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LETTER OF TRANSMITTAL

To: Russell Norman
State Water Resources Control Board
1001 I Street
Sacramento, CA 95814

Date: February 10, 2014

From:
☐ Mike Blankinship ☐ Sheri Backer
☐ Stephen Burkholder × Lindsey Curley

Project: **SIP Exception Request for Reclamation District 108 (RD 108) IS/MND**

We are transmitting the following:

Item #	*Quantity*	*Description*
1	1	RD 108 Final IS/MND Document
2	1	Notice of Determination (*)
3	1	SIP Requirements List (*)

(*) – Found under the "CEQA Documentation" section in Appendix F of the IS/MND document

For Your:

X	Review
X	Approval
X	Information
X	Files

Sent By:

☐	Regular U.S. Mail
☐	Federal Express
☐	Courier
X	Other: Email

Comments:

Russell,

Enclosed, find the documents necessary to apply for a SIP Section 5.3 Exception for RD 108's use of copper and acrolein. Please consider this submission a formal request by RD 108 for inclusion in Attachment G of the aquatic pesticide permit. At the earliest possible time, we would appreciate the SWRCB's consideration.

Please call our office with any questions. Thank You.

Use of Copper and Acrolein To Control Aquatic Vegetation In Water Conveyances

California Environmental Quality Act Initial Study And Mitigated Negative Declaration

February 10, 2014

Reclamation District 108
P.O. Box 50
975 Wilson Bend Road
Grimes, CA 95950
Contact: Lewis Bair
(530) 437-2221

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

Submitted to:
State Water Resources Control Board
1001 I Street
Sacramento, CA 95814
Contact: Russell Norman
(916) 323-5598

Use of Copper and Acrolein To Control Aquatic Vegetation In Water Conveyances

CEQA Initial Study & Mitigated Negative Declaration

Table of Contents

List of Figures

List of Tables

List of Appendices

1.0 PROJECT DESCRIPTION

1.1 Introduction

Reclamation District 108 (herein referred to as the "District") is located in Yolo and Colusa counties and lies west of the Sacramento River. It runs roughly north-south parallel to Interstate 5 and the topography is essentially flat. The western and southern boundary of the District is the 21-mile long eastern bank of the Colusa Basin Drain. The city of Knights Landing is located near the southern boundary, and the city of Grimes is located in the northern portion of the District. Refer to **Figures 1** and **Figure 2**.

The District receives water from the Sacramento River and delivers irrigation water to farmland within northern Yolo County and southern Colusa County. Shortly after beginning construction of irrigation and pumping canals in 1916, the District became the first reclamation district to deliver irrigation water in California.

The District maintains approximately 120 miles of irrigation canals; 40 miles are concrete-lined. Tailwater is collected in 300 miles of drains. This drain water is either recycled and reused in the District, or is channeled to the Rough and Ready Pump Station for return to the Sacramento River.

The District maintains efficient use of water through substantial water recycling operations, recycling more than 50,000 acre-feet of water annually. The District's extensive water recycling system consists of four dedicated pumping stations, Sycamore Slough Pump Station being the largest, which redistribute water throughout the District. Drainage is captured in this system and reapplied to the fields for irrigation.

Crops currently grown in the District include rice, wheat, corn, safflower, tomatoes, beans, cotton, nuts, and fruit. Rice is grown in over two-thirds of the District's 48,000 acres. During fall and winter, the numerous rice fields support over-wintering ducks, geese, and shorebirds.

The District aids in flood prevention in its service area. District collection and drainage channels help move rain water through the district to the Rough and Ready Pump Station. The pump station is used to pump water out of the District because it is bordered by levees. These levees include the Sacramento River levee that forms the eastern boundary of the district, a Back Levee along the District's western boundary designed to prevent flooding from the Colusa Basin, and a levee to the south that at one time took drainage water from the Colusa Basin back to the Sacramento River. Through coordinating with the Sacramento Westside Levee District and the Knights Landing Ridge Drainage District, the District helps maintain over 90 miles of levees, affording direct protection to 194,000 acres of farmland and to the rural communities of Grimes and Knights Landing. These levees also provide indirect protection to the cities of Sacramento and West Sacramento as they are fundamental to the network-wide efficacy of the Sacramento River Flood Control Project.

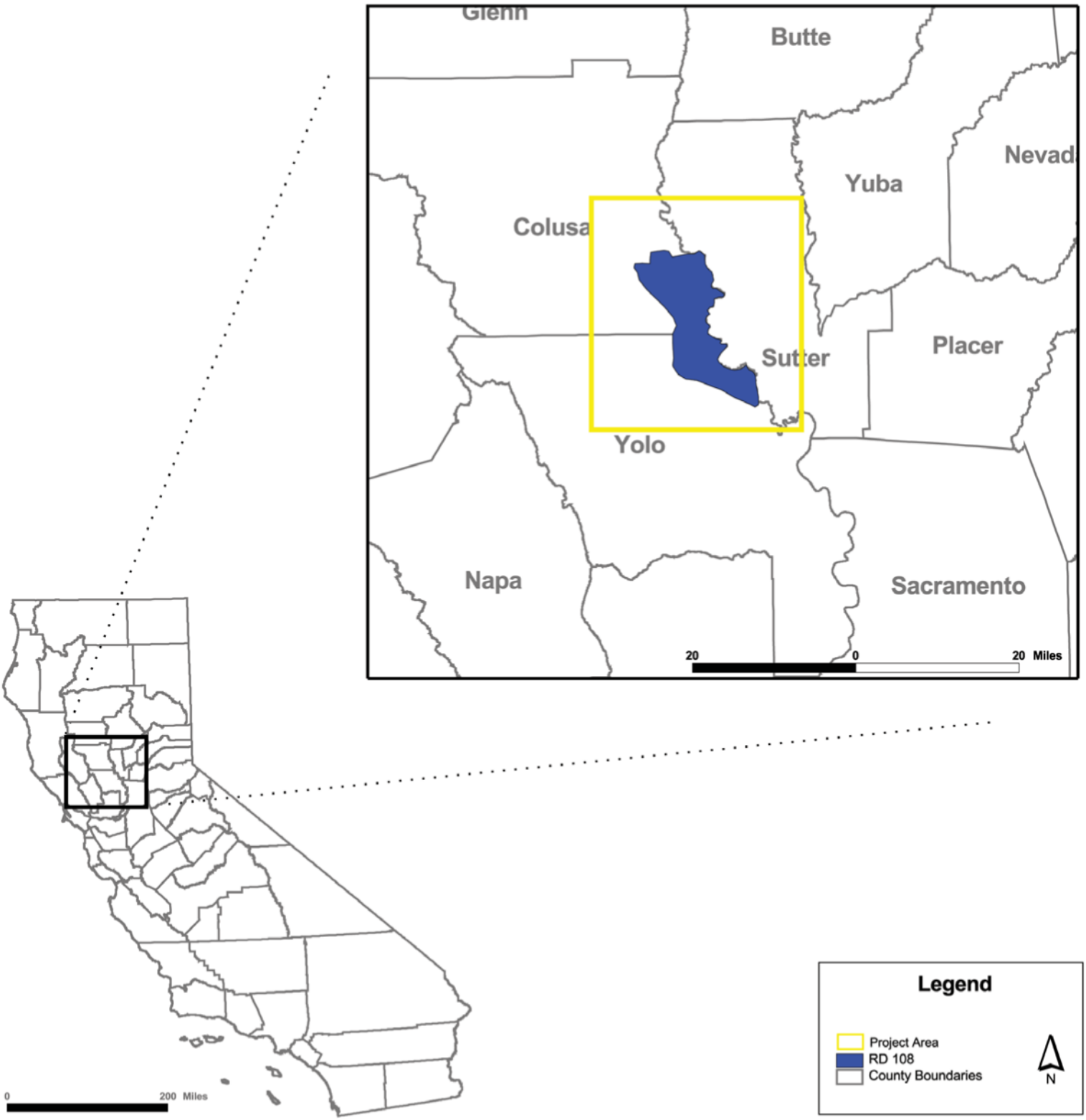
Efficient conveyance of irrigation water is critical to the functions of the District. However, the District's conveyances are prone to infestation by several floating and submersed aquatic weeds including pondweeds (sago, American, curly-leaf), parrotfeather, coontail, water

primrose, and algae. The presence of these weeds can slow or stop the flow of water in a conveyance, reducing its irrigation and flood control capacity.

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

Depending on weed presence and density, aquatic herbicides containing copper and/or acrolein may be applied at locations throughout the District. Applications may be made if the District's IPM thresholds are met, or expected to be met based on the weather, weed density, weed growth or predicted growth, water demand, or water level in the system. Some years, aquatic herbicides my not be used if thresholds are not met. Applications may be made during the irrigation season, typically between March and November. Applications may be made throughout the irrigation supply canal system. The District makes no aquatic herbicide applications to the Colusa Basin Drain or to drains that go directly to the Sacramento River.

The "Project" is defined as the District's applications of aquatic herbicides to canals and laterals to control a variety of aquatic vegetation as needed for the efficient delivery of irrigation water.



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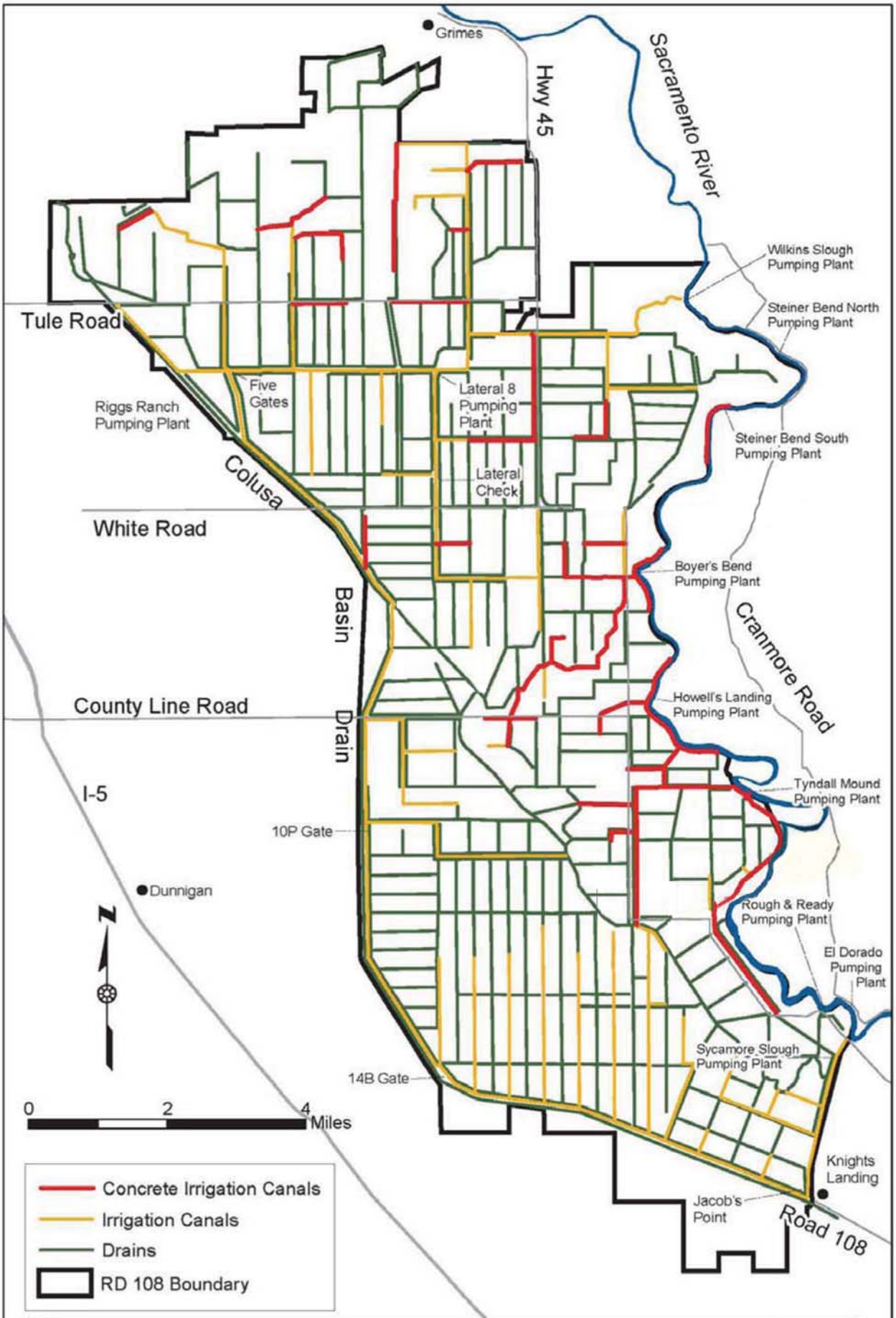
Reclamation District 108
Project Location Map

Figure
1



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Reclamation District No. 108

Figure 2

1.2 Regulatory Setting

On June 4, 2004, The State Water Resources Control Board (SWRCB) released the Statewide General National Pollutant Discharge Elimination System (NPDES) Permit for the Discharge of Aquatic Pesticides for Aquatic Weed Control in Waters of the United States, #CAG990005. This permit expired in May 2009, but was administratively continued until November 30, 2013. 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 will become 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, 2003)

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

The SIP does, however, allow exceptions if determined to be necessary to implement control measures either for resource or pest management conducted by public entities to fulfill statutory requirements, or regarding drinking water conducted to fulfill statutory requirements under the federal Safe Drinking Water Act or the California Health and Safety Code. Such 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 they meet one or more of the criteria for gaining a SIP exception.

Permittees who elect to use a SIP exception must satisfactorily complete several steps, including preparation and submission of a California Environmental Quality Act (CEQA) document. This document must be submitted to the SWRCB for the permittee to place on Attachment E of the Permit, and subsequently be afforded coverage.

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

[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."

1.3 Required Approvals

To obtain approval of an exception under Section 5.3 of the SIP 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, including the proposed method of completing the action;
b. A time schedule;
c. 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);
d. CEQA documentation;
e. Contingency plans (to the extent applicable);
f. Identification of alternate water supply (if needed and to the extent applicable);
g. Residual waste disposal plans (to the extent applicable); and
h. Upon completion of the project, the discharger 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

Prior to applications of copper and/or acrolein, the District will send a written notification of intent to use acrolein and/or copper to the California Department of Fish and Wildlife (CDFW) annually. Upon the District's receipt of CDFW herbicide use acknowledgement and requirements letter, the requirements must be followed including notification to the CDFW by phone, Fax, or e-mail 24 hours prior to treatment.

1.4.2 Yolo and Colusa County Agricultural Commissioners

Prior to the start of every season, the District obtains a Restricted Materials permit from the County Agricultural Commissioner (CAC) as needed.

1.4.3 NPDES Aquatic Pesticide Permit Notifications

Every calendar year, at least 15 days prior to the first application of acrolein or copper aquatic herbicides, the Discharger notifies potentially affected public agencies. The District may post the notification on its website if possible. The notification includes the following information:

1. A statement of the District's intent to apply algaecide or aquatic herbicide(s);
2. Name of algaecide and 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

Water is typically recycled within the District to the extent feasible and/or necessary throughout the irrigation season. Pumping plants at water collection points can pump water back into irrigation supply canals, to the Sacramento River, or Ridge Cut Slough as needed. Water can only leave the district by being pumped over the levees surrounding the district to the Sacramento River or Ridge Cut Slough. Irrigation laterals are typically treated zero to two times per year depending on weed pressure, delivery needs, and IPM threshold.

The District implements an Integrated Pest Management (IPM) program for aquatic weed control. The IPM program involves the scouting of aquatic weed locations and densities, establishment of thresholds above which control is needed, and making applications of aquatic herbicides on an “as-needed” basis to achieve the aquatic weed control necessary to convey water.

Prior to application, the following tasks are accomplished:

1. A written recommendation is prepared by a DPR-licensed Pest Control Advisor (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, health and environmental hazards and restrictions, and 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**.

2. All District personnel review and strictly adhere to the aquatic herbicide product label that has clear and specific warnings that alert users to hazards that may exist. An example of a specific product label is included in **Appendix E**.

3. All District personnel review and consult the aquatic herbicide Material Safety Data Sheet (MSDS) in **Appendix E**, and the DPR Worker Health and Safety Branch Pesticide Safety Information Series (PSIS). The PSIS and the MSDS have specific information that describes precautions to be taken during the use of the aquatic herbicide. If acrolein is to be used, District personnel obtain annual training on its use as described in the Magnacide H Herbicide Application and Safety Manual**.**

4. The condition of the canals and lateral(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 weed species, level of infestation, water and flow conditions, alternate control methods, and amount of aquatic herbicide to be applied.

5. After field evaluation, notices are sent to the County Agricultural Commissioner (CAC) and the California Department of Fish and Wildlife (CDFW).

6. Growers are also given the opportunity to postpone water deliveries in case of sensitivities, such as pastures with lactating cows or organic crops. Growers are instructed not to make adjustments to the turnout gates during the 6-day hold period prescribed by the acrolein label.

7. Prior to an application, District personnel inspect and seal any emergency spill structures to District drainage canals with boards and plastic, as necessary if control structures are leaking.

8. 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 for the label-prescribed 6 day hold period before being released.

During and after an aquatic herbicide application, the District accomplishes the following:

1. Do not allow water to be released from canals and laterals before the label-prescribed 6 day hold time for acrolein applications.

2. Control small leaks (< 1 gallon per minute) that may develop at gates or check structures with sand bags, installation of additional plastic around boards, temporary dikes, pumps, or by lowering the level of treated water below the elevation of the leak.

All these actions effectively prevent the release of water treated with aquatic herbicide from leaving a canal or lateral.

2.0 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(d) 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 a less-than-significant levels. No other environmental categories for this evaluation were found to be potentially affected in a significant manner by the proposed Project.

2.1 CEQA Initial Study & Environmental Check List Form

1. Project Title: Use of Copper and Acrolein to Control Aquatic Vegetation in Water Conveyances

2. Lead Agency Name and Address: Reclamation District 108
P.O. Box 50
975 Wilson Bend Road
Grimes, California 95950

3. Contact Person & Phone Number: Lewis Bair, General Manager
(530) 437-2221

4. Project Location: Yolo and Colusa Counties, California

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

6. General Plan Land Use Designation: Agriculture

7. Zoning: Exclusive Agriculture

8. Description of Project: See Section 1.5

9. Surrounding Land Uses and Setting: Agriculture/Designated Floodway/Commercial Residential/Public Services/Industrial

10. Other Agencies Whose Approval is Required: As Listed in Section 1

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.

Lewis Bair
Signature

2/10/14
Date

Lewis Bair
Printed Name

Reclamation District 108
For

3.0 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.*** No designated scenic vistas or state scenic highways overlook any of the project sites, therefore no impact would occur.

Item c): ***No Impact.*** The Project involves the application of aquatic herbicides to conveyances in the District to control a variety of aquatic vegetation. These weeds are typically at or below the water surface. Upon control, the removal of these weeds would be unnoticed and as a result not degrade the visual character of the project site.

Item d): ***No Impact.*** The Project is done during the daylight hours, therefore no light sources are needed and no 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.*** On the contrary, the Project accomplishes objectives that maintain and enhance agricultural land 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 for purposes of transporting 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 aquatic herbicides. Short-term vehicle emissions will be generated during aquatic herbicide application; however, they will be minor 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.

The District is located in the Northern Sacramento Valley Air Basin (NSVAB), which includes the following counties: Butte, Colusa, Glenn, Shasta, Sutter, Tehama, and Yuba. The application of aquatic herbicides does not conflict with the NSVAB 2003 Air Quality Attainment Plan, violate any air quality standards, or contribute to an existing or projected violation available from the Yolo-Solano Air Quality Management District and Colusa County Air Pollution Control District.

Item c): ***No Impact.*** Levels of ozone and suspended matter (PM_{10}) in Yolo County have exceeded California Clean Air standards, and therefore the area has been considered a "nonattainment" area for these pollutants. In Colusa County, levels of suspended matter

nearly meet California Clean Air standards, and therefore the area has been considered "nonattainment-transitional" for PM_{10}. Although neither area is attainment for both PM_{10} and ozone California Clean Air standards, the Project will not increase either of these criteria pollutants.

Items d) & e): ***No Impact.*** Aquatic herbicides are applied by District personnel or their contractors in agricultural areas rarely frequented by people. Applications are not made near, schools, playgrounds, health care facilities, day care facilities, and athletic facilities, thereby eliminating exposure to these sensitive receptors and creating no impact.

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

Items 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), and the U.S. Fish and Wildlife Service (USFWS), Sacramento Office. 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 designation, 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 is presented in **Appendix B.**

With one exception, no special status species has habitat in or near, or is otherwise expected to be exposed to aquatic herbicides used for the Project.

The one species that may be at risk is the giant garter snake. A giant garter snake could move from rice fields or natural water bodies within and near the district, and enter treated canals. Once in a treated canal, a giant garter snake may be exposed to copper or acrolein through contact with or ingestion of treated water, leading to potential risk.

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 is Present from Project Activities
AMPHIBIAN						
California tiger salamander	*Ambystoma californiense*	FT, SCSC	Herbaceous wetland, temporary pool; Grassland/herbaceous, Savanna, Woodland - Hardwood; Benthic, Burrowing in or using soil		**X** (1)	
California red-legged frog	*Rana aurora draytonii*	FT, SCSC	Quiet permanent water of streams, marshes, or (less often) ponds and other quiet bodies of water.		**X** (2)	
western spadefoot toad	*Spea hammondii*	SCSC	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** (3)	

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 is Present from Project Activities
BIRD						
tricolored blackbird	*Agelaius tricolor*	SCSC	Fresh-water marshes of cattails, tule, bulrushes and sedges; Cropland/hedgerow, Grassland/herbaceous		**X** (4)	
burrowing owl	*Athene cunicularia*	SCSC	Agriculture/Rangeland, Grassland		**X** (4)	
Aleutian Canada goose	*Branta canadensis leucopareia*	FD	Open Water, Pasture/Grainfields (winter only)	**X**		
Swainson's hawk	*Buteo swainsoni*	ST	Cropland/hedgerow, Desert, Grassland/herbaceous, Savanna, Woodland - Mixed		**X** (4)	
western snowy plover	*Charadrius alexandrinus nivosus*	SCSC	Sandy beaches, alkali lakeshores and dry evaporation ponds; unvegetated open areas, primarily in sand dunes, for nest sites	**X**		
mountain plover	*Charadrius montanus*	SCSC	Rrecently plowed fields, sparsely vegetated fields, and pastureland with little to no vegetative growth	**X**		
western yellow-billed cuckoo	*Coccyzus americanus occidentalis*	FC, SE	Open woodland (especially where undergrowth is thick), 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**		
greater sandhill crane	*Grus canadensis tabida*	ST, SFP	Herbaceous wetland, Riparian; Cropland/hedgerow, Grassland/herbaceous (winter only)	**X**		
bank swallow	*Riparia riparia*	ST	riparian and other lowland habitats; requires vertical banks/cliffs with fine soils		**X** (5)	

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 is Present from Project Activities
FISH						
green sturgeon	*Acipenser medirostris*	FT, SCSC	Most often in marine waters; estuaries, lower reaches of large rivers, salt or brackish water off river mouths; adults feed on bottom invertebrates and small fish	**X**		
delta smelt	*Hypomesus transpacificus*	FT, SE	open waters of bays, tidal rivers, channels, and sloughs; breeds in medium to large rivers	**X**		
Central Valley steelhead	*Oncorhynchus mykiss irideus*	FT	Sacramento and San Joaquin Rivers and Tributaries	**X**		
chinook salmon spring run	*Oncorhynchus tshawytscha* spring run	FT, ST	Sacramento River and Tributaries	**X**		
chinook salmon winter run	*Oncorhynchus tshawytscha* winter run	FE, SE	Sacramento River and Tributaries	**X**		
Sacramento splittail	*Pogonichthys macrolepidotus*	SCSC	Lakes, Slow-moving Rivers with Vegetated Floodplain, Tidal Estuarine Marsh	**X**		
MAMMAL						
pallid bat	*Antrozous pallidus*	SCSC	Deserts, grasslands, shurblands, woodlands & forests. Most common in open, dry habitats with rocky areas for roosting		**X**(6)	
Marysville California kangaroo rat	*Dipodomys californicus eximius*	SCSC	Deserts and chaparral areas with soil soft enough to allow digging burrows, or in the burrows of other rodents in areas of harder soil	**X**		
western red bat	*Lasiurus blossevillii*	SCSC	Along riparian and agricultural areas in broadleaf tree communities throughout the Central Valley		**X**(7)	
American badger	*Taxidea taxus*	SCSC	Most abundant in drier open stages of most shrub, forest, and herbaceous habitats. Preys on burrowing rodents; digs burrows for dens and during foraging activities	**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 is Present from Project Activities
REPTILE						
giant garter snake	*Thamnophis gigas*	FT, ST	prefers freshwater marsh and low gradient streams, has adapted to drainage canals and irrigation ditches			**X**
INVERTEBRATE						
Conservancy fairy shrimp	*Branchinecta conservatio*	FE	Vernal Pools			
vernal pool fairy shrimp	*Branchinecta lynchi*	FT	Vernal Pools	**X**		
valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*	FT	Riparian		**X**(8)	
vernal pool tadpole shrimp	*Lepidurus packardi*	FE	Vernal Pools	**X**		
PLANT						
Ferris's milk-vetch	*Astragalus tener var. ferrisiae*	CNPS-1	Grassland	**X**		
alkali milk-vetch	*Astragalus tener var. tener*	CNPS-1	Alkali areas of floodplains; Vernal Pools	**X**		
heartscale	*Atriplex cordulata*	CNPS-1	Alkali Scrub or Grassland	**X**		
brittlescale	*Atriplex depressa*	CNPS-1	Alkali Scrub or Grassland, Vernal Pools	**X**		
San Joaquin spearscale	*Astragalus tener var. tener*		Alkali scrub, grasslands	**X**		
vernal pool smallscale	*Atriplex persistens*	FSC, CNPS-2	Vernal Pools	**X**		
palmate-bracted bird's-beak	*Cordylanthus palmatus*	FE, SE, CNPS-2	Alkali Scrub or Grassland	**X**		
recurved larkspur	*Delphinium recurvatum*	CNPS-1	Alkali Scrub or Grassland	**X**		
round-leaved filaree	*Erodium macrophyllum*	CNPS-1	Grassland, Woodland	**X**		
wooly rose-mallow	*Hibiscus lasiocarpos var. occidentalis*	CNPS-1	Freshwater Marsh		**X**(9)	
Coulter's goldfields	*Lasthenia glabrata ssp. coulteri*	CNPS-1	Grassland, Playas, 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 is Present from Project Activities
Colusa layia	*Layia septentrionalis*	CNPS-1	Chaparral, Grassland, Oak Woodland	**X**		
Heckard's pepper-grass	*Lepidium latipes var. heckardii*	CNPS-1	Grassland, Vernal Pools	**X**		
veiny monardella	*Monardella douglasii ssp. venosa*	CNPS-1	Cismontane Woodland, Valley and foothill grassland	**X**		
Baker's navarretia	*Navarretia leucocephala ssp. bakeri*	CNPS-1	Grassland, Coniferous Forest, Oak Woodland, Vernal Pools	**X**		
Hartweg's golden sunburst	*Pseudobahia bahiifolia*	FE, SE, CNPS-1	Cismontane Woodland, Grassland	**X**		
San Francisco campion	*Silene verecunda ssp. verecunda*	CNPS-1	Coastal bluff Scrub, Chaparral, Coastal Prairie, Coastal Scrub, Grassland	**X**		
Wright's trichocoronis	*Trichocoronis wrightii var. wrightii*	CNPS-2	Mud flats of vernal lakes, drying river beds, alkali meadows	**X**		
saline clover	*Trifolium hydrophilum*	CNPS-1	Vernal Pools, Marshes and Swamps, Grassland		**X**(9)	
Greene's tuctoria	*Tuctoria greenei*	FE, CNPS-1	Vernal Pools	**X**		

Table 1 Numbered Notes:

(1) Species not present in water during application due to aestivation (summer-time dormancy).

(2) Species not present in project area according to U.S. Fish and Wildlife Service Recovery Plan for the California red-legged frog (see **Appendix A**).

(3) This is a terrestrial species that is known to enter water only during part of its' reproductive cycle. This period of time does not coincide with the application period of aquatic herbicides.

(4) Species not likely to have any exposure as its target prey base consists of terrestrial species.

(5) Species forage for emergent aquatic insects over water. These insects may bioaccumulate copper. But, given the large amount of potential foraging area, the emergent aquatic insects from treated canals would likely only contribute an insignificant percentage of the total diet. Therefore, no risk due to copper exposure is anticipated.

(6) Species not likely to have any exposure as its target prey base consists of terrestrial invertebrates.

(7) Species not likely to have any exposure as its target prey base consists of terrestrial insects.

(8) The habitat of the valley elderberry longhorn beetle is limited exclusively to elderberry bushes (*Sambucus* spp.). Elderberry bushes are terrestrial species. Accordingly, irrigation water containing aquatic herbicides is unlikely to come into contact with these

plants. Therefore, no risk is present to elderberry bushes or valley elderberry longhorn beetles.

(9) Wooly rose-mallow and saline clover do not grow in standing water but may grow on moist banks of canals or ditches. Exposure to canal water containing aquatic herbicides is indirect, if any. Exposure will only occur through root uptake of soil water. Aquatic herbicide concentration in root zone water is not expected to be sufficient to cause risk.

Table 1 Status Abbreviation:

FC – Federally Listed Candidate Species
FD = Federally Delisted
FE = Federally Listed as Endangered
FSC – Federally Listed Species of Concern
FT = Federally Listed as Threatened
SCSC = State Listed Species of Concern
SE = State Listed as Endangered
SFP = State Listed as Fully Protected
ST = State Listed as Threatened
CNPS-1 = California Native Plant Society Listed, Rare, Threatened, or Endangered in CA only
CNPS-2 = California Native Plant Society Listed Rare, Threatened, or Endangered

(Continued Item a): Discussion)

Methods for Estimating Risk

The United States Environmental Protection Agency (USEPA) has 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 were found in USEPA's OPP database (2012).

The USEPA (1989) suggests applying a 20X safety factor to median toxicity values for aquatic threatened or endangered species and a 10X safety factor for terrestrial threatened or endangered species.

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 and terrestrial-phase amphibians. The uncertainty involved with using avian endpoint data to estimate risk to a reptile species does not require the application of an additional safety factors (EPA 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 environmental concentration (EEC) an organism may be exposed to the derived TRV to calculate a risk. Risk is present when the EEC divided by the TRV is greater than or equal to 1.0. There is no risk given the scenario and assumptions if the result is less than 1.0.

$$\text{Risk} = \frac{\text{EEC}}{\text{TRV}}$$

Where:
EEC = Estimated Environmental Concentration
TRV = derived Toxicity Reference Value

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 (OPP 2000). This endpoint was used to derive a reptilian TRV by applying the recommended 10X safety factor for threatened terrestrial species. Therefore, the derived reptilian TRV of 0.91 mg copper/kg body weight was used to determine if the exposure to acrolein-treated water presents a risk to the giant garter snake.

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 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.

It was estimated that applications of acrolein at the maximum label rate (15 mg/L , or 15,000 ug/L) will cause exposure greater than the derived TRV for reptiles of 0. 91 mg acrolein/kg body weight/day. Until the water concentration of acrolein drops below 12,720 ug/L, the giant garter snake is exposed to a concentration of acrolein that may cause risk.

Given the conservatively estimated acrolein half-life in irrigation canals (10.2 hours), acrolein applied at the maximum label rate (15 mg/L) can be estimated to degrade to below 12.72 mg/L after approximately 2.5 hours. See **Table 2** for details on the acrolein degradation and dissipation over time. Once the concentration of acrolein in the water is below 12.72 mg/L (shown in **bold** in Table 2, below), the giant garter snake is not anticipated to be at risk from exposure to treated water.

Table 2. Anticipated Rate of Acrolein Degradation and Dissipation

Time (Hours)	Time (Days)	Acrolein Concentration (µg/L)
0	0	15,000
1	0.042	14,015
2	0.083	13,094
2:26	**0.10**	**12,720**
3	0.125	12,234
6	0.25	9,977
12	0.5	6,636
18	0.75	4,414
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
78	3.25	75
84	3.5	50
90	3.75	33
96	4	22

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 340 mg copper/kg body weight (OPP 2000). 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 34 mg copper/kg body weight was used to determine if the exposure to copper-treated water presents a risk to the giant garter snake.

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 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 (2.0 mg/L) will not lead a dietary exposure greater than or equal to the dietary TRV for reptiles

of 34 mg copper/kg body weight/day. Thus, copper applied to irrigation canals for aquatic weed and algae control does not appear to pose risk to the giant garter snake.

BIO-1: Mitigation for potential exposure of giant garter snake to acrolein-treated water will be to have District staff survey for the giant garter snake and its habitat adjacent to and downstream of canals receiving treatment, on the day prior to an aquatic herbicide application. The distance to be surveyed following an acrolein application will be the distance the acrolein-treated water would travel in approximately 1 day.

If a giant garter snake is found, the application will be temporarily postponed and the conveyance surveyed again. Once found to be void of giant garter snake over the distances specified, the conveyance can be treated.

District staff surveying for the giant garter snake will be educated through a Worker's Environmental Awareness Program (WEAP) that will include how to identify the giant garter snake, its habitat, and what to do if one is found.

Item b): ***No Impact.*** The Project takes place in the District's conveyances and, 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. A list of current special status communities was compiled from the CDFW CNDDB. Once this list was compiled, a preliminary assessment of the project area was performed to characterize the whether or not the special status communities were present. None of the listed communities were within the project area.

Item c): ***No Impact*****.** The Project takes place in the District's 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*****.** Water for the District is diverted from the Sacramento River. Before entering the District's conveyance system, the water passes through the Wilkins Slough Positive Barrier Fish Screen, designed to prevent migrating salmon from entering the canal system. Due to the presence of this screen, project activities will not adversely influence movement of any native resident or migratory fish.

Items e) and f): ***No Impact*****.** The Project does not conflict with, and has no impact to any local policies or ordinances 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 conveyances. 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 applying aquatic herbicides to conveyances within the jurisdiction of the District. 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 a septic or other wastewater system, as workers would use existing facilities in the operation areas of the reservoirs.

3.7 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 aquatic herbicides which are regulated hazardous materials. Acute exposure to humans can cause eye, skin, and respiratory irritation, and can be harmful if swallowed. Refer to the representative MSDS presented in **Appendix E**. Use of this material would create a potential for spills that could affect worker safety and the environment. The spills could occur potentially at the District facility, at the point of application, or during transport.

The District handles, stores, transports aquatic herbicides and disposes of containers in accordance with federal, state, and county requirements and manufacturer's recommendations. This approach is supplemented by the following components of the District's aquatic weed management program:

1. Signs are posted throughout the District that swimming in canals is prohibited.

2. District personnel and their contractors that make aquatic herbicide applications are under the direct supervision of a Qualified Applicator Certificate or License holder (QAC/QAL). Expertise and training used by these personnel result in mitigating potentially significant impacts.

3. A written recommendation is prepared by a DPR-licensed Pest Control Advisor (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, health and environmental hazards and restrictions, and 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.**

4. All District personnel and their contractors review and strictly adhere to the aquatic herbicide product label that has clear and specific warnings that alert users to hazards that may exist. An example of a specific product label is included in **Appendix E**.

5. All District personnel and their contractors review and consult the aquatic herbicide Material Safety Data Sheet (MSDS) in **Appendix E**, and the DPR Worker Health and Safety Branch Pesticide Safety Information Series (PSIS). The PSIS and the MSDS have specific information that describes precautions to be taken during the use of the aquatic herbicide.

6. District personnel obtain annual training on the use of acrolein as described in the Magnacide H Herbicide Application and Safety Manual.

7. District personnel's familiarity with the DPR PSIS series mitigates potentially significant impacts. For example, the PSIS series describes the personal protective equipment (PPE) needed for the safe handling of aquatic herbicides, including goggles, disposable coveralls, gloves and respirators.

8. The condition of the lateral(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 weed species, level of infestation, water and flow conditions, alternate control methods, and amount of chemical to be applied.

9. After field evaluation, notice is given to the County Agricultural Commissioner (CAC) and the California Department of Fish and Wildlife (CDFW) for acrolein applications. Growers are also given the opportunity to postpone water deliveries in case of sensitivities, such as organic crops. Growers are reminded not to make adjustments to the turnout gates during the hold period prescribed by the label for acrolein.

10. Prior to an application, the water operator will seal spill structures to District drainage canals with boards and plastic if control structures are leaking.

