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LETTER OF TRANSMITTAL

To: James Maughan
State Water Resources Control Board
1001 I Street
Sacramento, CA 95814

Date: July 28, 2004

From: X Mike Blankinship MSB ☐ Joshua Owens
☐ Sara Castellanos ☐_____

Project: **SIP Exception Request for South Sutter Water District (SSWD) IS/MND**

We are transmitting the following:

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

(*) Found Under "Documentation" Tab

For Your:

X Review
Approval
Information
Files

Sent By:

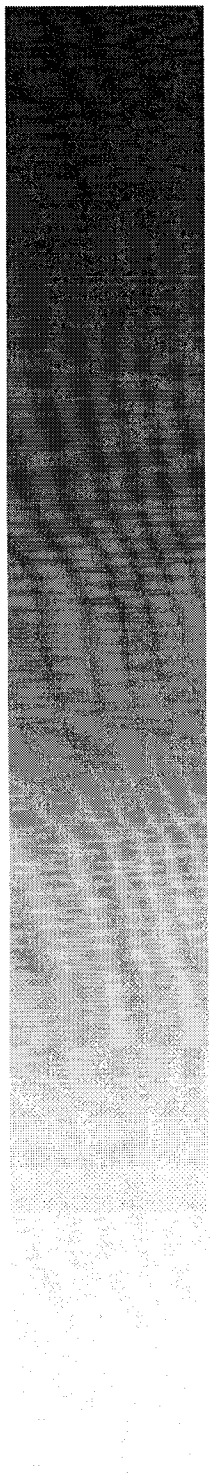
☐ Regular U.S. Mail
X Federal Express
☐ Courier
☐ Other: _____

Comments:

Jim: Under the "Documentation" tab, please find the documents necessary to apply for a SIP Section 5.3 Exception for SSWD's use of copper and acrolein. Please consider this submission a formal request by SSWD for inclusion in Attachment E of the aquatic pesticide permit. At the earliest possible time, we would appreciate the SWRCB's consideration.

Please call me with any questions. Thank You.

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



California Environmental Quality Act Initial Study And Mitigated Negative Declaration

July 27, 2004

Project Sponsor and Lead Agency:
South Sutter Water District
2464 Pacific Avenue
Trowbridge, CA 95659
Contact: Brad Arnold 530.656.2242

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

CEQA Initial Study & Mitigated Negative Declaration

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1.0 PROJECT DESCRIPTION

1.1 Introduction

The South Sutter Water District (herein referred to as the "District") is located in southeastern Sutter County and western Placer County. The lower Bear River, from approximately Highway 65 to near its confluence with the Feather River, forms the northern boundary of the district. The District's primary objective is the delivery of water to irrigated agriculture.

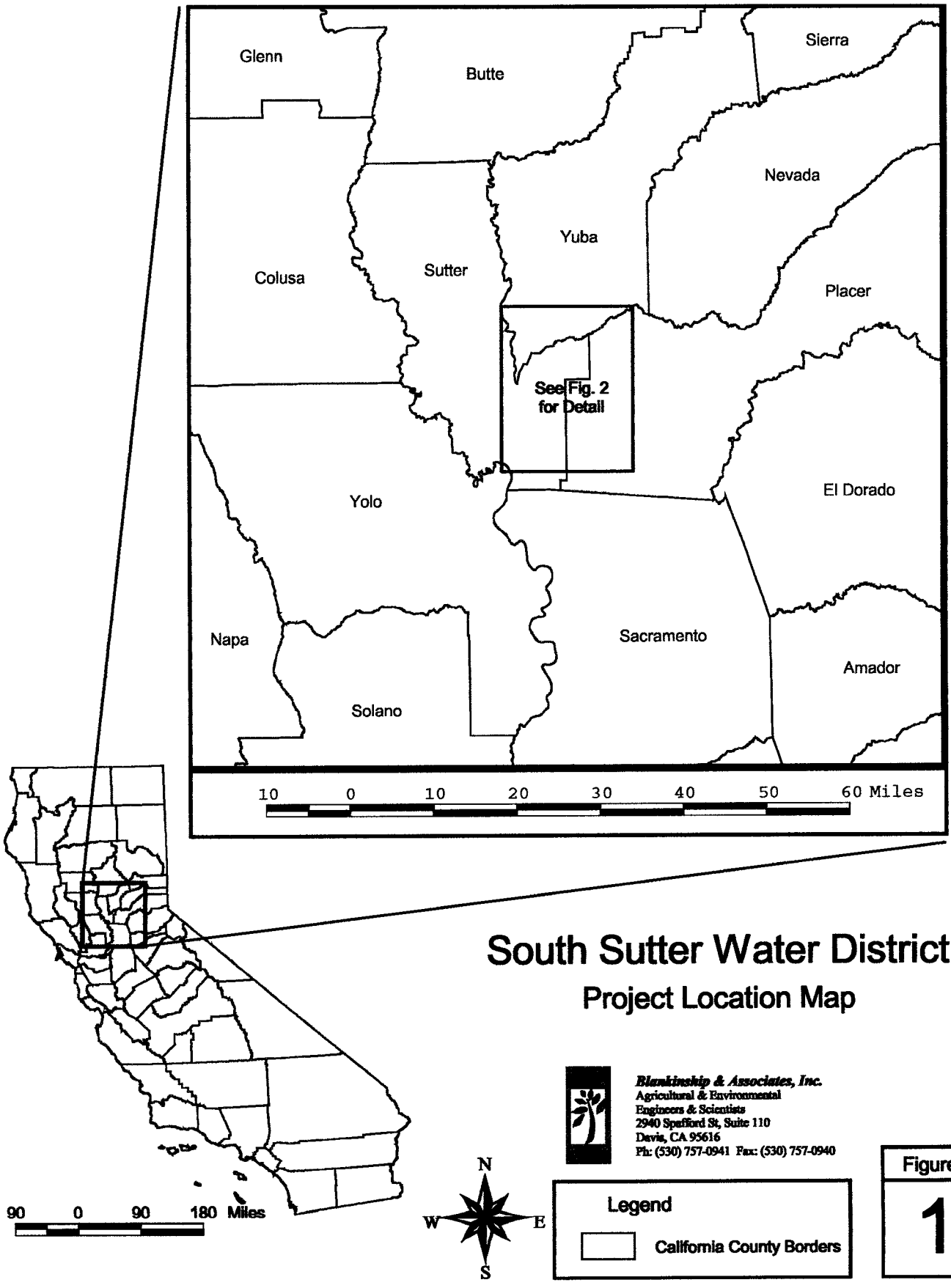
The District owns and operates the Camp Far West dam, reservoir, and associated water diversion and distribution systems. Camp Far West Reservoir is the primary source of water for the District.

The District also receives water from Auburn Ravine via a diversion dam, and from groundwater. After leaving Camp Far West, the District's main canal branches off in a southerly direction and extends for a distance of approximately 21.6 miles to its point of discharge into Pleasant-Grove Creek. The drainage system flows from east to west and has the following five natural drainage courses: Yankee Slough, Markham Ravine, Auburn Ravine, Pleasant Grove Creek, and Coon Creek. All the surface drainage in the District flows into the Cross Canal, leaving the District from its southwest side. The Cross Canal empties into the Sacramento River at Joe's Landing, about 1 mile downstream of the confluence of the Sacramento and Feather Rivers.

There are approximately 45,000 acres of land within the District's jurisdiction of which an average of 30,000 to 35,000 acres of land are planted and irrigated each year. The majority of cultivated acreage is used to produce rice, which is the most common crop grown in the District, but also includes orchards, pasture, and row crops.

The District employees a staff of water operators who release water from District conveyances into grower's fields by manually operating gates and valves. The water operators ensure that enough water is flowing in the laterals to meet demand. Gates and valves in the delivery system are maintained by the District, and can only be adjusted by District water operators. Growers are not allowed to make adjustments.

To maintain acceptable rates of flow in its conveyances, the District uses acrolein and/or copper to treat algae and several types of submersed aquatic weeds. Acrolein is typically preferred because it is highly efficacious and targets the range of weeds that may be present in the lateral system. Copper may also be used to treat laterals depending on the weed species present.



South Sutter Water District

Project Location Map

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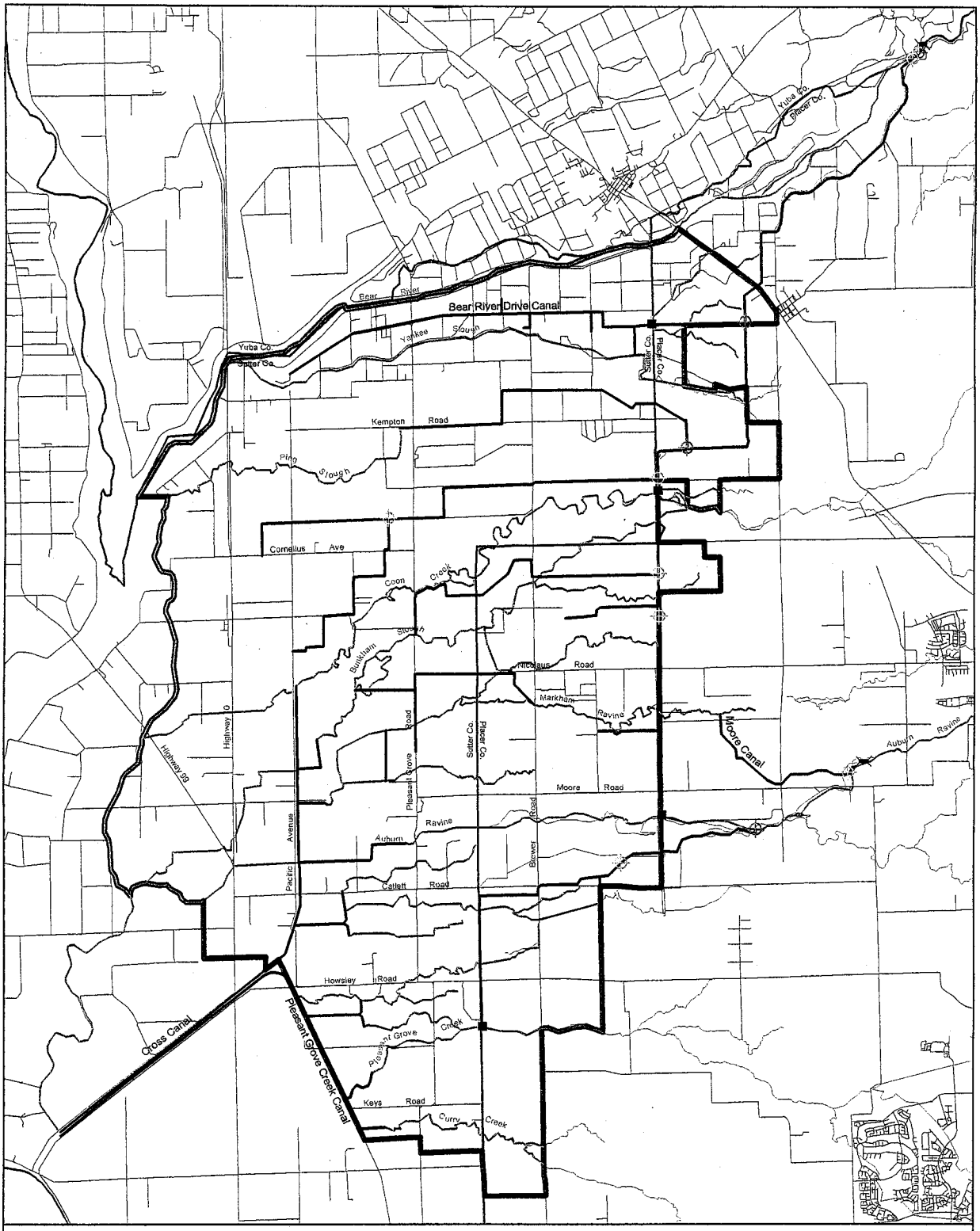
Figure 1



Legend

- Potential Acrolein Application Point
- Potential Copper Application Point
- Diversion Dam
- Outlet
- Canals
- Creeks
- Roads
- District Borders
- County Borders

South Sutter Water District

Project Detail Map

Scale
1 : 100,000

Figure
2

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N
W E
S

Aquatic pesticides are typically applied between 0 to 3 times per year dependent on need from June to August in main laterals just downstream of the turnout from the main canal. A treatment at that single location is typically enough to treat the entire lateral system (including sub lateral branches). In some instances a sub lateral may need to be treated separately. The District makes no aquatic pesticide applications to Pleasant's Grove Creek or any of the 5 natural drainage courses in its jurisdiction.

1.2 Regulatory Setting

The emergency NPDES permit used by the District for the application of aquatic pesticides expired on January 31, 2004. The State Water Resources Control Board (SWRCB) has released a draft general permit (Permit) to replace the emergency permit. 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 pesticides acrolein and copper. Further, the SIP prohibits discharges of priority pollutants in excess of applicable water quality criteria outside the mixing zone[1].

The SIP does, however, allow categorical exceptions if determined to be necessary to implement control measures either for resource or pest management conducted by public entities to fulfill statutory requirements, or regarding drinking water conducted to fulfill statutory requirements under the federal Safe Drinking Water Act or the California Health and Safety Code. Such categorical exceptions may also be granted for draining water supply reservoirs, canals, and pipelines for maintenance, for draining municipal storm water conveyances for cleaning or maintenance, or for draining water treatment facilities for cleaning or maintenance. The District has concluded that they meet one or more of the criteria for gaining a SIP exception.

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

The SWRCB adopted the Permit on May 20, 2004 and has suggested that the Permit may be re-opened for additional CEQA document submission in 6 months.

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

1.3 Required Approvals

To obtain approval of an exception under Section 5.3 of the SIP to the CTR criterion for copper and acrolein, the District will submit the following documents to the SWRCB and RWQCB for acceptance:

a. A detailed description of the proposed action, including the proposed method of completing the action;
b. A time schedule;
c. A discharge and receiving water quality monitoring plan (before project initiation, during the project, and after project completion, with the appropriate quality assurance and quality control procedures);
d. CEQA documentation;
e. Contingency plans (to the extent applicable);
f. Identification of alternate water supply (if needed and to the extent applicable);
g. Residual waste disposal plans (to the extent applicable); and
h. Upon completion of the project, the discharger shall provide certification by a qualified biologist that the receiving water beneficial uses have been restored.

1.4 Required Notifications

1.4.1 California Department of Fish and Game

Twenty four (24) hours prior to application of acrolein, the District informs the California Department of Fish and Game (CDFG) via phone.

1.4.2 Sutter, Yuba, and Placer County Agricultural Commissioners

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

1.5 Standard Operating Procedures

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

Prior to application, the following tasks are accomplished:

1. A written recommendation is prepared by a DPR-licensed Pest Control Advisor (PCA). A PCA undergoes 40 hours of training every 2 years on issues including health and safety and prevention of exposure to sensitive receptors. The written recommendation prepared by the PCA must evaluate proximity of occupied buildings and people, health and environmental hazards and restrictions, and a certification that alternatives and mitigation measures that substantially lessen any significant adverse impact on the environment have been considered and if feasible, adopted. Refer to Appendix A.

2. All District personnel and their contractors review and strictly adhere to the aquatic pesticide 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 B.

3. All District personnel and their contractors review and consult the aquatic pesticide Material Safety Data Sheet (MSDS) in Appendix B, 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 pesticide. In addition, the District obtains annual training on the use of acrolein as described in the Magnacide H Herbicide Application and Safety Manual in Appendix B.

4. The condition of the lateral(s) being treated is field evaluated to ensure that the application is necessary, feasible and can be conducted safely and according to label. This evaluation considers target weed species, level of infestation, water and flow conditions, alternate control methods, and amount of chemical to be applied.

5. After field evaluation, notices are sent to the County Agricultural Commissioner (CAC) and the California Department of Fish and Game (CDFG). Growers are also given the opportunity to postpone water deliveries in case of sensitivities, such as pastures with lactating cows or organic crops. Growers are instructed not to make adjustments to the turnout gates during the hold period prescribed by the label.

6. The day before an application the water operator will seal all emergency spill structures with boards and plastic. Emergency spills are overflows that allow excess water in the lateral to spill into the drain system. The applicator inspects all seals immediately prior to application and faulty seals are repaired.

7. Water treated with acrolein is only used for irrigation of fields (crop bearing, fallow, or pasture) where the treated water remains on the field, or is held for the label-prescribed period before being released to fish bearing waters or will drain to them.

During and after the start of application, the District accomplishes the following:

1. Inspections of the conveyance continues for up to 6 days following the treatment to ensure that if water is not discharged to a field, the necessary label-prescribed hold time is met before water is released from the conveyance. Occasionally, small leaks (< 1 gallon per minute) may develop at gates or check structures and are controlled with sand bags, temporary dikes, pumps, or lowering the level of treated water below the elevation of the leak. All these actions effectively prevent the release of water treated with aquatic herbicide from entering natural drainages prior to holding time expiration.

2.0 INITIAL STUDY

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

This Initial Study, Environmental Checklist, and evaluation of potential environmental effects were completed in accordance with Section 15063(d) of the *State CEQA Guidelines* to

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

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

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

2.1 CEQA Initial Study & Environmental Check List Form

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

2. Lead Agency Name and Address: South Sutter Water District
2464 Pacific Avenue
Trowbridge, CA 95659

3. Contact Person & Phone Number: Brad Arnold 530.656.2242

4. Project Location: Yuba, Sutter and Placer Counties, California

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

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

7, Zoning: Agriculture/Residential/Commercial/Industrial

8. Description of Project: See Section 1.5

9. Surrounding Land Uses and Setting: Agriculture

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

2.2 Environmental Factors Potentially Affected

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

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

2.3 Determination (To be completed by lead agency)

On the basis of this initial evaluation:

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

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

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

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

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

Brad Arnold
Signature

7/27/04
Date

Brad Arnold
Printed Name

South Sutter Water District
For

3.0 EVALUATION OF ENVIRONMENTAL IMPACTS

3.1 Aesthetics

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

Discussion

Items a) & b): ***No Impact.*** No designated scenic vistas or state scenic highways overlook any of the project sites, therefore no impact would occur.

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

Item d): ***No Impact.*** The project is done during the daylight hours, therefore no light sources are needed and no light or glare is produced.

3.2 Agriculture Resources

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

Discussion

Items a) through c): ***No Impact.*** On the contrary, the project accomplishes objectives that maintain and enhance agricultural land use.

3.3 Air Quality

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

Discussion

Items a) & b): ***Less Than Significant Impact.*** The project requires the use of pick-up trucks for purposes of transporting aquatic pesticides to locations where they are needed. Pick-up trucks are also used for purposes of site reconnaissance before, during, and after application of aquatic pesticides. Short-term vehicle emissions will be generated during aquatic pesticide application; however, they will be minor and last only from April to October. To minimize impacts, all equipment will be properly tuned, muffled and/or smog checked and unnecessary idling will be minimized.

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

The eastern part of the district is in Placer County. Placer County is classified as a non-attainment area for ozone and PM_{10}. As part of this project 2 light-duty pickups may make weekly round trips of up to 100 miles each. This results in small impacts on air quality that are consistent with the permit requirements established by the Placer County Air Pollution Control District (Placer Co, 2004). This small incremental impact to air quality is not

cumulatively considerable and the potential cumulative impact is considered to be less than significant.

Item c) ***No Impact.*** Yuba and Sutter Counties are designated as attainment for PM_{10} and ozone. Placer County is designated a non-attainment area for PM_{10} and ozone. Designations are assigned by the California Air Resources Board (ARB). See Items a) & b) for discussion.

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

3.4 Biological Resources

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

Discussion

Items a) & b): **Potentially Significant Unless Mitigation Incorporated.** A list of current special status species was compiled from the California Department of Fish and Game (CDFG) California Natural Diversity Database (CNDDB) and the U.S. Fish and Wildlife Service (USFWS), Sacramento Office. Once this list was compiled, a preliminary assessment of the project area was performed to characterize the actual habitats present on-site and the likelihood of special status species occurrence.

A summary of the listed species, their designation, and whether or not they were considered for evaluation of potential impact is presented in **Table 1.** Species habitat and rationale for removal from further consideration is presented in **Appendix C.** Physical, chemical and toxicological data on copper and acrolein is presented in **Appendix D.**

With two (2) exceptions, no special status species has habitat in or near, or is otherwise exposed to aquatic pesticides used for the project.

The two (2) species that may be at risk are the northwestern pond turtle and the giant garter snake because they could move from natural water bodies and enter treated canals. The estimated exposure of the northwestern pond turtle and giant garter snake due to exposure to copper and acrolein at typical application rates would diminish to concentrations not estimated to pose a risk (*e.g.* impair reproduction, alter behavior, or cause death) after approximately 3.5 days for copper and 0.75 days for acrolein. Further discussion of this impact is at Section 3.8 of this Initial Study and Mitigated Negative Declaration.

BIO-1: Mitigation for potential exposure of northwestern pond turtle and giant garter snake will be to have qualified personnel survey for these species and their habitat on the day prior to an aquatic pesticide application. The distance to be surveyed following an acrolein or copper application will be the distance the treated water would travel during 0.75 days or 3.5 days, respectively.

If a northwestern pond turtle or a giant garter snake is found the application will be temporarily postponed and the conveyance surveyed again. Once found to be void of northwestern pond turtles and giant garter snakes, the conveyance can be treated.

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

Item d): ***No Impact.*** Water for the District is derived from the Bear River via Camp Far West. Migrating salmon are prevented from entering Camp Far West and subsequently the District's conveyance system because of the diversion dam on the Bear River. Accordingly, project activities will not adversely influence movement of any native resident or migratory fish. The fish species described below may occur in the Cross Canal and Auburn Ravine at various times of the year. For the duration of the project, check structures are in place along the Cross Canal to prevent District water from entering the cross canal. These check structures also prevent fish from entering the District. Likewise, where water is diverted from Auburn Ravine, herbicide treatments occur only once the water has flowed over a drop structure. This drop structure prevents District water from entering Auburn Ravine.

