and flame. Keep away from incompatible materials. Keep container tightly closed when not in use. To avoid fire or explosion, ensure containers and equipment are properly bonded and grounded prior to transferring product. This is normally accomplished through the use of Baker Petrolite-specified standard application procedures. When using product under non-routine conditions (e.g., laboratory samples), ensure material and container are properly bonded and grounded.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store locked up. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

Additional information

Do not reuse empty container. Return empty containers to Taft Manufacturing Company 19815 South Lake Road, Taft, CA 93268.

Section 8. Exposure controls/personal protection

Control parameters

Section 8. Exposure controls/personal protection

Occupational exposure limits		TWA (8 hours)			STEL (15 mins)			Ceiling			
Ingredients:	List name	ppm	mg/m³	Other	ppm	mg/m³	Other	ppm	mg/m³	Other	Notations
Acrolein	US ACGIH	-	-	-	-	-	-	0.1	-	-	[1]
	OSHA PEL	0.1	0.25	-	-	-	-	-	-	-	
	OSHA PEL 1989	0.1	0.25	-	0.3	0.8	-	-	-	-	
Hydroquinone	US ACGIH	-	1	-	-	-	-	-	-	-	[3]
	OSHA PEL	-	2	-	-	-	-	-	-	-	
	OSHA PEL 1989	-	2	-	-	-	-	-	-	-	

Consult local authorities for acceptable exposure limits.

Only components of this product with established exposure limits appear in the box above.

If OSHA permissible exposure levels are shown above they are the OSHA 1989 levels or are from subsequent OSHA regulatory actions. Although the 1989 levels have been vacated the 11th Circuit Court of Appeals, Baker Hughes recommends that these lower exposure levels be observed as reasonable worker protection.

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Contaminated work clothing should not be allowed out of the workplace. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Chemical safety goggles.

Hand protection : Chemical-resistant gloves.Butyl rubber gloves.Replace as needed.

Skin protection : Long sleeved shirts and work pants.

Respiratory protection : Full-face respirator use is required when connecting or disconnecting containers to application equipment, or any situations where the permissible exposure limit may be exceeded. As per NIOSH, full-face air-purifying respirators may be worn to protect personnel up to 2 ppm (IDLH) acrolein. The air purifying respirators should have organic vapor cartridge(s) or canister and a protection factor of 50. Exposure levels of unknown concentrations or greater than 2 ppm acrolein require the use of full-face positive pressure supplied-air breathing apparatus with a protection factor of 10,000.

Additional information

Persons exposed to vapors may have a delayed reaction and experience severe irritation of the respiratory tract and delayed pulmonary edema. Therefore, it is advisable to keep person exposed to high concentrations of vapor under observation for 24 hours following exposure.

The STEL of 0.3 ppm for acrolein was vacated by Court order, but it is still in effect in AK, CA, MI, MN, NC, TN and WA.. The OSHA permissible exposure levels shown above are the OSHA 1989 levels or from subsequent OSHA regulatory actions. Although the 1989 levels have been vacated the 11th Circuit Court of Appeals, Baker Petrolite recommends that these lower exposure levels be observed as reasonable worker protection.

Section 9. Physical and chemical properties

Appearance

Physical state : Liquid.

Color : Colorless to light yellow.

Odor : Aldehyde like.

Odor threshold : Not available.

pH : Not available.

Melting/freezing point : -87°C (-124.6°F)

Boiling point : 53°C (127.4°F)

Initial Boiling Point : Not available.

Flash point : Closed cup: -25°C (-13°F) [TCC]

Burning time : Not applicable.

Burning rate : Not applicable.

Evaporation rate : >1 (Ether (anhydrous) = 1)

Flammability (solid, gas) : Highly flammable in the presence of the following materials or conditions: open flames, sparks and static discharge and heat.
Toxic gases and vapors (such as carbon monoxide and peroxides) may be released in a fire involving acrolein. In the presence of sufficient oxygen and complete combustion, the combustion products further breakdown to carbon dioxide and water.

Lower and upper explosive (flammable) limits : Lower: 2.8%
Upper: 31%

Vapor pressure : 31.3 kPa (234.9 mm Hg) @ 22°C

Vapor density : 1.93 [Air = 1]

Relative density : 0.85 (15.6°C)

Density : 7.1 (lbs/gal)

Solubility in water : Soluble (22% by weight @ 20ºC)

Partition coefficient: n-octanol/water : Not available.

Auto-ignition temperature : 220°C (428°F)

Decomposition temperature : Not available.

Viscosity : Dynamic (20°C): 0.329 cP

VOC : Not available.

Pour Point : -86.7°C (-124.1°F)

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : This product is stable unless there is loss of inhibitor.

Possibility of hazardous reactions : Hazardous reactions or instability may occur under certain conditions of storage or use. Hazardous polymerization may occur.Loss of hydroquinone stabilizer may result in polymerization under certain conditions. Air introduced into closed containers may cause a slow polymerization, resulting in loss of product quality.

Conditions to avoid : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Do not allow vapor to accumulate in low or confined areas.

Section 10. Stability and reactivity

Incompatible materials : Reactive or incompatible with the following materials: .Alkalies, amines, light, and oxidizing materials. Alkaline or strong acid contamination can cause a reaction which can be rapid and violent. Prevent water contamination of acrolein storage containers.

Hazardous decomposition products : carbon oxides (CO, CO2) Peroxides.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Acrolein	LC50 Inhalation Gas.	Rat	8 ppm	4 hours
	LC50 Inhalation Vapor	Rat	26 ppm	1 hours
	LC50 Inhalation Vapor	Rat	18 mg/m³	4 hours
	LC50 Inhalation Vapor	Rat	8.3 ppm	4 hours
	LD50 Dermal	Rabbit	160 mg/kg	-
	LD50 Dermal	Rabbit	231.4 mg/kg	-
	LD50 Oral	Rat	26 mg/kg	-
	LD50 Oral	Rat	29 mg/kg	-
Hydroquinone	LD50 Oral	Rat	302 mg/kg	-
XCH	LC50 Inhalation Vapor	Rat	26 ppm	1 hours
	LC50 Inhalation Vapor	Rat	8.3 ppm	4 hours
	LD50 Dermal	Rabbit	231.4 mg/kg	-
	LD50 Oral	Rat	29 mg/kg	-

Irritation/Corrosion

See additional information

Sensitization

No applicable toxicity data

Mutagenicity

See additional information

Carcinogenicity

Product/ingredient name	OSHA	IARC	NTP
Acrolein	-	3	-
Hydroquinone	-	3	-

Section 11. Toxicological information

Information on the likely routes of exposure : Routes of entry anticipated: Dermal, Inhalation.