11. During and after the start of application, the District inspects acrolein treated laterals following treatment to ensure the label-prescribed 6 day hold time for acrolein is met before water is released. 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 or drained to fish bearing waters.

12. Control small leaks (< 1 gallon per minute) that may develop at gates or check structures and are controlled with sand bags, plastic sheeting, cat litter, temporary dikes, pumps, or lowering the level of treated water below the elevation of the leak. All these actions effectively prevent the release of water treated with aquatic herbicide from leaving the conveyance prior to holding time expiration for acrolein applications.

13. The location at which the aquatic herbicide is introduced into the conveyance is continuously staffed until the application is complete. District staff performing conveyance inspections are in continuous cell phone or radio contact with staff at the head of the conveyance where the aquatic herbicide is being introduced into the conveyance. In the event that a spill or leak is discovered, addition of aquatic herbicide stops and water delivery to the conveyance is reduced or stopped to increase freeboard to lessen subsequent leakage. Not until the leak is fixed does aquatic herbicide application resume.

Item c): ***No Impact.*** No known, existing or proposed schools are located within ¼ mile of locations were applications are made.

Item d): ***No Impact.*** The project sites are not listed on any hazardous waste site lists compiled in Government Code Section *65962.5*.

Items e) & f): ***No Impact.*** The Project is not located within an airport land use plan or within two miles of a public airport or private airstrip.

Item g): ***No Impact.*** The Project will not impact emergency evacuation routes because public roadways are not be 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 muffler contact with dry grass.

3.8 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 Integrated Pest Management (IPM) program for aquatic weed control. The IPM program involves the scouting of aquatic weed locations and densities, establishment of thresholds above which control is needed, and making applications of aquatic herbicides on an "as-needed" basis to achieve the aquatic weed control necessary to convey water.

Depending on weed presence, aquatic herbicides containing copper and acrolein may be applied as necessary at different locations in the District, depending on need, between the months of March and November. Generally, aquatic herbicide applications are made between May and October. Some years, neither of these aquatic herbicides are used. Treatments may be made throughout the irrigation supply canal system. The District makes no aquatic herbicide applications to its drainage collection channels.

Aquatic herbicide applications are done over a short duration (typically less than approximately 12 hours per location) and not all conveyances are treated at the same time, for the same length of time, or treated every year. Depending on weed presence, some conveyances may not get treated at all while others may require multiple treatments the same season. Once water is treated with aquatic herbicides, it is either held for the time required on the product label or delivered to a grower's field. Not until the label hold time is reached is acrolein treated water released from the conveyance or 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.

Prior to aquatic herbicide applications, the following tasks are accomplished:

1. A written recommendation is prepared by a DPR-licensed Pest Control Advisor (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, health and environmental hazards and restrictions, and 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.**

2. All District personnel and their contractors review and strictly adhere to the aquatic herbicide product label that has clear and specific warnings that alert users to hazards that may exist. An example of a specific product label is included in **Appendix E**.

3. All District personnel and their contractors review and consult the aquatic herbicide Material Safety Data Sheet (MSDS) in **Appendix E**, and the DPR Worker Health and Safety Branch Pesticide Safety Information Series (PSIS). The PSIS and the MSDS have specific information that describes precautions to be taken during the use of the aquatic herbicide. In addition, the District obtains annual training on the use of acrolein as described in the Magnacide-H Herbicide Application and Safety Manual.

4. The condition of the lateral(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 weed species, level of infestation, water and flow conditions, alternate control methods, and amount of chemical to be applied.

5. After field evaluation, notices are sent to the County Agricultural Commissioner (CAC) and the California Department of Fish and Wildlife (CDFW) for acrolein applications. Growers are also given the opportunity to postpone water deliveries in case of sensitivities, such as pastures with lactating cows or organic crops. Growers are reminded not to make adjustments to the turnout gates during the 6 day product label hold time for acrolein.

6. Prior to an application, the water operator will seal spill structures to District drainage channels with boards and plastic if control structures have any leaks are found.

7. During and after the start of application, District personnel inspect acrolein treated laterals to ensure the label-prescribed 6 day hold time for acrolein is met before water is released. Water treated with acrolein is only used for irrigation of fields where the treated water remains on the field, or held for the label-prescribed period before being released to the district drainage channels.

8. The location at which the aquatic herbicide is introduced into the conveyance is continuously staffed until the application is complete. District staff who are performing a conveyance inspection are in continuous cell phone or radio contact with staff at the head of the conveyance where the aquatic herbicide is being introduced into the system. In the event that a spill or leak is discovered, the addition of aquatic herbicide stops and water delivery to the conveyance is reduced to create freeboard which will lessen subsequent leakage. Not until the leak is fixed does aquatic herbicide application resume.

Overview of Aquatic Herbicide Use

Depending on weed presence, aquatic herbicides containing copper and acrolein may be applied as necessary at different locations between the months of March and November. Applications most years are made between May and September. Some years, neither of these aquatic herbicides is applied. The District makes no applications of copper or acrolein to its drainage collection channels.

Item a): **Potentially Significant Unless Mitigation Incorporated**. As presented in Section 1.2, the District intends to obtain coverage under the 2004 General Permit that requires compliance with the SIP and the CTR.

Acrolein Discussion

Application of acrolein according to label direction typically results in a concentration of approximately 5,000 µg/L in conveyance water, although applications may be made as high as the maximum label application rate of 15,000 µg/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 held for 6 days before being released to fish bearing waters.

Water quality criteria for acrolein are described in the CTR as 320 µg/L for sources of drinking water and 780 µg/L for "other waters"; and by the Central Valley RWQCB as 110 ug/L for the acrolein taste and odor threshold (RWQCB 2003). 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. "other than MUN, WARM, or COLD" is applicable to receiving waters within the District.

The aforementioned water quality criteria are expected to exceeded at and downstream of the treatment area (i.e., in receiving waters) when acrolein is applied at labeled 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 µg/L and a conservatively estimated half-life of 10.2 hours, acrolein can reasonably be expected to dissipate according to **Table 2** shown earlier:

As **Table 2** shows, only a short-term acrolein CTR water quality criteria exceedance are expected to occur in District canals. The temporary acrolein CTR exceedance is estimated to return below the 780 ug/L WQO in less than 2 days, and less than 2.5 days to return below the 320 ug/L WQO. It is anticipated that the temporary acrolein RWQCB taste and odor exceedance will return below 110 ug/L in just over 3 days.

In spite of significant evidence that suggests that when used according to label directions by qualified personnel, impacts of acrolein-containing 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: This mitigation measure is:

HWQ-1. As required by the SIP and the SWRCB general permit for the application of aquatic herbicides, the District will prepare and execute an Aquatic Pesticide Application Plan (APAP). The APAP will call 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, the District will arrange for a qualified biologist to assess receiving water beneficial uses.

BIO-1. See Biological Resources Section. Mitigation for potential exposure of giant garter snake will be to have District staff survey for the giant garter snake and its habitat adjacent to and downstream of canals receiving treatment, on the day prior to an aquatic herbicide application. The distance to be surveyed following an acrolein application will be the distance the acrolein-treated water would travel in 1 day.

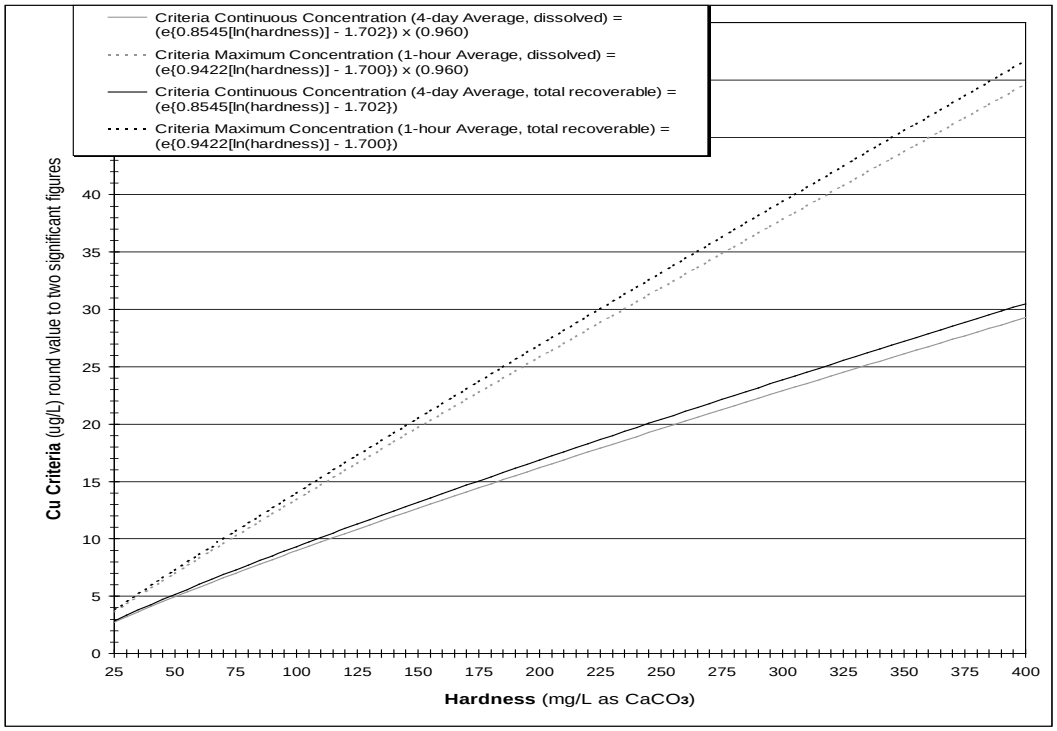
If a giant garter snake is found, the application will be temporarily postponed and the conveyance surveyed again. Once found to be void of giant garter snake over the distances specified, the conveyance can be treated.

District staff surveying for the giant garter snake will be educated through a Worker's Environmental Awareness Program (WEAP) that will include how to identify the giant garter snake, its habitat, and what to do if one is found.

Copper Discussion

Applications of copper-based aquatic herbicides according to label direction typically require concentrations of copper between 500 and 2,000 μg/L. Water quality criteria for copper as described in the CTR and by the Central Valley RWQCB (RWQCB 2003) 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 lateral has a hardness of 100 mg $CaCO_3$/L, the continuous dissolved concentration (4 day average) water quality criteria for copper in District conveyances will be the following:

Continuous Dissolved Concentration (4 day Average) 8.96 µg/L

These water quality criteria are exceeded at and downstream of the point of 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 aquatic herbicides applied in District canals and laterals 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 2000 µg/L 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)
0	0	2,000
6	0.25	1,607
12	0.5	1,291
24	1	833
48	2	347
72	3	145
96	4	60
120	5	25
144	6	10
168	7	4.4
192	8	1.8
216	9	0.76
240	10	0.32
264	11	0.13
288	12	0.05
312	13	0.02

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

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 (EPA 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 (EPA 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 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 **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.

When used according to label directions by qualified personnel, impacts of copper-containing 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 are:

HWQ-1. As required by the SIP and the SWRCB general permit for the application of aquatic herbicides, the District will prepare and execute an Aquatic Pesticide Application Plan (APAP). The APAP will call 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, the District will arrange for a qualified biologist to assess receiving water beneficial uses.

Item b): ***No Impact.*** The Project would 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 would not increase erosion or siltation on- or off-site. No streambeds would be altered. No increase in drainage capacity of local storm sewers would be required.

Item f): See response to item a).

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

3.9 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 conveyances. Nearby housing, if any, is rural and will not be affected. The Project would 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). No known plan conflicts with the Project.

3.10 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 aquatic herbicides to the District's conveyances and has no impact on the availability of any known mineral resource recovery site.

3.11 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 occurs in rural and agricultural areas that commonly have machinery operating that include tractors, generators, large groundwater and irrigation pumps and heavy trucks. The incidental noise and vibration generated by the use of pick-up trucks is temporary and inconsequential and thus will have no impact.

Items e) & f): ***No Impact.*** The project site is not located within an airport land plan use or within the vicinity of a private airstrip.

3.12 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.

3.13 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.

3.14 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 conveyances. District policy strictly prohibits swimming and fishing in conveyances. Treatment of aquatic vegetation improves the ability of the District to deliver water for irrigation purposes and has no impact on recreational activities.

3.15 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 to medium 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.

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.

3.16 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 does not discharge to a wastewater treatment plant and does not generate any solid waste. All containers used to store and transport aquatic herbicides are returned to the vendor for reuse.

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 aquatic vegetation in conveyances used to transport irrigation water and has no known influence on the entitlements or resources utilized by the District.

3.17 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 copper and acrolein-based 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 aquatic herbicides are less than significant.

However, the District will implement mitigation (**BIO-1 and HWQ-1**) to reduce any future potential impacts to less than a significant level.

Although copper and acrolein are hazardous materials, under the standard operating

procedures used District personnel and their contractors, less than a significant impact exists.

Item b): **Less Than Significant Impact.** The cumulative impacts of continued application of copper-based herbicides is not known. Specifically, the extent to which copper accumulates and is bioavailable, if at all, is not clear. Acrolein is known to degrade rapidly and not accumulate. Mitigation has been incorporated into the Project (**BIO-1 and HWQ-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, any hazard/hazardous material impacts to the human beings is reduced to a less than a significant level.

4.0 LIST OF MITIGATION MEASURES

4.1 Biological Resources

BIO-1. Mitigation for potential exposure of giant garter snake will be to have District staff survey for the giant garter snake and its habitat adjacent to and downstream of canals receiving treatment, on the day prior to an aquatic herbicide application. The distance to be surveyed following an acrolein application will be the distance the acrolein-treated water would travel in 1 day.

If a giant garter snake is found, the application will be temporarily postponed and the conveyance surveyed again. Once found to be void of giant garter snake over the distances specified, the conveyance can be treated.

District staff surveying for the giant garter snake will be educated through a Worker's Environmental Awareness Program (WEAP) that will include how to identify the giant garter snake, its habitat, and what to do if one is found.

With this mitigation, a less than significant impact exists to these species. By regularly monitoring and reporting the presence/absence of these species in its conveyances, the District will be able to identify problems with water quality and take corrective action if necessary.

4.2 Hydrology & Water Quality

HWQ-1. As required by the SIP and the SWRCB general permit for the application of aquatic herbicides, the District will revise its Aquatic Pesticide Application Plan (APAP) to reflect the use, monitoring and reporting of copper and acrolein upon be listed on the SIP Exception list of the permit. The APAP will call 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, the District will arrange for a qualified biologist to assess receiving water beneficial uses.

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6.0 PERSONS AND AGENCIES CONTACTED

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7.0 LIST OF PREPARERS

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Appendix A

(Species Descriptions)

Approach

A Habitat Assessment of the Reclamation District 108 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), and current species information from the U.S. Fish and Wildlife Service, Sacramento Office website. 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 all 6 quads that intersect with the District's boundaries. In addition, a buffer area made up of the outlying quads adjacent to the original 6 quads was selected for the query, resulting in a total of 19 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 boundaries.

The approach used for the internet query of the U.S. Fish and Wildlife Service local office website, was somewhat different given that their data is not organized geographically based on reported occurrences of species. The quads selected in this query were the quads that represented the largest overall percentage of the District's area. This approach was appropriate for this database due to the fact that the geographical designation provided by the website is conservative in nature and includes all species in the selected area and surrounding areas.

Habitat requirements of each of the species were reviewed to determine whether habitat existed within the project area that would meet that species' needs. The breeding or foraging habitat of animals and the habitat requirements of plant species likely to occur in the project area are fully described in below.

Amphibians

California Tiger Salamander (*Ambystoma californiense*)
California tiger salamanders are restricted to the Central Valley of California and to lower elevations to the west. Some populations have been extirpated due to urbanization and conversion of native grasslands and wetlands to agriculture (Fisher and Shaffer 1996 in Petranka 1998). They breed in fish-free, seasonally ephemeral ponds. Juveniles and adults are fossorial and are rarely seen other than during the winter breeding season. Breeding migrations occur from November to March (Storer 1925 in Petranka 1998). They commonly use California ground squirrel (*Spermophilus beecheyi*) or valley pocket gopher (*Thomomys bottae*) burrows for summer aestivation. During the summer when herbicide applications will be made, adults will be underground aestivating, and irrigation canals would be not suitable habitat for developing tadpoles, so exposure to herbicides introduced to irrigation canals is **unlikely**.

California Red-legged Frog (*Rana aurora draytonii*)
California red-legged frogs occur in dense, shrubby riparian vegetation associated with deep (< 0.7 m), still or slow-moving water (Jennings 1988 in Jennings and Hayes 1994, Hayes and Jennings 1988 in Jennings and Hayes 1994). The shrubby riparian vegetation that structurally seems to be most suitable for California red-legged frogs is that provided by arroyo willow (*Salix lasiolepis*), and cattails (*Typha* sp.) and bulrushes (*Scirpus* sp.) also provide suitable habitat (Jennings 1988 in Jennings and Hayes 1994). Juvenile frogs seem to favor open, shallow aquatic habitats with dense submergents (pers. observ. in Jennings and Hayes 1994). Postmetamorphs have a highly variable animal food diet (Hayes and Tennant 1986 in Jennings and Hayes 1994). Frogs and small mammals may contribute significantly to the diet of adults and subadults (Arnold and Halliday 1986 in Jennings and Hayes 1994, Hayes and Tennant 1986 in Jennings and Hayes 1994). The movement ecology of California red-legged frogs is not well understood (Jennings and Hayes 1994). The only exposure that California red-legged frogs could have to herbicides in irrigation canals would be to enter the canals shortly after treatment from nearby aquatic habitats. District canals conveying water are not densely vegetated nor do they contain dense submerged vegetation, therefore suitable habitat for the red-legged frog is

not likely present. Accordingly, exposure of red-legged frogs to aquatic herbicides is expected to be **insignificant**.

Western Spadefoot Toad (*Spea* (=*Scaphiopus*) *hammondii*)
Western spadefoot toads are almost completely terrestrial, entering water only to breed (see Dimmitt and Ruibal 1980 in Jennings and Hayes 1994). Western spadefoots become surface active following relatively warm (> 10.0-12.8ºC) rains in late winter-spring and fall, emerging from burrows in loose soil to a depth of at least 1 m (Stebbins 1972 in Jennings and Hayes 1994, A. McCready, pers. comm. in Jennings and Hayes 1994), but surface activity may occur in any month between October and April if enough rain has fallen (Morey and Guinn 1992 in Jennings and Hayes 1994, S. Morey, pers. comm. in Jennings and Hayes 1994). Since western spadefoot toads are not likely to enter water during the season when aquatic weeds will need to be controlled in irrigation canals, it is **not likely** that they would be exposed to herbicides introduced to irrigation canals for the control of aquatic weeds.

Birds

Tricolored Blackbird (*Agelaius tricolor*)
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 canals, the risk posed by treating irrigation canals for the control of aquatic weeds is **insignificant**.

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 indicate that exposure to herbicides applied to irrigations canals will be **insignificant**.

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 herbicides in irrigation canals, so the risk posed by treating irrigation canals for the control of aquatic weeds is **insignificant**.

Bank Swallow (*Riparia riparia*)
Bank swallows breed along ocean coasts, rivers, streams, lakes, reservoirs, and wetlands (Cramp *et al*. 1988 in Garrison 1999, Turner and Rose 1989 in Garrison 1999, American Ornithologists' Union 1998 in Garrison 1999). They require vertical banks, cliffs, and bluffs in alluvial, friable soils for nesting. Bank swallows forage while flying and consume flying or jumping insects and occasionally eat terrestrial and aquatic insects or larvae (Garrison 1999). They feed over lakes, ponds, rivers and streams, meadows, fields, pastures, and bogs. They occasionally feed over forests and woodlands (Stoner 1936 in Garrison 1999, Gross 1942 in Garrison 1999, Turner and Rose 1989 in Garrison 1999). During the breeding season, they generally forage within 200 m of their nests for feeding the nestlings (Mead 1979 in Garrison 1999, Turner 1980 in Garrison 1999). The only area where bank swallows might nest is along the Sacramento River. They generally forage within 200 m of nesting areas while they have young in June and July (Garrison 1999). Bank swallows could feed on emergent insects from the main canal near the Sacramento River which is not treated for control of aquatic weeds and where treated lateral canals are near the river. The comparative quality and quantity of foraging habitat immediately along the river is much greater than that along the treated lateral canals. It is unlikely for bank swallows to gather the majority of their prey from treated irrigation ditches, so the risk to bank swallows from treating irrigation ditches with herbicides for the control of aquatic weeds would be **insignificant**.

Fish

Reclamation District 108 maintains fish screens at their pumping stations on the Sacramento River, so it is not possible for fish to enter the irrigation canals from the Sacramento River. Therefore, the risk posed by treating irrigation canals for the control of aquatic weeds is **insignificant**.

Mammals

Pallid Bat (*Antrozous pallidus)*
Pallid bats inhabit arid deserts and grasslands, often near rocky outcrops and water. They are less abundant in evergreen and mixed conifer woodland. They usually roost in a rock crevice or building, less often in cave, tree hollow, mine, etc. (NatureServe 2004). In Oregon, night roosts were in buildings, under rock overhangs, and under bridges; bats generally were faithful to particular night roosts both within and between years (Lewis 1994 in NatureServe 2004). They prefer narrow crevices in caves as hibernation sites (Caire *et al*. 1989 in NatureServe 2004). The primary diet is arthropods which are captured on the ground, after an aerial search. They also capture some food (large insects) in flight, within a few meters of ground vegetation. Food items include flightless arthropods, Jerusalem crickets, moths, beetles, etc.; may eat small vertebrates (NatureServe 2004). Since the diet consists of mostly terrestrial insects, the exposure to copper-containing aquatic pesticides introduced into reservoirs or creeks for control of aquatic weeds or algae would not be significant.

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). The diet of the western red bat is made up of terrestrial insects; therefore the exposure to aquatic pesticides in water would not be significant.

Reptiles

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 (less often) 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 be exposed to pulses of herbicide-treated water. Refer to **Appendix D** for a summary of exposure and risk analysis for the giant garter snake.

Invertebrates

Valley Elderberry Longhorn Beetle (*Desmocerus californicus dimorphus*)
The valley elderberry longhorn beetle occurs throughout California's Central Valley and associated foothill areas (U.S. Fish and Wildlife Service 1999). This species of insect is completely dependant upon its host plant, elderberry (*Sambucus* spp.). The beetle spends most of its larval stage within the stems of the elderberry plant, and emerges after a two-year period during mid-March through mid-May (U.S. Fish and Wildlife Service 1999). Adult males live for only a few days after emergence, while adult females will live for approximately 3 or 4 weeks (PlacerData 2003). Valley elderberry longhorn beetles feed exclusively on the stems, leaves and flowers of elderberry plants (PlacerData 2003). The project area is located in an area that is potential habitat for the valley elderberry longhorn beetle, however, no risk is anticipated given that this species lives and forages on a terrestrial plant, and copper and acrolein-containing aquatic pesticides will not be applied to terrestrial areas. In addition, the adult stage of the beetle is brief and little time over-lap exists between their emergent life span and the typical application period for aquatic herbicides in the District.

Plants

Woolly Rose-mallow (*Hibiscus lasiocarpos var. occidentalis*)
Rose-mallow is a rhizomatous dicot in the Malvaceae family (CalFlora 2005). This native California species can be found in freshwater marsh habitat, but has also been known to grow on moist banks of rivers, streams, canals and ditches (CNDDB 2005). Potential habitat for this species is present in the project area. However, its potential exposure to canal water, if any, is through root uptake of soil water, which is not expected to be sufficient to cause risk.

Saline Clover (*Trifolium hydrophilum*)
Saline clover is an annual dicot in the Fabaceae family (CNPS 2012). This native herb can be found in freshwater marshes and swamps, Valley and foothill grassland, and along the margins of vernal pools (CNDDB 2012). Saline clover has potential habitat in the project area. However, its potential exposure to canal water, if any, only occurs through root uptake of soil water, which is not expected to be sufficient enough to cause risk.

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Appendix B

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

Toxicity Reference Values and Risk

For contaminants frequently considered 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 were found in USEPA's OPP database.

The U.S. EPA (1989) suggests applying a 20X safety factor to median toxicity values for aquatic threatened or endangered species and a 10X safety factor for terrestrial threatened or endangered species. In this analysis, safety factors to all species regardless of their specific designation.

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 and terrestrial-phase amphibians. The uncertainty involved with using avian endpoint data to estimate risk to a reptile species requires the application of an additional conservative safety factor of 10X to account for the inter-species variability in sensitivity to copper or acrolein.

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 environmental concentration (EEC) an organism may be exposed to the derived TRV to calculate a risk. Risk is present when the EEC divided by the TRV is greater than or equal to 1.0. There is no risk given the scenario and assumptions if the result is less than 1.0.

$$\text{Risk} = \frac{\text{EEC}}{\text{TRV}}$$

Where:
EEC = Estimated Environmental Concentration
TRV = derived Toxicity Reference Value

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 (OPP 2000). 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 0.91 mg copper/kg body weight was used to determine if the exposure to acrolein-treated water presents a risk to the giant garter snake.

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 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.

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. Until the water concentration of acrolein drops below 12.72 mg/L, the giant garter snake is exposed to a concentration of acrolein that may cause risk.

Given the conservatively estimated acrolein half-life in irrigation canals (10.2 hours), acrolein applied at the maximum label rate (15 mg/L) can be estimated to degrade to below 12.72 mg/L after approximately 2.5 hours. See the acrolein degradation and dissipation table below for details. Once the concentration of acrolein in the water is below 12.72 mg/L, the giant garter snake is not anticipated to be at risk from exposure to treated water.

Time (Hours)	Time (Days)	Acrolein Concentration (µg/L)
0	0	15,000
6	0.25	9,977
12	0.5	6,636
18	0.75	4,414
24	1	2,936
30	1.25	1,953
36	1.5	1,299
42	1.75	864
48	2	575

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	(1)
Mallard Duck	***Anas platyrhynchos***	**Oral gavage or capsule administration of toxicant**	**92%**	**14 day**	**Oral LD50 (mg/kg-bw)**	**9.11**	**(2)**
Mallard Duck	*Anas platyrhynchos*	Oral gavage or capsule administration of toxicant	95.09%	21 day	Oral LD50 (mg/kg-bw)	28	(3)

General Notes:
The bolded study endpoint estimate was used for derivation of a reptilian TRV.
Abbreviations:
A.I. - Active Ingredient
LD50 - Median Lethal Dose
OPP - Office of Pesticide Programs

References:

(1) Retrieved online from the OPP Pesticide Ecotoxicity Database (July 9, 2012):
http://www.ipmcenters.org/Ecotox/Details.cfm?RecordID=7635
(2) Retrieved online from the OPP Pesticide Ecotoxicity Database (July 9, 2012:
http://www.ipmcenters.org/Ecotox/Details.cfm?RecordID=7505
(3) Retrieved online from the OPP Pesticide Ecotoxicity Database (July 9, 2012):
http://www.ipmcenters.org/Ecotox/Details.cfm?RecordID=14230

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 340 mg copper/kg body weight (OPP 2000). This endpoint was used for derivation of a reptilian TRV by applying the 10X safety factor for bird to reptile conversion and the recommended 10X safety factor for threatened terrestrial species for a total safety factor of 100X. The derived reptilian TRV of 3.4 mg copper/kg body weight was used to determine if the exposure to copper-treated water presents a risk to the giant garter snake.

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 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 (2 mg/L) will not lead a dietary exposure greater than or equal to the dietary TRV for reptiles of 3.4 mg copper/kg body weight/day. Thus, copper applied to irrigation canals for aquatic weed and algae control does not appear to pose risk to the giant garter snake.

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)	>1,000	(1)
Bobwhite quail	*Colinus virginianus*	Oral gavage or capsule administration of the toxicant	99%	14 day	Oral LD50 (mg/kg-bw)	357.9	(2)
Bobwhite quail	***Colinus virginianus***	**Oral gavage or capsule administration of the toxicant**	**99%**	**14 day**	**Oral LD50 (mg/kg-bw)**	**340**	**(3)**
Mallard duck	*Anas platyrhynchos*	Administration of the toxicant ad libitum in the diet	99%	8 day	Oral LC50 (ppm)	>1,000	(4)
Ring-necked pheasant	*Phasianus colchicus*	Administration of the toxicant ad libitum in the diet	NR	8 day	Oral LC50 (ppm)	>40,000	(5)

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
OPP - Office of Pesticide Programs
NR - Not Reported

References:

(1) Retrieved online from the OPP Pesticide Ecotoxicity Database (July 9, 2012): http://www.ipmcenters.org/Ecotox/Details.cfm?RecordID=3837
(2) Retrieved online from the OPP Pesticide Ecotoxicity Database (July 9, 2012): http://www.ipmcenters.org/Ecotox/Details.cfm?RecordID=3840
(3) Retrieved online from the OPP Pesticide Ecotoxicity Database (July 9, 2012): http://www.ipmcenters.org/Ecotox/Details.cfm?RecordID=3836
(4) Retrieved online from the OPP Pesticide Ecotoxicity Database (July 9, 2012): http://www.ipmcenters.org/Ecotox/Details.cfm?RecordID=3838
(5) Retrieved online from the OPP Pesticide Ecotoxicity Database (July 9, 2012): http://www.ipmcenters.org/Ecotox/Details.cfm?RecordID=3839

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

The procedures used here to assess dietary exposure are possibly overly conservative for acrolein because the uptake of the herbicides into dietary components is assumed to reach steady state concentrations instantaneously and toxic impacts are also assumed to occur immediately upon exposure. For copper exposure to aquatic invertebrates we were able to calculate a bioconcentration factor (BCF) adjusted for dissipation through time. Rodgers *et al.* (1992 in Washington Department of Ecology 2004) provides the body burdens and water concentrations in mollusks following an application of Komeen® (0.4 ppm Cu) to Guntersville Reservoir in Alabama. They report that the concentration in water returns to its pretreatment concentration of 0.015 ppm by 21 hours post-treatment. The body burden of mollusks increased to 82.667 mg/kg from a pretreatment level of 37.867 mg/kg—a change of 44.8 mg/kg. Using an average concentration of 0.2 ppm for this period, a 21-hr BCF is 224. Since this work was done with Komeen rather than copper sulfate and using mollusks to represent all aquatic invertebrates, we applied a 10X safety factor to arrive a BCF for our exposure assessments of 2240 for aquatic invertebrates. Uptake of copper for all other dietary items used the more conservative approach of instantaneous uptake.

Risk Assessment
To determine whether adverse effects were likely, the anticipated exposure was compared to the TRV. Whenever the exposure estimate exceeded the TRV, we concluded a potential risk was present. For terrestrial animals, exposure to drinking the treated water, consuming treated sediments, and consuming exposed prey items or vegetation were included in the exposure estimate. For fish, only exposure to treated water was considered. The only herbicide with available dietary toxicity data for fish was copper.

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)
Photodegradation on soil – $t_{1/2}$ =
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 Available Photodegradation in water – Not Available Photodegradation on soil – Not Available Aerobic soil metabolism – Not Available Anaerobic aquatic metabolism – 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	EPA Pesticide Ecotoxicity Database
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	EPA Pesticide Ecotoxicity Database
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	EPA Pesticide Ecotoxicity Database
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.	EPA Pesticide Ecotoxicity Database
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.	U.S. EPA 2003

Test	Scientific Name	Common Name	Category	Test Result	Value (C.I.)	Toxicity Class	Slope	NOEL	Information Source
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
Acute Oral Toxicity (N.R.)	Sprague-Dawley	Laboratory Rat	Mammal	LD_{50}	29 mg/kg (N.R.)	Very Highly Toxic	N.A.	N.R.	U.S. EPA 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.	U.S. EPA 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	U.S. EPA 2003
Acute Oral Toxicity (92%)	*Colinus virginianus*	Northern Bobwhite	Bird	LD_{50}	19 mg/kg (16-22)	Highly Toxic	N.A.	N.R.	EPA Pesticide Ecotoxicity Database
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; EPA Pesticide Ecotoxicity Database

Test	Scientific Name	Common Name	Category	Test Result	Value (C.I.)	Toxicity Class	Slope	NOEL	Information Source
Acute Oral Toxicity (95.09%)	*Anas platyrhynchos*	Mallard	Bird	LD_{50}	28 mg/kg (18-38)	Highly Toxic	N.A.	< 14.7 mg/kg	EPA Pesticide Ecotoxicity Database
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
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

Test	Scientific Name	Common Name	Category	Test Result	Value (C.I.)	Toxicity Class	Slope	NOEL	Information Source
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
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

Test	Scientific Name	Common Name	Category	Test Result	Value (C.I.)	Toxicity Class	Slope	NOEL	Information Source
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.	EPA Pesticide Ecotoxicity Database
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.	EPA Pesticide Ecotoxicity Database
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

Test	Scientific Name	Common Name	Category	Test Result	Value (C.I.)	Toxicity Class	Slope	NOEL	Information Source
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

Test	Scientific Name	Common Name	Category	Test Result	Value (C.I.)	Toxicity Class	Slope	NOEL	Information Source
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
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

Test	Scientific Name	Common Name	Category	Test Result	Value (C.I.)	Toxicity Class	Slope	NOEL	Information Source
Aquatic Plant Toxicity – Frond Count ($CuSO_4$)	*Lemna minor*	Duckweed	Aquatic Plant	EC_{50}	0.8 ppm (0.7 – 0.9)	N.A.	N.R.	N.R.	Bishop and Perry 1981
Aquatic Plant Toxicity – Dry Weight ($CuSO_4$)	*Lemna minor*	Duckweed	Aquatic Plant	EC_{50}	0.8 ppm (0.4 – 1.2)	N.A.	N.R.	N.R.	Bishop and Perry 1981
Aquatic Plant Toxicity – Root Length ($CuSO_4$)	*Lemna minor*	Duckweed	Aquatic Plant	EC_{50}	0.6 ppm (0.3 – 0.8)	N.A.	N.R.	N.R.	Bishop and Perry 1981
Aquatic Plant Toxicity – Growth Rate ($CuSO_4$)	*Lemna minor*	Duckweed	Aquatic Plant	EC_{50}	1.2 ppm (1.1 – 1.3)	N.A.	N.R.	N.R.	Bishop and Perry 1981
2-day Contact toxicity (Copper Sulfate)	*Eisenia fetida*	Earthworm	Oligochaeta	LC_{50}	0.00198 mg/L (N.R.)	N.A.	N.R.	N.R.	Callahan *et al.* 1994
2-day Contact toxicity (Copper Chloride	*Eisenia fetida*	Earthworm	Oligochaeta	LC_{50}	0.000596 mg/L (N.R.)	N.A.	N.R.	N.R.	Callahan *et al.* 1994
2-day Contact toxicity (Copper Nitrate)	*Eisenia fetida*	Earthworm	Oligochaeta	LC_{50}	0.000429 mg/L (N.R.)	N.A.	N.R.	N.R.	Callahan *et al.* 1994
2-day Contact toxicity (Copper Sulfate)	*Eisenia fetida*	Earthworm	Oligochaeta	LC_{50}	638 mg/L (N.R.)	N.A.	N.R.	N.R.	Callahan *et al.* 1994
14-day Soil toxicity (Copper Nitrate)	*Eisenia fetida*	Earthworm	Oligochaeta	LC_{50}	0.000353 mg/kg (N.R.)	N.A.	N.R.	N.R.	Callahan *et al.* 1994
14-day Soil toxicity (Copper Sulfate)	*Eisenia fetida*	Earthworm	Oligochaeta	LC_{50}	0.000522 mg/kg (N.R.)	N.A.	N.R.	N.R.	Callahan *et al.* 1994
Freshwater Acute Toxicity ($Cu(NO_3)2 \cdot 3H_2O$)	*Ceriodaphnia dubia*	Ceriodaphnia	Freshwater Crustacea	LC_{50}	*c.* 1.1 ppm (N.R.)	Moderately Toxic	N.R.	*c.* 0.1 ppm	Cowgill and Milazzo 1991
3-Brood Toxicity Test ($Cu(NO_3)2 \cdot 3H_2O$)	*Ceriodaphnia dubia*	Ceriodaphnia	Freshwater Crustacea	LC_{50}	*c.* 0.2 ppm (N.R.)	Highly Toxic	N.R.	N.R.	Cowgill and Milazzo 1991
Sediment Acute Toxicity ($CuSO_4$)	*Chironomus tentans*	Midge (2^{nd} Instar)	Aquatic Insect	LC_{50}	1.170 ppm (N.A.)	N.A.	N.A.	N.R.	Dobbs *et al.* 1994 in EPA 2003
Filter Paper Acute Toxicity (Copper Sulfate)	*Eisenia fetida*	Earthworm	Oligochaeta	LC_{50}	26.0 $\mu g/cm^2$ (17.1 – 34.9)	N.A.	N.R.	N.R.	Edwards and Bater 1992

Test	Scientific Name	Common Name	Category	Test Result	Value (C.I.)	Toxicity Class	Slope	NOEL	Information Source
Artificial Soil Acute Toxicity (Copper Sulfate)	*Eisenia fetida*	Earthworm	Oligochaeta	LC_{50}	1104.9 ppm (727.6 – 1482.2)	N.A.	N.R.	N.R.	Edwards and Bater 1992
Freshwater Acute Toxicity (Copper Sulfate)	*Anguilla rostrata*	American Eel	Freshwater Fish	LC_{50}	3.20 ppm (2.17 – 13.35)	Moderately Toxic	N.R.	N.R.	Hinton and Eversole 1979
Freshwater Acute Toxicity (Copper form N.R.) (24 hr static)	*Brachionus calyciflorus*	Rotifer	Freshwater Crustacea	LC_{50}	0.026 ± 0.0026 ppm (N.R.)	Very Highly Toxic	N.R.	N.R.	Janssen *et al.* 1994
Chronic Life Cycle (Copper form N.R.)	*Brachionus calyciflorus*	Rotifer	Freshwater Crustacea	LOEC	0.005 ppm[1] (N.A.)	N.A.	N.A.	0.0025 ppm	Janssen *et al.* 1994
48-hr Freshwater Acute Toxicity ($Cu(NO_3)_2 \cdot 3H_2O$)	*Gambusia affinis*	Mosquitofish	Freshwater Fish	LC_{50}	0.140 ppm (0.11 – 0.16)	Highly Toxic	1.47	N.R.	Joshi and Rege 1980
96-hr Freshwater Acute Toxicity ($Cu(NO_3)_2 \cdot 3H_2O$)	*Gambusia affinis*	Mosquitofish	Freshwater Fish	LC_{50}	0.093 ppm (0.08 – 0.15)	Very Highly Toxic	1.56	N.R.	Joshi and Rege 1980
48-hr Freshwater Acute Toxicity ($CuSO_4 \cdot 5H_2O$)	*Gambusia affinis*	Mosquitofish	Freshwater Fish	LC_{50}	0.460 ppm (0.25 – 0.83)	Highly Toxic	1.82	N.R.	Joshi and Rege 1980
96-hr Freshwater Acute Toxicity ($CuSO_4 \cdot 5H_2O$)	*Gambusia affinis*	Mosquitofish	Freshwater Fish	LC_{50}	0.20 ppm (0.11 – 0.33)	Highly Toxic	1.70	N.R.	Joshi and Rege 1980
96-hr Freshwater Acute Toxicity (Cutrine Formulation)	*Salmo trutta*	Brown Trout	Freshwater Fish Fingerlings	LC_{50}	0.198 ppm (0.11 – 0.33)	Highly Toxic	1.70	N.R.	Simonin and Skea 1977
Sediment Acute Toxicity ($CuSO_4$)	*Tubifex tubifex*	Tubifex	Freshwater Worm	LC_{50} (Dry wt.)	> 1000 ppm (N.A.)	N.A.	N.A.	500 ppm	Meller *et al.* 1998
Sediment Acute Toxicity ($CuSO_4$)	*Limnodrilus hoffmeisteri*	Limnodrilus	Freshwater Worm	LC_{50} (Dry wt.)	516 ppm (458 – 581)	N.A.	N.R.	250 ppm	Meller *et al.* 1998
Earthworm Reproduction ($CuCl_2 \cdot H_2O$)	*Enchytraeus crypticus*	Earthworm	Terrestrial Worm	EC_{50}	477 ppm (345 – 658)	N.A.	N.R.	N.R.	Posthuma *et al.* 1997

Test	Scientific Name	Common Name	Category	Test Result	Value (C.I.)	Toxicity Class	Slope	NOEL	Information Source
Freshwater Acute Toxicity ($CuCl_2$)	*Balanus amphitrite*	Acorn Barnacle (nauplii)	Freshwater Crustacea	LC_{50}	0.480 ppm (0.310 – 0.740)	Highly Toxic	N.R.	N.R.	Sasikumar *et al.* 1995
Freshwater Acute Toxicity ($CuCl_2$)	*Artemia* sp.	Brine Shrimp	Freshwater Crustacea	LC_{50}	1.280 ppm (1.01 – 1.560)	Highly Toxic	N.R.	N.R.	Sasikumar *et al.* 1995
14-day Acute Toxicity [$Cu(NO_3)_2 \cdot 3H_{2O}$]	*Eisenia fetida*	Earthworm	Oligochaeta	LC_{50}	683 µg/g (570 – 812)	N.A.	N.R.	N.R.	Spurgeon *et al.* 1994
56-day Toxicity [$Cu(NO_3)_2 \cdot 3H_{2O}$]	*Eisenia fetida*	Earthworm	Oligochaeta	LC_{50}	555 µg/g (460 – 678)	N.A.	N.R.	210 µg/g	Spurgeon *et al.* 1994
56-day Cocoon Production [$Cu(NO_3)_2 \cdot 3H_{2O}$]	*Eisenia fetida*	Earthworm	Oligochaeta	EC_{50}	53.3 µg/g (32.5 – 186)	N.A.	N.R.	32 µg/g	Spurgeon *et al.* 1994

[1] No criteria for LOEC provided.