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

Table 1: Species and Habitat Summary

Common Name	Scientific Name	Status	Habitat	Habitat is not Present in Project Area; Species Eliminated from Further Consideration	Habitat is Present in Project Area; Species Eliminated from Further Consideration for Reasons Given (see numbered notes)	Potential Risk is Present from Project Activities
AMPHIBIAN						
California Tiger Salamander	*Ambystoma californiense*	FPT, SCSC	Herbaceous wetland, temporary pool; Grassland/herbaceous, Savanna, Woodland - Hardwood; Benthic, Burrowing in or using soil		X (1)	
California Red-Legged Frog	*Rana aurora draytonii*	FT, SCSC	Quiet permanent water of streams, marshes, or (less often) ponds and other quiet bodies of water.		X (2)	
Western Spadefoot Toad	*Spea (=Scaphiopus) hammondii*	FSC, SCSC	Lowlands to foothills; grasslands, open chaparral, pine-oak woodlands. Prefers shortgrass plains, sandy or gravelly soil. Fossorial. Breeds in temporary rain pools and slow-moving streams		X (3)	
BIRD						
Tricolored Blackbird	*Agelaius tricolor*	FSC, SCSC	Fresh-water marshes of cattails, tule, bulrushes and sedges; Cropland/hedgerow, Grassland/herbaceous		X (4)	
Great Egret	*Ardea alba*		Marshes, swampy woods, tidal estuaries, lagoons, mangroves, streams, lakes, and ponds; also fields and meadows		X (5)	
Great Blue Heron	*Ardea herodias*		Estuarine, Freshwater Marsh, Riverine		X (5)	
Burrowing Owl	*Athene cunicularia*	FSC, SCSC	Agriculture/Rangeland, Grassland		X (4)	
Western Burrowing Owl	*Athene cunicularia hypugaea*	FSC	See Burrowing Owl		X (4)	
Oak Titmouse	*Baeolophus inornatus*		Forest - Hardwood, Forest - Mixed, Shrubland/chaparral, Suburban/orchard, Woodland - Hardwood, Woodland - Mixed	X		
Aleutian Canada Goose	*Branta canadensis leucopareia*	FD	Open Water, Pasture/Grainfields (winter only)	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
Ferruginous Hawk	*Buteo regalis*	FSC, SCSC	Open country, primarily prairies, plains and badlands; sagebrush, saltbush-greasewood shrubland, periphery of pinyon-juniper and other woodland, desert (winter only)	X		
Swainson's Hawk	*Buteo swainsoni*	ST	Cropland/hedgerow, Desert, Grassland/herbaceous, Savanna, Woodland - Mixed		X (4)	
Lawrence's Goldfinch	*Carduelis lawrencei*	FSC	Oak woodland, chaparral, riparian woodland, pinyon-juniper association, and weedy areas in arid regions but usually near water	X		
Vaux's Swift	*Chaetura vauxi*	FSC, SCSC	Found in mature forests but also forages and migrates over open country	X		
Mountain Plover	*Charadrius montanus*	FSC, SCSC	short grasslands, freshly plowed fields, newly sprouting grain fields, and sometimes sod farms (wintering)	X		
Western Yellow-Billed Cuckoo	*Coccyzus americanus occidentalis*	FC, SE	Open woodland (especially where undergrowth is thick), parks, deciduous riparian woodland; requires patches of at least 10 hectares (25 acres) of dense riparian forest with a canopy cover of at least 50 percent in both the understory and overstory	X		
Yellow Warbler	*Dendroica petechia brewsteri*	SCSC	Riparian plant associations, prefers willows, cottonwoods, aspens, sycamores, and alders for nesting and foraging		X (4)	
Snowy Egret	*Egretta thula*	FSC	Rookery sites situated clsoe to foraging areas: marshes, tidal-flats, streams, wet meadows, and borders of lakes		X (6)	
White-Tailed Kite	*Elanus leucurus*	FSC, SFP	Savanna, open woodland, marshes, partially cleared lands and cultivated fields, mostly in lowland situations		X (4)	

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
Little Willow Flycatcher	*Empidonax traillii brewsteri*	SE	See Willow Flycatcher	X		
American Peregrine Falcon	*Falco peregrinus anatum*	FD, SE, SFP	herbaceous wetland, lagoon, river mouth/tidal river, tidal flat/shore, bare rock/talus/scree, cliff, shrubland/chaparral, urban/edificarian, woodland		X (4)	
Greater Sandhill Crane	*Grus canadensis tabida*	ST, SFP	Herbaceous wetland, Riparian; Cropland/hedgerow, Grassland/herbaceous (winter only)	X		
Bald Eagle	*Haliaeetus leucocephalus*	FT, SE, SFP	coastal areas, bays, rivers, lakes, or other bodies of water (winter only)	X		
Loggerhead Shrike	*Lanius ludovicianus*	FSC, SCSC	Open country with scattered trees and shrubs, savanna, desert scrub, and, occasionally, open woodland		X (4)	
California Black Rail	*Laterallus jamaicensis coturniculus*	FSC, ST, SFP	Saltwater Marsh, Freshwater Marsh	X		
Lewis' Woodpecker	*Melanerpes lewis*	FSC	Open forest and woodland, often logged or burned, including oak, coniferous forest, riparian woodland and orchards		X (4)	
Long-Billed Curlew	*Numenius americanus*	FSC, SCSC	Prairies and grassy meadows, generally near water (winter only)	X		
Black-Crowned Night Heron	*Nycticorax nycticorax*		Rookery sites located adjacent to foraging areas: lake margins, mud-bordered bays, marshy spots.		X (6)	
Osprey	*Pandion haliaetus*	SCSC	Primarily along rivers, lakes, reservoirs, and seacoasts.		X (5)	
Nuttall's Woodpecker	*Picoides nuttallii*		Riparian; Forest - Hardwood, Shrubland/chaparral, Woodland - Hardwood		X (4)	

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
White-Faced Ibis	*Plegadis chihi*	FSC, SCSC	Marshes, swamps, ponds and rivers, mostly in freshwater habitats; in the Central Valley of California, ibises preferentially selected foraging sites close to emergent vegetation		X (7)	
Purple Martin	*Progne subis*	SCSC	Inhabits woodlands, low elevation coniferous forest of douglas fir, ponderosa pine, and monterey pine, frequently near water or around towns		X (8)	
Bank Swallow	*Riparia riparia*	FSC, ST	riparian and other lowland habitats; requires vertical banks/cliffs with fine soils		X (8)	
Rufous Hummingbird	*Selasphorus rufus*	FSC	Alpine, Forest - Conifer, Grassland/herbaceous, Shrubland/chaparral, Suburban/orchard, Woodland - Conifer, Woodland - Mixed (winter only)	X		
FISH						
Green Sturgeon	*Acipenser medirostris*	FC, SCSC	Most often in marine waters; estuaries, lower reaches of large rivers, salt or brackish water off river mouths; adults feed on bottom invertebrates and small fish	X		
Delta Smelt	*Hypomesus transpacificus*	FT, ST	open waters of bays, tidal rivers, channels, and sloughs; breeds in medium to large rivers	X		
River Lamprey	*Lampetra ayresi*	FSC, SCSC	San Joaquin-Sacramento Delta and northward, including the Sacramento River	X		
Pacific Lamprey	*Lampetra tridentata*	FSC	Estuaries, rivers and creeks with fine gravel substrate	X		
Steelhead - Central Valley	*Oncorhynchus mykiss irideus*	FT	Sacramento and San Joaquin Rivers and Tributaries		X (9)	
Chinook Salmon Central Valley Fall-Run	*Oncorhynchus tshawytscha fall-run*	FC, SCSC	Most spawning occurs in gravel riffles in main streams		X (9)	

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
Chinook Salmon Central Valley Spring-Run	*Oncorhynchus tshawytscha spring-run*	FT, ST	Sacramento and San Joaquin Rivers and Tributaries		X (9)	
Chinook Salmon Central Valley Winter-Run	*Oncorhynchus tshawytscha winter run*	FE, SE	Sacramento River and Tributaries		X (9)	
Sacramento Splittail	*Pogonichthys macrolepidotus*	FSC, SCSC	Lakes, Slow-moving Rivers with Vegetated Floodplain, Tidal Estuarine Marsh		X (9)	
Longfin Smelt	*Spirinchus thaleichthys*	FSC, SCSC	Coastal waters near shore, bays, estuaries, and rivers, and landlocked in some lakes	X		
MAMMAL						
Pacific Western Big-Eared Bat	*Corynorhinus townsendii townsendii*	FSC, SCSC	In CA; solitary males and small groups of females are known to hibernate in buildings in central CA known from limestone caves, lava tubes, and human-made structures in coastal lowlands, cultivated valleys, and nearby hills covered with mixed vegetation		X (4)	
Greater Western Mastiff-Bat	*Eumops perotis californicus*	FSC, SCSC	Many open, semi-arid to arid habitats including conifer and deciduous woodlands, coastal scrub, grasslands, chaparral etc. Roosts in crevices in cliff faces, high buildings, trees and tunnels	X		
Small-Footed Myotis Bat	*Myotis ciliolabrum*	FSC	Generally inhabits desert, badland, and semiarid habitats	X		
Long-Legged Myotis Bat	*Myotis volans*	FSC	Primarily in montane coniferous forests; also riparian habitats; roosts in abandoned buildings, rock crevices, under bark, etc.in some areas hollow trees are the most common nursery sites, but buildings and rock crevices are also used		X (4)	

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
Yuma Myotic Bat	*Myotis yumanensis*	FSC	found in a wide variety of upland and lowland habitats, including riparian, desert scrub, moist woodlands and forests, but usually found near open water; flys low; nursery colonies usually are in buildings, caves and mines, and under bridges		X (8)	
San Joaquin Pocket Mouse	*Perognathus inornatus inornatus*	FSC	Friable Soils in Grasslands, Oak Savanna	X		
REPTILE						
Northwestern Pond Turtle	*Clemmys marmorata marmorata*	FSC, SCSC	Permanent and intermittent waters of rivers, creeks, small lakes and ponds, marshes, irrigation ditches, and reservoirs			X
Western Pond Turtle	*Clemmys marmorata*		Permanent and intermittent waters of rivers, creeks, small lakes and ponds, marshes, irrigation ditches, and reservoirs			X
California Horned Lizard	*Phrynosoma coronatum frontale*	FSC, SCSC	wide variety of habitats, mostly common in lowlands along sandy washes with scattered low bushes	X		
Giant Garter Snake	*Thamnophis gigas*	FT, ST	prefers freshwater marsh and low gradient streams, has adapted to drainage canals and irrigation ditches			X
INVERTEBRATE						
Antioch Dunes Anthicid Beetle	*Anthicus antiochensis*	FSC	sand dunes; species only known to occur in Antioch, CA	X		
Sacramento Anthicid Beetle	*Anthicus sacramento*	FSC	Sand dunes and sandbars within riparian areas of the Sacramento-San Joaquin Delta	X		
Conservancy Fairy Shrimp	*Branchinecta conservatio*	FE	Large turbid pools, endemic to central valley in California	X		
Vernal Pool Fairy Shrimp	*Branchinecta lynchi*	FT	Vernal Pools	X		

Common Name	Scientific Name	Status	Habitat	Habitat is not Present in Project Area; Species Eliminated from Further Consideration	Habitat is Present in Project Area; Species Eliminated from Further Consideration for Reasons Given (see numbered notes)	Potential Risk is Present from Project Activities
Midvalley Fairy Shrimp	*Branchinecta mesovallensis*	FSC	Vernal Pools	X		
Sacramento Valley Tiger Beetle	*Cicindela hirticollis abrupta*	FSC	Open sandy banks and beaches along streams and ponds	X		
Valley Elderberry Longhorn Beetle	*Desmocerus californicus dimorphus*	FT	Riparian		X (10)	
Vernal Pool Tadpole Shrimp	*Lepidurus packardi*	FE	Vernal Pools	X		
California Linderiella Fairy Shrimp	*Linderiella occidentalis*	FSC	Vernal Pools	X		
Terrestrial Plant						
Alkali Milk-Vetch	*Astragalus tener var. tener*	FSC, CNPS-2	Alkali playa, Grassland, Vernal Pools	X		
Brittlescale	*Atriplex depressa*	FSC, CNPS-2	Alkali Scrub or Grassland, Vernal Pools	X		
San Joaquin Saltbush	*Atriplex joaquiniana*	FSC, CNPS-2	Alkali scrub, grasslands	X		
Big-Scale Balsamroot	*Balsamorhiza macrolepis var. macrolepis*	FSC, CNPS-2	Grassland, Woodland	X		
Brandegee's Clarkia	*Clarkia biloba ssp. Brandegeeae*	FSC, CNPS-2	Chaparral, Woodland	X		
Hispid Bird's Beak	*Cordylanthus mollis ssp. Hispidus*	FSC, CNPS-2	alkaline meadows, playas, grassland	X		
Palmate-Bracted Bird's-Beak	*Cordylanthus palmatus*	FE, SE, CNPS-2	Alkali Scrub or Grassland	X		
Dwarf Downingia	*Downingia pusilla*	CNPS-1	Grassland, Vernal Pools	X		
Boggs Lake Hedge-Hyssop	*Gratiola heterosepala*	FSC, SE, CNPS-2	Clay soils; usually in vernal pools, sometimes on lake margins	X		
Ahart's Dwarf Rush	*Juncus leiospermus var. ahartii*	FSC, CNPS-2	Vernal Pools	X		
Red Bluff Dwarf Rush	*Juncus leiospermus var. leiospermus*	FSC, CNPS-2	Chaparral, Grassland, Foothill Woodland	X		
Legenere	*Legenere limosa*	FSC, CNPS-2	Vernal Pools	X		
Heckard's Pepper-Grass	*Lepidium latipes var. heckardii*	FSC, CNPS-2	Grassland, Vernal Pools	X		

Common Name	Scientific Name	Status	Habitat	Habitat is not Present in Project Area; Species Eliminated from Further Consideration	Habitat is Present in Project Area; Species Eliminated from Further Consideration for Reasons Given (see numbered notes)	Potential Risk is Present from Project Activities
Pincushion Navarretia	*Navarretia myersii ssp. Myersii*	FSC, CNPS-2	Vernal Pools, Grassland	X		
Hartweg's Golden Sunburst	*Pseudobahia bahiifolia*	FE, SE, CNPS-2	Grassland, Woodland	X		
Wetland Plant						
Rose-Mallow	*Hibiscus lasiocarpus*	CNPS-1	Freshwater Marsh		X (11)	
Sanford's Arrowhead	*Sagittaria sanfordii*	FSC, CNPS-2	found in standing or slow-moving freshwater ponds, marshes		X (12)	

Table 2 Numbered Notes:

(1) Species not present in water during application due to aestivation (summer-time dormancy).
(2) Species not present in project area according to U.S. Fish and Wildlife Service Recovery Plan for the Red-Legged Frog (see bibliography in **Appendix C**).
(3) This is a terrestrial species that is known to enter water only during part of its reproductive cycle. This period of time does not coincide with the application period of aquatic pesticides.
(4) Species not likely to have any exposure as its target prey base consists of terrestrial species.
(5) The dissipation of copper or acrolein, limited uptake in fish, along with a time-dependent bioconcentration factor for copper in aquatic invertebrates (see **Appendix C**) will limit dietary exposure to a level that would not impair reproduction, alter behavior, or cause death.
(6) Species is not likely to be found outside of National Wildlife Refuge habitat areas. Aquatic pesticides have significantly dissipated/degraded in treated water prior this water entering habitat areas. After dissipation/degradation, aquatic pesticide concentrations are not expected to pose a risk (*e.g.* impair reproduction, alter behavior, or cause death).
(7) Species known to forage in irrigated fields. Aquatic pesticides begin to dissipated/degraded in treated water prior to this water entering irrigated fields. Additional dissipation/degradation as well as dilution will occur should any treated water enter a field. After dissipation/degradation, aquatic pesticide concentrations are not expected to pose a risk (*e.g.* impair reproduction, alter behavior, or cause death).
(8) These species forage for emergent aquatic insects over water. These insects may bioaccumulate copper. But, given the large amount of potential foraging area, the emergent aquatic insects from treated canals would likely only contribute an inconsequential percentage of the total diet. Therefore, no risk due to copper exposure is anticipated.
(9) Migrating salmon are prevented from entering Camp Far West and subsequently the District's conveyance system because of the diversion dam on the Bear River. For the duration of the project, check structures are in place along the Cross Canal to prevent District water from entering the cross canal. These check structures also prevent fish from entering the District. Likewise, where water is diverted from Auburn Ravine, herbicide treatments occur only once the water has flowed over a drop structure. This drop structure prevents District water from entering Auburn Ravine.
(10) The habitat of the valley elderberry longhorn beetle is limited exclusively to elderberry bushes (*Sambucus* spp.). Elderberry bushes are terrestrial species. Accordingly, irrigation water containing aquatic pesticides is unlikely to come into contact with these plants. Therefore, no risk is present to elderberry bushes or valley elderberry longhorn beetles.
(11) Rose-mallow is not an emergent plant and therefore does not grow in standing water but may grow on moist banks of canals or ditches. Exposure to canal water containing aquatic pesticides is indirect, if any. Exposure will only occur through root uptake of soil water. Aquatic pesticide concentration in root zone water is not expected to be sufficient to cause impair growth or cause death.
(12) According to The CalFlora Database, no reported occurrences of these species exist within any of the counties in the project area.

Table 2 Status Codes:

FE = Federally Listed as Endangered
FT = Federally Listed as Threatened
FPE = Federally Proposed Endangered
FPT = Federally Proposed Threatened
FPD = Federally Proposed Delisted
FSC = Federally Listed Species of Concern
FC = Federally Listed Candidate Species
FD = Federally Delisted
SCSC = State Listed Species of Concern
SE = State Listed as Endangered
SFP = State Listed as Fully Protected
ST = State Listed as Threatened
SR = State Listed as Rare
SCE = State Candidate Endangered
SCT = State Candidate Threatened
CNPS-1 = California Native Plant Society Listed, Rare, Threatened, or Endangered in CA only
CNPS-2 = California Native Plant Society Listed Rare, Threatened, or Endangered
CNPS-3 = California Native Plant Society Listed Presumed Extinct in CA

3.5 Cultural Resources

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

Discussion

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

3.6 Geology and Soils

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

Discussion

Items a) through e): ***No Impact.*** The project consists of applying aquatic pesticides to

conveyances within the jurisdiction of the District. The project does not include any new structures, ground disturbances, or other elements that could expose persons or property to geological hazards. There would be no risk of landslide or erosion of topsoil. The Project would not require a septic or other wastewater system, as workers would use existing facilities in the operation areas of the reservoirs.

3.7 Hazards and Hazardous Materials

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

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

Discussion

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

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

1. District personnel and their contractors that make aquatic pesticide applications are under the direct supervision of a QAC. Expertise and training used by these personnel result in mitigating 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, health and environmental hazards and restrictions, and a certification that alternatives and mitigation measures that substantially lessen any significant adverse impact on the environment have been considered and if feasible, adopted. Refer to **Appendix A.**

3. All District personnel and their contractors review and strictly adhere to the aquatic pesticide 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 B.**

4. All District personnel and their contractors review and consult the the aquatic pesticide Material Safety Data Sheet (MSDS) in **Appendix B**, and 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 pesticide. In addition, the District obtains annual training on the use of acrolein as described in the Magnacide H Herbicide Application and Safety Manual in **Appendix B**. District personnel's familiarity with the DPR PSIS series mitigates potentially significant impacts. For example, the PSIS series describes the personal protective equipment (PPE) needed for the safe handling of aquatic pesticides, including goggles, disposable coveralls, gloves and respirators.

5. The condition of the lateral(s) being treated is field evaluated to ensure that the application is necessary, feasible and can be conducted safely and according to label.

This evaluation considers target weed species, level of infestation, water and flow conditions, alternate control methods, and amount of chemical to be applied.

6. After field evaluation, notice is given to the appropriate County Agricultural Commissioner(s) (CAC) and the California Department of Fish and Game (CDFG). Growers are also given the opportunity to postpone water deliveries in case of sensitivities, such as pastures with lactating cows or organic crops. Growers are instructed not to make adjustments to the turnout gates during the hold period prescribed by the label.

7. The day before an application the water operator will seal all emergency spill structures with boards and plastic. Emergency spills are overflows that allow excess water in the lateral to spill into the drain system. The applicator inspects all seals immediately prior to application and faulty seals are repaired.

8. During and after the start of application, the District inspects the treated lateral for up to 6 days following treatment to ensure that the necessary label-prescribed hold time is met before water is released. Water treated with acrolein is only used for irrigation of fields (crop bearing, fallow, or pasture) where the treated water remains on the field, or held for the label-prescribed period before being released or drained to fish bearing waters.

9. Occasionally, small leaks (< 1 gallon per minute) may develop at gates or check structures. Routine maintenance during and following an application is to inspect gates or check structures that hold back treated water. Any detected leaks are controlled with sand bags, temporary dikes, pumps, or lowering the level of treated water below the elevation of the leak. All these actions effectively prevent the release of water treated with aquatic herbicide from leaving the conveyance prior holding time expiration.

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

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

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

Items e) & f): ***No Impact.*** No airports are located within a 2 mile range of the project.

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

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

3.8 Hydrology and Water Quality

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

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

General Discussion

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

Consistent with the District's IPM program, the application of aquatic pesticides is done infrequently (0-3 times per year per conveyance) and over a short duration (< 6 hours per conveyance). Not all conveyances are treated at the same time, for the same length of time, or treated every year. Depending on weed presence, some conveyances may not get treated at all while others may require multiple treatments the same season. Once water is treated with aquatic pesticides, it is either held for the time required on the product label or delivered to a grower's field. Not until the label hold time is reached is treated water released to natural watercourses or to a wildlife refuge. Copper-based and acrolein-based pesticides will be discussed for checklist item a) above. All other checklist items will be discussed together at the end of this section.

Copper-based and acrolein-based pesticides 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 pesticide applications, the following tasks are accomplished:

1. A written recommendation is prepared by a DPR-licensed Pest Control Advisor (PCA). A PCA undergoes 40 hours of training every 2 years on issues including health and safety and prevention of exposure to sensitive receptors. The written recommendation prepared by the PCA must evaluate proximity of occupied buildings and people, health and environmental hazards and restrictions, and a certification that alternatives and mitigation measures that substantially lessen any significant adverse impact on the environment have been considered and if feasible, adopted. Refer to **Appendix A.**

2. All District personnel and their contractors review and strictly adhere to the aquatic pesticide 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 B**.

3. All District personnel and their contractors review and consult the aquatic pesticide Material Safety Data Sheet (MSDS) in **Appendix B**, 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 pesticide. In addition, the District obtains annual training on the use of acrolein as described in the Magnacide H Herbicide Application and Safety Manual in **Appendix B**.

4. The condition of the lateral(s) being treated is field evaluated to ensure that the application is necessary, feasible and can be conducted safely and according to label. This evaluation considers target weed species, level of infestation, water and flow conditions, alternate control methods, and amount of chemical to be applied.

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

6. The day before an application the water operator will seal all emergency spill structures with boards and plastic. Emergency spills are overflows that allow excess water in the lateral to spill into the drain system. The applicator inspects all seals immediately prior to application and faulty seals are repaired prior to the start of the application.

7. During and after the start of application, the District inspects the treated lateral for up to 6 days following treatment to ensure that the label-prescribed hold time is met before water is released. If leaks develop the emergency spills will be shored up with sand bags or a temporary dike. A pump will be used to move water back into the treated lateral and preventing it from flowing into the untreated conveyance.

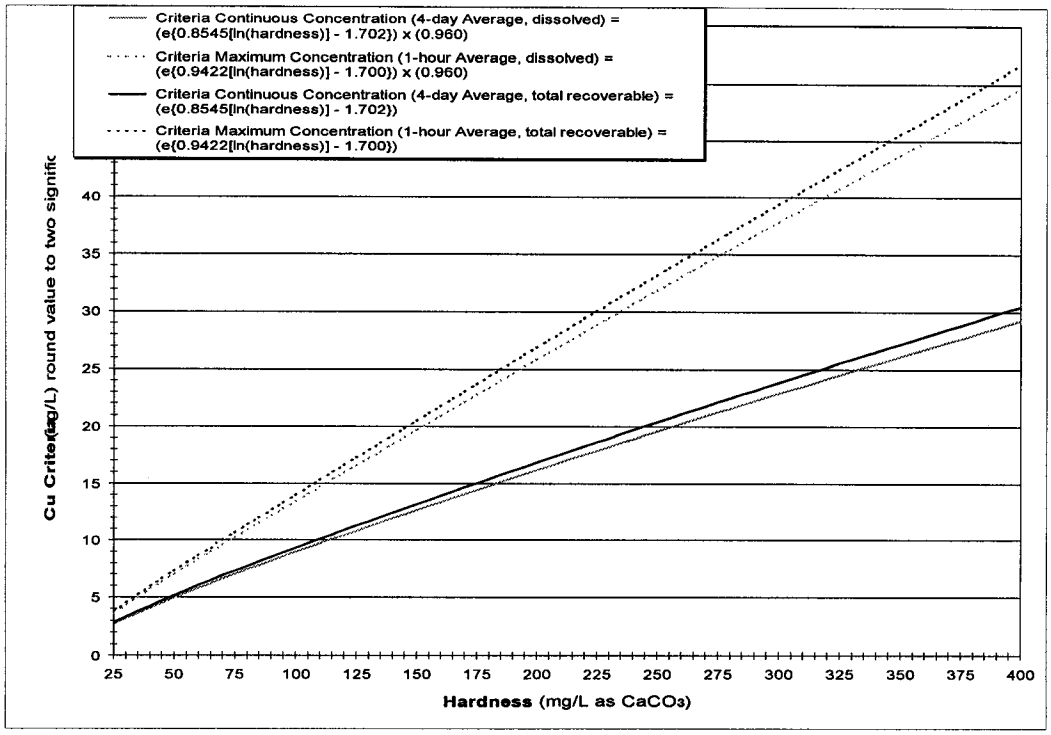
8. The location at which the aquatic pesticide is introduced into the conveyance is continuously staffed until the application is complete. District staff performing conveyance inspection are in continuance radio contact with staff at the head of the conveyance where the aquatic pesticide is being introduced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

Copper Discussion

Item a): **Potentially Significant Unless Mitigation Incorporated**. As presented in Section 1.2, the existing interim emergency NPDES permit used by the District has expired. The District intends to obtain coverage under the new 2004 general permit that requires compliance with the SIP and the CTR.