Numerical measures of toxicity

Acute toxicity estimates

Route	ATE value
Inhalation (gases) Inhalation (vapors)	8.421 ppm 0.01895 mg/l

Additional information

Irritation - Draize Test (Rabbit)
Skin - 2 mg/24H: Severe
Eye - 50 ug/24H: Severe
Skin - 15 ppm solution: Not irritating

A potential human health effect resulting from overexposure is the development of permanent lung damage in the form of decreased pulmonary (lung) function, and delayed pulmonary edema (fluid in the lungs) which can lead to chronic respiratory disease. As a highly reactive aldehyde, prolonged or repeated overexposures can produce long-term respiratory effects by significantly reducing ciliary action in the upper airways (i.e., interfering with the body's ability to clear mucous and foreign substances from the respiratory tract) and causing tissue damage throughout the lungs manifested as emphysema.

Acrolein levels of 0.4 to 4.9 ppm caused eye and nose irritation and structural changes in the respiratory system of hamsters, rats and rabbits (Ref. 1). Acrolein produced greater susceptibility to respiratory infections in mice (Ref. 2) and rats (Ref. 3).

Developmental/Reproduction studies
Acrolein has been tested for developmental and reproductive health effects. Results from developmental studies (Ref. 4, 5) indicated this material did not cause teratogenic effects in rats or rabbits at doses that caused maternal toxicity. A twogeneration rat reproductive study (Ref. 6) did not reveal any evidence of reproductive toxicity in either sex from any treatment group (maximum dose = 7.2 mg/kg). A second two-generation reproductive study in rats did not reveal any evidence of reproductive toxicity in either sex from any treatment group (maximum dose = 6 mg/kg) (Ref. 6).

Dermal Testing
In a 21 day dermal toxicity test in rabbits dosed at 7, 21 and 63 mg/kg of acrolein, toxicity was evidenced by slight to significant reduction in body weight gain, nasal mucous discharge, lethargy, slight to moderately lowered food consumption and increased frequency of lesions of the skin and lungs. Slight mortality in female rabbits dosed at 21 and 63 mg/kg was observed. No notable effects in hematology, blood chemistry, organ weights or organ weight ratios were observed (Ref. 7).

Section 11. Toxicological information

Chronic toxicity/Oncogenicity studies
In a 12-month chronic toxicity test in dogs (Ref. 9), the highest dose (2 mg/kg) tested resulted in changes in blood chemistry, but no compound-related tumors or lesions were observed. An 18-month oncogenicity study in mice (Ref. 10) did not reveal any compound-related tumors or lesions; the highest dose tested (4.5 mg/kg) resulted in increased mortality in the test group. A 24-month chronic toxicity/oncogenicity study in rats (Ref. 11) also did not reveal any compound related tumors or lesions. The high dose, 2.5 mg/kg, caused an increased mortality in the test group. No indications of cancer were found in the tests.

Other Studies

Mutagenicity studies
Effects of Acrolein on the In Vitro Induction of Chromosomal Aberrations in CHO Cells: No significant increase in the number of chromosomal aberrations above the background (Ref. 12). Effects of Acrolein on the In Vivo Induction of Chromosomal Aberrations in Rat Bone Marrow Cells: No significant increase in the number of chromosomal aberrations above the background (Ref. 13). Salmonella Liquid Suspension Mutant Fraction Assay: Acrolein did not induce concentration-dependent mutagencity in any of the 5 Salmonella strains, either in the presence or absence of metabolic activation (Ref. 14). Metabolism Data
Metabolism studies in freshwater fish, shellfish, goats, hens, rats and leaf lettuce indicate that acrolein is metabolized and does not accumulate in the tissue (Ref. 15-19).

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
Acrolein	Acute EC50 30 µg/l Fresh water	Daphnia - Daphnia magna	48 hours
	Acute LC50 0.018 mg/l Marine water	Crustaceans - Americamysis bahia - Juvenile (Fledgling, Hatchling, Weanling)	48 hours
	Acute LC50 0.67 mg/l	Daphnia	96 hours
	Acute LC50 0.5 ppm	Daphnia	96 hours
	Acute LC50 0.016 mg/l	Fish	96 hours
	Acute LC50 0.02 mg/l	Fish	96 hours
	Acute LC50 0.57 ppm	Fish	96 hours
	Acute LC50 0.18 ppm	Fish	96 hours
	Acute LC50 14 µg/l Fresh water	Fish - Pimephales promelas	96 hours
	Chronic NOEC 9.1 µg/l Fresh water	Fish - Pimephales promelas	32 days
Hydroquinone	Acute LC50 162 µg/l Fresh water	Daphnia - Daphnia pulicaria	48 hours
	Acute LC50 44 µg/l Fresh water	Fish - Oncorhynchus mykiss	96 hours
XCH	Acute LC50 24 mg/l	Fish	96 hours

Persistence and degradability

Conclusion/Summary : In an aerobic aquatic metabolism study, the water phase revealed the rapid degradation of acrolein with all metabolites further mineralized to carbon dioxide. Results indicate hydration was an early step in acrolein degradation. The first-order kinetic half-life of acrolein was determined to be 33.7 hours in the water phase under laboratory conditions. Under field conditions, the halflife of acrolein in freshwater ranged from six to ten hours. In an aerobic soil metabolism study the half-life of acrolein was found to be 4. 2 hours in soil-water mixtures and was ultimately transformed into carbon dioxide.

Other adverse effects : No known significant effects or critical hazards.

Additional information

Section 12. Ecological information

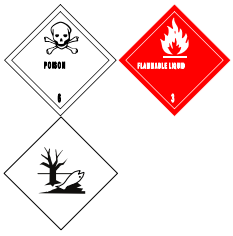
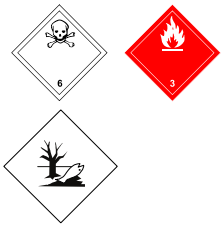
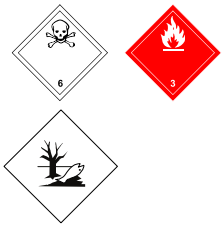
This product is very toxic to aquatic organisms:
Bluegill sunfish (Lepomis macrochirus), 96 hour LC50, 24 ppb
Rainbow trout (Oncorhynchus mykiss), 6 hour LC50, 24 ppb
Water flea (Daphnia magna), 48 hour LC50, 22 ppb
Eastern oysters (Crassostrea virginica), 96 hour EC50, 180 ppb
Mysid shrimp (Mysidopsis bahia), 96 hour LC50, 500 ppb
Mysid shrimp (Holmesimysis costata), 96 hour LC50, 790 ppb
Sheepshead minnows (Cyprinodon variegatus), 96 hour LC50, 570 ppb
Marine copepod (Acartia tonsa), 48 hour LC50, 55 ppb
Saltwater diatom (Skeletonema costatum), 120 hour EC50, 27 ppb

Section 13. Disposal considerations

Disposal methods : Responsibility for proper waste disposal rests with the generator of the waste. Dispose of any waste material in accordance with all applicable federal, state and local regulations. Note that these regulations may also apply to empty containers, liners and rinsate. Processing, use, dilution or contamination of this product may cause its physical and chemical properties to change.