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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 (EPA 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.

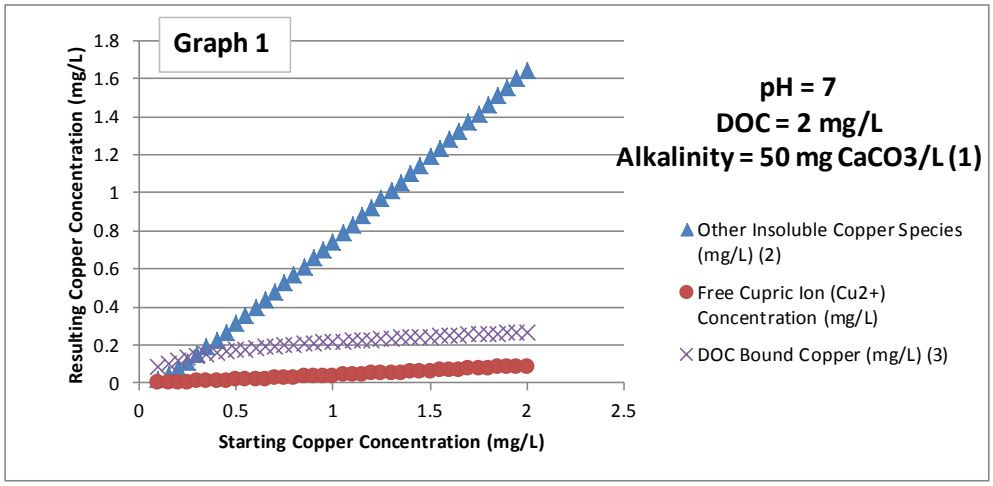
The BLM was developed to predict copper toxicity to aquatic organisms in relation to water quality parameters including pH, hardness, alkalinity, and dissolved organic carbon (DOC). According to the BLM, copper bioavailability is strongly influenced by these parameters. The free cupric ion (Cu^{2+})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

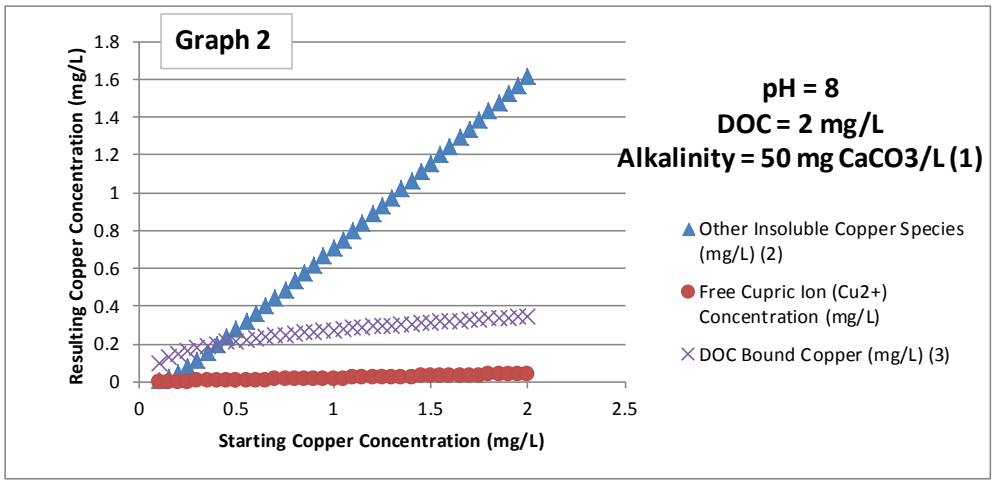
In order to derive freshwater quality criterion for copper, the BLM uses ten water quality inputs: temperature; pH; dissolved organic carbon (DOC); major cations including calcium (Ca), magnesium (Mg), sodium (Na), potassium (K); major anions including sulfate (SO_4), chloride (Cl); and alkalinity. Copper 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.

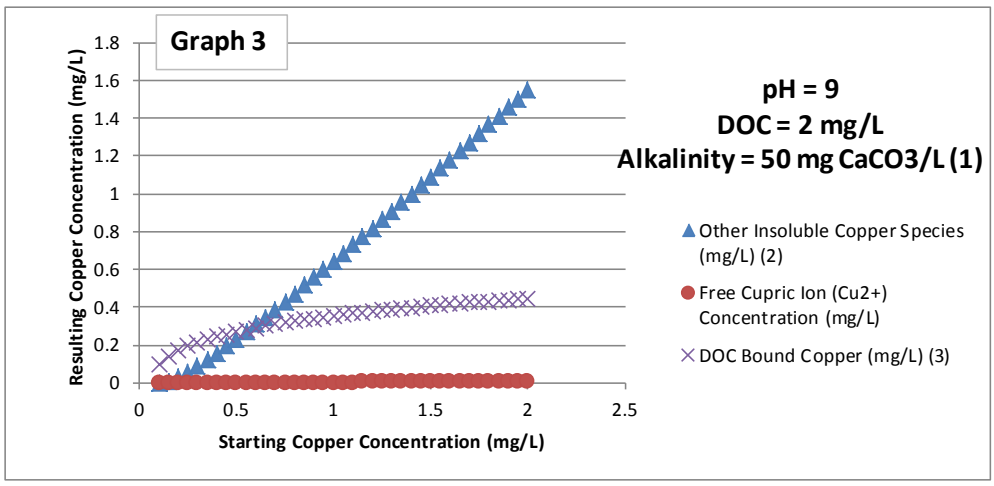
The BLM may also be used to predict copper toxicity and speciation in varying water conditions. When the model is run in toxicity prediction mode, it predicts the concentration of dissolved copper that produces a particular endpoint (e.g. NOAEL, LOAEL, or LC_{50}) for the selected aquatic species. When 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 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 #	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





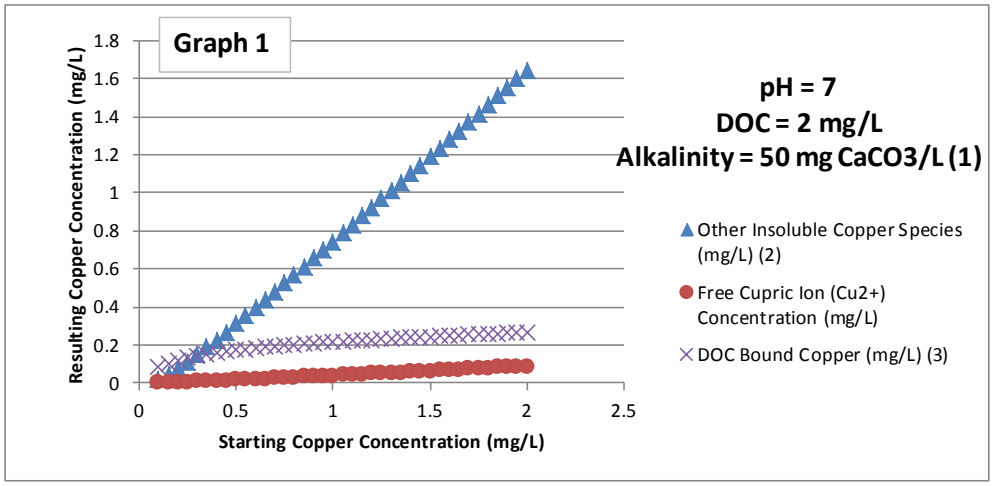


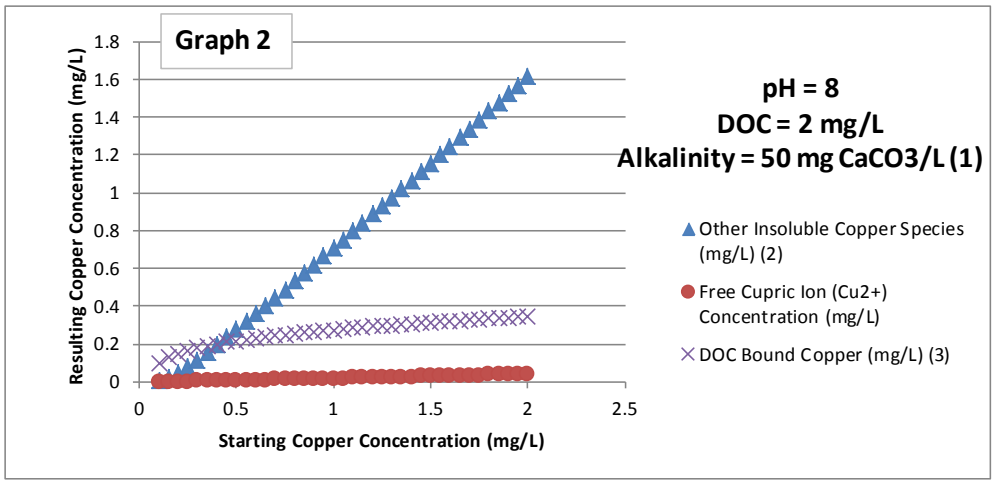
Notes:

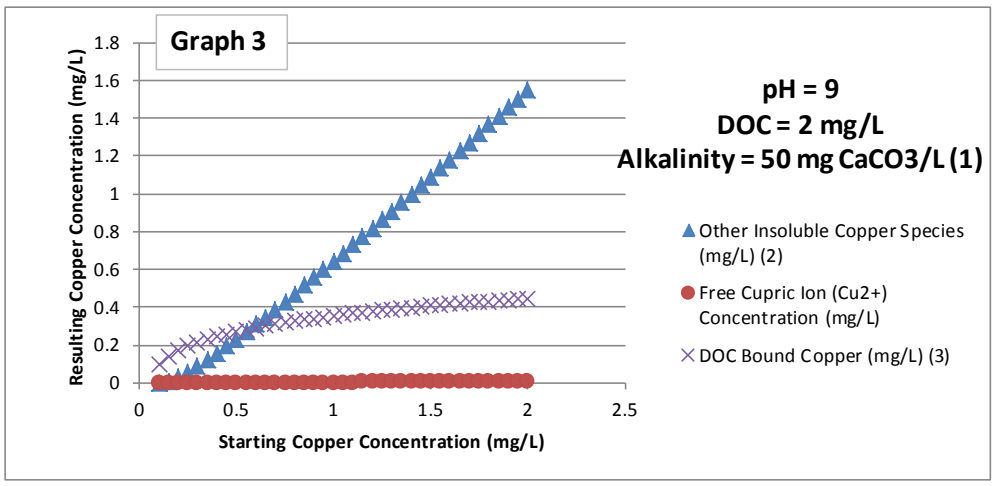
(1) Hardness and Alkalinity are both expressed as CaCO3 and are assumed equal.

(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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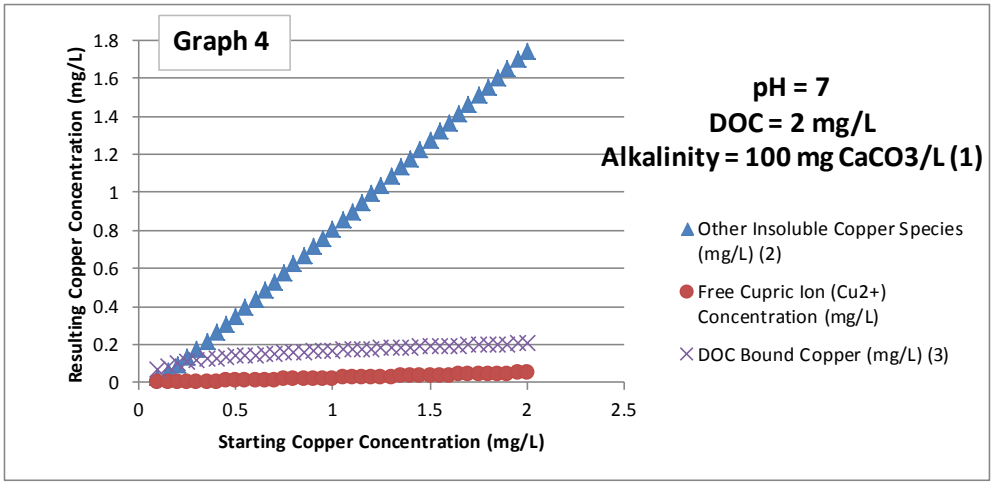

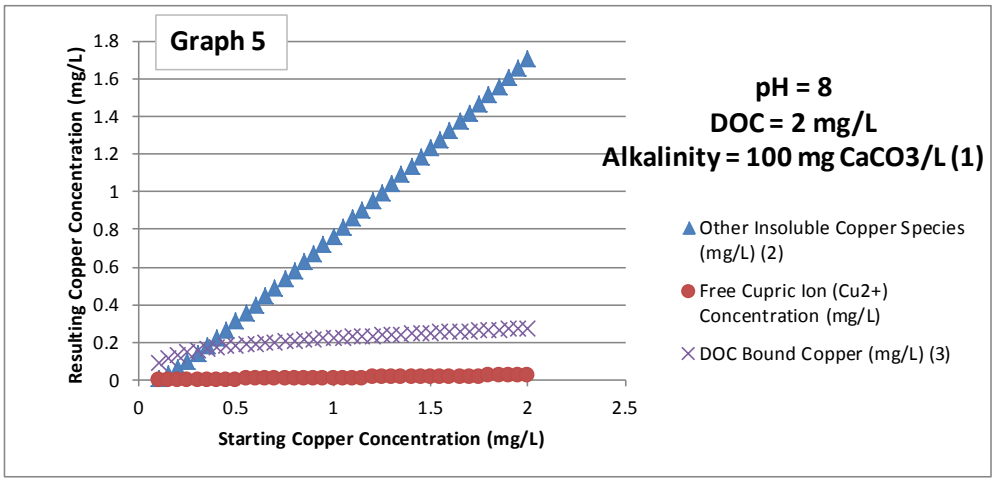

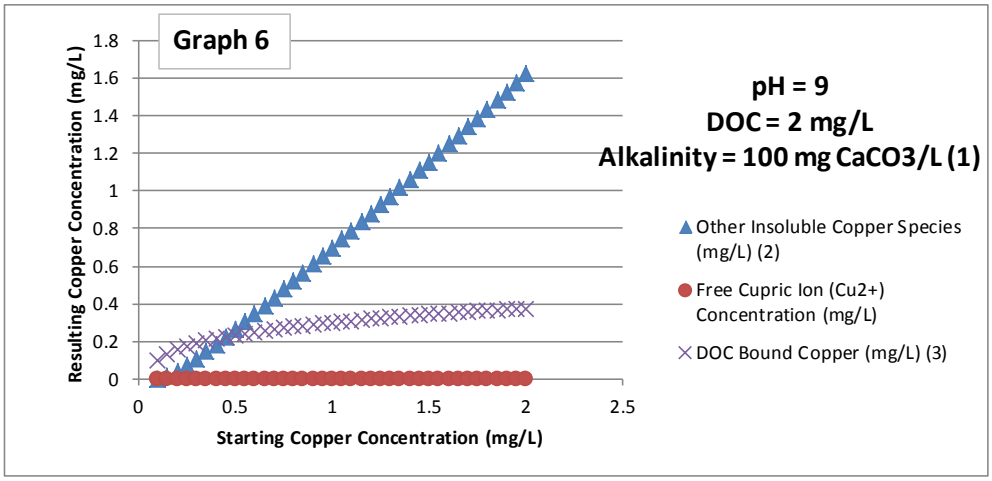

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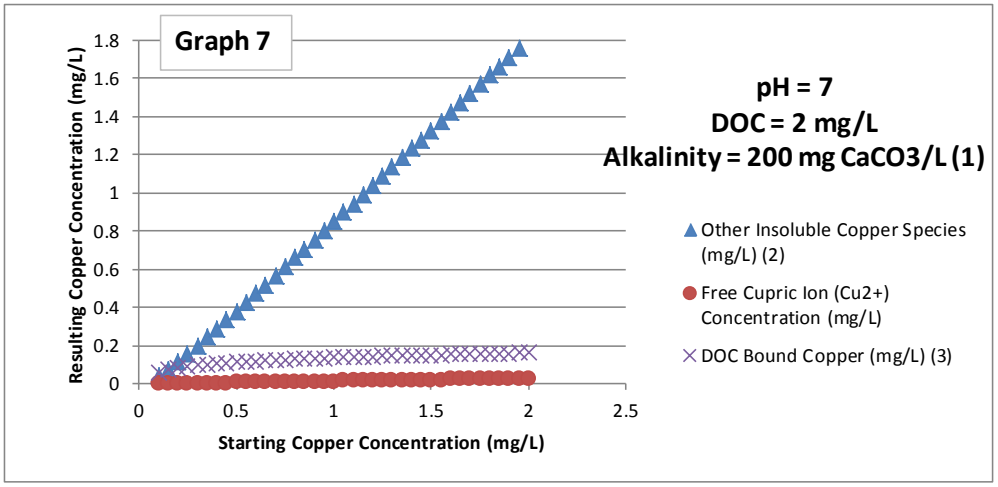

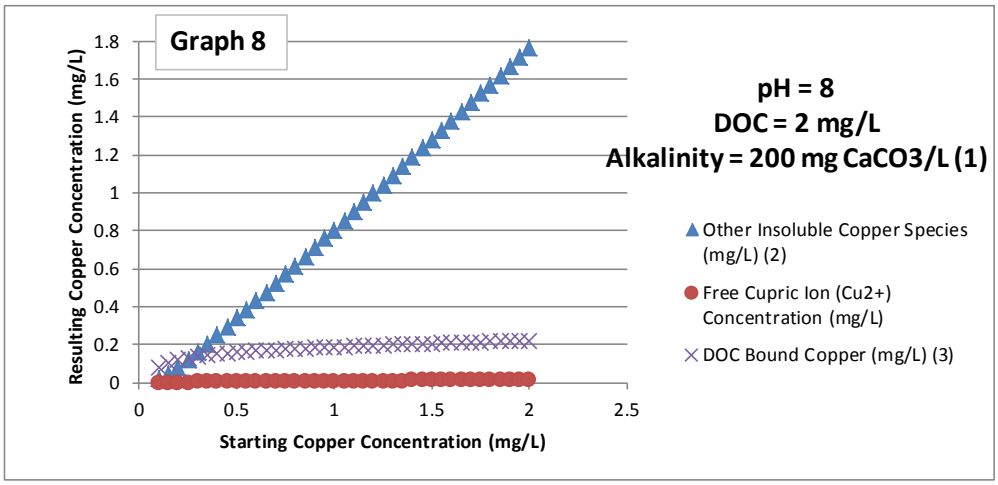

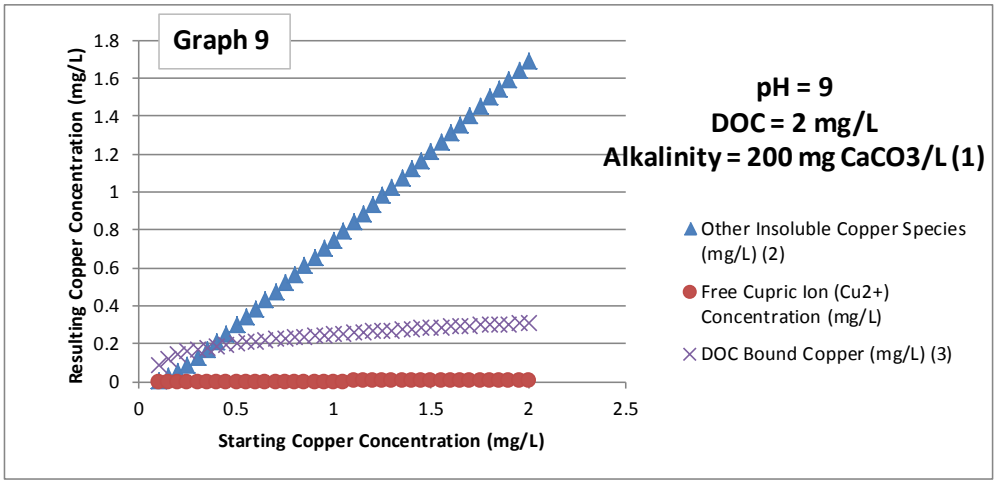

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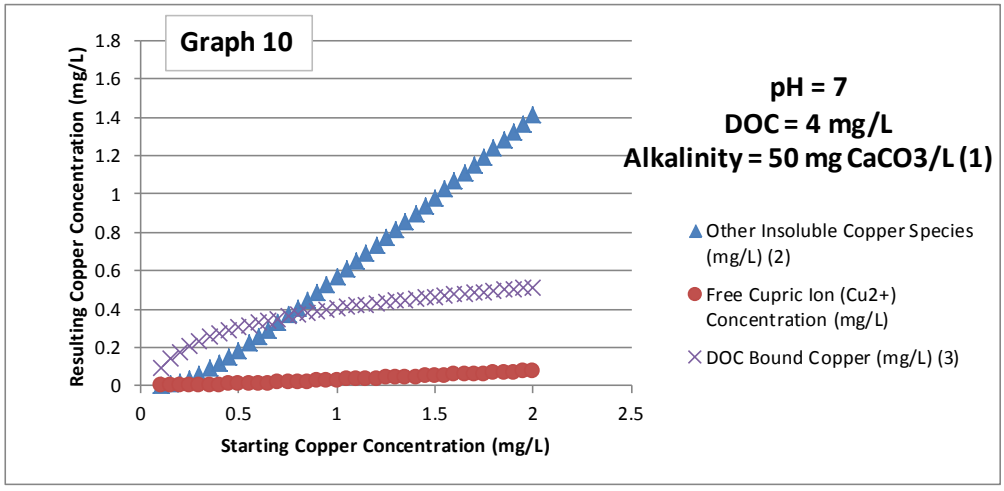

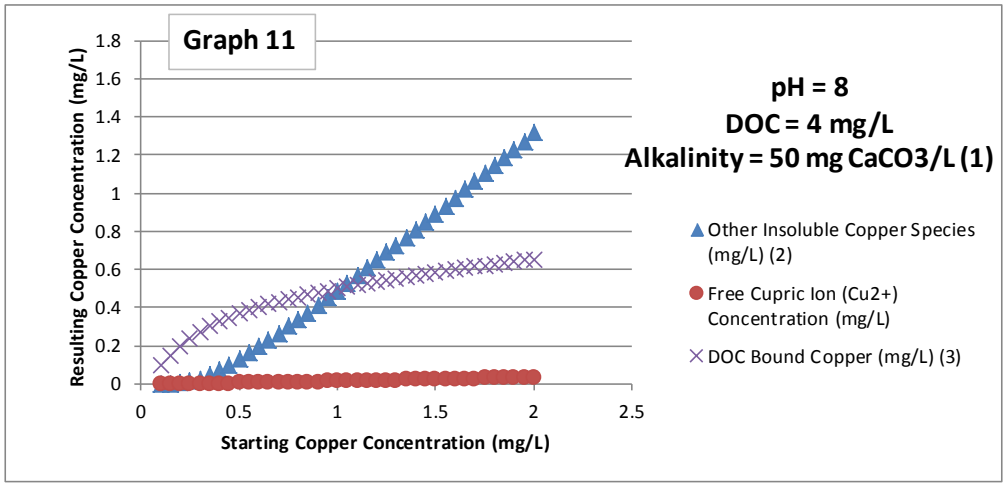

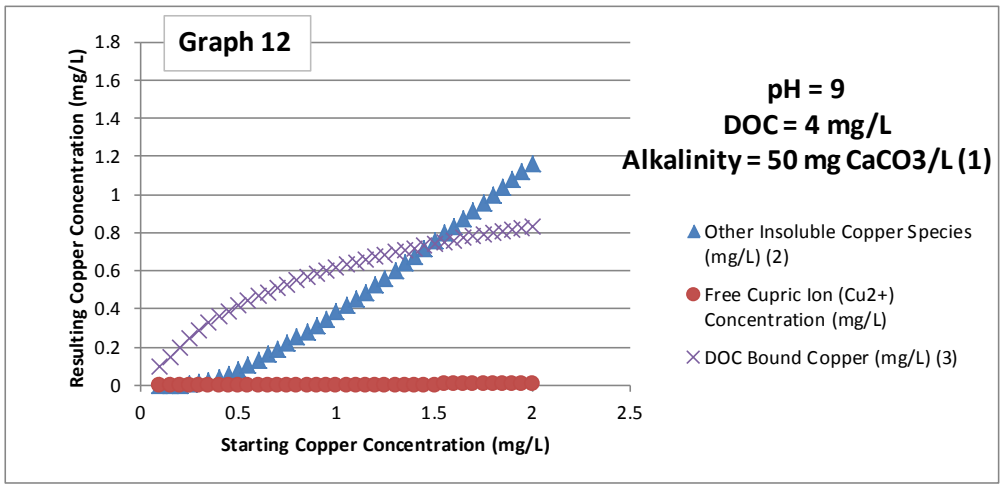

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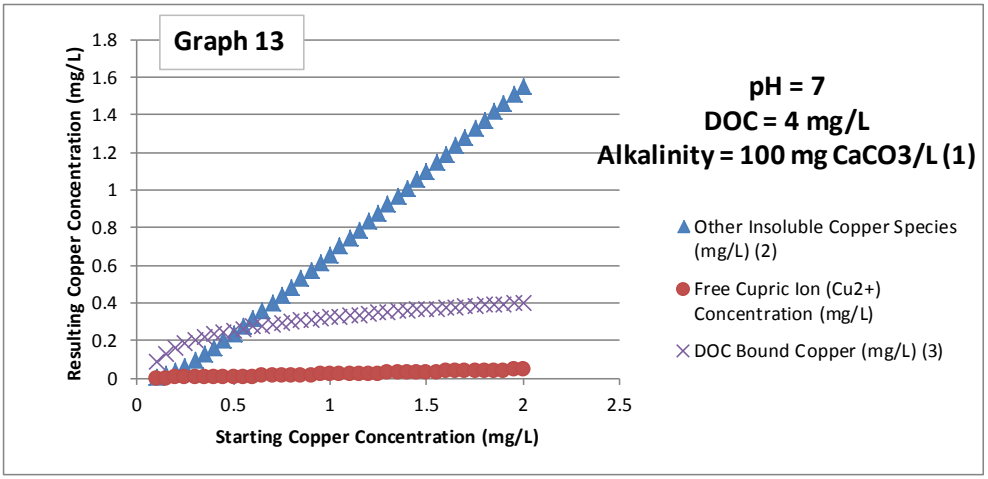

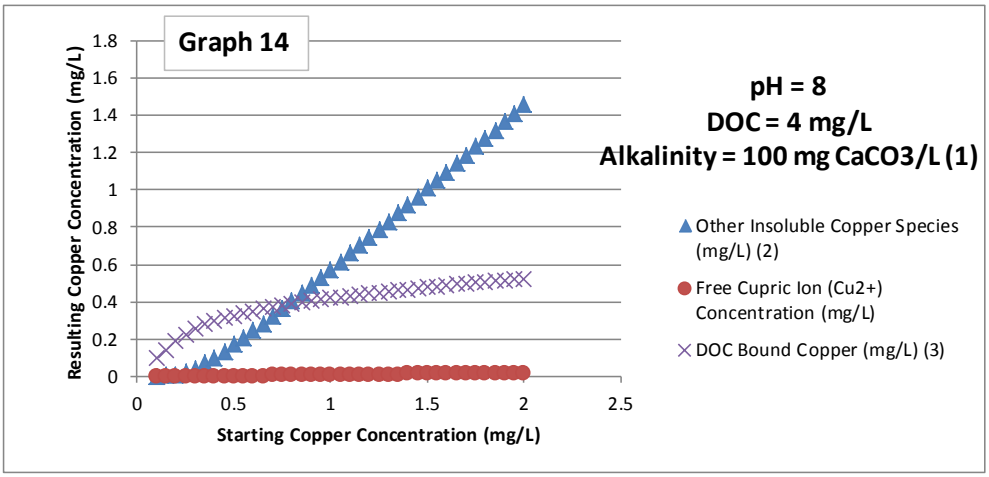

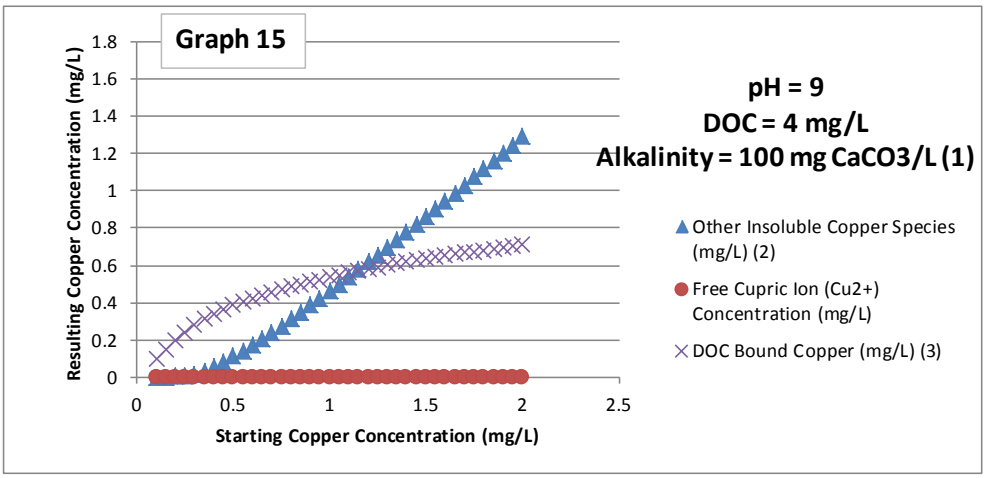

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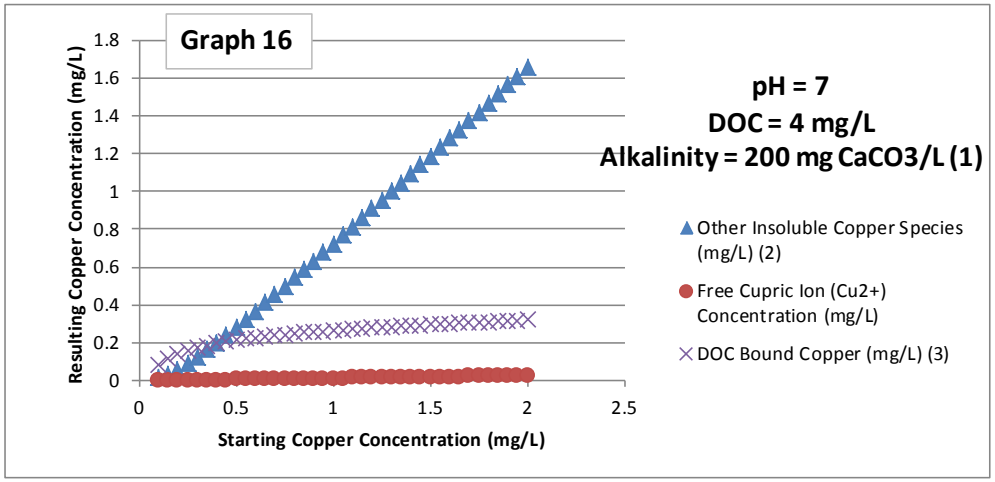