Application of copper-based aquatic pesticides according to label direction typically require concentrations of copper between 500 and 2,000 µg/L. Water quality criteria for copper as described in the CTR and by the Central Valley RWQCB (RWQCB 2003) are hardness-dependent. Refer to **Figure 3.** District water varies in hardness between approximately 65 and 300 mg/L as calcium carbonate ($CaCO_3$).

Figure 3. Cu Criteria Dependence on Hardness



Based on the relation of copper criteria to hardness, the applicable water quality criteria for copper in District conveyances have the following ranges:

Continuous Dissolved Concentration (4 day Average):	6-23 µg/L
Continuous Total Concentration (4 day Average)	7-24 µg/L
Maximum Dissolved Concentration (1 Hour Average)	9–38 µg/L
Maximum Total Concentration (1 Hour Average)	9–39 µg/L

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

Copper-containing aquatic pesticide treatments are made to moving water. As such, the combination of dilution and uptake occur. Copper-containing aquatic pesticides applied in District conveyances rapidly dissipate and/or become permanently insoluble 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, adsorption by biota and particulate matter, and complexation with organic matter.

Given a starting concentration of 2000 µg/L and a half-life of 19 hours, copper can reasonably be expected to dissipate according to the table below:

Table 2. Anticipated Rate of Copper Dissipation

Time (Hours)	Time (Days)	Cu Concentration (ug/L)
0	0	2000
6	0.25	1607
12	0.5	1291
24	1	833
48	2	347
72	3	145
96	4	60
120	5	25
144	6	10
168	7	4
192	8	2
216	9	0.76
240	10	0.32
264	11	0.13
288	12	0.05
312	13	0.02

As **Table 2** shows, only a short-term CTR copper water quality criteria exceedance will occur in District canals.

Assuming typical label rate starting concentrations and the previously mentioned half-life, the risk to species shown in **Table 1** from copper was estimated. Species exposure was conservatively assumed to occur immediately after introduction of copper into the conveyance. With the exception of the giant garter snake and the northwest pond turtle, the concentration of copper in the District's conveyances does not pose a risk. This is consistent with the fact that District personnel have not reported adverse impacts to aquatic, avian, terrestrial or benthic organisms as a result of using copper-based aquatic pesticides.

In spite of significant evidence that suggests that when used according to label directions by qualified personnel, impacts of copper-containing aquatic pesticides have no adverse impacts on the reproductive health, behavior or morbidity of giant garter snakes or northwestern pond turtles, the District will implement the following mitigation measures to continue operating without a significant impact and reduce any future potentially significant impacts to less than a significant level: These mitigation measures are:

HWQ-1. As required by the SIP and the SWRCB general permit for the application of aquatic pesticides, the District will prepare and execute a sampling and analysis plan. The plan will call for surfacewater sampling and analysis before, during, and after project completion to assess the impact, if any, that the project may have on beneficial uses of water. Additionally, consistent with SIP exception requirements. The District will arrange for a qualified biologist to assess receiving water beneficial uses.

BIO-1. See Biological Resources Section. District staff will implement mitigation

measure **BIO-1** to address potential risks to the northwest pond turtle and the giant garter snake. With this mitigation, a less than significant impact exists to these species. By regularly monitoring and reporting the presence/absence of these species in its conveyances, the District will be able to identify problems with water quality and delay applications if necessary to avoid exposure of giant garter snakes and northwestern pond turtles.

Acrolein Discussion

Application of acrolein according to label direction typically results in a concentration of approximately 5,000 µg/L in conveyance water. Water treated with acrolein is only used for irrigation of fields (crop bearing, fallow, or pasture) where the treated water remains on the field, or held for 6 days before being released or drained to fish bearing waters.

Water quality criteria for acrolein as described in the CTR and by the Central Valley RWQCB (RWQCB 2003) are 320 µg/L and 110 µg/L, respectively. The CTR value is based on human health (carcinogenic risk) and the RWQCB value is based on a taste and odor threshold. These water quality criteria are exceeded at and downstream of the point of aquatic pesticide introduction into the conveyance. Accordingly, because label application rates exceed the CTR water quality criteria, the District is obtaining a SIP exception.

Like copper, all acrolein applications are made to moving water exposed to sunlight during the summer months. As such, the combination of dilution, evaporation, and degradation due to exposure to water and sunlight result in relatively fast rates of degradation. Numerous references in the scientific literature report half-lives ranging from 10-26 hours (Turner 2003, WHO 2002). Given a starting concentration of 5,000 µg/L and a half-life of 26 hours, acrolein can reasonably be expected to dissipate according to the table below:

Table 3. Anticipated Rate of Acrolein Dissipation

Time (Hours)	Time (Days)	Acrolein Concentration (ug/L)
0	0	5000
6	0.25	4261
12	0.5	3631
24	1	2637
48	2	1391
72	3	733
96	4	387
120	5	204
144	6	108
168	7	57
192	8	30
216	9	15.78
240	10	8.32
264	11	4.39
288	12	2.31
312	13	1.22

As **Table 3** shows, only a short-term acrolein CTR water quality criteria exceedance will occur in District canals.

The risk to species shown in **Table 1** from acrolein was estimated. With the exception of the giant garter snake and the northwest pond turtle, the concentration of acrolein in the District's conveyances does not pose a risk. This is consistent with the fact that District personnel have not reported adverse impacts to aquatic, avian, terrestrial or benthic organisms as a result of using copper-based aquatic pesticides.

In spite of significant evidence that suggests that when used according to label directions by qualified personnel, impacts of acrolein-containing aquatic pesticides have no adverse impacts on the reproductive health, behavior or morbidity of giant garter snakes or northwestern pond turtles, the District will implement the following mitigation measures to continue operating without a significant impact and reduce any future potentially significant impacts to less than a significant level: This mitigation measure is:

HWQ-1. Same as HWQ-1 described above.

BIO-1. Same as BIO-1 described above.

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

Copper and Acrolein Discussion

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

Item f): See response to item a).

Items g), h), i), & j): ***No Impact.*** Since the project would involve no new construction, no housing or other structures would be placed within a designated 100-year floodplain. The project would not alter the floodplain or have the potential to redirect flood flows. The Project would not be subject to tsunami or inundation due to mudflows. Nor would the Project expose personnel to a substantial risk due to seiche waves or from flooding as a result of a catastrophic dam failure. In fact, the District's use of aquatic pesticides allows for the conveyance of stormwater and as a result, directs flood flows away from property.

3.9 Land Use Planning

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

Discussion

Item a): ***No Impact.*** The project will be implemented within the District's existing conveyances. Nearby housing, if any, is rural and will not be affected. The proposed Project would not result in any division of an established community.

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

Item c): ***No Impact.*** Refer to Section 3.4, item f). No known plan conflicts with the project.

3.10 Mineral Resources

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

Discussion

Items a) & b): ***No Impact.*** The project involves the addition of aquatic pesticides to the District's conveyances and has no impact on the availability of any known mineral resource recovery site.

3.11 Noise

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

Discussion

Items a) through d): ***No Impact.*** Project activity occurs in rural and agricultural areas that commonly have machinery operating that include tractors, generators large groundwater and irrigation pumps and heavy trucks. The incidental noise and vibration generated by the use of pick-up trucks is temporary and inconsequential and thus will have no impact.

Items e) & f): ***No Impact.*** No airports are located within a 2-mile range of the project.

3.12 Population and Housing

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

Discussion

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

3.13 Public Services

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

Discussion

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

3.14 Recreation

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

Discussion

Items a) & b): ***No Impact.*** The project takes place in the District's conveyances. District policy strictly prohibits playing in and fishing in conveyances.

3.15 Transportation/Traffic

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

Discussion

Items a) & b): ***No Impact.*** The project involves the use of light to medium duty trucks that will not cause an increase in traffic that is substantial in relation to the existing traffic load and capacity of the county roads in the project area.

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

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

3.16 Utilities and Service Systems

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

Discussion

Items a) & b), and e) through g): ***No Impact.*** The project does not discharge to a wastewater treatment plant and does not generate any solid waste. All containers used to store and transport aquatic pesticides are returned to the vendor for reuse.

Item c): ***No Impact.*** The project will maintain and enhance existing storm drainage capacity in the District's facilities. In fact, if the project was not completed, stormwater conveyance

may be diminished and could result in flooding and subsequent loss of, or damage to, property.

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

3.17 Mandatory Findings of Significance

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

Discussion

Item a): **Potentially Significant Unless Mitigation Incorporated.** The project involves the use of copper and acrolein-based aquatic pesticides introduced into the District's conveyances at concentrations that temporarily exceed CTR water quality objectives. Significant evidence suggests that when used according to label directions by qualified personnel, CTR exceedence is short-term and impacts of these aquatic pesticides are less than significant.

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

Although copper and acrolein are hazardous materials, under the standard operating procedures used District personnel and their contractors, less than a significant impact exists.

Item b): **Potentially Significant Unless Mitigation Incorporated.** The water entering the District has not passed through other irrigation districts and would contain inconsequential amount of pesticides, if any. Acrolein-based pesticides are known to degrade rapidly and not accumulate. Acrolein is unlikely to remain in water that leaves the District. Therefore, the incremental impact to water quality and biological resources from the use of acrolein is not cumulatively considerable and thus, potential cumulative impact is considered to be less than significant. There is no substantial evidence that the continued application of copper-based pesticides adversely affects reproductive health, behavior, or morbidity. Moreover, copper is unlikely to remain in water that leaves the District. Therefore, no cumulative effects occur outside the District from the use of copper-based herbicides. Potential cumulative impacts within the District, if any, are addressed through mitigation **HWQ-1**. As a result, the incremental impact to water quality and biological resources is not cumulatively considerable, and thus, potential cumulative impact is considered to be less than significant.

Item c): **Less Than Significant Impact.** As a result of implementation of District standard procedures as described in the Hazards and Hazardous Materials section, any hazard/hazardous material impacts to the human beings is reduced to a less than a significant level.

4.0 LIST OF MITIGATION MEASURES

4.1 Biological Resources

BIO-1. Mitigation for exposure of northwestern pond turtle and giant garter snake will be to have a qualified personnel survey for these species and their habitat on the day prior to an aquatic pesticide application. The distance to be surveyed following an acrolein and copper applications will be the distance the treated water would travel during 0.75 days and 3.5 days, respectively.

If a northwestern pond turtle or a giant garter snake is found, the application can be temporarily postponed and the conveyance surveyed again. Once found to be void of northwestern pond turtles and giant garter snakes, the conveyance can be treated.

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

4.2 Hydrology & Water Quality

HWQ-1. As required by the SIP and the SWRCB general permit for the application of aquatic pesticides, the District will prepare and execute a sampling and analysis plan. The plan will call for surfacewater sampling and analysis before, during, and after project completion to assess the impact, if any, that the project may have on beneficial uses of water. Additionally, consistent with SIP exception requirements, the District will arrange for a qualified biologist to assess receiving water beneficial uses.

5.0 REFERENCES

California Toxics Rule (CTR), May 18, 2000. 65 Federal Register 31682-31719 (Adds Section 131.38 to 40 CFR).

California Department of Food and Agriculture (CDFA). 2002. The California Department of Food and Agriculture Hydrilla Eradication Program water monitoring report, 2002.

Placer County Air Pollution Control District (APCD) 2004. Rules and Regulations. Website: <http://www.placer.ca.gov/airpollution/regs/complete-rules-regs.pdf>, accessed June 18,2004.

Regional Water Quality Control Board, Central Valley Region (RWQCB), 1998. Basin Plan.

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SWRCB, 2000. The Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries in California (the State Implementation Plan, or SIP)

Trumbo, J. 1997. Environmental monitoring of hydrilla eradication activities in Clear Lake, 1996. State of California, The Resources Agency, Department of Fish and Game. Rancho Cordova, California.

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Turner, L. 2003. Acrolein analysis of risks from the aquatic herbicide use in irrigation supply canals to eleven evolutionary significant units of Pacific salmon and steelhead. U.S. Environmental Protection Agency, Office of Pesticide Programs, Environmental Field Branch. 49 pp.

WA DOE. 2003. Washington Department of Ecology SEIS for Aquatic Herbicides Vol 6, Section 3, Copper Environmental Fate Table 3.5

WHO. 2002. Acrolein, Concise International Chemical Assessment Document 43. World Health Organization, The International Programme on Chemical Safety. 49 pp.

6.0 PERSONS AND AGENCIES CONTACTED

1.) Wayne Sobieralski, SWRCB
2.) Jim Maughn, SWRCB
3.) Phillip Isorena, SWRCB
4.) Emily Alejandrino, RWQCB-CV
5.) Rudy Schnagl, RWQCB-CV
6.) Joel Trumbo, CDFG
7.) Cathy Johnson, USFWS
8.) Mike Wolder, USFWS

7.0 LIST OF PREPARERS

1.) Michael S. Blankinship, PE, PCA, Blankinship & Associates
2.) Joshua M. Owens, Staff Scientist, Blankinship & Associates
3.) Sara Castellanos, Staff Scientist, Blankinship & Associates
4.) Joseph P. Sullivan, Certified Wildlife Biologist, Ardea Consulting
5.) Brad Arnold, SSWD

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Appendix A

Pest Control Recommendation

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

8. Name of Pesticide(s)	Rate Per Acre or Unit	Dilution Rate	Volume Per Acre or Unit

9. Hazards and/or Restrictions:
- ☐ 1. Highly toxic to bees
- ☐ 2. Toxic to birds, fish and wildlife
- ☐ 3. Do not apply during irrigation or when run-off is likely to occur
- ☐ 4. Do not apply near desirable plants
- ☐ 5. Do not allow to drift onto humans, animals, desirable plants or property
- ☐ 6. Keep out of lakes, streams and ponds
- ☐ 7. Birds feeding on treated area may be killed
- ☐ 8. Do not apply when foliage is wet (dew, rain, etc.)
- ☐ 9. May cause allergic reaction to some people
- ☐ 10. This product is corrosive and reacts with certain materials (see label)
- ☐ 11. Closed system required
- ☐ 12. Restricted use pesticide (California and/or Federal)
- ☐ 13. Hazardous area involved (see map and warnings)
- ☐ 14. Other (see attachment)

10. Schedule, Time or Conditions

11. Surrounding Crop Hazards

12. Proximity of Occupied Dwellings, People, Pets or Livestock

13. Non-Pesticide Pest Control, Warnings and Other Remarks

14. Criteria Used for Determining Need for Pest Control Treatment:
- ☐ Sweep Net Counts ☐ Leaf or Fruit Counts ☐ Preventive
- ☐ Field Observation ☐ Pheromone or Other Trap ☐ Soil Sampling
- ☐ History ☐ Other

15. Crop and Site Restrictions:
- ☐ 1. Worker reentry interval _____ days
- ☐ 2. Do not use within _____ days of harvest/slaughter
- ☐ 3. Posting required ☐ Yes ☐ No _____ days
- ☐ 4. Do not irrigate for at least _____ days after application
- ☐ 5. Do not apply more than _____ application(s) per season
- ☐ 6. Do not feed treated foliage or straw to livestock
- ☐ 7. Plantback restrictions (see label)
- ☐ 8. Other (see attachment)

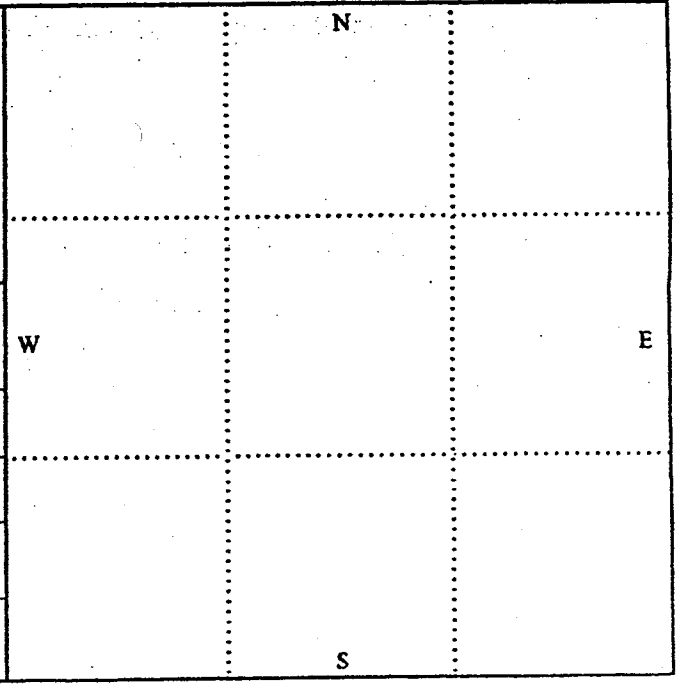
16. I certify that alternatives and mitigation measures that would substantially lessen any significant adverse impact on the environment have been considered and, if feasible, adopted.

Adviser Signature / Date

Adviser License Number

Employer

Employers Address



Explanation and Instructions For Completing the Written Recommendation

1. Include the name and address of the grower, agency or firm for whom the recommendation is written.
2. Include the date the recommendation expires.
3. Provide information on how to locate the property or site to be treated.
4. Indicate the commodity, crop or site to be treated.
5. Indicate the total acres or units to be treated.
6. Check the box adjacent to the method of application.
7. Identification of pest or pests to be controlled by recognized common name.
8. Name of pesticide (common name or trade name), dosage rate per acre or other units, dilution rate and volume per acre.
9. Check the box adjacent to the applicable hazard(s) and/or restriction(s).
10. Indicate the schedule, time or conditions for the application in relation to temperature, time of day, irrigation, etc. Also, include any label restrictions on use or disposition of crop or crop by-product.
11. Indicate any surrounding crops that may be sensitive to the recommended treatment.
12. Identify any occupied dwellings, fieldworkers, pets or livestock in the proximity of the treatment area.
13. Indicate any non-pesticide substance, pest control method or device that will be used to control pest(s). Warning of the possibility of damages by the pesticide applicator that reasonable should have been known to exist at the time of the recommendation.
14. Check the box adjacent to the criteria used for determining need for pest control treatment.
15. Check the box adjacent to the applicable crop and site restrictions.
16. Signature of the licensed pest control adviser or person acting in the capacity of a pest control adviser in accordance with the licensing exemption under Section 12001 of the California Food and Agriculture Code, the date the recommendation was made, and if applicable the adviser's license number. Also, include the name and address of the adviser's employer.

Map -Sketch the property or site to be treated and any surrounding hazards that are known to exist.

Appendix B

MAGNACIDE® H Herbicide

APPLICATION AND SAFETY MANUAL

EPA Registration Number 10707-9

Manual Revision Date: July 2001

Supersedes: April 1997

Baker Petrolite Corporation makes no warranty of merchantability, fitness for any purpose or otherwise, expressed or implied, concerning this product or its uses which extend beyond the use of the product under normal conditions in accord with the statements made in this manual.

PLEASE SIGN AND RETURN

The attached MAGNACIDE® H Herbicide Application and Safety Manual contains instructions for use concerning this label. Federal law requires that this handbook be in the possession of the applicator. Please acknowledge receipt of this handbook by signing below and returning this page to the address listed below.

Baker Petrolite Corporation
P. O. Box 11192
Bakersfield, CA 93389

Signature _____ Date _____

Title or Capacity _____ Firm or Organization _____

RESTRICTED USE PESTICIDE

FOR RETAIL SALE TO AND USE ONLY BY CERTIFIED APPLICATORS OR PERSONS UNDER THEIR DIRECT SUPERVISION AND ONLY FOR THOSE USES COVERED BY THE CERTIFIED APPLIOCATOR'S CERTIFICATION.

Manual Revision Date: July 2001

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I. INTRODUCTION

This manual provides information on the proper application and handling of MAGNACIDE® H Herbicide (active ingredient: acrolein, inhibited). MAGNACIDE® H Herbicide is registered with the U.S. Environmental Protection Agency (EPA) under Registration Number 10707-9 for the control of submersed and floating weeds and algae in irrigation canals. The legal uses of MAGNACIDE® H Herbicide are limited to those listed on the EPA registered product label, this manual, and applicable 24(c) (Special Local Need) registrations.

This product is toxic by inhalation; therefore, EPA has classified MAGNACIDE® H Herbicide as a RESTRICTED USE PESTICIDE for retail sale to, and use only by, certified applicators or persons under their direct supervision and only for those uses covered by the certified applicator's certification. The various states each have different requirements concerning record keeping for restricted use pesticides. Contact the appropriate agency in your state for further information.

MAGNACIDE® H Herbicide controls submersed and floating vegetation in irrigation canals. Since 1956 hundreds of field trials have been conducted in the United States using MAGNACIDE® H in cooperation with public and private agencies. In addition, MAGNACIDE® H Herbicide has been widely used for commercial applications since 1959.

MAGNACIDE® H Herbicide is extremely water soluble. Applications are made by injecting the chemical into the flowing water at a point of good mixing, such as downstream of a weir or siphon. Once mixed, the MAGNACIDE® H Herbicide travels downstream as a wave of treated water, bathing the unwanted aquatic vegetation with herbicide. Once the wave of treated water has passed a particular point in the canal, the concentration of MAGNACIDE® H Herbicide at that point drops to zero. No residual chemical remains after passage of the wave. MAGNACIDE® H Herbicide-treated water can be used for irrigation. At use concentrations, MAGNACIDE® H has been found to be compatible with the commonly used materials of construction in drip and conventional irrigation equipment.

Effective dosages range from 1 part per million (ppm, parts of MAGNACIDE® H Herbicide per 1,000,000 parts water) to 15 ppm. In irrigation canals, submersed weed control is obtained at these dosages with application times ranging from 30 minutes to 8 hours. All typical submersed aquatic weed species and algae are susceptible. Floating forms such as watercress, water hyacinth and water primrose are typically not completely controlled at label rates. Emergent species, such as cattails and tules, are not affected.

Although acrolein, the active ingredient in MAGNACIDE® H Herbicide, is toxic, flammable, highly reactive chemically, and a lachrymator, the process of controlling submerged weeds with this product can be carried out safely and effectively. Specialized application equipment permits introduction of MAGNACIDE® H Herbicide with minimal handling. MAGNACIDE® H Herbicide is supplied in United States Department of Transportation (DOT) specification pressurized containers. It is directly forced through a metering device into the irrigation canal, using industrial grade nitrogen gas (typically containing 10 ppm or less of oxygen).

MAGNACIDE® H Herbicide is available in a variety of container sizes, all of which meet DOT specifications for acrolein, inhibited. Container sizes are shown in Table 1.

Table 1. Acrolein Container Sizes

Container Type	Acrolein Net Weight (lbs.)	Acrolein Volume at 60° F (gallons)
Cylinder	58	8.2
Cylinder	370	52.4
Portable Skid Tank	2,300	326.0
Portable Skid Tank	2,450	347.0
Portable Skid Tank	2,500	354.0
Portable Skid Tank	3,000	425.0

All orders are F.O.B. Taft, California. Round trip freight charges for the containers are included in the product billing. Empty containers are to be returned to Taft, California.

