
Use of Copper To Control Algae and Aquatic Vegetation In Redwood Shores Lagoon

California Environmental Quality Act Initial Study And Mitigated Negative Declaration

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CEQA Initial Study & Mitigated Negative Declaration

Table of Contents	Page
1.0 PROJECT DESCRIPTION	4
1.1 Introduction and Environmental Setting	4
1.2 Regulatory Setting.....	7
1.3 Required Approvals.....	8
1.4 Required Notifications	8
1.5 Standard Operating Procedures	9
2.0 INITIAL STUDY	10
2.1 CEQA Initial Study & Environmental Check List Form	10
2.2 Environmental Factors Potentially Affected	11
2.3 Determination (To be completed by lead agency)	11
3.0 EVALUATION OF ENVIRONMENTAL IMPACTS.....	12
3.1 Aesthetics.....	12
3.2 Agriculture Resources.....	13
3.3 Air Quality.....	14
3.4 Biological Resources.....	16
3.5 Cultural Resources.....	32
3.6 Geology and Soils	33
3.7 Greenhouse Gas Emissions	35
3.8 Hazards and Hazardous Materials.....	36
3.9 Hydrology and Water Quality	40
3.10 Land Use Planning.....	45
3.11 Mineral Resources	46
3.12 Noise	47
3.13 Population and Housing	49
3.14 Public Services.....	50
3.15 Recreation	51
3.16 Transportation/Traffic.....	52
3.17 Utilities and Service Systems.....	54
3.18 Mandatory Findings of Significance	56
4.0 MITIGATION MEASURES.....	58
4.1 Hydrology & Water Quality.....	58
4.2 Mitigation Monitoring and Reporting Program	58
5.0 REFERENCES	59
6.0 PERSONS AND AGENCIES CONTACTED	60
7.0 LIST OF PREPARERS	60

List of Figures

- Figure 1 Project Location Map
- Figure 2 Project Site Map

List of Tables

- Table 1 Species & Habitat Summary

List of Appendices

- Appendix A Species Descriptions
- Appendix B Herbicide Ecological Toxicity Data
- Appendix C DPR PCA Recommendation Form (Blank)
- Appendix D Example Product Labels and MSDS Sheets
- Appendix E CEQA and Other Documentation
 - SWRCB SIP Information Sheet
 - Notice of Intent (NOI)
 - Notice of Completion (NOC)
 - Notice of Determination (NOD)
 - State Clearing House Letter
 - Comments and Response to Comments
 - CDFW Filing Fee Receipt

1.0 PROJECT DESCRIPTION

1.1 Introduction and Environmental Setting

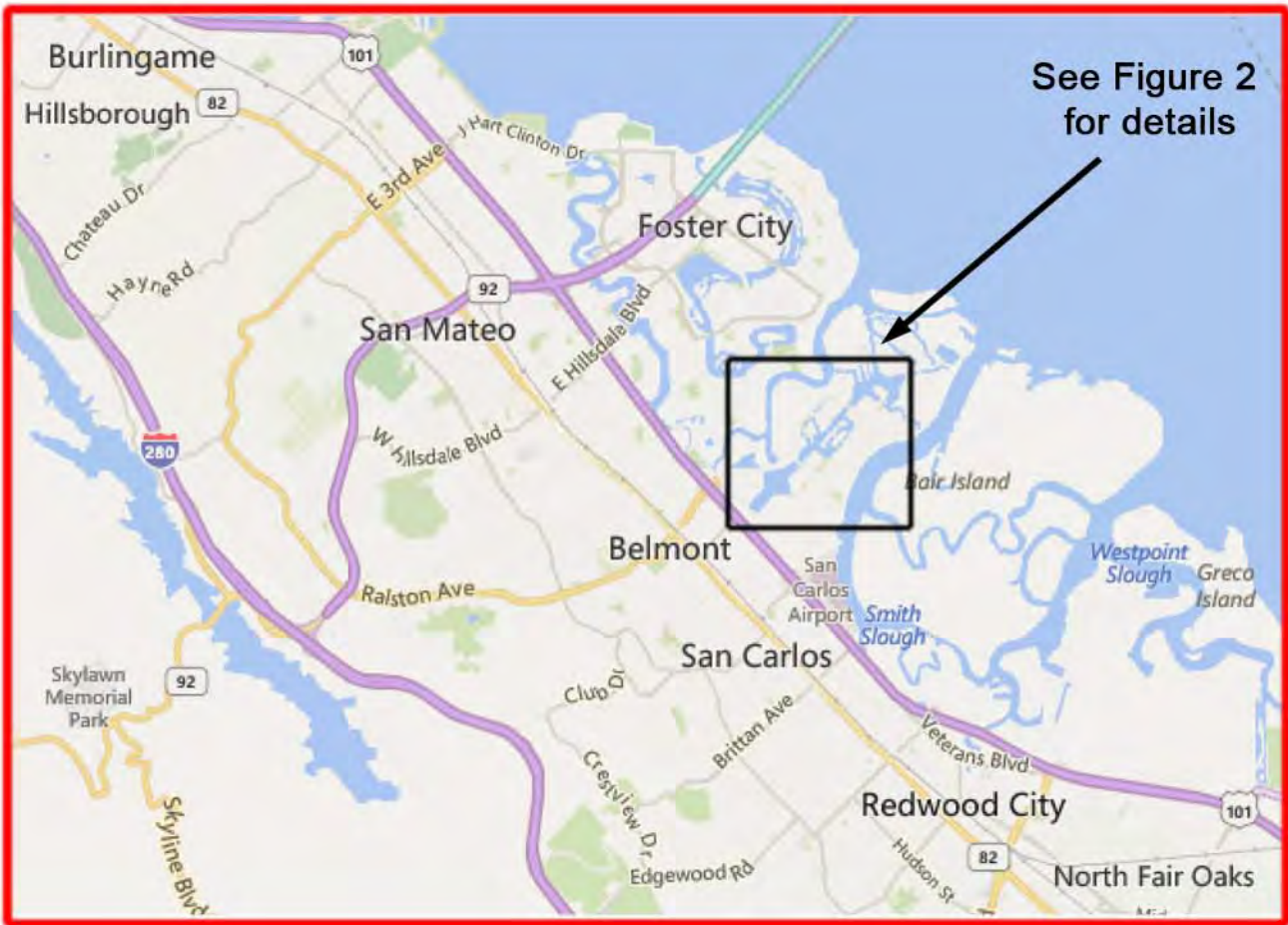
Redwood City (herein referred to as the “City”) covers approximately 35 square miles with a population of about 80,000 people. The City is located on the Peninsula in the San Francisco Bay Area. The City’s Public Work Division, is responsible for maintaining the City’s Redwood Shores Lagoon (herein referred to as “Lagoon”) located within the Redwood Shores development area of the Redwood Peninsula. The Lagoon is a central point of development and contributes to the aesthetic quality, aquatic habitat, and recreation within the area. It also serves as a stormwater retention basin, providing urban flood protection by storing surface runoff during high tide periods in San Francisco Bay.


The Lagoon is approximately 9,000 feet long across its main portion and is connected to sloughs leading to San Francisco Bay at six locations. Refer to **Figures 1** and **Figure 2**. Two sloughs are gravity inlets from Belmont Slough and one from Bay Slough. There is one gravity outlet to Belmont Slough from the diamond-shaped portion of the lagoon. The lagoon’s primary source is tidal flow from San Francisco Bay through Belmont Slough and Bay Slough. In addition, there are two pump stations, referred to as Lagoon Discharge Facility 1 and 2 which pump water from the lagoon to Steinberger Slough. During the summer, these discharge facilities generally operate on a gravity outflow basis. Lagoon Discharge Facility No. 1, located in the vicinity of Waterside Drive, discharges water from the channel located between Redwood Shores Parkway and Steinberger Slough. Lagoon Discharge Facility No. 2, located adjacent to Radio Road, discharges water from the channel located just south of Radio Road. This latter facility also receives the outflow from the narrow Area 1 lagoons located to the northeast. Storm drains connect to the lagoon at a number of points along its periphery. During periods of rain, they discharge storm water into the lagoon. Most of the storm drains are connected to dewatering structures just upstream of the lagoon.

The Lagoon experiences severe impacts to aesthetic and recreational benefits in addition to loss of water quality due to the presence of aquatic vegetation and algae. Nuisance algae and aquatic vegetation includes, but is not limited to, widgeon grass (*Ruppia maritima*) and filamentous algae (*Cladophora spp.*).

Using Integrated Pest Management (IPM) techniques, the City or its contractor plans to apply copper-containing algaecides and/or aquatic herbicides on an “as-needed” basis to achieve aquatic weed and/or algae control necessary to maintain the lagoon’s beneficial uses. Depending on algae or aquatic weed presence, density, and species type(s), algaecides or aquatic herbicides containing copper may be applied at locations throughout the Lagoon. Applications may be made if the City’s IPM thresholds are met, or are expected to be met, based on the weather, weed density, weed growth or predicted growth, water flow, water level in the system, or resident complaints. Some years, copper-containing algaecides and/or aquatic herbicides may not be used if thresholds are not met. Applications are typically made between April and November. No algaecide or aquatic herbicide applications are made directly to the San Francisco Bay.

The “Project” is defined as the City’s application of copper-containing algaecides and/or aquatic herbicides to the Redwood Shores Lagoon to control algae and/or aquatic vegetation. These applications may result in short-term or seasonal exceedances of the State Implementation Plan’s (SIP) copper Water Quality Objectives.



 <p>Blankinship & Associates, Inc. Agricultural & Environmental Scientists & Engineers</p>	<p>Redwood Shores Lagoon Project Location Map</p>		<p>Project Redwood City IS/MND</p>	<p>Figure 1</p>
			<p>Date June 11, 2015</p>	

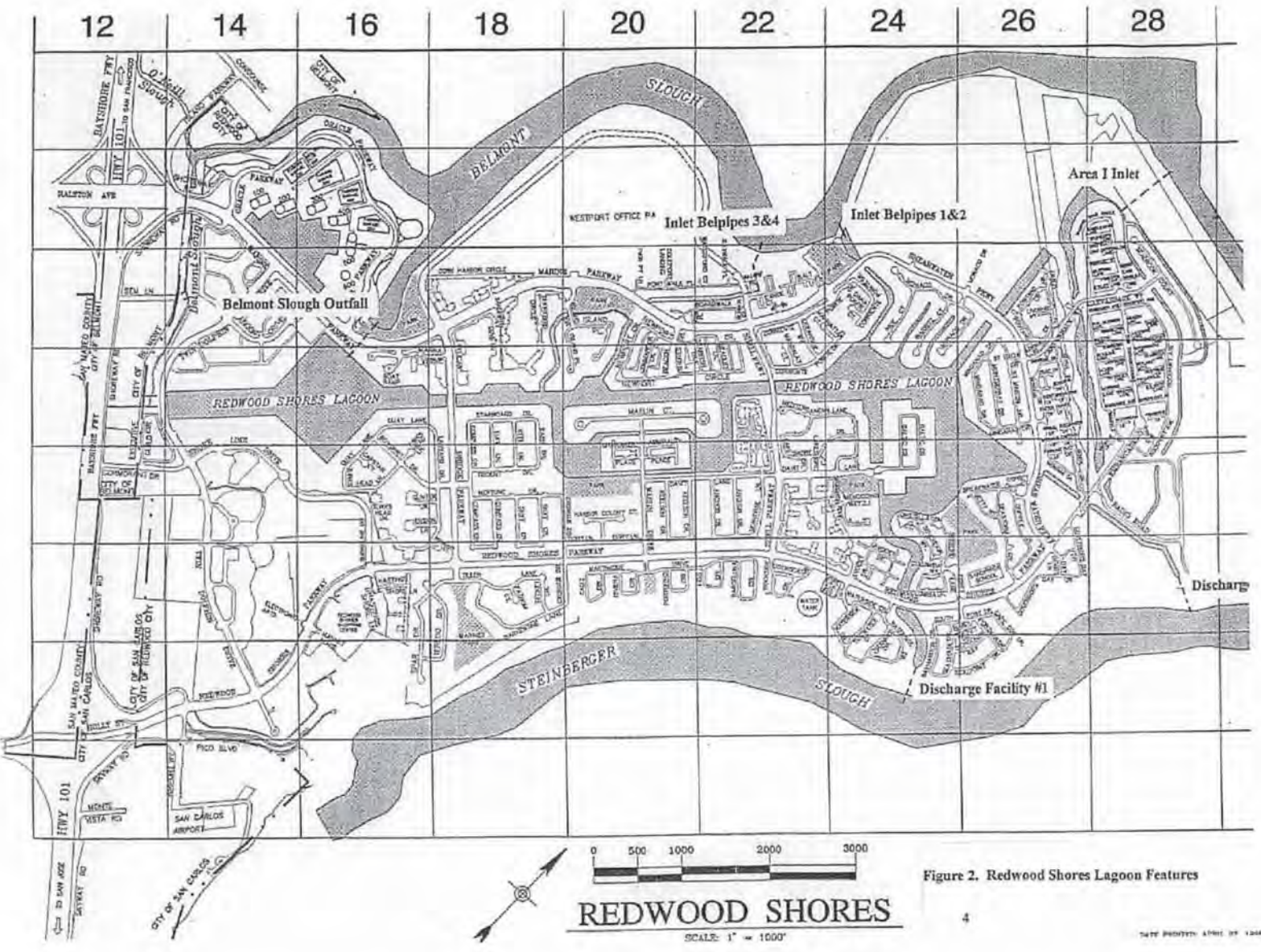


Figure 2. Redwood Shores Lagoon Features

Image source: Redwood Shores Lagoon City of Redwood City 2013. APAP for NPDES General Permit for Discharges of Aquatic Pesticides to Waters of the United States.

Redwood Shores Lagoon Project Area



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

Project	Figure
Redwood City IS/MND	2

Date
June 11, 2015

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 became available on December 1, 2013 (SWRCB 2013). The Permit requires compliance with the following:

- The Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries in California (aka the State Implementation Plan, or SIP) (SWRCB, 2000)
- The California Toxics Rule (CTR) (CTR, 2000)
- Applicable Regional Water Quality Control Board (RWQCB) Basin Plan Water Quality Objectives (WQOs) (RWQCB, 2003)

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

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

Permittees who elect to use a SIP exception must satisfactorily complete several steps, including preparation and submission of an application and California Environmental Quality Act (CEQA) document to SWRCB. Consistent with Section IX.C.1.a. of the Permit, entities may be added to Attachment G of the Permit if they have qualified for a SIP Section 5.3 exception². Accordingly, when the application and CEQA process is complete, and a short-term or seasonal exemption from meeting the receiving water limit for copper is granted, Attachment G of the Permit will be revised to list the City's exemption and the City may apply aquatic herbicides in accordance with the Permit as revised. This document must be submitted to the

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

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

SWRCB for the permittee to be placed on Attachment G of the Permit, and subsequently be afforded coverage.

1.3 Required Approvals

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

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

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

1.4 Required Notifications

1.4.1 California Department of Fish and Wildlife

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

1.4.2 NPDES Aquatic Pesticide Permit Notifications

Every calendar year, at least 15 days prior to the first application of copper-containing aquatic herbicide, the City will notify potentially affected public agencies. The City may post the notification on its website if possible. The notification must include the following information:

1. A statement of the City'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 City.

1.5 Standard Operating Procedures

The City implements an Integrated Pest Management (IPM) program for algae and aquatic weed control. The IPM program involves scouting for algae and aquatic weed presence in the Lagoon to determine if the locations and densities exceed or are likely to exceed treatment thresholds. If algae or aquatic weeds are present in locations and densities that exceed thresholds above which control is needed, the City may make applications of copper-containing aquatic herbicides on an “as-needed” basis to achieve the aquatic weed control necessary to maintain the system’s design capacity and flow, or prevent nuisance conditions due to odors or mosquito-breeding habitat.

Prior to application copper-containing aquatic herbicides, the following tasks will be 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 stating 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 C**.
2. All City or contractor personnel applying herbicides 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 for an herbicide that contains copper is included in **Appendix D**.
3. All City or contractor personnel applying herbicides review and consult the aquatic herbicide Material Safety Data Sheet (MSDS) (an example is provided in **Appendix D**), 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.
4. The condition of the area(s) of the lagoon 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 or algae species, level of infestation, water and flow conditions, alternate control methods, and amount of aquatic herbicide to be applied.
5. Notifications, as needed, are sent to the potentially affected public agencies and the California Department of Fish and Wildlife (CDFW).
6. Prior to an application, City or contractor personnel inspect and seal any emergency spill structures, as necessary if control structures are leaking. The City or contractor will coordinate with pump operators to confirm that pumps, if present, will remain off during application.

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 of the *State CEQA Guidelines* to determine if the proposed Project could have any potentially significant effect on the physical environment, and if so, what mitigation measures would be imposed to reduce such impacts to less-than-significant levels.

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

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

2.1 CEQA Initial Study & Environmental Check List Form

1. **Project Title:** Use of Copper to Control Algae and Aquatic Vegetation in Redwood Shores Lagoon
2. **Lead Agency Name and Address:** City of Redwood City, Public Works Division
1400 Broadway
Redwood City, California 94063
3. **Contact Person & Phone Number:** Terence Kyaw, Assistant Public Works Director
(650) 780-7466
4. **Project Location:** Redwood City, California
5. **Project Sponsor’s Name and Address:** See #2. above
6. **General Plan Land Use Designation:** Agricultural/Industrial/Commercial/Residential/Flood Control
7. **Zoning:** Agricultural/Industrial/Commercial/Residential
8. **Description of Project:** See Section 1.0
9. **Surrounding Land Uses and Setting:** Agriculture/Airport/Residential/Commercial/Industrial
10. **Other Agencies Whose Approval is Required:** See Sections 1.3 and 1.4

2.2 Environmental Factors Potentially Affected

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

- Checklist of environmental factors with checkboxes. Checked items include: Biological Resources, Hydrology/Water Quality, and Mandatory Findings of Significance.

2.3 Determination (To be completed by lead agency)

On the basis of this initial evaluation:

- Five options for determination with checkboxes. The second option is checked: '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.'

Handwritten signature in blue ink over a horizontal line, labeled 'Signature'.

Handwritten date '10/23/2015' in blue ink over a horizontal line, labeled 'Date'.

Handwritten name 'Terence T. Kyaw' in blue ink over a horizontal line, labeled 'Printed Name'.

Handwritten 'City of Redwood City' in blue ink over a horizontal line, labeled 'For'.

3.0 EVALUATION OF ENVIRONMENTAL IMPACTS

3.1 Aesthetics

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
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Would the Project:

a) Have a substantial adverse effect on a scenic vista?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c) Substantially degrade the existing visual character or quality of the site and its surrounding?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Discussion

Items a) & b): **No Impact.** There are no designated scenic vistas, state scenic highways, or scenic resources in the vicinity of the Project sites, therefore no impact would occur. The visual quality of the Lagoon, which is considered an important aesthetic site, would not be negatively impacted by Project activities. To the contrary, the Project would enhance the visual quality of the Lagoon by clearing nuisance algae and weeds.

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

Item d): **No Impact.** The Project is 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
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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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Discussion

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

3.3 Air Quality

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the Project:				
a) Conflict with or obstruct implementation of the applicable air quality plan?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d) Expose sensitive receptors to substantial pollutant concentrations?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
e) Create objectionable odors affecting a substantial number of people?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Discussion

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

The City is located in the San Francisco Bay Area Air Basin, which includes the following counties: Napa, Western Solano, Contra Costa, Alameda, Santa Clara, San Mateo, San Francisco, Marin, and Southern Sonoma. The application of aquatic herbicides does not conflict with any San Francisco Bay Area Air Quality Management Plans, violate any air

quality standards, or contribute to an existing or projected violation based on data available from the Bay Area Air Quality Management District.

Item c): **No Impact.** Levels of ozone and suspended matter (PM_{2.5}) in San Mateo County have exceeded California Clean Air standards, and therefore the area is considered a “nonattainment” area for these pollutants. Although San Mateo County is nonattainment for both PM_{2.5} and ozone California Clean Air standards, the Project will not increase either of these criteria pollutants.

Items d) & e): **No Impact.** Aquatic herbicides containing copper will be applied by City or contractor personnel. Applications will take place in the Lagoon. Applications are typically brief in duration and made infrequently (i.e. a few times per year). Applications are not made near schools, health care facilities, or day care facilities, thereby eliminating exposure to these sensitive receptors and creating no impact. Similarly, there will be no objectionable odors that affect a substantial number of people as a result of the application of copper-containing aquatic herbicides.

3.4 Biological Resources

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
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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?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Discussion

Item a): **Less Than Significant Impact.** A list of current special status species was compiled from the California Department of Fish and Wildlife (CDFW) California Natural Diversity Database (CNDDDB), 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 conservation status, and whether or not they were considered for evaluation of potential impact is presented in **Table 1**. Species habitat and rationale for removal from further consideration is presented in **Table 1** and more detailed species life history information can be found in **Appendix A**. Physical, chemical and toxicological data on copper is presented in **Appendix B**.

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

The one species that may be present in the project area is the longfin smelt. Adult longfin smelt may swim from the San Francisco Bay into the Lagoon and enter treated water bodies. Once in the Lagoon, longfin smelt may be exposed to copper through contact with treated water.

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	<i>Ambystoma californiense</i>	FT, ST, SCSC	Herbaceous wetland, temporary pool; Grassland/herbaceous, Savanna, Woodland - Hardwood; Benthic, Burrowing in or using soil	X		
California red-legged frog	<i>Rana draytonii</i>	FT, SCSC	Lowland foothills in or near permanent sources of deep water with dense, shrubby, or emergent riparian vegetation.	X		
western spadefoot	<i>Spea hammondi</i>	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		

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	<i>Agelaius tricolor</i>	SCSC	Freshwater and brackish marshes of cattails, tule, bulrushes and sedges; Cropland/hedgerow, Grassland/herbaceous		X (1)	
grasshopper sparrow	<i>Ammodramus savannarum</i>	SCSC	Dense grasslands on rolling hills, lowland plains, in valleys and on hillsides on lower mountain slopes	X		
short-eared owl	<i>Asio flammeus</i>	SCSC	Salt and fresh swamp lands, lowland meadow. May nest in tule patches and tall grass		X (1)	
burrowing owl	<i>Athene cucularia</i>	SCSC	Agriculture/rangeland, grassland, parks with open ground squirrel burrows	X		
Swainson's hawk	<i>Buteo swainsoni</i>	ST	Cropland/hedgerow, Desert, Grassland/herbaceous, Savanna, Woodland - Mixed	X		
western snowy plover	<i>Charadrius alexandrinus nivosus</i>	FT, SCSC	Sandy beaches, alkali lakeshores and dry evaporation ponds; un-vegetated open areas, primarily in sand dunes, for nest sites	X		
mountain plover	<i>Charadrius montanus</i>	SCSC	Recently plowed fields, sparsely vegetated fields, and pastureland with little to no vegetative growth	X		
northern harrier	<i>Circus cyaneus</i>	SCSC	Coastal salt and fresh water marsh. May nest and forage in grasslands and shrubby vegetation, usually at marsh edge.		X (1)	
western yellow-billed cuckoo	<i>Coccyzus americanus occidentalis</i>	SE	Open woodland parks, deciduous riparian woodland; requires patches of at least 10 hectares (25 acres) of dense riparian forest with a canopy cover of at least 50 percent in both the understory and overstory	X		
saltmarsh common yellowthroat	<i>Geothlypis trichas sinuosa</i>	SCSC	Fresh and salt water marshes. May nest in tule patches, tall grasses, and willows.		X (1)	

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
California black rail	<i>Laterallus jamaicensis coturniculus</i>	ST	Salt or fresh water marshes, wet meadows, shallow margins of saltwater marshes bordering larger bays; areas with water depths of about 1 inch; dense vegetation for nesting habitat		X (2)	
song sparrow ("Modesto" population)	<i>Melospiza melodia</i>	SCSC	Fresh-water marshes and riparian thickets	X		
Alameda song sparrow	<i>Melospiza melodia pusillula</i>	SCSC	Salt marshes. May nest low in grindelia bushes and in <i>Salicornia</i> .		X (1)	
purple martin	<i>Progne subis</i>	SCSC	Inhabits woodlands, low elevation coniferous forest of douglas-fir, ponderosa pine, and Monterey pine	X		
California clapper rail	<i>Rallus longirostris obsoletus</i>	FE, SE	Salt water and brackish marshes, abundant growths of pickleweed		X (2)	
bank swallow	<i>Riparia riparia</i>	ST	riparian and other lowland habitats; requires vertical banks/cliffs with fine soils	X		
black skimmer	<i>Rynchops niger</i>	SCSC	Nests on gravel bars, low islets, and sandy beaches		X (3)	
yellow warbler	<i>Setophaga petechia</i>	SCSC	May nest in montane shrubbery in open conifer forests. May nest and forage in willow shrubs and thickets, and in other riparian plants including cottonwoods.		X (1)	
California least tern	<i>Sternula antillarum browni</i>	FE, SE	May nest along coasts. Colonial breeder on bare or sparsely vegetated substrates including sand beaches, alkali flats, land fills, and paved areas.		X (3)	
least Bell's vireo	<i>Vireo bellii pusillus</i>	FE, SE	Summer resident of Southern California in low riparian in vicinity of water or in dry river bottoms; nests placed along margins of bushes or on twigs projecting into pathways, usually willow, <i>Baccharis</i> , mesquite	X		