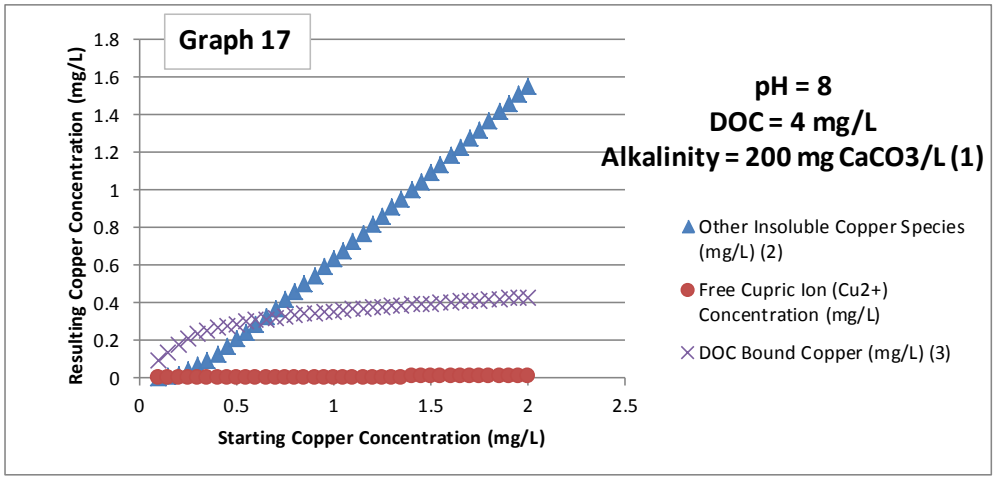

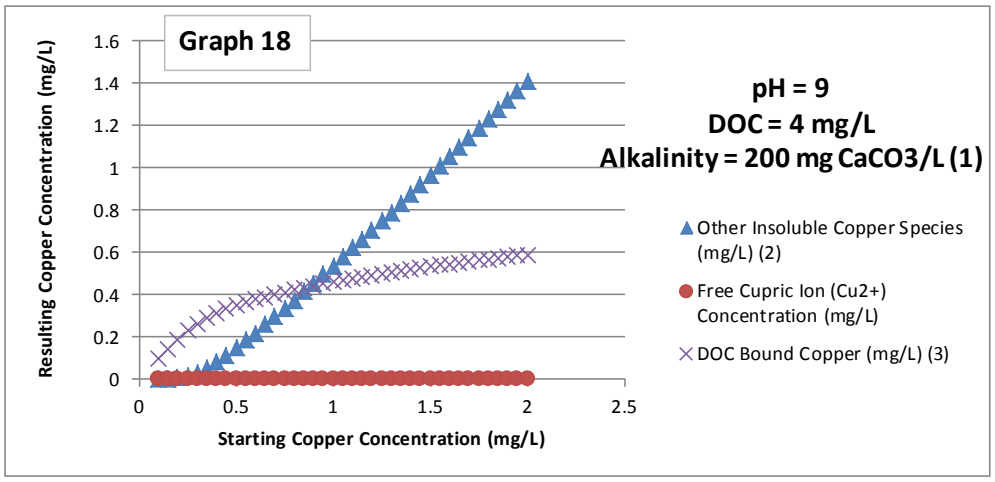

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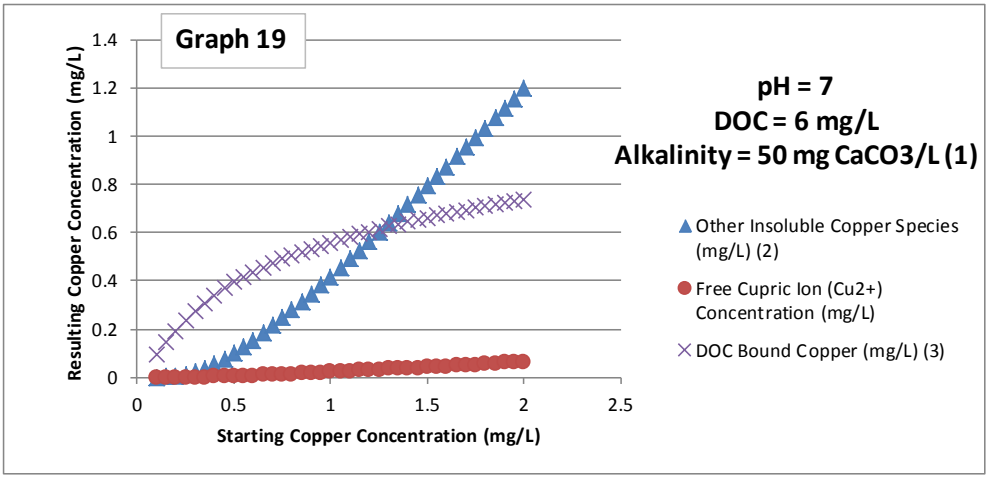

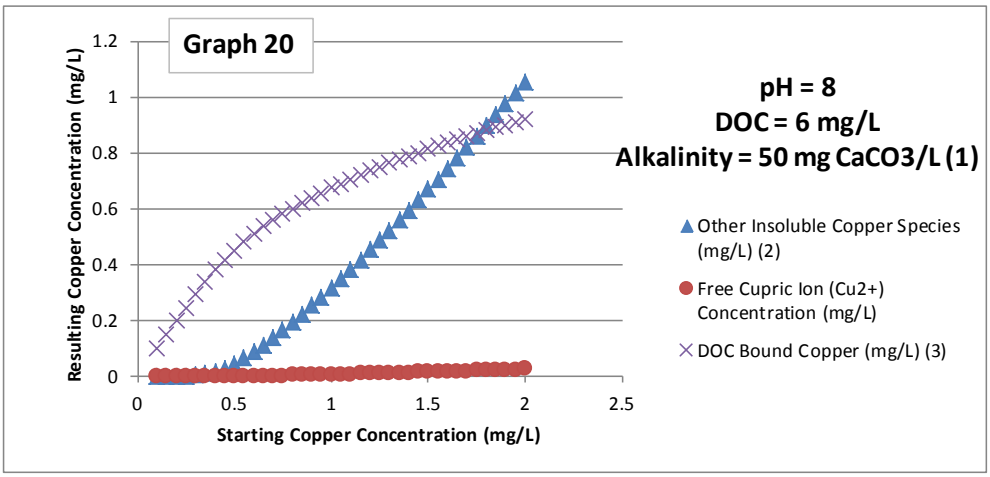

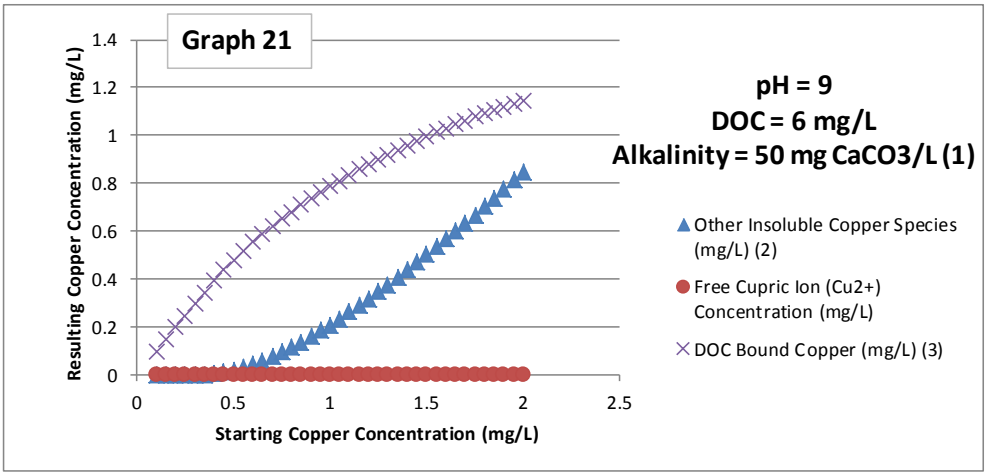

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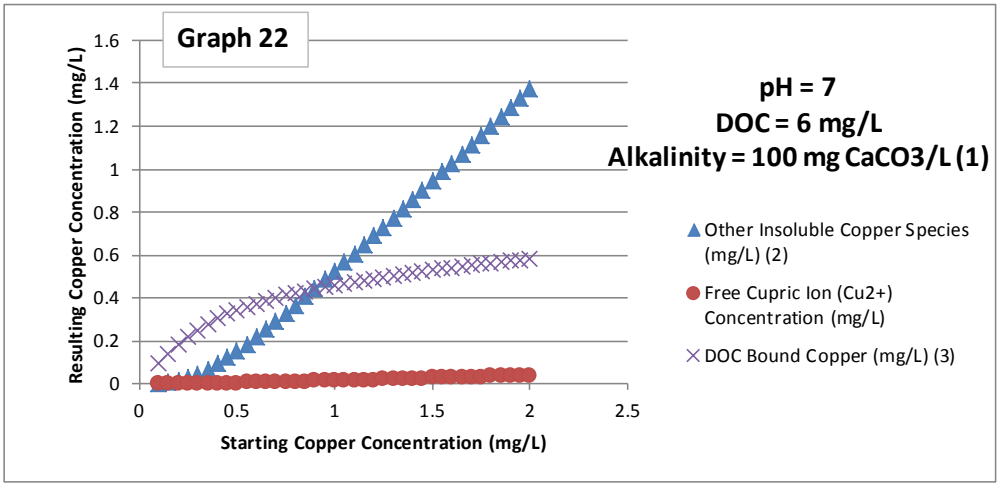

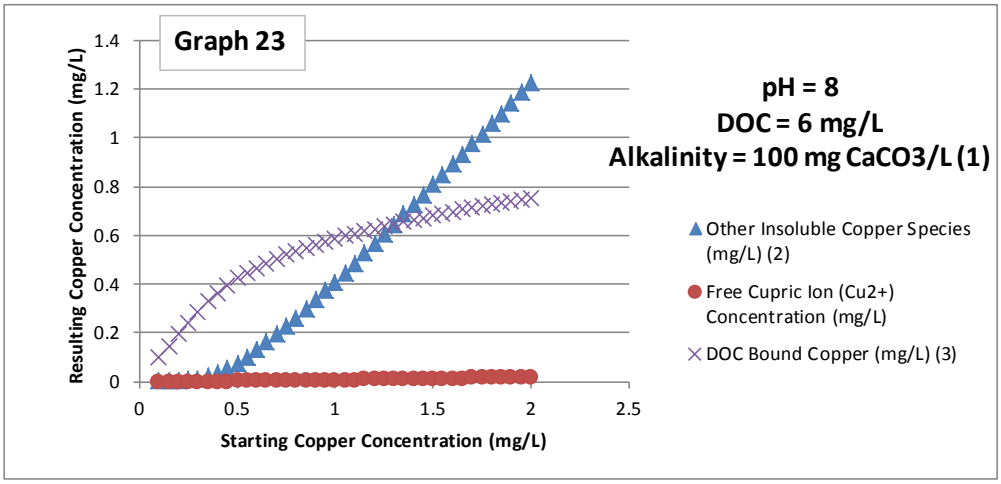

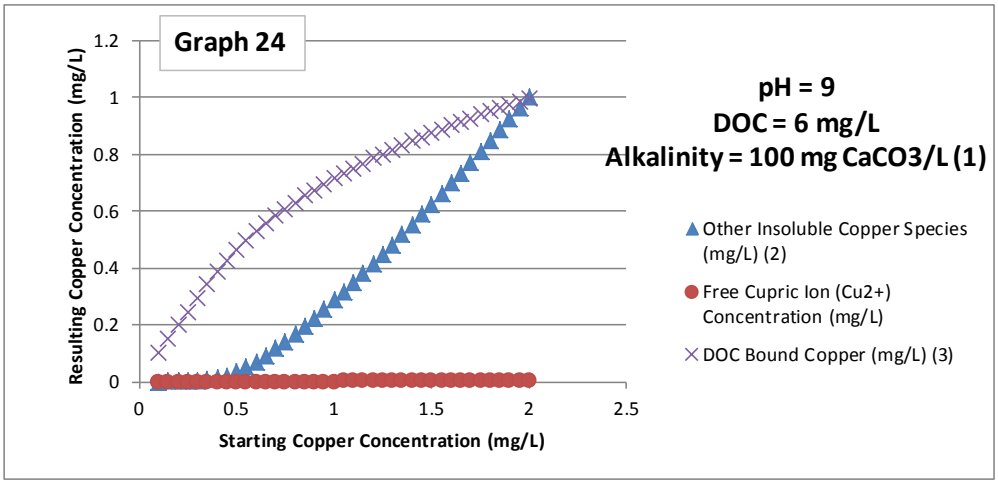

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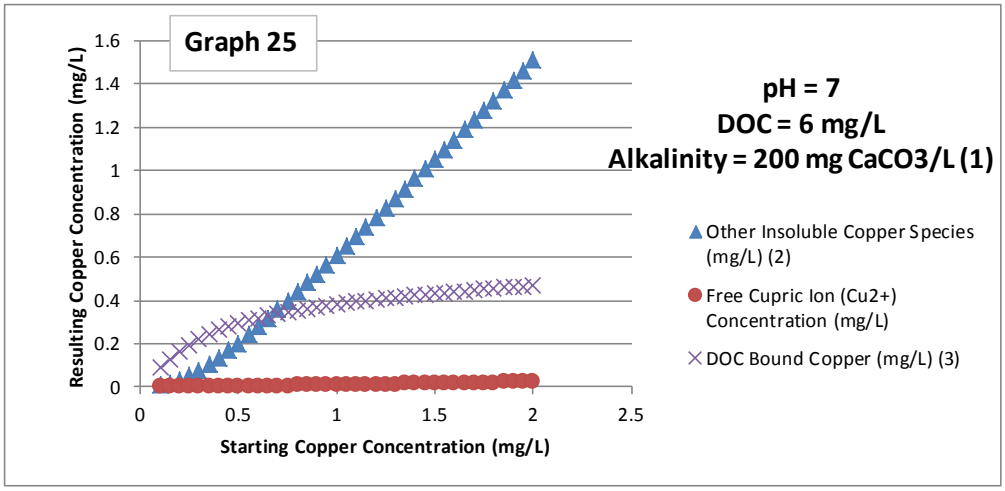

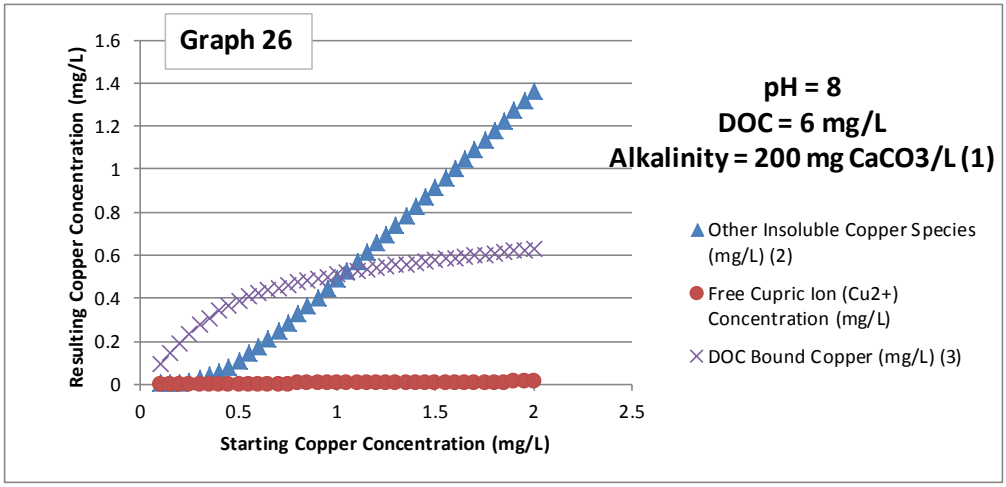

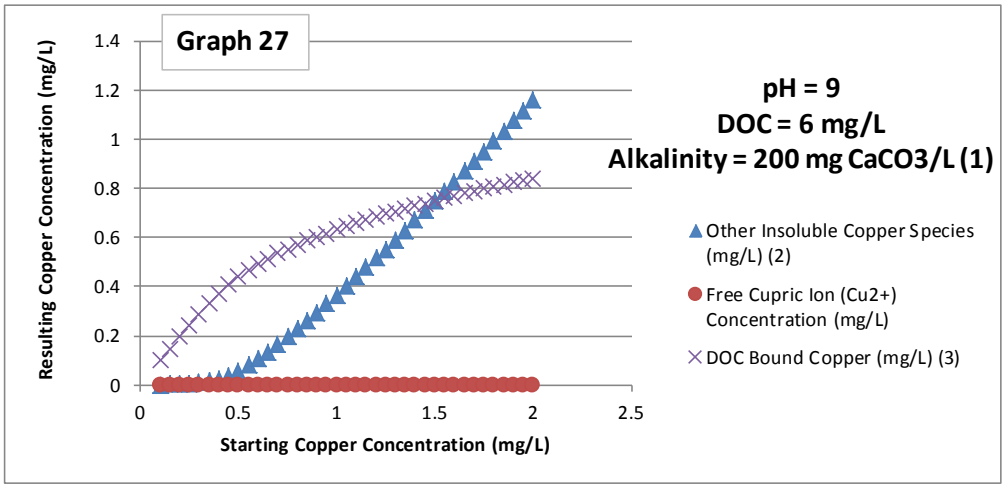

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Appendix D

(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 MSDS Sheets)

Revised 3-22-06 by notification to restore original language to Specific Instructions---control algae in irrigation conveyance systems
1-31-2006 Bordeaux, storage and disposal, Florida septic systems---changes and additions (Bordeaux) are indicated

50 LBS. NET WEIGHT (22.7 KILOS)

COPPER SULFATE CRYSTALS

ACTIVE INGREDIENT	BY WEIGHT
COPPER SULFATE PENTAHYDRATE	99.0%
OTHER INGREDIENTS	1.0%
TOTAL	100.0%

CAS #7758-99-8
COPPER AS METALLIC NOT LESS THAN 25%

See back panel for specific pesticidal use directions.

Also for non-pesticidal uses of copper sulfate including but not limited to:

- For Non-Pesticidal Manufacturing and Industrial Uses.
- For manufacturing, repackaging, formulation of algaecides and fungicides.
- For use as foot baths to control hoof rot in cattle.
- For use in preparing Bordeaux mixture.
- For use as a trace mineral for mixing in animal feeds at levels in accord with good feeding and feed manufacturing practices.
- For use as a fertilizer trace mineral for plant growth and used in accord with recommended agronomic practices.

(NOTE: For the states of Wisconsin, California, Oregon and Washington fertilizer recommendations and information, refer to back panel.)

When this product is used as a feed or fertilizer ingredient:
Guaranteed Analysis: Copper (Cu) = 25.0% Derived from Copper Sulfate

KEEP OUT OF REACH OF CHILDREN

DANGER - PELIGRO

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.)

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 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. Call a poison control center or doctor for further treatment advice.
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 to rinse eye. Call a poison control center or doctor for treatment advice.
If swallowed:	Call 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.
Notes:	Have the product container or label with you when calling a poison control center or doctor, or going for treatment. In the event of a medical emergency, you may also contact the National Pesticide Information Center at 1-800-858-7378.

CHEM ONE LTD.

This product manufactured for
CHEM ONE LTD.
HOUSTON, TEXAS 77040-6519
TEL. (713) 896-9966

EPA REG. NO. 56576-1
EPA EST. NO. 52117-MX-001

PRECAUTIONARY STATEMENTS
HAZARDS TO HUMANS AND DOMESTIC ANIMALS

DANGER - PELIGRO

CORROSIVE: Causes eye damage and irritation to the skin and mucous membranes. Harmful or fatal if swallowed. Do not get in eyes, on skin or on clothing. Do not breathe dust or spray mist. May cause skin sensitization reactions to certain individuals.

PERSONAL PROTECTIVE EQUIPMENT

Applicators and other handlers must wear: Long-sleeved shirt and long pants, chemical-resistant gloves made of any waterproof material, shoes plus socks, and protective eyewear. Some materials that are chemical-resistant to this product are listed below. If you want more options, follow the instructions for category A on an EPA chemical resistance category selection chart. Discard clothing and other absorbent materials that have been drenched or heavily contaminated with this product's concentrate. Do not reuse them. Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

USER SAFETY RECOMMENDATIONS:

Users should: Wash hands before eating, drinking, chewing gum, using tobacco or using the toilet. Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing Remove PPE immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing.

ENVIRONMENTAL HAZARDS

This product is toxic to fish. Direct application of Copper Sulfate to water may cause a significant reduction in populations of aquatic invertebrates, plants and fish. Do not treat more than one-half of lake or pond at one time in order to avoid depletion of oxygen from decaying vegetation. Allow 1 to 2 weeks between treatments for oxygen levels to recover. Trout and other species of fish may be killed at application rates recommended on this label, especially in soft or acid waters. However, fish toxicity generally decreases when the hardness of water increases. Do not contaminate water by cleaning of equipment or disposal of wastes. Consult your local State Fish and Game Agency before applying this product to public waters. Permits may be required before treating such waters.

STORAGE AND DISPOSAL

PROHIBITIONS: Do not contaminate water, food or feed by storage or disposal. Open burning and dumping is prohibited. Do not re-use empty container.
STORAGE: Keep pesticide in original container. Do not put concentrate or dilutions of concentrate in food or drink containers.
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 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: Completely empty bag into application equipment. Then dispose of empty bag in a sanitary landfill or by incineration, or if allowed by state and local authorities, by burning. If burned, stay out of smoke.
If Plastic Container: Triple rinse (or equivalent). Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or by incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke.

STORAGE AND DISPOSAL

Do not contaminate water, food or feed by storage or disposal.
STORAGE: Store in original container and place in a locked storage area.
PESTICIDE DISPOSAL: Call your local solid waste agency (or 1-800-CLEANUP or equivalent organization) for disposal instructions. Unless otherwise instructed, place in the trash. Never pour unused product down the drain or on the ground.
CONTAINER DISPOSAL: Do not reuse this container. Do not rinse unless required for recycling. Place in trash.

DIRECTIONS FOR USE

It is a violation of Federal Law to use this product in a manner inconsistent with its labeling.
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 requirements specific to your State or Tribe, consult the agency responsible for pesticide regulations.

AGRICULTURAL USE REQUIREMENTS

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR part 170. This standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE), and restricted-entry interval. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.

Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 24 hours.

PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil, or water, is: Coveralls, chemical-resistant gloves made of any waterproof material (such as polyvinyl chloride, nitrile rubber, or butyl rubber), shoes plus socks, and protective eyewear.

NON-AGRICULTURAL USE REQUIREMENTS

The requirements in this box apply to uses of this product that are NOT within the scope of the Worker Protection Standard for agricultural pesticides (40 CFR Part 170). The WPS applies when this product is used to produce agricultural plants on farms, forests, nurseries, or greenhouses.
Applicators and other handlers who handle this pesticide for any use NOT covered by the Worker Protection Standard (40 CFR Part 170) must wear: long-sleeved shirt, chemical-resistant gloves made of any waterproof material (such as polyvinyl chloride, nitrile rubber, or butyl rubber), shoes plus socks, and protective eyewear.

GENERAL INSTRUCTIONS FOR USE

Water hardness, temperature of the water, the type and amount of vegetation to be controlled, and the amount of water flow are to be considered in using Copper Sulfate to control algae. Begin treatment soon after plant growth has started. If treatment is delayed until a large amount of algae is present, larger quantities of Copper Sulfate will be required. Algal growth is difficult to control with Copper Sulfate when water temperatures are low or when the water conditions are hard water. Larger quantities of Copper Sulfate will be required to kill and control algae in water which is flowing than in a body of stagnant water. If possible, curtail the flow of water before treatment and hold dormant for approximately three days after treatment or until the algae have begun to die. When preparing a Copper Sulfate solution in water, the mixing container should be made of plastic or glass: or, a painted, enameled, or copper lined metal container. It is usually best to treat algae on a sunny day when the heavy mats of filamentous algae are most likely to be floating on the surface where it can be sprayed directly. If there is some doubt about the concentration to apply, it is generally best to start with a lower concentration and to increase this concentration until the algae are killed.

Treatment of algae can result in oxygen loss from decomposition of dead algae. This loss can cause fish suffocation. Therefore, to minimize this hazard, treat one-third to one-half of the water area in a single operation and wait 10 to 14 days in between treatments. Begin treatments along the shore and proceed outward in bands to allow fish to move into untreated water. NOTE: If treated water is to be used as a source of potable water, the metallic copper residual must not exceed 1 ppm (4 ppm copper sulfate pentahydrate).

CALCULATIONS FOR THE AMOUNT OF WATER IMPOUNDED AND FOR THE AMOUNT OF COPPER SULFATE TO BE USED: Calculate water volume as follows: (1) Obtain surface area by measuring of regular shaped ponds or mapping of irregular ponds or by reference to previously recorded engineering data or maps. (2) Calculate average depth by sounding in a regular pattern and taking the mean of these readings or by reference to previously obtained data. (3) Multiply surface area in feet by average depth in feet to obtain cubic feet of water volume. (4) Multiply surface area in acres by average depth in feet to obtain total acre-feet of water volume.

CALCULATE WEIGHT OF WATER TO BE TREATED AS FOLLOWS: (1) Multiply volume in cubic feet by 62.44 to obtain total pounds of water, or (2) Multiply volume in acre feet by 2,720,000 to obtain pounds of water.

CALCULATIONS OF ACTIVE INGREDIENT TO BE ADDED: To calculate the amount of Copper Sulfate Pentahydrate needed to achieve the recommended concentration, multiply the weight of water by the recommended concentration of Copper Sulfate. Since recommended concentrations are normally given in parts per million (ppm), it will first be necessary to convert the value in parts per million to a decimal equivalent. For example, 2 ppm is the same as 0.000002 when used in this calculation. Therefore, to calculate the amount of Copper Sulfate Pentahydrate to treat 1 acre-foot of water with 2 ppm Copper Sulfate, the calculation would be as follows:

0.000002 X 2,720,000 = 5.44 lbs. Copper Sulfate Pentahydrate

CALCULATION OF WATER FLOW IN DITCHES, STREAMS, AND IRRIGATION SYSTEMS: The amount of water flow in cubic feet per second is found by means of a weir or other measuring device.

SPECIFIC INSTRUCTIONS

SEWER TREATMENT – ROOT DESTROYER*

ROOT CONTROL GENERAL INFORMATION: Plant roots can penetrate through small cracks and poorly sealed joints of sewer lines. If not controlled, these small roots will continue to grow larger in number causing breakage, reduced flow, and eventually, flow stoppage. Copper sulfate has been known to be an effective means to control roots in residential and commercial sewers.

COMMERCIAL, INSTITUTIONAL, AND MUNICIPAL SEWERS:

ROOT CONTROL IN SEWERS: As a preventive measure, apply into each junction or terminal manhole 2 pounds of Copper Sulfate Crystals every 6 to 12 months. At time of reduced flow (some water flow is essential), add copper sulfate. If flow has not completely stopped, but has a reduced flow due to root masses, add Copper Sulfate Crystals in the next manhole above the reduced flow area. For complete stoppage, penetrate the mass with a rod to enable some flow before treatment.

ROOT CONTROL IN STORM DRAINS: Apply when water flow is light. If no water flow, as in dry weather, use a hose to produce a flow. Apply 2 pounds Copper Sulfate Crystals per drain per year. It may be necessary to repeat treatments 3 to 4 times, at 2 week intervals, if drains become nearly plugged.

SEWER PUMPS AND FORCE MAINS: At the storage well inlet, place a cloth bag containing 2 pounds of Copper Sulfate Crystals. Repeat as necessary.

RESIDENTIAL OR HOUSEHOLD SEWER SYSTEMS:

When a reduced water flow is first noticed, and root growth is thought to be the cause, treat with Copper Sulfate Crystals. It is important not to wait until a stoppage occurs because some water flow is necessary to move the Copper Sulfate Crystals to the area of root growth. Usually, within 3 to 4 weeks, after roots have accumulated sufficient copper sulfate, the roots will die and begin to decay and water flow should increase. As the roots regrow, follow-up treatments with copper sulfate will be required. Applications may be made each year in the spring after plant growth begins, during late summer or early fall, or any time a reduced water flow, thought to be caused by root growth, occurs.

Apply 2-6 pounds Copper Sulfate Crystals two times a year to household sewers. Add Copper Sulfate Crystals to sewer line by pouring about ½ pound increments into the toilet bowl nearest the sewer line and flush, repeat this process until recommended dose has been added, or remove cleanout plug and pour entire recommended quantity directly into the sewer line. Replace the plug and flush the toilet several times.

ROOT CONTROL IN SEPTIC TANK AND LEACH LINES AND LEACH LINE PIPES:

SEPTIC TANKS – The majority of the copper sulfate will settle in the septic tank itself and little will pass into the leach lines. To treat leach line pipes, add 2 to 6 pounds of Copper Sulfate Crystals to the distribution box located between the septic tank and the leach lines. To achieve effective root control in the leach lines it is necessary to transfer Copper Sulfate Crystals from the septic tank to the leach lines. A cleanout plug opening may need to be installed if the distribution box does not have an opening leading to the leach lines.

***NOTE:** Do not apply Copper Sulfate Crystals through sink or tub drains as it will corrode the metal drains.

***NOTE:** Copper sulfate added to an active 300 gallon septic tank at 2, 4 and 6 pounds per treatment will temporarily reduce bacterial action, but it will return to normal approximately 15 days after treatment. Trees and shrubbery growing near a treated line normally are not affected due to only a small portion of their roots being in contact with the copper sulfate. The copper sulfate kills only those roots inside the leach line.

***NOTE:** Do not use as a sewer additive where prohibited by State law. State law prohibits the use of this product in sewage systems in the State of Connecticut. Not for sale or use in the California counties of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma for root control in sewers. Not for sale or use in septic systems in the State of Florida.

TO CONTROL ALGAE AND THE POTOMOGETON POND WEEDS, LEAFY AND SAGO, IN IRRIGATION SYSTEMS: Once the amount of Copper Sulfate required for treating ditches or streams has been calculated, use a continuous application method, selecting proper equipment to supply Copper Sulfate granular crystals as follows:
FOR ALGAE CONTROL – Begin continuous addition application of granular Copper Sulfate when water is first turned into the system and continue throughout the irrigation system, applying 0.1 to 0.2 lbs per cubic ft per second per day.
FOR LEAFY AND SAGO POND WEED CONTROL – Use the same continuous feeder, applying 1.6 to 2.4 pounds Copper Sulfate Pentahydrate per cubic foot per second per day. NOTE: For best control of leafy and sago pond weed, it is essential to begin Copper Sulfate additions when water is first turned into the system or ditch to be treated and to continue throughout the irrigation system. Copper Sulfate becomes less effective as the alkalinity increases. Its effectiveness is significantly reduced when the bicarbonate alkalinity exceeds 150 ppm. Should Copper Sulfate fail to control pond weeds satisfactorily, it may be necessary to treat the ditch with either a suitable approved herbicide or use a mechanical means to remove excess growth. In either case, resume Copper Sulfate addition as soon as possible.
TO CONTROL ALGAE IN IMPOUNDED WATERS, LAKES, PONDS AND RESERVOIRS: There are several methods by which to apply Copper Sulfate to impounded water. Probably the most satisfactory and simplest method is to dissolve the Copper Sulfate crystals in water and to spray this water over the body of water from a boat. A small pump mounted in the boat can easily be used for this purpose. Fine crystals may be broadcast directly on the water surface from a properly equipped boat. A specially equipped air blower can be used to discharge fine crystals at a specific rate over the surface of the water. When using this method, the direction of the wind is an important factor. Do not use this method unless completely familiar with this type of application. Where the situation permits, Copper Sulfate may be applied under the water by dragging burlap bags containing Copper Sulfate. The crystals are placed in burlap bags and dragged through the water by means of a boat. Begin treatment along the shoreline and proceed outward until one-third to one-half of the total area has been treated. Care should be taken that the course of the boat is such as to cause even distribution of the chemical. In large lakes, it is customary for the boat to travel in parallel lines about 20 to 100 feet apart. Continue dragging the burlap bags over the treated area until the minimum dosage is achieved and all crystals have been dissolved. Large or medium size crystals that dissolve slowly should be used with this method.
Copper Sulfate can be applied to impounded waters by injecting a copper sulfate solution in water via a piping system.
CONTROL OF ALGAE AND BACTERIAL ODOR IN SEWAGE LAGOONS AND PITS (Except California): Application rates may vary depending on amounts of organic matter in effluent stream or retention ponds. Use 2 lbs. of Copper Sulfate Crystals in 60,000 gals. (8,000 cu. ft.) of effluent to yield 1 ppm of dissolved copper. Dosage levels may vary depending upon organic load. Other Organic Sludges: Copper Sulfate Crystal solution must be thoroughly mixed with sludge. Dissolve 2 lbs. in 1-2 gals. of water and apply to each 30,000 gals. of sludge.
Useful formulas for calculating water volume flow rates: Multiply the water volume in cu. ft. times 7.5 to obtain gallons.
Note: 1 C.F.S./Hr. = 27,000 Gals. 1 Acre Foot = 326,000 Gals.
TO CONTROL ALGAE IN IRRIGATION CONVEYANCE SYSTEMS USING THE SLUG APPLICATION METHOD: Make an addition (dump) of Copper Sulfate into the irrigation ditch or lateral at 0.25 to 2.0 lbs. per cubic foot per second of water per treatment. Repeat on approximate 2-week intervals as required. Depending on water hardness, alkalinity and algae concentration, a dump is usually required every 5 to 30 miles. Effectiveness of Copper Sulfate decreases as the bicarbonate alkalinity increases and is significantly reduced when the alkalinity exceeds approximately 150 ppm as CaCO3.
TO CONTROL ALGAE IN RICE (Domestic and Wild) FIELDS: Application should be made when algae have formed on the soil surface in the flooded field. Applications are most effective when made prior to the algae's leaving the soil surface and rising to the water surface. Apply 10-15 pounds Copper Sulfate Crystals per acre to the water surface as either crystals or dissolve in water and make a surface spray. Apply higher rate in deeper water (6 inches or greater).
TO CONTROL TADPOLE SHRIMP IN RICE FIELDS: Application should be made to the flooded fields any time the pest appears from planting time until the seedlings are well rooted and have emerged through the water. Apply 5-10 pounds Copper Sulfate Crystals per acre. The use rate per acre should be determined by the water depth and flow. Use the lower rate at minimum flow and water depth and the higher rate when water depth and flow are maximum.

STATE	SPECIES	BULLETIN NO.	COUNTY
CALIFORNIA	Solano grass	EPA/ES-85-13	Solano
TENNESSEE	Slackwater Darter	EPA/ES-85-04	Lawrence Wayne Hancock
	Freshwater Mussels	EPA/ES-85-07	Claiborne Hawkins Sullivan
ALABAMA	Slackwater Darter	EPA/ES-85-05	Lauderdale Limestone Madison
VIRGINIA	Freshwater Mussels	EPA/ES-85-06	Grayson Smyth Scott Washington Lee

ENDANGERED SPECIES RESTRICTIONS: It is a violation of Federal Law to use any pesticide in a manner that results in the death of an endangered species or adverse modification of their habitat. The use of this product may pose a hazard to certain Federally designated endangered species known to occur in specific areas within the above counties. ***PLEASE NOTE*** Before using this product in the above counties you must obtain the EPA Bulletin specific to your area. This Bulletin identifies areas within these counties where the use of this pesticide is prohibited, unless specified otherwise. The EPA Bulletin is available from either your County Agricultural Extension Agent, the Endangered Species Specialist in your State Wildlife Agency Headquarters, or the appropriate Regional Office of the U.S. Fish and Wildlife Service. THIS BULLETIN MUST BE REVIEWED PRIOR TO PESTICIDE USE.

COPPER SULFATE REQUIRED FOR TREATMENT OF DIFFERENT GENERA OF ALGAE

The genera of algae listed below are commonly found in waters of the United States. Use the lower recommended rate in soft waters (less than 50 ppm methyl orange alkalinity) and the higher concentration in hard waters (above 50 ppm alkalinity). Always consult State Fish and Game Agency before applying this product to municipal waters.

ORGANISM	¼ to ½ ppm*	½ to 1 ppm*	1 to 1½ ppm*	1½ to 2 ppm*
Cyanophyceae (Blue-green)	Anabaena Anacystis Aphanizomenon Gloeotrichia Gomphosphaeria Polycystis Rivularia	Cylindrospermum Oscillatoria Plectonema	Nostoc Phormidium	Calothrix Symploca
Chlorophyceae (Green)	Closterium Hydrodictyon Spirogyra Ulothrix	Botryococcus Cladophora Coelastrum Draparnaldia Enteromorpha Gloeocystis Microspora Tribonema Zygnema	Chlorella Crucigenia Desmidium Golenkinia Oocystis Palmella Pithophora Staurastrum Tetraedron	Ankistrodesmus Chara Nitella Scenedesmus
Diatomaceae (Diatoms)	Asterionella Fragilaria Melosira Navicula	Gomphonema Nitzschia Stephanodiscus Synedra Tabellaria	Achnanthes Cymbella Neidium	
Protozoa (Flagellates)	Dinobryon Synura Uroglena Volvox	Ceratium Cryptomonas Euglena Glenodinium Mallomonas	Chlamydomonas Hawmatococcus Peridinium	Eudorina Pandorina
	* ¼ - ½ ppm = .67 – 1.3 lbs/acre ft. * ½ - 1 ppm = 1.3 – 2.6 lbs/acre ft.		* 1 – 1½ ppm = 2.6-3.9 lbs/acre ft. * 1½ - 2 ppm = 3.9 – 5.32 lbs/acre ft.	