Do not clean or reuse empty container. Return empty containers to Taft Manufacturing Company,
19815 South Lake Road, Taft, CA 93268
EPA Waste Code for acrolein is:
Waste Acrolein, stabilized
Waste Code - P003

Section 14. Transport information

	DOT Classification	TDG Classification	IMDG	IATA
UN number	UN1092	UN1092	UN1092	
UN proper shipping name	Acrolein, stabilized	ACROLEIN, STABILIZED	Acrolein, stabilized	Forbidden
Transport hazard class(es)	6.1 (3) 	6.1 (3) 	6.1 (3) 	
Packing group	I	I	I	
Environmental hazards	Yes.	Yes.	Yes.	
Additional information	**Special provisions** Toxic-Inhalation Hazard, Zone A **Remarks** DOT SP 10705 (DOT SP 10705 applies only to mixed loads) DOT SP-14341 (DOT: SP-14341 applies only	**Special provisions** toxic by inhalation **Remarks** ERAP #: ERP2-0132 24 Hour Number: 1-866-334-1290 Equivalency Certificate No. SU 10922 Dangerous goods	**Emergency schedules (EmS)** F-E S-D	

Section 14. Transport information

	to 4BW welded cylinders.)	may be marked in accordance with 49 CFR		

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code : Not available.

DOT Reportable Quantity Acrolein, 0.15 gal of this product.
Hydroquinone, 4401 gal of this product.

Marine pollutant Acrolein

North-America NAERG : 131P

Section 15. Regulatory information

U.S. Federal regulations :

TSCA 4(a) final test rules: Acetaldehyde

TSCA 12(b) one-time export: No products were found.

TSCA 12(b) annual export notification: No products were found.

United States inventory (TSCA 8b): All components are listed or exempted.

Clean Water Act (CWA) 307: Acrylaldehyde; Benzene

Clean Water Act (CWA) 311: Acrylaldehyde; Benzene; Acetaldehyde

Clean Air Act (CAA) 112 regulated toxic substances: Acrylaldehyde

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Listed

SARA 302/304

Name	%	EHS	SARA 302 TPQ (lbs)	SARA 302 TPQ (gallons)	SARA 304 RQ (lbs)	SARA 304 RQ (gallons)
Acrolein	95	Yes.	500	71.4	1	0.14
Hydroquinone	0.1 - 1	Yes.	500 / 10000	-	100	-

SARA 311/312

Classification : Fire hazard
Immediate (acute) health hazard

SARA 313

	Product name	CAS number	%
Supplier notification	Acrolein	107-02-8	95

Canada

Canada (CEPA DSL): : All components are listed or exempted.

Additional information

Section 15. Regulatory information

References:
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8. A Sub-Chronic Inhalation Study of Fischer 344 Rats Exposed to 0, 0.4, 1.4, or 4.0 ppm Acrolein. Brookhaven National Laboratory, Upton, NY, 1981.
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18. Sharp, D.E., Berge, M.A., Hennes, M.G., Wilkes, L.C., Servatius, L.J., Loftus, M.L., Caravello, H.E., and Parent, R.A.. Metabolism and Distribution of [2,3-14C]Acrolein in Laying Hens. J. of Agric. and Food Chem. 49(3): 1639-1647 (2001).
19. Parent, R.A., Caravello, H.E., and Sharp, D.E.. Metabolism and Distribution of [2,3-14C]Acrolein in Sprague-Dawley rats. Journal of Applied Toxicology, Vol 16(5), 449-457 (1994).
20. Smith, A.M., Mao, J., Doane, R.A., and Kovacs, M.F.. Metabolic Fate of [14C]Acrolein Under Aerobic and Anaerobic Aquatic Conditions. J. of Agric. and Food Chem. 43(9): 2497-2503 (1995).
21. Estimation of the Aerobic Biotransformation Rates of Acrolein (MAGNACIDE® H Herbicide, MAGNACIDE® B Biocide) in Soil, SRI International, Menlo Park, CA, (1990) (Unpublished Study).

Section 16. Other information

National Fire Protection Association (U.S.A.)

History

Date of printing : 3/20/2015.

Indicates information that has changed from previously issued version.

Notice to reader

Section 16. Other information

NOTE: The information on this SDS is based on data which is considered to be accurate. Baker Hughes, however, makes no guarantees or warranty, either expressed or implied of the accuracy or completeness of this information.

The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use or disposal of this product.

This SDS was prepared and is to be used for this product. If the product is used as a component in another product, this SDS information may not be applicable.

Appendix F

(CEQA Documentation-To Be Completed)

SWRCB SIP Exception Info Sheet
CEQA NOI
CEQA NOC
CEQA NOD
State Clearinghouse Letter
Comments and Response to Comments
Board Resolution & MMRP
CDFW Filing Fee Receipts

State Implementation Policy (SIP) Section 5.3 Exception Information Sheet

Use of Copper and Acrolein to Control Algae and Aquatic Vegetation

in Irrigation Facilities

South San Joaquin District

November 7, 2016

1. **Notification.** South San Joaquin Irrigation District (District) will notify potentially effected public and governmental agencies of the project. The project is described in the District's Initial Study/Mitigated Negative Declaration (IS/MND) dated November 7, 2016.

2. **Description of the Proposed Action.** The proposed action is the application of copper- and acrolein-containing algaecides and/or aquatic herbicides to control algae and aquatic vegetation. For a more detailed description, see the District's aforementioned IS/MND.

3. **Schedule.** The schedule for the action will be according to Integrated Pest Management (IPM) principles. For example, the application of aquatic herbicides will be done at times and frequencies when the type and density of algae or aquatic vegetation equals or exceeds thresholds established by the District. Algaecide and/or aquatic herbicide applications typically take place annually between April and October.