Those interested in the commercial application of MAGNACIDE® H Herbicide should contact:

Baker Petrolite Corporation
Crop Protection Chemicals
P. O. Box 11192
Bakersfield, CA 93389
Telephone: (661) 763-5137
FAX: (661) 765-6046
E-mail address: cropprotectionchemicals@bakerpetrolite.com

II. CONTROLLING SUBMERSED AQUATIC VEGETATION WITH MAGNACIDE® H Herbicide

A. Introduction

Aquatic vegetation is a serious pest in many waterways of the world. This is particularly true in irrigation canals where weeds and algae reduce flow below that of the designed capacity of the channel. Unhampered weed growth causes the water level to rise, thus increasing the chance of overflow and levee breaks. Weeds collect silt and debris, necessitating periodic costly cleanouts. Occasionally these weeds break loose, clogging weirs, siphons and other canal structures. Control of this vegetation is a costly, but necessary part of the maintenance of these systems. The process of controlling submersed aquatic vegetation with MAGNACIDE® H Herbicide as described in this manual is an effective means of overcoming many of these problems.

B. Mode of Action on Plants

MAGNACIDE® H Herbicide is a general cell toxicant that reacts with various vital proteins. The dead plant tissues gradually disintegrate and float downstream, without releasing any large masses of vegetation to clog canal structures. The weeds disintegrate slowly and clear out over a period of 3 or 4 days to 2 weeks, depending on the temperature. The time for restoration of the canal to full capacity will, of course, depend on the rate at which the weeds die and disintegrate. However, an increase in capacity may be apparent in a few hours, as the weeds become flaccid.

C. Weed Specificity

MAGNACIDE® H Herbicide appears to be toxic to all submersed algae and weeds. While algae species were easily controlled, pondweeds such as *Zannichellia* sp. and *Potamogeton crispus* were more easily controlled than the forms which also have floating leaves such as *P. nodosus* and *P. illinoensis*. The latter pondweeds are best controlled when immature. Baker Petrolite Corporation has conducted efficacy studies on *Anabaena flos-aquae*, *Lemna gibba*, *Navicilla pelliculosa*, *Selenastrum capricornutum* and *Skeletonema costatum*.

The following species have been controlled by recommended label use rates:

Algae:

Anabaena flos-aquae	(blue-green algae)
Chara sp.	(stoneworts)
Cladophora sp.	(green algae)
Cladophora glomerata	(green algae)
Hydrodictyon reticulatum	
Navicilla pelliculosa	(freshwater diatom)
Selenastrum capricornutum	(green algae)
Skeletonema costatum	(marine diatom)
Spirogyra sp.	(green algae)

Submersed Aquatic Weeds:

Callitriche sp.	(water starwort)
Ceratophyllum demersum	(coontail)
Elodea canadensis	(waterweed)
Heteranthera dubia	(waterstargrass)
Lemna gibba	(duckweed)
Potamogeton crispus	(curlyleaf pondweed)
Potamogeton foliosus	(leafy pondweed)
Potamogeton illinoensis	(pondweed)
Potamogeton nodosus	(American pondweed)
Potamogeton obtusifolius	(pondweed)
Potamogeton pectinatus	(sago pondweed)
Potamogeton richardsonni	(richardson pondweed)
Najas sp.	(naiad)
Zannichellia palustris	(horned pondweed)

III. PRECAUTIONARY STATEMENTS

A. Hazards to Humans and Domestic Animals

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

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

B. First Aid

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

1. 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.

2. 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.

3. 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 five minutes, then continue rinsing eye.
- Call a poison control center for treatment advice.

4. 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.

5. Note to Physician

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

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

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

C. Environmental Hazards Statement

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

IV. RECOMMENDATIONS FOR THE PROPER HANDLING OF MAGNACIDE® H Herbicide

This section has been developed to inform the applicator of the required handling methods for MAGNACIDE® H Herbicide. It summarizes the importance of proper storage, chemically compatible hardware, use of safety equipment, disposal, fire control, first aid and other safety related issues. All persons who handle MAGNACIDE® H Herbicide should be trained thoroughly in correct operation techniques. They should be completely familiar with its properties and with proper emergency procedures.

A. Physical and Chemical Properties

MAGNACIDE® H Herbicide is a formulation containing a minimum of 95% (by weight) acrolein as the active ingredient. Some of the typical physical and chemical properties are shown in the following list.

Formula	(CH_2=CH-CHO)
Molecular weight	56.06
Appearance	clear, colorless to light yellow liquid
Odor	aldehydic (extremely irritating)
Specific gravity at 60°F	0.847
Pounds per gallon at 60°F	7.06
Boiling point (@760 mmHg)	127°F
Freezing point	-124°F
Vapor density	1.93 (air = 1.0)
Flash point	
Tag open cup	-20°F (approx.)
Tag closed cup	-13°F (approx.)
Flammability limits in air	
Lower limit	2.8% (by volume)
Upper limit	31.0% (by volume)
Solubility at 20°C	
Acrolein in water	22% by weight
Water in acrolein	7% by weight
Vapor pressure at 100°F	8.6 psia
Coefficient of expansion at 59°F	0.000762 per degree F
Viscosity at 32°F (Abs.)	0.43 cps
Permissible Exposure Level (PEL)*	0.1 ppm

**PEL as defined by OSHA, United States Department of Labor*

B. Fire and Polymerization Hazards

MAGNACIDE® H Herbicide is a highly volatile liquid. In certain combinations with air, vapors can have an explosive potential if ignition sources are present. Keep away from all sources of heat, sparks and flame.

Liquid MAGNACIDE® H Herbicide is highly chemically reactive and readily forms polymers generating tremendous heat. Contamination of neat material with air, alkalies, or strong acids can initiate polymerization. Contamination with all foreign materials must be avoided. If the product is stored or handled improperly, the polymerization may proceed with sufficient violence to rupture the container.

MAGNACIDE® H Herbicide polymerizes slowly in the presence of air. Therefore, all containers are packaged with a blanket of nitrogen to exclude air. To avoid the possibility of air contamination during use, MAGNACIDE® H Herbicide must be pressured from the container with industrial grade nitrogen (typically containing 10 ppm or less of oxygen). In addition, hydroquinone is added to inhibit oxygen-catalyzed polymerization. However, hydroquinone does not inhibit polymerization catalyzed by alkalies and strong acids.

C. Health Hazards

The occupational exposure levels for acrolein, the active ingredient in MAGNACIDE® H Herbicide are shown in Table 2.

Table 2. Occupational Exposure Levels for Acrolein

PEL (OSHA)	ACGIH
TWA	Ceiling
0.1 ppm	0.1 ppm

PEL = Permissible Exposure Level
OSHA = Occupational Health and Safety Administration
TWA = Time-Weighted Average
ACGIH = American Conference of Governmental Industrial Hygienists
Ceiling – the concentration that should not be exceeded even instantaneously

MAGNACIDE® H Herbicide vapor is toxic and a strong irritant (lachrymator). It is extremely irritating to the eyes, nose, throat and lungs. However, it is practically impossible to unknowingly remain in a vapor-contaminated atmosphere long enough to produce serious physiological effects because of its high lachrymatory activity. The vapor concentration tolerable to man (0.1-1 ppm in air) serves as a warning of its presence and is far below the minimal lethal concentration. Chronic toxicity studies have not revealed any cumulative effects. However, overexposure to the vapor can result in serious injury to the lungs. Additional information is found in Appendix C, *Toxicity*.

Eye contact with MAGNACIDE® H Herbicide liquid will produce severe damage; the chemical must be removed immediately by flushing with large quantities of water. Skin contact with liquid MAGNACIDE® H Herbicide can cause skin irritations ranging from simple reddening of the skin to severe blistering (see "First Aid" section of this manual).

Symptoms of exposure to MAGNACIDE® H Herbicide include irritation of the eyes, throat, and skin, reddening or blistering of the skin, headaches, acute distress in affected areas and cessation of breathing. There is no emergency antidote for MAGNACIDE® H Herbicide.

D. Process Safety Management

Personnel should be aware of the requirements of OSHA Standard 1910.119, Process Safety Management of Highly Hazardous Chemicals. The major objectives of process safety management (PSM) of highly hazardous chemicals is to prevent unwanted releases of hazardous chemicals especially into locations which could expose employees and others to serious hazards. With regard to MAGNACIDE® H Herbicide, PSM applies to a process involving acrolein at or above the 150-pound threshold quantity. To ensure compliance, consult local, state and federal safety regulations.

E. Personal Protective Equipment Use

The applicator, to protect from an accidental splash or spray, must wear a full-face air purifying respirator, with organic vapor (OV) cartridges jointly approved by the Mine Safety and Health Administration (MSHA) and the National Institute of Occupational Safety and Health (NIOSH).and butyl rubber gloves.

Applicators must also have fresh water available in case of accidental irritation to the eyes or skin from MAGNACIDE® H Herbicide liquid or vapors. In addition, the applicator must have a ten (10) pound dry chemical fire extinguisher at his disposal when working with MAGNACIDE® H Herbicide. All of the equipment mentioned above must be provided for the applicator's use during each application. Personnel who may be involved with the storage, transportation, use, disposal or emergency response of MAGNACIDE® H Herbicide must be trained in the safety and health aspects of acrolein, including, but not limited to, the use of personal protective equipment, respiratory protection and emergency response as explained in the relevant OSHA standards.

F. MAGNACIDE® H Herbicide Storage

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

If MAGNACIDE® H Herbicide is stored at a single location in quantities greater than 5,000 pounds net, a Risk Management Plan is required. To ensure compliance, consult local, state and federal regulations.

G. 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.

V. SPILL AND FIRE CONTROL PROCEDURE

A. General Information

MAGNACIDE® H Herbicide spills can be deactivated using sodium carbonate (soda ash). This will polymerize the spill forming a hard odorless polymer. Sodium carbonate is to be added to the spill in powder form followed by 10 to 20 volumes of water. The deactivated polymer can then be placed in marked containers for disposal in an approved hazardous waste disposal facility. Never flush MAGNACIDE® H Herbicide into sewers or natural waterways as this can result in biological upset of treatment systems or kill fish in waterways.

B. Recommended Procedure for Handling Spills

1. All personnel responding to a spill of MAGNACIDE® H Herbicide must have completed the appropriate training as outlined in 29 CFR 1910.120 (q), Emergency Response to Hazardous Substance Releases.
2. Evacuate all nonessential personnel to an upwind area.
3. All decontamination personnel must wear self-contained breathing apparatus and appropriate protective clothing.
4. Contain spill by diking with dirt.
5. Add sodium carbonate (soda ash) to the spill in powdered form. Follow by dilution and mixing with water.
6. When deactivation is complete, scoop the polymer in properly marked containers for disposal at an approved hazardous waste disposal facility in compliance with state and/or federal requirements.

C. Recommended Fire Control

Pursuant to local regulations, the appropriate fire department should be notified of the location where MAGNACIDE® H Herbicide is stored.

MAGNACIDE® H Herbicide is highly flammable and produces toxic vapors. All fire fighting personnel must wear self-contained breathing apparatus and protective clothing.

Carbon dioxide or dry chemical extinguishers can be used on small fires. Alcohol-type foam is

recommended for large fires. If the fire can be tolerated without endangering additional personnel or property, then it should be left to burn itself out.

Water spray may be effective if used in large quantities, at least 20 volumes of water per volume of MAGNACIDE® H Herbicide. Use water spray to help disperse vapors and cool containers. For additional details, reference the acrolein Emergency Response Plan (ERP).

VI. DIRECTIONS FOR USE

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

Information contained in the following pages of this manual will assist the applicator in determining: (1) the proper size orifice through which MAGNACIDE® H Herbicide should be applied; (2) the nitrogen application pressure which should be used; and (3) the proper setup and shut down of the MAGNACIDE® H Herbicide Application Equipment as distributed by Baker Petrolite Corporation.

A. Guide for MAGNACIDE® H Herbicide Application from Cylinders and Portable Skid Tanks

MAGNACIDE® H Herbicide is forced from the container using nitrogen gas and introduced directly into the canal over a period of 15 minutes to 8 hours to form a wave of treated water. Because of its high activity against submersed vegetation, concentrations in the range of 1-15 ppm are required for control. As MAGNACIDE® H Herbicide proceeds down the canal, it moves like a chemical wave, destroying weeds as it moves.

The amount of MAGNACIDE® H Herbicide required is primarily determined by the amount of water flow and weed density in the canal, although velocity, water temperature and water quality must also be considered. Canal flow is generally stated in cubic feet per second (cfs) and the amount of material used can also be expressed in terms of this value. As an example, if MAGNACIDE® H Herbicide is recommended at 1 gallon/cfs, it means that for a canal flowing 10 cfs a total of 10 gallons of material will be needed.

Since MAGNACIDE® H Herbicide is added over a time interval, a wave of treated water is formed that moves downstream, bathing the weeds in herbicide. Once the wave of treated water has passed a particular point in the canal, the concentration of MAGNACIDE® H Herbicide at that point drops to zero. No residual chemical remains after passage of the wave. The amount of herbicide the weeds receive is, therefore, determined by (1) its concentration in the water and (2) the time required for the treated water to pass over the plants. In fast flowing canals (linear velocity greater than 2.5 ft/sec), masses of vegetation may be compacted or bent by the water; channeling will occur preventing the free movement of the treated water through the weeds. The same situation may prevail in canals heavily infested with weed growth. Consequently, all plants may not receive their proportionate share of the available herbicide and control will be less effective. Therefore, in canals flowing faster than 2.5 ft/sec, the time period of treatment may need to be extended to allow more contact time.

B. Preventive Maintenance Program

By utilizing a preventive maintenance program, the irrigation system will be kept free of weeds throughout the irrigation season, solving water delivery problems and minimizing off-season maintenance created by aquatic weeds. Preventive maintenance programs require less herbicide usage. Better application results will also

be obtained, as the weeds are more susceptible while immature.

It has been determined through various field studies that the most effective and economical method of aquatic weed control is obtained by utilization of a preventive maintenance program. A preventive maintenance program consists of making a series of MAGNACIDE® H Herbicide applications over the irrigation season such that the aquatic weeds are never allowed to reach a "problem" condition. The first MAGNACIDE® H Herbicide application should be made as soon as aquatic weed growth appears (Weed Condition Code A or B). This will normally occur 3 - 6 weeks after the canal receives a constant supply of water. The second and subsequent applications should be made at two to three week intervals, depending upon the regrowth of aquatic weeds. Regrowth will depend on several variables such as water and atmospheric temperatures, species of aquatic plant, turbidity of water, water quality and sunlight conditions.

C. MAGNACIDE® H Herbicide Application Guide

To determine the proper orifice size and nitrogen pressure setting, the following must be determined:

1. The weed growth condition of the canal – Naturally, the more severe the weed growth condition, the more MAGNACIDE® H Herbicide which will be required for control. Use Table 3, Weed Growth Condition Chart, below, to determine the weed growth condition and gallons of MAGNACIDE® H Herbicide per cubic foot per second (cfs).

Table 3. Weed Growth Condition Chart

Condition Code			MAGNACIDE® H Herbicide per cfs
A.	Little algae and pondweed less than 6 inches long	=	0.17 gallons per cfs (for preventive maintenance)
B.	Algae (non-floating) and pondweed less than 12 inches long	=	0.25 gallons per cfs (for preventive maintenance)
C.	Algae (some floating) and pondweed 12 - 24" long	=	0.50 gallons per cfs
D.	Algae (some floating) and mature pondweed	=	1.0 gallons per cfs
E.	Choked conditions	=	1.5 gallons per cfs

NOTE: Water temperatures also affect the amount of MAGNACIDE® H Herbicide required for effective treatment. MAGNACIDE® H Herbicide is less soluble in cooler water and plant reactivity is lowered. The above conditions are for water temperatures above 60°F. Correct the amount of MAGNACIDE® H Herbicide required for effective treatment as follows:

Water Temperatures	Increase Amount of MAGNACIDE® H Herbicide
60°F - 55°F	20%
55°F - 50°F	50%
50°F or below	100%

2. Canal rate of flow – The volume of water that passes a particular reference section in a unit of time. Usually designated as cubic feet per second (cfs). Calculated as mean depth in feet times mean

width in feet times the linear velocity in feet per second.

3. Determine the temperature of the canal water to be treated.

4. Application Time: Normal application times will range from 15 minutes to 8 hours. Items to be considered in selecting an application time are:

   a. Contact time: Since MAGNACIDE® H Herbicide is a contact herbicide, consider the velocity of the canal. In fast flowing canals (2 mph or more) extend the application time to insure good contact. In slower canals (0.5 mph or less), shorten the application time.

   b. Concentration of MAGNACIDE® H Herbicide in parts per million (ppm): The concentration may be controlled by adjusting the application time. Concentrations must not exceed 15 ppm. See Table 5, MAGNACIDE® H Herbicide Concentrations.

After you have determined the above items you can calculate the orifice size and nitrogen pressure setting.

Example A:

1. Weed growth condition: Some algae and pondweed 10 inches in length.
2. Canal rate of flow is 50 cfs.
3. Temperature of 65°F.
4. Application time 3 hours.

Step 1

From Table 3, Weed Growth Condition Chart, we determine a Condition Code B, or 0.25 gallons of MAGNACIDE® H Herbicide per cfs. **NOTE:** Temperature is above 60°F.

Step 2

Determine total gallons of MAGNACIDE® H Herbicide required:
Multiply canal rate of flow (cfs) by weed growth condition code (MAGNACIDE® H Herbicide per cfs) to find the total gallons of MAGNACIDE® H Herbicide required.

50 cfs X 0.25 gallons MAGNACIDE® H Herbicide per cfs = 12.5 gallons of MAGNACIDE® H Herbicide required

Step 3

Determine gallons of MAGNACIDE® H Herbicide per hour. Divide total gallons of MAGNACIDE® H Herbicide by application time to find gallons of MAGNACIDE® H Herbicide per hour.

12.5 gallons MAGNACIDE® H Herbicide / 3 hours = 4.2 gph of MAGNACIDE® H Herbicide

Step 4

Determine orifice size and nitrogen pressure setting. Refer to Table 4, Orifice Flow Table. Locate the gallons per hour of MAGNACIDE® H Herbicide, or the closest number in the table. Read to the left to find the orifice size and read up to find the nitrogen pressure setting. We determine 4.1 gph is the closest number to 4.2 gph and locate the orifice size and pressure setting of:

Orifice Size, Inches	Pressure Setting, psig
0.025	25

Example B:

1. Weed growth condition: Floating algae and floating pondweed 12 - 24" long.
2. Canal rate of flow 120 cfs.
3. Temperature 57°F.
4. Application time 4 hours.

Step 1

From Table 3, Weed Growth Condition Chart, we determine Condition Code C, or 0.50 gallons of MAGNACIDE® H Herbicide per cfs. **NOTE:** Temperature of 57°F will increase rate by 20%.

Step 2

Determine total gallons of MAGNACIDE® H Herbicide required. Multiply canal rate of flow (cfs) by weed growth condition code (MAGNACIDE® H Herbicide per cfs) to find the gallons of MAGNACIDE® H Herbicide. Due to the temperature being below 60°F, we will increase the volume of MAGNACIDE® H Herbicide by 20%.

120 cfs X 0.50 gallons of MAGNACIDE® H Herbicide per cfs = 60 gallons of MAGNACIDE® H Herbicide.

60 gallons MAGNACIDE® H Herbicide x 0.20 (for water temperature) = 12 gallons

60 gallons + 12 gallons = 72 total gallons MAGNACIDE® H Herbicide required

Step 3

Determine gallons of MAGNACIDE® H Herbicide per hour: Divide total gallons of MAGNACIDE® H Herbicide by the application time to find gallons of MAGNACIDE® H Herbicide per hour.

72 total gallons MAGNACIDE® H Herbicide / 4 hours = 18 gph of MAGNACIDE® H Herbicide.

Step 4

Determine orifice size and nitrogen pressure setting. Refer to Table 4, Orifice Flow Table, and locate the gallons per hour of MAGNACIDE® H Herbicide, or the closest number on the table. Read to the left to find the orifice size and read up to find the nitrogen pressure setting. We determine 18.5 gph is the closest number to 18 gph and locate the orifice size and pressure setting:

Orifice Size, Inches	Pressure Setting, psig
0.045	50

The concentration of MAGNACIDE® H Herbicide should not exceed 15 ppm. The concentration in ppm is calculated as follows:

$$\frac{\text{dosage (gal/cfs) x 1,884}}{\text{application time (minutes)}} = \text{ppm (MAGNACIDE® H Herbicide concentration)}$$

Alternately, the treating rate can be calculated using the following formula:

Gallons per Hour (gph) MAGNACIDE® H Herbicide = cfs x 0.032 x MAGNACIDE® Herbicide (in ppm)

Based on the weed growth conditions at the time of treatment, choose the application time and concentration appropriate from Table 5, MAGNACIDE® H Herbicide Concentrations. Insert the flow rate and ppm into the equation and calculate the gallons per hour of MAGNACIDE® H Herbicide required.

Table 4. Orifice Flow Table

Orifice Size (in.)	Nitrogen Pressure Settings									
	6 psig	8 psig	10 psig	15 psig	20 psig	25 psig	30 psig	40 psig	50 psig	60 psig
	Gallons per Hour									
0.014	0.65	0.72	0.85	1.05	1.2	1.3	1.4	1.6	1.9	2.1
0.016	0.85	0.98	1.05	1.3	1.5	1.7	1.9	2.2	2.4	2.6
0.020	1.3	1.5	1.6	2.1	2.4	2.7	2.8	3.3	3.7	4.0
0.025	2.1	2.3	2.6	3.2	3.7	4.1	4.5	5.1	5.9	6.3
0.030	2.8	3.3	3.7	4.6	5.3	5.9	6.4	7.3	8.5	9.2
0.035	3.9	4.5	5.1	6.2	7.2	7.9	9.2	10.5	11.1	12.5
0.045	6.4	7.0	8.5	10.5	11.8	13.1	14.2	16.5	18.5	21.0
0.055	9.8	11.1	12.4	15.0	17.0	20.0	22.0	25.0	27.0	30.0
0.070	15.0	17.0	21.0	25.0	28.0	32.0	35.0	40.0	46.0	49.0
0.081	21.0	24.0	27.0	33.0	38.0	42.0	47.0	53.0	60.0	65.0

Table 5. MAGNACIDE® H Herbicide Concentrations

MAGNACIDE® Herbicide Concentrations Flowing Irrigation Canals Concentration in ppm at Various Gallons/cfs Rates					
Application Time	Weed Condition A Gal/cfs 0.17	Weed Condition B Gal/cfs 0.25	Weed Condition C Gal/cfs 0.50	Weed Condition D Gal/cfs 1.0	Weed Condition E Gal/cfs 1.5
	ppm				
30 Minutes	10.0	-	-	-	-
1 Hour	5.0	7.8	-	-	-
2 Hours	2.6	3.9	7.8	-	-
3 Hours	1.7	2.6	5.2	10.4	-
4 Hours	1.3	2.0	3.9	7.9	11.8
6 Hours	-	1.3	2.6	5.2	7.9
8 Hours	-	1.0	1.9	3.9	5.9

VII. APPLICATIONS FROM CYLINDERS AND SKID TANKS

A. General Instructions

The applicator must wear a respirator when setting up or breaking down application equipment. Once the application equipment is in place, and the treatment in progress, an applicator should monitor the treatment if the containers are not secured. If the containers are secured (e.g., locked enclosures), an applicator may simply check on the treatment periodically (at least every two hours).

Know your procedures thoroughly; rehearse them if necessary before the job. Use only specified equipment as provided by Baker Petrolite Corporation. Application equipment should be inspected prior to and during each application to insure that it is working properly.

Turn all valves cautiously, insuring that there are no leaks and that all hardware is working properly.

Insure that you have fresh wash water available for personal emergency use.

Maintain accurate records of all MAGNACIDE® H Herbicide applications including:

1. Date
2. Time application started and stopped
3. Location
4. Flow of canal (cfs)
5. Water temperature
6. Orifice size and pressure setting
7. Parts per million concentration of MAGNACIDE® H Herbicide
8. Amount of MAGNACIDE® H Herbicide injected
9. Any additional information required by your state Department of Agriculture.