SCHISTOSOME-INFECTED FRESH WATER SNAILS

For recreational lakes, reservoirs, and ponds, 5.32 -13.3 lbs/acre-ft Copper Sulfate Crystals (i.e., 2-5 ppm copper sulfate), is usually sufficient for treatment of Schistosome-infected fresh water snails. Use surface area in acres multiplied by average depth in feet to determine water volume and application rate. Apply only along shoreline swimming areas and/or to infected snail beds on a calm sunny day when water temp is at least 60°F. Not allowing swimming for at least 12 hrs following treatment is recommended. If this lower dosage is not sufficient, up to 32 ppm copper sulfate, i.e., 87 lbs/acre (= 2 lbs/1000 sq ft) bottom surface area can be applied. Not allowing swimming for 48 hrs is recommended. Using either dosage, a second application may be made if necessary, 10 to 14 days later. DO NOT make more than two applications a season. Broadcast application using boat, aircraft, or hand equipped with power or hand seeder or underwater dispenser. Do not exceed 1 ppm copper (4 ppm Copper Sulfate) in potable water systems. This labeling must be in the possession of the user at the time of pesticide application. **NOTE : In the State of New York** –For use in recreational lakes, reservoirs and ponds ONLY in areas where infected snail beds have been identified. Apply medium grade crystals by hand broadcast method of application only. This product is a restricted use pesticide in New York State. Pesticide applicator certification or a special use permit is required for sale, possession, or use. Each individual treatment must be approved by the Department of Environmental Conservation. Therefore, you must contact the Pesticide Control Specialist at the appropriate regional office of the Department 30 days in advance of the proposed treatment.

FOOT BATHS FOR CATTLE

Foot baths of Copper Sulfate Crystals can be used as an aid in the treatment of hoof rot in cattle. Prior to treatment, a veterinarian should be consulted to confirm presence of hoof rot. Animals may be walked through a foot bath of 2% (add 2 lbs copper sulfate to 11.8 gals water) to 5% (add 5 lbs copper sulfate to 11.4 gals water) aqueous solution with an immersion time of 5 to 20 min twice daily for a period of time as prescribed by a veterinarian. Keep foot baths clean during treatment period. Do not allow cattle to drink from foot baths as copper sulfate is highly toxic. Follow instructions under Storage and Disposal when solutions are discarded at end of treatment period.

Wisconsin State Copper fertilizer recommendations[a]

Crop	Pounds per Acre					
	Sands		Loams,silts,clays		Organic	
	Bdct[b]	Band	Bdct[b]	Band	Bdct[b]	Band
Lettuce, onion, Spinach	10	2	12	3	13	4
Carrot, cauliflower, celery, alfalfa, clover, corn, oat, radish, sudan grass, wheat	4	1	8	2	12	3
Asparagus, barley, beans, beet, broccoli, mint, pea, potato, rye, soybean	0	0	0	0	0	2

[a]Recommendations are for inorganic sources of copper. Copper chelates can also be used at 1/6 of the rates recommended above. Do not apply copper unless a deficiency has been verified by plant analysis. [b]Bdct = broadcast

Washington, Oregon, and California Fertilizer Use

Information received by the Washington State Dept. of Agriculture regarding the components in this product is available on the internet at http://agr.wa.gov Information regarding the contents and levels of metals in this product is available at the Oregon Dept of Agriculture internet site: http://oda.state.or.us/fertilizer

BORDEAUX SPRAY MIXTURE

Understanding Bordeaux Formulations: If the Bordeaux mixture instructions read 10-10-100, the first figure indicates the number of lbs of Copper Sulfate Crystals. The second figure is the lbs of hydrated spray lime and the third figure is the gallons of water to be used. Use as a full coverage spray to point of runoff.

Preparation of Bordeaux Spray Mixture: Fill a tank 1/4 full with water. Then, with agitator running, mix in Copper Sulfate Crystals through a copper, bronze, stainless steel or plastic screen. Add water so the tank is 3/4 full. Mix in the hydrated spray lime through the screen and finish filling the tank with water.

CROP USE RECOMMENDATIONS

Almond, Apricot, Peach, Nectarine: Shot Hole Fungus – Prepare a 10-10-100 Bordeaux and apply as a dormant spray in late fall or early spring.

Almond, Apricot, Cherry, Peach, Nectarine, Plum, Prune: Brown Rot Blossom Blight – Prepare a 10-10-100 Bordeaux and apply when buds begin to swell.

Apple: Fireblight – Mix 5 lbs of Copper Sulfate Crystals in 100 gals of water and spray uniformly to the point of runoff. Apply in dormant only at silver tip stage. After silver tip, severe burn will occur on any exposed green tissue. Do not mix lime to make a Bordeaux spray for this treatment.

Blueberries: Bacterial Canker – Prepare and apply an 8-8-100 Bordeaux mixture in the fall before heavy rains begin and again 4 weeks later.

Bulbs (Easter Lily, Tulip, Gladiolus): Botrytis Blight – Prepare a 10-10-100 Bordeaux mixture and apply as a foliar spray to 1 acre. Apply for thorough coverage beginning at the first sign of disease and repeat as needed to control disease at 3 to 10 day intervals. Use the shorter intervals during periods of frequent rains or when severe disease conditions persist. Avoid spray just before flower cutting season if residues are a problem.

Caneberries: For leaf and cane spot and Pseudomonas blight, prepare and apply an 8-8-100 Bordeaux mixture in the fall before heavy rains begin and again 4 weeks later.

Cherry (Sweet): Dead Bud, Bacterial Canker (Pseudomonas Syringae) – Prepare a 12-12-100 Bordeaux. Apply at leaf fall and again in late winter before buds begin to swell. In wet cool Northwest U.S. winters, a third spray may be needed between above sprays.

Cherry (Sour): Leaf Spot – Prepare a 10-10-100 Bordeaux. Apply as a full coverage spray after petal fall or as recommended by the State Extension Service.

CITRUS

(NOTE: Adding foliar nutritionals to spray mixtures containing Copper Sulfate Crystals or other products and applying to citrus during the post-bloom period when young fruit is present may result in spray burn.)

Bacterial Blast – Prepare a 10-10-100 Bordeaux spray and apply a spray in late October to early November or before fall rains begin. Make a complete coverage spray using 10 to 25 gals per mature tree.

Lemon, Orange, Grapefruit: Phytophthora Brown Rot - Prepare a 3-4.5-100 Bordeaux mixture only where there is no history of copper injury or use a 3-2-6-100 (Zinc Sulfate-Copper Sulfate Crystals-Hydrated Lime-Gallons of water) Bordeaux mixture. Spray 6 gals on skirt of tree 3 to 4 ft high and 2 to 4 gals on trunk and ground under tree. If P. hibernalis is present, use 10 to 25 gals to completely cover each tree. Apply in November or December just before or after first rain. In severe brown rot season, apply second application in January or February.

Lemon, Orange, Grapefruit: Septoria Fruit, Leaf Spot;Central California – Brown Rot, Zinc, Copper Deficiencies – Prepare a 3-2-6-100 Bordeaux mixture (Zinc Sulfate-Copper Sulfate Crystals-Hydrated Lime Gallons of water) and use 10 to 25 gals to completely cover each tree. Apply in October, November or December before or just after first rain.

Grape: **Downy Mildew** – Prepare and apply a 2-6-100 Bordeaux spray beginning when downy mildew is detected. Repeat as needed to achieve and maintain control. This mixture and its use will exhibit some phytotoxicity on most varieties.

Grape (Dormant): Powdery Mildew – Apply in spring before bud-swell and before any green tissue is present. Use 4 to 8 lbs of Copper Sulfate Crystals per 100 gals of water. Apply in a high volume spray of 300 gals water per acre. Direct spray to thoroughly wet the dormant vine, especially the bark of the trunk, head or cordons.

Olive: Olive Leaf Spot (Peacock spot), Olive Knot – Prepare a 10-10-100 Bordeaux and apply up to 500 gals per acre. Apply in autumn before heavy winter rains to prevent peacock spot. In wet winters, a repeat spray may be needed in mid-winter. In areas with less than 10 inches of annual rainfall, a 5-5-100 Bordeaux applied in up to 500 gals per acre may be used. To help protect against olive knot, apply a 10-10-100 Bordeaux before heavy rains and again in the spring. Injury may occur in areas of less than 10 inches of rainfall.

Peach: Leaf Curl – Prepare a 10-10-100 Bordeaux and apply at leaf fall or as a dormant spray in late fall or early spring before buds begin to swell.

Potatoes: **To enhance vine-kill and suppress late blight**, apply 10 lbs. per acre in 10 to 100 gals of water (ground equipment) or in 5 to 10 gals (aerial equipment) with Diquat at vine-kill to enhance vine desiccation and suppress late blight. Additional applications can be made with Diquat if needed to within 7 days of harvest. Copper Sulfate Crystals may be applied alone until harvest to suppress late blight. NOTE: This product can be mixed with Diquat for use on potatoes in accordance with the most restrictive of label limitations and precautions. No label dosage rates should be exceeded.

Walnuts: Walnut Blight – Apply 15 lbs with 10 lbs of lime in 100 gals of water. Make application in early pre-bloom before catkin blooms are showing (10-20% pistilate) before or after rain. Use only if Bordeaux mixture has been shown to be non-phytotoxic in your area. If desired, add one-half gal summer oil emulsion per 100 gals of water. **NOTE**: Addition of summer oil emulsion to pre-bloom and early bloom sprays may result in plant injury.

GENERAL CHEMIGATION INSTRUCTIONS

Apply this product only through one or more of the following types of systems: sprinkler including center pivot, lateral move, end tow, side (wheel) roll, traveler, big gun, solid set, or hand move irrigation system(s). Do not apply this product through any other type of irrigation system. Crop injury, lack of effectiveness, or illegal pesticide residues in the crop can result from nonuniform distribution of treated water. If you have questions about calibration, you should contact State Extension Service specialists, equipment manufacturers 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. A person 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.

Posting of areas to be chemigated is required when 1) any part of a treated area is within 300 feet of sensitive areas such as residential area, labor camps, businesses, day care centers, hospitals, in-patient clinics, nursing homes or any public areas such as schools, parks, playgrounds, or other public facilities not including public roads, or 2) when the chemigated area is open to the public such as golf courses or retail greenhouses. Posting must conform to the following requirements. Treated areas shall be posted with signs at all usual points of entry and along likely routes of approach from the listed sensitive areas. When there are no usual points of entry, signs must be posted in the corners of the treated areas and in any other location affording maximum visibility to sensitive areas. The printed side of the sign should face away from the treated area towards the sensitive area. The signs shall be printed in English. Signs must be posted prior to application and must remain posted until foliage has dried and soil surface water has disappeared. Signs may remain in place indefinitely as long as they are composed of materials to prevent deterioration and maintain legibility for the duration of the posting period. At the top of the sign shall be the words "KEEP OUT", followed by an octagonal stop sign symbol at least 8 inches in diameter containing the word "STOP". Below the symbol shall be the words "PESTICIDES IN IRRIGATION WATER". All words shall consist of letters at least 2 ½ inches tall, and all letters and the symbol shall be a color that sharply contrasts with their immediate background. This sign is in addition to any sign posted to comply with the Worker Protection Standard.

CHEMIGATION SYSTEMS CONNECTED TO PUBLIC WATER SYSTEMS:

Public water system means 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, backflow preventer (RPZ) or the functional equivalent in the water supply line upstream from the point of pesticide introduction. As an option to the RPZ, the water from the public water system should be discharged into the reservoir tank prior to 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 flow of fluid back toward the injection pump. 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.
See Treatment Instructions, below.

SPRINKLER CHEMIGATION:

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 and capable of being fitted with a system interlock. The system must contain a functional check valve, vacuum relief valve, and low pressure drain approximately located on the irrigation pipeline to prevent water source contamination from backflow. The pesticide injection pipeline must contain a functional, automatic, quick-closing check valve to prevent the flow of fluid back toward the injection pump. This 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.

TREATMENT INSTRUCTIONS:

Do not apply when wind speed favors drift beyond the area intended for treatment. When mixing, fill nurse tank half full with water. Add Copper Sulfate Crystals slowly to tank while hydraulic or mechanical agitation is operating and continue filling with water. Stickers, spreaders, insecticides, nutrients, etc. should be added last. If compatibility is in question, use the compatibility jar test before mixing a whole tank. Because of the wide variety of possible combinations which can be encountered, observe all cautions and limitations on the label of all products used in mixtures. Copper Sulfate Crystals should be added through a traveling irrigation system continuously or at the last 30 minutes of solid set or hand moved irrigation systems. Agitation is recommended.

NOTICE: CHEM ONE LTD. warrants that this product in its unopened package conforms to the chemical description on the label. THERE ARE NO OTHER WARRANTIES EXPRESS OR IMPLIED, INCLUDING A WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE. This warranty does not extend to the handling or use of this product contrary to label instructions or under abnormal conditions or under conditions not reasonably foreseeable to seller and buyer assumes all risk of any such use.

CHEM ONE LTD.
8017 Pinemont Drive, Suite 100
HOUSTON, TEXAS 77040-6519
TEL: (713) 896-9966

ENVIRONMENTALLY HAZARDOUS SUBSTANCES
SOLID, N.O.S. (CUPRIC SULFATE) UN3077, RQ

Material Safety Data Sheet

Material Name: Copper Sulfate Pentahydrate ID: C1-121A

* * * Section 1 - Chemical Product and Company Identification * * *

Chemical Name: Copper Sulfate Pentahydrate
Product Use: For Commercial Use
Synonyms: Copper Sulfate Crystals, Blue Copper, Blue Stone, Blue Vitriol, Copper (II) sulfate, Cupric Sulfate, Copper Sulfate Fine 200, Fine 100, Fine 30, 20, Small, Medium, Large, FCC IV, and Very High Purity

Supplier Information

Chem One Ltd. (Importer of record)
8017 Pinemont Drive, Suite 100
Houston, Texas 77040-6519

Phone: (713) 896-9966
Fax: (713) 896-7540
Emergency # (800) 424-9300 or (703) 527-3887

General Comments

NOTE: Emergency telephone numbers are to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure, or accident involving chemicals. All non-emergency questions should be directed to customer service.

* * * Section 2 - Composition / Information on Ingredients * * *

CAS #	Component	Percent
7758-99-8	Copper (II) Sulfate Pentahydrate	> 99

Component Related Regulatory Information

This product may be regulated, have exposure limits or other information identified as the following: Copper (7440-50-8) and inorganic compounds, as Cu, Copper (7440-50-8) dusts and mists, as Cu and Copper fume, Cu.

Component Information/Information on Non-Hazardous Components

This product is considered hazardous under 29 CFR 1910.1200 (Hazard Communication).

* * * Section 3 - Hazards Identification * * *

Emergency Overview

Copper Sulfate Pentahydrate is a blue crystalline or powdered, odorless solid. Potentially fatal if swallowed. May cause irritation to the eyes, respiratory system and skin. Fire may produce irritating, corrosive and/or toxic fumes. Firefighters should use full protective equipment and clothing.

Hazard Statements

HARMFUL OR FATAL IF SWALLOWED. Can cause irritation of eyes, skin, respiratory tract and, in extreme cases, burns. Avoid contact with eyes and skin. Avoid breathing dusts. Wash thoroughly after handling. Keep container closed. Use with adequate ventilation. Keep from contact with clothing and other combustible materials.

Potential Health Effects: Eyes

Exposure to particulates or solution of this product may cause redness and pain. Prolonged contact may cause conjunctivitis, ulceration and corneal abnormalities.

Potential Health Effects: Skin

This product can cause irritation of the skin with pain, itching and redness. Severe overexposure can cause skin burns. Prolonged exposure may cause dermatitis and eczema.

Potential Health Effects: Ingestion

Harmful or fatal if swallowed. May cause gastrointestinal irritation with symptoms such as nausea, vomiting, and diarrhea. Ingestion may cause degeneration of liver, kidney, or renal failure. Persons who survive ingestion may develop granulomatous lesions of the kidney. Ingestion of large amounts may lead to convulsions, coma or death.

Potential Health Effects: Inhalation

May irritate the nose, throat and respiratory tract. Symptoms can include sore throat, coughing and shortness of breath. In severe cases, ulceration and perforation of the nasal septum can occur. If this material is heated, inhalation of fumes may lead to development of metal fume fever. This is a flu-like illness with symptoms of metallic taste, fever and chills, aches, chest tightness and cough. Repeated inhalation exposure can cause shrinking of the lining of the inner nose.

HMIS Ratings: Health Hazard: 2* **Fire Hazard:** 0 **Physical Hazard:** 1 **Personal Protective Equipment:** E = chemical goggles, impervious gloves, dust respirator.

Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe * = Chronic hazard

* * * Section 4 - First Aid Measures * * *

First Aid: Eyes

In case of contact with eyes, rinse immediately with plenty of water for at least 20 minutes. Seek immediate medical attention.

First Aid: Skin

Remove all contaminated clothing. For skin contact, wash thoroughly with soap and water for at least 20 minutes. Seek immediate medical attention if irritation develops or persists.

First Aid: Ingestion

DO NOT INDUCE VOMITING. Have victim rinse mouth thoroughly with water, if conscious. Never give anything by mouth to a victim who is unconscious or having convulsions. Contact a physician or poison control center immediately.

First Aid: Inhalation

Remove source of contamination or move victim to fresh air. Apply artificial respiration if victim is not breathing. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Administer oxygen if breathing is difficult. Get immediate medical attention.

First Aid: Notes to Physician

Provide general supportive measures and treat symptomatically. Basic Treatment: Establish a patent airway. Suction if necessary. Watch for signs of respiratory insufficiency and assist ventilations if necessary. Administer oxygen by non-rebreather mask at 10 to 15 L/minutes. Monitor for shock and treat if necessary. For eye contamination, flush eyes immediately with water. Irrigate each eye continuously with normal saline during transport. Do not use emetics. For ingestion, rinse mouth and administer 5 mL/kg up to 200 mL of water for dilution if the patient can swallow, has a strong gag reflex, and does not drool. Administer activated charcoal. Advanced Treatment: Consider orotracheal or nasotracheal intubation for airway control in the patient who is unconscious. Start an IV with lactated Ringer's SRP: "To keep open", minimal flow rate. Watch for signs of fluid overload. For hypotension with signs of hypovolemia, administer fluid cautiously. Consider vasopressors if hypotensive with a normal fluid volume. Watch for signs of fluid overload. Use proparacaine, hydrochloride to assist eye irrigation.

* * * Section 5 - Fire Fighting Measures * * *

Flash Point: Not flammable
Method Used: Not applicable
Upper Flammable Limit (UEL): Not applicable
Lower Flammable Limit (LEL): Not applicable
Auto Ignition: Not applicable
Flammability Classification: Not applicable
Rate of Burning: Not applicable

General Fire Hazards

Copper Sulfate Pentahydrate is not combustible, but may decompose in the heat of a fire to produce corrosive and/ or toxic fumes.

Hazardous Combustion Products

Sulfur oxides and copper fumes.

Extinguishing Media

Use methods for surrounding fire.

Fire Fighting Equipment/Instructions

Firefighters should wear full protective clothing including self-contained breathing apparatus. Runoff from fire control or dilution water may be corrosive and/or toxic and cause pollution.

NFPA Ratings: Health: 2 **Fire:** 0 **Reactivity:** 1 **Other:**

Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe

* * * Section 6 - Accidental Release Measures * * *

Containment Procedures

Stop the flow of material, if this can be done without risk. Contain the discharged material. If sweeping of a contaminated area is necessary use a dust suppressant agent, which does not react with product (see Section 10 for incompatibility information).

Clean-Up Procedures

Wear appropriate protective equipment and clothing during clean-up. Shovel the material into waste container. Thoroughly wash the area after a spill or leak clean-up. Prevent spill rinsate from contamination of storm drains, sewers, soil or groundwater.

Evacuation Procedures

Evacuate the area promptly and keep upwind of the spilled material. Isolate the spill area to prevent people from entering. Keep materials which can burn away from spilled material. In case of large spills, follow all facility emergency response procedures.

Special Procedures

Remove soiled clothing and launder before reuse. Avoid all skin contact with the spilled material. Have emergency equipment readily available.

* * * Section 7 - Handling and Storage * * *

Handling Procedures

It is a violation of Federal Law to use this product in a manner inconsistent with its labeling, when used as a pesticide. Do not breathe dust. Avoid all contact with skin and eyes. Use this product only with adequate ventilation. Wash thoroughly after handling.

Storage Procedures

Keep in original container in locked storage area. Keep container tightly closed when not in use. Store containers in a cool, dry location, away from direct sunlight, sources of intense heat, or where freezing is possible. Material should be stored in secondary containers or in a diked area, as appropriate. Store containers away from incompatible chemicals (see Section 10, Stability and Reactivity). Storage areas should be made of fire-resistant materials. Post warning and "NO SMOKING" signs in storage and use areas, as appropriate. Use corrosion-resistant structural materials, lighting, and ventilation systems in the storage area. Floors should be sealed to prevent absorption of this material. Have appropriate extinguishing equipment in the storage area (i.e., sprinkler system, portable fire extinguishers). Empty containers may contain residual particulates; therefore, empty containers should be handled with care. Do not cut, grind, weld, or drill near this container. Never store food, feed, or drinking water in containers that held this product. Keep this material away from food, drink and animal feed. Inspect all incoming containers before storage, to ensure containers are properly labeled and not damaged. Do not store this material in open or unlabeled containers. Limit quantity of material stored. Store in suitable containers that are corrosion-resistant.

* * * Section 8 - Exposure Controls / Personal Protection * * *

Exposure Guidelines

A: General Product Information

Follow the applicable exposure limits.

B: Component Exposure Limits

The exposure limits given are for Copper & inorganic Compounds, as Cu (7440-50-8), Copper fume as Cu or Copper dusts and mists, as Cu.

ACGIH:	1 mg/m^3 TWA (dusts & mists)
	0.2 mg/m^3 TWA (fume)
OSHA:	1 mg/m^3 TWA (dusts & mists)
	0.1 mg/m^3 TWA (fume)
NIOSH:	1 mg/m^3 TWA (dusts & mists)
	0.1 mg/m^3 TWA (fume)
DFG MAKs	1 mg/m^3 TWA Peak, 30 minutes, average value (copper and inorganic copper compounds)
	0.1 mg/m^3 TWA Peak, 30 minutes, average value (fume)

Engineering Controls

Use mechanical ventilation such as dilution and local exhaust. Use a corrosion-resistant ventilation system and exhaust directly to the outside. Supply ample air replacement. Provide dust collectors with explosion vents.

PERSONAL PROTECTIVE EQUIPMENT

The following information on appropriate Personal Protective Equipment is provided to assist employers in complying with OSHA regulations found in 29 CFR Subpart I (beginning at 1910.132). Please reference applicable regulations and standards for relevant details.

Personal Protective Equipment: Eyes/Face

Wear safety glasses with side shields (or goggles) and a face shield, if this material is made into solution. If necessary, refer to U.S. OSHA 29 CFR 1910.133.

Personal Protective Equipment: Skin

Wear chemically-impervious gloves, made of any waterproof material, boots and coveralls to avoid skin contact. If necessary, refer to U.S. OSHA 29 CFR 1910.138.

* * * Section 8 - Exposure Controls / Personal Protection (Continued)* * *

Personal Protective Equipment: Respiratory

If respiratory protection is needed, use only protection authorized in the U.S. Federal OSHA Standard (29 CFR 1910.134), applicable U.S. State regulations. Oxygen levels below 19.5% are considered IDLH by OSHA. In such atmospheres, use of a full-facepiece pressure/demand SCBA or a full facepiece, supplied air respirator with auxiliary self-contained air supply is required under OSHA's Respiratory Protection Standard (1910.134-1998). If airborne concentrations are above the applicable exposure limits, use NIOSH-approved respiratory protection. If airborne concentrations are above the applicable exposure limits, use NIOSH-approved respiratory protection. The following NIOSH Guidelines for Copper dust and mists (as Cu) are presented for further information.

Up to 5 mg/m^3: Dust and mist respirator.

Up to 10 mg/m^3: Any dust and mist respirator except single-use and quarter mask respirators or any SAR.

Up to 25 mg/m^3: SAR operated in a continuous-flow mode or powered air-purifying respirator with a dust and mist filter(s).

Up to 50 mg/m^3: Air purifying, full-facepiece respirator with high-efficiency particulate filter(s), any powered air-purifying respirator with tight-fitting facepiece and high-efficiency particulate filter(s) or full-facepiece SCBA, or full-facepiece SAR.

Up to 100 mg/ m^3: Positive pressure, full-facepiece SAR.

Emergency or Planned Entry into Unknown Concentrations or IDLH Conditions: Positive pressure, full-facepiece SCBA, or positive pressure, full-facepiece SAR with an auxiliary positive pressure SCBA.

Escape: Full-facepiece respirator with high-efficiency particulate filter(s), or escape-type SCBA.

NOTE: The IDLH concentration for Copper dusts and mists (as Cu) is 100 mg/m^3.

Personal Protective Equipment: General

Have an eyewash fountain and safety shower available in the work area

* * * Section 9 - Physical & Chemical Properties * * *

Physical Properties: Additional Information

The data provided in this section are to be used for product safety handling purposes. Please refer to Product Data Sheets, Certificates of Conformity or Certificates of Analysis for chemical and physical data for determinations of quality and for formulation purposes.

Appearance:	Blue crystals or powder	**Odor:**	Odorless
Physical State:	Solid	**pH:**	3.7-4.2 (10% soln.)
Vapor Pressure:	20 torr at 22.5 deg C	**Vapor Density:**	8.6
Boiling Point:	560 deg C (1040 deg F) [decomposes]	**Freezing/Melting Point:**	150 deg C (302 deg F)
Solubility (H2O):	31.6 g/100 cc (@ 0 deg C)	**Specific Gravity:**	2.28 @ 15.6 deg C (H2O = 1)
Softening Point:	Not available	**Particle Size:**	Various
Molecular Weight:	249.68	**Bulk Density:**	Not available
		Chemical Formula:	CuSO4*5H2O

* * * Section 10 - Chemical Stability & Reactivity Information * * *

Chemical Stability

Copper Sulfate Pentahydrate is hygroscopic, but stable when kept dry, under normal temperature and pressures.

Chemical Stability: Conditions to Avoid

Avoid high temperatures, exposure to air and incompatible materials.

Incompatibility

Copper Sulfate causes hydroxylamine to ignite and the hydrated salt is vigorously reduced. Solutions of sodium hypobromite are decomposed by powerful catalytic action of cupric ions, even as impurities. Copper salts, including Copper Sulfate may react to form explosive acetylides when in contact with acetylene or nitromethane. Contact with reducing agents, can cause a vigorous reaction, especially in solution. This product can corrode steel and iron. Copper Sulfate Pentahydrate is incompatible with magnesium, strong bases, alkalines, phosphates, acetylene, hydrazine, and zirconium. Copper Sulfate Pentahydrate can be corrosive to aluminum.

Hazardous Decomposition

Sulfur oxides and Copper oxides.

Hazardous Polymerization

Will not occur.

* * * Section 11 - Toxicological Information * * *

Acute and Chronic Toxicity

A: General Product Information

Acute toxicity is largely due to the caustic (alkaline) properties of this material. Harmful or fatal if swallowed. Product is an eye and skin irritant, and may cause burns. Product is a respiratory tract irritant, and inhalation may cause nose irritation, sore throat, coughing, and chest tightness and possibly, ulceration and perforation of the nasal septum.

Chronic: Long term skin overexposure to this product may lead to dermatitis and eczema. Prolonged or repeated eye contact may cause conjunctivitis and possibly corneal abnormalities. Chronic overexposure to this product may cause liver and kidney damage, anemia and other blood cell abnormalities.

B: Component Analysis - LD_{50}/LC_{50}

Copper Sulfate Pentahydrate (7758-99-8)

Oral-rat LD_{50}: = 300 mg/kg; Intraperitoneal-Rat LD_{50}: 18,700 mg/kg; Intraperitoneal-rat LD_{50}: 20 mg/kg; Subcutaneous-rat LD_{50}: 43 mg/kg; Intravenous-rat LD_{50}: 48900 µg/kg; Unreported-rat LD_{50}: 520 mg/kg; Oral-mouse LD_{50}: 369 mg/kg; Intraperitoneal-Mouse LD_{50}: 33 mg/kg; Intraperitoneal-mouse LD_{50}: 7182 µg/kg; Intravenous-mouse LD_{50}: 23300 µg/kg

B: Component Analysis - TDLo/LDLo

Copper Sulfate Pentahydrate (7758-99-8)

Oral-man LDLo: 857 mg/kg; Oral-Human LDLo: 50 mg/kg: Behavioral: somnolence (general depressed activity); Kidney, Urethra, Bladder: changes in tubules (including acute renal failure, acute tubular necrosis); Blood: hemorrhage; Oral-Human TDLo: 11 mg/kg: Gastrointestinal: gastritis; Gastrointestinal: hypermotility, diarrhea, nausea or vomiting; Oral-Human TDLo: 272 mg/kg: liver, kidney, Blood effects; Oral-Human LDLo: 1088 mg/kg; Oral-child : 150 mg/kg: Kidney, Urethra, Bladder: changes in tubules (including acute renal failure, acute tubular ; necrosis); Blood: other hemolysis with or without anemia; unknown-Man LDLo: 221 mg/kg; Oral-Woman TDLo: 2400 mg/kg/day: Gastrointestinal tract effects; DNA Inhibition-Human: lymphocyte 76 mmol/L; Oral-woman LDLo: 100 mg/kg: Vascular: Blood pressure lowering not characterized in autonomic section; Liver: hepatitis (hepatocellular necrosis), diffuse; Kidney, Urethra, Bladder: changes in tubules (including acute renal failure, acute tubular necrosis); Oral-Human LDLo: 143 mg/kg: Pulmonary system effects, Gastrointestinal tract effects ;Oral-rat TDLo: 915 mg/kg/1 year-intermittent: Cardiac: changes in coronary arteries; Blood: changes in serum composition (e.g. TP, bilirubin, cholesterol; Oral-rat TDLo: 157 mg/kg/6 weeks-intermittent: Endocrine: changes in adrenal weight; Nutritional and Gross Metabolic: weight loss or decreased weight gain; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: dehydrogenases; Oral-rat TDLo: 7530 mg/kg/30 days-intermittent: Blood: changes in serum composition (e.g. TP, bilirubin, cholesterol); Blood: changes in erythrocyte (RBC) count; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels:- multiple enzyme effect; Oral-rat TDLo: 2 gm/kg/20 days-intermittent: Liver: other changes; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: phosphatases, Enzyme inhibition, induction, or change in blood or tissue levels; Intraperitoneal-rat TDLo: 791 mg/kg/18 weeks-intermittent: Nutritional and Gross Metabolic: weight loss or decreased weight gain; Intraperitoneal-rat TDLo: 7500 µg/kg: female 3 day(s) after conception: Reproductive: Fertility: other measures of fertility; Subcutaneous-rat TDLo: 12768 µg/kg: male 1 day(s) pre-mating: Reproductive: Paternal Effects: testes, epididymis, sperm duct; Intratesticular-rat TDLo: 3192 µg/kg: male 1 day(s) pre-mating: Reproductive: Paternal Effects: spermatogenesis (incl. genetic material, sperm morphology, motility, and count), testes, epididymis, sperm duct; Oral-mouse TDLo: 3 gm/kg/8 weeks-continuous: Blood: changes in spleen; Immunological Including Allergic: decrease in cellular immune response, decrease in humoral immune response; Oral-mouse TDLo: 2 gm/kg/3 weeks-continuous: Blood: changes in spleen; Immunological Including Allergic: decrease in cellular immune response, decrease in humoral immune response; Subcutaneous-mouse LDLo: 500 µg/kg; Subcutaneous-mouse TDLo: 12768 µg/kg: male 30 day(s) pre-mating: Reproductive: Paternal Effects: testes, epididymis, sperm duct; Intravenous-mouse TDLo: 3200 µg/kg: female 8 day(s) after conception: Reproductive: Effects on Embryo or Fetus: fetotoxicity (except death, e.g., stunted fetus), Specific Developmental Abnormalities: Central Nervous System, cardiovascular (circulatory) system; Intravenous-mouse TDLo: 3200 µg/kg: female 7 day(s) after conception: Reproductive: Fertility: post-implantation mortality (e.g. dead and/or resorbed implants per total number of implants); Oral-Dog, adult LDLo: 60 mg/kg; Intravenous-guinea pig TDLo: 2 mg/kg; Subcutaneous-Guinea Pig, adult LDLo: 62 mg/kg; Oral-Pigeon LDLo: 1000 mg/kg; Oral-Domestic animals (Goat, Sheep) LDLo: 5 mg/kg; Oral-Bird-wild species LDLo: 300 mg/kg; Intravenous-frog LDLo: 25 mg/kg; Parenteral-chicken TDLo: 10 mg/kg: Tumorigenic: equivocal tumorigenic agent by RTECS criteria; Endocrine: tumors; Oral-pig TDLo: 140 mg/kg: female 1-15 week(s) after conception, lactating female 4 week(s) post-birth: Reproductive: Effects on Newborn: biochemical and metabolic; Intravenous-hamster TDLo: 2130 µg/kg: female 8 day(s) after conception: Reproductive: Fertility: post-implantation mortality (e.g. dead and/or resorbed implants per total number of implants), Specific Developmental Abnormalities: Central Nervous System, body wall

* * * Section 11 - Toxicological Information (Continued) * * *

Carcinogenicity

A: General Product Information

Copper Sulfate Pentahydrate (7758-99-8)

Cytogenetic Analysis-Rat/ast 300 mg/kg

B: Component Carcinogenicity

Copper dusts and mists, as Cu (7440-50-8)

EPA: EPA-D (Not Classifiable as to Human Carcinogenicity - inadequate human and animal evidence of carcinogenicity or no data available)

Epidemiology

No information available.

Neurotoxicity

Has not been identified.

Mutagenicity

Human and animal mutation data are available for Copper Sulfate Pentahydrate; these data were obtained during clinical studies on specific human and animal tissues exposed to high doses of this compound.

Teratogenicity

There are no reports of teratogenicity in humans. Animal studies indicate that a deficiency or excess of copper in the body can cause significant harm to developing embryos. The net absorption of copper is limited and toxic levels are unlikely from industrial exposure.

Other Toxicological Information

Individuals with Wilson's disease are unable to metabolize copper. Thus, persons with pre-existing Wilson's disease may be more susceptible to the effects of overexposure to this product.

* * * Section 12 - Ecological Information * * *

Ecotoxicity

A: General Product Information

Harmful to aquatic life in very low concentrations. Copper Sulfate Pentahydrate is toxic to fish and marine organisms when applied to streams, rivers, ponds or lakes.

B: Ecotoxicity

Copper Sulfate Pentahydrate (7758-99-8)

LC_{50} (*Lepomis machochirus* bluegill) wt 1.5 g = 884 mg/L at 18°C, static bioassay (95% confidence limit 707-1,100 mg/L) (technical material, 100% (about 25% elemental copper); LC_{50} (*Leopmis cyanellus*, Green Sunfish) = 1.1 g, 3,510 µg/L at °C; LC_{50} (*Pimephales promelas*, Fat-head minnow) = 1.2 g, 838 µg/L at 18°C; LC_{50} (*Crassius auratus*, Goldfish) = 0.9 g, 1380 µg/L at 18°C; LC_{50} (*Crassius auratus*, Goldfish) = 0.1-2.5 mg/L; LC_{50} (*EEL*) = 0.1-2.5 mg/L; LC_{50} (*Salmo gairdneri*, Rainbow trout) = 1.6 g, 135 µg/L at 18°C; LC_{50} (*Salmo gairdneri*, Rainbow trout) 48 hours =0.14 ppm; LC_{50} (*Daphnia magna*) no time specified = 0.182 mg/L; LC_{50} (*Salmo gairdneri*, Rainbow trout) no time specified = 0.17 mg/L; LC_{50} (*Lepomis machochirus*, Blue gill) no time specified = 1.5 g, 884 µg/L at 18°C; LC_{50} (Stripped Bass) 96 hours = 1 ppm or lower; LC_{50} (Prawn) 48 hours = 0.14; LC_{50} (Shrimp) 96 hours = 17.0 ppm copper; LC_{50} (Blue Crab) 96 hours = 28 ppm copper; LC_{50} (Oyster) 96 hours = 5.8 ppm copper; LC_{50} (*Viviparus bengalensis* snail) 96 hours = 0.060 ppm copper (at 32.5°C; 0.066 ppm copper static bioassay); LC_{50} (*Viviparus bengalensis* snail) 96 hours = 0.09 ppm copper (at 27.3°C; 0.066 ppm copper static bioassay); LC_{50} (*Viviparus bengalensis* snail) 96 hours = 0.39 ppm copper (at 20.3°C; 0.066 ppm copper static bioassay)

Environmental Fate

If released to soil, copper sulfate may leach to groundwater, be partly oxidized or bind to humic materials, clay or hydrous oxides of iron and manganese. In water, it will bind to carbonates as well as humic materials, clay and hydrous oxides of iron and manganese. Copper is accumulated by plants and animals, but it does not appear to biomagnify from plants to animals. In air, copper aerosols have a residence time of 2 to 10 days in an unpolluted atmosphere and 0.1 to greater than 4 days in polluted, urban areas.