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yellow-headed blackbird	<i>Xanthocephalus xanthocephalus</i>	SCSC	Nests in freshwater emergent wetlands with dense vegetation and deep water; often along borders of lakes or ponds	X		
FISH						
Sacramento perch	<i>Archoplites interruptus</i>	SCSC	Historically found in the sloughs, slow-moving rivers, and lakes of the central valley	X		
tidewater goby	<i>Eucyclogobius newberryi</i>	FE, SCSC	Brakish water habitats along the California coast, shallow lagoons and lower stream reaches		X (4)	
Delta smelt	<i>Hypomesus transpacificus</i>	FT, SE	Sacramento-San Joaquin River Delta; seldom found at salinities > 10 ppt	X		
hardhead	<i>Mylopharodon conocephalus</i>	SCSC	Low- to mid-elevation streams in the Sacramento-San Joaquin drainage, clear, deep pools wit sand-gravel-boulder bottoms and slow water velocity	X		
steelhead - Central Valley DPS	<i>Oncorhynchus mykiss irideus</i>	FT	Sacramento River and San Joaquin Rivers and their tributaries	X		
steelhead - central California coast DPS	<i>Oncorhynchus mykiss irideus</i>	FT	Sacramento River and San Joaquin Rivers and their tributaries	X		
chinook salmon - Sacramento River winter-run ESU	<i>Oncorhynchus tshawytscha</i>	FE, SE	Sacramento river below Keswick Dam; spawns in the Sacramento River but not in tributary streams	X		
chinook salmon - Central Valley spring-run ESU	<i>Oncorhynchus tshawytscha</i>	FT, ST	Sacramento river below Keswick Dam; spawns in the Sacramento River but not in tributary streams	X		
Sacramento splittail	<i>Pogonichthys macrolepidotus</i>	SCSC	Lakes, Slow-moving Rivers with Vegetated Floodplain, Tidal Estuarine Marsh	X		
longfin smelt	<i>Spirinchus thaleichthys</i>	ST, SCSC	Found in open waters of estuaries, prefer salinities of 15-30 ppt, but may be found in completely freshwater to almost pure seawater			X
eulachon	<i>Thaleichthys pacificus</i>	FT, SCSC	Found in Klamath river, Mad River, Redwood creek & in small numbers in Smith river & Humboldt Bay tributaries		X (5)	

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INVERTEBRATE						
Conservancy fairy shrimp	<i>Branchinecta conservatio</i>	FE	Vernal pools	X		
vernal pool fairy shrimp	<i>Branchinecta lynchi</i>	FT	Vernal pools	X		
San Bruno elfin butterfly	<i>Callophrys mossii bayensis</i>	FE	Coastal, mountainous areas with grassy ground cover	X		
Bay checkerspot butterfly	<i>Euphydryas editha bayensis</i>	FT	Native grasslands on outcrops of serpentine soil. Primary host is <i>Plantago erecta</i> . Secondary hosts are <i>Orthocarpus densiflorus</i> and <i>O. purpurascens</i> .	X		
vernal pool tadpole shrimp	<i>Lepidurus packardii</i>	FE	Vernal pools	X		
Mission blue butterfly	<i>Plebejus icarioides missionensis</i>	FE	Grasslands and areas inhabited by its three larval host plants: <i>Lupinus albifrons</i> , <i>L. variicolor</i> , and <i>L. formosus</i>	X		
callippe silverspot butterfly	<i>Speyeria callippe callippe</i>	FE	Northern coastal scrub of the San Francisco Peninsula	X		
Myrtle's silverspot butterfly	<i>Speyeria zerene myrtleae</i>	FE	Foggy, coastal dunes and hills of the Point Reyes Peninsula, extirpated from coastal San Mateo County	X		
MAMMAL						
pallid bat	<i>Antrozous pallidus</i>	SCSC	Deserts, grasslands, shrublands, woodlands & forests. Most common in open, dry habitats with rocky areas for roosting	X		
Townsend's big-eared bat	<i>Corynorhinus townsendii</i>	SCSC	Mesic habitats, roosts in the open, hanging from walls and ceilings		X (1)	
western mastiff bat	<i>Eumops perotis californicus</i>	SCSC	Semi-arid to arid habitats including conifer and deciduous woodlands, coastal scrub, grasslands, & chaparral. Roosts in crevices in cliff faces, high buildings, trees, and tunnels		X (1)	
western red bat	<i>Lasiurus blossevillii</i>	SCSC	Along riparian and agricultural areas in broadleaf tree communities throughout the Central Valley		X (1)	
San Francisco dusky-footed woodrat	<i>Neotoma fuscipes annectens</i>	SCSC	Forest habitats of moderate canopy & moderate to dense understory, may prefer chaparral & redwood habitats	X		

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big free-tailed bat	<i>Nyctinomops macrotis</i>	SCSC	Low-lying arid areas in Southern California, needs high cliffs or rocky outcrops for roosting sites		X (1)	
salt-marsh harvest mouse	<i>Reithrodontomys raviventris</i>	FE, SE	Saline emergent wetlands, primary habitat is pickleweed	X		
Alameda Island mole	<i>Scapanus latimanus parvus</i>	SCSC	Annual & perennial grasslands, prefers moist, friable soils	X		
salt-marsh wandering shrew	<i>Sorex vagrans halicoetes</i>	SCSC	Salt marshes of the south arm of the San Francisco Bay	X		
American badger	<i>Taxidea taxus</i>	SCSC	Most abundant in drier open stages of most shrub, forest, and herbaceous habitats, with friable soils	X		
PLANT						
San Mateo thorn-mint	<i>Acanthomintha duttonii</i>	FE, SE, CRPR-1	Chaparral, Valley and foothill grassland, coastal scrub	X		
Franciscan onion	<i>Allium peninsulare</i> var. <i>franciscanum</i>	CRPR-1	Cismontane woodland, valley and foothill grassland, clay soils	X		
bent-flowered fiddleneck	<i>Amsinckia lunaris</i>	CRPR-1	Cismontane woodland, valley and foothill grassland	X		
Anderson's manzanita	<i>Arctostaphylos andersonii</i>	CRPR-1	Broadleaved upland forest, chaparral, North Coast coniferous forest, open sites, redwood forest	X		
Franciscan manzanita	<i>Arctostaphylos franciscana</i>	FE, CRPR-1	Chaparral, serpentine outcrops	X		
San Bruno Mountain manzanita	<i>Arctostaphylos imbricata</i>	SE, CRPR-1	Chaparral, coastal scrub	X		
Presidio manzanita	<i>Arctostaphylos montana</i> ssp. <i>ravenii</i>	FE, SE, CRPR-1	Chaparral, coastal prairie, coastal scrub	X		
Montara manzanita	<i>Arctostaphylos montaraensis</i>	CRPR-1	Chaparral, coastal scrub	X		
Pacific manzanita	<i>Arctostaphylos pacifica</i>	SE, CRPR-1	Coastal scrub	X		
Kings Mountain manzanita	<i>Arctostaphylos regismontana</i>	CRPR-1	Broadleaved upland forest, chaparral, North Coast coniferous forest	X		
coastal marsh milk-vetch	<i>Astragalus pycnostachyus</i> var. <i>pycnostachyus</i>	CRPR-1	Coastal dunes, coastal salt marshes, coastal scrub, mesic sites in dunes or along streams or coastal salt marshes	X		
Ferris' milk-vetch	<i>Astragalus tener</i> var. <i>ferrisiae</i>	CRPR-1	Grassland	X		
alkali milk-vetch	<i>Astragalus tener</i> var. <i>tener</i>	CRPR-1	Alkali areas of floodplains; vernal pools	X		

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heartscale	<i>Atriplex cordulata</i> <i>var. cordulata</i>	CRPR-1	Saline or alkaline soils in chenopod scrub, valley and foothill grassland	X		
brittscale	<i>Atriplex depressa</i>	CRPR-1	Alkaline clay soils in chenopod scrub, meadows, vernal pools, and valley and foothill grassland	X		
San Joaquin spearscale	<i>Atriplex joaquinana</i>	CRPR-1	Alkaline clay soils in chenopod scrub, meadows, vernal pools, and valley and foothill grassland	X		
big-scale balsamroot	<i>Balsamorhiza macrolepis</i>	CRPR-1	Chaparral, valley and foothill grassland, cismontane woodland	X		
watershield	<i>Brasenia schreberi</i>	CRPR-2	Lakes, ponds and slow-moving streams; 0.5-3 m deep	X		
bristly sedge	<i>Carex comosa</i>	CRPR-2	Marshes and swamps	X		
Congdon's tarplant	<i>Centromadia parryi</i> ssp. <i>congdonii</i>	CRPR-1	Valley and foothill grassland, alkaline soils	X		
pappose tarplant	<i>Centromadia parryi</i> ssp. <i>parryi</i>	CRPR-1	Coastal prairie, meadows and seeps, coastal salt marsh, valley and foothill grassland	X		
Point Reyes salty bird's-beak	<i>Chloropyron maritimum</i> ssp. <i>palustre</i>	CRPR-1	Coastal salt marsh	X		
hispid salty bird's-beak	<i>Chloropyron molle</i> ssp. <i>hispidum</i>	CRPR-1	Meadows and seeps, playas, valley and foothill grassland	X		
palmate-bracted salty bird's-beak	<i>Chloropyron palmatum</i>	FE, SE, CRPR-1	Chenopod scrub, valley and foothill grassland	X		
San Francisco Bay spineflower	<i>Chorizanthe cuspidata</i> var. <i>cuspidata</i>	CRPR-1	Coastal bluff scrub, coastal dunes, coastal prairie, coastal scrub	X		
robust spineflower	<i>Chorizanthe robusta</i> var. <i>robusta</i>	FE, CRPR-1	Cismontane woodland, coastal dunes, coastal scrub	X		
Bolander's water-hemlock	<i>Cicuta maculata</i> var. <i>bolanderi</i>	CRPR-2	Marshes and swamps, coastal, fresh or brackish water		X (6) (7)	
Franciscan thistle	<i>Cirsium andrewsii</i>	CRPR-1	Coastal bluff scrub, broadleaved upland forest, coastal scrub, coastal prairie	X		
Crystal Springs fountain thistle	<i>Cirsium fontinale</i> var. <i>fontinale</i>	FE, SE, CRPR-1	Valley and foothill grassland, chaparral, serpentine seeps	X		
compact cobwebby thistle	<i>Cirsium occidentale</i> var. <i>compactum</i>	CRPR-1	Chaparral, coastal dunes, coastal prairie, coastal scrub	X		

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lost thistle	<i>Cirsium praeteriens</i>	CRPR-1	Not seen since 1901. Little information exists on this plant. Collected from Palo Alto area at the turn of the 20th century.	X		
San Francisco collinsia	<i>Collinsia multicolor</i>	CRPR-1	Closed-cone coniferous forest, coastal scrub, decomposed shale (mudstone) mixed with humus	X		
Peruvian dodder	<i>Cuscuta obtusiflora</i> var. <i>glandulosa</i>	CRPR-2	Freshwater marshes and swamps	X		
western leatherwood	<i>Dirca occidentalis</i>	CRPR-1	Broadleaved upland forest, chaparral, closed-cone coniferous forest, cismontane woodland, North Coast coniferous forest, riparian forest, riparian woodland	X		
dwarf downingia	<i>Downingia pusilla</i>	CRPR-1	Valley and foothill grassland (Mesic sites), vernal pools	X		
San Mateo woolly sunflower	<i>Eriophyllum latilobum</i>	FE, SE, CRPR-1	Cismontane woodland	X		
Hoover's button-celery	<i>Eryngium aristulatum</i> var. <i>hooveri</i>	CRPR-1	Vernal pools	X		
Hillsborough chocolate lily	<i>Fritillaria biflora</i> var. <i>ineziana</i>	CRPR-1	Cismontane woodland, valley and foothill grassland	X		
fragrant fritillary	<i>Fritillaria liliacea</i>	CRPR-1	Coastal scrub, valley and foothill grassland, coastal prairie	X		
blue coast gilia	<i>Gilia capitata</i> ssp. <i>chamissonis</i>	CRPR-1	Coastal dunes, coastal scrubs	X		
Boggs Lake hedge-hyssop	<i>Gratiola heterosepala</i>	SE, CRPR-1	Clay soils at the margins of lakes and vernal pools	X		
Diablo helianthella	<i>Helianthella castanea</i>	CRPR-1	Broadleaved upland forest, chaparral, cismontane woodland, coastal scrub, riparian woodland, valley & foothill grassland	X		
white seaside tarplant	<i>Hemizonia congesta</i> ssp. <i>congesta</i>	CRPR-1	Coastal scrub, valley and foothill grassland	X		
short-leaved evax	<i>Hesperovax sparsiflora</i> var. <i>brevifolia</i>	CRPR-1	Coastal bluff scrub, coastal dunes, sandy bluffs and flats	X		
Marin western flax	<i>Hesperolinon congestum</i>	FT, ST, CRPR-1	Chaparral, valley and foothill grassland	X		
water star-grass	<i>Heteranthera dubia</i>	CRPR-2	Marshes and swamps. Alkaline, still, or slow-moving water	X		
woolly rose-mallow	<i>Hibiscus lasiocarpus</i> var. <i>occidentalis</i>	CRPR-1	Freshwater Marsh	X		

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Loma Prieta hoita	<i>Hoita strobilina</i>	CRPR-1	Chaparral, cismontane woodland, riparian woodland, mesic sites	X		
Santa Cruz tarplant	<i>Holocarpha macradenia</i>	FT, SE, CRPR-1	Coastal prairie, coastal scrub, valley and foothill grassland	X		
Kellogg's horkelia	<i>Horkelia cuneata var. sericea</i>	CRPR-1	Closed-cone coniferous forest, coastal scrub, coastal dunes, chaparral	X		
Point Reyes horkelia	<i>Horkelia marinensis</i>	CRPR-1	Coastal dunes, coastal prairie, coastal scrub	X		
Northern California black walnut	<i>Juglans hindsii</i>	CRPR-1	Riparian forest, riparian woodland, deep alluvial soil associated with a creek or stream	X		
Ahart's dwarf rush	<i>Juncus leiospermus var. ahartii</i>	CRPR-1	Vernal pools, valley and foothill grassland	X		
Red Bluff dwarf rush	<i>Juncus leiospermus var. leiospermus</i>	CRPR-1	Chaparral, valley and foothill grassland, cismontane woodland, vernal pools, meadows and seeps	X		
Contra Costa goldfields	<i>Lasthenia conjugens</i>	FT, CRPR-1	Valley and foothill grassland, vernal pools, alkaline playas, cismontane woodland	X		
Delta tule pea	<i>Lathyrus jepsonii var. jepsonii</i>	CRPR-1	Estuarine salt marshes and tidally influenced river banks, slough edges and levees		X (7) (8)	
beach layia	<i>Layia carnosa</i>	FE, SE, CRPR-1	Coastal dunes, coastal scrubs	X		
legenere	<i>Legenere limosa</i>	CRPR-1	Vernal pools	X		
Heckard's pepper-grass	<i>Lepidium latipes var. heckardii</i>	CRPR-1	Grassland, Vernal Pools	X		
coast yellow leptosiphon	<i>Leptosiphon croceus</i>	CRPR-1	Coastal bluff scrub, coastal prairie	X		
rose leptosiphon	<i>Leptosiphon rosaceus</i>	CRPR-1	Coastal bluff scrub	X		
Crystal Springs lessingia	<i>Lessingia arachnoidea</i>	CRPR-1	Coastal sage scrub, valley and foothill grassland, cismontane woodland	X		
San Francisco lessingia	<i>Lessingia germanorum</i>	FE, SE, CRPR-1	On remnant dunes, open sandy soils relatively free of completing plants	X		
Mason's lilaepsis	<i>Lilaeopsis masonii</i>	CRPR-1	Freshwater and brackish marshes, riparian scrub		X (7)	
Ornduff's meadowfoam	<i>Limnanthes douglasii ssp. ornduffii</i>	CRPR-1	Meadows and seeps, agricultural fields	X		
Delta mudwort	<i>Limosella australis</i>	CRPR-2	Riparian scrub, freshwater and brackish marshes	X		

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Indian Valley bush-mallow	<i>Malacothamnus aboriginum</i>	CRPR-1	Cismontane woodland, chaparral, granitic outcrops and sandy bare soil	X		
arcuate bush-mallow	<i>Malacothamnus arcuatus</i>	CRPR-1	Chaparral, cismontane woodland, gravelly alluvium	X		
Davidson's bush-mallow	<i>Malacothamnus davidsonii</i>	CRPR-1	Coastal scrub, riparian woodland, chaparral, cismontane woodland	X		
Hall's bush-mallow	<i>Malacothamnus hallii</i>	CRPR-1	Chaparral	X		
northern curly-leaved monardella	<i>Monardella sinuata</i> ssp. <i>nigrescens</i>	CRPR-1	Coastal dunes, coastal scrub, chaparral, lower montane coniferous	X		
woodland woollythreads	<i>Monolopia gracilens</i>	CRPR-1	Chaparral, valley and foothill grasslands, cismontane woodland, broadleaved upland forests, North Coast coniferous forest	X		
Baker's navarretia	<i>Navarretia leucocephala</i> ssp. <i>bakeri</i>	CRPR-1	Grassland, Coniferous Forest, Oak Woodland, Vernal Pools	X		
pincushion navarretia	<i>Navarretia myersii</i> ssp. <i>myersii</i>	CRPR-1	Vernal pools	X		
Colusa grass	<i>Neostapfia colusana</i>	FT, SE, CRPR-1	Vernal pools	X		
slender Orcutt grass	<i>Orcuttia tenuis</i>	FT, SE, CRPR-1	Vernal pools	X		
Sacramento Orcutt grass	<i>Orcuttia viscida</i>	FE, SE, CRPR-1	Vernal pools	X		
white-rayed pentachaeta	<i>Pentachaeta bellidiflora</i>	FE, SE, CRPR-1	Valley and foothill grassland, cismontane woodland	X		
Choris' popcornflower	<i>Plagiobothrys chorisianus</i> var. <i>chorisianus</i>	CRPR-1	Mesic sites, chaparral, coastal scrub, coastal prairie	X		
hairless popcornflower	<i>Plagiobothrys glaber</i>	CRPR-1	Meadows and seeps, marshes and swamps, coastal salt marshes and alkaline meadows		X (7) (8)	
bearded popcornflower	<i>Plagiobothrys hystriculus</i>	CRPR-1	Vernal pools, valley and foothill grassland	X		
Oregon polemonium	<i>Polemonium carneum</i>	CRPR-2	Coastal prairie, coastal scrub, lower montane coniferous forest	X		
Hickman's cinquefoil	<i>Potentilla hickmanii</i>	FE, SE, CRPR-1	Coastal bluff scrub, closed-cone coniferous forest, meadows and seeps, marshes and swamps	X		
Sanford's arrowhead	<i>Sagittaria sanfordii</i>	CRPR-1	Marshes and swamps	X		
adobe sanicle	<i>Sanicula maritima</i>	CRPR-1	Meadows and seeps, valley and foothill grassland, chaparral, coastal prairie	X		
marsh skullcap	<i>Scutellaria galericulata</i>	CRPR-2	Marshes and swamps, meadows and seeps	X		

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side-flowering skullcap	<i>Scutellaria lateriflora</i>	CRPR-2	Meadows and seeps, marshes and swamps	X		
chaparral ragwort	<i>Senecio aphanactis</i>	CRPR-2	Chaparral, cismontane woodland, coastal scrub	X		
San Francisco campion	<i>Silene verecunda ssp. verecunda</i>	CRPR-1	Coastal scrub, valley and foothill grassland, coastal bluff scrub, chaparral, coastal prairie	X		
most beautiful jewelflower	<i>Streptanthus albidus ssp. peramoenus</i>	CRPR-1	Chaparral, valley and foothill grassland, cismontane woodland	X		
slender-leaved pondweed	<i>Stuckenia filiformis ssp. alpina</i>	CRPR-2	Marshes and swamps. Shallow, clear waters of lakes and drainage channels	X		
California seablite	<i>Suaeda californica</i>	FE, CRPR-1	Marshes and swamps		X (7) (8)	
Suisun Marsh aster	<i>Symphotrichum lentum</i>	CRPR-1	Marshes and swamps (brackish and freshwater)	X		
showy rancheria clover	<i>Trifolium amoenum</i>	FE, CRPR-1	Valley and foothill grassland, coastal bluff scrub	X		
saline clover	<i>Trifolium hydrophilum</i>	CRPR-1	Marshes and swamps, valley and foothill grassland, vernal pools		X (8) (9)	
San Francisco owl's-clover	<i>Triphysaria floribunda</i>	CRPR-1	Coastal prairie, coastal scrub, valley and foothill grassland	X		
coastal triquetrella	<i>Triquetrella californica</i>	CRPR-1	Coastal bluff scrub, coastal scrub valley and foothill grasslands	X		
Crampton's tuctoria or Solano grass	<i>Tuctoria mucronata</i>	FE, SE, CRPR-1	Vernal pools, valley and foothill grassland	X		
REPTILE						
western pond turtle	<i>Emys marmorata</i>	SCSC	Thoroughly aquatic turtle of ponds, marshes, rivers, streams & irrigation ditches, usually with aquatic vegetation	X		
Alameda whipsnake	<i>Masticophis lateralis euryxanthus</i>	FE, ST	Typically found in chaparral and scrub habitats but will also use adjacent grassland, oak savanna and woodland habitats	X		
giant garter snake	<i>Thamnophis gigas</i>	FT, ST	prefers freshwater marsh and low gradient streams, has adapted to drainage canals and irrigation ditches	X		
San Francisco garter snake	<i>Thamnophis sirtalis tetrataenia</i>	FE, SE	Vicinity of freshwater marshes, ponds and slow-moving streams	X		

Table 1 Numbered Notes:

- (1) Species not likely to have any exposure as its food base consists of terrestrial species.
- (2) Species may forage in the shallow water at the margins of the Redwood Shores Lagoon. Given the large amount of potential foraging area, the food items from treated areas would likely constitute an insignificant percentage of the total diet. Therefore, no risk due to copper exposure is anticipated.
- (3) Species forages over water. Given the large amount of potential foraging area, the food items from treated areas would likely only contribute an insignificant percentage of the total diet. Therefore, no risk due to copper exposure is anticipated.
- (4) According to the February 6, 2013 Final Rule issued by USFWS, no designated Critical Habitat occurs within the San Francisco Bay.
- (5) According to the January 5, 2011 Critical Habitat proposal issued by USFWS, no designated Critical Habitat occurs within the San Francisco Bay.
- (6) Not a submerged aquatic plant. Therefore exposure to copper treated water 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 impaired growth or cause death.
- (7) According to the CalFlora Database, no reported occurrences of these species exist within the county of the Project Area.
- (8) Not an emergent plant and therefore does not grow in standing water but may grow on moist banks of the Lagoon. Exposure to treated water containing aquatic herbicides is indirect, if any. Exposure will only occur through root uptake of soil water; however, the chemical properties of copper-containing herbicides make it unlikely that copper will be able to move through soil pore water to the roots of the plant. Aquatic herbicide concentration in root zone water is not expected to be sufficient to cause impaired growth or cause death.
- (9) According to the CalFlora Database, no reported occurrences of these species exist within the project area.

Table 1 Status Abbreviation:

FE = Federally Listed as Endangered

FT = Federally Listed as Threatened

FD = Federally Delisted

SCSC = State Listed Species of Concern

SE = State Listed as Endangered

ST = State Listed as Threatened

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

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

(Continued Item a): Discussion)

Methods for Estimating Risk

The United States Environmental Protection Agency (USEPA) has developed Toxicity Reference Values (TRVs) for many chemicals. However, published TRVs generally do not exist for herbicides. Therefore, herbicide-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 to the longfin smelt were found in the published literature. As copper applications are sufficiently intermittent and copper is not significantly persistent within the water column, only acute TRVs are derived.

The U.S. EPA (2004) suggests applying a 20X safety factor to acute median toxicity values (LC50s and LD50s) for aquatic threatened or endangered species and a 10X safety factor for terrestrial threatened or endangered species. Often, no herbicide-specific toxicity results are available for various taxonomic groups. For example, database and literature searches for copper toxicity testing of saltwater fish species did not yield any useable studies. In this case, fish toxicity endpoints of a species with similar size and life history to the longfin smelt were used.

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. Exposure was estimated assuming the copper containing algaecides and herbicides are applied at the maximum allowable label rate of 1 ppm metallic copper, equivalent to 1 mg/L metallic copper. 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 estimate a risk. Risk may be present when the EEC divided by the TRV is greater than or equal to 1.0. Risk is likely not present if the result is less than 1.0.

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

Where:

EEC = Estimated Environmental Concentration

TRV = derived Toxicity Reference Value

Copper Discussion

Copper toxicity is largely driven by its environmental concentration. However, water quality parameters such as pH, hardness, alkalinity, salinity, and dissolved organic carbon (DOC) affect the bioavailability of copper. These parameters affect the competitive binding of copper to other molecules in the water column, thereby altering the fraction of copper that is bioavailable to elicit toxic effects.

The USEPA suggests the use of the Biotic Ligand Model to analyze and/or predict toxicity of bioavailable copper in freshwater systems. The free cupric ion (Cu^{2+}) is the primary driver of copper bioavailability and toxicity in aquatic ecosystems (USEPA 2007). Because the Redwood Shores Lagoon is not a freshwater system, this model was not appropriate and therefore not used. Instead, the highly conservative assumption was made that 100% of the copper present in the water column is bioavailable.

Since no adequate published TRVs for copper were available for fish, the approach used here was to select the most sensitive and applicable fish endpoint from studies available in the literature. Studies indicate that, although early life stages generally are most sensitive, size rather than developmental stage may be the more significant factor when evaluating

interspecies differences in copper toxicity (Grosell et al., 2007). Thus, similarity in size between the test organism and longfin smelt was an important consideration in the selection of an endpoint for TRV derivation. Additionally, test conditions, such as salinity and duration of exposure, were also considered in the selection process.