B. Application Instructions

Refer to Figure 1, MAGNACIDE® H Application Set Up, and Figure 2, MAGNACIDE® H Application Kit.

1. Calculate proper orifice size and regulator pressure setting using the appropriate tables shown in Section VI, Directions for Use.

2. Install orifice in orifice assembly (18). Make sure the screen filter is clean and in place. Wrap threads on orifice assembly (both cap and hose ends) with two layers of Teflon® tape to insure that a good seal is obtained. Wrap the threaded portions (14) of the nitrogen (blue) (A) and MAGNACIDE® H Herbicide (orange) (B) assemblies with two layers of Teflon® tape to insure that a good seal is obtained.

3. Secure nitrogen tank to prevent it from falling over. Do not lay tank down on its side. Connect nitrogen regulator (1) to nitrogen tank. Connect nitrogen hose (5) to tee (4).

   Note: It is necessary to examine the integrity of the nitrogen check valve and excess flow valve each time a new cylinder of nitrogen is used.

4. To check excess flow valve:
   Ensure nitrogen tank valve (F) is shut off and nitrogen pressure handle (G) is closed (counterclockwise). Remove check valve and attachments. Excess flow valve should remain attached to the regulator. Open nitrogen regulator pressure handle fully clockwise. Open nitrogen tank valve. Excess flow valve should activate to prevent unrestricted flow of nitrogen. Repair or replace if necessary. Close nitrogen tank valve (F) and nitrogen pressure handle (G).

5. To check integrity of check valve:
   Reinsert check valve only – backwards (arrow pointing toward regulator). Open nitrogen tank valve (F). Turn nitrogen regulator pressure handle (G) clockwise to open, to approximately 10 psi. Listen and

check with finger to see if any nitrogen is escaping through the check valve. Repair or replace if necessary. Close nitrogen tank valve (F) and nitrogen pressure handle (G). Reverse check valve, retape and reassemble nitrogen regulator system in original configuration.

6. Check MAGNACIDE® H cylinder/skid valves, nitrogen intake valve (blue) (C) and MAGNACIDE® H discharge valve (orange) (D) to insure that they are in the closed and secured position. Inspect purging assembly ball valve (blue) (11) and pressure bleed off valve (6) to insure each is closed.

   Note: Put on gloves, respirator and have wash water available before proceeding to Step 7.

7. Remove the plugs from the nitrogen intake (blue) (C) and MAGNACIDE® H Herbicide discharge (orange) (D) valves. Remove any Teflon® tape that may be in the valves. This tape could restrict flow of MAGNACIDE® H Herbicide and the desired application rate would not be obtained. Connect the nitrogen assembly (blue) (A) assembly to the nitrogen intake valve (blue) (C) and MAGNACIDE® H Herbicide assembly (orange) (B) to the MAGNACIDE® H Herbicide discharge valve (orange) (D).

8. Connect MAGNACIDE® H Herbicide injection hose (21) to the MAGNACIDE® H Herbicide assembly at the orifice outlet (19). A weight must be attached to the end of the injection hose (22) to insure that the hose remains submerged. Drop the weighted end of the injection hose into the canal at a point where MAGNACIDE® H Herbicide will mix thoroughly.

9. Connect nitrogen hose (5) to the nitrogen assembly (blue) (A) on the cylinder/skid.

10. In order to pressure test the application system for leaks, slowly open the nitrogen tank valve (F). Adjust regulator (G) to 30 psi. Check for leaks on nitrogen assembly, using soap solution. Retighten connections if necessary. Close nitrogen tank valve (F) and open bleed valve (blue) (6) to relieve nitrogen pressure.

11. Disconnect nitrogen hose at quick coupler (8) on nitrogen assembly (A). Reconnect nitrogen quick coupler (8) to the blue purge valve (9) on orange MAGNACIDE® H Herbicide assembly. Slowly open the nitrogen tank valve (F) and adjust regulator (G) to 30 psi. Open handle on purge valve (11). Check for leaks using soap solution. Retighten connections if necessary. Close nitrogen tank valve (F) and open bleed valve (6) to relieve nitrogen pressure. Reconnect nitrogen line (5) to nitrogen assembly (blue) (A) on the cylinder/skid.

12. Open blue nitrogen intake valve (C) on cylinder/skid slowly. Read cylinder/skid low pressure regulator gauge (7). If reading is greater than desired pressure setting for application (Step 1), the excess pressure must be bled off. Connect the MAGNACIDE® H Herbicide injection hose (21) to the pressure bleed off valve (blue) (6). Bleed the cylinder/skid pressure down below the desired application pressure. After bleeding down, the hose can be purged with nitrogen by closing the cylinder/skid blue nitrogen intake valve (C), opening the nitrogen tank valve (F) and opening the nitrogen pressure handle for 30 seconds. Close the pressure bleed off valve (6) and remove the MAGNACIDE® H Herbicide injection hose (21). Reconnect hose to MAGNACIDE® H Herbicide assembly (orange) (B).

13. Open nitrogen tank valve (F) and set pressure using the nitrogen regulator pressure handle (G) as calculated in Step 1, using pressure bleed off valve (6) as necessary. Check for leaks.

14. Open cylinder/skid blue nitrogen valve (C) slowly. The cylinder/skid will pressurize with nitrogen to the desired setting. Check for leaks.

15. Open orange MAGNACIDE® H Herbicide cylinder/skid discharge valve (D) slowly. You should observe MAGNACIDE® H Herbicide flowing through the injection hose.

16. Check for leaks on the MAGNACIDE® H Herbicide assembly (orange) (B) and injection hose (21). If a leak is detected, close the orange MAGNACIDE® H Herbicide discharge valve (D). If necessary, rinse with water. In most cases, the leak can be repaired by tightening the threaded connections on the

orange MAGNACIDE® H Herbicide assembly and hose.

Note: The orange MAGNACIDE® H Herbicide assembly and injection hose may need to be disassembled and retaped with Teflon® tape to repair the leak. Follow shutdown steps 6, 7, 8, 9 and 20 – 26 to purge MAGNACIDE® H Herbicide from assembly and hose before disassembly of injection equipment.

Repair leak and follow application Steps 7 - 16.

Be sure pressure is readjusted to desired application pressure as determined in Step 1.

17. Make note of time that application began to determine duration of application. Complete application record.

18. Periodically during application check MAGNACIDE® H Herbicide application equipment to insure that equipment is functioning properly. Goggles are to be worn during visual checks.

19. Monitor the nitrogen usage such that the remaining pressure in the nitrogen cylinder never drops below 100 psi during the application. This, in addition to the check valve, will prevent any backflow of MAGNACIDE® H Herbicide vapors into the nitrogen cylinder.

C. Shutdown Procedure

Note: Put on respirator and gloves and have wash water available before proceeding to Step 20.

20. Close orange MAGNACIDE® H Herbicide cylinder/skid discharge valve (D) slowly.

21. Close blue cylinder/skid nitrogen intake valve (C) slowly and secure the valve handle.

22. Remove nitrogen hose from nitrogen assembly (blue) (A).

23. Connect nitrogen hose female quick coupler (8) to the blue purge valve (9) on orange MAGNACIDE® H Herbicide assembly (B). Adjust pressure with the nitrogen regulator pressure handle (G) 10 psi higher than the previously set application pressure. Open handle on purge valve (11). Nitrogen will immediately flow through the application hose and bubbles will be seen in the canal. Let nitrogen flow for at least 60 seconds to purge all MAGNACIDE® H Herbicide out of injection hose. Check any coils for remaining chemical.

24. Open and close orange MAGNACIDE® H Herbicide discharge valve (D) several times to force all MAGNACIDE® H Herbicide in chemical assembly and valve back into container.

25. Close orange MAGNACIDE® H Herbicide discharge valve (D) and secure. Close purge valve (11).

26. Remove nitrogen hose female quick coupler (8) from purge valve (9).

27. Close nitrogen tank valve (F).

28. Bleed pressure from nitrogen line with pressure bleed off valve (6) on regulator.

29. Disconnect nitrogen regulator (1) from nitrogen tank. Wrap regulator in a protective covering to prevent damage.

30. Replace nitrogen tank valve stem cover.

31. Remove nitrogen assembly (blue) (A) from cylinder/skid nitrogen intake valve (C) and install valve plug.

32. Disconnect injection hose (21) from the orange MAGNACIDE® H Herbicide assembly (B).

33. Remove orange MAGNACIDE® H Herbicide assembly from cylinder/skid valve (D) and install valve plug.

34. Secure cylinder/skid bonnet lid.

35. Wash assemblies and application hose with fresh water to remove any remaining traces of MAGNACIDE® H in order to prevent any inadvertent exposure to acrolein vapors.

36. Remove respirator and gloves.

37. Store all equipment properly. Store all personal protective equipment separately from application equipment to prevent contamination.

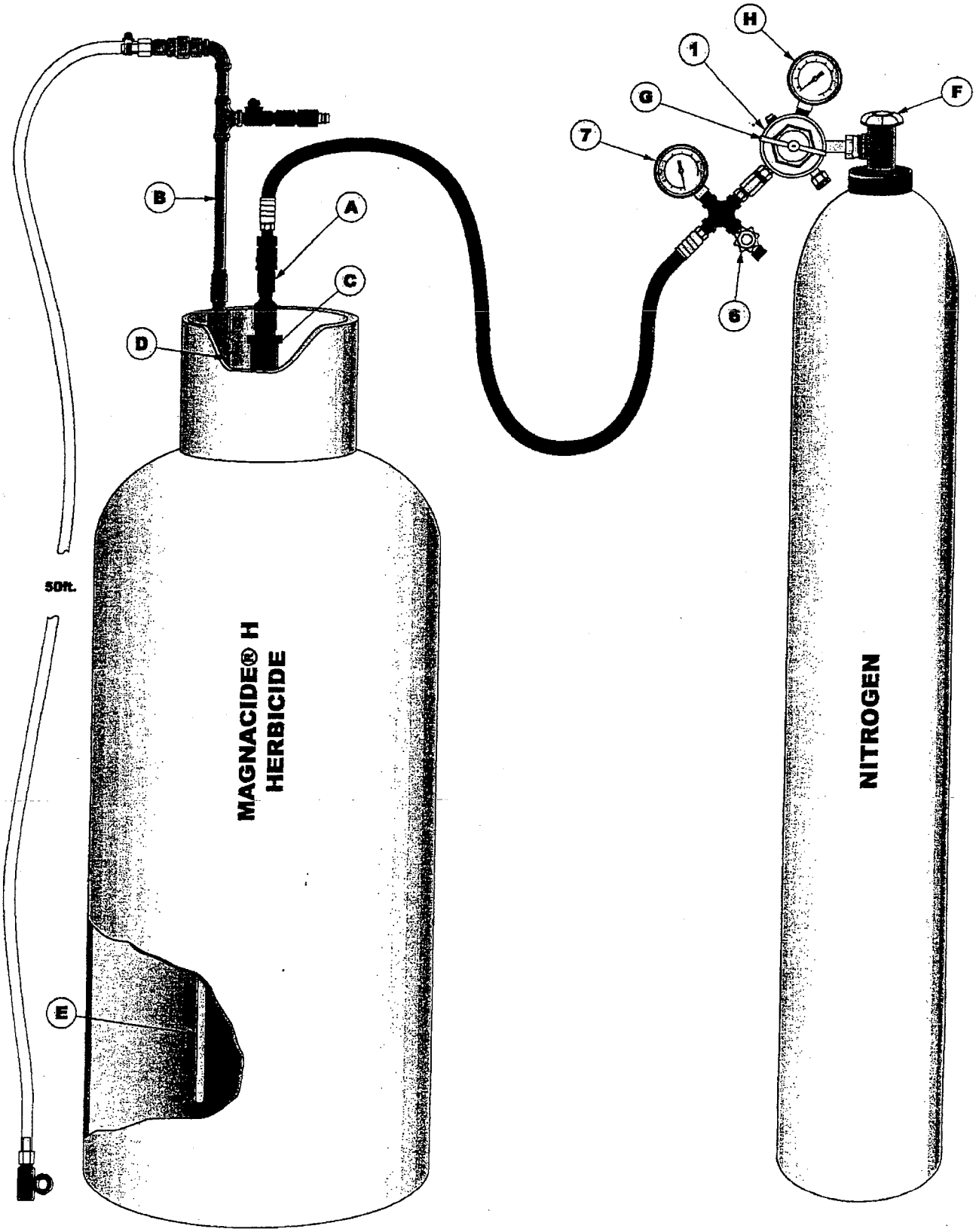
VIII. MAGNACIDE® H APPLICATION SET UP INDEX
(for use with Figure 1, MAGNACIDE® H Application Set Up)

A. Nitrogen assembly (blue)
B. MAGNACIDE® H Herbicide assembly (orange)
C. MAGNACIDE® H Herbicide cylinder nitrogen intake valve
D. MAGNACIDE® H Herbicide cylinder discharge valve
E. MAGNACIDE® H Herbicide dip tube (delivers chemical from bottom of cylinder to assembly B)
F. Nitrogen tank valve
G. Nitrogen regulator pressure handle
H. Nitrogen tank high pressure (psi) gauge

1. Nitrogen regulator with high pressure gauge
6. Pressure bleed off valve (blue)
7. Low pressure nitrogen gauge

Figure 1.

MAGNACIDE® H APPLICATION SET UP

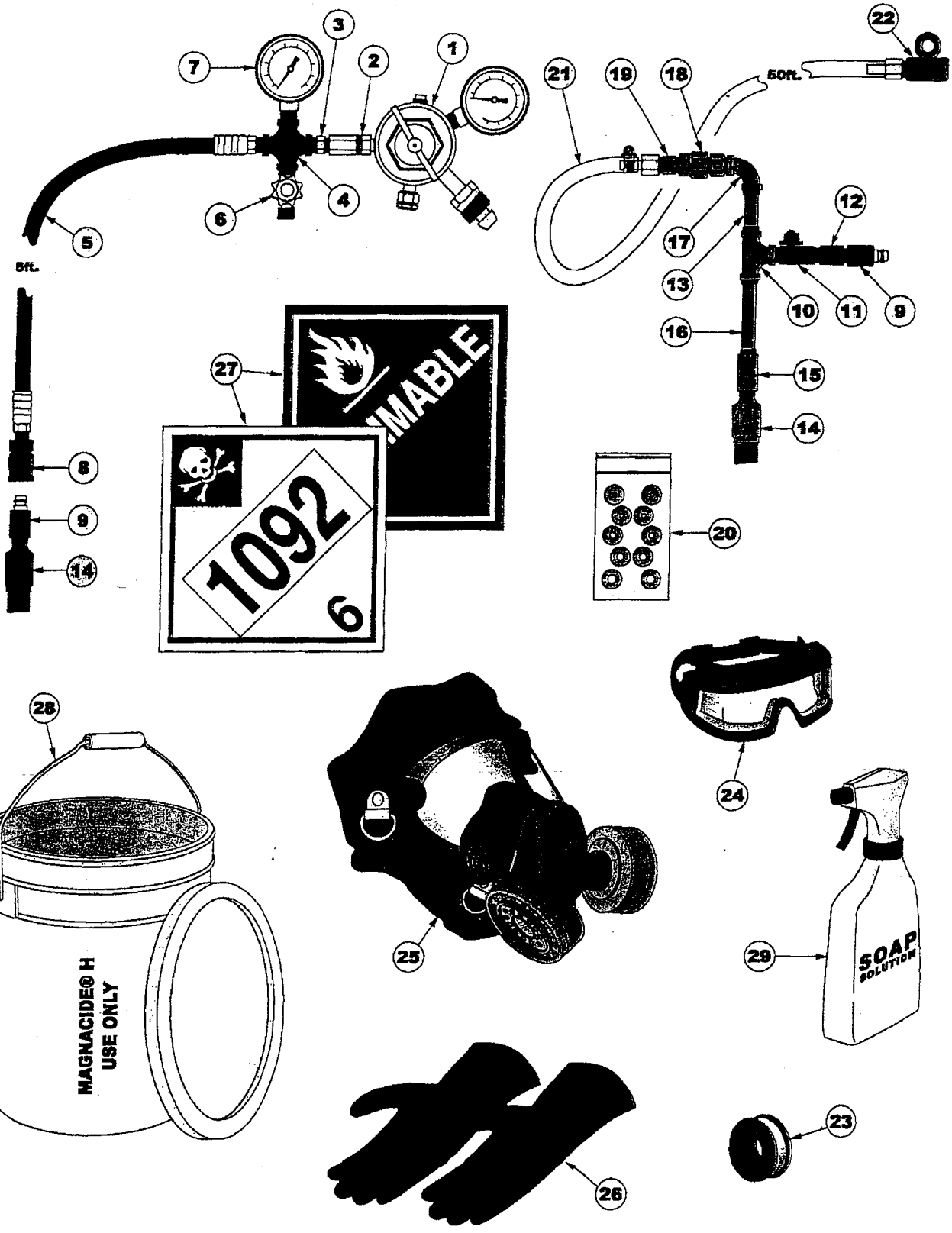


IX. MAGNACIDE® H APPLICATION KIT INDEX
(for use with Figure 2, MAGNACIDE® H Application Kit)

1. Nitrogen regulator with high pressure gauge
2. Excess flow valve
3. Check valve
4. Tee
5. Nitrogen hose
6. Pressure bleed off valve
7. Low pressure nitrogen gauge
8. Nitrogen hose female quick coupler
9, 14. Nitrogen assembly (A)
9 - 19. MAGNACIDE® H Herbicide assembly
18 - 19. Orifice assembly with screen filter
20. One set of orifice plates
21. 50' MAGNACIDE® H Herbicide injection hose
22. Hose end for attaching weight
23. Teflon tape
24. Goggles
25. Respirator
26. Butyl rubber gloves
27. Placards (8 total – 1092 and flammable)
28. Plastic 6-gallon bucket with lid
29. Soap solution

Figure 2.

MAGNACIDE® H APPLICATION KIT



X. EQUIPMENT AND HARDWARE

All hardware used in a MAGNACIDE® H Herbicide system must be chemically compatible. This means that the materials used in the system must not cause a reaction with the MAGNACIDE® H Herbicide or be dissolved or deteriorated by it. If the materials are not compatible, either the materials will be degraded or the MAGNACIDE® H Herbicide will itself degrade, resulting in a polymerization reaction. A polymerization reaction will release heat and pressure and could rupture the container, causing possible damage to personnel or property.

All parts used in the MAGNACIDE® H Herbicide Application Kit have been thoroughly tested for their compatibility with our product. No substitutions should be made without authorization from Baker Petrolite Crop Protection Chemicals.

In addition, all equipment and hardware must be free from all traces of contaminants, especially alkalies (such as ammonia and caustics) and acids. Contamination of MAGNACIDE® H Herbicide with these substances can cause vessels, piping and other hardware to rupture.

XI. TRANSPORTING MAGNACIDE® H Herbicide CONTAINERS

Transportation of hazardous chemicals is regulated by the U. S. Department of Transportation (DOT). The DOT requirements for transporting MAGNACIDE® H Herbicide (acrolein, inhibited) are as follows:

1. Transporting vehicle must be placarded when hauling full, partial or empty containers. Required placards are Inhalation Hazard 1092 and Flammable Liquid, available at cost through Baker Petrolite Corporation. All four sides of the transporting vehicle must have placards displayed, with the 1092 placards (primary hazard) in left or upper position.

2. Driver must carry correct shipping papers at all times. These must include the correctly worded bill-of-lading supplied by Baker Petrolite Corporation or commercial freight line, material safety data sheet for MAGNACIDE® H Herbicide, and Chemtrec emergency response information (supplied with bill-of-lading).

3. Special drivers license requirements are in effect for transporting hazardous materials. For details, contact the Department of Motor Vehicles in your state.

Bills-of-lading for transportation of empty containers are available from your Baker Petrolite Crop Protection Chemicals representative or Baker Petrolite Corporation's Taft, CA office.

XII. RETURN OF EMPTY MAGNACIDE® H Herbicide CONTAINERS

Empty containers are to be returned, freight collect, to:

Baker Petrolite Corporation
19815 S. Lake Rd.
Taft, CA 93268

Please Note: No partly used containers should be returned to Baker Petrolite Corporation without prior notification. For information concerning the return of partly used containers, contact:

Baker Petrolite Corporation
Telephone: (661) 763-5137
E-mail address: cropprotectionchemicals@bakerpetrolite.com

Normally, no credit will be issued for unused material returned from opened cylinders or skid tanks.

A. Preparation for Shipment of Empty Containers

Prepare empty containers for shipment as follows:

1. Relieve container pressure down to 15-25 psig. This is normally accomplished by venting into the irrigation system during treatment.
2. Replace plugs in the inlet and outlet valves and tighten securely.
3. Fasten down valve handles securely.
4. Close lid and secure with latch.
5. Containers must be transported upright. Alert the carrier to secure containers to prevent overturning during transport.

The DOT has special shipping paper requirements for shipment of empty containers which previously contained a hazardous material. Properly worded bills-of-lading for empty containers are available through your technical sales representative or Baker Petrolite Corporation's Taft, CA office. Trucks transporting empty containers must be placarded. It is the responsibility of the shipper to provide necessary placards.

XIII. DISCLAIMER

This document is intended to serve as general information for companies to review and use in implementing their MAGNACIDE® H Herbicide application and safety programs. The information contained herein has been compiled from a number of sources, including information readily available to the public. Although every effort has been made to provide complete and accurate information, Baker Petrolite Corporation cannot accept responsibility, nor shall it be liable, for any inaccuracies of public information sources, misinterpretations or incomplete information which may be contained in this document.

APPENDIX A

Water Measurement Equivalents

Discharge or Rate of Flow	The volume of water that passes a particular reference section in a unit of time. Usually designated as cubic feet per second or miner's inches.
1 cfs	1 cubic foot per second (mean depth (ft) x mean width (ft) x linear velocity (ft/sec)).
Miner's Inch	The quantity of water which will flow through an orifice one inch square under a stated head which varies from 4 to 6 1/2 inches in different localities.
Acre Foot	A commonly employed unit of volume defined as that quantity of water required to cover one acre of land to a depth of one foot or 43,560 cubic feet.
1 cfs	450 gallons per minute
1 cfs	50 miner's inches in Idaho, Kansas, Nebraska, New Mexico, North Dakota, South Dakota, Northern California, Washington and Utah.
1 cfs	40 miner's inches in Arizona, Southern California, Montana and Oregon.
1 cfs	38.4 miner's inches in Colorado.
1 cfs Flowing 1 Hour	1 acre inch.
1 cfs in 12 Hours	1 acre foot.
1 cu. ft. of Water at 25°C	62.2 lb., 7.48 gallons.
1 Gallon Water	8.34 lb.
1 Acre Foot of Water	2.7 million lb.
2.7 lb. Product/Acre Ft.	1 ppm MAGNACIDE® H Herbicide.
1 lb. Product/Million Gallons	0.12 ppm MAGNACIDE® H Herbicide.
1 Acre	43,560 sq. ft., 1/640 square mile.
1 Mile	5,280 feet; 1,760 yards.
1 Kilometer	0.62 miles.
1 Inch	2.54 cm = 25.4 mm.
1 Ounce	28.35 grams.
1 Gram	0.0353 ounces.
1 lb.	453.59 grams.
1 Fluid Ounce	29.57 ml.
1 Pint	473.2 ml.
1 Gallon (U. S.)	0.823 gallon (British)
1 mph	88 ft/min = 1.5 ft/sec.
m^3	264.2 gallons
1.6 kilometers	1 mile
1 m^3/sec.	35.3 cubic ft/sec.
1 hectare	2.47 acres
3.79 liters	1 gallon
2.2046 lbs.	1 kilogram
2.2 mega liters/day	1 cubic foot per second/24 hours

APPENDIX B

MAGNACIDE® H Herbicide Monitor

The MAGNACIDE® H Herbicide monitor is a hand held colorimeter designed to quickly and easily determine the concentration of MAGNACIDE® H Herbicide in irrigation waters. The instrument's compact size and easy operating procedures make it a handy tool for measuring MAGNACIDE® H Herbicide levels in even the most remote irrigation channels.