* * * Section 13 - Disposal Considerations * * *

US EPA Waste Number & Descriptions

A: General Product Information

This product is a registered pesticide.

B: Component Waste Numbers

No EPA Waste Numbers are applicable for this product's components.

* * * Section 13 - Disposal Considerations (Continued) * * *

Disposal Instructions

All wastes must be handled in accordance with local, state and federal regulations. This material can be converted to a less hazardous material by weak reducing agents followed by neutralization. Do not reuse empty containers. Do not rinse unless required for recycling. If partly filled, call local solid waste agency or (1-800-CLEANUP or equivalent organization) for disposal instructions. Never pour unused product down drains or on the ground.

Pesticide Disposal

Pesticide wastes are acutely hazardous. Improper disposal of excess pesticides, spray mixtures, or rinsate is a violation of U.S. Federal and Canadian Law. If these wastes cannot be disposed of by use, according to product label instruction, contact your U.S. State, or Canadian Province Pesticide or Environmental Control Agency, or the hazardous waste representative at the nearest U.S. EPA Regional Office for guidance.

* * * Section 14 - Transportation Information * * *

NOTE: The shipping classification information in this section (Section 14) is meant as a guide to the overall classification of the product. However, transportation classifications may be subject to change with changes in package size. Consult shipper requirements under I.M.O., I.C.A.O. (I.A.T.A.) and 49 CFR to assure regulatory compliance.

US DOT Information

Shipping Name: Environmentally Hazardous Substance, solid, n.o.s. (cupric sulfate)
Hazard Class: 9 (Miscellaneous Hazardous Materials)
UN/NA #: UN 3077
Packing Group: III
Required Label(s): Class 9 (Miscellaneous Hazardous Materials)
RQ Quantity: 10 lbs (4.54 kg)[Cupric Sulfate]

Additional Shipping Information

Cupric Sulfate is a Severe Marine Pollutant (49 CFR 172.322) and requires the marine pollutant mark for vessel transportation. Because Copper Sulfate is listed as a Severe Marine Pollutant as found in Appendix B to 172.101 and when shipped by vessel, each inner package which exceeds 500 g (17.6 ounces) will need a marine pollutant marking. UN-certified package, marked with the Proper Shipping Name, UN Number will be required when shipped by vessel, when each inner package exceeds 500 g (17.6 ounces).

Limited Quantity Shipments: Inner packagings less than 500 g (17.6 ounces) will not need to be in a UN-approved box and will not need a Marine Pollutant marking. Such shipments need not be marked with the Proper Shipping Name of the contents, but shall be marked with the UN Number (3077) of the contents, preceded by the letters "UN", placed within a diamond. The width of the line forming the diamond shall be at least 2 mm; the number shall be at least 6 mm high. The total weight of each outer packaging cannot exceed 30 kg (66 pounds). For a shipment by air the class 9 label will be required.

Domestic Transportation Exception

49 CFR 172.504(f)(9) Domestic transportation, a Class 9 placard is not required. A bulk packaging containing a Class 9 material must be marked with the appropriate identification number displayed on a Class 9 placard, an orange panel or a white-square-on-point display configuration as required by subpart D of this part. 49 CFR 172(d)(3) allows the use of the class 9 placard to replace the marine pollutant marking for domestic shipments.

* * * Section 14 - Transportation Information (Continued) * * *

International Air Transport Association (IATA)

For Shipments by Air transport: We classify this product as hazardous (Class 9) when shipped by air because 49 CFR 173.140 (a). "For the purposes of this subchapter, miscellaneous hazardous material (Class 9) means a material which presents a hazard during transportation, but which does not meet the definition of any other hazard class. This class includes: (a) Any material which has an anesthetic, noxious, or other similar property which could cause extreme annoyance or discomfort to a flight crew member so as to prevent the correct performance of assigned duties."

Proper Shipping Name: Environmentally hazardous substance, solid, n.o.s. (cupric sulfate)
Hazard Class: 9
UN: UN 3077
Packing Group: III
Passenger & Cargo Aircraft Packing Instruction: 911
Passenger & Cargo Aircraft Maximum Net Quantity: No Limit
Limited Quantity Packing Instruction (Passenger & Cargo Aircraft): Y911
Limited Quantity Maximum Net Quantity (Passenger & Cargo Aircraft): 30 kg
Special Provisions: A97
ERG Code: 9L

International Maritime Organization (I.M.O.) Classification

For shipments via marine vessel transport, the following classification information applies.

Proper Shipping Name: Environmentally hazardous substance, solid, n.o.s. (Cupric sulfate)
Hazard Class: class 9
UN #: UN3077
Packing Group: III
Special Provisions: 274, 909, 944
Limited Quantities: 500g.
Packing Instructions: P002, LP02
Packing Provisions: PP12
IBC Provisions: IBC07
IBC Provisions: B3
EmS: Fire F-A Spill S-B
Stowage and Segregation: Category A

This material is considered a severe marine pollutant by the IMO and shipments of the material must carry the marine pollutant mark label. Refer to IMO Amendment 31-02 Chapter 2.10.

* * * Section 15 - Regulatory Information * * *

US Federal Regulations

A: General Product Information

Copper Sulfate Pentahydrate (CAS # 7758-99-8) is listed as a Priority and Toxic Pollutant under the Clean Water Act.

B: Component Analysis

This material contains one or more of the following chemicals required to be identified under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 313 (40 CFR 372.65) and/or CERCLA (40 CFR 302.4):

Copper Compounds (7440-50-8)

SARA 313: final RQ = 5000 pounds (2270 kg) Note: No reporting of releases of this substance is required if the diameter of the pieces of the solid metal released is equal to or greater than 0.004 inches.

Cupric Sulfate (7758-98-7)

CERCLA: final RQ = 10 pounds (4.54 kg)

C: Sara 311/312 Tier II Hazard Ratings:

Component	CAS #	Fire Hazard	Reactivity Hazard	Pressure Hazard	Immediate Health Hazard	Chronic Health Hazard
Copper Sulfate Pentahydrate	7758-99-8	No	No	No	Yes	Yes

* * * Section 15 - Regulatory Information (Continued)* * *

US Federal Regulations (continued)

State Regulations

A: General Product Information

California Proposition 65

Copper Sulfate Pentahydrate is not on the California Proposition 65 chemical lists.

B: Component Analysis - State

The following components appear on one or more of the following state hazardous substance lists:

Component	CAS #	CA	FL	MA	MN	NJ	PA
Copper	7440-50-8	Yes	No	Yes	No	Yes	Yes
Copper, fume, dust and mists		No	Yes	No	Yes	No	Yes
Copper Sulfate Pentahydrate	7758-99-8	No	No	No	No	Yes	Yes

Other Regulations

A: General Product Information

When used as a pesticide, the requirements of the U.S. Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), or requirements under the Canadian Pest Control Act, are applicable.

B: Component Analysis - Inventory

Component	CAS #	TSCA	DSL	EINECS
Copper Sulfate Pentahydrate	7758-99-8	Excepted	No	Yes

Although this compound is not on the TSCA Inventory, it is excepted as a hydrate of a listed compound, Copper Sulfate (CAS # 7758-98-7), per 40 CFR 710.4 (d)(3) and 40 CFR 720.30 (h)(3). Under this section of TSCA, any chemical substance which is a hydrate of a listed compound is excepted.

C: Component Analysis - WHMIS IDL

The following components are identified under the Canadian Hazardous Products Act Ingredient Disclosure List:

Component	CAS #	Minimum Concentration
Copper Sulfate Pentahydrate	7758-99-8	1 percent

ANSI Labeling (Z129.1):

DANGER! MAY BE FATAL IF SWALLOWED. CAUSES SKIN AND EYE IRRITATION. HARMFUL IF INHALED. Keep from contact with clothing. Do not taste or swallow. Do not get on skin or in eyes. Avoid breathing dusts or particulates. Keep container closed. Use only with adequate ventilation. Wash thoroughly after handling. Wear gloves, goggles, faceshields, suitable body protection, and NIOSH-approved respiratory protection, as appropriate. **FIRST-AID:** In Case of Contamination of Skin or Clothing: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. In Case of Contamination of 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 to rinse eye. 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 Ingested: Call 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. Call a poison control center or doctor for treatment advice. Have the product container or label with you when calling a poison control center or doctor, or going for treatment. In the event of a medical emergency, you may also contact The National Pesticide Information Center at 1-800-858-7378. **IN CASE OF FIRE:** Use water fog, dry chemical, CO_2, or "alcohol" foam. **IN CASE OF SPILL:** Absorb spill with inert material. Place residue in suitable container. Consult Material Safety Data Sheet for additional information.

Labeling Information for Pesticide Use of Product:

DANGER! HAZARD TO HUMANS AND DOMESTIC ANIMALS.

DANGER: CORROSIVE: Causes eye damage and irritation to the skin and mucous membrane. Harmful or fatal if swallowed. Do not get in eyes, on skin or on clothing. Do not breathe dust or spray mist. May cause skin sensitization reactions to certain individuals.

PERSONAL PROTECTIVE EQUIPMENT: Applicators and other handlers must wear long-sleeved shirt and long pants, chemical-resistant gloves, made of any water-proof material, shoes, plus socks and protective eyewear. Discard clothing and other absorbent materials that have been drenched or heavily contaminated with this solutions of this product. Do not reuse such contaminated items. Follow manufacturer's instructions for cleaning and maintaining PPE. If no such instructions for reusable items exist, wash using detergent and hot water. Keep and wash PPE separately for other laundry.

* * * Section 15 - Regulatory Information (Continued)* * *

US Federal Regulations (continued)

Labeling Information for Pesticide Use of Product (continued):

USER SAFETY RECOMMENDATIONS: Persons using this product should wash hands before eating, drinking, chewing gum, using tobacco or using the toilet. Remove clothing immediately if contaminated by the pesticide. Wash contaminated clothing thoroughly and put on clean clothing. Remove PPE immediately after use with this product. Wash outside of gloves and other equipment before removing. After removal of PPE, wash thoroughly and change into clean clothing.

ENVIRONMENTAL HAZARDS: This product is toxic to fish. Direct application of Copper Sulfate to water may cause a significant reduction in populations of aquatic invertebrates, plants and fish. Do not treat more than one-half of lake or pond at one time in order to avoid depletion of oxygen from decaying vegetation. Allow 1 to 2 weeks between treatments for oxygen levels to recover. Trout and other species of fish may be killed at application rates recommended on this label, especially in soft or acid waters. However, fish toxicity generally decreases when the hardness of the water increases. Do not contaminate water by cleaning of equipment of disposal of wastes. Consult local State Fish and Game Agency before applying this product to public waters. Permits may be required before treating such waters.

STORAGE AND DISPOSAL: PROHIBITIONS: Do not contaminate water, food or feed by storage or disposal. Open burning and dumping is prohibited. Do not re-use empty containers. Keep pesticide in original container. Do not put concentrate or dilutions of concentrate in food r drink containers. 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, 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. Completely empty bag of product into application equipment. Dispose of empty bag in a sanitary landfill or by incineration, or if allowed by State and local authorities, by burning. If burned, avoid smoke.

DIRECTIONS FOR USE: It is a violation of Federal Law to use this product inconsistent with its labeling. Do not apply this product in a way that will contaminate workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For requirements specific to your State, consult the agency responsible for your pesticide regulations.

AGRICULTURAL USE REQUIREMENTS: Use this product only in accordance with its labeling and with the Worker Protection Standard, CFR Part 170. This standard contains requirements for the protection of agricultural workers on farms, forests, nurseries and greenhouses, and handlers of agricultural pesticides. The Standard contains requirements for the training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE), and restricted-entry interval. These requirements only apply to uses of this product that are covered under the Worker Protection Standard. Do not apply this product in a way that will contaminate workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. Do not allow worker entry into treated areas during the restricted interval (REI) of 24 hours. PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil or water, is" Coveralls, waterproof gloves, shoes, plus socks and protective eyewear.

GENERAL USE INSTRUCTIONS: Water hardness, temperature of the water, the type and amount of vegetation to be controlled and the amount of water flow, are to be considered in using Copper Sulfate to control algae. Begin treatment soon after plant growth has started. If treatment is delayed until a large amount of algae is present, larger quantities of Copper Sulfate will required. Algal growth is difficult to control with Copper Sulfate when water temperatures are low or when water is hard. Larger quantities of Copper Sulfate will required to kill and control algae in water which is flowing than in a body of stagnant water. If possible, curtail the flow of water before treatment and hold dormant until approximately three days after treatment or until the algae have begun to die. When preparing a Copper Sulfate solution in water, the mixing container should be made of plastic or glass, or a painted, enameled, or copper-lined metal container. It is usually best to treat algae on a sunny day when the heavy mats of filamentous algae are most likely to be floating on the surface, allowing the solution to be sprayed directly on the algae. If there is some doubt about the concentration to apply, it is generally best to start with a lower concentration and to increase this concentration until the algae are killed.

ENDANGERED SPECIES RESTRICTION: It is a violation of Federal Law to use any pesticide in a manner that results in the death of an endangered species or adverse modification to their habitat. The use of this product may pose a hazard to certain Federally Designated species known to occur in specific areas. Contact the EPA for information on these areas. Obtain a copy of the EPA Bulletin specific to your area. This bulletin identifies areas within specific State counties where the use of this pesticide is prohibited, unless specified otherwise. The EPA Bulletin is available from either your County Agricultural Extension Agent, the Endangered Species Specialist in your State Wildlife Agency Headquarters, or the appropriate Regional Office of the U.S. Fish and Wildlife Service. THIS BULLETIN MUST BE REVIEWED PRIOR TO PESTICIDE USE.

EPA REG. NO. 56576- EPA EST. NO. 52117-MX-001

* * * Section 16 - Other Information * * *

Other Information

Chem One Ltd. ("Chem One") shall not be responsible for the use of any information, product, method, or apparatus herein presented ("Information"), and you must make your own determination as to its suitability and completeness for your own use, for the protection of the environment, and for health and safety purposes. You assume the entire risk of relying on this Information. In no event shall Chem One be responsible for damages of any nature whatsoever resulting from the use of this product or products, or reliance upon this Information. By providing this Information, Chem One neither can nor intends to control the method or manner by which you use, handle, store, or transport Chem One products. If any materials are mentioned that are not Chem One products, appropriate industrial hygiene and other safety precautions recommended by their manufacturers should be observed. Chem One makes no representations or warranties, either express or implied of merchantability, fitness for a particular purpose or of any other nature regarding this information, and nothing herein waives any of Chem One's conditions of sale. This information could include technical inaccuracies or typographical errors. Chem One may make improvements and/or changes in the product (s) and/or the program (s) described in this information at any time. If you have any questions, please contact us at Tel. 713-896-9966 or E-mail us at Safety@chemone.com. Revision date: 05/31/01

Key/Legend

EPA = Environmental Protection Agency; TSCA = Toxic Substance Control Act; ACGIH = American Conference of Governmental Industrial Hygienists; IARC = International Agency for Research on Cancer; NIOSH = National Institute for Occupational Safety and Health; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration

Contact: Sue Palmer-Koleman, PhD **Contact Phone:** (713) 896-9966

Revision log

07/24/00 4:24 PM SEP Changed company name, Sect 1 and 16, from Corporation to Ltd.
07/27/00 2:49 PM SEP Added "Fine 200, FCC IV, Very High Purity" to synonyms, Section 1
08/23/00 3:15 PM SEP Added "Copper Sulfate Crystals" to synonyms, Section 1
05/31/01 9:31 AM HDF Checked exposure limits; made changes to Sect 9; overall review, add SARA 311/312 Haz Ratings.
06/01/01 7:28 AM HDF Added text to label information from EPA Approved Label
07/24/01 4:31 AM CLJ Add Shipments by Air information to Section 14, Changed contact to Sue, non-800 Chemtrec Num.
09/18/01 11:34 AM SEP Added Domestic Transportation Exception, Sect 14
10/05/01 3:30 PM SEP Deleted Alternate Shipping Name, Sect 14
02/15/02 11:01 AM: HDF Revision of SARA Chronic Hazard Rating to "Yes".
2/21/02 4:21 PM HDF Added more information on Marine Pollutant Markings and Limited Quantity Shipments
223/03: 2:21 pm HDF Addition of chronic health hazard information. Addition of inhalation hazard information, Section 3. Section 4 – expansion of information on Information for Physicians. Up-graded Section 10 Reactivity Information. Up-Dated entire Section 14 Transportation Information to include IATA, IMO transport information.

This is the end of MSDS # C1-121A

APPENDIX D

Specimen MAGNACIDE H® Herbicide Label

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

BAKER HUGHES

Baker Petrolite

MAGNACIDE® H HERBICIDE
(Acrolein, Inhibited)

CONTENTS UNDER PRESSURE

DANGER POISON

KEEP OUT OF REACH OF CHILDREN

EPA Reg. No. 10707-9 EPA Est. 10707-CA-005

ACTIVE INGREDIENT	BY WEIGHT
Acrolein	95%
INERT INGREDIENTS	5%
TOTAL	100%

This product contains the toxic inert ingredient hydroquinone.
(MAGNACIDE® H Herbicide contains 6.7 pounds of active ingredient per gallon.)

PRECAUTIONARY STATEMENTS
HAZARDS TO HUMANS AND DOMESTIC ANIMALS

DANGER

EXTREMELY FLAMMABLE AND IRRITATING VAPOR AND LIQUID. POISONOUS BY INHALATION, SKIN CONTACT OR SWALLOWING. DO NOT BREATHE VAPOR. CORROSIVE. CAUSES EYE AND SKIN DAMAGE. DO NOT GET IN EYES, ON SKIN OR ON CLOTHING. KEEP AWAY FROM FIRE, SPARKS AND HEATED SURFACES.

When setting up and breaking down application equipment, a full-face air purifying respirator with organic vapor (OV) cartridges jointly approved by the Mine Safety and Health Administration (MSHA) and the National Institute of Occupational Safety and Health (NIOSH) and butyl rubber gloves must be worn. For visual inspection during treatment, chemical splash goggles must be worn. If spilled on clothing, gloves, or shoes, remove them immediately and wash thoroughly with soap and water before reuse. Use with adequate ventilation.

ENVIRONMENTAL HAZARDS

This product is toxic to fish and wildlife. Keep out of lakes, streams or ponds. Fish, shrimp and crabs will be killed at application rates recommended. Do not apply where they are important resources. Do not apply to water drainage areas where runoff or flooding will contaminate ponds, lakes, streams, tidal marshes and estuaries. Do not contaminate water by cleaning of equipment or disposal of wastes. Notify your State Fish and Game Agency before applying this product. Use only as specified.

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) 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.

FIRST AID

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.
- Call a poison control center or doctor for further treatment advice.

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 in eyes:
- Hold eye open and rinse slowly and gently with water for 15-20 minutes.
- Remove contact lenses, if present, after 5 minutes, then continue rinsing eye.
- 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 the poison control center or doctor.
- Do not give anything by mouth to an unconscious person.

Have the product container, label or application manual with you when calling a poison control center or doctor, or going for treatment. CALL A PHYSICIAN IMMEDIATELY IN ALL CASES OF SUSPECTED POISONING.

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 eye. 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 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.

DIRECTIONS FOR USE

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

STORAGE AND DISPOSAL

STORAGE OF MAGNACIDE® H HERBICIDE TANKS

All containers of MAGNACIDE® H Herbicide should be stored in a secured, well-ventilated area, away from all other chemicals. No alkalies or oxidizing materials should be near. Any electrical equipment should be Class 1 - Division 2 and properly grounded. Do not reuse empty container. Return empty containers to Baker Petrolite Corporation.

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 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.

NOTICE OF WARRANTY

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.

NET WEIGHTS

Cylinder-370 lbs. Skid Tank-2450 lbs.

Acrolein, Inhibited, 6.1, (3), UN 1092, PG I, Toxic-Inhalation Hazard, Zone A, Marine Pollutant, RQ

PC 0801

MANUFACTURED BY: BAKER PETROLITE CORPORATION 12645 W. Airport Blvd., Sugar Land, TX 77478 Customer Care: 800-872-1916

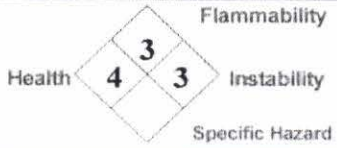
BAKER HUGHES
Baker Petrolite

Material Safety Data Sheet

Section 1. Chemical Product and Company Identification

Product Name	**MAGNACIDE® H HERBICIDE**	Code	XCH
Supplier	Baker Petrolite A Baker Hughes Company 12645 W. Airport Blvd. (77478) P.O. Box 5050 Sugar Land, TX 77487-5050 For Product Information/MSDSs Call: 800-231-3606 (8:00 a.m. - 5:00 p.m. cst, Monday - Friday) 281-276-5400	Version	10.0
Material Uses	Herbicide	Effective Date	**08/21/2009**
24 Hour Emergency Numbers	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)	Print Date	08/21/2009
			® a trademark of Baker Hughes, Inc.

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



Section 2. Hazards Identification

Physical State and Appearance	State: Liquid., Color: Colorless to light yellow., Odor: Aldehyde like.
CERCLA Reportable Quantity	Acrolein, 0.15 gal. of this product. Hydroquinone, 4401 gal. of this product.
Hazard Summary	DANGER. May be highly toxic if inhaled.. May cause chronic effects. Flammable liquid. Vapors can form an ignitable or explosive mixture with air. Can form explosive mixtures at temperatures at or above the flash point. Vapors can flow along surfaces to a distant ignition source and flash back. Static discharges can cause ignition or explosion when container is not bonded. May be toxic by skin absorption. May cause skin sensitization (allergic reaction).
Routes of Exposure	Skin (Permeator), Skin (Contact), Eyes, Inhalation.
Potential acute health effects	
Eyes	May be severely irritating to the eyes. Prolonged contact may cause burns.
Skin	May be severely irritating to the skin. May cause burns on prolonged contact. Skin sensitizer. May cause allergic skin reactions with repeated exposure. May be toxic if absorbed through the skin.
Inhalation	May be highly toxic if inhaled.
Ingestion	Not considered a likely route of exposure, however, may be toxic if swallowed.
Medical Conditions aggravated by Exposure	Exposure to this product may aggravate medical conditions involving the following: cardiovascular system, respiratory tract, skin/epithelium, eyes.

See Toxicological Information (section 11)

Continued on Next Page

Additional Hazard Identification Remarks	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

Name	CAS #	% by Weight
Acrolein	107-02-8	95

See Section 8 for information on permissible exposure limits and threshold limit values.

Section 4. First Aid Measures

Eye Contact	Immediately flush the eye(s) continuously with lukewarm, gently flowing water for at least 20-60 minutes while holding the eyelid(s) open. Get 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 at least 20-60 minutes). Get medical attention if irritation occurs.
Inhalation	Remove to fresh air. Oxygen may be administered if breathing is difficult. If not breathing, administer artificial respiration and seek medical attention. Get medical attention if symptoms appear.
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 of water. Never induce vomiting or give anything by mouth to a victim who is unconscious or having convulsions.
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.
Additional First Aid Remarks	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

Flammability of the Product	Flammable liquid. Vapors can form an ignitable or explosive mixture with air. Can form explosive mixtures at temperatures at or above the flash point. Vapors can flow along surfaces to a distant ignition source and flash back. Static discharges can cause ignition or explosion when container is not bonded.
OSHA Flammability Class	IB

Continued on Next Page

Products of Combustion	These products are carbon oxides (CO, CO2) Peroxides..
Fire Hazards in Presence of Various Substances	Open Flames/Sparks/Static. Heat.
Fire Fighting Media and Instructions	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.
Protective Clothing (Fire)	Do not enter fire area without proper personal protective equipment, including NIOSH approved self-contained breathing apparatus.
Special Remarks on Fire Hazards	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

Spill	General Information: 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. Large Spill: Vapor suppression: if available, blanket spill area with alcohol-resistant foam 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. Small Spill (< 1 pound) 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.
Other Statements	If RQ (Reportable Quantity) is exceeded, report to National Spill Response Office at 1-800-424-8802.
Additional Accidental Release Measures Remarks	Not available.

Continued on Next Page

Section 7. Handling and Storage

Handling and Storage	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.
Additional Handling and Storage Remarks	Do not reuse empty container. Return empty containers to Baker Petrolite Corporation, 19815 South Lake Road, Taft, CA 93268.

Section 8. Exposure Controls/Personal Protection

Exposure Limits	Acrolein	**ACGIH (United States). Skin** CEIL: 0.1 ppm **OSHA PEL 1989 (United States).** TWA: 0.1 ppm 8 hours. TWA: 0.25 mg/m³ 8 hours.
Additional Information on Exposure Limits	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 Corporation recommends that these lower exposure levels be observed as reasonable worker protection.	
Engineering Controls	Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors or particles below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.	

Personal Protection

Personal Protective Equipment recommendations are based on anticipated known manufacturing and use conditions. These conditions are expected to result in only incidental exposure. A thorough review of the job tasks and conditions by a safety professional is recommended, however, to determine the level of personal protective equipment appropriate for these job tasks and conditions.

Eyes	Chemical safety goggles.
Body	Long sleeved shirts and work pants.
Respiratory	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
Hands	Chemical resistant gloves. Butyl rubber gloves.Replace as needed.
Feet	Chemical resistant boots or overshoes.
Other information	Not available.

Additional Exposure Control Remarks	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.

Continued on Next Page

Section 9. Physical and Chemical Properties

Physical State and Appearance	Liquid.	Odor	Aldehyde like.
pH	Not available.	Color	Colorless to light yellow.
Specific gravity	0.846 - 0.858 @ 16°C (60°F)		
Density	7.05 - 7.15 lbs/gal @ 16°C (60°F)		
Flash Points	Closed cup: -25°C (-13°F). (TCC)		
Flammable Limits	L.E.L. 2.8% U.E.L. 31%		
Autoignition Temperature	220°C (428°F)		
Initial Boiling Point	Not available.		
Boiling Point	53°C (127°F)		
Vapor Density	1.93 (Air = 1)		
Vapor Pressure	234.9 - mm Hg @ 22°C (72°F)		
Evaporation Rate	>1 (compared with Ether (anhydrous)).		
VOC	Not available.		
Viscosity	0 - 0 cP @ 20°C (68°F)		
Pour Point	-86.7°C(-124°F)		
Solubility (Water)	Soluble (22% by weight @ 20°C)		
Physical Chemical Comments	Not available.		

Section 10. Stability and Reactivity

Stability and Reactivity	The product is stable.
Conditions of Instability	This product is stable unless there is loss of inhibitor.
Incompatibility with Various Substances	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 and peroxides.
Hazardous Polymerization	Hazardous polymerization may occur.
Special Stability & Reactivity Remarks	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.

Continued on Next Page

Section 11. Toxicological information

Component Toxicological Information

Acute Animal Toxicity

Acrolein	ORAL (LD50): Acute: 29 mg/kg [Rat]. 11.8 mg/kg [Female rat]. 10.3 mg/kg [Male rat]. DERMAL (LD50): Acute: 231.4 mg/kg [Rabbit]. VAPOR (LC50): Acute: 26 ppm 1 hours [Rat]. 8.3 ppm 4 hours [Rat]. 18 mg/m^3 4 hours [Rat].

Chronic Toxicity Data

1) Acrolein

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 two-generation 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).

Inhalation toxicity study

Rats were exposed by inhalation (6h/day 5 d/week for 62 days) to 0, 0.4, 1.4 and 4.0 ppm acrolein. Mortality was only observed in the 4 ppm group and was due mainly to acute bronchopneumonia. Weight gain in the 4 ppm group was significantly slower than the control group. Examination of the 4 ppm group revealed bronchiolar epithelial necrosis and sloughing and edema (Ref. 8).

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

Continued on Next Page

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).

Product Toxicological Information

Acute Animal Toxicity	ORAL (LD50): Acute: 29 mg/kg [Rat]. 11.8 mg/kg [Female rat]. 10.3 mg/kg [Male rat]. DERMAL (LD50): Acute: 231.4 mg/kg [Rabbit]. VAPOR (LC50): Acute: 26 ppm 1 hours [Rat]. 8.3 ppm 4 hours [Rat].
Target Organs	cardiovascular system, respiratory tract, skin/epithelium, eyes.
Other Adverse Effects	

Section 12. Ecological Information

Ecotoxicity	Not available.
BOD5 and COD	Not available.
Biodegradable/OECD	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 half-life of acrolein in freshwater ranged from six to ten hours (Ref. 20). 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 (Ref.21).
Toxicity of the Products of Biodegradation	Not available.
Special Remarks	This product is very toxic to aquatic organisms: Bluegill sunfish (Lepomis macrochirus): 96H LC50 24 ppb Rainbow trout (Oncorhynchus mykiss): 6H LC50 24 ppb Water flea (Daphnia magna): 48H LC50 22 ppb Eastern oysters (Crassostrea virginica): 96H EC50 180 ppb Mysid shrimp (Mysidopsis bahia): 96H LC50 500 ppb Mysid shrimp (Holmesimysis costata) 96H LC50: 790 ppb Sheepshead minnows (Cyprinodon variegatus) 96H LC50: 570 ppb Marine copepod (Acartia tonsa): 48H LC50 55 ppb Saltwater diatom (Skeletonema costatum) 120H EC50: 27 ppb

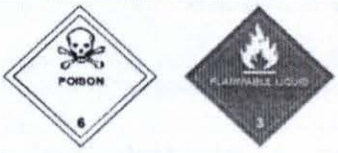
Section 13. Disposal Considerations

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.

Continued on Next Page

Additional Waste Remarks	Do not reuse empty container. Return empty containers to Baker Petrolite Corporation, 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	Acrolein, stabilized, 6.1(3), UN1092, I	
DOT Reportable Quantity	Acrolein, 0.15 gal. of this product. Hydroquinone, 4401 gal. of this product.	
Marine Pollutant	Acrolein.	
Additional DOT Information	Toxic-Inhalation Hazard, Zone A DOT SP-14341 (DOT: SP-14341 applies only to 4BW welded cylinders.)	
Emergency Response Guide Number	131P	

Section 15. Regulatory Information

HCS Classification	Target organ effects. Flammable liquid. Toxic.
U.S. Federal Regulations	
Environmental Regulations	Extremely Hazardous Substances: Acrolein; SARA 313 Toxic Chemical Notification and Release Reporting: Acrolein; SARA 302/304 Emergency Planning and Notification substances: Acrolein; Hazardous Substances (CERCLA 302): Acrolein, 0 gal. of this product.; SARA 311/312 MSDS distribution - chemical inventory - hazard identification: fire; reactive; immediate health hazard; Clean Water Act (CWA) 307 Priority Pollutants: Acrolein; Clean Water Act (CWA) 311 Hazardous Substances: Acrolein; Clean Air Act (CAA) 112(r) Accidental Release Prevention Substances: Acrolein;
Threshold Planning Quantity (TPQ)	Acrolein 74 gal.
TSCA Inventory Status	All components are included or are exempted from listing on the US Toxic Substances Control Act Inventory. This product does not contain any components that are subject to the reporting requirements of TSCA Section 12(b) if exported from the United States.
State Regulations	State specific information is available upon request from Baker Petrolite.

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International Regulations	
Canada	All components are compliant with or are exempted from listing on the Canadian Domestic Substance List.
WHMIS (Canada)	B-2, D-1A, E
European Union	All components are included or are exempted from listing on the European Inventory of Existing Commercial Chemical Substances or the European List of Notified Chemical Substances.
	International inventory status information is available upon request from Baker Petrolite for the following countries: Australia, China, Korea (TCCL), Philippines (RA6969), or Japan.
Other Regulatory Information	No further regulatory information is available.

Section 16. Other Information

Other Special Considerations

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10/07/02 - Update to Section 3
10/31/02 - Update to Section 14
11/06/02 - Update to sections 5, 8, 14, and 15 (Canada)
04/29/03 - Update to Section 2
05/05/03 - Update to Section 7
12/30/03 - Changes to Sections 2, 3, 8, 10, and 11.
05/18/04 – Changes to Sections 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 and 16.
01/25/05 – Changes to Sections 3 and 11.
01/08/07 – Changes to Section 15.
03/18/09 - Changes to sections 2, 3, 5, 8, 9, and 15.
08/21/09 - Changes to section 5 and 6.

Specimen Label

Nautique*

Aquatic Herbicide

For control of floating, emersed, and submersed vegetation in still or flowing aquatic sites such as potable water sources, lakes, rivers, reservoirs, and ponds, slow-flowing or quiescent water bodies, crop and non-crop irrigation systems (canals, laterals, and ditches), fish, golf course, ornamental, swimming, and fire ponds and aquaculture including fish and shrimp.

Active Ingredient	
Copper Carbonate†	15.9%
Inert Ingredients	84.1%
TOTAL	100.0%

†Metallic copper equivalent, 9.1%.

Keep Out of Reach of Children

DANGER / PELIGRO

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.)

Precautionary Statements

Hazards to Humans and Domestic Animals

DANGER: Corrosive. Causes irreversible eye damage and skin burn. May be fatal if absorbed through skin. Harmful if swallowed. Do not get in eyes on skin or on clothing. Wear goggles, face shield, or safety glasses, protective clothing and chemical-resistant gloves. Prolonged or frequently repeated skin contact may cause allergic reactions in some individuals. Wash thoroughly with soap and water after handling and before eating, drinking and using tobacco. Remove contaminated clothing and wash before reuse.

Environmental Hazards

Fish toxicity is dependent on the hardness of the water. In soft water, trout and other species of fish may be killed at application rates recommended on this label. Do not use in waters containing trout or other sensitive species if the carbonate hardness of the water is less than 50 ppm. Fish toxicity generally decreases when the hardness of water increases. Do not treat more than one-half of lake or pond at one time to avoid depletion of oxygen levels due to decaying vegetation. Consult State Fish and Game Agency or other responsible Agency before applying this product to public waters.

First Aid	
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 poison control center or doctor for treatment advice.
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 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.

Note to Physician: Probable mucosal damage may contraindicate the use of gastric lavage.
Have the product container or label with you when calling a poison control center or doctor, or going for treatment.
In case of emergency endangering health or the environment involving this product, call **INFOTRAC** at **1-800-535-5053**.

Refer to inside of label booklet for additional precautionary information and Directions for Use.

Notice: Read the entire label before using. Use only according to label directions. Before buying or using this product, read **"Warranty Disclaimer", "Inherent Risks of Use"** and **"Limitation of Remedies"** inside label booklet.

For product information, visit our web site at **www.sepro.com**.

EPA Reg. No. 67690-10
FPL 070705

*Trademark of SePRO Corporation.
SePRO Corporation Carmel, IN 46032 U.S.A.

Directions for Use

It is a violation of Federal Law to use this product in a manner inconsistent with its label directions.

GENERAL INFORMATION

Nautique may be applied to potable water sources, lakes, rivers, reservoirs, ponds, slow-flowing or quiescent water bodies, crop and non-crop irrigation systems (ditches, canals, and laterals), fish, golf course, ornamental, swimming, and fire ponds, and aquaculture including fish and shrimp. In waters with greater calcium carbonate hardness, the higher use rates are recommended for improved plant control.

Target Species

Nautique Aquatic Herbicide is a double chelated copper formulation that provides effective control of floating, submersed, and emersed aquatic plants having a sensitivity to copper absorption including:

Coontail
Curlyleaf Pondweed
Egeria (*Brazilian Elodia*)
Elodea
Eurasian Watermilfoil†
Horned Pondweed†
Hydrilla
Naiads
Thin Leaf Pondweed
Vallisneria
Water Lettuce
Water Hyacinth
Widgeon Grass
Pondweed (e.g., Sago, American,)†

†Variable control may be obtained in waters with greater calcium carbonate hardness.