After a substantial literature review, the 96-hour acute LC50 of 86.5 mg/L was selected from the following study as the endpoint used for TRV Derivation:

Mohapatra and Rengarajan 1997

The acute toxicity of copper to wild-caught *Liza parsia* was evaluated. *Liza parsia* weighing between 15.0 to 30.0 grams (g) and measuring between 75.0 to 105.0 mm (approximately 3 to 4 inches) total length were collected from the brackish water canals of Pudukkottai area in Cochin. The fish were acclimatized to laboratory conditions for about one week at an approximate salinity of 9.8 parts per thousand (ppt), temperature of 28 °C, and total hardness of 2,956 ppm. Fish were exposed to copper sulfate pentahydrate in 5 separate aquarium bioassays to estimate the 12, 24, 48, 72, and 96 hour toxicity of copper. The metallic copper LC50 estimated for the 12, 24, 48, 72, and 96 hour bioassays were 35.9, 34.9, 28.0, 22.0, and 21.8 mg/L, respectively. We selected the 96 hour LC50 of 21.8 mg/L, consistent with acute endpoint selection recommendations (USEPA 2004).

To derive a TRV from the 96 hour LC50, a safety factor of 20 was applied. The resultant derived TRV for the longfin smelt is estimated at 1.09 mg/L (i.e. $21.8 / 20 = 1.09$). It was estimated that applications of copper at the maximum label rate of 1.0 mg/L metallic copper will not lead to aquatic exposure greater than or equal to the derived aquatic TRV of 1.09 mg/L because the calculated risk value is 0.917 (unitless). The copper-containing algaecides and/or aquatic herbicides applied to the Lagoon are not anticipated to pose unacceptable risk to longfin smelt.

To educate City or contractor staff working in the Lagoon of the potential presence of longfin smelt, a qualified biologist shall conduct a worker's environmental awareness program (WEAP). The WEAP training will be completed prior to application of aquatic herbicides containing copper to control vegetation in the Lagoon. The WEAP will include, at a minimum, species identification, a description of suitable habitat for the species, and measures to implement in the event that this species is found during application. This training shall instruct personnel to recognize longfin smelt their habitats and life history.

As described above, no unacceptable acute risk to the longfin smelt is anticipated due to applications of copper-containing algaecides and/or aquatic herbicides. A qualified biologist will conduct a WEAP training session prior to the application of copper-containing algaecides or aquatic herbicides to the lagoon after the City's SIP Exception is granted.

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

Item c): **No Impact.** The Project will take place in the Lagoon and, therefore, will not impact any upland habitat or wetlands. However, the assessment of risk for species that live in these areas was considered. Specifically, the risk to longfin smelt was assessed and it was concluded that the use of aquatic herbicides containing copper does not pose an unacceptable risk to the species.

Item d): **No Impact.** The Project involves applications of copper herbicides to the Lagoon. Project activities will not adversely influence movement of any native, resident, or migratory birds or fish.

Items e) and f): **No Impact.** The Project does not conflict with, and has no impact to any local policies, ordinances, or plans protecting biological resources.

3.5 Cultural Resources

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
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Would the Project:

a) Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d) Disturb any human remains, including those interred outside of formal cemeteries?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Discussion

Items a) through d): **No Impact.** The Project is confined to the Lagoon. 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
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Would the Project:

a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
ii) Strong seismic-related ground shaking?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
iii) Seismic-related ground failure, including liquefaction?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
iv) Landslides?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Result in substantial soil erosion or the loss of topsoil?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Discussion

Items a) through e): **No Impact.** The Project consists of applying aquatic herbicides that contain copper to the Lagoon. 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.

3.7 Greenhouse Gas Emissions

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
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Would the Project:

a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
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b) Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
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Discussion

Item a) & b): **Less Than Significant Impact.** The Project requires the use of pick-up trucks or other service vehicles for purposes of transporting algaecides and/or aquatic herbicides to locations where they are needed. A boat or pick-up truck is used to make applications of algaecides and/or aquatic herbicides. Pick-up trucks are also used for purposes of site reconnaissance before, during, and after application of aquatic herbicides. Applications are typically brief in duration (2 to 4 hours) and made infrequently (i.e., a few times per year). Although short-term vehicle or outboard motor emissions will be generated during aquatic herbicide application; these emissions will be minor and create only a small incremental additional contribution to emissions created by other City activity. As a result, project activities are not expected to be cumulatively considerable. To minimize impacts, all equipment will be properly tuned and muffled, and unnecessary idling will be minimized. Generally, one or two vehicles and/or boats are used for the transport and application of the algaecide and/or aquatic herbicide. As needed, the City or contractor may use a small generator or gas-powered pump during the course of application. The City or contractor may also use a boat with an outboard motor in some locations where application from the banks is not feasible.

The use of vehicles and application equipment described above are not expected to conflict with the City's Climate Action Plan, other greenhouse gas emissions plans or violate greenhouse gas emission standards (City of Redwood City 2013). Additionally, greenhouse gas generated by Project-related activities will result in less greenhouse gas emission than other alternative IPM methods such as the mechanical harvesting of aquatic vegetation.

3.8 Hazards and Hazardous Materials

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
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Would the Project:

a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
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?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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Discussion

Items a & b): **Less Than Significant Impact.** The Project would involve handling aquatic herbicides which are regulated hazardous materials. Acute exposure to humans of the undiluted, formulated product can cause eye, skin, and respiratory irritation, and can be harmful if swallowed. Refer to the representative MSDS presented in **Appendix D**. Use of this material would create a potential for spills that could affect worker safety and the environment. The spills could occur potentially at City or contractor facilities, at the point of application, or during transport.

The City or its contractors handle, store, and transport aquatic herbicides and dispose of containers in accordance with federal, state, and county requirements and manufacturer’s recommendations. This approach is supplemented by the following components of the City’s aquatic vegetation management program, which would be applied to the use of herbicides that include copper:

1. City personnel or contractors that make aquatic herbicide applications are themselves, or under the direct supervision of, a DPR-licensed Qualified Applicator Certificate or License holder (QAC/QAL). Expertise and training used by these personnel mitigate potentially significant impacts.
2. A written recommendation is prepared by a DPR-licensed Pest Control 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, and health and environmental hazards and restrictions, and include a certification that alternatives and mitigation measures that substantially lessen any significant adverse impact on the environment have been considered and if feasible, adopted. Refer to **Appendix C**.
3. All City personnel or contractors applying algaecides and/or aquatic herbicides review and strictly adhere to the aquatic herbicide product label that has clear and specific warnings that alert users to hazards that may exist. Examples of specific product labels are included in **Appendix D**.
4. All City personnel or contractors applying herbicides review and consult the aquatic herbicide Material Safety Data Sheet (MSDS) (an example is provided in **Appendix D**), 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 herbicides.
5. City or contractor personnel are familiar with and implement the DPR PSIS series that mitigates potentially significant impacts. For example, the PSIS series describes the

personal protective equipment (PPE) needed for the safe handling of aquatic herbicides, including goggles, disposable coveralls, gloves and respirators.

6. The condition of the portion of the Lagoon 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.
7. Prior to an application, City or contractor staff will confirm no water is being pumped out of portions of the lagoon being treated.
8. The location(s) at which the aquatic herbicide is introduced into the water is staffed until the application is complete. City or contractor staff performing inspections are in continuous cell phone or radio contact with staff making the application. In the event that a pump is accidentally turned on during an application event, addition of aquatic herbicide stops. Not until the pump is turned off does aquatic herbicide application resume.

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

Item c): **Less Than Significant Impact.** There are schools located within ¼ mile of locations where applications may be made. However, applicators will be present at the herbicide application sites and will not let unauthorized people (including students) near herbicide application equipment. Herbicide applications do not result in a release of copper to the air so no airborne risk is present. Once copper has been applied to the water, there are no restrictions on contact with the water.

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.** Although the Project site is located within the boundaries of the San Carlos Airport comprehensive airport land use plan, the Project will not result in a safety hazard for persons using the airport or for persons residing or working in the project area because herbicide application activity is conducted on the water and away from residents or airport users. The Project will not result in a release of a hazardous material that could migrate from the project site to the airport for the same reason as previously stated. Applications of herbicides will be made consistent with the product label and only when weather conditions and application techniques will not result in spray drift. Further, applications may be made by sub-surface injection or by using a surface spray with medium to coarse droplet size to prevent off-site drift. Once a herbicide has been applied to the water, there are no restrictions on contact with the water and so no unacceptable hazard is posed to swimmers.

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.

3.9 Hydrology and Water Quality

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
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Would the Project:

a) Violate any water quality standards or waste discharge requirements?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
f) Otherwise substantially degrade water quality?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
g) Place housing within 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
j) Inundation by seiche, tsunami, or mudflow?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Discussion

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

Depending on algae or aquatic weed presence, aquatic herbicides containing copper may be applied as necessary between the months of April and November. Some years, no copper-containing aquatic herbicides will be used. Treatments may be made to only small sections, or may be made throughout the lagoon.

Copper-containing aquatic herbicide applications will be done over a short duration (typically less than approximately 36 hours per location) and not all areas of the lagoon will be treated at the same time, for the same length of time, or treated every year. Depending on weed presence, some portions of the Lagoon may not get treated at all while others may require multiple treatments the same season. Copper-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 will be 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, and health and environmental hazards and restrictions, and include a certification that alternatives and mitigation measures that substantially lessen any significant adverse impact on the environment have been considered and if feasible, adopted. Refer to **Appendix C**.
2. All City or contractor personnel applying herbicides 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 D**.
3. All City or contractor personnel applying herbicides review and consult the aquatic

herbicide Material Safety Data Sheet (MSDS) (an example is provided in **Appendix D**), 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.

4. The condition of the portion of the Lagoon 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. Prior to an application, the water operator will confirm no water is being pumped out of the portion of the Lagoon being treated.
6. The location(s) at which the aquatic herbicide is introduced into the lagoon is continuously staffed until the application is complete. Staff who are performing lagoon inspection are in continuous cell phone or radio contact with staff making applications. In the event that lagoon pumps are turned on while the application is being made, the addition of aquatic herbicide will stop if it is deemed that the herbicide-treated water may be pumped out of the lagoon. Not until the pump is turned off does aquatic herbicide application resume.

Overview of Aquatic Herbicide Use

Depending on weed presence, aquatic herbicides containing copper may be applied as necessary at different locations between the months of April and November. Some years, no copper-containing aquatic herbicides will be applied.

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

Copper Discussion

Within the San Francisco Bay, copper has been a pollutant of concern since the late 1980s (CEP, 2004). In 1989, the lower South San Francisco Bay was declared impaired by copper, leading businesses and government agencies to invest significantly in the identification of copper sources and control measures. As a result of these activities, a wealth of information has been produced on copper releases to surface waters.

Identified sources of copper in San Francisco Bay surface waters are numerous and include vehicle brake pads, architectural copper, copper pesticides, industrial copper use, copper air emissions, soil erosion, copper in domestic water discharged to storm drains, vehicle fluid leaks and dumping, marine antifouling coatings, and copper algacides applied directly to surface waters. Among these sources, vehicle brake pads have been identified as the predominant contributor representing around 42% of all copper loading (point and non-point sources) to the Bay (CEP, 2004). Other significant sources and their contributions are wastewater treatment plants at 28% and other non-point sources such as natural erosion and reservoir spills at 19% of total load to the Bay. Copper applied as a pesticide to surface waters represents an even smaller fraction of the total load to the Bay. A significant factor in

the lower contribution of copper pesticides to surface water concentrations is the aquatic pesticide general permit which requires an Aquatic Pesticides Application Plan describing management practices to mitigate effects to water quality resulting from pesticide application (TDC Environmental, 2004). These requirements serve as control measures to limit copper algaecide discharges from lagoons and sloughs to San Francisco Bay.

Applications of copper-based aquatic herbicides according to label direction typically require concentrations of copper between 500 and 1,000 µg/L (equivalent to 0.5 to 1.0 mg/L). Within the Lower & South San Francisco Bay, site specific objectives (SSOs) are in place for copper limiting the maximum average concentration allowed for copper within the Lagoon and connected waterways (CRWQCB, 2013). These SSOs are enforceable water quality objectives limiting the 1-hr average copper concentration (Criteria Maximum Concentration) to 10.8 ug/L and the 4-day average concentrate (Criteria Continuous Concentration) to 6.9 ug/L.

These water quality criteria may be exceeded within the treatment area, shortly after application, and downstream of the point of aquatic herbicide use (i.e., outside of the treatment area or in "receiving waters") when applied at labeled rates. Accordingly, because label application rates may exceed the SSOs, the City is obtaining a SIP exception.

As a result of both dilution and uptake, copper-containing aquatic herbicides, as they will be applied in the Lagoon, 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.

When used according to label directions by qualified personnel, impacts of copper-containing aquatic herbicides have no significant impact. The City or contractor will implement the following mitigation measure for applications of copper to reduce any 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 City or contractor will execute the Aquatic Pesticide Application Plan (APAP). The APAP calls for surfacewater sampling and analysis before, during, and after aquatic herbicide application to assess the impact, if any, that the Project may have on beneficial uses of water. Additionally, consistent with SIP exception requirements, the City will arrange for a qualified biologist to assess impacts to receiving water beneficial uses.

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

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

Item f): See response to item a).

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

3.10 Land Use Planning

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
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Would the Project:

a) Physically divide an established community?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Discussion

Item a): **No Impact.** The Project will be implemented within the Lagoon. Nearby housing will not be affected. The Project will not result in any division of an established community.

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

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

3.11 Mineral Resources

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
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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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Discussion

Items a) & b): **No Impact.** The Project involves the addition of aquatic herbicides to the Lagoon and has no impact on the availability of any known mineral resource recovery or locally-important mineral resource recovery site.

3.12 Noise

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
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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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Discussion

Items a) through d): **No Impact.** Project activity primarily occurs in the Lagoon. Project activity in urban areas is consistent with ambient noise from adjacent roads and other typical urban activities. Application equipment includes the use of one or two pick-up trucks, and occasionally a small generator and an outboard boat motor. The incidental noise and

vibration generated by the use of small engines or pick-up trucks is temporary and inconsequential and thus will have no impact.

Items e) & f): **No Impact.** Although the Project site is located within the boundaries of the San Carlos Airport comprehensive airport land use plan, the Project will not expose people using the airport or persons residing or working in the project area to excessive noise levels. Application equipment consists of one or two pick-up trucks, and, occasionally, a small generator and an outboard motor. Applications are typically brief in duration and are made infrequently; noise generated by Project activity is consistent with ambient noise from typical urban activities and nearby roads. As such, the Project will not create a noise problem or expose people using the airport or people residing or working in the project area to excessive noise levels.

3.13 Population and Housing

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
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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)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Displace substantial numbers of existing housing units, necessitating the construction of replacement housing elsewhere?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Discussion

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

3.14 Public Services

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

Discussion

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

3.15 Recreation

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Discussion

Items a) & b): **No Impact.** The Lagoon is used for various recreational activities including boating, swimming, and sport fishing. Treatment of aquatic vegetation within the Lagoon improves its aesthetic quality, minimizes the presence of nuisance conditions, and will have no impact on recreational activities.

3.16 Transportation/Traffic

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
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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)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
e) Result in inadequate emergency access?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
f) Result in inadequate parking capacity?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
g) Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Discussion

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

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

Items d) through g): **No Impact.** The Project does not involve changes in road design or encourage incompatible road or highway uses. Further, the Project does not impact emergency access or parking. Lastly, the Project does not impact or conflict with adopted policies, plans, or programs supporting alternative transportation.

3.17 Utilities and Service Systems

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
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Would the Project:

a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
g) Comply with federal, state, and local statutes and regulations related to solid waste?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Discussion

Items a) & b), and e) through g): **No Impact.** The Project will not discharge to a wastewater treatment plant and does not generate any solid waste. All containers used to store and transport aquatic herbicides are typically 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 the Lagoon and has no known influence on the entitlements or resources utilized by the City.

3.18 Mandatory Findings of Significance

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal, or eliminate important examples of the major periods of California history or prehistory?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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)?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Item a): **Potentially Significant Unless Mitigation Incorporated.** The Project involves the use of copper-based aquatic herbicides introduced into the Lagoon at concentrations that may temporarily exceed SSOs set for the Lower San Francisco Bay. Significant evidence suggests that when used according to label directions by qualified personnel, any SSO exceedance will likely be short-term and impacts of these aquatic herbicides are less than significant.

However, the City or contractor will implement mitigation (**HWQ-1**) to reduce any potential impacts to less than a significant level.

Although copper containing aquatic herbicides are a hazardous material, under the standard

operating procedures that will be used by City or contractor personnel, there is a less than a significant potential for impact.

Item b): **Less Than Significant Impact.** The cumulative impacts of continued application of copper-based herbicides is not precisely known. However, studies examining the relationship between sediment copper concentration and toxicity support the conclusion that sediment-bound copper is not bioavailable. Deaver *et al.* (1996) compared limnetic water and copper-amended sediment toxicity to *Hyalella azteca*, an epibenthic detritivore sentinel species, and found that sediment concentrations were not predictive of copper toxicity across various water and sediment conditions. The limnetic water median lethal concentration (LC₅₀) of the free cupric ion, however, varied by <4% in the sediment-toxicity tests, indicating that the form of copper associated most strongly with toxicity (i.e. the bioavailable fraction) in its aquatic phase rather than sediment-bound copper. These results are corroborated by those of Suedel *et al.* (1996) which showed that copper toxicity to several aquatic organisms, including fish, water fleas, a midge, and an amphipod species, were correlated with overlying (limnetic) water concentration rather than sediment or pore water concentration. As noted in the IS/MND, copper-containing herbicides rapidly dissipate and/or become permanently insoluble, and as a result, are not bioavailable shortly after application (CDFA 2002; Trumbo 1997, 1998; WA DOE 2004).

Toxicity studies have also been conducted using water and sediment samples from copper herbicide application sites. Gallagher *et al.* (2005) collected water and sediment samples from a 20,234 hectare lake treated for 10 years in some areas with Komeen, a form of chelated copper applied annually at concentrations of 1 mg Cu/L. This rate of application is similar to the rate and application interval to what the City or contractor anticipates using. The Gallagher study also looked at untreated areas to assess bioavailability to *Hyalella azteca* and *Ceriodaphnia dubia*. No statistical differences in response of either *H. azteca* or *C. dubia* to treated (16.3-18.0 mg Cu/kg) and untreated (0.3 mg Cu/kg) sediments were observed when compared to control sediments. In a 10-day exposure study by Huggett *et al.* (1999), sediments were collected from Steilacoom Lake (WA) and amended with CuSO₄ (800-2,000 mg Cu/kg dry weight) to assess copper bioavailability to *H. azteca*, *Chironomous tentans*, and *C. dubia*. When comparing the no observable adverse effect concentrations (NOECs) derived under these experimental conditions (906-2,010 mg Cu/kg) with the current concentrations of copper in the lake sediment (180-1,110 mg Cu/kg), it is apparent that the sediment-bound copper in the lake is not bioavailable to the three species.

Mitigation has been incorporated into the Project (**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 City or contractor 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 MITIGATION MEASURES

4.1 *Hydrology & Water Quality*

HWQ-1. As required by the SIP and the SWRCB general permit for the application of aquatic herbicides, the City or contractor will revise its Aquatic Pesticide Application Plan (APAP) to reflect the use, monitoring and reporting of copper-containing aquatic herbicides upon being listed on the SIP Exception list of the permit. The APAP will call for surface water sampling and analysis before, during, and after Project completion to assess the impact, if any, that the Project may have on beneficial uses of water. Additionally, consistent with SIP exception requirements, the City or contractor will arrange for a qualified biologist to assess impacts to receiving water beneficial uses.

4.2 *Mitigation Monitoring and Reporting Program*

Mitigation HWQ-1 is the implementation of the City's Aquatic Pesticide Application Plan (APAP) that requires surface water sampling, analysis, visual monitoring, and reporting as a condition of the NPDES Aquatic Permit issuance. The City's APAP has been reviewed and approved by the SWRCB and reporting to them is done annually by March 1. Implementation of the APAP mitigates any significant environmental effects of aquatic herbicide use.

5.0 REFERENCES

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6.0 PERSONS AND AGENCIES CONTACTED

- 1.) Joel Trumbo, CDFW

7.0 LIST OF PREPARERS

- 1.) Michael S. Blankinship, PE, PCA, Blankinship & Associates, Inc.
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- 3.) Stephen Burkholder, Project Scientist, Blankinship & Associates, Inc.
- 4.) Ryan Beil, Staff Scientist, Blankinship & Associates, Inc.
- 5.) Brandon Gilmore, Management Analyst, Redwood City Public Works
- 6.) Thomas McNabb, Clean Lakes, Inc.

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Appendix A

(Species Descriptions)

Approach

A Habitat Assessment of the City of Redwood City project site, the Redwood Shores Lagoon (“Lagoon”), 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 (CNDDDB), and current species information from the U.S. Fish and Wildlife Service (USFWS), 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 CNDDDB database was queried using the boundary map for the Department, and selecting the two quads that in which the Lagoon is located. In addition, a buffer area made up of the outlying quads adjacent to the original 2 quads was selected for the query, resulting in a total of 12 quads. This approach was used to identify species that might be located in the surrounding areas, but not necessarily reported to CNDDDB as a sighting event within the Lagoon boundaries.

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

Amphibians

The Lagoon is not suitable habitat for any of the amphibians found in the CNDDDB query. As such, project activities will not adversely impact any amphibians.

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 Lagoon the risk posed by copper-containing algaecides and/or aquatic herbicides applied to the Lagoon is insignificant.

Short-eared Owl (*Asio flammeus*)

Short-eared owls inhabit wetlands, bogs, fens, grasslands, and croplands (NatureServe 2014). They typically nest and forage in broad expanses of open land with low vegetation. Their diet consists primarily of rodents, but they are also known to regularly prey on small mammals, small birds, and insects. Because they prey mostly on

terrestrial animals, short-eared owls are not likely to be exposed to copper-containing algaecides and/or aquatic herbicides applied to the Lagoon.

Northern Harrier (*Circus cyaneus*)

Northern harriers inhabit bogs, fens, herbaceous wetland, alpine, cropland, grassland, and tundra (NatureServe 2014). They frequently nest in dense vegetation with larger and deeper nests often being built in wet or flood-prone areas. Their diet primarily consists of terrestrial prey such as small mammals (especially voles and cotton rats), small to medium-sized birds (especially passerines), reptiles, amphibians, large insects, and carrion. Because they prey mostly on terrestrial animals, northern harriers are not likely to be exposed to copper-containing algaecides and/or aquatic herbicides applied to the Lagoon.

Saltmarsh common yellowthroat (*Geothlypis trichas sinuosa*)

Saltmarsh common yellowthroat inhabit salt marshes and herbaceous wetlands (NatureServe 2014). They nest just above ground or over water, in thick herbaceous vegetation. Their diet primarily consists of small terrestrial insects obtained among low plants. Because they prey mostly on terrestrial insects, saltmarsh common yellowthroat are not likely to be exposed to copper-containing algaecides and/or aquatic herbicides applied to the Lagoon.

California Black Rail (*Laterallus jamaicensis coturniculus*)

Black rails nest in high portions of salt marshes, shallow freshwater marshes, wet meadows, and flooded grassy vegetation (Eddleman et al. 1988 in Eddleman et al 1994). Most breeding areas are vegetated by fine-stemmed emergent plants, rushes, grasses, and sedges (Todd 1977 in Eddleman et al 1994). They select sites with shallow, stable water level, gently sloping shorelines, and vegetation dominated by fine-stemmed bulrush (*Scirpus* spp.) or grasses (Repking and Ohmart 1977 in Eddleman et al 1994). They feed on aquatic and terrestrial invertebrates and seeds, presumably along edges of emergent vegetation (Eddleman et al 1994). The California black rail may forage in the shallow water at the margins of the Lagoon. However, given the large amount of potential foraging area, the food items from treated areas would likely only contribute an insignificant percentage of the total diet. Therefore, the risk posed by copper-containing algaecides and/or aquatic herbicides applied to the Lagoon is insignificant.

Alameda song sparrow (*Melospiza melodia pusillula*)

Alameda song sparrow is endemic to California where it is restricted to tidal salt marshes (Shuford and Gardali 2008). Vegetation is required for nesting sites with upper marsh vegetation being required so that nests remain dry during all but the highest tides. The majority of their diet consists of terrestrial vegetable matter and insects. Because they prey mostly on terrestrial vegetable matter and insects, Alameda song sparrows are not likely to be exposed to copper-containing algaecides and/or aquatic herbicides applied to the Lagoon.

California clapper rail (*Rallus longirostris obsoletus*)

California clapper rail inhabit herbaceous wetlands (NatureServe 2014). They nest in cordgrass, pickleweed, gum-plant, or salt grass within marshlands near tidal ponds, arranging plant or drift material over their nest as a canopy. Their diet consists mostly of mussels, clams, small crabs, and spiders. The California clapper rail may forage in the shallow water at the margins of the Lagoon. However, given the large amount of potential foraging area, the food items from treated areas would likely only contribute an insignificant percentage of the total diet. Therefore, the risk posed by copper-containing algaecides and/or aquatic herbicides applied to the Lagoon is insignificant.

Black skimmer (*Rynchops niger*)

Black skimmer inhabit primarily coastal waters, including bays and estuaries, and may also be found in rivers, lakes, and herbaceous wetlands (NatureServe 2014). They nest primarily near coasts on sandy beaches, shell banks, coastal and estuary islands, on wrack and drift of salt marshes, along tropic rivers, and along salt pond levees. The species eats mainly small fish and crustaceans and skim the surface of water for food while flying. Given the large amount of potential foraging area, the food items from treated areas would likely only contribute an insignificant percentage of the total diet. Therefore, the risk posed by copper-containing algaecides and/or aquatic herbicides applied to the Lagoon is insignificant.