A simple test determines the parts per million (ppm) of chemical present in the treated water with an accuracy of 0.1 ppm. The monitor readily measures the concentration of MAGNACIDE® H Herbicide in the range of 0.25 to 15.0 ppm. Test results are read directly off the monitor's scale, thus eliminating the need for complicated calculations.

The MAGNACIDE® H Herbicide monitor is furnished in a kit with all necessary equipment to conduct a number of tests. For additional information on the MAGNACIDE® H Herbicide monitor, please contact your technical sales representative.

APPENDIX C

Toxicity

Results of toxicological studies are summarized below:

The acute oral toxicity (LD_{50}) of MAGNACIDE® H Herbicide for rats is approximately 29 mg/kg. The acute dermal LD_{50} of undiluted MAGNACIDE® H Herbicide in rabbits is 231.4 mg/kg.

In a subacute study conducted with male and female rats for 90 days, MAGNACIDE® H Herbicide was added to the drinking water at 0, 5, 13, 32, 80, and 200 ppm. Growth of both sexes was equal or better than the controls. Food efficiency was equivalent to the controls at all levels. Water consumption was reduced by 1/3 at the 200 ppm level for the first 3 weeks, but by the 12th week the animals had apparently adapted to the odor and taste of the MAGNACIDE® H Herbicide in the drinking water. There were no hematological, organ weight or pathological changes that could be attributed to the ingestion of the drinking water containing the MAGNACIDE® H Herbicide.

In a study of skin absorption, rabbits were immersed, except for the head, for one hour in 20 or 100 ppm aqueous solutions of MAGNACIDE® H Herbicide. There was no adverse effect at 20 ppm. At 100 ppm, one rabbit appeared weakened, but returned to normal in 24 hours.

Lactating dairy cows were given MAGNACIDE® H Herbicide in their drinking water at levels of 30, 60, or 90 ppm for 24 hours. There were no adverse effects at 30 and 60 ppm on body weight, water intake, feed and water consumption, and milk and butterfat production. No off-flavor was imparted to the milk. At 90 ppm, the only noticeable effect was 1/4 - 1/3 drop in water and hay consumption with a transitory drop in weight. However, all factors measured returned to normal the following day.

Data on vapor toxicity show that MAGNACIDE® H Herbicide vapor exerts its main action on the eyes and mucous membranes of the respiratory tract; severe exposure may produce serious injury to the lungs. A table of sensory response values is given below.

Atmospheric Concentration (ppm)	Duration of Exposure	Probable Human Response
0.25	5 minutes	Moderate irritation
1.0	5 minutes	Painful irritation
1.0	2 - 3 minutes	Eye and nose irritation
5.5	20 seconds	Painful eye and nose irritation
5.5	1 minute	Practically intolerable
153.0	10 minutes	May be fatal

The odor threshold for acrolein will vary among humans, depending upon the olfactory sensitivity and acuteness. Detection threshold will vary between 0.02 and 1.8 ppm[1].

[1]Carson, B. L., Beall, C. M., Ellis, H. V., Baker, L. H. and Herndon, B. L., Acrolein Health Effects. U. S. Environmental Protection Agency (US EPA), EPA-460/3-81-034, NTIS PB82-161282, 1-121, September 1981.

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

BAKER HUGHES

Baker Petrolite

MAGNACIDE® H HERBICIDE (Acrolein, Inhibited)

CONTENTS UNDER PRESSURE

DANGER POISON

KEEP OUT OF REACH OF CHILDREN

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

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

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

PRECAUTIONARY STATEMENTS
HAZARDS TO HUMANS AND DOMESTIC ANIMALS

DANGER

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

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

ENVIRONMENTAL HAZARDS

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

PHYSICAL AND CHEMICAL HAZARDS

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

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

FIRST AID

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

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

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

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

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

NOTE TO PHYSICIAN

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

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

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

DIRECTIONS FOR USE

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

STORAGE AND DISPOSAL

STORAGE OF MAGNACIDE® H HERBICIDE TANKS

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

DISPOSAL

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

NOTICE OF WARRANTY

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

NET WEIGHTS

Cylinder-370 lbs. Skid Tank-2450 lbs.

Acrolein, Inhibited, 6.1, (3), UN 1092, PG 1, Toxic-Inhalation Hazard, Zone A, Marine Pollutant, RQ

RC 0601

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

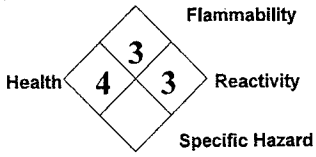
BAKER HUGHES
Baker Petrolite

Material Safety Data Sheet

Section 1. Chemical Product and Company Identification

Product Name	**MAGNACIDE® H HERBICIDE**	**Code**	XCH
Supplier	Baker Petrolite A Baker Hughes Company 12645 W. Airport Blvd. (77478) P.O. Box 5050 Sugar Land, TX 77487-5050 For Product Information/MSDSs Call: 800-231-3606 (8:00 a.m. - 5:00 p.m. cst, Monday - Friday) 281-276-5400	**Version**	5.0
Material Uses	Herbicide	**Effective Date**	**5/6/2003**
24 Hour Emergency Numbers	CHEMTREC 800-424-9300 (U.S. 24 hour) Baker Petrolite 800-231-3606 (North America 24 hour) CANUTEC 613-996-6666 (Canada 24 hours) CHEMTREC Int'l 01-703-527-3887 (International 24 hour)	**Print Date**	5/6/2003

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



Section 2. Composition and Information on Ingredients

Name	CAS #	% by Weight	Exposure Limits
1) Acrolein	107-02-8	92-98	CEIL: 0.1 (ppm) from ACGIH (TLV) SKIN TWA: 0.1 STEL: 0.3 (ppm) from OSHA (PEL) TWA: 0.25 STEL: 0.8 (mg/m^3) from OSHA (PEL)
2) Acetaldehyde	75-07-0	0.1-1	CEIL: 45 (mg/m^3) from ACGIH (TLV) CEIL: 25 (ppm) from ACGIH (TLV) TWA: 100 STEL: 150 (ppm) from OSHA (PEL) TWA: 180 STEL: 270 (mg/m^3) from OSHA (PEL)

The STEL of 0.3 ppm for acrolein was vacated.

Section 3. Hazards Identification

Physical State and Appearance	State: Liquid., Color: Colorless to light yellow., Odor: Aldehyde like.
CERCLA Reportable Quantity	Acrolein 0.15 gal.
Hazard Summary	DANGER. May cause chronic effects. Flammable liquid. Vapors can form an ignitable or explosive mixture with air. Can form explosive mixtures at temperatures at or above the flash point. Vapors can flow along surfaces to a distant ignition source and flash back. Static discharges can cause ignition or explosion when container is not bonded. May be toxic by skin absorption. May be highly toxic if inhaled.
Routes of Exposure	Skin (Permeator), Skin (Contact), Eyes, Inhalation.
Potential Acute Health Effects	

Eyes May be severely irritating to the eyes. Prolonged contact may cause burns.

Skin May be severely irritating to the skin. May cause burns on prolonged contact. May be toxic if absorbed through the skin.

Inhalation May be highly toxic if inhaled.

Ingestion Not considered a likely route of exposure, however, may be toxic if swallowed.

Continued on Next Page

Medical Conditions aggravated by Exposure	Exposure to this product may aggravate medical conditions involving the following: cardiovascular system, respiratory tract, skin/epithelium, eyes.
See Toxicological Information (section 11)	
Additional Hazard Identification Remarks	May be toxic if ingested.

Section 4. First Aid Measures

Eye Contact	Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.
Skin Contact	Remove contaminated clothing and shoes immediately. Wash affected area with soap and mild detergent and large amounts of water until no evidence of chemical remains (approximately 15-20 minutes). Get medical attention immediately.
Inhalation	Remove to fresh air. Oxygen may be administered if breathing is difficult. If not breathing, administer artificial respiration and seek medical attention. Get medical attention if symptoms appear.
Ingestion	Get medical attention immediately. If swallowed, do not induce vomiting unless directed to do so by medical personnel. Wash out mouth with water if person is conscious. Never induce vomiting or give anything by mouth to a victim who is unconscious or having convulsions.
Notes to Physician	Not available.
Additional First Aid Remarks	Persons exposed to vapors may have a delayed reaction and experience severe irritation of the respiratory tract and delayed pulmonary edema. Therefore, it is advisable to keep person exposed to high concentrations of vapor under observation for 24 hours following exposure If fully conscious promptly drink one to two glasses of water. Get immediate medical attention. Probable mucosal damage may contraindicate the use of gastric lavage. Measures against circulatory shock, respiratory depression, and convulsion may be needed.

Section 5. Fire Fighting Measures

Flammability of the Product	Flammable liquid. Vapors can form an ignitable or explosive mixture with air. Can form explosive mixtures at temperatures at or above the flash point. Vapors can flow along surfaces to a distant ignition source and flash back. Static discharges can cause ignition or explosion when container is not bonded.
OSHA Flammability Class	IB
Autoignition temperature	220°C (428°F)
Flash Points	CLOSED CUP: -25°C (-13°F). (TCC)
Flammable Limits	L.E.L. 2.8% U.E.L. 31%
Products of Combustion	These products are carbon oxides (CO, CO2) Peroxides..
Fire Hazards in Presence of Various Substances	Open Flames/Sparks/Static. Heat.
Fire Fighting Media and Instructions	In case of fire, use foam, dry chemicals, or CO2 fire extinguishers. Evacuate area and fight fire from a safe distance. Water spray may be used to keep fire-exposed containers cool. Keep water run off out of sewers and public water ways. Note that flammable vapors may form an ignitable mixture with air. Vapors may travel considerable distances and flash back if ignited.
Protective Clothing (Fire)	Do not enter fire area without proper personal protective equipment, including NIOSH approved self-contained breathing apparatus.
Special Remarks on Fire Hazards	Fumes are toxic. For additional information see MAGNACIDE H Application and Safety Manual.

Continued on Next Page

Section 6. Accidental Release Measures

Spill	Put on appropriate personal protective equipment. Keep personnel removed and upwind of spill. Shut off all ignition sources; no flares, smoking, or flames in hazard area. Approach release from upwind. Shut off leak if it can be done safely. Contain spilled material. Keep out of waterways. Dike large spills and use a non-sparking or explosion proof means to transfer material to an appropriate container for disposal. For small spills add absorbent (soil may be used in the absence of other suitable materials) scoop up material and place in a sealed, liquid-proof container. Note that flammable vapors may form an ignitable mixture with air. Vapors may travel considerable distances from spill and flash back, if ignited. Waste must be disposed of in accordance with federal, state and local environmental control regulations.
Other Statements	If RQ (Reportable Quantity) is exceeded, report to National Spill Response Office at 1-800-424-8802.
Additional Accidental Release Measures Remarks	Not available.

Section 7. Handling and Storage

Handling and Storage	Put on appropriate personal protective equipment. Avoid contact with eyes, skin, and clothing. Avoid breathing vapors or spray mists. Use only with adequate ventilation. Store in a secure and well ventilated area, away from all other chemicals. Keep away from heat, sparks and flame. Keep away from incompatibles. Keep container tightly closed and dry. To avoid fire or explosion, ground container equipment and personnel before handling product.
Additional Handling and Storage Remarks	Do not reuse empty container. Return empty containers to Baker Petrolite Corporation.

Section 8. Exposure Controls/Personal Protection

Engineering Controls Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors or particles below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection

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

Eyes	Chemical safety goggles. Safety glasses sufficient when handling sealed containers.
Body	Wear long sleeves to prevent repeated or prolonged skin contact.
Respiratory	Respirator use is not expected to be necessary under normal conditions of use. In poorly ventilated areas, emergency situations or if exposure levels are exceeded, use NIOSH approved full face respirator.
Hands	Chemical resistant gloves. (See other information below)
Feet	Chemical resistant boots or overshoes.
Other informatior	Suggested gloves are butyl rubber; replace as needed. As per NIOSH, full-facepiece air-purifying respirators may be worn to protect personnel up to 2 ppm (IDLH) acrolein. The air purifying respirators should have organic vapor cartridge(s) or canister and should have a protection factor of 50. Exposure levels of unknown concentrations or greater than 2 ppm acrolein require the use of full-facepiece positive pressure supplied-air breathing apparatus with a protection factor of 10,000.

Protective Clothing (Pictograms)

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

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Section 9. Typical Physical and Chemical Properties

Physical State and Appearance	Liquid.	**Odor**	Aldehyde like.
pH	Not available.	**Color**	Colorless to light yellow.
Specific gravity	0.85 @ 16°C (60°F)		
Density	7.1 lbs/gal @ 16°C (60°F)		
Vapor Density	>1.93 (Air = 1)		
Vapor Pressure	234.9 mm of Hg @ 22C		
Evaporation Rate	>1 (compared to Ether (anhydrous)).		
VOC	Not available.		
Viscosity	0.329 cps @ 20°C (68°F)		
Pour Point	-124°F (punto de congelación)		
Solubility (Water)	Soluble (22% by weight @ 20°C)		
Boiling Point	53°C (127°F)		
Physical Chemical Comments	Not available.		

Section 10. Stability and Reactivity

Stability and Reactivity	The product is stable.
Conditions of Instability	This product is stable unless there is loss of inhibitor.
Incompatibility with Various Substances	Oxidizing material. Concentrated Mineral Acids. Alkali. Amines. Sulfur dioxide. Thiourea. Metal Salts. Water contamination of storage tanks. Light.
Hazardous Decomposition Products	Carbon oxides; and/or peroxides
Hazardous Polymerization	Hazardous polymerization may occur.
Special Stability & Reactivity Remarks	Loss of inhibitor may result in polymerization reaction under certain conditions.

Section 11. Toxicological Information

Component Toxicological Information

Acute Animal Toxicity

1) Acrolein	ORAL (LD50): Acute: 29 mg/kg [Rat]. 11.8 mg/kg [Female rat]. 10.3 mg/kg [Male rat]. DERMAL (LD50): Acute: 200 mg/kg [Rabbit]. VAPOR (LC50): Acute: 26 ppm 1 hours [Rat]. 8.3 ppm 4 hours [Rat].
2) Acetaldehyde	ORAL (LD50): Acute: 661 mg/kg [Rat]. DERMAL (LD50): Acute: 3540 mg/kg [Rabbit].

Chronic Toxicity Data

1) Acrolein

Acrolein is a component of this product. The one major health effect in humans resulting from chronic exposure is the development of permanent lung damage in the from of decreased pulmonary (lung) function, and delayed pulmonary edema (fluid in the lungs) which can lead to chronic respiratory disease.

Chronic exposure to low concentrations of acrolein may be accompanied by tolerance (Clayton & Clayton, 1993). Acrolein can cause allergies, including skin rash, hives (NIOSH/OSHA), and asthma (HSDB) characterized by delayed hypersensitivity (RTECS). Levels of 0.4 to 4.9 ppm caused eye and nose irritation and structural changes in the respiratory system of hamsters, rats and rabbits (Feron et al, 1978). Acrolein produced greater susceptibility to respiratory infections in mice (Jakab, 1977) and rats (Bouley et al, 1975).

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Acrolein has been reported to induce a variety of genetic changes, including mutations in the Ames Salmonella/microsome assay, DNA damage and inhibition of DNA repair, and sister chromatid exchanges in hamster cells. As is common with volatile substances, some disagreement exists in the literature over its genotoxic potency. At least three studies have reported it to be mutagenic in the Ames test (Lijinsky & Andrews, 1980; Schiffmann et al, 1983; Bignami et al, 1977), one study found no activity (Rosen et al, 1980), and one reported it to be weakly positive (Hales, 1982). Volatile substances may not be detected as mutagens in the Ames test and other genetic assays unless they are tested in the volatile state using special modifications.

Acrolein has induced sex-linked recessive lethal mutations in Drosophila melanogaster. It appears to be transformed to inactive forms by phenobarbital-induced cytochrome P450 and/or glutathione conjugation (Barros et al, 1994).

2) Acetaldehyde

Acetaldehyde is a component of this product. Acetaldehyde is a metabolite of ethanol in humans and has been implicated as the active agent damaging mitochondrial respiration in ethanol-induced liver disease (Barry & McGivan, 1985; von Wartburg, 1987). Symptoms of chronic acetaldehyde exposure resemble those of chronic alcoholism. In experimental animals, chronic exposure has caused growth retardation, upper respiratory tract irritation, mild anemia, increased urinary glutamic-oxaloacetic transaminase (SGOT/AST) activity, increased urinary protein content, increased kidney weights (without renal pathology), and histopathological changes (the study of abnormal or diseased tissue) in the nasal mucosa and trachea (including hyperplasia (an increase in the number of cells in a tissue or organ, excluding tumors), squamous metaplasia (the changing of glandular or mucosal epitheleum into stratified spuamous epithelium), and inflammation) (ACGIH, 1991; Hathaway et al, 1991).

Acetaldehyde has produced respiratory tract tumors in rats and hamsters, including nasal mucosa adenocarcinomas (malignant abnormal growth of tissue or cells) and squamous cell carcinomas (Hathaway et al, 1991; ACGIH,1991; HSDB, 1996; RTECS, 1996). NIOSH regards acetaldehyde as a potential occupational carcinogen (NIOSH, 1996). The IARC has classified acetaldehyde in Group 2B (inadequate evidence of carcinogenicity in humans, sufficient evidence of carcinogenicity in animals, possibly carcinogenic to humans (HSDB, 1996). NTP classifies acetaldehyde as a suspect carcinogen, and OSHA classifies it as a possible select carcinogen based on IARC's data. Acetaldehyde is listed in Group A3 (animal carcinogen) by the ACGIH (ACGIH, 1996).

As a reactive aldehyde, acetaldehyde has been genotoxic in a variety of short-term genetic tests. Both single- and double-strand DNA breaks have been detected in human lymphocytes incubated with acetaldehyde (Singh & Khan, 1995). Acetaldehyde has induced DNA cross-linking in Chinese hamster ovary cells, DNA repair in E. coli, DNA inhibition in cultured human cells, and DNA damage in rats in vitro and in vivo (HSDB, 1996; RTECS, 1996). Acetaldehyde was mutagenic in human and rat cells (RTECS, 1996). Acetaldehyde induced chromosome aberrations in Chinese hamster ovary cells and in cultured human leukocytes (Dulout & Furnus, 1988; HSDB, 1996; RTECS, 1996). Acetaldehyde induced sister chromatic exchanges in mice and hamsters in vivo and in human lymphocytes in vitro (Norppa et al, 1985). The genotoxicity of acetaldehyde has been reviewed (Dellarco, 1988).

Workplace exposure is thought to present no reproductive risk when occupational exposure guidelines are followed and no maternal toxicity exists (AMA, 1985). Fetal alcohol syndrome (FAS) is known to be caused by maternal ethanol (ethyl alcohol) consumption. Ethanol is a metabolic precursor of acetaldehyde. A fetal alcohol-like syndrome is thus theoretically possible with sufficient acetaldehyde exposure. In experimental animals, acetaldehyde was embryotoxic (increased resorptions), induced neural tube and musculoskeletal defects, and caused significant growth retardation (HSDB, 1996; RTECS, 1996). Acetaldehyde induced delayed ossification, wavy ribs, eye/ear defects, and craniofacial abnormalities in fetal rats (Fadel & Persaud, 1990; Sreenathan et al, 1984; ACGIH, 1991; HSDB, 1996; RTECS, 1996). Pregnant rats administered 240 mg/kg of acetaldehyde throughout gestation produced offspring with lower body weights and immature and hemorrhagic visceri (Imai & Omato, 1992; HSDB, 1996). A slight increase in fetal defects was seen in the offspring of mice administered 4 percent acetaldehyde intraperitoneally as a single dose on days 7 through 10 of gestation (Webster et al, 1983). Acetaldehyde was 100 percent embryolethal to explanted rat embryos when added to the culture medium at a concentration of 20 mcg/dL and caused growth retardation and teratogenic effects at a concentration of 10 mcg/dL (Giavini et al, 1991, 1992).

Product Toxicological Information

Acute Animal Toxicity	ORAL (LD50): Acute: 29 mg/kg [Rat]. 11.8 mg/kg [Female rat]. 10.3 mg/kg [Male rat]. VAPOR (LC50): Acute: 26 ppm 1 hours [Rat]. 8.3 ppm 4 hours [Rat].
Target Organs	cardiovascular system, respiratory tract, skin/epithelium, eyes.
Other Adverse Effects	Irritation - Draize Test (Rabbit) Skin - 2 mg/24H: Severe Eye - 50 ug/24H: Severe Skin - 15 ppm solution: Not irritating Acrolein has been tested for developmental, reproductive and chronic health effects. Results from developmental studies (Ref.1,2) indicated this material did not cause teratogenic effects in rats or rabbits at doses that caused maternal toxicity. A two-generation reproductive study (Ref. 3) in rats did not reveal any evidence of reproductive toxicity in either sex from any treatment group (maximum dose = 7.2 mg/kg). A second two-generation reproductive study in rats (Ref. 7) also did not reveal any evidence of reproductive toxicity in either sex from any treatment group (maximum dose = 6 mg/kg). Rats dosed orally at 6 mg/kg/day for two generations demonstrated significant increases in deaths and or moribund

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(at the point of death) sacrifices of males and females in both generations. Doses of 3 mg/kg/day increased the number of these incidents in the F1 generation of male and female rats. No other significant reproductive effects were observed (Ref. 7).

In a 12-month chronic toxicity test in dogs (Ref.4), the highest dose (2 mg/kg) tested resulted in changes in blood chemistry, but no compound-related tumors or lesions were observed. An 18-month oncogenicity study in the mouse (Ref.5) did not reveal any compound-related tumors or lesions; the highest dose tested (4.5 mg/kg) resulted in increased mortality in the test group. A 24-month chronic toxicity/oncogenicity study in the rat (Ref.6) also did not reveal any compound related tumors or lesions. The high dose, 2.5 mg/kg caused an increased mortality in the test group. No indications of cancer were found in any of the chronic tests.

Metabolism Data

Metabolism studies in freshwater fish, shell fish, goats, hens, rats and leaf lettuce indicate that acrolein is metabolized and does not accumulate in the tissue. (Ref. 8 - 11)

Aquatic Toxicity Data

Holmesimysis costata 96H LC50: 0.67 mg/l
Bluegill 96 LC50: 24 ppb
Rainbow trout 96H LC50: 24 ppb
Daphnia magna 48H LC50: 22 ppb
Eastern oysters 96H EC50: 0.18 ppm
Mysid shrimp 96H EC50: 0.5 ppm
Sheephead minnows 96H EC50: 0.57 ppm

Section 12. Ecological Information

Ecotoxicity	Not available.
BOD5 and COD	Not available.
Biodegradable/OECD	Not available.
Toxicity of the Products of Biodegradation	Not available.
Special Remarks	Not available.

Section 13. Disposal Considerations

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

Additional Waste Remarks Not available.

Section 14. Transport Information

DOT Classification	Acrolein, stabilized, 6.1(3), UN1092, I, Toxic-Inhalation Hazard, Zone A, RQ, Marine Pollutant	
DOT Reportable Quantity	Acrolein 0.15 gal.	
Marine Pollutant	Acrolein.	