Timing of Treatments

When target vegetation is actively growing, apply Nautique Aquatic Herbicide to the area of greatest concentration of foliage in such a way as to evenly distribute the herbicide. In lakes, reservoirs, ponds, and static canals, the application site is defined by this label as the specific location where Nautique is applied. In slow moving and flowing canals and rivers, the application site is defined by this label as the target location for plant control. In order to maximize effectiveness, apply Nautique early in the day under bright or sunny conditions when water temperatures are at least 60° F (15° C). The activity of this product may be reduced if there is insufficient penetration of light into the water or if the plants and weeds are covered with silt, scale, or algae. If algae mats are thick, use high pressure when spraying to break up the algae mats.

Dissolved Oxygen Consideration

Treatment of aquatic plants and weeds can result in a reduction of dissolved oxygen due to the decomposition of the dead vegetation. This loss of dissolved oxygen can cause fish suffocation. To minimize this possible hazard treat 1/3 to 1/2 of the water area in a single operation, then wait 10 - 12 days before treating the remaining area. Begin treatment in the shallow areas, gradually proceeding outward in bands to permit the fish to move into the untreated area.

Application Options

Nautique Aquatic Herbicide can be applied directly as a surface spray, subsurface through trailing weighted hoses, or in combination with other aquatic herbicides and algaecides, surfactants, sinking agents, polymers, or penetrants. These products are used to improve the retention time, sinking, and distribution of the herbicide. For surface application, this product may be applied diluted or undiluted, whichever is most suitable to insure uniform coverage of the area to be treated.

Aquatic plants and weeds will typically drop below the surface within 4 - 7 days after treatment. The complete results of treatment will be observed in 3 - 4 weeks in most cases. In heavily infested areas a second application may be necessary after 10 - 12 weeks. Repeating application of this product too soon after initial application may have no effect.

Use the lower rates for treating shallow water and the higher rates for treating deeper water and heavier infestations. Surface applications may be made from shore into shallow water along the shoreline.

Nautique Aquatic Herbicide inverts easily using either tank-mix or multi-fluid mixer techniques. For submersed plants invert applications should be made through weighted hoses dragged below the water surface; for heavy infestations, direct application is preferable.

NO RESTRICTIONS ON WATER USE

Waters treated with Nautique may be used immediately after application for swimming, fishing, drinking, livestock watering, or irrigating turf and ornamental plants.

Permits

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

APPLICATION RATES

Recommended application rates in the chart below are based on minimal water flow in ponds, lakes, reservoirs, and irrigation conveyance or drainage systems. Treatments that extend chemical contact time with target vegetation will generally result in improved efficacy. In lakes, reservoirs, ponds, and static canals, the application site is defined by this label as the specific location where Nautique is applied. In conveyance systems where significant water flow results in rapid off-site movement of copper, consult the Flowing Water Treatment Instructions for the recommended application instructions.

APPLICATION RATES		GALLONS PER SURFACE ACRE				LITERS PER SURFACE HECTARE			
		Depth in Feet				Depth in meters			
Relative Density	**ppm**	**1**	**2**	**3**	**4[2]**	**0.5**	**0.75**	**1.0**	**1.25[2]**
Low	.5	1.5	3.0	4.5	6.0	12.0	24.1	36.1	48.2
Density	.6	1.8	3.6	5.4	7.2	14.9	29.8	44.7	59.6
Medium	.7	2.1	4.2	6.3	8.4	17.2	34.4	51.6	68.8
Density	.8	2.4	4.8	7.3	9.6	19.5	39.0	58.5	78.0
High	.9	2.7	5.4	8.1	10.8	21.8	43.6	65.4	87.2
Density	1.0[3]	3.0	6.0	9.0	12.0	24.1	48.2	72.3	96.4

[1] For depths greater than 4 ft. (1.25 m) add rates given for the sum of the corresponding depths in the chart.
[2] Do not apply more than 1.0 ppm copper per application.

Free-Floating Plants Apply Nautique at a rate of 8 - 12 gallons/acre for control of water hyacinth and salvinia and 4 - 6 gallons/acre for control of water lettuce. Add Nautique and appropriate surfactant to 100 gallons of water and use an adequate spray volume to insure good coverage of the plant.

TANK-MIX

Nautique + Sonar* A.S. Tank-Mix (Except CA)

The following mixture can be used to provide rapid control of dense infestations of coontail, duckweed, egeria, elodea, Eurasian watermilfoil, hydrilla, sago and American pondweed, naiads, and other susceptible species. Apply 1 to 4 gallons of Nautique per surface acre in conjunction with normal Sonar rates. Observe all cautions and restrictions on the labels of both products used in this mixture.

Nautique + Reward® Tank-Mix

The following mixture can be used to enhance control of coontail, duckweed, egeria, elodea, Eurasian watermilfoil, hydrilla, pondweeds (Potamogeton species), salvinia, water lettuce, water hyacinth, and other susceptible species. Tank-mix a ratio of 2:1 or 1.5:1 Nautique to Reward. This can be applied as a tank mix or metered in as a concentrate. The addition of a surfactant is recommended to enhance performance on floating plants. Observe all cautions and restrictions on the labels of both products used in this mixture. **DO NOT MIX CONCENTRATES IN TANK WITHOUT FIRST ADDING WATER.**

FLOWING WATER TREATMENT:

Drip System or Metering Pump Application for Canals, Ditches, and Laterals

This product should be applied as soon as submersed macrophytes begin to interfere with normal delivery of water (clogging of lateral head gates, suction screens, weed screens, and siphon tubes). Delaying treatment could perpetuate the problem causing massing and compacting of plants. Heavy infestations and low flows may result in pooling or uneven chemical distribution resulting in unsatisfactory control. Under these conditions increasing the water flow rate during application may be necessary. In flowing canals the application site is defined by this label as the target location for aquatic plant control.

To achieve desired control with Nautique herbicide in flowing waters, it is recommended that a minimum exposure period of three hours be maintained. Other factors to consider include: plant species and density of infestation and water temperature and hardness. Treatment on bright sunny days will tend to enhance efficacy of this product.

1. Treatment with Nautique requires accurate calculations of water flow rates. Devices that provide accurate flow measurements such as weirs or orifices are the preferred method, however, the volume of water to be treated may also be estimated using the following formula:

   Average width (ft.) x Average Depth (ft.) x
   Average Velocity (ft./sec.) = Cubic Feet per Second (CFS)

   The velocity can be estimated by determining the length of time it takes a floating object to travel a defined distance. Divide the distance (ft.) by the time (sec.) to estimate velocity (ft./sec). This measure should be repeated 3 times at the intended application site and then calculate the average velocity.

2. After accurately determining the water flow rate in C.F.S. or gallons/minute, find the corresponding drip rate in the chart below.

Water Flow Rate		ppm Copper	Chemical Drip Rate	
C.F.S.	Gal/Min.		Quart/Hr.	Ml/Min.
1	450	0.5 – 1.0	0.5 – 1.0	8.0 – 16.0
2	900	0.5 – 1.0	1.0 – 2.0	16.0 – 32.0
3	1350	0.5 – 1.0	1.5 – 3.0	23.5 – 47.0
4	1800	0.5 – 1.0	2.0 – 4.0	31.5 – 63.0
5	2250	0.5 – 1.0	2.5 – 5.0	39.5 – 79.0

Calculate the amount of product needed to maintain the drip rate for a treatment period of 3 or more hours by multiplying quart/hr x 3; ml / min. by 180; or fl. oz. / min x 180. Dosage will maintain 1.0 ppm copper concentration in the treated water for the treatment period. Introduction of the chemical should be made in the channel at weirs or other turbulence-creating structures to promote the dispersion of the chemical.

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 stopwatch and appropriate measuring container to set the desired drip rate. Readjust accordingly if the canal flow rate changes during the treatment period. This product can also be applied by using metering pumps that adjust to flow rates in the canal.

Results can vary depending upon species and density of vegetation, desired distance of control and flow rate, and impact of water quality on copper residues and efficacy. Consult an Aquatic Specialist to determine optimal use rate and treatment period under local conditions. Periodic maintenance treatments may be required to maintain seasonal control.

Irrigation Ponds

When applying to irrigation ponds, it is best to hold water for a minimum of 3 hours before irrigating to ensure proper exposure of Nautique at targeted rates to plants. If water is to be continually pumped from the treated system during application, application techniques (drip, injection, or multiple spray applications) should be made to compensate for dilution of Nautique within the targeted area.

GENERAL TREATMENT NOTES

The following suggestions apply to the use of this product as an algaecide or herbicide in all approved use sites. For optimum effectiveness:

- Apply early in the day under calm, sunny conditions when water temperatures are at least 60° F.
- Treat when growth first begins to appear or create a nuisance, if possible.
- Apply in a manner that will ensure even distribution of the chemical within the treatment area.
- Re-treat areas if regrowth begins to appear and seasonal control is desired. Allow one to two weeks between consecutive treatments.
- Allow seven to ten days to observe the effects of treatment (bleaching and breaking apart of plant material).

Storage and Disposal

Store in a cool, dry place.

PESTICIDE DISPOSAL: Do not contaminate water, food or feed by storage and disposal. Wastes resulting from the use of this product may be disposed of on site or at an approved waste disposal facility. 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 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: Triple rinse (or equivalent). Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or incinerate, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke.

Warranty Disclaimer

SePRO Corporation warrants that the product conforms to the chemical description on the label and is reasonably fit for the purposes stated on the label when used in strict accordance with the directions, subject to the inherent risks set forth below. SEPRO CORPORATION MAKES NO OTHER EXPRESS OR IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR ANY OTHER EXPRESS OR IMPLIED WARRANTY.

Inherent Risks Of Use

It is impossible to eliminate all risks associated with use of this product. Plant injury, lack of performance, or other unintended consequences may result because of such factors as use of the product contrary to label instructions (including conditions noted on the label, such as unfavorable temperatures, soil conditions, etc.), abnormal conditions (such as excessive rainfall, drought, tornadoes, hurricanes), presence of other materials, the manner of application, or other factors, all of which are beyond the control of SePRO Corporation as the seller. All such risks shall be assumed by the buyer.

Limitation of Remedies

The exclusive remedy for losses or damages resulting from this product (including claims based on contract, negligence, strict liability, or other legal theories) shall be limited to, at SePRO Corporation's election, one of the following:

1. Refund of purchase price paid by buyer or user for product bought, or
2. Replacement of amount of product used.

SePRO Corporation shall not be liable for losses or damages resulting from handling or use of this product unless SePRO Corporation is promptly notified of such losses or damages in writing. In no case shall SePRO Corporation be liable for consequential or incidental damages or losses.

The terms of the Warranty Disclaimer above and this Limitation of Remedies can not be varied by any written or verbal statements or agreements. No employee or sales agent of SePRO Corporation or the seller is authorized to vary or exceed the terms of the Warranty Disclaimer or Limitations of Remedies in any manner.

Conforms to ANSI Z400.5-2004 Standard (United States).

Material Safety Data Sheet

Nautique* Aquatic Herbicide

1. Product and company identification

Product name	: Nautique* Aquatic Herbicide
EPA Registration Number	: 67690-10
Material uses	: Aquatic plant herbicide.
Supplier/Manufacturer	: **SePRO Corporation** 11550 North Meridian Street Suite 600 Carmel, IN 46032 U.S.A. Tel: 317-580-8282 Toll free: 1-800-419-7779 Fax: 317-428-4577 Monday - Friday, 8am to 5pm E.S.T. **www.sepro.com**
Responsible name	: KMK Regulatory Services inc.
In case of emergency	: **INFOTRAC - 24-hour service 1-800-535-5053**

2. Hazards identification

Physical state	: Liquid.
Odor	: Ammoniacal. [Slight]
OSHA/HCS status	: This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
Emergency overview	: **DANGER!** **CAUSES RESPIRATORY TRACT, EYE AND SKIN BURNS. MAY CAUSE SEVERE ALLERGIC RESPIRATORY AND SKIN REACTION. HARMFUL IF ABSORBED THROUGH SKIN. MAY BE HARMFUL IF SWALLOWED. CONTAINS MATERIAL THAT CAN CAUSE TARGET ORGAN DAMAGE.** Harmful if absorbed through the skin. Corrosive to the eyes, skin and respiratory system. Causes burns. May be harmful if swallowed. May cause sensitization by inhalation and skin contact. Avoid exposure - obtain special instructions before use. Do not breathe vapor or mist. Do not ingest. Do not get in eyes or on skin or clothing. Contains material that can cause target organ damage. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling.
Routes of entry	: Dermal contact. Eye contact. Inhalation. Ingestion.
Potential acute health effects	
Inhalation	: Corrosive to the respiratory system. May cause sensitization by inhalation. Exposure to decomposition products may cause a health hazard. Serious effects may be delayed following exposure.
Ingestion	: Harmful if swallowed. May cause burns to mouth, throat and stomach.
Skin	: Corrosive to the skin. Causes burns. Toxic in contact with skin. May cause sensitization by skin contact.
Eyes	: Corrosive to eyes. Causes burns.
Potential chronic health effects	
Chronic effects	: Contains material that can cause target organ damage.
Carcinogenicity	: No known significant effects or critical hazards.
Mutagenicity	: No known significant effects or critical hazards.
Teratogenicity	: No known significant effects or critical hazards.
Developmental effects	: No known significant effects or critical hazards.
Fertility effects	: No known significant effects or critical hazards.
Target organs	: Contains material which causes damage to the following organs: kidneys, liver, upper respiratory tract, skin, eye, lens or cornea.
Over-exposure signs/symptoms	

Inhalation	: Adverse symptoms may include the following: respiratory tract irritation coughing wheezing and breathing difficulties asthma
Ingestion	: Adverse symptoms may include the following: stomach pains
Skin	: Adverse symptoms may include the following: pain or irritation redness blistering may occur
Eyes	: Adverse symptoms may include the following: pain watering redness
Medical conditions aggravated by over-exposure	: Pre-existing respiratory and skin disorders and disorders involving any other target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product.

See toxicological information (section 11)

3 . Composition/information on ingredients

United States		
Name	**CAS number**	**%**
1,2-Diaminoethane	107-15-3	10 - 30
Triethanolamine	102-71-6	10 - 30
Copper (II) Carbonate Basic	12069-69-1	10 - 30

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

4 . First aid measures

Eye contact	: Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 20 minutes. Get medical attention immediately.
Skin contact	: In case of contact, immediately flush skin with plenty of water for at least 20 minutes. Get medical attention immediately.
Inhalation	: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.
Ingestion	: Do not induce vomiting. Never give anything by mouth to an unconscious person. Get medical attention immediately.
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.
Notes to physician	: In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

5 . Fire-fighting measures

Flammability of the product	: Flammable.
Extinguishing media	
Suitable	: Use an extinguishing agent suitable for the surrounding fire.
Not suitable	: None known.
Hazardous thermal decomposition products	: Decomposes above 390°F (200°C). May form oxides of carbon and nitrogen.
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.

6 . Accidental release measures

Personal precautions : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see section 8).

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).

Methods for cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble or absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

7 . Handling and storage

Handling : Put on appropriate personal protective equipment (see section 8). 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. Persons with a history of skin sensitization problems or asthma, allergies or chronic or recurrent respiratory disease should not be employed in any process in which this product is used. Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Do not ingest. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage : Store in accordance with local regulations. 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. 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.

8 . Exposure controls/personal protection

	United States
Product name	**Exposure limits**
1,2-Diaminoethane	**ACGIH TLV (United States, 1/2006). Skin** TWA: 25 mg/m³ 8 hour(s). **NIOSH REL (United States, 12/2001).** TWA: 25 mg/m³ 10 hour(s). **OSHA PEL (United States, 11/2006).** TWA: 25 mg/m³ 8 hour(s).
Triethanolamine	**ACGIH TLV (United States, 1/2006).** TWA: 5 mg/m³ 8 hour(s).

Consult local authorities for acceptable exposure limits.

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment. **Applicators should refer to the product label for personal protective clothing and equipment.**

Engineering measures : Use only with adequate ventilation. If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

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. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.
Personal protection	
	Applicators should refer to the product label for personal protective clothing and equipment.
Eyes	: Face shield.
Skin	: Synthetic apron. Boots.
Respiratory	: Vapor respirator.
Hands	: Nitrile gloves.
Personal protective equipment (Pictograms)	: 
HMIS Code/Personal protective equipment	: D
Environmental exposure controls	: Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

9 . Physical and chemical properties

Physical state	: Liquid.
Color	: Purple. [Dark]
Odor	: Ammoniacal. [Slight]
pH	: 12.03 [Conc. (% w/w): 1%]Typical
Relative density	: 1.2

10 . Stability and reactivity

Stability	: The product is stable.
Hazardous polymerization	: Under normal conditions of storage and use, hazardous polymerization will not occur.
Conditions to avoid	: No specific data.
Materials to avoid	: Reactive or incompatible with the following materials: Strong acids and nitrites. Should not be used in water where the pH is less than 6.0 due to the possible breakdown of the copper chelate, which could form copper ions, which would precipitate. Should not be applied to water when temperature of the water is below 60°F (15°C).
Hazardous decomposition products	: Under normal conditions of storage and use, hazardous decomposition products should not be produced. Highly flammable in the presence of the following materials or conditions: open flames, sparks and static discharge. Flammable in the presence of the following materials or conditions: heat.

11 . Toxicological information

Acute toxicity

Product/ingredient name	Species	Dose	Result	Exposure
Nautique* Aquatic Herbicide	Rabbit - Male, Female	700 mg/kg	LD50 Dermal	-
	Rat - Male, Female	0.68 g/kg	LD50 Oral	-
	Rat - Male, Female	2100 g/m³	LC50 Inhalation Vapor	4 hours

Inhalation : Corrosive to the respiratory system. May cause sensitization by inhalation. Exposure to decomposition products may cause a health hazard. Serious effects may be delayed following exposure.

Ingestion : Harmful if swallowed. May cause burns to mouth, throat and stomach.

Skin : Corrosive to the skin. Causes burns. Toxic in contact with skin. May cause sensitization by skin contact.

Eyes : Corrosive to eyes. Causes burns.

Carcinogenicity

Classification

Product/ingredient name	ACGIH	IARC	EPA	NIOSH	NTP	OSHA
1,2-Diaminoethane	A4	-	-	-	-	-
Triethanolamine	-	3	-	-	-	-

12 . Ecological information

Environmental effects : No known significant effects or critical hazards.

Aquatic ecotoxicity

Product/ingredient name	Test	Species	Exposure	Result
1,2-Diaminoethane	Population	Algae	48 hours	Acute EC50 >100 mg/L
	Mortality	Fish	96 hours	Acute LC50 275 mg/L
	Mortality	Fish	96 hours	Acute LC50 220 mg/L
	Mortality	Fish	96 hours	Acute LC50 115.7 mg/L
	Mortality	Fish	96 hours	Acute LC50 1544.7 mg/L

Remark: It is reasonable to assume that Copper compounds contain Arsenic, Cadmium, Chromium, and Lead in concentrations ranging from a few parts per billlion to several hundred parts per million.

13 . Disposal considerations

Waste disposal : The generation of waste should be avoided or minimized wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

AERG : 153

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
DOT Classification	UN2735	AMINES, LIQUID, CORROSIVE, N.O.S. (1,2-Diaminoethane)	8	III		-
IMDG Class	UN2735	AMINES, LIQUID, CORROSIVE, N.O.S. (1,2-Diaminoethane)	8	III		-
IATA-DGR Class	UN2735	AMINES, LIQUID, CORROSIVE, N.O.S. (1,2-Diaminoethane)	8	III		-

PG* : Packing group

15 . Regulatory information

United States

HCS Classification : Toxic material
Corrosive material
Sensitizing material
Target organ effects

U.S. Federal regulations : **United States inventory (TSCA 8b):** All components listed.
TSCA precursor chemical list: Triethanolamine

SARA 302/304/311/312 extremely hazardous substances: 1,2-Diaminoethane
SARA 302/304 emergency planning and notification: 1,2-Diaminoethane
SARA 302/304/311/312 hazardous chemicals: Copper (II) Carbonate Basic; 1,2-Diaminoethane; Triethanolamine
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: Copper (II) Carbonate Basic: Delayed (chronic) health hazard; 1,2-Diaminoethane: Fire hazard, Immediate (acute) health hazard, Delayed (chronic) health hazard; Triethanolamine: Immediate (acute) health hazard, Delayed (chronic) health hazard

Clean Water Act (CWA) 307: Copper (II) Carbonate Basic

Clean Water Act (CWA) 311: 1,2-Diaminoethane

Clean Air Act (CAA) 112 accidental release prevention: 1,2-Diaminoethane

Clean Air Act (CAA) 112 regulated flammable substances: No products were found.

Clean Air Act (CAA) 112 regulated toxic substances: 1,2-Diaminoethane

SARA 313

	Product name	CAS number	Concentration
Form R - Reporting requirements	Copper (II) Carbonate Basic	12069-69-1	10 - 30
Supplier notification	Copper (II) Carbonate Basic	12069-69-1	10 - 30

SARA 313 notifications must not be detached from the MSDS and any copying and redistribution of the MSDS shall include copying and redistribution of the notice attached to copies of the MSDS subsequently redistributed.

State regulations : **Connecticut Carcinogen Reporting**: None of the components are listed.
Connecticut Hazardous Material Survey: None of the components are listed.
Florida substances: None of the components are listed.
Illinois Chemical Safety Act: None of the components are listed.
Illinois Toxic Substances Disclosure to Employee Act: None of the components are listed.
Louisiana Reporting: None of the components are listed.
Louisiana Spill: None of the components are listed.
Massachusetts Spill: None of the components are listed.
Massachusetts Substances: The following components are listed: 1,2-Diaminoethane
Michigan Critical Material: None of the components are listed.
Minnesota Hazardous Substances: None of the components are listed.
New Jersey Hazardous Substances: The following components are listed: 1,2-Diaminoethane;Copper (II) Carbonate Basic
New Jersey Spill: None of the components are listed.
New Jersey Toxic Catastrophe Prevention Act: None of the components are listed.
New York Acutely Hazardous Substances: The following components are listed: 1,2-Diaminoethane
New York Toxic Chemical Release Reporting: None of the components are listed.
Pennsylvania RTK Hazardous Substances: The following components are listed: 1,2-Diaminoethane;Copper (II) Carbonate Basic
Rhode Island Hazardous Substances: None of the components are listed.

California Prop. 65 : No products were found.

International regulations

International lists : This product, (and its ingredients) is (are) listed on national inventories, or is (are) exempted from being listed, in Australia (AICS), in Europe (EINECS/ELINCS), in Korea (TCCL), in Japan (METI), in the Philippines (RA6969).

16 . Other information

Label requirements : CAUSES RESPIRATORY TRACT, EYE AND SKIN BURNS. MAY CAUSE SEVERE ALLERGIC RESPIRATORY AND SKIN REACTION. HARMFUL IF ABSORBED THROUGH SKIN. MAY BE HARMFUL IF SWALLOWED. CONTAINS MATERIAL THAT CAN CAUSE TARGET ORGAN DAMAGE.

Hazardous Material Information System (U.S.A.) :

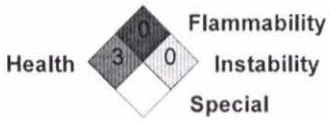
Health	*	3
Fire hazard		0
Physical Hazard		0
Personal protection		D

HAZARD RATINGS

4- Extreme
3- Serious
2- Moderate
1- Slight
0- Minimal
See section 8 for more detailed information on personal protection.

The customer is responsible for determining the PPE code for this material.

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



References : ANSI Z400.1, MSDS Standard, 2004. - Manufacturer's Material Safety Data Sheet. - 29CFR Part1910.1200 OSHA MSDS Requirements. - 49CFR Table List of Hazardous Materials, UN#, Proper Shipping Names, PG.

Date of issue : 07/15/2009
Date of previous issue : 01/15/2009
Version : 2.1

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above named supplier nor any of its subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist. The data in this MSDS relates only to the specific material designated herein. Possible adverse effects (see Section 2, 11 and 12) may occur if this material is not handled in the recommended manner.

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Appendix F

(CEQA Documentation)

SWRCB SIP Exception Info Sheet
CEQA NOD
CEQA NOI
CEQA NOC
State Clearinghouse Letter, Comments, Responses
DFW Filing Fee Receipts

State Implementation Plan (SIP) Section 5.3 Exception Information Sheet

Use of Copper and Acrolein To Control Aquatic Vegetation In Water Conveyances

Reclamation District 108

February 6, 2014

1. **Description of the Proposed Action.** The proposed action is Reclamation District 108 (District)'s application of acrolein- and copper-containing aquatic herbicides to irrigation canals for the purposes of controlling aquatic vegetation and algae. For a more detailed description, see the District's Initial Study/Mitigated Negative Declaration (IS/MND) dated November 18, 2013.

2. **Method of Completing the Action.** The action (the application of acrolein- and copper-containing aquatic herbicides) will be completed according to the pesticide manufacturer's product label directions. Refer to the 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 pesticides will be done at times and frequencies when the concentration of aquatic vegetation equals or exceeds thresholds established by the District. Aquatic herbicide applications typically take place annually between March and November.

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 other herbicides and/or manual removal of aquatic vegetation and aquatic herbicides that do not contain acrolein or copper. Alternative aquatic weed and algae control methods are not always as cost-effective, easy to apply, or efficacious as acrolein or copper. Refer to the aforementioned IS/MND for a discussion of the use of acrolein- and copper-containing aquatic herbicides.

6. **CEQA Documentation and Notification.** The District will notify potentially affected public and governmental agencies of the project. The project is described in the District's aforementioned IS/MND. All CEQA Documentation can be found in Appendix F of the IS/MND.

7. **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.

REC# 447279
DOC# 14-04

Notice of Determination

ENDORSED
FILED
FEB 10 2014
KATHLEEN MORAN
COLUSA COUNTY CLERK-RECORDER

To: Colusa County Clerk
546 Jay Street
Colusa, CA 95932

From: Reclamation District 108
975 Wilson Bend Rd., P.O. Box 50
Grimes, CA 95950

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

Project Title: Use of Copper and Acrolein Aquatic Pesticides to Control Aquatic Vegetation in Water Conveyances

Contact Person: Lewis Bair, phone: 530-437-2221

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

- Project Location: within Yolo and Colusa Counties, CA
- Project Description: The use of acrolein and/or copper to treat algae and aquatic weeds in water conveyances, including irrigation canals and ditches. Reclamation District 108 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 Reclamation District 108 approved the above-described project February 7, 2014, 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 & Wildlife 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:
      ☒ $2,181.25 for review of a Negative Declaration
      ☐ $2,995.25 for review of an Environmental Impact Report
      ☐ $50.00 for County Fish and Game program processing fees

Lewis Bair, General Manager

2-7-
Date

RECEIVED
FEB 10 2014
STATE CLEARING HOUSE

Notice of Determination

FILED
YOLO COUNTY CLERK/RECORDER
FEB 10 2014
FREDDIE OAKLEY, CLERK
BY KIMBERLI QUAM
DEPUTY

To: Yolo County Clerk
625 Court St., Room B01
Woodland, CA 95695

From: Reclamation District 108
975 Wilson Bend Rd., P.O. Box 50
Grimes, CA 95950

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

Project Title: Use of Copper and Acrolein Aquatic Pesticides to Control Aquatic Vegetation in Water Conveyances

Contact Person: Lewis Bair, phone: 530-437-2221

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

- Project Location: within Yolo and Colusa Counties, CA
- Project Description: The use of acrolein and/or copper to treat algae and aquatic weeds in water conveyances, including irrigation canals and ditches. Reclamation District 108 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 Reclamation District 108 approved the above-described project on February 7, 2014, 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:
      ☒ $2,181.25 for review of a Negative Declaration
      ☐ $850 for review of an Environmental Impact Report
      ☐ $25 for County Fish and Game program processing fees

RECEIVED
FEB 10 2014
STATE CLEARING HOUSE

Lewis Bair, General Manager

2-7-14
Date

POSTED FEB 10 2014 TO

2014-06

NOTICE OF INTENT

To Adopt a Mitigated Negative Declaration for
Reclamation District 108

Use of Copper and Acrolein to Control Aquatic Vegetation In Irrigation Canals and Ditches

Reclamation District 108 (RD 108) is proposing to begin to use acrolein and copper-based aquatic pesticides to control aquatic weeds in its ditches and canals in Yolo and Colusa Counties, California.

The proposed project would include the following elements:

- Application of acrolein and copper-based aquatic pesticides; 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), RD 108 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, RD 108 has determined that the proposed project can be carried out without significant impacts on the environment. Therefore, RD 108 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, RD 108 will consider public comments on the Initial Study and proposed Mitigated Negative Declaration. All interested parties are invited to submit written comments to:

Lewis Bair
General Manager
Reclamation District 108
PO Box 50
975 Wilson Bend Road
Grimes, CA 95950

The Initial Study and proposed Mitigated Negative Declaration are available for public review at the above address during normal working hours, 8:00 a.m. to 5:00 p.m. The public review period begins on 11/20/13 and ends on 12/24/13. **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 Negative Declaration will be held during the RD 108 Board Meeting scheduled for **January 16, 2014 at 8:30 a.m.** at the District's Office located at 975 Wilson Bend Road in Grimes, California. After consideration of all comments, the RD 108 Board of Directors will either certify or reject the proposed Mitigated Negative Declaration.

NOTICE OF INTENT

To Adopt a Mitigated Negative Declaration for
Reclamation District 108

Use of Copper and Acrolein to Control Aquatic Vegetation In Irrigation Canals and Ditches

Reclamation District 108 (RD 108) is proposing to begin to use acrolein and copper-based aquatic pesticides to control aquatic weeds in its ditches and canals in Yolo and Colusa Counties, California.

The proposed project would include the following elements:

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

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Lewis Bair
General Manager
Reclamation District 108
PO Box 50
975 Wilson Bend Road
Grimes, CA 95950

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Print Form

Appendix C

Notice of Completion & Environmental Document Transmittal

2013112044

SCH #

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

Project Title: Use of Copper and Acrolein To Control Aquatic Vegetation In Water Conveyances

Lead Agency: Reclamation District 108 | Contact Person: Lewis Bair

Mailing Address: P.O. Box 50, 975 Wilson Bend Road | Phone: (530) 437-2221

City: Grimes | Zip: 95950 | County: Yolo and Colusa

Project Location: County: Yolo and Colusa | City/Nearest Community: Grimes, CA

Cross Streets: Wilson Bend and Fruchtenicht Roads | Zip Code: 95950

Longitude/Latitude (degrees, minutes and seconds): 39 ° 0.69 ′ 00 ″ N / -121 ° 50 ′ 00 ″ W | Total Acres: 48,000

Assessor's Parcel No.: Various | Section: Various | Twp.: 13N | Range: 1E | Base: Mt Diablo

Within 2 Miles: State Hwy #: Along Hwy 45 | Waterways: Sacramento River, Colusa Basin Drain

Airports: None | Railways: Southern Pacific | Schools: Grand Island Elementary

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:

RECEIVED
NOV 18 2013
2:35 p.M.
STATE CLEARING HOUSE

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 Irrigate&Recharge MGD ____
☐ Transportation: Type ____
☐ Mining: Mineral ____
☐ Power: Type ____ MW ____
☐ Waste Treatment: Type ____ MGD ____
☐ Hazardous Waste: Type ____
☒ Other: 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: Herbicide applicatio

Present Land Use/Zoning/General Plan Designation:

Residential, Commercial, Agricultural, Open Space

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

The use of acrolein and/or copper to treat algae and aquatic weeds in water conveyances, including irrigation canals and ditches. Reclamation District 108 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.

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
X	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 #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: Yolo Co Ag Commissioner
____	Housing & Community Development	X	Other: Colusa Co Ag Commissioner
____	Native American Heritage Commission		

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

Starting Date November 20, 2013 Ending Date December 24, 2013

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: Reclamation District 108
Address: 975 Wilson Bend Road
City/State/Zip: Grimes, CA 95950
Phone: (530) 437-2221

Signature of Lead Agency Representative: [signature] **Date:** Nov 15 2013

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

Blankenship
Chad

STATE OF CALIFORNIA

GOVERNOR'S OFFICE *of* PLANNING AND RESEARCH

STATE CLEARINGHOUSE AND PLANNING UNIT

EDMUND G. BROWN JR.
GOVERNOR

KEN ALEX
DIRECTOR

Orig. to Chad

December 19, 2013

Lewis Bair
Reclamation District No. 108
P.O. Box 50
975 Wilson Bend Road
Grimes, CA 95950-0050

Subject: Use of Copper and Acrolein to Control Aquatic Vegetation in Water Conveyances
SCH#: 2013112044

Dear Lewis Bair:

The State Clearinghouse submitted the above named Mitigated Negative Declaration to selected state agencies for review. On the enclosed Document Details Report please note that the Clearinghouse has listed the state agencies that reviewed your document. The review period closed on December 18, 2013, and the comments from the responding agency (ies) is (are) enclosed. If this comment package is not in order, please notify the State Clearinghouse immediately. Please refer to the project's ten-digit State Clearinghouse number in future correspondence so that we may respond promptly.

Please note that Section 21104(c) of the California Public Resources Code states that:

> "A responsible or other public agency shall only make substantive comments regarding those activities involved in a project which are within an area of expertise of the agency or which are required to be carried out or approved by the agency. Those comments shall be supported by specific documentation."

These comments are forwarded for use in preparing your final environmental document. Should you need more information or clarification of the enclosed comments, we recommend that you contact the commenting agency directly.

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 contact the State Clearinghouse at (916) 445-0613 if you have any questions regarding the environmental review process.

Sincerely,

Scott Morgan

Scott Morgan
Director, State Clearinghouse

Enclosures
cc: Resources Agency

Document Details Report
State Clearinghouse Data Base

SCH# 2013112044
Project Title Use of Copper and Acrolein to Control Aquatic Vegetation in Water Conveyances
Lead Agency Reclamation District No. 108

Type MND Mitigated Negative Declaration

Description The use of acrolein and/or copper to treat algae and aquatic weeds in water conveyances, including irrigation canals and ditches. Reclamation District 108 is preparing this IS/MND to meet requirements of 1) The State Implementation Plan (SIP) Section 5.3 and 2) NPDES Permit #CAG990005.

Lead Agency Contact

Name Lewis Bair
Agency Reclamation District No. 108
Phone 530 437 2221 **Fax**
email
Address P.O. Box 50
975 Wilson Bend Road
City Grimes **State** CA **Zip** 95950-0050

Project Location

County Yolo, Colusa
City
Region
Lat / Long 39° .69' 0" N / 121° 50' 0" W
Cross Streets Wilson Bend and Fruchtenicht Road
Parcel No. Various
Township 13N **Range** 1E **Section** Varies **Base** MDB&M

Proximity to:

Highways Hwy 45
Airports No
Railways SPRR
Waterways Sacramento River, Colusa Basin Drain
Schools Grand Island ES
Land Use Residential, Commercial, Agricultural, Open Space

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; Other Issues

Reviewing Agencies Resources Agency; Department of Fish and Wildlife, Region 2; Department of Parks and Recreation; Department of Water Resources; California Highway Patrol; Caltrans, District 3 S; CA Department of Public Health; Air Resources Board; State Water Resources Control Board, Division of Water Quality; Regional Water Quality Control Bd., Region 5 (Sacramento); Department of Toxic Substances Control; Native American Heritage Commission; State Lands Commission

Date Received 11/18/2013 **Start of Review** 11/19/2013 **End of Review** 12/18/2013

State of California – Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE
North Central Region/Region 2
1701 Nimbus Road, Suite A
Rancho Cordova, CA 95670
www.wildlife.ca.gov

EDMUND G. BROWN JR., Governor
CHARLTON H. BONHAM, Director

December 18, 2013

Lewis Bair
Reclamation District 108
P.O. BOX 50
975 Wilson Bend Road
Grimes, CA 95950

Subject: Comments on the Mitigated Negative Declaration for the Use of Copper and Acrolein to Control Aquatic Vegetation in Water Conveyances; SCH# 2013112044

Dear Mr. Bair:

The California Department of Fish and Wildlife (CDFW) is providing comments on the Initial Study (IS)/Mitigated Negative Declaration (MND) for the Use of Copper and Acrolein to Control Aquatic Vegetation in Water Conveyances (proposed project) as both a trustee agency and responsible agency under the California Environmental Quality Act (CEQA). As trustee for the State's fish and wildlife resources, the CDFW has jurisdiction over the conservation, protection, and management of fish, wildlife, native plants, and the habitats necessary for biologically sustainable populations of such species. The CDFW may also be a responsible agency, for a project affecting biological resources where we will exercise our discretion after the lead agency, to approve or carry out a proposed project or some facet thereof.