4. **Discharge and Receiving Water Quality Monitoring Plan.** The District has prepared and will use its Aquatic Pesticide Application Plan (APAP) as required in the Statewide General NPDES Permit for Residual Aquatic Pesticide Discharges to Waters of the United States from Algae and Aquatic Weed Control Applications #CAG990005 (#2013-0002-DWQ). The APAP describes in detail the requirements for sampling, analysis, and reporting before, during, and after the project. Further, the APAP contains a Quality Assurance Project Plan (QAPP) that describes in detail the quality assurance and quality control procedures used for the project.

5. **Contingency Plans.** The District will maintain its ability to use manual removal of aquatic vegetation and/or aquatic herbicides that do not contain copper or acrolein. Alternative aquatic weed and algae control methods are not always as cost-effective, easy to apply, or efficacious as materials that contain copper or acrolein. Refer to the aforementioned IS/MND for a discussion of the use of copper- and acrolein-containing aquatic herbicides.

6. **Identification of Alternate Water Supply.** No alternative irrigation water supply exists for the District.

7. **Residual Waste Disposal Plans.** The District's use of copper- and acrolein-containing algaecides or aquatic herbicides to control algae and/or aquatic vegetation does not create residual waste.

8. **Certification by a Qualified Biologist.** At the annual completion of the project, the District will provide certification by a qualified biologist that the receiving water beneficial uses have been maintained. Pre- and post-project certification will take into account natural variations in project site conditions and the influence these conditions have on beneficial uses.

NOTICE OF INTENT

To Adopt a Mitigated Negative Declaration for
South San Joaquin Irrigation District

Use of Copper and Acrolein to Control Algae and Aquatic Vegetation In Irrigation Facilities

South San Joaquin Irrigation District (herein referred to as the "District") is proposing to use copper- and acrolein-based aquatic herbicides to control algae and aquatic weeds in its irrigation facilities in San Joaquin and Stanislaus Counties.

The proposed project would include the following elements:

- Application of copper- and acrolein-based aquatic herbicides; and
- Monitoring and reporting to the State Water Resource Control Board (SWRCB) and the Regional Water Quality Control Board (RWQCB)

To comply with the requirements of the California Environmental Quality Act (CEQA), the District authorized Blankinship & Associates, Inc. to prepare an Initial Study for the proposed project. The Initial Study includes an environmental checklist that evaluates the potential environmental impacts of the proposed project. Based on the results of the Initial Study, the District has determined that the proposed project can be carried out without significant impacts on the environment. Therefore, the District proposes to adopt a Mitigated Negative Declaration in order to meet its obligation under CEQA.

Prior to taking final action on the proposed Mitigated Negative Declaration, the District will consider public comments on the Initial Study and proposed Mitigated Negative Declaration. All interested parties are invited to submit written comments to:

Peter Rietkerk
General Manager
South San Joaquin Irrigation District
P.O. Box 747
Ripon, CA 95366

The Initial Study, proposed Mitigated Negative Declaration, and supporting documents are available for public review at the District office, located at 11011 E. Highway 120, Manteca, CA 95336, during normal working hours, 7:30 AM to 4:30 PM. The Initial Study and proposed Mitigated Negative Declaration are also available electronically on the District's website (http://www.ssjid.com/). The public review period begins on 11/17/2016 and ends on 12/21/2016. **All written comments must be received by the close of business on the last day of the review period.**

A public hearing on the proposed Mitigated Negative Declaration will be held during the Board Meeting scheduled for **February 14, 2017 at 9:00 AM** in the Board Room at the District office located at 11011 E. Highway 120, Manteca, CA 95336. After consideration of all comments, the Board will either certify or reject the proposed Mitigated Negative Declaration.

Print Form

Appendix C

Notice of Completion & Environmental Document Transmittal

Mail to: State Clearinghouse, P.O. Box 3044, Sacramento, CA 95812-3044 (916) 445-0613
For Hand Delivery/Street Address: 1400 Tenth Street, Sacramento, CA 95814

SCH #

Project Title: Use of Copper and Acrolein to Control Algae and Aquatic Vegetation in Irrigation Facilities

Lead Agency: South San Joaquin Irrigation District — Contact Person: Peter Rietkerk

Mailing Address: P.O. Box 747 — Phone: 209-249-4600

City: Ripon, CA — Zip: 95366 — County: San Joaquin & Stanislaus

Project Location: County: San Joaquin & Stanislaus — City/Nearest Community: Manteca, Ripon, Escalon

Cross Streets: Numerous — Zip Code: 95366

Longitude/Latitude (degrees, minutes and seconds): 37 ° 46 ′ 31.7 ″ N / 121 ° 3 ′ 48.3 ″ W — Total Acres: 66,000

Assessor's Parcel No.: Numerous — Section: 11 — Twp.: 2S — Range: 8E — Base: Mt. Diablo

Within 2 Miles: State Hwy #: I-5, 120, 99 — Waterways: San Joaquin River, Stanislaus River

Airports: Stockton Metropolitan — Railways: Union Pacific Railroad — Schools: Manteca Unif. Sch. Dist.

Document Type:

CEQA: ☐ NOP ☐ Early Cons ☐ Neg Dec ☒ Mit Neg Dec ☐ Draft EIR ☐ Supplement/Subsequent EIR (Prior SCH No.) ☐ Other: ☐

NEPA: ☐ NOI ☐ EA ☐ Draft EIS ☐ FONSI

Other: ☐ Joint Document ☐ Final Document ☐ Other: ☐

Local Action Type:

☐ General Plan Update ☐ General Plan Amendment ☐ General Plan Element ☐ Community Plan
☐ Specific Plan ☐ Master Plan ☐ Planned Unit Development ☐ Site Plan
☐ Rezone ☐ Prezone ☐ Use Permit ☐ Land Division (Subdivision, etc.)
☐ Annexation ☐ Redevelopment ☐ Coastal Permit ☒ Other: NPDES Permit

Development Type:

☐ Residential: Units ☐ Acres ☐
☐ Office: Sq.ft. ☐ Acres ☐ Employees ☐
☐ Commercial: Sq.ft. ☐ Acres ☐ Employees ☐
☐ Industrial: Sq.ft. ☐ Acres ☐ Employees ☐
☐ Educational: ☐
☐ Recreational: ☐
☐ Water Facilities: Type ☐ MGD ☐
☐ Transportation: Type ☐
☐ Mining: Mineral ☐
☐ Power: Type ☐ MW ☐
☐ Waste Treatment: Type ☐ MGD ☐
☐ Hazardous Waste: Type ☐
☒ Other: Algae & Aquatic Weed Mgt with Herbicides