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Additional DOT information	DOT-E 10705 (DOT-E 10705 applies only to mixed loads) DOT-E 13144 (DOT-E 13144 applies only to 4BW welded cylinders.)
Emergency Response Guide Page Number	131P

Section 15. Regulatory Information

HCS Classification	Target Organ Effects. Flammable liquid. Vapors can form an ignitable or explosive mixture with air. Can form explosive mixtures at temperatures at or above the flash point. Vapors can flow along surfaces to a distant ignition source and flash back. Static discharges can cause ignition or explosion when container is not bonded. Toxic.
U.S. Federal Regulations	
Environmental Regulations	Extremely Hazardous Substances: Acrolein; SARA 313 Toxic Chemical Notification and Release Reporting: Acrolein; Acetaldehyde; SARA 302/304 Emergency Planning and Notification substances: Not applicable to any components in this product. Hazardous Substances (CERCLA 302): Acrolein 0.15 gal.; SARA 311/312 MSDS distribution - chemical inventory - hazard identification: fire; Reactive; immediate health hazard; Clean Water Act (CWA) 307 Priority Pollutants: Acrolein; Clean Water Act (CWA) 311 Hazardous Substances: Acrolein; Acetaldehyde; Clean Air Act (CAA) 112(r) Accidental Release Prevention Substances: Acrolein; Acetaldehyde;
Threshold Planning Quantity (TPQ)	Acrolein 74 gal.
TSCA Inventory Status	All components are included or are exempted from listing on the US Toxic Substances Control Act Inventory. This product contains the following components that are subject to the reporting requirements of TSCA Section 12(b) if exported from the United States: Hydroquinone; Acetone.
State Regulations	State specific information is available upon request from Baker Petrolite.
International Regulations	
Canada	All components are compliant with or are exempted from listing on the Canadian Domestic Substance List.
WHMIS (Canada)	B-2, D-1A, E
European Union	All components are included or are exempted from listing on the European Inventory of Existing Commercial Chemical Substances or the European List of Notified Chemical Substances.
	International inventory status information is available upon request from Baker Petrolite for the following countries: Australia, and Australia (NICNAS), China, Korea (TCCL), Philippines (RA6969), or Japan.
Harmonized Tariff Code	Not available.
Other Regulatory Information	This product is subject to regulation under the US Federal Insecticide, Fungicide and Rodenticide ACT (FIFRA) and is therefore exempt from US Toxic Substance Control Act (TSCA) Inventory listing requirements. EPA Registration No. 10707-9

Section 16. Other Information

Other Special Considerations

References:

1. Parent, Richard A., Halina E. Caravello, Mildred S. Christian, and Alan M. Hoberman. Developmental Toxicity of Acrolein in New Zealand White Rabbits. Fundamental and Applied Toxicology. 20, 248-256 (1993).
2. Parent, Richard A., Halina E. Caravello, Marilyn F. Balmer, Thomas E. Shellenberger, and James E. Long. One-year Toxicity of Orally Administered Acrolein to the Beagle Dog. Journal of Applied Toxicology, Vol 12(5), 311-316 (1992).
3. Parent, Richard A., Halina E. Caravello and James E. Long. Two-year Toxicity and Carcinogenicity Study of Acrolein in Rats. Journal of Applied Toxicology, Vol. 12(5), 131-139 (1992).
4. Parent, Richard A., Halina E. Caravello, and Alan M. Hoberman. Reproductive Study of Acrolein on Two Generations of Rats. Fundamental and Applied Toxicology. 19, 228-237 (1992).
5. Parent, Richard A., Halina E. Caravello, and James E. Long, Oncogenicity Study of Acrolein in Mice. Journal of the American College of Toxicology. 10(6), 647-659 (1991).
6. Smith, Ann M., Rebecca A. Doane, and Martin F. Kovacs, Jr. Metabolic Fate of [Carbon-14]Acrolein under

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7. Reproductive Effects of Acrolein Administered Orally via Gavage to Crl: CD(SD)BR Rats for Two Generations, 1991.
8. 14C-Acrolein: Nature and Magnitude of Residues Using Freshwater Fish and Sun Fish, 1994.
9. 14C-Acrolein: Accumulation and Metabolism in Leaf Lettuce (Crop Tolerance), 1995.
10. Nature of Residue in Livestock (Lactating Goats and Laying Hens), 1996.
11. Rat Metabolism, 1994.

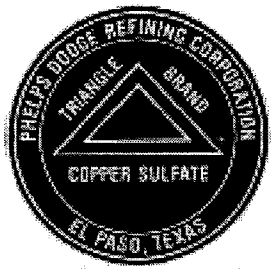
10/07/02 - Update to Section 3
10/31/02 - Update to Section 14
11/06/02 - Update to sections 5, 8, 14, and 15 (Canada)
04/29/03 - Update to Section 2
05/05/03 - Update to Section 7

Baker Petrolite Disclaimer

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

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

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



TRIANGLE BRAND COPPER SULFATE CRYSTAL

Not for medicinal use

ACTIVE INGREDIENT:	
Copper sulfate pentahydrate*	99.0%
INERT INGREDIENTS:	1.0%
TOTAL	100.0%

*Metallic copper equivalent 25.2%

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.)

Information for Right-to-Know States:
Copper sulfate pentahydrate/CAS Reg. No. 7758-99-8: sulfuric acid, copper (2+) salt (1:1)/ CAS Reg. No. 7758-98-7; Water/CAS Reg. No. 7732-18-5

STATEMENT OF PRACTICAL TREATMENT

IF SWALLOWED: Drink promptly a large quantity of milk, egg white, gelatin solution, or if these are not available, large quantities of water. Avoid alcohol. Do not give anything by mouth to an unconscious person.
NOTE TO PHYSICIAN: Probable mucosal damage may contraindicate the use of gastric lavage. Measures against circulatory shock, respiratory depression and convulsions may be needed.
IF IN EYES: Immediately flush eyes with plenty of water for at least 15 minutes and get medical attention.
IF ON SKIN: Remove contaminated clothes and shoes; immediately wash skin with soap and plenty of water and get medical attention.

See side panel for additional precautionary statements.

EPA Reg. No. 1278-8 **EPA Est. No. 1278-TX-1**

Manufactured by
Phelps Dodge Refining Corporation
El Paso, Texas 79998

Net Weight
50 Lbs./22.68 Kg.

PRECAUTIONARY STATEMENTS

DANGER

HAZARDS TO HUMANS AND DOMESTIC ANIMALS

Causes severe eye and skin irritation. Harmful if swallowed or absorbed through the skin. Avoid breathing mist or dust and contact with skin, eyes, or clothing. Causes substantial but temporary eye injury. May cause skin sensitization reactions in certain individuals.

PERSONAL PROTECTIVE EQUIPMENT

Applicators and other handlers must wear long-sleeved shirt and long pants, waterproof gloves, shoes plus socks, and protective eyewear. Discard clothing and other absorbent materials that have been drenched or heavily contaminated with product's concentrate. Do not reuse them. Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

USER SAFETY RECOMMENDATIONS

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

ENVIRONMENTAL HAZARDS

This pesticide is toxic to fish and aquatic organisms. For terrestrial uses, do not apply directly to water, or to areas where surface water is present or to intertidal areas below the mean high water mark. Drift and runoff from treated areas may be hazardous to fish and aquatic organisms in adjacent sites. 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 to avoid depletion of oxygen levels due to decaying vegetation. Allow one to two weeks between treatments for oxygen levels to recover.

Trout and other species of fish may be killed at application rates recommended on this label, especially in soft or acid waters. However, fish toxicity generally decreases when the hardness of water increases. Do not contaminate water when disposing of equipment washwaters. Consult your State Fish and Game Agency before applying this product to public waters. Permits may be required before treating such waters.

STORAGE AND DISPOSAL

STORAGE

Do not contaminate water, food, or feed by storage or disposal. Store unused product in original container only in a cool, dry area out of reach of children and animals. If container or bag is damaged, place the container or bag in a plastic bag. Shovel any spills into plastic bags and seal with tape.

DISPOSAL

PESTICIDE DISPOSAL: Pesticide wastes are acutely hazardous. Improper disposal of 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 dumping is prohibited.
CONTAINER DISPOSAL: Do not reuse empty container. Completely empty container by shaking and tapping sides and bottom to loosen clinging particles. Place the pesticide into application equipment. Then dispose of container in a sanitary landfill or by incineration if allowed by State and local authorities. If burned, stay out of smoke.

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 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, forest, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment(PPE) and restricted-entry interval. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.
Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 24 hours.
PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil, or water, is coveralls, waterproof gloves, shoes plus socks, and protective eyewear.

NON-AGRICULTURAL USE REQUIREMENTS

The requirements in this box apply to uses of this product that are NOT within the scope of the Worker Protection Standard for agricultural pesticides (40 CFR Part 170). The WPS applies when this product is used to produce agricultural plants on farms, forests, nurseries, or greenhouses.
Protective clothing, including goggles, should be worn.

FORMULATION OF PESTICIDES

This product is suitable for use in the manufacturing of algaecides, fungicides, mildewcides, herbicides, wood preservatives, including CCA, ACA, and ACZA compounds and tanning and preserving agents for leather and hides.

It is the responsibility of formulators using this product to register all pesticidal formulations made from it with the EPA.

CONTROL OF ALGAE AND TADPOLE SHRIMP (TRIOPS LONGICAUDATUS) IN RICE FIELDS (DOMESTIC AND WILD)

Tadpole shrimp in rice fields may be effectively controlled by the prompt and proper use of Copper Sulfate Crystal. After the rice field has been flooded to a depth of 6 to 8 inches, the Copper Sulfate Crystal should be uniformly applied at a rate of 10 to 15 pounds per acre at the first sign of infestation. Following these directions carefully should keep the concentration of copper sulfate less than 10 ppm. The "Diamond" size crystals are especially graded for maximum solubility.

POTATOES (Except California)

To enhance vine-kill and suppress late blight, apply 10 lbs. per acre in 10 to 100 gallons of water (ground equipment) or in 5 to 10 gallons (aerial equipment) with Diquat at vine-kill to enhance vine desiccation and suppress late blight. Additional applications can be made with Diquat if needed within 7 days of harvest. Triangle Brand Copper Sulfate Crystal 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.

SEWER TREATMENT FOR ROOT AND FUNGUS CONTROL*

Copper Sulfate Crystal is effective in keeping sewer lines free of roots.

FOR PARTIAL STOPPAGE: Add 1/2 pound of Copper Sulfate Crystal to sewer or drain and flush toward blockage with 5 gallons of water. Repeat at 6 month intervals to prevent growth of new roots.

FOR COMPLETE STOPPAGE: Physically remove the root blockage and repeat as above.

FOR HOUSEHOLD SEWERS: Use 2 to 6 lbs. Copper Sulfate Small Crystal twice yearly in spring and early fall. Apply in toilet bowl near sewer line. Flush 1/2 lb. portions at a time. Or, remove the clean-out plug and pour entire quantity directly into sewer line and flush with water. **Do not use in septic tank systems.**

FOR COMMERCIAL, INSTITUTIONAL AND MUNICIPAL USE

SEWERS: Use 2 lbs. of Copper Sulfate Small Crystal each 6 to 12 months, applied to each junction or terminal manhole.

STORM DRAINS: Use 2 lbs. of Copper Sulfate Small Crystal per drain per year. Apply during period of light flow. In dry weather, induce a flow with hose. If storm drains become almost plugged, repeat treatment 3 or 4 times at two week intervals.

SEWER PUMPS AND FORCE MAINS: Place 2 lbs. of Copper Sulfate Small Crystal in a cloth bag at the storage wall inlet. Repeat as needed.

***State laws prohibit the use of this product in sewage systems in Connecticut and in the following nine counties in California: Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma.**

CONTROLLING WEEDS, ALGAE, AND MICROSCOPIC ORGANISMS IN IMPOUNDED WATERS, LAKES, PONDS, AND RESERVOIRS

It is a violation of New York State Law for anyone to apply this product to surface waters unless he is either privately or commercially certified in category 5 (aquatic), or possesses a purchase permit for the specific application proposed.

PRECAUTION CONCERNING FISH: The treatment of algae with Copper Sulfate Crystal can result in oxygen loss in the water from decomposition of dead algae. This can cause the fish to suffocate. Care should be taken when water temperature exceeds 85°F. At this water temperature, aquatic plants treated with copper sulfate decompose rapidly causing an increase in oxygen depletion. Therefore, to minimize this hazard, treat 1/3 to 1/2 of the water area in a single operation. Wait 7 to 14 days between treatments. Begin treatments along the shore and proceed outwards in bands to allow fish to move into untreated water.

APPLICATION BY DRAGGING COPPER SULFATE CRYSTAL UNDER WATER: Large or small sized Copper Sulfate Crystal is placed in burlap bags or baskets and dragged through the water by means of a boat. Begin treatment along the shoreline and proceed outward until 1/3 to 1/2 of the total area has been treated. The path of the boat should insure a distribution that is even. In large lakes, the boat should move in parallel lines about 60 feet apart. Continue dragging until all of the weighed Copper Sulfate Crystal is dissolved.

APPLICATION BY SPRAYING COPPER SULFATE SOLUTION ON WATER SURFACE: A solution can be made with Copper Sulfate Powder or Fine Crystal which dissolve easily in water. This solution can then be sprayed on the pond or lake surface from a boat. When using this method, the wind direction is important as well as the operation of the boat. Do not endanger people or animals in the boat with the copper sulfate spray.

APPLICATION BY INJECTING COPPER SULFATE SOLUTION IN WATER: A solution can be made with Copper Sulfate Powder or Crystal. This solution can then be injected into the water via a piping system.

APPLICATION BY BROADCASTING DRY COPPER SULFATE CRYSTAL: Crystals may be broadcast directly on the water surface from the shore or from a properly equipped boat. Triangle Brand Crystals ranging from $\pm$10 mesh to $\pm$1/2 inch are preferred for this method of application. A specifically equipped air blower can be used to discharge these size crystals at a specific rate over the surface of the water. When using this method, the wind direction is an important factor. Do not use this method unless completely familiar with this type of application.

APPLICATION BY SPRAYING DRY COPPER SULFATE CRYSTAL FROM AIRPLANES AND HELICOPTERS: Professional personnel licensed by the State Agricultural Extension Service are allowed to apply Copper Sulfate Crystal in some states.

If treated water is to be used as a source of potable water, the metallic residual must not exceed 1 ppm copper. This equals 10.64 pounds per acre foot of water or 4 ppm of this product.

HOW TO FIND THE POUNDS OF COPPER SULFATE TO ADD TO WATER

To find acre-feet of water in a body of water, measure the body of water in feet. Calculate the surface area in square feet, divided by 43,560 (sq. ft./acre) times the average depth in feet.

1 acre-foot of water = Water measuring 208.7 ft. long by 208.7 ft. wide by 1 ft. deep.
1 acre-foot of water = 43,560 cubic feet of water.
1 cubic foot of water = 62.4 pounds.
1 acre-foot of water = (43,560)(62.4) = 2,720,000 pounds.

COPPER SULFATE PENTAHYDRATE IN WATER

POUNDS OF COPPER SULFATE CRYSTAL PER ACRE-FOOT OF WATER	=	PARTS (BY WEIGHT) COPPER SULFATE CRYSTAL PER MILLION PARTS (BY WEIGHT) OF WATER	=	PARTS (BY WEIGHT) COPPER PER MILLION PARTS (BY WEIGHT) OF WATER
0.67#/acre-foot	=	1/4 ppm	=	0.0625 ppm
1.3#/acre-foot	=	1/2 ppm	=	0.125 ppm
2.6#/acre-foot	=	1 ppm	=	0.25 ppm
5.32#/acre-foot	=	2 ppm	=	0.50 ppm

TREATMENT OF SOME ALGAE WITH COPPER SULFATE CRYSTAL

Dosage is in ppm of Copper Sulfate Crystal. A higher concentration is required if the water is hard. Consult with the State Fish and Game Agency before applying product in municipal waters.

0.25 to 0.50 ppm	0.50 to 1.00 ppm	1.00 to 1.50 ppm	1.50 to 2 ppm
CYANOPHYCEAE ORGANISM (BLUE GREEN)			
Anabaena	Cylindrospermum	Nostoc	Calothrix
Anacystis	Oscillatoria	Phormidium	Symploca
Aphanizomenon	Plectonema		
Gloeotrichia			
Gomphosphaeria			
Polycystis			
Rivularia			
CHLOROPHYCEAE ORGANISM (GREEN)			
Closterium	Botryococcus	Chlorella	Ankistrodemus
Hydrodictyon	Cladophora	Crucigenia	Chara*
Spirogyra	Coelastrum	Desmidium*	Nitella*
Ulothrix	Draparnaldia	Golenkinia	Scenedesmus
	Enteromorpha	Oocystis	
	Gloeocystis	Palmella	
	Microspora	Pithophora*	
	Tribonema	Staurastrum	
	Zygnema	Tetraedron	
DIATOMACEAE ORGANISM (DIATOMS)			
Asterionella	Gomphonema	Achnanthes	
Fragilaria	Nitzschia	Cymbella	
Melorias*	Stephanodiscus	Neidium	
Navicula	Synedra		
	Tabellaria		
PROTOZOA ORGANISM (FLAGELLATES)			
Dinobryon	Ceratium	Chlamydomonas	Eudorina*
Synura	Cryptomonas	Hawmatococcus*	Pandorina*
Uroglena*	Euglena	Peridinium	
	Glenodinium		
	Mallomonas		

*Not for use in California.

CONTROL OF WEEDS AND ALGAE IN FLOWING WATER

Potamogeton pondweeds, leafy and sago, in irrigation conveyance systems: Use the continuous application method, selecting proper equipment to supply Copper Sulfate Crystal at 0.25 to 0.5 pounds per hour for each cubic foot per second of flow for 12 hours of each 24 hours. For best control, begin copper sulfate additions when water is first turned into system to be treated and continue throughout the irrigation season. Copper Sulfate Crystal becomes less effective for mature plants. Copper Sulfate Crystal becomes less effective as the bicarbonate alkalinity increases and is substantially reduced above 150 ppm as $CaCO_3$. Mechanical or other means may then be required to remove excess growth.

Algae (such as filamentous green, pigmented flagellates, diatoms) in irrigation conveyance systems: Begin continuous addition when water is first turned on, using suitable equipment to uniformly deliver 0.1 to 0.2 pounds of Copper Sulfate Crystal per hour per cubic foot per second of flow for 12 of each 24 hours. (Note: Copper Sulfate Crystal comes in several "free flowing" crystal sizes but should be selected to match requirements of your feeder.)

Algae and weeds in irrigation systems by "slug" method of addition: Make a dump of Copper Sulfate Crystal into the irrigation ditch or lateral at 1/2 to 2 pounds per second of water per treatment. Repeat about every 2 weeks as needed. A dump is usually necessary every 5 to 30 miles depending on water hardness, alkalinity and algae concentration.

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 Crystal in 60,000 gals. (8,000 cu. ft.) of effluent to yield 1 ppm of dissolved copper. Dosage levels may vary depending upon organic load.

Other Organic Sludges: Copper Sulfate Crystal solution must be thoroughly mixed with sludge. Dissolve 2 lbs. in 1-2 gals. of water and apply to each 30,000 gals. of sludge.

Useful formulas for calculating water volume and flow rates: Multiply the water volume in cu. ft. times 7.5 to obtain gallons.

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

NOTICE TO BUYER

Seller makes no warranty, expressed or implied, concerning the use of this product other than indicated on the label. Buyer assumes all risk of use and/or handling of this material when such use and/or handling is contrary to label instructions.

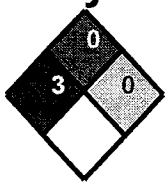
DOT Hazard Class
RQ, Environmentally Hazardous Substances,
Solid, n.o.s. (Cupric Sulfate) 9, UN 3077, III

NOTES TO THE FILE

June 14, 1999: Revised "slug" application method by Notification.

Copper Sulfate Pentahydrate

Date Prepared: April 11, 2000



NFPA RATING

HEALTH	3
FLAMMABILITY	0
REACTIVITY	0
PROTECTIVE EQUIPMENT	

HMIS RATING

MATERIAL SAFETY DATA SHEET

SECTION I. PRODUCT IDENTIFICATION

Product Name: Copper Sulfate Pentahydrate

Manufacturer/Vendor Information: PHELPS DODGE REFINING CORP.
P.O Box 20001
El Paso, Texas

24-Hour Emergency Phone: (800)424-9300
Chemtrec
Other Information Phone: (915)778-9881

SECTION II. COMPOSITION / INFORMATION ON INGREDIENTS

CAS No.	Chemical Name	Exposure Limits	% by wt.
7758-99-8	Copper sulfate pentahydrate ($CuSO_4 \cdot 5H_2O$), (Cupric sulfate), (Blue Vitriol), (Bluestone)	ACGIH TLV TWA: 1.0 mg/m^3 (as copper dust/mist) OSHA PEL TWA: 1.0 mg/m^3 (as copper dust/mist)	99
	Anhydrous Cupric Sulfate (CAS# 7758-98-7)	*Phelps Dodge Triangle Brand Copper Sulfate*	
		Copper Sulfate Pentahydrate (CAS 7758-99-8)	*=99%*
		Contains copper sulfate	*=63.3%*
		Contains water of crystallization	*=35.7%*
		Metallic copper equivalent	*=25.2%*

SECTION III. HAZARDS IDENTIFICATION

Emergency Overview: Odorless, transparent blue crystals, granules or powder. Can cause irreversible eye damage and severe skin irritation. Harmful if swallowed or absorbed through the skin. Avoid breathing mist or dust and contact with skin, eyes or clothing. May cause skin sensitization reactions in certain individuals.

Route(s) of Entry: Inhalation, eye, skin and ingestion.

Acute Exposure: Can cause skin, eye and respiratory irritation.

Chronic Exposure: Prolonged or repeated skin contact may cause dermatitis. Prolonged or repeated eye contact may cause conjunctivitis.

Carcinogenicity (NTP) (IARC) (OSHA): Not listed.

Eye: Can cause severe eye irritation and may result in irreversible eye damage.

Skin Contact: Can cause severe skin irritation. May cause localized discoloration of the skin.

Inhalation: Can result in irritation of the upper respiratory tract and in excessive quantities may cause ulceration and perforation of the nasal septum.

Ingestion: Can result in digestive tract irritation with abdominal pain.

SECTION IV. FIRST AID MEASURES

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes and get medical attention.

Skin: Remove contaminated clothes and shoes; immediately wash skin with soap and plenty of water and get medical attention.

Ingestion: Drink promptly a large quantity of milk, egg white, gelatin solution, or if they are not available, large quantities of water. Avoid alcohol. Do not give anything by mouth to an unconscious person.

Inhalation: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get immediate medical attention.

SECTION V. FIRE FIGHTING MEASURES

Flash Pt:	Not available
Flammable Limits in Air-Lower:	Not available
Flammable Limits in Air – Upper:	Not available
Auto Ignition Temperature:	Not available
Fire Fighting Extinguishing Media:	Does not burn or support combustion. Use extinguishing media appropriate for surrounding fire (CO_2, dry chemical or water).
Fire Fighting Equipment:	As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.
Fire Fighting Instructions:	Evacuate area and fight fire from a safe distance.
Fire and Explosion Hazards:	Sealed containers may rupture when heated due to release of water from crystals.
Unusual Hazards:	Material is acidic when dissolved in water, contact with magnesium metal may evolve hydrogen gas. Anhydrous cupric sulfate formed on water loss (white color). Anhydrous salt will ignite hydroxylamine, if present.

SECTION VI. ACCIDENTAL RELEASE MEASURES

Accidental Release Measures: Use clean-up methods that avoid dust generation (vacuum, wet). Wear a NIOSH or MSHA approved respirator if dust will be generated in clean-up. Use protective clothing if skin contact is likely. If spilled solution is in a confined area, introduce lime or soda ash to form insoluble copper salts and dispose of by approved method. Prevent accidental entry of solution into streams and other water bodies. Shovel any spills into plastic bags and seal with tape. Copper sulfate solution may deteriorate concrete.

SECTION VII. HANDLING AND STORAGE

Signal Word: Danger.

Handling Information: Avoid breathing dust or solution mist. Sweep up crystals or powder, vacuum is preferred. Eye wash stations should be available in work areas. Users should wash hands before eating, drinking, chewing gum, using tobacco or using the toilet. 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.