The proposed project includes the use of copper and acrolein to treat algae and aquatic weeds in water conveyances, including irrigation canals and ditches.

The proposed project encompasses portions of Colusa and Yolo Counties in California, west of the Sacramento River, which are within the jurisdiction of Reclamation District 108 (District). The District runs roughly north-south parallel to Interstate 5. The western and southern boundary of the District is the 21-mile long eastern bank of the Colusa Basin Drain. The approximate centroid of the proposed project is located at Latitude 38° 55' 19"N, Longitude 121° 52' 22"W.

The CDFW's primary concern is the potential significant impact to the giant garter snake (*Thamnophis gigas*), which is federally and State-listed as threatened. The IS/MND indicates that giant garter snake may occur in the vicinity of the proposed project. Giant garter snakes are associated with low-gradient streams, irrigation channels, wetlands and marshes, and regions supporting rice agriculture. The CDFW does not believe that the IS/MND adequately analyzes the impacts to the giant garter snake, or that the mitigation proposed is sufficient to reduce impacts to a less-than-significant level and is recommending the inclusion of the following in to the IS/MND:

- Further evaluation of the invertebrate ecosystem impacts should be conducted. Giant garter snake diet consists primarily of amphibians and fish, and those organisms in turn depend on invertebrate food supplies. The IS/MND discusses the toxicity of acrolein (also known as magnacide) and copper in the water column, but. this evaluation does not include the impacts of giant garter snake food-base organism exposure to acrolein and copper and the potential bio-accumulative toxic implications to the giant garter snake via diet.

- A bioassessment for macroinvertebrates should be conducted to evaluate baseline conditions for these ecosystem food base organisms and post-treatment to determine and assess potential impacts. For example, frogs and bats consume terrestrial insects, and many of those insects have an aquatic life stage (e.g., mayfly, dragon/damselfly, mosquitos). Since aquatic organisms such as frogs, tadpoles, and invertebrates may utilize sediment habitat, the CDFW recommends that settling and absorption of the herbicide in sediment is evaluated for toxic impacts to sediment dwelling organisms.

- Further information regarding potential herbicide concentrations that could be harmful to the eyes of giant garter snakes and other species should be included in the IS/MND. Once blind or even reduced visibility, snakes would have difficulty foraging (USDOI, 1994). Even at low sublethal concentrations, acrolein is widely known for its acrid pungent odor and strong irritating effects on mucous membranes of the eyes and of the upper respiratory tract, as well as its toxicity to cilia in all organisms, and its interference with nucleic acid synthesis in bacteria.

- The copper sulfate material safety data sheet (MSDS) requires an Environmental Protection Agency (EPA) bulletin for endangered species. Further information regarding this bulletin for species in Yolo and Colusa Counties should be included in the IS/MND.

- Chemical removal of aquatic vegetation should only be used in areas where giant garter snake does not have the potential to occur. If aquatic vegetation must be removed where giant garter snake has the potential to occur, then CDFW recommends that it is removed by other means. This may include but is not limited to mechanical removal with a modified bucket on an excavator or by hand-removal. Alternatively, avoidance to species may be achieved if chemicals are released during certain times of the year when the snake is overwintering (approximately October 1st to May 1st depending on temperature). The IS/MND should quantify the loss of habitat as a result of the proposed project (i.e. removal of vegetative cover).

- Due to the cryptic nature of giant garter snakes, the CDFW does not believe that the mitigation proposed (BIO-1), which includes pre-application surveys, is adequate to reduce impacts to a less-than-significant level. The IS/MND estimates that the application of acrolein at the maximum label rate will expose giant garter snake to concentrations that may cause risk. In addition, the toxin will reduce the vegetative cover within the waterways and therefore increase the likelihood that giant garter snake would be vulnerable to predation.

- Before implementation of the proposed project, a qualified biologist should conduct a worker's environmental awareness program (WEAP) for all construction personnel. The WEAP should include, at a minimum, species identification, a description of suitable habitat for this species, and measures to implement in the event that this species is found during construction. The WEAP should be presented to all members of the construction crew. This training should instruct workers to recognize giant garter snake, their habitats and life histories, the purpose of mitigation measures, and the terms and conditions of any permit applicable to the proposed project.

- A qualified biologist or monitor familiar with the species in the region should be present to monitor on-site compliance with all minimization measures. If any giant garter snake

or other special-status species is detected on-site during the proposed project activities, work will cease immediately and the species left to freely move out of the project area. Capture and relocation of trapped or injured individuals should only be attempted by personnel or individuals with current CDFW Scientific Collecting Permits and U.S. Fish and Wildlife Service recovery permits pursuant to section 1O(a) 1 (A) of the Endangered Species Act. The appropriate agency should be notified in the event that a special status species is encountered.

- Acrolein and copper are extremely toxic to fish and other aquatic life. A review of the literature on the toxicity of acrolein to fish has shown that concentrations less than 0.1 mg/L may be lethal to sunfish, trout, and salmon; therefore the CDFW recommends extreme caution when using this material. The CDFW strongly encourages irrigation agencies and other water delivery entities to evaluate and consider less-environmentally toxic aquatic weed control treatments.

- Water quality monitoring for acrolein and copper concentrations in lateral canals should be required during and after treatment. After the 6-day holding period and before water is released into fish-bearing waters, the canal and lateral water shall be tested for acrolein and/or copper (as appropriate for treatment chemical) and have non-detectable herbicide concentrations.

- The CDFW requests the following language be added to Section 1.4.1 of the IS/MND: The CDFW requires yearly written notification of intent to use acrolein and/or copper prior to application every year. Upon the District's receipt of CDFW herbicide use acknowledgement and requirements letter, the requirements must be followed including notification to the CDFW by phone, Fax, or e-mail 24 hours prior to treatment.

The proposed project will have an impact to fish and/or wildlife habitat and should be evaluated in such a manner to reduce its impacts to biological resources. Assessment of fees under Public Resources Code §21089 and as defined by Fish and Game Code (FGC) §711.4 is necessary. Fees are payable by the project applicant upon filing of the Notice of Determination by the lead agency.

Furthermore, it is unlawful to take a State-listed endangered or threatened species (FGC §2050 et seq). Take is defined as "hunt, pursue, catch, capture or kill or attempt to hunt, pursue, catch, capture or kill" (FGC §86). If the proposed project has the potential to result in take of a State-listed plant or wildlife species over the life of the proposed project, California Endangered Species Act (CESA) take authorization should be obtained.

Issuance of an Incidental Take Permit (ITP/CESA take authorization) is a discretionary action and subject to CEQA. As a responsible agency and to be able to issue the ITP, the CDFW would rely on the final CEQA document for the project. The CEQA document must adequately specify impacts, mitigation measures, and include a mitigation monitoring and reporting program for the project. An ITP may only be obtained if the impacts of the authorized take of the species are minimized and fully mitigated and adequate funding has been ensured to implement the mitigation measures. Issuance of a CESA permit may take up to 180 days from receipt of an application from the applicant.

Pursuant to Public Resources Code §21092 and §21092.2, the CDFW requests written notification of proposed actions and pending decisions regarding the proposed project. Written

notifications shall be directed to: California Department of Fish and Wildlife Region 2, 1701 Nimbus Road, Rancho Cordova, CA 95670.

Thank you for considering our concerns for the proposed project. CDFW personnel are available for consultation regarding biological resources and strategies to minimize impacts. If you have questions please contact Tanya Sheya, Environmental Scientist, by e-mail at Tanya.Sheya@wildlife.ca.gov or by phone at (916) 358-2953.

Sincerely,

Tina Bartlett
Regional Manager

ec: Reclamation District
Lewis Bair lbair@rd108.org

Blankinship & Associates, Inc.
Stephen Burkholder Stephen@h2osci.com

California Department of Fish and Wildlife
Jeff Drongesen
Isabel Baer
Tanya Sheya
Carol Oz
Joel Trumbo
Janna Rinderneck

State Clearinghouse

References

U.S. Department of the Interior. 1994. Biological Report 23. Acrolein Hazards to Fish, Wildlife, and Invertebrates: A Synoptic Review. http://scholar.google.com/scholar_url?hl=en&q=http://www.dtic.mil/cgi-bin/GetTRDoc%3FAD%3DADA323207&sa=X&scisig=AAGBfm3FdP7YgR2bzzgxybTlzxqmm8rYkg&oi=scholarr

Material Safety Data Sheet. http://www.mathesongas.com/pdfs/msds/MAT00330.pdf

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

1590 Drew Ave, Suite 120, Davis, CA 95618
Tel. (530) 757-0941 Fax (530) 757-0940
www.h2osci.com

February 6, 2014

Carol Oz
Tanya Sheya
California Department of Fish and Wildlife
1701 Nimbus Road, Suite A
Rancho Cordova, CA 95670

Via Email: Tanya.Sheya@wildlife.ca.gov, Carol.Oz@wildlife.ca.gov

RE: Comments on the proposed Mitigated Negative Declaration for the Use of Copper and Acrolein to Control Aquatic Vegetation in Water Conveyances; SCH # 2013112044; Located in Colusa and Yolo Counties, California

Dear Carol and Tanya,

We are in receipt of your comments dated December 18, 2013. Consistent with our phone call on Wednesday, January 29, 2014 please see our Response to Comments below.

Comment 1:
Further evaluation of the invertebrate ecosystem impacts should be conducted. Giant garter snake diet consists primarily of amphibians and fish, and those organisms in turn depend on invertebrate food supplies. The IS/MND discusses the toxicity of acrolein (also known as magnacide) and copper in the water column, but this evaluation does not include the impacts of giant garter snake food-base organism exposure to acrolein and copper and the potential bio-accumulative toxic implications to the giant garter snake via diet.

Response to Comment 1:
Fish are not expected to be present in irrigation water delivery canals receiving treatment as the District has a fish screen to prevent entry of fish to the system. The Giant Garter Snake (herein referred to as GGS) does not typically forage in moderate or swift moving waterways like irrigation water delivery canals, but may occasionally use them as movement corridors. Additionally, the GGS appears to be absent from natural or artificial waterways that undergo routine mechanical or chemical weed control like the District's conveyances (Hansen 1998, Hansen and Brode 1993). GGS prefers to forage in slow moving water with sufficient emergent weed coverage such as rice fields (Fitch 1940, Hansen and Brode 1980). Fish may be present in drainage canals, however these drainage canals are not treated with copper or acrolein containing herbicides.

A USEPA estimated bioconcentration factor of 3 for acrolein suggests that the potential for bioconcentration in aquatic organisms is low (USEPA, 2003). Additionally, due to the rapid degradation of acrolein (a conservatively estimated half-life of 10.2 hours, see Appendix B of the IS/MND), no bioaccumulation is expected to occur. A literature review of the bio-accumulative effects of copper shows varied results (See the IS/MND, Appendix B). The most relevant study to an irrigation water delivery canal showed that copper depuration in benthic invertebrates was rapid and copper concentrations returned to normal within four days of exposure (Harrahy and Clements 1997). Given the short-term and seasonal duration of potential copper applications there is no risk expected to the GGS from potential copper bioaccumulation.

Comment 2:
A bioassessment for macroinvertebrates should be conducted to evaluate baseline conditions for these ecosystem food base organisms and post-treatment to determine and assess potential impacts. For example, frogs and bats consume terrestrial insects, and many of those insects have an aquatic life stage (e.g., mayfly, dragon/damselfly, mosquitos). Since aquatic organisms such as frogs, tadpoles, and invertebrates may utilize sediment habitat, the CDFW recommends that settling and absorption of the herbicide in sediment is evaluated for toxic impacts to sediment dwelling organisms.

Response to Comment 2:
A biological assessment for macroinvertebrates in an irrigation water delivery canal that is dry during the non-irrigation season, typically November through March, will likely not yield useful information. Data would be highly variable and it would be difficult to differentiate causes in community makeup (abundance and composition) between normal seasonal changes, water presence/absence and aquatic herbicide use. The San Francisco Estuary Institute (SFEI), as part of the Aquatic Pesticide Monitoring Program, attempted to characterize potential effects of aquatic herbicide applications by conducting bioassessments before and after applications. They concluded that the aquatic herbicide applications did not cause acute changes to the macroinvertebrate assemblages and that most differences were likely due to seasonal differences in groups found at the study sites (SFEI 2004). Lastly, acrolein does not settle or adsorb to soil particles; it rapidly breaks down and dissipates in the water column and as a result is not expected to be present in sediment pore water at concentrations or exposure times that are deleterious to sediment dwelling invertebrates (See Appendix B of the IS/MND).

A pre- and post- irrigation season biological assessment will be done. This is done as a condition of the State Implementation Policy (SIP) exception that is required by the NPDES Aquatic Pesticide permit when acrolein and copper are used. This screening level assessment is used to evaluate the general species and habitat present. It includes scouting for the type and location of a variety of flora including algae, emergent, submersed and floating aquatic plant species; aquatic fauna including invertebrates, reptiles, fish, and amphibians; and terrestrial fauna that may interact with receiving waters or treated water including insects, reptiles, mammals and birds. Examples of species regularly recorded during biological assessments include: filamentous, benthic and planktonic algae, Eurasian watermilfoil, *Elodea*, sago pondweed, *Arundo*, *Tamarix*, waterprimrose, duckweed, red eared sliders, bullfrogs and tadpoles, Pacific chorus frogs and tadpoles, mallards, cormorants, various raptors, barn and cliff swallows, kingfishers, snowy and great egrets, black-crowned night herons, various gulls, gadwall, cinnamon teal, largemouth bass, various minnows, carp, dragonflies and larvae, damselflies, *Corbicula*, signal and red swamp crayfish, water boatman, beavers, muskrats, and raccoons.

As we discussed during our phone call, we will develop a screening level assessment approach to evaluate aquatic invertebrates. Once a draft of this screening assessment is complete, we will send it to you for your review and comment. Once final, we will implement this screening level aquatic invertebrate assessment to supplement the aforementioned biological assessments already being done. Results of this assessment will be presented in the NPDES Aquatic Pesticide Permit Annual Report.

Comment 3:
Further information regarding potential herbicide concentrations that could be harmful to the eyes of giant garter snakes and other species should be included in the IS/MND. Once blind or even reduced visibility, snakes would have difficulty foraging (USDOI,1994). Even at low sublethal concentrations, acrolein is widely known for its acrid pungent odor and strong irritating effects on mucous membranes of the eyes and of the upper respiratory tract, as well as its toxicity to cilia in all organisms, and its interference with nucleic acid synthesis in bacteria.

Response to Comment 3:
We are unaware of acrolein sub-lethal effects for the GGS, or similar reptiles and amphibians, in the open literature. Therefore, it is difficult to determine the concentration of copper or acrolein in the water column that could cause ocular degeneration to the GGS. It is agreed that snakes would have difficulty foraging with reduced vision, however considering the expected lack of suitable habitat for GGS in irrigation water delivery canals (See Response to Comment 1) and implementation of the BIO-1 mitigation, no risk to GGS is expected.

Comment 4:
The copper sulfate material safety data sheet (MSDS) requires an Environmental Protection Agency (EPA) bulletin for endangered species. Further information regarding this bulletin for species in Yolo and Colusa Counties should be included in the IS/MND.

Response to Comment 4:
The worksheet for herbicides from the USEPA bulletins for endangered species for Yolo and Colusa counties was reviewed and completed. These bulletins do not apply to the District's activities being considered by the IS/MND. However, these bulletins will be monitored for changes and updates.

Comment 5:
Chemical removal of aquatic vegetation should only be used in areas where giant garter snake does not have the potential to occur. If aquatic vegetation must be removed where giant garter snake has the potential to occur, then CDFW recommends that it is removed by other means. This may include but is not limited to mechanical removal with a modified bucket on an excavator or by hand-removal. Alternatively, avoidance to species may be achieved if chemicals are released during certain times of the year when the snake is overwintering (approximately October 1st to May 1st depending on temperature). The IS/MND should quantify the loss of habitat as a result of the proposed project (i.e. removal of vegetative cover).

Response to Comment 5:
See Response to Comment 1. Refer to the attached Figures 1-4. By in-large, the planned aquatic herbicide use is limited to concrete-lined irrigation water delivery canals that provide no suitable GGS habitat. Refer to **Figures 1-2**. Only approximately four miles of high flow (500 to 600 CFS) unlined irrigation water delivery canal may receive applications of copper or acrolein. These 4 miles represent less than 15% of the total canals miles treated within the District and are not suitable for GGS due to swift moving water. Refer to **Figure 3**. Unlined drainage canals that do provide GGS habitat are not treated with copper or acrolein. Refer to **Figure 4**.

Alternatives to aquatic herbicide use include mechanical means such as the use of dragging chains and backhoe excavators. This is costly, dangerous, may create water quality problems (siltation, high TDS, etc.) and movement of equipment to and along canals may be disruptive to nearby GGS habitat. To the extent feasible, these mechanical means are used during the winter months as part of the District's Integrated Pest Management (IPM) program to reduce or eliminate the need for aquatic herbicide use in the summer months. Hand removal of weeds is infeasible due to the large amounts of weeds in the District.

Aquatic weed control in irrigation water delivery canals targets primarily submersed aquatic vegetation like sago pondweed. Because irrigation water delivery canals contain swift moving water, these canals are unsuitable for GGS habitat. In contrast, nearby drainage canals contain slow moving water that have a mix of submersed, emergent and floating vegetation. Fish are expected to be present in drainage canals and are not expected to be present in irrigation water delivery canals. As a result of these contrasting characteristics, drainage canals are more likely to be suitable for GGS than are irrigation water delivery canals. As previously stated, drainage canals are not treated with acrolein or copper herbicides and as a result, GGS are not exposed to these herbicides and are therefore not at risk.

In many cases, the use of aquatic herbicides for weed control in irrigation water delivery canals is the most efficient, effective, and environmentally sensitive way to improve and maintain a high rate of flow, minimize water losses due to infiltration and evaporation, and prevent bank over-topping. Water from irrigation water delivery canals is used to irrigate fields that, depending on a variety of factors, may drain to drainage canals. Without efficient delivery of irrigation water and the subsequent movement of that water to drainage canals, suitable GGS habitat in drainage canals may not exist or be adversely impacted. Accordingly, maintaining irrigation water delivery canals with copper or acrolein containing herbicides contributes to the creation and sustainability of suitable GGS habitat in drainage canals.

Comment 6:
Due to the cryptic nature of giant garter snakes, the CDFW does not believe that the mitigation proposed (BIO-1), which includes pre-application surveys, is adequate to reduce impacts to a less-than-significant level. The IS/MND estimates that the application of acrolein at the maximum label rate will expose giant garter snake to concentrations that may cause risk. In addition, the toxin will reduce the vegetative cover within the waterways and therefore increase the likelihood that giant garter snake would be vulnerable to predation.

Response to Comment 6:
The IS/MND estimates an acrolein concentration that might cause risk to GGS if it is exposed. For the reasons stated previously, it is unlikely that GGS will have exposure to either copper or acrolein aquatic herbicides, and therefore it is not at risk.

As described in Table 2 of the IS/MND, acrolein in the water column is only expected to be at a concentration that may cause risk to the GGS for 2.5 hours. Due to infrequent and short-term duration of applications of acrolein, and the low probability that GGS will be present in an irrigation water delivery canal containing acrolein-treated water, it is unlikely that the GGS would come in contact with acrolein-treated water. If, however, the GGS did come in contact with acrolein-treated water, this would have to occur in a very narrow 2.5 hour "window" of time. The co-incidence of GGS presence and this small 2.5 hour "window" time is highly improbable. Accordingly, we believe that mitigation BIO-1 is sufficient to reduce the risk to the GGS to an acceptable level.

It should be noted that the aquatic herbicides being applied are intended primarily to reduce the density submersed aquatic vegetation like sago pondweed in water delivery canals. Unlike emergent vegetation such as cattails and tules, submersed aquatic vegetation does not provide cover to the GGS. Accordingly, the control of submersed aquatic vegetation will not result in an increase in GGS predation.

Comment 7:
Before implementation of the proposed project, a qualified biologist should conduct a worker's environmental awareness program (WEAP) for all construction personnel. The WEAP should include, at a minimum, species identification, a description of suitable habitat for this species, and measures to implement in the event that this species is found during construction. The WEAP should be presented to all members of the construction crew. This training should instruct workers to recognize giant garter snake, their habitats and life histories, the purpose of mitigation measures, and the terms and conditions of any permit applicable to the proposed project.

Response to Comment 7:
Agreed. As a point of clarification, the application of aquatic herbicides is not a construction project and no construction will take place. The worker's environmental awareness program (WEAP) will be included in the Initial Study/Mitigated Negative Declaration in the BIO-1 mitigation section.

Comment 8:
A qualified biologist or monitor familiar with the species in the region should be present to monitor on-site compliance with all minimization measures. If any giant garter snake or other special-status species is detected on-site during the proposed project activities, work will cease immediately and the species left to freely move out of the project area. Capture and relocation of trapped or injured individuals should only be attempted by personnel or individuals with current CDFW Scientific Collecting Permits and U.S. Fish and Wildlife Service recovery permits pursuant to section 10(a)1(A) of the Endangered Species Act. The appropriate agency should be notified in the event that a special status species is encountered.

Response to Comment 8:
We believe that Mitigation BIO-1, including incorporation of the WEAP, will adequately protect the GGS. Copper and acrolein applications will not occur if a GGS is detected in or near the treatment area and will not occur until the GGS has moved out of the area. No capturing of the GGS will occur. If a GGS is encountered, this will be reported in the NPDES annual report. Please advise us if you would like a copy of the report sent to you.

Comment 9:
Acrolein and copper are extremely toxic to fish and other aquatic life. A review of the literature on the toxicity of acrolein to fish has shown that concentrations less than 0.1mg/L may be lethal to sunfish, trout, and salmon; therefore the CDFW recommends extreme caution when using this material. The CDFW strongly encourages irrigation agencies and other water delivery entities to evaluate and consider less-environmentally toxic aquatic weed control treatments.

Response to Comment 9:
See responses to Comments 1 and 5. Extreme caution is used by the District when any aquatic herbicide is used. As stated in the IS/MND, the District employs a Pest Control Adviser (PCA) licensed by the California Department of Pesticide Regulation (CDPR) to make a determination of the need for an aquatic pesticide application. The PCA puts the recommendation for aquatic herbicide use in writing and certifies the recommendation as follows:

> "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".

If it is determined that there is a need for an aquatic pesticide application, this application is only done by staff licensed by CDPR. Rigorous reoccurring annual and bi-annual training is required by all staff involved in aquatic pesticide applications to maintain their respective licenses.

Further, as stated in the IS/MND, the District uses an IPM approach to aquatic weed management which involves a careful evaluation of the tools available to accomplish a particular objective. Management tools considered include mechanical, biological, cultural and chemical techniques. One or more of these techniques may be employed to meet the weed management objective.

It should be noted that there is an important difference between toxicity and risk. As stated in the IS/MND, copper and acrolein are toxic to a variety of aquatic receptors. However, if there is little or no exposure of these receptors to an herbicide, then there is little or no risk. As stated above, we believe that there is little to no exposure of the GGS to copper or acrolein and as a result, little or no risk.

Comment 10:

Water quality monitoring for acrolein and copper concentrations in lateral canals should be required during and after treatment. After the 6-day holding period and before water is released into fish-bearing

waters, the canal and lateral water shall be tested for acrolein and/or copper (as appropriate for treatment chemical) and have non-detectable herbicide concentrations.

Response to Comment 10:
Water quality monitoring for copper and acrolein will be done consistent with the requirements of the Statewide NPDES Aquatic Pesticide permit, which includes background, event and post-event monitoring. As stated previously, irrigation water treated with aquatic herbicides is used to irrigate crops. As such, it is highly unlikely that this water is ever released to fish-bearing waters such as a drainage canal without first passing through a field. Passage through a field removes all copper and acrolein from irrigation water and the concentration of these herbicides is non-detect in field drainage water. The concentration, if any, of copper and acrolein in receiving waters will comply with permit limitations.

Comment 11:
The CDFW requests the following language be added to Section 1.4.1 of the IS/MND: The CDFW requires yearly written notification of intent to use acrolein and/or copper prior to application every year. Upon the District's receipt of CDFW herbicide use acknowledgement and requirements letter, the requirements must be followed including notification to the CDFW by phone, Fax, or e-mail 24 hours prior to treatment.

Response to Comment 11:
Agreed.

We appreciate the comments and concerns from CDFW and the opportunity to respond. We look forward to continuing to work together towards protecting the GGS. Please call either of us should you require additional information at (530) 757-0941.

Regards,

BLANKINSHIP & ASSOCIATES, INC.

Stephen Burkholder
Project Biologist

Mike Blankinship, PE, PCA
President

Attachments: References
Figures 1-4

References

Fitch, H.S. 1940. A biogeographical study of the ordinoides artenkreis of garter snakes (genus Thamnophis). Univ. Calif. Publ. Zool. 44:1-150.

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Hansen, G.E. 1998. Cherokee Canal sediment removal project post-construction giant garter snake (Thamnophis gigas) surveys. Final report for California Department of Water Resources, Contract No. B-81535. Unpublished. 9 pp.

Hansen, G.E. and J.M. Brode. 1993. Results of relocating canal habitat of the giant garter snake (Thamnophis gigas) during widening of State Route 99/70 in Sacramento and Sutter Counties, California. Final report for Caltrans Interagency Agreement 03E325 (FG7550) (FY 87/88-91-92). Unpublished. 36 pp.

Harrahy, E.A. and W.H. Clements 1997. Toxicity and bioaccumulation of a mixture of heavy metals in Chrionomus tentans (Dipteera: Chironomidae) in synthetic sediment. Environmental Toxicology and Chemistry 16(2): 317-327.

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U.S. EPA. 2003. Toxicological review of acrolein: in support of summary information on the integrated risk information system (IRIS). U.S. Environmental Protection Agency. Report EPA/635/R-03/003

Figure 1

Figure 2.

Figure 3.

Figure 4.

CALIFORNIA
Water Boards

Edmund G. Brown Jr.
GOVERNOR

Matthew Rodriquez
SECRETARY FOR
ENVIRONMENTAL PROTECTION

Central Valley Regional Water Quality Control Board

18 December 2013

Lewis Bair
Reclamation District 108
975 Wilson Bend Road
Grimes, CA 95950

CERTIFIED MAIL
7012 2210 0002 1419 6189

COMMENTS TO REQUEST FOR REVIEW FOR THE DRAFT MITIGATED NEGATIVE DECLARATION, USE OF COPPER AND ACROLEIN TO CONTROL AQUATIC VEGETATION IN WATER CONVEYANCES PROJECT, SCH NO. 2013112044, YOLO AND COLUSA COUNTY

Pursuant to the State Clearinghouse's 20 November 2013 request, the Central Valley Regional Water Quality Control Board (Central Valley Water Board) has reviewed the *Request for Review for the Draft Mitigated Negative Declaration* for the Use of Copper and Acrolein to Control Aquatic Vegetation in Water Conveyances Project, located in Yolo and Colusa County.

Our agency is delegated with the responsibility of protecting the quality of surface and groundwaters of the state; therefore our comments will address concerns surrounding those issues.

Construction Storm Water General Permit

Dischargers whose project disturb one or more acres of soil or where projects disturb less than one acre but are part of a larger common plan of development that in total disturbs one or more acres, are required to obtain coverage under the General Permit for Storm Water Discharges Associated with Construction Activities (Construction General Permit), Construction General Permit Order No. 2009-009-DWQ. Construction activity subject to this permit includes clearing, grading, grubbing, disturbances to the ground, such as stockpiling, or excavation, but does not include regular maintenance activities performed to restore the original line, grade, or capacity of the facility. The Construction General Permit requires the development and implementation of a Storm Water Pollution Prevention Plan (SWPPP).

For more information on the Construction General Permit, visit the State Water Resources Control Board website at:
http://www.waterboards.ca.gov/water_issues/programs/stormwater/constpermits.shtml.

Phase I and II Municipal Separate Storm Sewer System (MS4) Permits[1]

The Phase I and II MS4 permits require the Permittees reduce pollutants and runoff flows from new development and redevelopment using Best Management Practices (BMPs) to the maximum extent practicable (MEP). MS4 Permittees have their own development standards, also known as Low Impact Development (LID)/post-construction standards that include a hydromodification component. The MS4 permits also require specific design concepts for LID/post-construction BMPs in the early stages of a project during the entitlement and CEQA process and the development plan review process.

For more information on which Phase I MS4 Permit this project applies to, visit the Central Valley Water Board website at:
http://www.waterboards.ca.gov/centralvalley/water_issues/storm_water/municipal_permits/.

For more information on the Phase II MS4 permit and who it applies to, visit the State Water Resources Control Board at:
http://www.waterboards.ca.gov/water_issues/programs/stormwater/phase_ii_municipal.shtml

Industrial Storm Water General Permit

Storm water discharges associated with industrial sites must comply with the regulations contained in the Industrial Storm Water General Permit Order No. 97-03-DWQ.

For more information on the Industrial Storm Water General Permit, visit the Central Valley Water Board website at:
http://www.waterboards.ca.gov/centralvalley/water_issues/storm_water/industrial_general_permits/index.shtml.

Clean Water Act Section 404 Permit

If the project will involve the discharge of dredged or fill material in navigable waters or wetlands, a permit pursuant to Section 404 of the Clean Water Act may be needed from the United States Army Corps of Engineers (USACOE). If a Section 404 permit is required by the USACOE, the Central Valley Water Board will review the permit application to ensure that discharge will not violate water quality standards. If the project requires surface water drainage realignment, the applicant is advised to contact the Department of Fish and Game for information on Streambed Alteration Permit requirements.

If you have any questions regarding the Clean Water Act Section 404 permits, please contact the Regulatory Division of the Sacramento District of USACOE at (916) 557-5250.

[1] Municipal Permits = The Phase I Municipal Separate Storm Water System (MS4) Permit covers medium sized Municipalities (serving between 100,000 and 250,000 people) and large sized municipalities (serving over 250,000 people). The Phase II MS4 provides coverage for small municipalities, including non-traditional Small MS4s, which include military bases, public campuses, prisons and hospitals.

Clean Water Act Section 401 Permit – Water Quality Certification

If an USACOE permit, or any other federal permit, is required for this project due to the disturbance of waters of the United States (such as streams and wetlands), then a Water Quality Certification must be obtained from the Central Valley Water Board prior to initiation of project activities. There are no waivers for 401 Water Quality Certifications.

Waste Discharge Requirements

If USACOE determines that only non-jurisdictional waters of the State (i.e., "non-federal" waters of the State) are present in the proposed project area, the proposed project will require a Waste Discharge Requirement (WDR) permit to be issued by Central Valley Water Board. Under the California Porter-Cologne Water Quality Control Act, discharges to all waters of the State, including all wetlands and other waters of the State including, but not limited to, isolated wetlands, are subject to State regulation.

For more information on the Water Quality Certification and WDR processes, visit the Central Valley Water Board website at:
http://www.waterboards.ca.gov/centralvalley/help/business_help/permit2.shtml.

If you have questions regarding these comments, please contact me at (916) 464-4684 or tcleak@waterboards.ca.gov.

Trevor Cleak
Environmental Scientist

cc: State Clearinghouse Unit, Governor's Office of Planning and Research, Sacramento

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February 6, 2014

Trevor Cleak
Environmental Scientist
Central Valley Regional Water Quality Control Board
11020 Sun Center Drive #200
Rancho Cordova, CA 95670

Via email: tcleak@waterboards.ca.gov

RE: SCH # 2013112044 Notice of Completion; Proposed Mitigated Negative Declaration for the "Use of Copper and Acrolein to Control Aquatic Vegetation In Water Conveyances"; Located in Colusa and Yolo Counties, California

Dear Mr. Cleak

We are in receipt of your letter dated December 18, 2013. The above referenced project does not require a Construction Storm Water General Permit, Phase I or II Municipal Separate Storm Swer System (MS4) Permit, Industrial Storm Water General Permit, Clean Water Act Section 404 Permit, or Clean Water Act Section 401 Permit. The project will be regulated under the State Water Resources Control Board Statewide General National Pollutant Discharge Elimination System (NPDES) Permit for residual aquatic pesticide dischargers to waters of the United States from algae and aquatic weed control applications (General Permit No. CAG 990005).

If you have any questions or comments, please feel free to contact us.

Stephen Burkholder

Mike Blankinship

State of California - Department of Fish and Wildlife
2014 ENVIRONMENTAL FILING FEE CASH RECEIPT
DFW 753.5a (Rev. 09/13)

RECEIPT# 446881
STATE CLEARING HOUSE # *(If applicable)* 201312044

SEE INSTRUCTIONS ON REVERSE. TYPE OR PRINT CLEARLY

LEAD AGENCY: Reclamation District 108 | DATE: 2/10/2014
COUNTY/STATE AGENCY OF FILING: Yolo County | DOCUMENT NUMBER: 14-06
PROJECT TITLE: Use of Copper & Acrolein Aquatic Pesticides to Control Aquatic Vegetation
PROJECT APPLICANT NAME: Lewis Blair | PHONE NUMBER: (530) 437-2221
PROJECT APPLICANT ADDRESS: 975 Wilson Bend Road | CITY: Grimes | STATE: CA | ZIP CODE: 95950

PROJECT APPLICANT *(Check appropriate box)*:
☒ Local Public Agency ☐ School District ☐ Other Special District ☐ State Agency ☐ Private Entity

CHECK APPLICABLE FEES:

☐ Environmental Impact Report (EIR)	$3,029.75	$
☐ Mitigated/Negative Declaration (MND)(ND)	$2,181.25	$
☐ Application Fee Water Diversion *(State Water Resources Control Board only)*	$850.00	$
☐ Projects Subject to Certified Regulatory Programs (CRP)	$1,030.25	$
☒ County Administrative Fee	$50.00	$ 50.00
☐ Project that is exempt from fees		
☐ Notice of Exemption (attach)		
☐ CDFW No Effect Determination (attach)		
☒ Other Paid in Colusa Co ($2181.25)		$ 50.00

PAYMENT METHOD:
☐ Cash ☐ Credit ☒ Check #114073 ☐ Other _____ TOTAL RECEIVED $ 50.00

SIGNATURE: X [signature] TITLE: Deputy

WHITE - PROJECT APPLICANT YELLOW - CDFW/ASB PINK - LEAD AGENCY GOLDEN ROD - COUNTY CLERK

State of California - Department of Fish and Wildlife
2014 ENVIRONMENTAL FILING FEE CASH RECEIPT
DFW 753.5a (Rev. 09/13)

RECEIPT# 447279
STATE CLEARING HOUSE # *(If applicable)* 201312044

SEE INSTRUCTIONS ON REVERSE. TYPE OR PRINT CLEARLY

LEAD AGENCY: RECLAMATION DISTRICT 108 | DATE: 02/10/2014
COUNTY/STATE AGENCY OF FILING: COLUSA COUNTY CLERK-RECORDER | DOCUMENT NUMBER: 14-04
PROJECT TITLE: Use of Copper & Acrolein Pesticides to control Aquatic Vegetation
PROJECT APPLICANT NAME: Reclamation District 108 - Lewis Blair | PHONE NUMBER: (530) 437-2221
PROJECT APPLICANT ADDRESS: 975 Wilson Bend Rd | CITY: Grimes | STATE: CA | ZIP CODE: 95950

PROJECT APPLICANT *(Check appropriate box)*:
☒ Local Public Agency ☐ School District ☐ Other Special District ☐ State Agency ☐ Private Entity

CHECK APPLICABLE FEES:

☐ Environmental Impact Report (EIR)	$3,029.75	$
☒ Mitigated/Negative Declaration (MND)(ND)	$2,181.25	$ 2,181.25
☐ Application Fee Water Diversion *(State Water Resources Control Board only)*	$850.00	$
☐ Projects Subject to Certified Regulatory Programs (CRP)	$1,030.25	$
☒ County Administrative Fee	$50.00	$ 50.00
☐ Project that is exempt from fees		
☐ Notice of Exemption (attach)		
☐ CDFW No Effect Determination (attach)		
☐ Other _____		$

PAYMENT METHOD:
☐ Cash ☐ Credit ☒ Check #1442 & 114072 ☐ Other _____ TOTAL RECEIVED $ 2,231.25

SIGNATURE: X Jackie Sanchez TITLE: Deputy clerk

WHITE - PROJECT APPLICANT YELLOW - CDFW/ASB PINK - LEAD AGENCY GOLDEN ROD - COUNTY CLERK