Project Issues Discussed in Document:

☒ Aesthetic/Visual
☒ Agricultural Land
☒ Air Quality
☒ Archeological/Historical
☒ Biological Resources
☐ Coastal Zone
☐ Drainage/Absorption
☐ Economic/Jobs
☐ Fiscal
☐ Flood Plain/Flooding
☐ Forest Land/Fire Hazard
☒ Geologic/Seismic
☒ Minerals
☒ Noise
☒ Population/Housing Balance
☒ Public Services/Facilities
☒ Recreation/Parks
☒ Schools/Universities
☐ Septic Systems
☐ Sewer Capacity
☐ Soil Erosion/Compaction/Grading
☐ Solid Waste
☒ Toxic/Hazardous
☒ Traffic/Circulation
☒ Vegetation
☒ Water Quality
☒ Water Supply/Groundwater
☒ Wetland/Riparian
☐ Growth Inducement
☐ Land Use
☐ Cumulative Effects
☐ Other: ☐

Present Land Use/Zoning/General Plan Designation:

Agricultural/Industrial/Commercial/Residential

Project Description: *(please use a separate page if necessary)*

The use of copper and acrolein to treat algae and aquatic weeds within the District's irrigation facilities. South San Joaquin Irrigation District is preparing this Initial Study/Mitigated Negative Declaration to meet requirements of 1) The State Implementation Plan (SIP) Section 5.3 and 2) NPDES Permit #CAG990005. See CEQA Initial Study and Mitigated Negative Declaration for details.

Note: The State Clearinghouse will assign identification numbers for all new projects. If a SCH number already exists for a project (e.g. Notice of Preparation or previous draft document) please fill in.

Revised 2010

Reviewing Agencies Checklist

Lead Agencies may recommend State Clearinghouse distribution by marking agencies below with and "**X**".
If you have already sent your document to the agency please denote that with an "**S**".

____	Air Resources Board	____	Office of Historic Preservation
____	Boating & Waterways, Department of	____	Office of Public School Construction
____	California Emergency Management Agency	____	Parks & Recreation, Department of
____	California Highway Patrol	X	Pesticide Regulation, Department of
____	Caltrans District # ____	____	Public Utilities Commission
____	Caltrans Division of Aeronautics	X	Regional WQCB #5
____	Caltrans Planning	____	Resources Agency
____	Central Valley Flood Protection Board	____	Resources Recycling and Recovery, Department of
____	Coachella Valley Mtns. Conservancy	____	S.F. Bay Conservation & Development Comm.
____	Coastal Commission	____	San Gabriel & Lower L.A. Rivers & Mtns. Conservancy
____	Colorado River Board	____	San Joaquin River Conservancy
____	Conservation, Department of	____	Santa Monica Mtns. Conservancy
____	Corrections, Department of	____	State Lands Commission
____	Delta Protection Commission	____	SWRCB: Clean Water Grants
____	Education, Department of	X	SWRCB: Water Quality
____	Energy Commission	____	SWRCB: Water Rights
X	Fish & Game Region #2 & 4	____	Tahoe Regional Planning Agency
X	Food & Agriculture, Department of	____	Toxic Substances Control, Department of
____	Forestry and Fire Protection, Department of	____	Water Resources, Department of
____	General Services, Department of		
____	Health Services, Department of	X	Other: San Joaquin Co Ag Commissioner
____	Housing & Community Development	X	Other: Stanislaus Co Ag Commissioner
____	Native American Heritage Commission		

Local Public Review Period (to be filled in by lead agency)

Starting Date November 17, 2016 Ending Date December 21, 2016

Lead Agency (Complete if applicable):

Consulting Firm: Blankinship & Associates, Inc.
Address: 1590 Drew Ave, Ste 120
City/State/Zip: Davis, CA 95618
Contact: Michael Blankinship
Phone: (530) 757-0941

Applicant: South San Joaquin Irrigation District
Address: 11011 E. Highway 120
City/State/Zip: Manteca, CA 95336
Phone: 209-249-4600

Signature of Lead Agency Representative: Peter M. Rietkerk, General Manager **Date:** 11/14/2016

Authority cited: Section 21083, Public Resources Code. Reference: Section 21161, Public Resources Code.

Document Details Report
State Clearinghouse Data Base

SCH# 2016112043
Project Title Use of Copper and Acrolein to Control Algae and Aquatic Vegetation in irrigation Facilities
Lead Agency South San Joaquin Irrigation District

Type MND Mitigated Negative Declaration
Description Note: Review Per Lead

The use of copper and acrolein to treat algae weeds within the district's irrigation facilities. South San Joaquin Irrigation District is preparing this initial study/MND to meet requirements of 1) the state implementation plan section 5.3 and 2) NPDES Permit #cag990005.

Lead Agency Contact

Name Peter Rietkerk
Agency South San Joaquin Irrigation District
Phone 209-249-4600 **Fax**
email
Address PO Box 747
City Manteca **State** CA **Zip** 95336-9750

Project Location

County San Joaquin, Stanislaus
City Manteca, Ripon, Escalon
Region
Lat / Long 37° 46' 31.7" N / 121° 3' 48.3" W
Cross Streets Numerous
Parcel No. numerous
Township 2S **Range** 8E **Section** 11 **Base** MD

Proximity to:

Highways 5, 120, 99
Airports Stockton Metropolitan
Railways UPRR
Waterways San Joaquin River, Stanislaus River
Schools Manteca USD
Land Use Ag/industrial/commercial/residential

Project Issues Aesthetic/Visual; Agricultural Land; Air Quality; Archaeologic-Historic; Biological Resources; Geologic/Seismic; Minerals; Noise; Population/Housing Balance; Public Services; Recreation/Parks; Schools/Universities; Toxic/Hazardous; Traffic/Circulation; Vegetation; Water Quality; Water Supply; Wetland/Riparian

Reviewing Agencies Resources Agency; Department of Fish and Wildlife, Region 2; Department of Fish and Wildlife, Region 4; Department of Parks and Recreation; Central Valley Flood Protection Board; Department of Water Resources; Caltrans, Division of Aeronautics; California Highway Patrol; Caltrans, District 10; Regional Water Quality Control Bd., Region 5 (Sacramento); State Water Resources Control Board, Division of Water Quality; Department of Toxic Substances Control; Native American Heritage Commission; Public Utilities Commission; State Lands Commission

Date Received 11/15/2016 **Start of Review** 11/15/2016 **End of Review** 12/21/2016

Note: Blanks in data fields result from insufficient information provided by lead agency.