Yellow warbler (*Setophaga petechial*)

Yellow warblers inhabit scrub-shrub wetlands, forested wetlands, open scrub, second-growth woodlands, and thickets (NatureServe 2014). Nests are placed in upright forks or crotches of bushes, saplings, or large trees, from less than a meter above ground to high in tall trees. Nesting locations are chosen based primarily on characteristics of the vegetation patch rather than the characteristic of the nest plant itself. They primarily eat terrestrial insects (especially caterpillars) and spiders, taking most food items from leaves or bark. Because their food base consists of terrestrial species, yellow warblers are not likely to be exposed to copper-containing-algaecides and/or aquatic herbicides applied to the Lagoon.

California least tern (*Sternula antillarum browni*)

California least tern inhabit seacoasts, beaches, bays, estuaries, lagoons, lakes, and rivers (NatureServe 2014). They usually nest on open, flat beaches along lagoon or estuary margins. The species eats mainly small fish obtained by diving from air into shallow water. Given the large amount of potential foraging area, the food items from treated areas would likely only contribute an insignificant percentage of the total diet. Therefore, the risk posed by copper-containing algaecides and/or aquatic herbicides applied to the Lagoon is insignificant.

Fish**Tidewater Goby (*Eucyclogobius newberryi*)**

Tidewater gobies are found in shallow lagoons and lower stream reaches where the water is brackish to fresh and slow-moving or fairly still, but not stagnant. Their salinity preference is usually <10 parts per thousand – ppt. They avoid open areas where there is strong wave action or strong currents. Tidewater gobies are capable of living in saline water ranging from 0 to over 50 ppt salinity and at temperatures of 8-23°C. Suitable water conditions for nesting have been reported as 5-10 ppt salinity and 18-22°C temperatures. Water depth in tidewater goby habitat ranges from 25-100 cm and dissolved oxygen is fairly high. Gobies sometimes can persist, however, under anoxic conditions and have been observed to come up and gulp air at the water surface. The substrate usually consists of sand and mud, with abundant emergent and submerged vegetation. Severe salinity changes and tidal or flow fluctuations have a detrimental effect on the survival of tidewater gobies, resulting in population declines (Moyle et al. 1995). According to the February 6, 2013 Final Rule issued by USFWS, no designated Critical Habitat occurs within the San Francisco Bay. Accordingly, no exposure of tidewater gobies to copper-containing algaecides and/or aquatic herbicides is expected; therefore, no risk is anticipated.

Eulachon (*Thaleichthys pacificus*)

Eulachon are anadromous fish that may be found in bays, sounds, rivers, near shore, and coastal inlets (NatureServe 2014). They migrate short distances up coastal streams to spawn in coastal freshwater streams over bottoms of silt, sand, gravel, cobble, or detritus. Spawning migrations usually occur in April or May, often corresponding to high tides. They are mainly particulate feeders that consume primarily marine euphausiid crustaceans. Young fish eat mostly copepod larvae, phytoplankton, copepods, and other zooplankton, but may also eat smaller eulachon larvae. According to the January 5, 2011 Critical Habitat proposal issued by USFWS, no designated Critical Habitat occurs within the San Francisco Bay (USFWS 2015). Accordingly, no exposure of eulachon to copper-containing algaecides and/or aquatic herbicides is expected; therefore, no risk is anticipated.

Longfin smelt (*Spirinchus thaleichthys*)

Longfin smelt are anadromous fish that spend their adult life in bays, estuaries, and nearshore coastal areas, and migrate into freshwater rivers to spawn (CDFG 2009). Spawning migrations occur primarily from January through March, in the Delta. Newly hatched larvae may be swept downstream into brackish waters and stay in areas where fresh and salt water mix. Adults may be found in a wide range of salinities and primarily feed on small crustaceans and fishes (NatureServe 2014). The typical length of longfin smelt is 3.5 to 4.3 inches, although third-year females may grow up to 5.9 inches (USFWS 2012). Adults prefer salinities of 15 to 30 ppt (CNDDDB 2012). Although larval and juvenile longfin smelt are unlikely to enter the Lagoon due to significant

distance between the freshwater Delta and the saltwater Lagoon, the preferred salinities and migratory habits indicate that adults may enter the Lagoon where they may be exposed to water treated with copper containing algaecides and/or aquatic herbicides.

Invertebrates

No appropriate habitat for invertebrates of concern exists within or downstream from the Lagoon. As such, project activities will not adversely impact invertebrates.

Mammals

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

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

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

Mastiff bats favor rugged, rocky areas where suitable crevices area available for day-roosts. Characteristically, day-roosts are located in large cracks in exfoliating slabs of granite or sandstone. The crevices must open downward, be at least 5 cm wide and 30 cm deep, and narrow to at least 2.5 cm at their upper end. Mastiff bats also frequently roost in buildings, provided these have sheltering places with conditions similar to those described above. They forage at an estimated height of as much as 200 ft above the ground. They probably forage for considerable distances from their roosting sites (Williams 1986). The foraging height of these bats precludes exposure from applications of copper-based algaecides and/or aquatic herbicides.

Western Red Bat (*Lasiurus blossevillii*)

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

Big free-tailed bat (*Nyctinomops macrotis*)

The big free-tailed bat inhabits riparian and rocky areas in rugged country may also be found in shrub desert and woodland habitats (NatureServe 2014). Big free-tailed bats roost in rock crevices in cliffs, building caves, and occasionally in tree holes. They feed primarily on terrestrial insects including large moths, crickets, longhorned grasshoppers, flying ants, stinkbugs, froghoppers, and leafhoppers. Given their diet of terrestrial invertebrates, big free-tailed bats are not likely to be exposed to copper-containing algaecides and/or aquatic herbicides. Therefore, no risk is anticipated.

Plants

Bolander's water-hemlock (*Cicuta maculata* var. *bolanderi*)

Bolander's water-hemlock is a perennial herb in the Apiaceae family (CalFlora 2014). The species is found at various places within the United States including California, Arizona, New Mexico and Washington (CNPS 2014). Its habitat includes coastal salt marshes and swamps. It is included in the California Rare Plant Rank 2B.1 (rare, threatened, or endangered in California; common elsewhere) (CNPS 2014). According to the CalFlora Database there are no reported occurrences of this species within the project area (CalFlora 2014). Furthermore, the species is not an emergent plant and is not expected to grow in standing water, but may grow on moist banks of the Lagoon. Exposure of Bolander's water-hemlock to water in the portion of the Lagoon containing aquatic herbicides is indirect, if any. Exposure will only occur through root uptake of soil water. The chemical properties of copper-containing algaecides and /or aquatic herbicides make it unlikely that copper will be able to move through soil pore water to the roots of the plant. As such, exposure to copper-containing algaecides and /or aquatic herbicides applied to the Lagoon is insignificant.

Delta Tule Pea (*Lathyrus jepsonii* var. *jepsonii*)

The delta tule pea is a rhizomatous perennial dicot in the Fabaceae family. The species is native and endemic to California. Its habitat includes both freshwater and brackish marshes and swamps (CNPES 2014). It is included in the California Rare Plant Rank 1B.2 (rare, threatened, or endangered in California and elsewhere). According to the CalFlora Database, there are no reported occurrences of this species within the project area (CalFlora 2014). Furthermore, the species is not an emergent plant and is not expected to grow in standing water, but may grow on moist banks of the Lagoon. Exposure of delta tule pea to water in the Lagoon containing aquatic herbicide is indirect, if any. Exposure will only occur through root uptake of soil water. The chemical properties of copper containing algaecides and/or aquatic herbicides make it unlikely that copper will be able to move through soil pore water to the roots of the plants. As such, exposure to copper-containing algaecides and/or aquatic herbicides applied to the Lagoon is insignificant.

Mason's Lilaepsis (*Lilaepsis masonii*)

Mason's lilaepsis is rhizomatous perennial herb that can be found in freshwater or brackish-water marsh. This species is native to California and endemic to this state only. Its blooming period lasts from April through October. Mason's lilaepsis is often observed in tidal zones and on silty soil formed through river deposition or river bank erosion (CNDDDB 2004). According to the CalFlora Database, there are no reported occurrences of this species within the Project area (CalFlora 2014). Therefore, the likelihood of exposure to copper-containing algaecides and/or herbicides is insignificant.

Hairless popcornflower (*Plagiobothrys glaber*)

Hairless popcornflower is an annual, dicot herb that is native to California (CalFlora 2014). It is included in the California Rare Plant Rank 1A (presumed extinct) (CNPS, 2014). According to the CalFlora Database, there are no reported occurrences of this species within the county of the Project area (CalFlora 2014). Furthermore, the species is not an emergent plant and is not expected to grow in standing water, but may grow on moist banks of the Lagoon. Exposure of hairless popcornflower in the Lagoon containing aquatic herbicides is indirect, if any. Exposure will only occur through root uptake of soil water. The chemical properties of copper-containing algaecides and/or aquatic herbicides make it unlikely that copper will be able to move through soil pore water to the roots of the plant. As such, exposure to copper-containing algaecides and/or aquatic herbicides applied to the Lagoon is insignificant.

California seablite (*Suaeda californica*)

California seablite is a dicot shrub that is native to California. It is included in the California Rare Plant Rank 1B.1 (rare, threatened, or endangered in CA and elsewhere). According to the CalFlora Database, there are no reported occurrences of this species within the county of the Project area (CalFlora 2014). Furthermore, the species is not an emergent plant and is not expected to grow in standing water, but may grow on moist banks of the Lagoon. Exposure of California seablite in the Lagoon containing aquatic herbicides is indirect, if any. Exposure will only occur through root uptake of soil water. The chemical properties of copper-containing algaecides and/or aquatic herbicides make it unlikely that copper will be able to move through soil pore water to

the roots of the plant. As such, exposure to copper-containing algaecides and/or aquatic herbicides applied to the Lagoon for control of algae or aquatic weeds would be insignificant.

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 (CNDDDB 2012). Saline clover has potential habitat in the project area, however according to the CalFlora Database, no reported occurrences of this species exist within the project area (CalFlora 2014). Saline clover is not an emergent plant; exposure of the species to water in the Lagoon containing aquatic herbicides is indirect, if any. Exposure will only occur through root uptake of soil water. The chemical properties of copper-containing algaecides and/or aquatic herbicides make it unlikely that copper will be able to move through soil pore water to the roots of the plant. As such, exposure to copper-containing algaecides and/or aquatic herbicides applied to the Lagoon is insignificant.

Reptiles

The Lagoon is not suitable habitat for any of the reptiles found in the CNDDDB query. As such, project activities will not adversely impact any reptiles.

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Appendix B

(Copper Species-Specific Risk and Ecological Toxicity Data)

Toxicity Reference Values and Risk

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

The USEPA (2004) suggests applying a 20X safety factor to acute median toxicity values (LC50s and LD50s) for aquatic threatened or endangered species when deriving TRVs from literature studies. In this analysis, a safety factor was applied to the endpoint used as a TRV for the longfin smelt.

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. Exposure was estimated assuming the copper containing algaecides and herbicides are applied at the maximum label-allowable rate of 1 mg/L metallic copper, equivalent to 1 part per million (ppm) metallic copper.

Risk is estimated by comparing the estimated environmental concentration (EEC) an organism may be exposed to with 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. If an estimated exposure is lower than the derived TRV, the resultant risk value is less than 1.0, and the scenario is not considered to pose a risk.

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

Where:

EEC = Estimated Environmental Concentration

TRV = derived Toxicity Reference Value

Copper

Since no adequate published TRVs for copper were available for saltwater fish species with similar life history to the longfin smelt, the most sensitive and applicable fish endpoint from studies available in the literature was selected. Studies indicate that although early life stages generally are most sensitive, size, rather than developmental stage, may be the more significant factor when evaluating interspecies differences in copper toxicity (Grosell et al., 2007). Thus, similarity in size between the test organism and longfin smelt was an important consideration in the selection of an endpoint for TRV derivation. Additionally, test conditions, such as salinity and duration of exposure, were also considered in the selection process.

The USEPA ECOTOX Database was reviewed for appropriate studies (USEPA, 2004). Literature reviewed included numerous saltwater fish acute toxicity studies including Grosell et al. (2007), Burton and Fisher (1990), Krishnani et al. (2003), Mohapatra and Rengarajan (1997), Dung et al. (2005), Torres et al. (1987), and Sappington et al. (2001). Given the breadth of studies available, very few were done with test organisms of similar life stages and size to longfin smelt. The results of Mohapatra and Rengarajan (1997) were selected for derivation of the acute TRV for longfin smelt as the test organisms used (*Liza parsia*) were of similar size and life stage. This selection approach was taken consistent with the findings of Grosell et al. (2007). See the review below for details on the Mohapatra and Rengararajan (1997) study and endpoint selected for TRV derivation:

Mohapatra and Rengarajan 1997

The acute toxicity of copper to wild-caught *Liza parsia* was evaluated. *Liza parsia* weighing between 15.0 to 30.0 grams (g) and measuring between 75.0 to 105.0 mm (approximately 3 to 4 inches) total length were collected from the brackish water canals of Puduvypeen area in Cochin. The fish were acclimatized to laboratory conditions for about one week at an approximate salinity of 9.8 ppt, temperature of 28 °C, and total hardness of 2,956 ppm. Fish were aquatically exposed to copper sulphate pentahydrate in 5 separate bioassays to determine the 12, 24, 48, 72, and 96 hour toxicity of copper. The metallic copper LC50 estimated for the 12, 24, 48, 72, and 96 hour bioassays were 35.9, 34.9, 28.0, 22.0, and 21.8 mg/L, respectively. We selected the 96 hour LC50 of 21.8 mg/L, consistent with acute endpoint selection recommendations (USEPA 2004).

To derive a TRV from the 96 hour LC50, a safety factor of 20 was applied. The resultant derived TRV for the longfin smelt is estimated at 1.09 mg/L. It was estimated that applications of copper at the maximum label rate of 1.0 mg/L metallic copper will not lead to aquatic exposure greater than or equal to the derived aquatic TRV of 1.09 mg/L – calculated risk value is 0.917 (unitless). Thus, copper-containing algaecides and/or aquatic herbicides applied to the Lagoon is not anticipated to pose a risk to longfin smelt.

COPPER

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

Water Solubility:	Copper Sulfate: 230.5 g/kg (25°C) (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, $t_{1/2-1} = 0.36$ d and $t_{1/2-2} = 37$ 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 $\mu\text{g/g}$ dry weight and water concentrations of up to 127 $\mu\text{g/L}$, 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 $\mu\text{g/L}$ Cu, 1.1 $\mu\text{g/L}$ Cd, 3.2 $\mu\text{g/L}$ Pb, and 50 $\mu\text{g/L}$ Zn. Cu concentrations in the shrimp were 20, 40, and 80 $\mu\text{g/g}$ 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 $\mu\text{g/g}$ wet weight). Adult fish received invertebrates containing 3.20 As, 0.24 Cd, 26.13 Cu, 1.77 Pb, 68.99 Zn (all $\mu\text{g/g}$ 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 (CuSO₄·5H₂O) at concentrations of 0.0001 to 0.01 ppm in the laboratory.

Folmar 1978

Mayfly nymphs (*Ephemerella walkeri*) showed strong avoidance to copper (CuSO₄·5H₂O) at a concentration of 0.1 ppm but not 0.001 or 0.01 ppm in the laboratory.

Copper Ecological Aquatic Toxicity Studies

Chemical	Species Name	Common Name	FW or SW?	Study Duration (days)	Effect Type	Response Measurement	>,<	Response Value	Response Unit	Reference
Copper ethanolamine complex	<i>Egeria densa</i>	Brazilian waterweed	FW	1	Biochemical	LOEL	None	1000	ug/L	USEPA, 2013
Copper ethanolamine complex	<i>Egeria densa</i>	Brazilian waterweed	FW	1	Biochemical	NOEL	None	1000	ug/L	USEPA, 2013
Copper ethanolamine complex	<i>Lepomis macrochirus</i>	Bluegill sunfish	FW	4	Mortality	NOEL	None	2000	ug/L	USEPA, 2014
Copper ethanolamine complex	<i>Lepomis macrochirus</i>	Bluegill sunfish	FW	4	Mortality	LC50	None	42000	ug/L	USEPA, 2014
Copper ethanolamine complex	<i>Oncorhynchus mykiss</i>	Rainbow Trout	FW	4	Mortality	LC50	None	1500	ug/L	USEPA, 2014
Copper ethylenediamine complex	<i>Landoltia punctata</i>	Duckweed	FW	2	Biochemical	NOEL	None	100	ug/L	USEPA, 2013
Copper ethylenediamine complex	<i>Landoltia punctata</i>	Duckweed	FW	2	Biochemical	NOEL	None	100	ug/L	USEPA, 2013
Copper triethanolamine complex	<i>Landoltia punctata</i>	Duckweed	FW	2	Biochemical	NOEL	None	100	ug/L	USEPA, 2013
Copper triethanolamine complex	<i>Landoltia punctata</i>	Duckweed	FW	2	Biochemical	NOEL	None	100	ug/L	USEPA, 2013

Chemical	Species Name	Common Name	FW or SW?	Study Duration (days)	Effect Type	Response Measurement	>,<	Response Value	Response Unit	Reference
Copper triethanolamine complex	<i>Anas platyrhynchos</i>	Mallard Duck	NA	9	Mortality	NOEL	>	5000	mg/kg	USEPA, 2014
Copper triethanolamine complex	<i>Anas platyrhynchos</i>	Mallard Duck	NA	9	Mortality	LC50	>	5000	mg/kg	USEPA, 2014
Copper triethanolamine complex	<i>Colinus virginianus</i>	Northern Bobwhite Quail	NA	8	Mortality	LC50	>	5000	mg/kg	USEPA, 2014
Copper triethanolamine complex	<i>Lepomis macrochirus</i>	Bluegill sunfish	FW	4	Mortality	LC50	None	17600	ug/L	USEPA, 2014
Copper triethanolamine complex	<i>Lepomis macrochirus</i>	Bluegill sunfish	FW	4	Mortality	NOEL	None	18500	ug/L	USEPA, 2014
Copper triethanolamine complex	<i>Lepomis macrochirus</i>	Bluegill sunfish	FW	4	Mortality	LC50	None	51000	ug/L	USEPA, 2014
Copper triethanolamine complex	<i>Lepomis macrochirus</i>	Bluegill sunfish	FW	4	Mortality	LC50	None	57000	ug/L	USEPA, 2014
Copper triethanolamine complex	<i>Lepomis cyanellus</i>	Green sunfish	FW	4	Mortality	LC50	None	1300	ug/L	USEPA, 2014
Copper triethanolamine complex	<i>Oncorhynchus mykiss</i>	Rainbow Trout	FW	4	Mortality	LC50	None	840	ug/L	USEPA, 2014
Copper triethanolamine complex	<i>Oncorhynchus mykiss</i>	Rainbow Trout	FW	4	Mortality	NOEL	None	100	ug/L	USEPA, 2014

Chemical	Species Name	Common Name	FW or SW?	Study Duration (days)	Effect Type	Response Measurement	>,<	Response Value	Response Unit	Reference
Copper triethanolamine complex	<i>Oncorhynchus mykiss</i>	Rainbow Trout	FW	2	Mortality	LC50	None	790	ug/L	USEPA, 2014
Copper triethanolamine complex	<i>Oncorhynchus mykiss</i>	Rainbow Trout	FW	4	Mortality	LC50	None	26	ug/L	USEPA, 2014
Copper sulfate pentahydrate	<i>Anabaena flos-aquae</i>	bluegreen algae	FW	5	Population	NOEL	None	20	ug/L	USEPA, 2014
Copper sulfate pentahydrate	<i>Selenastrum capricornutum</i>	Green algae	FW	5	Population	NOEL	None	2	ug/L	USEPA, 2014
Copper sulfate pentahydrate	<i>Lemna minor</i>	Duckweed	FW	5	Growth	NOEL	None	100	ug/L	USEPA, 2014
Copper sulfate pentahydrate	<i>Lemna minor</i>	Duckweed	FW	5	Growth	EC50	None	2300	ug/L	USEPA, 2014
Copper sulfate pentahydrate	<i>Colinus virginianus</i>	Northern Bobwhite Quail	NA	14	Mortality	LC50	None	368	mg/kg b.w.	USEPA, 2014
Copper sulfate pentahydrate	<i>Colinus virginianus</i>	Northern Bobwhite Quail	NA	14	Mortality	LC50	None	357.9	mg/kg b.w.	USEPA, 2014
Copper sulfate pentahydrate	<i>Colinus virginianus</i>	Northern Bobwhite Quail	NA	14	Mortality	NOEL	<	120	mg/kg b.w.	USEPA, 2014
Copper sulfate pentahydrate	<i>Lepomis macrochirus</i>	Bluegill sunfish	FW	4	Mortality	LC50	None	2870	ug/L	USEPA, 2014
Copper sulfate pentahydrate	<i>Lepomis macrochirus</i>	Bluegill sunfish	FW	4	Mortality	LC50	None	1300	ug/L	USEPA, 2014
Copper sulfate pentahydrate	<i>Lepomis macrochirus</i>	Bluegill sunfish	FW	4	Mortality	NOEL	None	650	ug/L	USEPA, 2014
Copper sulfate pentahydrate	<i>Lepomis macrochirus</i>	Bluegill sunfish	FW	4	Mortality	NOEL	None	1000	ug/L	USEPA, 2014

Chemical	Species Name	Common Name	FW or SW?	Study Duration (days)	Effect Type	Response Measurement	>,<	Response Value	Response Unit	Reference
Copper sulfate pentahydrate	<i>Oncorhynchus mykiss</i>	Rainbow Trout	FW	4	Mortality	NOEL	None	1960	ug/L	USEPA, 2014
Copper sulfate pentahydrate	<i>Oncorhynchus mykiss</i>	Rainbow Trout	FW	4	Mortality	LC50	None	3580	ug/L	USEPA, 2014
Copper sulfate pentahydrate	<i>Oncorhynchus mykiss</i>	Rainbow Trout	FW	4	Mortality	NOEL	None	56	ug/L	USEPA, 2014
Copper sulfate pentahydrate	<i>Oncorhynchus mykiss</i>	Rainbow Trout	FW	4	Mortality	LC50	None	130	ug/L	USEPA, 2014
Copper (II) sulfate	<i>Fundulus heteroclitus</i>	Killifish	SW (10 ppt)	4	Mortality	LC50	>	963	ug/L	Grosell et al. 2007
Copper (II) sulfate	<i>Fundulus heteroclitus</i>	Killifish	SW (35 ppt)	4	Mortality	LC50	None	294	ug/L	Grosell et al. 2007
Copper (II) sulfate	<i>Fundulus heteroclitus</i>	Killifish	SW	2	Mortality	LC50	None	19	mg/L	Burton and Fisher, 1990
Copper (II) sulfate	<i>Lates calcarifer</i>	Barramundi (11 mm length)	SW (26 ppt)	2	Mortality	LC50	None	1.3	mg/L	Krishnani et al., 2003
Copper (II) sulfate	<i>Lates calcarifer</i>	Barramundi (24 mm length)	SW (26 ppt)	2	Mortality	LC50	None	1.3	mg/L	Krishnani et al., 2003
Copper (II) sulfate	<i>Liza parsia</i>	Gold-spot Mullet	SW (9.8 ppt)	4	Mortality	LC50	None	85.6	mg/L	Mohapatra and Rengarajan, 1997
Copper (II) sulfate	<i>Rachycentron canadum</i>	Cobia (40 days old)	SW (22-25%)	4	Mortality	LC50	None	0.240	mg/L	Dung et al., 2005
Copper (II) sulfate	<i>Scyliorhinus canicula</i>	Dogfish	SW	1	Mortality	LC50	None	16	mg/L	Torres et al., 1987

Chemical	Species Name	Common Name	FW or SW?	Study Duration (days)	Effect Type	Response Measurement	>,<	Response Value	Response Unit	Reference
Copper (II) sulfate	<i>Scyliorhinus canicula</i>	Dogfish	SW	2	Mortality	LC50	None	4	mg/L	Torres et al., 1987
Copper (II) sulfate	<i>Cyprindodon variegatus</i>	Sheepshead Minnow	SW (2 ppt)	2	Mortality	LC50	None	2.5	mg/L	Sappington et al., 2001
Copper (II) sulfate	<i>Cyprindodon variegatus</i>	Sheepshead Minnow	SW (2 ppt)	4	Mortality	LC50	None	2.5	mg/L	Sappington et al., 2001
Copper (II) sulfate	<i>Cyprindodon bovinus</i>	Leon Springs Pupfish	SW (2 ppt)	2	Mortality	LC50	>	4.8	mg/L	Sappington et al., 2001
Copper (II) sulfate	<i>Cyprindodon bovinus</i>	Leon Springs Pupfish	SW (2 ppt)	4	Mortality	LC50	None	4.6	mg/L	Sappington et al., 2001
Copper (II) sulfate	<i>Microcystis aeruginosa</i>	bluegreen algae	FW	1	Biochemical	NOEC	None	250	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Euglenophyceae</i>	Euglenoid Class	FW	27	Population	NOEL	None	65.3	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Chlorella sp.</i>	Green Algae	FW	3	Population	NOEC	None	2.3	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Chlorella sp.</i>	Green Algae	FW	3	Population	LOEC	None	7.9	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Pseudokirchneriella subcapitata</i>	Green Algae	FW	3	Population	NOEC	None	4.2	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Chlorella sp.</i>	Green Algae	FW	2	Population	LOEL	None	0.4	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Xenopus laevis</i>	African Clawed Frog	FW	4	Mortality	LC50	None	1370	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Xenopus laevis</i>	African Clawed Frog	FW	4	Growth	NOEC	None	100	ug/L	USEPA, 2013

Chemical	Species Name	Common Name	FW or SW?	Study Duration (days)	Effect Type	Response Measurement	>,<	Response Value	Response Unit	Reference
Copper (II) sulfate	<i>Bufo boreas</i>	Boreal Toad	FW	4	Mortality	LC50	None	120	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Epidalea calamita</i>	Natterjack toad	FW	4	Mortality	LC50	None	80	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Epidalea calamita</i>	Natterjack toad	FW	4	Growth	NOEC	None	100	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Epidalea calamita</i>	Natterjack toad	FW	4	Growth	LOEC	None	50	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Gammarus balcanicus</i>	Amphipod	FW	4	Biochemical	NOEL	None	10000	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Tetrahymena sp.</i>	Ciliate Protozoan	FW	1	Mortality	LC50	None	3300	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Mesocyclops pehpeiensis</i>	Copepod	FW	2	Mortality	LC50	None	75	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Mesocyclops pehpeiensis</i>	Copepod	FW	9	Growth	EC50	None	25	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Barytelphusa cunicularis</i>	Crab	FW	4	Mortality	LC50	None	215000	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Cherax destructor</i>	Crayfish	FW	4	Mortality	LC50	None	379	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Cherax destructor</i>	Crayfish	FW	4	Mortality	LC50	None	379	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Astacus leptodactylus</i>	Crayfish	FW	14	Biochemical	LOEL	None	10	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Orconectes immunis</i>	Crayfish	FW	5	Physiology	LOEL	None	160	ug/L	USEPA, 2013

Chemical	Species Name	Common Name	FW or SW?	Study Duration (days)	Effect Type	Response Measurement	>,<	Response Value	Response Unit	Reference
Copper (II) sulfate	<i>Astacus leptodactylus</i>	Crayfish	FW	14	Biochemical	NOEL	None	10	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Cherax destructor</i>	Crayfish	FW	3	Mortality	LC50	None	509	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Orconectes immunis</i>	Crayfish	FW	5	Mortality	LC50	None	20000	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Spiralothelphusa hydrodroma</i>	Freshwater Field Crab	FW	15	Biochemical	LOEC	None	25460	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Macrobrachium dayanum</i>	Freshwater Prawn	FW	2	Cellular	NOEC	None	418	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Macrobrachium dayanum</i>	Freshwater Prawn	FW	4	Mortality	LC50	None	418	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Macrobrachium dayanum</i>	Freshwater Prawn	FW	1	Cellular	LOEC	None	418	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Macrobrachium rosenbergii</i>	Giant River Prawn	FW	7	Biochemical	NOEC	None	10	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Macrobrachium rosenbergii</i>	Giant River Prawn	FW	7	Biochemical	LOEC	None	50	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Macrobrachium rosenbergii</i>	Giant River Prawn	FW	4	Mortality	LC50	None	452	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Hydra viridissima</i>	Hydra	FW	4	Mortality	LC50	None	28	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Chasmagnathus granulata</i>	Neohelice Crab	FW	14	Growth	NOEL	None	100	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Hyalella sp.</i>	Scud	FW	4	Mortality	LC50	None	170	ug/L	USEPA, 2013

Chemical	Species Name	Common Name	FW or SW?	Study Duration (days)	Effect Type	Response Measurement	>,<	Response Value	Response Unit	Reference
Copper (II) sulfate	<i>Typha latifolia</i>	Cattail	FW	8	Biochemical	NOEC	None	500	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Typha latifolia</i>	Cattail	FW	4	Biochemical	NOEC	None	500	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Typha latifolia</i>	Cattail	FW	8	Biochemical	LOEC	None	500	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Typha latifolia</i>	Cattail	FW	4	Biochemical	LOEC	None	1000	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Typha latifolia</i>	Cattail	FW	2	Biochemical	LOEC	None	5000	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Ceratophyllum demersum</i>	Coontail	FW	1	Physiology	LOEC	>	2500	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Ceratophyllum demersum</i>	Coontail	FW	1	Physiology	LOEC	>	100	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Lemna gibba</i>	Duckweed	FW	14	Growth	NOEC	None	100	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Lemna gibba</i>	Duckweed	FW	14	Growth	LOEC	None	250	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Lemna minor</i>	Duckweed	FW	10	Growth	EC50	None	470	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Lemna minor</i>	Duckweed	FW	4	Biochemical	LOEC	None	5000	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Lemna minor</i>	Duckweed	FW	4	Biochemical	NOEC	None	500	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Lemna minor</i>	Duckweed	FW	4	Biochemical	LOEC	None	500	ug/L	USEPA, 2013

Chemical	Species Name	Common Name	FW or SW?	Study Duration (days)	Effect Type	Response Measurement	>,<	Response Value	Response Unit	Reference
Copper (II) sulfate	<i>Lemna minor</i>	Duckweed	FW	4	Biochemical	NOEC	None	50	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Lemna minor</i>	Duckweed	FW	4	Biochemical	NOEC	None	50	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Cabomba aquatica</i>	Fanwort	FW	4	Physiology	LOEC	None	12	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Elodea canadensis</i>	Pondweed	FW	4	Physiology	LOEC	None	12	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Eichhornia crassipes</i>	Water Hyacinth	FW	14	Biochemical	NOEC	None	500	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Eichhornia crassipes</i>	Water Hyacinth	FW	14	Biochemical	LOEC	None	1000	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Gallus domesticus</i>	Domestic Chicken	NA	12	Growth	NOEC	None	2	mg/kg	USEPA, 2013
Copper (II) sulfate	<i>Gallus domesticus</i>	Domestic Chicken	NA	15	Biochemical	LOEL	None	20	mg/kg	USEPA, 2013
Copper (II) sulfate	<i>Lepomis macrochirus</i>	Bluegill sunfish	FW	4	Mortality	LC50	None	2640	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Ictalurus punctatus</i>	Channel catfish	FW	4	Mortality	LC50	None	710	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Pimephales promelas</i>	Fathead Minnow	FW	2	Mortality	LC50	None	7.2	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Pimephales promelas</i>	Fathead Minnow	FW	2	Mortality	LC50	None	5.9	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Pimephales promelas</i>	Fathead Minnow	FW	4	Mortality	LC50	None	96.6	ug/L	USEPA, 2013

Chemical	Species Name	Common Name	FW or SW?	Study Duration (days)	Effect Type	Response Measurement	>,<	Response Value	Response Unit	Reference
Copper (II) sulfate	<i>Gambusia affinis</i>	Mosquitofish	FW	4	Mortality	LC50	None	250	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Oncorhynchus mykiss</i>	Rainbow Trout	FW	4	Mortality	LC50	None	94	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Oncorhynchus mykiss</i>	Rainbow Trout	FW	7	Biochemical	NOEC	None	41.06	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Oncorhynchus mykiss</i>	Rainbow Trout	FW	4	Mortality	LC50	None	80	ug/L	USEPA, 2013
Copper (II) sulfate	<i>Pelodiscus sinensis</i>	Chinese Softshell Turtle	FW	112	Growth	NOEC	None	10.9	mg/kg	USEPA, 2013
Copper (II) sulfate	<i>Pelodiscus sinensis</i>	Chinese Softshell Turtle	FW	112	Growth	LOEC	None	20.4	mg/kg	USEPA, 2013
Copper (II) sulfate	<i>Pelodiscus sinensis</i>	Chinese Softshell Turtle	FW	112	Biochemical	NOEC	None	41.8	mg/kg	USEPA, 2013
Copper (II) sulfate	<i>Pelodiscus sinensis</i>	Chinese Softshell Turtle	FW	112	Biochemical	LOEC	None	78.6	mg/kg	USEPA, 2013

Notes:

EC50 - Effective concentration for 50% of the population

FW - Freshwater

LC50 - Lethal concentration for 50% of the population

LD50 - Lethal dose for 50% of the population

LOEC - Lowest Observable Effect Concentration

LOEL - Lowest Observable Effect Level

NA - Not Applicable

NOEC - No Observable Effect Concentration

NOEL - No Observable Effect Level

SW - Saltwater

Biochemical - Measurement of biotransformation or metabolism of chemical compounds, modes of toxic action, and biochemical responses in plants and animals. Examples of biochemical effects include changes in enzyme or hormonal activity.

Behavior - Overt activity measurement of an organism including but not limited to avoidance, aggression, and feeding behavior.

Cellular - Measurements regarding changes in structure and chemical composition of cells and tissues of plants or animals as related to their functions.

Growth - Measurements that include changes in body weight, morphology, and development.

Mortality - Measurements where the cause of death can be attributed to the chemical.

Physiology - Measurement regarding basic activity within tissues and cells of plants or animals. Effects include physiological responses such as injury, immunity, and intoxication.

Population - Measurements related to changes in a group of organisms of the same species occupying the same area at a given time.

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Appendix C

(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: <input type="checkbox"/> Air <input type="checkbox"/> Ground <input type="checkbox"/> Fumigation <input type="checkbox"/> 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: <input type="checkbox"/> 1. Highly toxic to bees. <input type="checkbox"/> 2. Toxic to birds, fish and wildlife. <input type="checkbox"/> 3. Do not apply when irrigation or run-off is likely to occur. <input type="checkbox"/> 4. Do not apply near desirable plants. <input type="checkbox"/> 5. Do not allow to drift onto humans, animals, or desirable plants. <input type="checkbox"/> 6. Keep out of lakes, streams, and ponds. <input type="checkbox"/> 7. Birds feeding on treated area may be killed. <input type="checkbox"/> 8. Do not apply when foliage is wet (dew, rain, etc.). <input type="checkbox"/> 9. May cause allergic reaction to some people. <input type="checkbox"/> 10. This product is corrosive and reacts with certain materials (see label). <input type="checkbox"/> 11. Closed system required. <input type="checkbox"/> 12. Restricted use pesticide (California and/or EPA). <input type="checkbox"/> 13. Hazardous area involved (see map and warnings) <input type="checkbox"/> 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: <input type="checkbox"/> Sweep Net Counts <input type="checkbox"/> Leaf or Fruit Counts <input type="checkbox"/> Preventative <input type="checkbox"/> Field Observation <input type="checkbox"/> Pheromone or Other Trap <input type="checkbox"/> Soil Sampling <input type="checkbox"/> Other	
15. Crop and Site Restrictions: <input type="checkbox"/> 1. Worker reentry interval _____ days. <input type="checkbox"/> 2. Do not use within _____ days of harvest/slaughter. <input type="checkbox"/> 3. Posting required? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> 4. Do not irrigate for at least _____ days after application. <input type="checkbox"/> 6. Do not feed treated foliage or straw to livestock. <input type="checkbox"/> 7. Plantback restrictions (see label) <input type="checkbox"/> 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.		W	E
Adviser Signature _____	Date _____		
Adviser License Number _____			
Employer _____			
Employer's Address _____		S	

Appendix D

(Example Product Labels and MSDS Sheets)

CUTRINE®-PLUS

ALGAECIDE and HERBICIDE

GENERAL INFORMATION

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

DIRECTIONS FOR USE

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

GENERAL APPLICATION RESTRICTIONS:

(For end-use products in containers \geq 5 gallons or \geq 50 pounds.)

Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your State or Tribe, consult the State or Tribe agency responsible for pesticide regulation.

(For end-use consumer products in containers less than 5 gallons or less than 50 pounds)

Do not apply this product in a way that will contact adults, children, or pets, either directly or through drift. Some states may require permits for the application of this product to public waters. Check with your local authorities.

(For all sizes) Do not enter or allow others to enter until application of product has been completed.

PRE-TREATMENT CONSIDERATIONS:

(For end-use products in containers \geq 5 gallons or \geq 50 pounds.)

In Potable Water Reservoirs, Lakes, Industrial Ponds & Wastewater or other monitored water systems, initial treatment with this product must be considered at the onset of nuisance bloom conditions as evidenced by initial taste and odor complaints; high cell counts or chlorophyll *a* concentrations; high MIB or geosmin concentrations; visible surface scum formations; low Secchi disk readings; significant daily fluctuations in dissolved oxygen; and/or sudden increases in pH. Monitoring of several of these parameters on a regular basis will assist in optimizing the timing of treatments and reducing the amounts of this product needed for seasonal control. Identification of primary nuisance species or genera may also be helpful in determining and refining dosage rates.

(For end-use consumer products in containers less than 5 gallons or less than 50 pounds)

In Ponds (Farm, Fire, Fish, Golf Course, Irrigation, Ornamental, Stormwater Retention, Swimming), Small Lakes, Fish Hatcheries, Aquaculture Facilities, treatment with this product should be started when visible, actively growing algae and susceptible plants appear in spring, preferably before significant surface accumulations occur. Aeration and/or fountain system, where available, should be in operation at the time of treatment.

Spray Drift Management

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

Droplet Size

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

Wind Speed

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

Temperature Inversions

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

Other State and Local Requirements

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

Equipment

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

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

ACTIVE INGREDIENTS:

Copper Ethanolamine Complex, Mixed (Mono CAS# 14216-52-2 and Tri CAS# 82027-59-6)*.....27.9%

OTHER INGREDIENTS.....72.1%

TOTAL.....100.0%

*Metallic copper equivalent, 9%.

Contains 0.909 lbs. of elemental copper per gallon.

KEEP OUT OF REACH OF CHILDREN CAUTION

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

See additional precautions on Back Panel

Manufactured for:
Applied Biochemists
W175N11163 Stonewood Drive
Suite 234,
Germantown Wisconsin 53022
1-800-558-5106
www.appliedbiochemists.com
Pat. No. 3,930,834
EPA Reg. No. 8959-10
EPA Est. No. 42291-GA-1

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This specimen label is intended as informational purposes only and not for use as container labeling

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

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

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

Table 1 - Copper Concentration

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

Table 2 - Product Application Rate (Gallons)

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

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

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

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

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

OTHER TREATMENT FACTORS AND CONSIDERATIONS

- Calm and sunny conditions when water temperature is at least 60°F will usually expedite control results.
- Effective control of algae requires direct contact with all cells throughout the water column, since these plants do not have vascular systems to transport copper from cell to cell.
- Visible reduction in algae growth should be observed in 24 to 48 hours following application with full infestation and water temperatures.
- Re-treat areas if re-growth or new growth begins to appear and seasonal control is desired. Identify new growth to re-check required copper concentration that may be needed for control. Apply treatment along the shore and proceed outwards in bands to allow fish to move into untreated areas.
- No more than 1/2 of the water body may be treated at one time. (refer to Environmental Hazards for additional guidance)
- The minimum retreatment interval between consecutive treatments is 14 days.

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

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

HERBICIDE APPLICATION (For Hydrilla Control)

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

CUTRINE-PLUS ; HARVESTER® TANK MIX

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

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

Application Rates
Gallons/Surface Acre*

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

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

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

PRE-TREATMENT CONSIDERATIONS

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

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

$$\text{Average Width (feet)} \times \text{Average Depth (feet)} \times \text{Velocity}^* \text{ (feet/second)} \times 0.9 = \text{Cubic Feet per Second (C.F.S.)}$$

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

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

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

- turbulence-creating structures to promote the dispersion of 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 stop watch and appropriate measuring container to set the desired drip rate. Readjust accordingly if flow rate changes during the 3 hour treatment period.
- Distance of control obtained down the waterway will vary depending upon density of vegetation growth. Treatment period may have to be extended up to 6 hours in areas where control may be difficult due to high flows or significant growth. Periodic maintenance treatments may be required to maintain seasonal control.

Chemigation System Application

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

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

CHEMIGATION SYSTEM APPLICATION

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

Chemigation Systems Connected to a Public Water Supply

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

Sprinkler Chemigation Requirements

- The system must contain a functional check valve, vacuum relief valve, and low pressure drain appropriately located on the irrigation pipeline to prevent water source contamination from back flow.
- The pesticide injection pipeline must contain a functional, automatic, quick-closing check valve to prevent the backflow of solution toward the injection pump.
- The pesticide injection pipeline must also contain a functional, normally closed, solenoid operated valve located on the intake side of the injection pump and connected to the system interlock to prevent fluid from being withdrawn from the supply tank when the irrigation system is either automatically or manually shut down.
- The system must contain functional interlocking controls to automatically shut off the pesticide injection pump when the water pump motor stops.

- The irrigation line or water pump must include a functional pressure switch which will stop the water pump motor when the water pressure decreases to the point where pesticide distribution is adversely affected.
- Systems must use a metering pump, such as a positive displacement injection pump (e.g. diaphragm pump) effectively designed and constructed of materials that are compatible with pesticides and capable of being fitted with a system interlock.
- Do not apply when drift would extend beyond the area intended for treatment.

Floor (Basin). Furrow and Border Chemigation Requirements

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

Drip Chemigation Requirements

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

Submersed Plant Control Applications

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

Tank Mix Applications

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

FIRST AID

If on skin or clothing:

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

If swallowed:

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

If in eyes:

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

If inhaled:

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

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

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

PRECAUTIONARY STATEMENTS

HAZARDS TO HUMANS AND DOMESTIC ANIMALS

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

Personal Protective Equipment (PPE)

Mixers, loaders, applicators, and other handlers must wear the following:

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

USER SAFETY REQUIREMENTS

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

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

ENVIRONMENTAL HAZARDS:

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

FISH AND AQUATIC ORGANISMS:

Waters treated with this product may be hazardous to aquatic organisms. Treatment of aquatic weeds and algae can result in oxygen loss from decomposition of dead algae and weeds. This oxygen loss can cause fish and invertebrate suffocation. To minimize hazard, do not treat more than 1/2 of the water body to avoid depletion of oxygen due to decaying vegetation. Wait at least 10 to 14 days between treatments. Begin treatment along the shore and proceed outwards in bands to allow fish to move into untreated areas. In regions where ponds freeze in winter, treatment should be done 6 to 8 weeks before expected freeze time to prevent masses of decaying algae under an ice cover. Consult with the State or local agency with primary responsibility for regulating pesticides before applying to public waters, to determine if a permit is required. This pesticide is toxic to some fish and aquatic invertebrates and may contaminate water through runoff. This product has a potential for runoff for several months or more after application. Poorly draining soils and soils with shallow water tables are more prone to produce runoff that contains this product. Do not contaminate water when disposing of equipment wash-waters or rinsate.

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

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

STORAGE & DISPOSAL:

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

PESTICIDE STORAGE:

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

PESTICIDE DISPOSAL:

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

CONTAINER DISPOSAL:

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

Nonrefillable container. Do not reuse container. Triple rinse as follows: Empty the remaining contents into application equipment or a mix tank. Fill the container 1/4 full with water and recap. Shake for 10 seconds. Pour rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Drain for 10 seconds after the flow begins to drip. Repeat this procedure two more times. Then offer for recycling or reconditioning if available or puncture and dispose of in approved landfill, or incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke. Consult Federal, State or local authorities for approved alternative procedures.

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

Nonrefillable container. Do not reuse container. Triple rinse as follows: Empty the remaining contents into application equipment or a mix tank. Fill the container 1/4 with water and recap. Replace and tighten closures. Tip container on its side and roll it back and forth, ensuring at least one complete revolution, for 30 seconds. Stand container on its end and tip it back and forth several times. Empty the rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Repeat this procedure two more times. Then offer for recycling or reconditioning if available or puncture and dispose of in approved landfill, or incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke. Consult Federal, State or local authorities for approved alternative procedures.

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

WARRANTY

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

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

PRODUCT NAME: **AB CUTRINE-PLUS**

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

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

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

REVISION DATE: 05/27/2015
 SUPERCEDES: 02/19/2010

MSDS Number: 000000024433
 SYNONYMS
 CHEMICAL FAMILY: None
 DESCRIPTION / USE: None established
 FORMULA: None established

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

SECTION 2. HAZARDS IDENTIFICATION


GHS Classification

Flammable liquids : Category 4

Eye irritation : Category 2B

Specific target organ toxicity -
single exposure : Category 3 (Respiratory system)

GHS Label element

Hazard pictograms	:	
Signal word	:	Warning
Hazard statements	:	H227 Combustible liquid. H320 Causes eye irritation. H335 May cause respiratory irritation.
Precautionary statements	:	Prevention: P210 Keep away from heat/sparks/open flames/hot surfaces. - No smoking. P261 Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray. P264 Wash skin thoroughly after handling. P271 Use only outdoors or in a well-ventilated area. P280 Wear protective gloves/ eye protection/ face protection. Response: P304 + P340 + P312 IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER or doctor/ physician if you feel unwell. P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. P312 Call a POISON CENTER or doctor/ physician if you feel unwell. P337 + P313 If eye irritation persists: Get medical advice/ attention. P370 + P378 In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish. Storage: P403 + P233 Store in a well-ventilated place. Keep container tightly closed. P403 + P235 Store in a well-ventilated place. Keep cool. P405 Store locked up. Disposal: P501 Dispose of contents/ container to an approved waste disposal plant.

Other hazards

None known.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

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

BASIC COPPER CARBONATE

12069-69-1

11 - 21

SECTION 4. FIRST AID MEASURES

General Advice:	Call a poison control center or doctor for treatment advice. For 24-hour emergency medical assistance, call Arch Chemical Emergency Action Network at 1-800-654-6911. Have the product container or label with you when calling a poison control center or doctor, or going for treatment.
Inhalation:	IF INHALED: Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible. Call a poison control center or doctor for further treatment advice.
Skin Contact:	IF ON SKIN OR CLOTHING: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice.
Eye Contact:	IF IN EYES: Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a poison control center or doctor for treatment advice.
Ingestion:	IF SWALLOWED: Call a poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by a poison control center or doctor. Do not give anything by mouth to an unconscious person.

SECTION 5. FIREFIGHTING MEASURES

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

Flammable Properties

Fire / Explosion Hazards:	0 - Will not burn
Extinguishing Media:	Carbon dioxide (CO2) Dry chemical Foam
Fire Fighting Instructions:	Use water spray to cool unopened containers. In case of fire, use normal fire-fighting equipment and the personal protective equipment recommended in Section 8 to include a NIOSH approved self-contained breathing apparatus.
Hazardous Combustion Products:	During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.

SECTION 6. ACCIDENTAL RELEASE MEASURES

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

Spill Mitigation Procedures

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

SECTION 7. HANDLING AND STORAGE

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

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

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

Protective Equipment for Routine Use of Product

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

Components with workplace control parameters

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

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

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

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

SECTION 10. STABILITY AND REACTIVITY

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

Decomposition Temperature: No data

SECTION 11. TOXICOLOGICAL INFORMATION

Component Animal Toxicology

Oral LD50 value:

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

Component Animal Toxicology

Dermal LD50 value:

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

Component Animal Toxicology

Inhalation LC50 value:

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

Product Animal Toxicity

Oral LD50 value LD50 Believed to be approximately 3,790 mg/kg Rat

Dermal LD50 value LD50 Believed to be > 2,000 mg/kg Rabbit

Inhalation LC50 value no data available

Skin Irritation Not expected to be irritating to the skin.

Eye Irritation slight irritation

Skin Sensitization: This material is not known or reported to be a skin or respiratory sensitizer.

Triethanolamine	This material tested negative for skin sensitization in animals.
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Ethanolamine	This material tested negative for skin sensitization in animals.
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Acute Toxicity: May cause mild eye irritation. Ingestion may cause mild gastrointestinal discomfort. Inhalation of mist or vapor may cause irritation to the mucous

	membranes of the respiratory tract.	
Subchronic / Chronic Toxicity	Not known or reported to cause subchronic or chronic toxicity.	
Triethanolamine	Animal studies suggest that chronic (repeated) overexposure may result in damage to the liver and kidney.	
Reproductive and Developmental Toxicity	Not known or reported to cause reproductive or developmental toxicity.	
Triethanolamine	This product has been tested and was shown not to produce any adverse effects on reproductive function or fetal development when administered to laboratory animals.	
Ethanolamine	This chemical has been tested in laboratory animals and no evidence of teratogenicity, embryotoxicity or fetotoxicity was seen.	
Mutagenicity:	Not known or reported to be mutagenic.	
Triethanolamine	This chemical has been shown to be non-mutagenic based on a battery of assays.	
Ethanolamine	This chemical has been tested in a battery of mutagenicity/genotoxicity assays and the results were negative.	
Carcinogenicity	This product is not known or reported to be carcinogenic by any reference source including IARC, OSHA, NTP or EPA.	
Triethanolamine	The International Agency for Research on Cancer (IARC) has classified this product or a component of this product as a Group 3 substance, Unclassifiable as to Its Carcinogenicity to Humans.	
Ethanolamine	This product is not known or reported to be carcinogenic by any reference source including IARC, OSHA, NTP or EPA. Chemicals of similar structure have been shown not to cause cancer in laboratory animals.	

SECTION 12. ECOLOGICAL INFORMATION

Overview: Toxic to fish and other aquatic organisms.

Ecological Toxicity Values for: Triethanolamine

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

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

Ecological Toxicity Values for: Ethanolamine

Rainbow trout (*Oncorhynchus mykiss*) - (nominal, static). 96 h LC50 = 150 mg/l

Mosquito fish - (nominal, static). 96 h LC50 = 337.5 mg/l

Bluegill - (nominal, static). 96 h LC50 = 329.16 mg/l

Pimephales promelas (fathead minnow) - (measured, flow-through) 96 h LC50 = 2,070 mg/l

Goldfish - (measured, static) 96 h LC50 = 170 mg/l

Daphnia magna (Water flea) - (nominal, static). 24 h LC50= 140 mg/l

Crangon crangon (shrimp) - (nominal, renewal). 48 h LC50> 100 mg/l

Brine shrimp - 48 h LC50= 7,100 mg/l

Daphnia magna (Water flea) - 48 h EC50= 65 mg/l

SECTION 13. DISPOSAL CONSIDERATIONS

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

Waste Disposal Summary : If this product becomes a waste, it DOES NOT meet the criteria of a hazardous waste as defined under 40 CFR 261, in that it does not exhibit the characteristics of hazardous waste of Subpart C, nor is it listed as a hazardous waste under Subpart D.