Notice of Determination

To: San Joaquin County Clerk
44 North San Joaquin Street
Second Floor Suite 260
Stockton, CA 95202

Filed Doc #: 39-02152017-064
2/15/17 11:29 AM
Steve J. Bestolarides
San Joaquin County Clerk

From: South San Joaquin Irrigation District
P.O. Box 747
Ripon, CA 95366

Subject: FILING OF NOTICE OF DETERMINATION IN COMPLIANCE WITH SECTION 21108 OF THE PUBLIC RESOURCES CODE

Project Title: Use of Copper and Acrolein to Control Algae and Aquatic Vegetation in Irrigation Facilities

Contact Person: Peter Rietkerk, phone: 209-249-4600.

A copy of the Mitigated Negative Declaration adopted for this project and related documents are available for public examination at the District's office at the above address and telephone number.

- Project Location: within San Joaquin County and Stanislaus County, CA
- Project Description: The use of copper- and acrolein-containing algaecides and/or aquatic herbicides to treat algae and aquatic weeds in irrigation facilities. South San Joaquin Irrigation District has prepared the Initial Study/Mitigated Negative Declaration to meet requirements of 1) The State Implementation Plan (SIP) Section 5.3 and 2) NPDES Permit #CAG990005

Determination: This notice is to advise that the Board approved the above-described project on February 14, 2017 and has made the following determinations:

1. The project ☐ will have a significant effect on the environment.
   ☒ will not have a significant effect on the environment.
2. ☐ An Environmental Impact Report was prepared for this project pursuant to the provisions of CEQA.
   ☒ A Mitigated Negative Declaration was prepared for this project pursuant to the provisions of CEQA.
3. Mitigation measures ☒ were, ☐ were not, made a condition of the approval of this project.
4. A statement of Overriding Considerations ☐ was, ☒ was not, adopted for this project.
5. California State Department of Fish & Game fees (AB 3158)
   a) ☐ The project has been found to be de minimis thus not subject to the provisions of AB 3158
   b) ☒ The project is not de minimis and is, therefore, subject to the following fees:
      ☒ $2,216.25 for review of a Negative Declaration
      ☐ $850 for review of an Environmental Impact Report
      ☐ $25 for County Fish and Game program processing fees

Peter M. Rietkerk
Peter Rietkerk, General Manager

2/14/2017
Date

COPY

Notice of Determination

FILED

2017 FEB 15 PM 1:20

STANISLAUS CO. CLERK-RECORDER
Jennifer Mercado

To: Stanislaus County Clerk-Recorder
1021 I Street, Suite 101
Modesto, CA 95354

From: South San Joaquin Irrigation District
P.O. Box 747
Ripon, CA 95366

Subject: FILING OF NOTICE OF DETERMINATION IN COMPLIANCE WITH SECTION 21108 OF THE PUBLIC RESOURCES CODE

Project Title: Use of Copper and Acrolein to Control Algae and Aquatic Vegetation in Irrigation Facilities

Contact Person: Peter Rietkerk, phone: 209-249-4600.

A copy of the Mitigated Negative Declaration adopted for this project and related documents are available for public examination at the District's office at the above address and telephone number.

- Project Location: within San Joaquin County and Stanislaus County, CA
- Project Description: The use of copper- and acrolein-containing algaecides and/or aquatic herbicides to treat algae and aquatic weeds in irrigation facilities. South San Joaquin Irrigation District has prepared the Initial Study/Mitigated Negative Declaration to meet requirements of 1) The State Implementation Plan (SIP) Section 5.3 and 2) NPDES Permit #CAG990005

Determination: This notice is to advise that the Board approved the above-described project on February 14, 2017 and has made the following determinations:

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   ☒ will not have a significant effect on the environment.
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   ☒ A Mitigated Negative Declaration was prepared for this project pursuant to the provisions of CEQA.
3. Mitigation measures ☒ were, ☐ were not, made a condition of the approval of this project.
4. A statement of Overriding Considerations ☐ was, ☒ was not, adopted for this project.
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   a) ☐ The project has been found to be de minimis thus not subject to the provisions of AB 3158
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      - ☒ $2,216.25 for review of a Negative Declaration
      - ☐ $850 for review of an Environmental Impact Report
      - ☐ $25 for County Fish and Game program processing fees

Peter M. Rietkerk

Peter Rietkerk, General Manager

2/14/2017
Date

COPY

STATE OF CALIFORNIA

GOVERNOR'S OFFICE *of* PLANNING AND RESEARCH

STATE CLEARINGHOUSE AND PLANNING UNIT

EDMUND G. BROWN JR.
GOVERNOR

KEN ALEX
DIRECTOR

December 22, 2016

Peter Rietkerk
South San Joaquin Irrigation District
PO Box 747
Manteca, CA 95336-9750

Subject: Use of Copper and Acrolein to Control Algae and Aquatic Vegetation in irrigation Facilities
SCH#: 2016112043

Dear Peter Rietkerk:

The State Clearinghouse submitted the above named Mitigated Negative Declaration to selected state agencies for review. The review period closed on December 21, 2016, and no state agencies submitted comments by that date. This letter acknowledges that you have complied with the State Clearinghouse review requirements for draft environmental documents, pursuant to the California Environmental Quality Act.

Please call the State Clearinghouse at (916) 445-0613 if you have any questions regarding the environmental review process. If you have a question about the above-named project, please refer to the ten-digit State Clearinghouse number when contacting this office.

Sincerely,

Scott Morgan
Director, State Clearinghouse

1400 10th Street P.O. Box 3044 Sacramento, California 95812-3044
(916) 445-0613 FAX (916) 323-3018 www.opr.ca.gov

Public Comments

Consistent with the State Clearinghouse Letter presented previously, no comments were received. Therefore, no responses have been prepared.