Disposal Methods : As a nonhazardous liquid waste, it should be disposed of in accordance with local, state and federal regulations.

SECTION 14. TRANSPORT INFORMATION

DOT
Not dangerous goods

TDG
Not dangerous goods

IATA
Not dangerous goods

IMDG-CODE

Not dangerous goods

SECTION 15. REGULATORY INFORMATION

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

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

EPCRA - Emergency Planning and Community Right-to-Know Act**CERCLA Reportable Quantity**

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

SARA 302

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

SARA 313

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

copper carbonate 12069-69-1

Clean Air Act

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

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

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

Clean Water Act

SAFETY DATA SHEET

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

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

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

	copper carbonate	12069-69-1	16.55 %
US State Regulations			
Massachusetts Right To Know	2,2',2''-Nitrilotriethanol	102-71-6	
	2-Aminoethanol	141-43-5	
Pennsylvania Right To Know	2,2',2''-Nitrilotriethanol	102-71-6	
	2-Aminoethanol	141-43-5	
	copper carbonate	12069-69-1	
New Jersey Right To Know	2,2',2''-Nitrilotriethanol	102-71-6	
	2-Aminoethanol	141-43-5	
	copper carbonate	12069-69-1	

California Prop 65

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

2,2'-Iminodiethanol	111-42-2
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The components of this product are reported in the following inventories:

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

Inventories

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

SECTION 16. OTHER INFORMATION

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

SAFETY DATA SHEET

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



EARTHTEC[®]

ALGICIDE/BACTERICIDE FOR LAKES, PONDS, RESERVOIRS, CANALS, LAGOONS AND OTHER WATER SYSTEMS



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 this label, find someone to explain it to you in detail.)

FIRST AID

IF SWALLOWED: Call a doctor or get medical attention. Do not induce vomiting or give anything by mouth to an unconscious person. Drink promptly a large quantity of milk, egg white, gelatin solution, or if these are not available, drink large quantities of water. Avoid alcohol.

IF ON SKIN: Wash with plenty of soap and water. Get medical attention if irritation persists.

IF IN EYES: Hold eyelids open and flush with a steady, gentle stream of water for 15 minutes. Get medical attention.

Note to Physician: Probable mucosal damage may contraindicate the use of gastric lavage.

SEE SIDE PANEL FOR ADDITIONAL PRECAUTIONARY STATEMENTS

ACTIVE INGREDIENTS:

Copper as Metallic 5%*
 Inert Ingredients 95%
TOTAL 100%

*From Copper Sulfate Pentahydrate

This Product Contains 9.9 Lbs. Per Gallon

9.9 Lbs. Per Gallon — 1.188 Kg/L

EPA Reg. No. 64962—1

EPA Est. No. 64962—NB—001

NET CONTENTS: FIVE(5) U.S. GALLON

Manufactured by: **Earth Science Laboratories, Inc.**
 515 Brown Street, P.O. Box 710, Holdrege, NE 68949 800 257-9283

PRECAUTIONARY STATEMENTS

Hazards to Humans and Domestic Animals

DANGER

Corrosive. Causes irreversible eye damage. Do not get in eyes or on clothing. Avoid contact with skin. Wear protective eyewear (goggles, face shield or safety glasses). Harmful if swallowed, inhaled or absorbed through skin. Wash thoroughly with soap and water after handling. Remove contaminated clothing and wash clothing before reuse.

ENVIRONMENTAL HAZARDS

Fish and Aquatic Organisms: 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 a lake or pond at one time to avoid depletion of oxygen from decaying vegetation. Allow 1 to 2 weeks between treatment 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 acidic waters. Do not contaminate water when disposing of equipment wash waters. (See Disposal Instructions). Consult your local State Fish and Game Agency before applying this product to public waters. Permits may be required before treating such waters.

Endangered Species Restrictions: It is a violation of Federal laws 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 following counties.

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

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.

For Chemical Emergency

Call INFOTRAC 1-800-535-5053

Non-Flammable. Do not Freeze.

THIS BULLETIN MUST BE REVIEWED PRIOR TO PESTICIDE USE

DIRECTIONS FOR USE

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

GENERAL INFORMATION

EARTHTEC is an innovative, formulation used for suppression of bacterial odors and toxic gases in sewage lagoons, feedlot run-off pits, animal confinement facilities and other ponds

containing organic matter or algae/bacteria. EARTHTEC may also be used to control algae, bacteria, and pond weed in irrigation reservoirs, ponds, and potable water supplies.

APPLICATION AND HANDLING EQUIPMENT

Application, handling or storage equipment MUST consist of either fiberglass, PVC'S, polypropylenes, viton, most plastics, aluminum or stainless steel. Never use mild steel, nylon, brass or copper around, full strength EARTHTEC.

Always rinse equipment free and clean of EARTHTEC each night with plenty of fresh, clean water.

Always store EARTHTEC above 32 degrees F. Freezing may cause product separation. Seller makes no warranty for the performance of product which has been frozen. Useful formulas for calculating water volume and flow rates. To find the capacity of water storage containment in gallons, multiply the water volume in cubic feet times 7.5.

NOTE: 1 CFS/Air = 27,000 gallons 1 Acre (ft) = 326,000 gallons

STORAGE AND DISPOSAL

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

STORAGE: Store in a safe place away from pets and keep out of the reach of children. Store away from excessive heat. EARTHTEC will freeze. Always keep container closed. Store EARTHTEC in its original container only. Keep away from galvanized pipe, and any nylon storage handling equipment.

DISPOSAL: Pesticide wastes are acutely hazardous. Improper disposal of excess EARTHTEC, spray mixture or rinsate is a violation of Federal Law. If these wastes can not 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. In the event of spill, neutralize with limestone or baking soda before disposal. May deteriorate concrete.

Container: Triple rinse (or equivalent). Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill or incineration or, if allowed by state and local authorities, by burning. If burned, stay out of smoke.

GENERAL BACTERIAL ODOR CONTROL

Application rates may vary depending on amounts of organic matter (sewage) in lagoons and pits. Application should be done by pouring EARTHTEC directly from the container into the pit or lagoon. Several application points speed up dispersal. Use one gallon of full strength EARTHTEC in 60,000 gallons (8,000 cubic feet) of sewage. For easiest results disperse EARTHTEC evenly throughout sewage. Bacterial odors should be noticeably reduced in 1-2 weeks. Repeat application when odor reoccurs.

Feedlot Run-Off Lagoons: Add a portion of the required dosage of EARTHTEC at several locations around the lagoon to speed dispersal of the product. A minimum of two applications per year (spring and fall) is recommended. Additional applications may be required as needed or when the lagoon is pumped.

Animal Confinement Pits: If pits are located under the confinement buildings, add EARTHTEC directly to these pits. If the pits are outside, add EARTHTEC to transfer line to the pit.

Other Organic Sludges: EARTHTEC must be thoroughly mixed with sludge. Apply at the rate of one gallon EARTHTEC in 30,000 gallons of sludge.

GENERAL ALGAE CONTROL

For algae control, apply in late spring or early summer when algae first appear. The dosages are variable and depend upon algae species, water hardness, water temperature, amount of algae present, as well as whether water is clear, turbid, flowing

or static. Preferably, the water should be clear with temperatures above 60 degrees F (15.6 degrees C). Higher dosages are required at lower water temperatures, higher algae concentrations and for hard waters. Application should be done by pouring EARTHTEC directly from the container into the lakes, ponds, reservoirs or irrigation canals. Several application points speed up dispersal. Static water requires less chemical for algae control than does flowing water. Use higher dosages for chara, nitella and filamentous algae (pond scum) and lower dosages for planktonic algae. If there is uncertainty about the dosage begin with a lower dosage and increase until control is achieved or until the maximum allowable level has been reached.

Treatment of algae can result in oxygen loss from the decomposition of dead algae. This loss can cause fish suffocation. If the algae cover more than one-third of the total water area, treat in sections. Treat one-half of the water area in a single operation and wait for 10 to 14 days between treatments. Begin treatment along the shore and proceed outward in bands to allow fish to move into untreated areas. In regions where ponds freeze in winter, treatment should be done 6 to 8 weeks before expected freeze to prevent masses of decaying algae under an ice cover.

Trout and certain other species of fish may be killed at recommended application rates, especially in soft or acidic waters. Before treating bodies of water, consult proper state authorities such as the Fisheries Commission or Conservation Department to obtain any necessary permits.

SPECIFIC DIRECTIONS FOR USE

To Control Algae in Irrigation Conveyance Systems: For continuous addition, add one pint EARTHTEC for each 7,500-300,000 gallons. For conveyance systems longer than 30 miles, it is recommended that the above dosage be dispersed among the injection points every 30 miles. However, do not exceed the total dose of one gallon in 60,000 gallons.

To Control Algae in Impounded Waters, Lakes, Ponds and Reservoirs: For easiest results disperse EARTHTEC evenly throughout the body of water. Apply at the rate of one pint EARTHTEC in 7,500 - 300,000 gallons. For best results apply to warm still water on a sunny day when algae are near the surface. For potable water systems, do not exceed one gallon in 60,000 gallons under any circumstances (1 ppm metallic copper).

LIMITED WARRANTY AND LIMITATION OF REMEDIES

Seller warrants that the product conforms to the chemical description and is reasonably fit for the purpose stated on the label for use under normal conditions, but makes no other warranties of FITNESS OR MERCHANTABILITY expressed or implied, or any other warranty if the product is used contrary to the label instructions, or under abnormal conditions or under conditions not foreseeable to the seller. In no case shall the seller be liable for more than the cost of this product to the buyer and will in no event be liable for any consequential, special or indirect damages connected with the use or handling of this product. This product is offered and the buyer or user accepts it subject to the foregoing terms which may not be varied.

Manufactured by:
Earth Science Laboratories, Inc.
515 Brown Street, P.O. Box 710
Holdrege, NE 68949

LOT No.

SAFETY DATA SHEET
According to OSHA Hazard Communication Standard 29 CFR 1910.1200 (GHS)

EARTH SCIENCE LABORATORIES, INC.
113 SE 22nd Street, Suite 1
Bentonville, AR 72712
earthsciencelabs.com

Emergency Phone Number: 1-800-535-5053 (Infotrac)
Information Phone Number: 1-479-271-7381

Material Name: *EarthTec*®

Page: 1 of 3
Issue Date: 12/93
Revision Date: 5/15

Section 1 – IDENTIFICATION

Product Name: *EarthTec*®

Certified to: NSF/ANSI Standard 60. Do not exceed 19 mg/L.

EPA Reg. No. 64962-1

Section 2 – HAZARDS IDENTIFICATION



Symbol

Primary Routes of Entry: *Absorption and ingestion.*

Eyes: Causes substantial but temporary eye injury. Do not get in eyes.

Skin: Harmful if absorbed through skin. Avoid contact with skin.

Ingestion: Harmful if swallowed.

Section 3 – COMPOSITION/INFORMATION ON INGREDIENT

Components	CAS#	OSHA PEL	ACGIH TLV	%
Copper sulfate pentahydrate	7758-99-8	1mg/m ³	1mg/m ³	18.25-21.75%

Section 4 – FIRST AID MEASURES

If in Eyes: Hold eye open and rinse slowly and gently with water for 20 minutes. Remove contact lenses, if present, after first 5 minutes, then continue rinsing eye. Call a poison control center or doctor for advice.

If on Skin or Clothing: Take off contaminated clothing. Rinse skin immediately with plenty of soap and water for 15 to 20 minutes. Call a poison control center or doctor for treatment.

If Swallowed: Call a poison control center or doctor immediately for treatment advice. Have a 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 to an unconscious person.

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. You may also contact INFOTRAC 1-800-535-5053 for emergency treatment.

Section 5 – FIRE FIGHTING MEASURES

Flash Point: N/E

UFL: N/E

LFL: N/E

Hazardous Combustion Products: May react with high carbon metals to produce hydrogen gas, which can form an explosive mixture.

Fire Fighting Equipment/Instructions: Firefighters must wear MSHA/NIOSH approved positive pressure breathing apparatus (SCBA) with full face mask and full protective equipment.

NFPA Ratings: Fire: 0

Health: 2

Reactivity: 1

Other: X

HMIS III Ratings: Fire: 0

Health: 2

Reactivity: 1

Personal Protection: X

Section 6 – ACCIDENTAL RELEASE MEASURES

Containment Procedures: Flush with water into retaining area or container. Caution should be exercised regarding personal safety and exposure to released product.

Clean-Up Procedures: Neutralize solution with bicarbonate of soda.

Evacuation Procedures: Keep unnecessary people away; isolate hazard area and deny entry.

Special Instructions: Notify local authorities and the National Response Center, if required.

Section 7 – HANDLING AND STORAGE

Application and Handling Equipment: Application, handling or storage equipment MUST consist of fiberglass, PVC, polypropylene, viton, corrosion resistant plastics or stainless steel. Never use mild steel, nylon, brass or copper around product. Always rinse and clean equipment thoroughly each night with plenty of fresh, clean water.

Storage: Store in a safe place away from pets and keep out of the reach of children. Store away from excessive heat. Product will freeze. Always store product above 32 degrees F (Do Not Freeze). Freezing may cause product separation. Always keep container closed. Store product in its original container only. Keep away from galvanized pipe, and any nylon storage or handling equipment.

Section 8 – EXPOSURE CONTROLS/PERSONAL PROTECTION

Personal Protective Equipment (PPE)

Mixers, loaders, applicators and other handlers must wear the following: long-sleeved shirt, long pants, shoes plus socks, chemical-resistant gloves made of any water proof material (Chemical Resistance Category A), and protective eyewear.

Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables exist, use detergent and hot water. Keep and wash PPE separately from other laundry. Discard clothing and other absorbent material that have been drenched or heavily contaminated with the product's concentrate. Do not reuse them.

Section 9 – PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Clear blue liquid

Physical State: Liquid

pH: 0.5

Vapor Pressure: 0.1mm 68° F

Boiling Point: 220° F

Melting Point: N/A

Odor: Minimal odor

Vapor Density (Air=1): 1.0

Evaporation Rate: N/A

Solubility in Water: Complete

Specific Gravity (H₂O=1): 1.188 +/- 0.05

Section 10 – STABILITY AND REACTIVITY

Chemical Stability: Stable.

Conditions to Avoid: Avoid mixing with strong bases and strong reducing agents.

Incompatibility: Incompatible with strong bases and strong reducing agents.

Hazardous Decomposition Products: Sulfur dioxide and sulfur trioxide may be produced with decomposition.

Hazardous Polymerization: Will not occur.

Section 11 - TOXICOLOGICAL INFORMATION

Acute Toxicity / Chronic Toxicity: Continued overexposure to this solution may cause systemic toxicity.

Carcinogenicity: N/A

Signs and Symptoms of Exposure: Overexposure may cause the following specific symptoms, depending on the concentration and duration of exposure: vomiting, shallow respiration and lung function changes.

Section 12 - ECOLOGICAL INFORMATION

Waters treated with this product may be hazardous to aquatic organisms.

Section 13 – DISPOSAL CONSIDERATIONS

Pesticide wastes are acutely hazardous. Improper disposal of excess product 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. In the event of spill, neutralize with limestone or baking soda before disposal. May deteriorate concrete.

Section 14 – TRANSPORT INFORMATION

DOT Information

Proper Shipping Name: Corrosive liquid, acidic, inorganic, n.o.s., (contains cupric sulfate)

Hazard Class: 8

UN/NA #: UN3264

Packing Group: III

- Packages that contain more than 5.1 US gallons are **RQ** (reportable quantity)
- Packages that contain less than 4.0 liters could be **ORM-D**
- The proper shipping information is the responsibility of the shipper and this information is only guidelines.

Section 15 - REGULATORY INFORMATION

This chemical is a pesticide product registered by the Environmental Protection Agency and is subject to certain labeling requirements under federal pesticide law. These requirements differ from the classification criteria and hazard information required for Safety Data Sheets, and for workplace labels of non-pesticide chemicals. Following is the hazard information as required on the pesticide label:

WARNING

Causes substantial but temporary eye injury.

Harmful if swallowed.

Harmful if absorbed through skin.

Section 16 - OTHER INFORMATION

Date of Last Revision: May 14, 2015.

The information set forth herein is furnished free of charge and is based on technical data that Earth Science Laboratories, Inc. believes to be reliable. It is intended for use by persons having technical skill and at their own discretion and risk. Since conditions of use are outside our control, we make no warranties, express or implied, and assume no liability in connection with any use of the information. Nothing herein is to be taken as a license to operate under or a recommendation to infringe any patents.

50 LBS. NET WEIGHT (22.68 KILOS)

(additional net weights: 25 lb, 60 lb)

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, 25.1%

See back panel for specific pesticide use directions and state restrictions.

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 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 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.
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.
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 available 7:30 AM to 3:30 PM PST M-F except holidays.
NOTE TO PHYSICIAN: Probable mucosal damage may contraindicate the use of gastric lavage. Product causes eye irritation	

This product manufactured for
CHEM ONE LTD.
HOUSTON, TEXAS 77041-1104
TEL. (713) 896-9966

CHEM ONE LTD. →

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

2-20-2012

PRECAUTIONARY STATEMENTS
HAZARDS TO HUMANS AND DOMESTIC ANIMALS
DANGER - PELIGRO

CORROSIVE: Causes irreversible eye damage. May be fatal if swallowed. Harmful if absorbed through skin. Do not get in eyes or on clothing. Avoid contact with skin. Do not breathe dust or spray mist. Wear goggles or face shield, long-sleeved shirt and long pants, socks, shoes and chemical resistant gloves made of any waterproof material.

For applications in waters destined for use as drinking water, those waters must receive additional and separate potable water treatment. Do not apply more than 1.0 ppm as metallic copper in these waters.

PERSONAL PROTECTIVE EQUIPMENT

Mixers, loaders, applicators and other handlers must wear the following: Long-sleeved shirt and long pants, chemical-resistant gloves made of any waterproof material, shoes plus socks, and goggles or face shield. Some materials that are chemical-resistant to this product are polyvinyl chloride, nitrile rubber, or butyl rubber. 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 by this product. Do not reuse them. Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables exist, use detergent and hot water. Keep and wash PPE separately from other laundry.

USER SAFETY RECOMMENDATIONS:

Users should wash hands before eating, drinking, chewing gum, using tobacco or using the toilet. Users should remove clothing/PPE immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing. Users should 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

For direct aquatic use: This pesticide is toxic to fish and aquatic invertebrates. Waters treated with this product may be hazardous to aquatic organisms. Treatment of aquatic weeds and algae can result in oxygen loss from decomposition of dead algae and weeds. This oxygen loss can cause fish and invertebrate suffocation. To minimize this hazard, do not treat more than 1/2 of the water body to avoid depletion of oxygen due to decaying vegetation. Wait at least 14 days between treatments. Begin treatment along the shore and proceed outwards in bands to allow fish to move into untreated areas. Consult with the State or local agency with primary responsibility for regulating pesticides before applying to public waters, to determine if a permit is required.

Certain water conditions including low pH (≤ 6.5), low dissolved organic carbon (DOC) levels (3.0 mg/L or lower), and "soft" waters (i.e., alkalinity less than 50 mg/L), increases the potential acute toxicity to non-target aquatic organisms.

For terrestrial use: This pesticide is toxic to fish and aquatic invertebrates and may contaminate water through runoff. This product has a potential for runoff for several months or more after application. Poorly draining soils and soils with shallow water tables are more prone to produce runoff that contains this product. Drift and runoff may be hazardous to aquatic organisms in water adjacent to treated areas.

Do not apply directly to water, to areas where surface water is present, or to intertidal areas below the mean high water mark. Do not contaminate water when disposing of equipment washwaters or rinsate.

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 any

requirements specific to your State or Tribe, consult the State or Tribal agency responsible for pesticide regulation.

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 48 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, shoes plus socks, and protective eyewear (goggles, face shield, or safety glasses).

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.

Do not enter or allow others to enter until sprays have dried.

SPRAY DRIFT MANAGEMENT

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

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

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

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

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

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

For aerial applications:

-The boom length must not exceed 75% of the wingspan or 90% of the rotor blade diameter.
-Release spray at the lowest height consistent with efficacy and flight safety. Do not release spray at a height greater than 10 feet above the crop canopy unless a greater height is required for aircraft safety.

-When applications are made with a crosswind, the swath must be displaced downwind. The applicator must compensate for this displacement at the up and downwind edge of the application area by adjusting the path of the aircraft upwind.

For ground boom application:

Do not apply with a nozzle height greater than 4 feet above the crop canopy.

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 Crystals 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 Crystals will be required. Algal growth is difficult to control with Copper Sulfate Crystals when water temperatures are low (less than 60° F) or when the water alkalinity is above 50 ppm. Larger quantities of Copper Sulfate

Crystals 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 Crystals solution in water, the mixing container should be made of plastic, 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 they can be sprayed directly. If there is some doubt about the concentration to apply, it is best to start with the lower concentration given in the Specific Instructions below.

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 no more than one-half of the water area in a single operation and wait at least 14 days 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 Crystals).

CALCULATIONS FOR THE AMOUNT OF WATER IMPOUNDED AND FOR THE AMOUNT OF COPPER SULFATE CRYSTALS 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 Crystals needed to achieve the recommended concentration, multiply the weight of water by the recommended concentration of Copper Sulfate Crystals. 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 Crystals to treat 1 acre-foot of water with 2 ppm Copper Sulfate Crystals (or 0.5 ppm metallic copper), the calculation would be as follows:
 $0.000002 \times 2,720,000 = 5.44$ lbs. Copper Sulfate Crystals

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 Crystals 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 Crystals. 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 in 6 month 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 in 6 or 12 month intervals, if 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 re-grow, follow-up treatments with Copper Sulfate Crystals will be required. Applications may be made each year in the spring after plant growth begins, or during late summer or early fall, or any time a reduced water flow, thought to be caused by root growth, occurs.

Apply 2 pounds Copper Sulfate Crystals to household sewers. Add Copper Sulfate Crystals to sewer line by pouring 1/2 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. Repeat in 6 or 12 month intervals, if necessary.

ROOT CONTROL IN SEPTIC TANKS, LEACH LINES AND LEACH LINE PIPES:

The majority of the Copper Sulfate Crystals will settle in the septic tank itself and little will pass into the leach lines. To treat leach line pipes, add 2 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. Repeat in 6 or 12 month intervals, if necessary.

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

***NOTE:** Copper Sulfate Crystals added to an active 300 gallon septic tank at 2 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 Crystals. Copper Sulfate Crystals 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 States of Florida and Massachusetts and State of Washington.

***NOTE:** For all sewer line treatment applications do not use more than 2 lbs Copper Sulfate Crystals (0.5 lbs. metallic copper) per application. Minimum retreatment interval is 6 months. Make no more than two applications per calendar year. Per EPA guidelines, do not exceed 8 lbs Copper Sulfate Crystals (2 lbs metallic copper) per year.

TO CONTROL ALGAE AND THE POTOMOGETON POND WEEDS, LEAFY AND SAGO, IN IRRIGATION SYSTEMS: Once the amount of Copper Sulfate Crystals required for treating ditches or streams has been calculated, use a continuous application method, selecting proper equipment to supply the granular crystals. Minimum retreatment interval is 2 weeks.

FOR ALGAE CONTROL – Begin continuous addition application of granular Copper Sulfate Crystals when water is first turned into the system and continue throughout the irrigation season, applying 0.1 to 0.2 lbs Copper Sulfate Crystals per hour per cubic ft per second for 12 hours of each 24 hours.

This rate provides 0.112 to 0.224 ppm metallic copper in the treated water. Maximum application rate is 4 ppm Copper Sulfate Crystals (1 ppm metallic copper). Note: 4 ppm Copper Sulfate Crystals = 10.88 lbs of product/acre ft. = 1.0 ppm metallic copper in the treated water.

FOR LEAFY AND SAGO POND WEED CONTROL – Use the same continuous feeder, applying 0.5 to 0.9 lbs Copper Sulfate Crystals per hour per cubic foot per second for 12 hours of each 24 hours.

This provides 0.5 to 1.0 ppm metallic copper in the treated water. Maximum application rate is 4 ppm Copper Sulfate Crystals (1 ppm metallic copper).

NOTE: For best control of leafy and sago pond weed, it is essential to begin Copper Sulfate Crystals additions when water is first turned into the system or ditch to be treated and to continue throughout the irrigation season. Copper Sulfate Crystals becomes less effective as the alkalinity increases. Its effectiveness is significantly reduced when the bicarbonate alkalinity exceeds 150 ppm. Should Copper Sulfate Crystals 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 Crystals addition as soon as possible.

Useful formulas for calculating water volume flow rates:

Multiply the water volume in cu. ft. times 7.5 to obtain gallons.

1 C.F.S./Hr. = 27,000 Gals. 1 Acre Foot = 326,000 Gals.

1 ppm Copper Sulfate Crystals = 0.25 ppm metallic copper 1 ppm Copper Sulfate Crystals = 2.72 lb of product/acre ft

TO CONTROL ALGAE IN IRRIGATION CONVEYANCE SYSTEMS USING THE SLUG

APPLICATION METHOD: Make an addition (dump) of Copper Sulfate Crystals into the irrigation ditch or lateral at 0.25 to 2.0 lbs per cubic foot per second of water per treatment. Repeat on 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 Crystals decreases as the bicarbonate alkalinity increases and is significantly reduced when the alkalinity exceeds approximately 150 ppm as CaCO₃. Maximum application rate is 4 ppm Copper Sulfate Crystals (1 ppm metallic copper).