SOUTH SAN JOAQUIN IRRIGATION DISTRICT
RESOLUTION NO. 17-03-C

WHEREAS, South San Joaquin Irrigation District (herein referred to as "District") proposes to apply aquatic herbicides containing acrolein and/or copper to control aquatic vegetation in its irrigation conveyance system (the "Project");

WHEREAS, Control of aquatic vegetation is necessary in order to efficiently convey irrigation water;

WHEREAS, the State Water Resources Control Board (SWRCB)'s Statewide General National Pollutant Discharge Elimination System permit for Residual Aquatic Pesticide Discharges to Water of the United States from Algae and Aquatic Weed Control Applications (Permit), regulates the District's use of aquatic herbicides containing acrolein and/or copper. Section 5.3 of the SWRCB's Policy for implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays and Estuaries in California, allows short-term or seasonal discharges of copper and acrolein to exceed applicable water quality criteria when necessary for resource or pest management conducted by public entities to fulfill statutory requirements (5.3 Exception). The District finds that it needs to use acrolein and/or copper to control aquatic vegetation in its irrigation system in order to provide irrigation service and that this need qualifies for the 5.3 Exception. The District is required to complete environmental review as a condition to applying to the SWRCB for a Section 5.3 Exception;

WHEREAS, pursuant to the California Environmental Quality Act (CEQA) guidelines, the District has prepared a CEQA Initial Study and Mitigated Negative Declaration for the Project dated November 7, 2016;

WHEREAS, the District Initial Study concluded that with the implementation of mitigation measures described in the initial study, the project will not have a significant effect on the environment;

WHEREAS, the District therefore has proposed to adopt a CEQA Mitigated Negative Declaration for the Project;

WHEREAS, pursuant to CEQA guidelines, the District has circulated for public review and comment a Notice of Intent to Adopt the Mitigated Negative Declaration and the Initial Study;

WHEREAS, the District has not received any public comments concerning the Mitigated Negative Declaration and the Initial Study; and

WHEREAS, the District's General Manager has recommended that the District's Board of Directors ("Board") adopt the Mitigated Negative Declaration and authorize the filing of a CEQA Notice of Determination; and

WHEREAS, the District's General Manager has recommended that the Board approve the Project.

NOW, THEREFORE BE IT RESOLVED as follows:

1) **Mitigated Negative Declaration.** The District hereby adopts the Mitigated Negative Declaration for the Project pursuant to CEQA.

2) **Findings.** The Board has reviewed the proposed Project, Initial Study, Mitigated Negative Declaration, and other information provided by District staff and Blankinship & Associates, Inc. staff. On the basis of this information and the whole record before the District, the Board hereby finds and determines as follows:

   a) The findings in the foregoing recitals are true and correct; and
   b) The Initial Study and Mitigated Negative Declaration reflect the District's independent judgment and analysis; and
   c) Although the project could have a significant effect on the environment without mitigation, there will not be a significant effect because the District has put appropriate mitigation measures in place, which are described in the Mitigated Negative Declaration and are hereby adopted, together with the Mitigation Monitoring and Reporting Program (MMRP) described therein, by the District; and
   d) There is no substantial evidence, in light of the whole record in front of the District that the Project may have a significant effect on the environment.

3) **Location and Custodian of Documents.** The Mitigated Negative Declaration, the Initial Study and Notice of Intent to Adopt the Initial Study are on file and available for public review at the District office located at 11011 E. Highway 120, Manteca, CA 95361. The District's Clerk of the Board at this address is the custodian of these documents that constitute the record of proceedings upon which the decision in this matter is based.

4) **Notice of Determination.** The District's Board hereby authorizes and directs the District's General Manager to prepare, sign and file a CEQA Notice of Determination with the Stanislaus and San Joaquin County Clerks and the State Clearinghouse within 5 days from the date of this Mitigated Negative Declaration, and to pay the California Department of Fish and Wildlife fee for review of the Mitigated Negative Declaration in accordance with Fish and Wildlife Code section 711.4.

PASSED AND ADOPTED by the Board of Directors of the District, at its regular meeting held on February 14, 2017 by the following roll call vote:

AYES:	HOLBROOK HOLMES KAMPER KUIL ROOS
NOES:	NONE
ABSTAIN:	NONE
ABSENT:	NONE

CERTIFICATION

The undersigned hereby certifies that she is the Secretary of South San Joaquin Irrigation District Board and that the foregoing Resolution was duly adopted by the above vote at the regular meeting of the Board of Directors held on February 14, 2017.

Peter M. Rietkerk

Peter M. Rietkerk, Secretary

Use of Copper and Acrolein to Control Algae and Aquatic Vegetation in Irrigation Facilities

Mitigation Monitoring and Reporting Program

In January 1989, Assembly Bill 3180 went into effect requiring the District to monitor all mitigation measures applicable to this project and included in the Mitigated Negative Declaration. For this project, mitigation reporting will be performed by the South San Joaquin Irrigation District in accordance with the monitoring and reporting program developed by the District to implement AB 3180.

This Mitigation Monitoring and Reporting Program is being prepared for the South San Joaquin Irrigation District, 11011 E. Highway 120, Manteca, CA 95336, pursuant to the California Environmental Quality Guidelines, Section 21081.

Project Name: Use of Copper and Acrolein to Control Algae and Aquatic Vegetation in Irrigation Facilities

Project Location: South San Joaquin Irrigation District

Project Description:

South San Joaquin Irrigation District (herein referred to as “District”) is the entity responsible for maintaining the District’s irrigation conveyance system. The District delivers water to approximately 54,200 acres of farmland around the cities of Manteca, Ripon, and Escalon. District irrigation water is delivered from Woodward Reservoir, located just north of the City of Oakdale. The District annually diverts approximately 230,000 acre-feet of water for irrigation purposes.

Efficient conveyance of irrigation water is critical to the functions of the District. However, the District’s conveyances are prone to infestation by floating and submersed aquatic weeds including American pondweed, sago, watermilfoil, parrot feather, and filamentous and planktonic algae. The presence of algae and/or submersed aquatic vegetation can slow or stop the flow of water in District conveyances, reducing their irrigation capacity.

To maintain flow rates and water elevation in its irrigation conveyances, the District uses Integrated Pest Management (IPM) techniques. As part of this approach, the District plans to use a variety of algaecides and/or aquatic herbicides including copper and/or acrolein on an “as-needed” basis to achieve algae and aquatic weed control necessary for efficient water conveyance.

Depending on weed or algae presence, type and density, algaecides and/or aquatic herbicides containing copper and/or acrolein may be applied at locations throughout the District’s irrigation conveyance system. Applications may be made if the District’s IPM thresholds are met, or expected to be met based on the water, weed or algae density, weed growth or predicted growth, water demand, or water level in the system. Some years, algaecides and/or aquatic herbicides may not be used if thresholds are not met. Applications may be made throughout the irrigation supply conveyance system. The District makes no algaecides and/or aquatic herbicide applications to the San Joaquin River or Stanislaus River.

The “Project” is defined as the District’s application of algaecides and/or aquatic herbicides that contain copper or acrolein to the irrigation conveyance system to control algae and a variety of aquatic vegetation as needed for the efficient delivery of irrigation water.