APPLICATION METHODS TO CONTROL ALGAE IN IMPOUNDED WATERS, LAKES, PONDS AND RESERVOIRS:

There are several methods by which to apply Copper Sulfate Crystals 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 Crystals may be applied under the water by dragging burlap bags containing Copper Sulfate Crystals. 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 Crystals can be applied to impounded waters by injecting a solution in water via a piping system. **Note:** Maximum application rate is 4 ppm Copper Sulfate Crystals (1 ppm metallic copper). Minimum retreatment interval is 14 days. EPA sets the maximum application rate at 4 ppm Copper Sulfate Crystals; however, based on the table below, 0.25 to 2 ppm Copper Sulfate Crystals can be used to treat for specific genera of algae.

COPPER SULFATE CRYSTALS 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	0.25 to 0.50 ppm*	0.50 to 1 ppm*	1 to 1.5 ppm*	1.5 to 2 ppm*
Cyanophyceae (Blue-green)	Anabaena	Cylindrospermum	Nostoc	Calothrix
	Anacystis	Oscillatoria	Phormidium	Symploca
	Aphanizomenon	Plectonema		
	Gloeotrichia			
	Gomphosphaeria			
	Polycystis			
	Rivularia			
Chlorophyceae (Green)	Closterium	Botryococcus	Chlorella	Ankistrodesmus
	Hydrodictyon	Cladophora	Crucigenia	Chara
	Spirogyra	Coelastrum	Desmidium	Nitella
	Ulothrix	Draparnaldia	Golenkinia	Scenedesmus
		Enteromorpha	Oocystis	
		Gloeocystis	Palmella	
		Microspora	Pithophora	
		Tribonema	Staurastrum	
		Zygnema	Tetraedron	
Diatomaceae (Diatoms)	Asterionella	Gomphonema	Achnanthes	
	Fragilaria	Nitzschia	Cymbella	

	Melosira Navicula	Stephanodiscus Synedra Tabellaria	Neidium	
Protozoa (Flagellates)	Dinobryon Synura Uroglena Volvox	Ceratium Cryptomonas Euglena Glenodinium Mallomonas	Chlamydomonas Hawmatococcus Peridinium	Eudorina Pandorina

* Copper Sulfate Crystals ppm (Cu metallic ppm) = lbs/acre ft
0.25 - 0.5 ppm (0.0625 - 0.125 ppm) = 0.68 - 1.36 lbs/acre ft.
0.5 - 1.0 ppm (0.125 - 0.25 ppm) = 1.36 - 2.72 lbs/acre ft
1.0 - 1.5 ppm (0.25 - 0.375 ppm) = 2.72 - 4.08 lbs/acre ft
1.5 - 2.0 ppm (0.375 - 0.50 ppm) = 4.08 - 5.44 lbs/acre ft

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: The solution of crystals must be thoroughly mixed with sludge. Dissolve 2 lbs of crystals in 1-2 gals of water and apply to each 60,000 gals of sludge. Maximum application rate is 4 ppm Copper Sulfate Crystals (1 ppm metallic copper). Minimum retreatment interval is 14 days.

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 at the first sign of algae after the field has been flooded and prior to the algae's leaving the soil surface and rising to the water surface. Apply to the water surface as either crystals or dissolve in water and make a surface spray. For a 3-inch flood depth, apply Copper Sulfate Crystals at a rate of 2.72 lbs per acre. Likewise, for a 6- inch flood depth, use 5.44 lbs per acre. Adjust the rate according to average water depth, not to exceed the maximum application rate of 4 ppm Copper Sulfate Crystals (1 ppm metallic copper), which is equivalent to 10.88 lbs Copper Sulfate Crystals / acre foot of water.

TO CONTROL TADPOLE SHRIMP IN RICE (Domestic and Wild) FIELDS: Tadpole shrimp in rice fields may be effectively controlled by the prompt and proper use of Copper Sulfate Crystals. After the rice field has been flooded, Copper Sulfate Crystals should be uniformly applied at the first sign of infestation. For a 3-inch flood depth, apply 6.8 lbs per acre. For a flood depth of 6 inches, use 13.6 lbs per acre. Adjust the rate according to average water depth, not to exceed the maximum application rate of 10 ppm Copper Sulfate Crystals (2.5 ppm metallic copper), which is equivalent to 27.2 lbs Copper Sulfate Crystals/ acre foot of water.

SCHISTOSOME-INFECTED FRESH WATER SNAILS: For recreational lakes, reservoirs, and ponds, 5.44- 13.6 lbs/acre-ft Copper Sulfate Crystals (i.e., 2-5 ppm Copper Sulfate Crystals), 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. A second application may be made if necessary, 10 to 14 days later. DO NOT make more than two applications per calendar year. Apply by 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 Crystals) in potable water systems. This labeling must be in the possession of the user at the time of pesticide application. Maximum application rate is 6 ppm Copper Sulfate Crystals (1.5 ppm metallic copper). Note: 6 ppm Copper Sulfate Crystals = 16.32 lbs of product /acre ft..

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.

PLANT DISEASE TREATMENT

Maximum Application Rates, Application Interval, and Season Maximum Application Rates are listed below. Weight of Copper Sulfate Crystals in lbs is followed by weight expressed as metallic copper, e.g., 1 lb Copper Sulfate Crystals equals 0.25 lb metallic copper.

Apple: Fireblight – Mix 5 lbs of Copper Sulfate Crystals in 100 gals of water and spray uniformly. Apply in dormant season up to 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 Do not exceed 64 lbs (16 lbs metallic copper) per acre per year. **Dormant use:** Make one application at no more than 32 lbs (8 lbs metallic copper) per acre. **Silver tip use:** Make one application at no more than 24 lbs (6 lbs metallic copper) per acre.

Grape (Dormant): Powdery Mildew – Apply in spring before bud-swell and before any green tissue is present. Use 4 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. Do not apply more than 12.0 lbs (3.0 lbs metallic copper) per acre per application. Minimum retreatment interval is 3 days. Do not exceed 80.0 lbs (20.0 lbs metallic copper) per acre per year.

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. Do not apply more than 10 lbs (2.5 lbs metallic copper) per acre per application. Minimum retreatment interval is 5 days. Do not exceed 100 lbs. (25 lbs metallic copper) per acre per year.

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. In the instruction below, weight of copper sulfate in lbs is followed by weight expressed as metallic copper, e.g., 1 lb Copper Sulfate Crystals equals 0.25 lb metallic copper.

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.

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. Do not apply more than 32 lbs copper sulfate (8 lbs metallic copper) per acre per application. Minimum retreatment interval is 7 days. Do not exceed 72 lbs (18 lbs metallic copper) per acre per year.

Almond, Apricot, Cherry, Peach, Nectarine, Plum, Prune: Brown Rot Blossom Blight – Prepare a 10-10-100 Bordeaux and apply when buds begin to swell (**late dormant**). Do not apply more than 32 lbs (8 lbs metallic copper) per acre per application. Minimum retreatment interval is 7 days. Do not exceed 72 lbs (18 lbs metallic copper) per acre per year.

Blueberries: Bacterial Canker (Not for use in California) – Prepare and apply an 8-8-100 Bordeaux mixture in the fall before heavy rains begin and again 4 weeks later. Do not apply more than 8.4 lbs (2.1 lbs metallic copper) per acre per application. Minimum retreatment interval is 7 days. Do not exceed 33.6 lbs (8.4 lbs metallic copper) per acre per year.

Bulbs (Easter Lily): 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 7 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. Do not apply more than 10 lbs (2.5 lbs metallic

copper) per acre per application. Do not exceed 300 lbs (75 lbs metallic copper) per acre per year. Do not apply any additional copper pesticide to this land for 36 months.

Bulbs (all other ornamentals, Tulip, Gladiolus): Botrytis Blight – Prepare a 8-8-80 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 7 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. Do not apply more than 8 lbs (2 lbs metallic copper) per acre per application. Minimum retreatment interval is 7 days. Do not exceed 80 lbs (20 lbs metallic copper) per acre per year.

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. Do not apply more than 8 lbs (2.0 lbs metallic copper) per acre per application. Minimum retreatment interval is 7 days. Do not exceed 40 lbs (10 lbs metallic copper) per acre per year.

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. Do not apply more than 32 lbs (8 lbs metallic copper) per acre per application. Minimum retreatment interval is 7 days. Do not exceed 72 lbs (18 lbs metallic copper) per acre per year.

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. Do not apply more than 60 gallons or 6 lbs (1.5 lbs metallic copper) per acre per application. Minimum retreatment interval is 5 days. Do not exceed 72 lbs (18 lbs metallic copper) per acre per year.

(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.)

Citrus: 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. Do not apply more than 12.6 lbs (3.15 lbs metallic copper) per acre per application. Minimum retreatment interval is 7 days. Do not exceed 50.4 lbs (12.6 lbs metallic copper) per acre per year.

Citrus: 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. Do not apply more than 12.6 lbs Copper Sulfate Crystals (3.15 lbs metallic copper) per acre per application. Minimum retreatment interval is 7 days. Do not exceed 50.4 lbs (12.6 lbs metallic copper) per acre per year.

Citrus: 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. Do not apply more than 12.6 lbs (3.15 lbs metallic copper) per acre per application. Minimum retreatment interval is 7 days. Do not exceed 50.4 lbs (12.6 lbs metallic copper) per acre per year.

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. Do not apply more than 12.0 lbs (3.0 lbs metallic copper) per acre per application. Minimum retreatment interval is 3 days. Do not exceed 80.0 lbs (20.0 lbs metallic copper) per acre per year.

Olive: Olive Leaf Spot (Peacock spot), Olive Knot – Prepare a 10-10-100 Bordeaux mixture. 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 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. Do not apply more than 24 lbs (6.0 lbs metallic copper) per acre per application. Minimum retreatment interval is 30 days. Do not exceed 72 lbs (18 lbs metallic copper) per acre per year.

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. Do not apply more than 32 lbs (8 lbs metallic copper) per acre per application. Minimum retreatment interval is 7 days. Do not exceed 72 lbs (18 lbs metallic copper) per acre per year.

Walnuts: Walnut Blight – Prepare a 15-10-100 Bordeaux mixture and apply in early pre-bloom before catkin blooms are showing (10-20% pistillate) 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. Do not apply more than 16 lbs (4.0 lbs metallic copper) per acre per application. Minimum retreatment interval is 7 days. Do not exceed 128 lbs (32 lbs metallic copper) per acre per year.

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 non-uniform 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 appropriately 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.

STORAGE AND DISPOSAL

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

PESTICIDE 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. Open burning and dumping is prohibited.

CONTAINER HANDLING: Nonrefillable container (bag). Do not reuse or refill this container. Completely empty bag into application equipment. Offer for recycling, if available. Or, 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.

(FOR RIGID, NONREFILLABLE CONTAINERS, EQUAL TO OR LESS THAN 50 LBS)

CONTAINER HANDLING: Nonrefillable container. Do not reuse or refill this container. Triple rinse container (or equivalent) promptly after emptying Triple rinse as follows: Empty the remaining contents into application equipment or a mix tank. Fill the container ¼ full with water and recap. Shake for 10 seconds. Pour rinsate into application equipment or mix tank or store rinsate for later use or disposal. Drain for 10 seconds after the flow begins to drip. Repeat this procedure two more times. Then, offer for recycling, if available, or puncture and dispose of in a sanitary landfill, or by incineration.

(FOR RIGID, NONREFILLABLE CONTAINERS GREATER THAN 50 LBS)

CONTAINER HANDLING: Non-refillable container. Do not reuse or refill this container. Triple rinse container (or equivalent) promptly after emptying. Triple rinse as follows. Empty the remaining contents into application equipment or a mix tank. Fill the container ¼ full with water. Recap and tighten closures. Tip container on its side and roll it back and forth, ensuring at least one complete revolution, for 30 seconds. Stand the container on its end and tip it back and forth several times. Turn the container over onto its other end and tip it back and forth several times. Empty the rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Repeat this procedures two more times. Then offer for recycling if available or puncture and dispose of in a sanitary landfill, or by incineration.

NOTICE: CHEM ONE LTD. warrants that this product conforms to the chemical description on the label thereof and is reasonably fit for purposes stated on such label only when used in accordance with directions under normal use conditions. It is impossible to eliminate all risks inherently associated with use of this product. Crop injury, ineffectiveness or other unintended consequences may result because of such factors as weather conditions, presence of other materials, or the manner of use or application, all of which are beyond the control of CHEM ONE LTD. To the extent consistent with applicable law, CHEM ONE LTD. shall not be liable for consequential, special or indirect damages resulting from the use or handling of this product. To the extent consistent with applicable law, all such risks shall be assumed by the Buyer. To the extent consistent with applicable law exclusive remedy of any buyer or user of this product for any and all losses, injuries, or damages resulting from or in any way arising from the use, handling or application of this product, whether in contract, warranty, tort, negligence, strict liability or otherwise, shall not exceed the purchase price paid for this product or at CHEM ONE LTD.'s election, the replacement of this product. CHEM ONE LTD. MAKES NO WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE NOR ANY OTHER EXPRESS OR IMPLIED WARRANTY EXCEPT AS STATED ABOVE.

CHEM ONE LTD.
14140 Westfair East Dr
HOUSTON, TEXAS 77041-1104

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

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: Specific applications are listed on the label for the product

RESTRICTIONS on USE

SPECIFIC RESTRICTION ARE LISTED ON THE LABEL FOR THE PRODUCT

Supplier Information

Chem One Ltd.
14140 Westfair East Drive
Houston, Texas 77041-1104

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 ***

GHS HAZARD

Hazard Classes

Acute toxicity, Oral
Acute toxicity, Dermal
Skin irritation
Eye irritation
Acute aquatic toxicity
Chronic aquatic toxicity

Hazard Categories

Category 4
Category 5
Category 2
Category 2A
Category 1
Category 1

Signal Word: Danger



Pictograms:

Hazard Statements

PHYSICAL HAZARDS:

None

HEALTH HAZARDS:

H302 Harmful if swallowed.
H313 May be harmful in contact with skin.
H315 Causes skin irritation.
H319 Causes serious eye irritation

ENVIRONMENTAL HAZARDS:

H400 Very toxic to aquatic life
H410: Very toxic to aquatic life with long lasting effects

PRECAUTIONARY STATEMENTS:

P102: Keep out of reach of children

Safety Data Sheet

Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

P202: Do not handle until all safety precautions have been read and understood

P261: Avoid breathing dust

P273 Avoid release to the environment

P280: Wear protective gloves, clothing and eye protection

RESPONSE STATEMENTS:

P301 +310+ P331: IF SWALLOWED: USA Immediately call the National POISON CENTER at 800-222-1222. DO NOT induce vomiting

P303+P361+353: IF ON SKIN Take off immediately all contaminated clothing. Rinse skin with water

P304+340: IF INHALED, Remove to fresh air and keep comfortable for breathing

P305+P351: IF IN EYES rinse cautiously with water for at least 15 minutes

P306+P361: IF ON CLOTHING, Take off contaminated clothing

P370: In case of fire use foam, carbon dioxide, dry chemical to extinguish fire

P376: Stop leaks if safe to do so. See section 6 for proper clean up

STORAGE STATEMENTS:

P403: Keep Cool Store in a well-ventilated place

DISPOSAL STATEMENTS:

P501: Dispose of content and/or container in accordance with local, regional, national or international regulations

*** Section 3 - Hazards Identification ***

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

Synonyms: Copper Sulfate Crystals, Blue Copper, Blue Stone, Blue Vitriol, Copper (II) sulfate, Cupric Sulfate, Copper Sulfate Fine 200, Fine 100, Fine 30, 20, 25, Small, Medium, Large, FCC IV, and Very High Purity

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

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.

First Aid: Eyes

Immediately flush eyes with large amounts of room temperature water, occasionally lifting the lower and upper lids, for at least 15 minutes. If symptoms persist after 15 minutes of irrigation, seek medical attention.

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.

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.

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.

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.

Safety Data Sheet

Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

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

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.

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 ***

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.

Safety Data Sheet

Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

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

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 laundry 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/m³ TWA (dusts & mists)
0.2 mg/m³ TWA (fume)

OSHA: 1 mg/m³ TWA (dusts & mists)
0.1 mg/m³ TWA (fume)

NIOSH: 1 mg/m³ TWA (dusts & mists)
0.1 mg/m³ TWA (fume)

DFG MAKs 1 mg/m³ TWA Peak, 2•MAK 15 minutes, average value, 1-hr interval (copper and inorganic copper compounds)
0.1 mg/m³ TWA Peak, 2•MAK 15 minutes, average value, 1-hr interval (fume)

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.

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.

Safety Data Sheet

Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

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

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

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.

Personal Protective Equipment: Respiratory

If airborne concentrations are above the applicable exposure limits, use NIOSH-approved respiratory protection. 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). The following NIOSH Guidelines for Copper dust and mists (as Cu) are presented for further information.

Up to 5 mg/m³: Dust and mist respirator.

Up to 10 mg/m³: Any dust and mist respirator except single-use and quarter mask respirators or any SAR.

Up to 25 mg/m³: SAR operated in a continuous-flow mode or powered air-purifying respirator with a dust and mist filter(s).

Up to 50 mg/m³: 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/m³: 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/m³.

Personal Protective Equipment: General

Wash hands thoroughly after handling material. Do not eat, drink or smoke in work areas. Have a safety shower or eye-wash fountain available. Use good hygiene practices when handling this material including changing and laundering work clothing after use. Discard contaminated shoes and leather goods.

Protective Clothing Pictograms



Splash Goggles



Gloves



Protective Apron



Dust Respirator

Safety Data Sheet

Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

*** 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
Flash Point: Not flammable	Chemical Formula: CuSO4*5H2O

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

*** 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 aluminum, steel and iron. Copper Sulfate Pentahydrate is incompatible with magnesium, strong bases, alkalines, phosphates, acetylene, hydrazine, and zirconium.

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 corrosive (acidic) 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 - LD₅₀/LC₅₀

Copper Sulfate Pentahydrate (7758-99-8)

Oral-rat LD₅₀ = 330 mg/kg (testing done June 2006, Consumer Product Testing Co., Inc.); Intraperitoneal-Rat LD₅₀: 18,700 mg/kg; Intraperitoneal-rat LD₅₀: 20 mg/kg; Subcutaneous-rat LD₅₀: 43 mg/kg; Intravenous-rat LD₅₀: 48900 µg/kg; Unreported-rat LD₅₀: 520 mg/kg; Oral-mouse LD₅₀: 369 mg/kg; Intraperitoneal-Mouse LD₅₀: 33 mg/kg; Intraperitoneal-mouse LD₅₀: 7182 µg/kg; Intravenous-mouse LD₅₀: 23300 µg/kg

Safety Data Sheet

Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

*** Section 11 - Toxicological Information Continued ***

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; Subcutaneousrat 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 weekscontinuous; 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: postimplantationmortality (e.g. dead and/or resorbed implants per total number of implants), Specific Developmental Abnormalities: Central Nervous System, body wall

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.

Safety Data Sheet

Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

*** Section 11 - Toxicological Information Continued ***

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)

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.

LC₅₀ (*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)); LC₅₀ (*Leopomis cyanellus*, Green Sunfish) = 1.1 g, 3,510 µg/L at °C; LC₅₀ (*Pimephales promelas*, Fat-head minnow) = 1.2 g, 838 µg/L at 18°C; LC₅₀ (*Crassius auratus*, Goldfish) = 0.9 g, 1380 µg/L at 18°C; LC₅₀ (*Crassius auratus*, Goldfish) = 0.1-2.5 mg/L; LC₅₀ (*EEL*) = 0.1-2.5 mg/L; LC₅₀ (*Salmo gairdneri*, Rainbow trout) = 1.6 g, 135 µg/L at 18°C; LC₅₀ (*Salmo gairdneri*, Rainbow trout) 48 hours = 0.14 ppm; LC₅₀ (*Daphnia magna*) no time specified = 0.182 mg/L; LC₅₀ (*Salmo gairdneri*, Rainbow trout) no time specified = 0.17 mg/L; LC₅₀ (*Lepomis machochirus*, Blue gill) no time specified = 1.5 g, 884 µg/L at 18°C; LC₅₀ (Stripped Bass) 96 hours = 1 ppm or lower; LC₅₀ (Prawn) 48 hours = 0.14; LC₅₀ (Shrimp) 96 hours = 17.0 ppm copper; LC₅₀ (Blue Crab) 96 hours = 28 ppm copper; LC₅₀ (Oyster) 96 hours = 5.8 ppm copper; LC₅₀ (*Viviparus bengalensis* snail) 96 hours = 0.060 ppm copper (at 32.5°C; 0.066 ppm copper static bioassay); LC₅₀ (*Viviparus bengalensis* snail) 96 hours = 0.09 ppm copper (at 27.3°C; 0.066 ppm copper static bioassay); LC₅₀ (*Viviparus bengalensis* snail) 96 hours = 0.39 ppm copper (at 20.3°C; 0.066 ppm copper static bioassay)

*** 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.

Safety Data Sheet

Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

***** Section 13 - Disposal Considerations *****

Disposal Instructions

All wastes must be handled in accordance with local, state and federal regulations or with regulations of Canada and its Provinces. 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 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, or the offices of Environment Canada for guidance.

***** Section 14 – Transportation Information Ground *****

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 49 CFR, IATA and IMDG to assure regulatory compliance.

US DOT 49 CFR 100-185 Revised December 31,2014 Information



UN/NA #: UN 3077

Shipping Name: Environmentally Hazardous Substance, solid, n.o.s. (cupric sulfate)

Hazard Class: 9

Packing Group: III

Required Label(s): Class 9

Special Provision: 8, 146, 335, A112, B54, IB8, IP2, N20, T1, TP33

Packaging: 172.155, 172.213

RQ Quantity: For a single package less than the RQ of 10lb (4.54 kg), the RQ designation should be not be used.

Marking: MARINE POLLUTANT Marine Pollutant when shipping ground greater than 882 pounds single container or any quantity by water

Safety Data Sheet

Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

*** Section 14 – Transportation Information Ground Continued ***

Additional Shipping Information



Limited Quantity Shipments: Shipments, except for air, need not be marked with the Proper Shipping Name and UN # of the contents, but shall be marked with a diamond. The top and bottom portions of the square-on-point must be black and the center white or of a suitable contrasting background. The mark must be at least 2 mm. Each side must have a minimum dimension of 100 mm. Small packages which cannot reasonably accommodate a 100 mm square-on-point mark may be marked with a square-on-point mark with a minimum side dimension of 50 mm. The total weight of each outer packaging cannot exceed 30 kg (66 pounds).

Small Quantities for Highway and Rail: The maximum quantity of this material per inner receptacle is limited to 30 g (1 ounce) per receptacle. The inner receptacles must be securely packed in an inside packaging with cushioning material to prevent movement of the inner receptacles and packed in a strong outer box with a gross mass not to exceed 29kg (64 pounds). The completed package must meet the drop test requirements of 173.4(6) (i). The outside of the package must be marked with the statement

"This package conforms to 49 CFR 173.4 for domestic highway or rail transport only."

Excepted Quantities: The maximum quantity of this material per inner receptacle is limited to 30 g (1 ounce) per receptacle and the aggregate quantity of this material per completed package does not exceed 1000 g (2.2 pounds). The inner receptacles must be securely packed in an inside packaging with cushioning material to prevent movement in the inner receptacles and packed in a strong outer box with a gross mass not to exceed 29kg (64 pounds). The completed package must meet a drop test. The requirements are found in 173.4(6) (i). The package must not be opened or otherwise altered until it is no longer in commerce. For highway or rail transportation no shipping paper is required. The package must be legibly marked with the following marking:



NOTE: The "" must be replaced by the primary hazard class, or when assigned, the division of each of the hazardous materials contained in the package. The "" must be replaced by the name of the shipper or consignee if not shown elsewhere on the package. The symbol shall be not less than 100 mm (3.9 inches) x 100 mm (3.9 inches), and must be durable and clearly visible.

De minimis Exceptions: The maximum quantity of this material per inner receptacle is limited to 1g (0.04 ounce) per receptacle and the aggregate quantity of this material per completed package does not exceed 100 g (0.22 pounds). The inner receptacles must be securely packed in an inside packaging with cushioning material to prevent movement in the inner receptacles and packed in a strong outer box with a gross mass not to exceed 29kg (64 pounds). The completed package must meet the drop test. The requirements are found in 173.4(6) (i). The package must not be opened or otherwise altered until it is no longer in commerce and may be transported by aircraft. If all of the above requirements are met, then this material is not regulated.

Safety Data Sheet

Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

*** Section 14 – Transportation Information Air ***

55th Edition International Air Transport Association (IATA):

For Shipments by Air transport: This information applies to air shipments both within the U.S. and for shipments originating in the U.S., but being shipped to a different country.



UN/NA #: UN 3077

Proper Shipping Name: Environmentally Hazardous Substance, solid, n.o.s. (cupric sulfate)

Hazard Class: 9 (Miscellaneous Dangerous Goods)

Packing Group: III

Passenger & Cargo Aircraft Packing Instruction: 956

Passenger & Cargo Aircraft Maximum Net Quantity: 400 kg

Limited Quantity Packing Instruction (Passenger & Cargo Aircraft): Y956

Limited Quantity Maximum Net Quantity (Passenger & Cargo Aircraft): 30 kg G

Excepted Quantities: E1

Excepted Quantity Maximum inner package: 30g

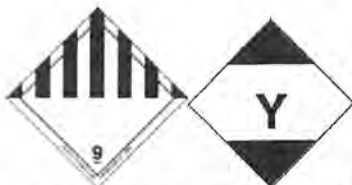
Excepted Quantity Maximum outer package: 1kg

Cargo Aircraft Only Packing Instruction: 956

Cargo Aircraft Only Maximum Net Quantity: 400 kg

Special Provisions: A97, A158, A179 A197

ERG: 9L



Limited Quantity Shipments: Shipments for air must be marked with the Proper Shipping Name and

UN # shall on the package. The top and bottom portions of the square-on-point must be black and the center white or of a suitable contrasting background and the symbol "Y" must be black and located in the center of the square-on-point. The mark must be at least 2 mm. Each side must have a minimum dimension of 100 mm. Small packages which cannot reasonably accommodate a 100 mm square-on-point mark may be marked with a square-on-point mark with a minimum side dimension of 50 mm. The total weight of each outer packaging cannot exceed 30 kg.

Excepted Quantities: The maximum quantity of this material per inner receptacle is limited to 30 g per receptacle and the aggregate quantity of this material per completed package does not exceed 1kg. The inner receptacles must be securely packed in an intermediate packaging with cushioning material to prevent movement in the inner receptacles and packed in a strong outer box with a gross mass not to exceed 29kg. The completed package must meet a drop test. The requirements are found in 2.7.6.1. The package must not be opened or otherwise altered until it is no longer in commerce. For air transportation no shipping paper is required. The package must be legibly marked with the following marking:



NOTE: The "" must be replaced by the primary hazard class, or when assigned, the division of each of the hazardous materials contained in the package. The "" must be replaced by the name of the shipper or consignee if not shown elsewhere on the package. The symbol shall be not less than 100 mm x 100 mm and must be durable and clearly visible.

Safety Data Sheet

Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

*** Section 14 – Transportation Information Vessel ***

Amendment 37-14 International Maritime Dangerous Goods (IMDG) Code

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



UN/NA #: UN 3077

Proper Shipping Name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Cupric sulfate)

Hazard Class: 9

Packing Group: III

Special Provisions: 274,335,966,967

Limited Quantities 5 kg

Excepted Quantities: E1

Packing Instructions: P002/LP02

Provisions: PP12

IBC Instructions IBC08

IBC Provisions: B2

EmS: F-A, S-F

Stowage and: Handling Category A., SW23

Segregation: None

Marine Pollutant: This material is considered a marine pollutant by the IMO and shipments of the material must carry the new marking Refer to IMO Amendment 36-12 Chapter 2.9 and 2.10.



Limited Quantity Shipments: Shipments need not be marked with the Proper Shipping Name of the contents, but shall be marked with a diamond. The top and bottom portions of the square-on-point must be black and the center white or of a suitable contrasting background. The mark must be at least 2 mm. Each side must have a minimum dimension of 100 mm. Small packages which cannot reasonably accommodate a 100 mm square-on-point mark may be marked with a square-on-point mark with a minimum side dimension of 50 mm. The total weight of each outer packaging cannot exceed 30 kg (66 pounds). Also requires an IMDG Dangerous Cargo Declaration.

Excepted Quantities: The maximum quantity of this material per inner receptacle is limited to 30 g per receptacle and the aggregate quantity of this material per completed package does not exceed 1000g. The inner receptacles must be securely packed in an intermediate packaging with cushioning material to prevent movement in the inner receptacles and packed in a strong outer box with a gross mass not to exceed 29kg. The completed package must meet a drop test. The requirements are found in 3.5.3.1. The package must not be opened or otherwise altered until it is no longer in commerce. For air transportation no shipping paper is required. The package must be legibly marked with the following marking:



NOTE: The *** must be replaced by the primary hazard class, or when assigned, the division of each of the hazardous materials contained in the package. The **** must be replaced by the name of the shipper or consignee if not shown elsewhere on the package. The symbol shall be not less than 100 mm x 100 mm and must be durable and clearly visible.

Safety Data Sheet

Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

*** 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

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	N/A	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

Safety Data Sheet

Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

*** Section 16 - Other Information ***

ANSI Labeling (Z129.1):

WARNING! MAY BE HARMFUL OR 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, CO₂, 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 solution 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.

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 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 or 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 or 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

Safety Data Sheet

Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

interval (REI) of 48 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.

Labeling Information for Pesticide Use of Product (continued):

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 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 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

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.

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

9/16/03: 3:45 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 DFG MAK exposure limits. Up-Dated entire Section 14 Transportation Information to include IATA, IMO and current Canadian transport information.

Safety Data Sheet

Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

06/22/05 2:24PM SEP Update IATA Section 14

01/06/2006 10:12 am SEP Corrected Section 14 DOT domestic transport exception to read 49 CFR 172.322 (d) (3).

09/08/06 2:52PM SEP Updated DOT and IMO Section 14 SEP

09/25/06 08:43 HDF Review of new toxicological data and addition of data to Section 11.

10/17/06 12:15 pm SEP Updated Section 11.

10/16/07 9:48am SEP Updated Section 14- IATA

10/10/08 3:48 PM DLY Changed Chem One Physical Address, Section 1

09/18/09 MMK Updated Section 14 limited & excepted quantities and exceptions, updated REI and treatment interval per EPA label
RED

04 /07/ 11 SEP Add "F 25" Section 1

01/14/2015 GHS revision all sections

This is the end of MSDS # C1-121A

Revised By:

SJC Compliance Education, Inc.

16516 El Camino Real Suite 417

Houston, TX 77062

Appendix E

(CEQA Documentation)

SWRCB SIP Exception Info Sheet
CEQA NOI
CEQA NOC
State Clearinghouse Letter
Comments and Response to Comments
City of Redwood City, City Council Resolution
CEQA NOD
CDFW Filing Fee Receipts

State Implementation Policy (SIP) Section 5.3 Exception Information Sheet

Use of Copper to Control Algae and Aquatic Vegetation

in Redwood Shores Lagoon

City of Redwood City, Public Works Division

December 10, 2015

1. **Notification.** The City of Redwood City, Public Works Division (City) will notify potentially effected public and governmental agencies of the project. The project is described in the City's Initial Study/Mitigated Negative Declaration (IS/MND) dated October 15, 2015.
2. **Description of the Proposed Action.** The proposed action is the application of copper-containing algaecides and/or aquatic herbicides to control algae and aquatic vegetation. For a more detailed description, see the City's aforementioned IS/MND.
3. **Schedule.** The schedule for the action will be according to Integrated Pest Management (IPM) principles. For example, the application of aquatic herbicides will be done at times and frequencies when the type and density of algae or aquatic vegetation equals or exceeds thresholds established by the City. Algaecide and/or aquatic herbicide applications typically take place annually between April 1st and November 30th.
4. **Discharge and Receiving Water Quality Monitoring Plan.** The City 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 City will maintain its ability to use manual removal of aquatic vegetation and/or aquatic herbicides that do not contain copper. Alternative aquatic weed and algae control methods are not always as cost-effective, easy to apply, or efficacious as copper. Refer to the aforementioned IS/MND for a discussion of the use of copper-containing aquatic herbicides.
6. **Identification of Alternate Water Supply.** Not applicable. The Redwood Shores Lagoon is supplied by stormwater drainage and water from the San Francisco Bay.
7. **Residual Waste Disposal Plans.** The City's use of copper-containing algaecides or aquatic herbicides to control algae and/or aquatic weeds does not create residual waste.
8. **Certification by a Qualified Biologist.** At the annual completion of the project, the City will provide certification by a qualified biologist that the receiving water beneficial uses have been maintained. Pre- and post-project certification will take into account natural variations in project site conditions and the influence these conditions have on beneficial uses.

NOTICE OF INTENT

To Adopt a Mitigated Negative Declaration for
the City of Redwood City, Public Works Division

Use of Copper to Control Algae and Aquatic Vegetation In Redwood Shores Lagoon

POSTING
ONLY

VM

OCT 27 2015

The City of Redwood City, Public Works Division (City) is proposing to begin to use copper-based aquatic herbicides to control aquatic weeds in its water bodies within the Redwood Shores Lagoon.

The proposed project would include the following elements:

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

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

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

Terence Kyaw
Assistant Public Works Director
City of Redwood City, Public Works Division
1400 Broadway
Redwood City, CA 94063

The Initial Study, proposed Mitigated Negative Declaration, and supporting documents are available for public review at the above address during normal working hours, 8:00 a.m. to 5:00 p.m. The Initial Study and proposed Mitigated Negative Declaration are also available electronically on the City's website (<http://www.redwoodcity.org/departments/public-works/storm/lagoon>). The public review period begins on 10/29/2015 and ends on 12/1/2015. **All written comments must be received by the close of business on the last day of the review period.**

A public hearing on the proposed Mitigated Negative Declaration will be held during the City Council Meeting scheduled for **February 8, 2016 at 7:00pm** in the City Council Chambers at: City Hall, 1017 Middlefield Road, Redwood City, 94063. After consideration of all comments, the City will either certify or reject the proposed Mitigated Negative Declaration.

2015102078

Notice of Completion & Environmental Document Transmittal

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

SCH #

Project Title: Use of Copper to Control Algae and Aquatic Vegetation in Redwood Shores Lagoon

Lead Agency: City of Redwood City Contact Person: Terence Kyaw
Mailing Address: 1400 Broadway Phone: 650-780-7466
City: Redwood City Zip: 94063 County: San Mateo

Project Location: County: San Mateo City/Nearest Community: Redwood City

Cross Streets: Marine Parkway and Lagoon Drive Zip Code: 95620

Longitude/Latitude (degrees, minutes and seconds): 37 0 31 37.99 N / 122 0 15 32.99 W Total Acres: 160

Assessor's Parcel No.: Section: 1 Twp.: 5S Range: 4W Base: Mt Diablo

Within 2 Miles: State Hwy #: 101 Waterways: San Francisco Bay, Steinberger Slough, Bay Slough

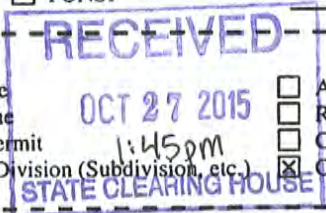
Airports: None Railways: Caltrain Schools: Hoover Children's Center

Document Type:

- CEQA: [] NOP [] Draft EIR [] Early Cons [] Supplement/Subsequent EIR [] Neg Dec [] Mit Neg Dec [] NEPA: [] NOI [] EA [] Draft EIS [] FONSI [] Other: [] Joint Document [] Final Document [] Other:

Local Action Type:

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



Development Type:

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

Project Issues Discussed in Document:

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

Present Land Use/Zoning/General Plan Designation:

Agriculture/Industrial/Commercial/Residential/Flood Control

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

The use of copper to treat algae and aquatic weeds within Redwood Shores Lagoon. Redwood City (City) 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".

- | | |
|---|--|
| <input type="checkbox"/> Air Resources Board | <input type="checkbox"/> Office of Historic Preservation |
| <input type="checkbox"/> Boating & Waterways, Department of | <input type="checkbox"/> Office of Public School Construction |
| <input type="checkbox"/> California Emergency Management Agency | <input type="checkbox"/> Parks & Recreation, Department of |
| <input type="checkbox"/> California Highway Patrol | <input checked="" type="checkbox"/> Pesticide Regulation, Department of |
| <input type="checkbox"/> Caltrans District # _____ | <input type="checkbox"/> Public Utilities Commission |
| <input type="checkbox"/> Caltrans Division of Aeronautics | <input checked="" type="checkbox"/> Regional WQCB # <u>2</u> |
| <input type="checkbox"/> Caltrans Planning | <input type="checkbox"/> Resources Agency |
| <input type="checkbox"/> Central Valley Flood Protection Board | <input type="checkbox"/> Resources Recycling and Recovery, Department of |
| <input type="checkbox"/> Coachella Valley Mtns. Conservancy | <input type="checkbox"/> S.F. Bay Conservation & Development Comm. |
| <input type="checkbox"/> Coastal Commission | <input type="checkbox"/> San Gabriel & Lower L.A. Rivers & Mtns. Conservancy |
| <input type="checkbox"/> Colorado River Board | <input type="checkbox"/> San Joaquin River Conservancy |
| <input type="checkbox"/> Conservation, Department of | <input type="checkbox"/> Santa Monica Mtns. Conservancy |
| <input type="checkbox"/> Corrections, Department of | <input type="checkbox"/> State Lands Commission |
| <input type="checkbox"/> Delta Protection Commission | <input type="checkbox"/> SWRCB: Clean Water Grants |
| <input type="checkbox"/> Education, Department of | <input checked="" type="checkbox"/> SWRCB: Water Quality |
| <input type="checkbox"/> Energy Commission | <input type="checkbox"/> SWRCB: Water Rights |
| <input checked="" type="checkbox"/> Fish & Game Region # <u>3</u> | <input type="checkbox"/> Tahoe Regional Planning Agency |
| <input checked="" type="checkbox"/> Food & Agriculture, Department of | <input type="checkbox"/> Toxic Substances Control, Department of |
| <input type="checkbox"/> Forestry and Fire Protection, Department of | <input type="checkbox"/> Water Resources, Department of |
| <input type="checkbox"/> General Services, Department of | <input checked="" type="checkbox"/> Other: <u>San Mateo Co Ag Commissioner</u> |
| <input type="checkbox"/> Health Services, Department of | <input type="checkbox"/> Other: _____ |
| <input type="checkbox"/> Housing & Community Development | |
| <input type="checkbox"/> Native American Heritage Commission | |

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

Starting Date October 29, 2015 Ending Date December 1, 2015

Lead Agency (Complete if applicable):

Consulting Firm: <u>Blankinship & Associates, Inc.</u>	Applicant: <u>City of Redwood City, Public Works Division</u>
Address: <u>1590 Drew Ave, Ste 120</u>	Address: <u>1400 Broadway</u>
City/State/Zip: <u>Davis, CA 95618</u>	City/State/Zip: <u>Redwood City, CA 94063</u>
Contact: <u>Michael Blankinship</u>	Phone: <u>(650) 780-7466</u>
Phone: <u>(530) 757-0941</u>	

Signature of Lead Agency Representative: Terence T. Kyaw Date: 10/23/2015

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



Edmund G. Brown Jr.
Governor

STATE OF CALIFORNIA
Governor's Office of Planning and Research
State Clearinghouse and Planning Unit



Ken Alex
Director

December 1, 2015

Terence Kyaw
City of Redwood City
1400 Broadway
Redwood City, CA 94063

Subject: Use of Copper to Control Algae and Aquatic Vegetation in Redwood Shores Lagoon
SCH#: 2015102078

Dear Terence Kyaw:

The State Clearinghouse submitted the above named Mitigated Negative Declaration to selected state agencies for review. The review period closed on November 30, 2015, and no state agencies submitted comments by that date. This letter acknowledges that you have complied with the State Clearinghouse review requirements for draft environmental documents, pursuant to the California Environmental Quality Act.

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

Sincerely,

Scott Morgan
Director, State Clearinghouse

**Document Details Report
State Clearinghouse Data Base**

SCH# 2015102078
Project Title Use of Copper to Control Algae and Aquatic Vegetation in Redwood Shores Lagoon
Lead Agency Redwood City

Type MND Mitigated Negative Declaration
Description The use of copper to treat algae and aquatic weeds within Redwood Shores Lagoon. Redwood City is preparing this Initial Study/MND to meet requirements of 1) The State Implementation Plan (SIP) Section 5.3 and 2) NPDES Permit #CAG990005.

Lead Agency Contact

Name Terence Kyaw
Agency City of Redwood City
Phone 650 780 7466 **Fax**
email
Address 1400 Broadway
City Redwood City **State** CA **Zip** 94063

Project Location

County San Mateo
City Redwood City
Region
Cross Streets Marine Parkway and Lagoon Drive
Lat / Long 37° 31' 37.99" N / 122° 15' 32.90" W
Parcel No.
Township 5S **Range** 4W **Section** 1 **Base** MDB&M

Proximity to:

Highways Hwy 101
Airports No
Railways Caltrain
Waterways San Francisco Bay, Steinberger Slough, Bay Slough
Schools Hoover Children's Central
Land Use Agriculture/Industrial/Commercial/Residential/Flood Control

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

Reviewing Agencies Resources Agency; Department of Fish and Wildlife, Region 3; Department of Parks and Recreation; San Francisco Bay Conservation and Development Commission; Department of Water Resources; Caltrans, District 4; Air Resources Board; State Water Resources Control Board, Division of Water Quality; Regional Water Quality Control Board, Region 2; Department of Toxic Substances Control; Native American Heritage Commission; Department of Pesticide Regulation

Date Received 10/27/2015 **Start of Review** 10/28/2015 **End of Review** 11/30/2015

Public Comments

Consistent with the State Clearinghouse Letter presented previously, the City of Redwood City received no public comments. Therefore, no responses have been prepared.

RESOLUTION NO. 15476**A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF REDWOOD CITY ADOPTING THE MITIGATED NEGATIVE DECLARATION AND MITIGATION MONITORING AND REPORTING PROGRAM FOR THE USE OF COPPER TO CONTROL ALGAE AND AQUATIC VEGETATION IN REDWOOD SHORES LAGOON ALL IN ACCORDANCE WITH THE REQUIREMENTS OF THE ENVIRONMENTAL QUALITY ACT**

WHEREAS, The State Water Resources Control Board released a 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 (Permit), and the City of Redwood City ("City") has obtained coverage under this Permit to apply aquatic pesticides to the Redwood Shores Lagoon; and

WHEREAS, The City desires to use aquatic algaecides and/or aquatic herbicides containing copper on an "as needed" basis to more efficiently control algae and/or aquatic vegetation in the Redwood Shores Lagoon. The Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries in California, also known as the State Implementation Plan ("SIP") assigns effluent limitations for California Toxics Rule priority pollutants, including algaecides or aquatic herbicides that contain copper. The SIP also prohibits discharges of priority pollutants such as copper in excess of applicable water quality criteria; and

WHEREAS, Although the SIP prohibits the discharge of copper in excess of applicable water quality criteria into receiving waters, Section 5.3 of the SIP allows for short-term or seasonal exceptions if determined to be necessary to implement control measures for resource or pest management (i.e., algae or aquatic vegetation control) conducted by public entities. The City has determined that it meets the criteria for gaining a Section 5.3 SIP exception for the use of copper to control algae and aquatic vegetation in the Redwood Shores Lagoon; and

WHEREAS, Pursuant to this exception and as part of the City's Integrated Pest Management ("IPM") program, the City proposes to apply aquatic algaecides and/or aquatic herbicides containing copper on an as needed basis to control algae and/or

aquatic vegetation, when determined to be the most effective treatment measure, in the Redwood Shores Lagoon (the "Project"). Control of this vegetation is necessary in order to maintain the aesthetic quality, aquatic habitat, and recreation within the area. Vegetation control is also necessary so that the Lagoon can reasonably serve as a stormwater retention basin and provide urban flood protection by storing surface runoff during high tide periods in San Francisco Bay; and

WHEREAS, Pursuant to the California Environmental Quality Act (Public Resources Code Section 21000 *et seq.*; hereafter, "CEQA") and the Guidelines for Implementation of the California Environmental Quality Act (Title 14, Sections 15000 *et seq.* of the California Code of Regulations; hereafter, the "CEQA Guidelines"), the City prepared an Initial Study and Mitigated Negative Declaration for the Project dated October 15, 2015; and

WHEREAS, the City circulated the Initial Study and Mitigated Negative Declaration for public review and comment between October 29, 2015 and December 1, 2015, as required under CEQA, and a Mitigation Monitoring and Reporting Program has been prepared; and

WHEREAS, the City did not receive any public comments on the Initial Study and Mitigated Negative Declaration during the public review and comment period; and

WHEREAS, the Initial Study and Mitigated Negative Declaration was revised on January 25, 2016 to consider the Project's impact on noise and safety for persons using the San Carlos Airport and for persons residing or working in the project area (the "Amended Initial Study and Mitigated Negative Declaration") and the Amended Initial Study and Mitigated Negative Declaration found that there was no impact.

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF REDWOOD CITY, AS FOLLOWS:

Section 1. The above recitals are true and correct and together with the Staff Report and the application materials, including without limitation the Amended Initial Study and Mitigated Negative Declaration and all other documents, reports, studies, memoranda, maps, oral and written testimony, and materials in the City's file for the application and the Project, and all adopted City planning documents relating to the

Project, and other applicable City laws and regulations and associated approved and certified environmental documents, have together served as an adequate and appropriate evidentiary basis for the findings and actions set forth in this Resolution.

Section 2. The City Council finds as follows:

A. Following preparation of an Initial Study for the Project, a Mitigated Negative Declaration (the “MND”) for the Project was completed, noticed, and circulated in accordance with the requirements of CEQA and the CEQA Guidelines.

B. A Notice of Intent to Adopt the MND (the “NOI”) dated October 15, 2015, was circulated for public comment for a public review period beginning October 29, 2015 and ending December 1, 2015. The NOI was posted in the office of the San Mateo County Clerk and sent to those public agencies that have jurisdiction by law with respect to the proposed Project and to other interested parties and agencies.

C. The MND was amended on January 25, 2016 (the “Amended MND”), and no new significant effects were identified in the Amended MND.

Section 3. The City Council has reviewed and considered the information contained in the Amended MND and the Initial Study. The City Council has determined that the Amended MND constitutes an adequate, accurate, objective, and complete review of the environmental effects of the Project.

Section 4. Based on its review of the Initial Study and Amended MND and on the basis of the whole record, the City Council finds that the Amended MND reflects the City Council’s independent judgment and analysis and that there is no substantial evidence that the Project, as mitigated, will have a significant effect on the environment. Changes or alterations have been required in, or incorporated into, the Project which avoid or substantially lessen the significant environmental effects as identified in the Initial Study and Amended MND.

Section 5. The City Council adopts the Amended MND for the Project.

Section 6. Pursuant to CEQA section 21081.6 and CEQA Guidelines section 15074, and in support of its approval of the Project, the City Council adopts a Mitigation Monitoring and Reporting Program to require all reasonably feasible mitigation measures be implemented by means of Project conditions, agreements, or other measures, as set forth in the Mitigation Monitoring and Reporting Program.

Section 7. The City Council approves the Project and authorizes the Public Works Division to proceed with Project implementation in accordance with City policies and requirements and Section 5.3 of the State Implementation Plan, by submitting the City's SIP exception request to the State Water Resources Control Board.

Section 8. City staff shall file or cause to be filed a Notice of Determination with the San Mateo County Clerk and the State Clearinghouse, pursuant to section 21152(a) of the Public Resources Code and section 15075 of the CEQA Guidelines.

Section 9. Pursuant to CEQA Guidelines section 15074(c), the documents and other materials that constitute the record of proceedings upon which the City Council has based its decision are located in and may be obtained from, the Office of the City Clerk at 1017 Middlefield Road, Redwood City, California. The City Clerk is the custodian of records for all matters before the City Council.

Section 10. Exhibits A and B are made a part of this Resolution.

* * *

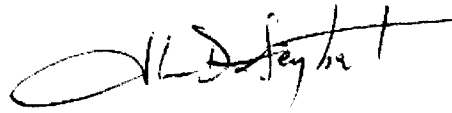
Passed and adopted by the Council of the City of Redwood City at a
Joint City Council/Successor Agency Board/Public Financing Authority Meeting
thereof held on the 22nd of February 2016 by the following votes:

Council Members: Aguirre, Bain, Borgens, Gee, Howard, Masur, and Mayor Seybert

NOES: None

ABSENT: None

ABSTAINED: None



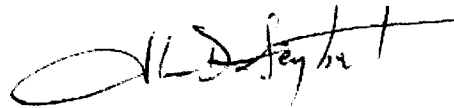
John D. Seybert
Mayor of the City of Redwood City

Attest:



Silvia Wonderlinden
City Clerk of Redwood City

I hereby approve the foregoing
resolution this 23rd day of February 2016.



John D. Seybert
Mayor of the City of Redwood City

Notice of Determination

FILED
SAN MATEO COUNTY

FEB 23 2016

MARK CHURCH, County Clerk
By GLENN S. CHANGIN
Deputy Clerk

To: San Mateo County Clerk
555 County Center
Redwood City, CA 94063

From: City of Redwood City, Public Works Division
1400 Broadway
Redwood City, CA 94063

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

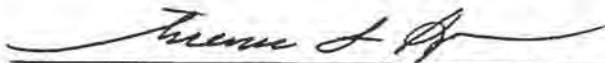
Project Title: Use of Copper to Control Algae and Aquatic Vegetation in Redwood Shores Lagoon
Contact Person: Terence Kyaw, phone: 650-780-7466.

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

- Project Location: within San Mateo County, CA
- Project Description: The use of copper pesticides to treat algae and aquatic weeds in the Redwood Shores Lagoon. The City of Redwood City, Public Works Division has prepared the Initial Study/Mitigated Negative Declaration to meet requirements of 1) The State Implementation Plan (SIP) Section 5.3 and 2) NPDES Permit #CAG990005

Determination: This notice is to advise that the City Council approved the above-described project on February 22, 2016 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:
 - \$2,210.00 for review of a Negative Declaration
 - \$850 for review of an Environmental Impact Report
 - \$25 for County Fish and Game program processing fees


Terence Kyaw, Assistant Public Works Director

2/23/2016
Date

County of San Mateo
Assessor-County Clerk-Recorder
Mark Church

555 County Center
Redwood City, CA, 94063

Finalization 2016010040
2/23/16 1:06 pm
020 77

Item	Title	
1	EIRMN	
Fish & Game: Mitigated Negative Declaration		
Document ID		Amount
DOC# 2016-000058		2260.25
Time Recorded 1:06 pm		

Total		2260.25
Payment Type		Amount
Check # 15100	tendered	2260.00
Cash	tendered	0.25

Amount Due 0.00

THANK YOU
PLEASE RETAIN THIS RECEIPT
FOR YOUR RECORDS