MITIGATION MONITORING AND REPORTING PROGRAM CHECKLIST FOR THE Use of Copper and Acrolein to Control Algae and Aquatic Vegetation in Irrigation Facilities

Mitigation Measure	Monitoring	Certification of Compliance	Reporting	Reporting / Responsible Party
Biological Resources				
BIO-1. Applications of acrolein will not be made above 12.7 mg/L to the District's irrigation conveyance system.	Not Applicable	Not Applicable	Not Applicable	South San Joaquin Irrigation District
Hydrology & Water Quality				
HWQ-1. As needed, the District will revise its Aquatic Pesticide Application Plan (APAP) and Notice of Intent (NOI) to reflect the use, monitoring and reporting of acrolein- and copper-containing aquatic herbicides upon being listed on the SIP Exception list of the permit. The APAP will call for surface water sampling and analysis before, during, and after Project completion to assess the impact, if any, that the Project may have on beneficial uses of water. Additionally, consistent with SIP exception requirements, the District will arrange for a qualified biologist to assess impacts to receiving water beneficial uses Mitigation HWQ-1 is the implementation of the District's Aquatic Pesticide Application Plan (APAP) that requires surface water sampling, analysis, visual monitoring, and reporting as a condition of the NPDES Aquatic Permit issuance. The District's APAP has been reviewed and approved by the SWRCB and reporting to them is done annually by March 1. Implementation of the APAP mitigates significant environmental effects of aquatic herbicide use.	All monitoring to adhere to Water Quality Order No. 2013-0002-DWQ, and implementation of the District's APAP. Field observations, measurements, sample collection and analysis conducted before, during and after project completion	A Qualified biologist certifies that beneficial uses of receiving waters have been restored upon completion of application	All Reporting to adhere to Water Quality Order No. 2013-0002-DWQ.	South San Joaquin Irrigation District and/or Consultant and/or Contractor

State of California - Department of Fish and Wildlife

2017 ENVIRONMENTAL FILING FEE CASH RECEIPT

DFW 753.5a (Rev. 01/01/17) Previously DFG 753.5a

RECEIPT NUMBER: 39-02152017-064

STATE CLEARINGHOUSE NUMBER *(If applicable)*

SEE INSTRUCTIONS ON REVERSE. TYPE OR PRINT CLEARLY.

LEAD AGENCY	LEADAGENCY EMAIL	DATE
SOUTH SAN JOAQUIN IRRIGATION DISTRICT		02/15/2017

COUNTY/STATE AGENCY OF FILING	DOCUMENT NUMBER
SAN JOAQUIN	39-02152017-064

PROJECT TITLE

USE OF COPPER AND ACROLEIN TO CONTROL ALGAE AND AQUATIC VEGETATION IN IRRIGATION FACILITIES

PROJECT APPLICANT NAME	PROJECT APPLICANT EMAIL	PHONE NUMBER
SOUTH SAN JOAQUIN IRRIGATION DISTRICT		(209) 249-4600

PROJECT APPLICANT ADDRESS	CITY	STATE	ZIP CODE
P O BOX 747	RIPON	CA	95366

PROJECT APPLICANT *(Check appropriate box)*

☒ Local Public Agency ☐ School District ☐ Other Special District ☐ State Agency ☐ Private Entity

CHECK APPLICABLE FEES:

☐ Environmental Impact Report (EIR)	$3,078.25	$	
☒ Mitigated/Negative Declaration (MND)(ND)	$2,216.25	$	$2,216.25
☐ Certified Regulatory Program document (CRP)	$1,046.50	$	

☐ Exempt from fee

- ☐ Notice of Exemption (attach)
- ☐ CDFW No Effect Determination (attach)

☐ Fee previously paid (attach previously issued cash receipt copy)

☐ Water Right Application or Petition Fee (State Water Resources Control Board only)	$850.00	$	
☒ County documentary handling fee		$	$50.00
☐ Other		$	

PAYMENT METHOD:

☐ Cash ☐ Credit ☒ Check ☐ Other **TOTAL RECEIVED** $ $2,266.25

SIGNATURE	AGENCY OF FILING PRINTED NAME AND TITLE
X	Rosa Arceo ,Deputy

ORIGINAL - PROJECT APPLICANT COPY - CDFW/ASB COPY - LEAD AGENCY COPY - COUNTY CLERK DFW 753.5a (Rev. 20151215)

State of California - Department of Fish and Wildlife

2017 ENVIRONMENTAL FILING FEE CASH RECEIPT

DFW 753.5a (Rev. 01/01/17) Previously DFG 753.5a

Print | StartOver | Finalize&Email

RECEIPT NUMBER:
50 — 2017 — 14

STATE CLEARINGHOUSE NUMBER *(If applicable)*

SEE INSTRUCTIONS ON REVERSE. TYPE OR PRINT CLEARLY.

LEAD AGENCY	LEAD AGENCY EMAIL	DATE
South San Joaquin Irrigation District		02/15/2017

COUNTY/STATE AGENCY OF FILING	DOCUMENT NUMBER
Stanislaus	2017-014

PROJECT TITLE

Use of Copper & Acrolein to Control Algae & Aquatic Vegetation in Irrigation Facilities

PROJECT APPLICANT NAME	PROJECT APPLICANT EMAIL	PHONE NUMBER
South San Joaquin Irrigation		(209) 249-4600

PROJECT APPLICANT ADDRESS	CITY	STATE	ZIP CODE
PO Box 747	Ripon	CA	95366

PROJECT APPLICANT *(Check appropriate box)*

☑ Local Public Agency ☐ School District ☐ Other Special District ☐ State Agency ☐ Private Entity

CHECK APPLICABLE FEES:

☐ Environmental Impact Report (EIR)	$3,078.25	$	0.00
☐ Mitigated/Negative Declaration (MND)(ND)	$2,216.25	$	0.00
☐ Certified Regulatory Program document (CRP)	$1,046.50	$	0.00

☐ Exempt from fee
- ☐ Notice of Exemption (attach)
- ☐ CDFW No Effect Determination (attach)

☑ Fee previously paid (attach previously issued cash receipt copy)

☐ Water Right Application or Petition Fee (State Water Resources Control Board only)	$850.00	$	0.00
☑ County documentary handling fee		$	57.00
☐ Other		$	

PAYMENT METHOD:

☐ Cash ☐ Credit ☑ Check ☐ Other **TOTAL RECEIVED** $ 57.00

SIGNATURE	AGENCY OF FILING PRINTED NAME AND TITLE
X Mercado	Jennifer Mercado, Legal Clerk

ORIGINAL - PROJECT APPLICANT | COPY - CDFW/ASB | COPY - LEAD AGENCY | COPY - COUNTY CLERK | DFW 753.5a (Rev. 20151215)