Storage Information: Store in closed containers in a cool, dry, well-ventilated area away from heat sources and reducing agents. Store copper sulfate in stainless steel, fiberglass, polypropylene, PVC's or plastic equipment. Keep away from galvanized pipe and nylon equipment. If container or bag is damaged, place the container or bag in a plastic bags. Use good housekeeping practices to prevent dust accumulation.

SECTION VIII. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering Controls: Use adequate general or local ventilation to keep airborne concentrations below the exposure limits.

Eye Protection: Use safety glasses with side-shields or goggles.

Skin Protection: Use protective clothing to prevent repeated or prolonged skin contact. Applicators and other handlers must wear long-sleeved shirt and long pants, waterproof gloves, shoes plus socks, and protective eyewear. Discard clothing and other absorbent materials that have been drenched or heavily contaminated with product's concentrate. Do not reuse them. Keep and wash PPE separately from other laundry.

Respiratory Protection: A respiratory protection program that meets OSHA 29 CFR 1910.134 requirements must be followed whenever workplace conditions warrant respirator use. For concentrations up to 10 times the exposure limit, use NIOSH or MSHA approved half- or full-face, air-purifying respirator. For higher concentrations, consult a professional industrial hygienist.

SECTION IX. PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Transparent blue crystals, granules or powder.
Melting Point:	Decomposition above 110 °C with –4 H_20
Boiling Point:	-5H2O @ 150 °C (760 mmHg)
Decomposition Temperature:	Not available
Density/Specific Gravity:	2.284 @ 15.6 °C
Vapor Pressure:	Not applicable
Vapor Density:	Not applicable
Solubility in Water:	83.1 g/100 cc water @ 30 °C
Molecular Weight:	249.68

SECTION X. STABILITY AND REACTIVITY

Stability: Stable.
Incompatibility: Acetylene gas, aluminum powder, hydroxylamine, magnesium, moist air. Contact with magnesium metal can generate dangerous levels of hydrogen gas.
Hazardous Decomposition Products: At temperatures >600 °C material decomposes to cupric oxide and sulfur dioxide.
Hazardous Polymerization: Will not occur.

SECTION XI. TOXICOLOGICAL INFORMATION

Toxicology Tests: (Triangle Brand Copper Sulfate Crystal)

Test: 1
LD/LC: LD_{50}
Test Type: Acute
Test Route: Percutaneous
Test Species: Rabbit
Results Amounts: >8.0 g/kg

Test: 2
LD/LC: LD_{50}
Test Type: Acute
Test Route: Oral
Test Species: Rat
Results Amounts: 472.5 mg/kg

Test: 3
LD/LC: LC_{50}
Test Type: Acute
Test Route: Inhalation
Test Species: Rats
Results Amounts: >2.95 mg/L

Primary Eye Irritation: Corrosive, irreversible eye damage
Primary Skin Irritation: No skin irritation.
Subacute dietary LC_{50}: >10,000 ppm (quail and duck).
96 hr acute toxicity LC_{50}: 0.65 ppm (bluegill), 0.056 ppm (trout), 16 ppm (pink shrimp)
48 hr EC_{50}: 54 ppb (eastern oysters)
48 hr LC_{50}: 17 ppm (pink shrimp), 600 ppb (daphnia)
24 hr LC_{50}: 6.9 ppm (blue crab), 600 ppb (daphnia)
Carcinogenic: Not listed by NTP, IARC or OSHA.

Additional Information: Inhalation of dust and mists of copper salts can result in irritation of nasal mucous membranes, sometimes of the pharynx and, on occasion ulceration with perforation of the nasal septum. Exposure to copper dust causes discoloration of the skin.
Note to Physician: Probable mucosal damage may contraindicate the use of gastric lavage. Measures against circulatory shock, respiratory depression and convulsions may be needed. Wilson's disease or G6PD deficiency (individual who absorbs, retains and stores copper) can be aggravated by excessive exposure. Symptoms may include nausea, vomiting, epigastric pain, diarrhea, dizziness, jaundice, and general debility.

SECTION XII. DISPOSAL CONSIDERATIONS

Waste Disposal Method: Waste must be disposed of in accordance with federal, state and local environmental control regulations. Improper disposal is a violation of Federal law. Do not reuse empty container. If allowed by State and local authorities, dispose of container in a sanitary landfill or by incineration.

SECTION XIII. TRANSPORT INFORMATION

	Proper Shipping Name:	Technical Name (If N.O.S.):	Hazard Class:	ID:	PG:
DOT:	*Environmentally Hazardous Substance, Solid, n.o.s., (Cupric Sulfate)**		9	UN3077	III
	Reportable Quantity (RQ) = 10 pounds (4.54 kg)				

*Applicable when product is shipped in packaging of 10 pounds or greater. If shipped in less than 10 pound packaging it is not regulated by DOT Hazardous Material Regulations.

SECTION XIV. REGULATORY INFORMATION

US Federal

Federal Drinking Water Standards: *(Copper)* EPA 1300µg/L (action level), 1000 µg/L

Clean Water Act: *(Copper)* 5.6 µg/L as a 24-hour average in freshwater; *(Copper)* 4.0 µg/L as a 24-hour average and not in excess of 23 µg/L at any time in saltwater.

TSCA: Listed

EPCRA, SARA Title III, Section 313 (40 CFR 372) Chemicals subject to reporting requirements (see Section II for CAS number and percentage in mixture): *(Copper)* >1%.

CERCLA Hazardous Substances: RQ is not assigned to the broad class of copper compounds.

DOT: RQ 10 pounds (4.54 kg), See Section XIII TRANSPORT INFORMATION

SECTION XV. OTHER INFORMATION

Prepared By:	Department of Occupational Health and Safety Phelps Dodge Corporation
Reason for Revision:	Revised statements in SECTION I; minor formatting changes

Disclaimer: This information is based on available scientific evidence known to the Phelps Dodge Corporation. It is provided solely for compliance to the Hazard Communication Standard. This information is furnished without warranty, expressed or implicit.

CUTRINE®-PLUS

ALGAECIDE/HERBICIDE

Pat. No. 3,930,834 EPA Reg. No. 8959-10 EPA Est. No. 42291-GA-1

FOR USE IN LAKES – POTABLE WATER RESERVOIRS FARMS, FISH AND INDUSTRIAL PONDS, FISH HATCHERIES AND RACEWAYS, CROP AND NON-CROP IRRIGATION CONVEYANCE SYSTEMS, DITCHES, CANALS AND LATERALS

ACTIVE INGREDIENTS:	
COPPER AS ELEMENTAL	*9.0%
INERT INGREDIENTS:	91.0%
TOTAL	100.0%

CUTRINE-PLUS contains 0.909 lbs. of elemental copper per gallon.
*From mixed Copper-Ethanolamine complexes

KEEP OUT OF REACH OF CHILDREN
DANGER

STATEMENT OF PRACTICAL TREATMENT
FIRST AID

If in eyes: Call a physician. Hold eyelids open and flush with a steady gentle stream of water for 15 minutes.

If on skin: Wash with plenty of soap and water. Get medical attention.

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

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

See Additional Precautions Below

MANUFACTURED BY:

applied biochemists

MILWAUKEE, WI 53022
1-800-558-5106

GENERAL INFORMATION

CUTRINE-PLUS, under field conditions, is effective in controlling a broad range of algae including: Chara, Spirogyra, Cladophora, Vaucheria, Ulothrix, Microcystis and Oscillatoria. **CUTRINE-PLUS** has also been proven effective in controlling the rooted aquatic plant, **Hydrilla verticillata.** The ethanolamines in **CUTRINE-PLUS** prevent the precipitation of copper with carbonates and bicarbonates in the water. Waters treated with **CUTRINE-PLUS** may be used for swimming, fishing, drinking, livestock watering or irrigating turf, ornamental plants or crops immediately after treatment.

DIRECTIONS FOR USE

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

SURFACE SPRAY/INJECTION

ALGAECIDE APPLICATION

For effective control, proper chemical concentration should 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.

- Identify the algae growth present as one of the following types: Planktonic (suspended), Filamentous (mat forming), or Chara/Nitella.
- Determine the surface acreage (1 acre=43,560 sq. ft.) and average depth of infested area.
- Refer to the chart below to determine gallons of **CUTRINE-PLUS** to apply per surface acre.

Application Rates
Gallons Per Surface Acre

ALGAE TYPE	PPM COPPER	DEPTH IN FEET 1	2	3	4
Planktonic	0.2	0.6	1.2	1.8	2.4
Filamentous	0.2	0.6	1.2	1.8	2.4
Chara/Nitella	0.4	1.2	2.4	3.6	4.8

- **For planktonic algae (suspended) algae and free-floating filamentous algae mats, application rates should be based upon treating only the upper 3 to 4 feet of water where algae is growing. Under conditions of heavy infestation, treat only 1/3 to 1/2 of the water body at a time to avoid fish suffocation caused by oxygen depletion from decaying algae.**
- Before applying, dilute the required amount of **CUTRINE-PLUS** with enough water to ensure even distribution with the type of equipment being used. For most effective results, apply under calm and sunny conditions when water temperature is at least 60°F. Break up floating algae mats before spraying or while application is being made. Use hand or power sprayer adjusted to rain-sized droplets. Spray shoreline areas first to avoid trapping fish.

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.

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 CUTRINE-PLUS treatment. Choose the application rate based upon stage and density of Hydrilla growth and respective water depth from the chart below.

Application Rates
Gallons/Surface Acre*

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

CUTRINE®-PLUS: REWARD®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 **REWARD®**. Apply mixture at the rate of 5½ 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.

*REWARD® is a trademark of Zeneca Group Company

PERMITS:

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

DRIP SYSTEM APPLICATION

FOR USE IN POTABLE WATER AND IRRIGATION CONVEYANCE SYSTEMS

- **CUTRINE®-PLUS** should be applied as soon as algae or Hydrilla begins 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 increasing water flow rate during application may be necessary.
- Prior to treatment it is important to accurately determine water flow rates. In the absence of weirs, orifices, or similar devices which give accurate water flow measurements, volume of flow may be estimated by the following formula:

  Average Width (feet) x Average Depth (feet) x Velocity* (feet/second) x 0.9 = Cubic Feed 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). This measurement should be repeated at least three times at the intended application site and then averaged.
- After accurately determining the water flow rate in C.F.S. or gallons/minute, find the corresponding **CUTRINE-PLUS** drip rate on the chart below.

WATER FLOW RATE		CUTRINE-PLUS 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

- Calculate the amount of **CUTRINE-PLUS** needed to maintain the drip rate for a period of 3 hours by multiplying Qts./Hr. x 3; ml/Min. x 180; or Fl. Oz./Min. x 180. Dosage will maintain 1.0 ppm Copper concentration in the treated water for the 3 hour period. Introduction of the chemical should be made in the channel at weirs or other turbulence-creating structures to promote the dispersion of chemical.
- Pour the required amount of **CUTRINE-PLUS** 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. Periodic maintenance treatments may be required to maintain seasonal control.

GENERAL TREATMENT NOTES

The following suggestions apply to the use of **CUTRINE-PLUS** as an algaecide or herbicide in all approved use sites.

For optimum effectiveness...

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

PRECAUTIONARY STATEMENTS

HAZARDS TO HUMANS AND DOMESTIC ANIMALS

DANGER

CORROSIVE. Causes irreversible eye damage and skin burns. Do not get in eyes, on skin, or on clothing. Wears goggles or face shield and rubber gloves when handling this product. Wash thoroughly with soap and water after handling and before eating, drinking or using tobacco. Remove and wash contaminated clothing before reuse. Prolonged or frequently repeated skin contact may cause allergic reaction in some individuals.

STORAGE & DISPOSAL:

Keep container closed when not in use. Do not contaminate water, food or feed by storage or disposal. Open dumping is prohibited.

PESTICIDE DISPOSAL: Pesticide wastes are acutely hazardous. Improper disposal of excess pesticide, spray mixture, or rinsate is a violation of Federal Law. If these wastes cannot be disposed of by use according to label instructions, contact your State Pesticide or Environmental Control Agency, or the Hazardous Waste representative at the nearest EPA Regional office for guidance. CONTAINER DISPOSAL: Reseal container and offer for recondition or triple rinse (or equivalent) and offer for recycling, reconditioning or disposal 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.

ENVIRONMENTAL HAZARDS:

This product may be toxic to trout and other species of fish. Fish toxicity is dependent upon the hardness of water. Do not use in water containing trout if the carbonate hardness of water does not exceed 50 ppm.

NOTICE

Neither the manufacturer nor the seller makes any warranty, expressed or implied concerning the use of this product other than indicated on the label. Buyer assumes risk of use of this material when such use is contrary to label instructions. Read and follow the label directions carefully.

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Material Safety Data Sheet

EMERGENCY

FOR CHEMICAL EMERGENCY: SPILL, LEAK, FIRE, EXPOSURE OR ACCIDENT CALL
CHEMTREC - DAY or NIGHT - (800) 424-9300

Product Name: **AB CUTRINE PLUS**

SECTION I - GENERAL INFORMATION

Manufacturer's Name: APPLIED BIOCHEMISTS
W175 N11163 Stonewood Drive
Suite 234
Germantown, WI 53022-4799
(800) 558-5106

Trade Name & Synonyms:	**AB CUTRINE PLUS**
Chemical Name & Synonyms:	CHELATED ELEMENTAL COPPER
Generic Description:	COPPER - ALGICIDE
Formula:	PROPRIETARY
D.O.T. Proper Shipping Name:	CORROSIVE LIQUID NOS (Copper Triethanolamine Complexes)
D.O.T. Hazard Class:	EIGHT
U.N. or N.A. Identification #:	UN 1760, PG III
D.O.T. Emergency Response Guide (1996 ed.):	154

Hazardous Mat'ls ID System Values (HMIS):	Health -2	Flammability -0	Reactivity -1	Personal Protection -B
Nat'l Fire Protection Assn. (NFPA 704M):	Health -1	Flammability -0	Reactivity -1	Specific Hazard:

SECTION II - HAZARDOUS INGREDIENTS

Hazardous Component(s)	CAS#	PEL	TLV
Copper Carbonate	12069-69-1	1 mg/m^3	1 mg/m^3
Monoethanolamine	141-43-5	3 ppm	3 ppm
Triethanolamine	102-71-6	NOT ESTABLISHED	NOT ESTABLISHED

Ingredients listed in this section have been determined to be hazardous as defined in 29 CFR 1910.1200. Materials determined to be health hazards are listed if they comprise 1% or more of the composition. Materials identified as carcinogens are listed if they comprise 0.1% or more of the composition. Information on proprietary materials is available as provided in 29 CFR 1910.1200 (i) (1).

SECTION III - PHYSICAL DATA

Boiling Point (F):	212°F	Specific Gravity (water = 1):	1.1 - 1.2
Vapor Pressure (mm Hg):	NOT DETERMINED	% Volatile (by Volume):	NOT DETERMINED
Vapor Density (air = 1):	> 1	Evaporation Rate:(Ether = 1)	< 1
Melting Point (F):	NOT APPLICABLE	pH:	10.0-11.0
Solubility in Water:	MISCIBLE IN WATER		
Appearance & Odor:	BLUE VISCOUS LIQUID. SLIGHT AMINE ODOR.		

SECTION IV - FIRE & EXPLOSION DATA

Flash Point :	NOT DETERMINED Method: TAG CLOSED CUP
Extinguishing Media:	CO_2, H_2O, DRY CHEMICAL. POLYMER FOAM FOR LARGE FIRES
Special Fire Fighting Procedures:	USE NIOSH APPROVED SELF-CONTAINED BREATHING APPARATUS.
Unusual Fire & Explosion Hazards:	NONE

SECTION V - REACTIVITY DATA

Stability -	_____Unstable __X__Stable
Conditions to Avoid:	AVOID CONTACT WITH STRONG ACIDS AND NITRATES.
Incompatibility (Materials to Avoid):	STRONG ACIDS AND NITRITES.
Hazardous Decomposition Products:	OXIDES OF NITROGEN
Hazardous Polymerization:	_____Will Occur __X__Will Not Occur
Conditions to Avoid:	CONTACT WITH STRONG ACIDS AND NITRITES.

AB CUTRINE PLUS

SECTION VI - HEALTH HAZARD DATA

Acute Health Hazards: $LD_{50(RAT)}$ = 1930mg/Kg: CORROSIVE TO SKIN

Chronic Health Hazards: NONE KNOWN

Signs & Symptoms of Exposure: CONTACT WITH SKIN AND EYES, VAPORS OR MISTS MAY CAUSE IRRITATION WITH PAIN, COUGHING AND DISCOMFORT TO EYES, NOSE, THROAT AND CHEST.

Medical Conditions Generally Aggravated by Exposure: MAY CAUSE SKIN SENSITIZATION.

Chemical Listed as Carcinogen or Potential Carcinogen by:

National Toxicology Program:	Yes:	No: ✓
I.A.R.C. Monographs:	Yes:	No: ✓
O.S.H.A.	Yes:	No: ✓

Emergency & First Aid Procedures: FOR PRINCIPLE ROUTE OF ENTRY, SEE APPROPRIATE EMERGENCY PROCEDURES BELOW.
NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON.

Route of Entry:

Inhalation: REMOVE TO FRESH AIR. ADMINISTER OXYGEN IF NECESSARY.

Eyes: FLUSH WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES. GET MEDICAL ATTENTION.

Skin: FLUSH WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES. WASH CLOTHES THOROUGHLY BEFORE REUSE.

Ingestion: IF INGESTED, GET IMMEDIATE MEDICAL ATTENTION.

SECTION VII - SPILL OR LEAK PROCEDURES

Steps to be Taken in Case Material is Released or Spilled: SOAK UP WITH APPROPRIATE ABSORBENT THAT DOES NOT CONTAIN CLAYS. GROUND CORNCOB IS THE IDEAL ABSORBENT. DO NOT FLUSH INTO SANITARY SEWERS.

Waste Disposal Methods: INCINERATE IN A FURNACE. MORE THAN 5 (FIVE) GALLONS, CONTACT LOCAL AUTHORITIES FOR DIRECTIONS.

SECTION VIII - SPECIAL PROTECTION AND CONTROL MEASURES

Respiratory Protection (Specify Type): NOT REQUIRED

Ventilation -	Local Exhaust:	ACCEPTABLE	Special Exhaust::	NOT REQUIRED
	Mechanical Exhaust:	ACCEPTABLE	Other Exhaust:	NOT REQUIRED
Protective Equipment -	Gloves:	RUBBER	Eye Protection:	SPLASH GOGGLES OR FACE SHIELD

Other Protective Equipment: EYEWASH AND SAFETY SHOWER SHOULD BE AVAILABLE WITHIN THE IMMEDIATE WORKING AREA.

Work or Hygienic Practices: USE SAFE CHEMICAL HANDLING PROCEDURES SUITABLE FOR THE HAZARDS PRESENTED BY THIS MATERIAL.

SECTION IX - SPECIAL PRECAUTIONS

Precautions to be Taken in Handling and Storage: STORE AT TEMPERATURES BETWEEN 32°F AND 100°F. DO NOT STORE IN DIRECT SUNLIGHT

Other Precautions: DO NOT CONTAMINATE WATER, FOOD OR FEED BY STORAGE, DISPOSAL OR CLEANING OF EQUIPMENT. STORE IN A COOL, DRY PLACE.

KEEP OUT OF REACH OF CHILDREN

THESE DATA ARE OFFERED IN GOOD FAITH AS TYPICAL VALUES AND NOT AS A PRODUCT SPECIFICATION. NO WARRANTY, EITHER EXPRESSED OR IMPLIED, IS HEREBY MADE. THE RECOMMENDED INDUSTRIAL HYGIENE AND SAFE HANDLING PROCEDURES ARE BELIEVED TO BE GENERALLY APPLICABLE. HOWEVER, EACH USER SHOULD REVIEW THESE RECOMMENDATIONS IN THE SPECIFIC CONTEXT OF THE INTENDED USE AND DETERMINE WHETHER THEY ARE APPROPRIATE.

DJK Date of Last Revision: 11/30/99

Appendix C

A Habitat Assessment of the South Sutter Water District project site was conducted by Ardea Consulting and Blankinship & Associates, Inc. personnel to characterize the habitats present and the likelihood of special status species occurring on the project site. A list of these special species was compiled using a records search of the California Natural Diversity Database (CNDDB), and current species information from the U.S. Fish and Wildlife Service (U.S. FWS), Sacramento Office website. Location specific species data from both of these sources is organized geographically into 7.5 minute U.S.G.S. quads. The CNDDB database was queried using the boundary map for the District, and selecting the four quads that intersect with the District's boundaries, along with the quads that lie adjacent to the central four quads. This resulted in a total of sixteen quads queried in the CNDDB database. The same central four quads that intersect the District's boundaries were also used in the query of species information from the U.S. FWS, Sacramento office website. Habitat requirements for each of the species were reviewed to determine whether habitat existed within the project area that would meet that species' needs. The breeding or foraging habitat of animals and the habitat requirements of plant species likely to occur in the project area are fully described below.

Amphibians

California Red-legged Frog (*Rana aurora draytonii*)
California red-legged frogs occur in dense, shrubby riparian vegetation associated with deep (< 0.7 m), still or slow-moving water (Jennings 1988 in Jennings and Hayes 1994, Hayes and Jennings 1988 in Jennings and Hayes 1994). The shrubby riparian vegetation that structurally seems to be most suitable for California red-legged frogs is that provided by arroyo willow (*Salix lasiolepis*), and cattails (*Typha* sp.) and bulrushes (*Scirpus* sp.) also provide suitable habitat (Jennings 1988 in Jennings and Hayes 1994). Juvenile frogs seem to favor open, shallow aquatic habitats with dense submergents (pers. observ. in Jennings and Hayes 1994). Postmetamorphs have a highly variable animal food diet (Hayes and Tennant 1986 in Jennings and Hayes 1994). Frogs and small mammals may contribute significantly to the diet of adults and subadults (Arnold and Halliday 1986 in Jennings and Hayes 1994, Hayes and Tennant 1986 in Jennings and Hayes 1994). The movement ecology of California red-legged frogs is not well understood (Jennings and Hayes 1994). The presence of this species in the project area is unlikely according to the habitat described in the "U.S. Fish and Wildlife Service Red-Legged Frog Recovery Plan" (USFWS, 2002).

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

Western Spadefoot Toad (*Spea (=Scaphiopus) hammondii*)
Western spadefoot toads are almost completely terrestrial, entering water only to breed (see Dimmitt and Ruibal 1980 in Jennings and Hayes 1994). Western spadefoots become surface active following relatively warm (> 10.0-12.8°C) rains in late winter-spring and fall, emerging from burrows in loose soil to a depth of at least 1 m (Stebbins 1972 in Jennings and Hayes 1994, A. McCready, pers. comm. in Jennings and

Hayes 1994), but surface activity may occur in any month between October and April if enough rain has fallen (Morey and Guinn 1992 in Jennings and Hayes 1994, S. Morey, pers. comm. in Jennings and Hayes 1994). Since western spadefoot toads are not likely to enter water during the season when aquatic weeds will need to be controlled in irrigation canals, it is not likely that they would be exposed to herbicides introduced to irrigation canals for the control of aquatic weeds.

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 broad-leaf forests, oak and conifer woodlands, arid grasslands and deserts, and high-elevation forests and meadows. Throughout most of its geographic range, it is most common in mesic sites (Kunz and Martin 1982 in Williams 1986). Known roosting sites in California include limestone caves, lava tubes, mine tunnels, buildings, and other human-made structures (Dalquest 1947 in Williams 1986, Graham 1966 in Williams 1986, Pearson *et al.* 1952 in Williams 1986). Both sexes hibernate in buildings, caves, and mine tunnels, either singly (males) or in small groups (Pearson *et al.*, 1952 in Williams 1986). They feed on various flying insects near the foliage of trees and shrubs and may feed primarily on moths (Barbour and Davis 1969 in NatureServe 2004). Since the feeding habits do not focus on emergent insects or other aquatic prey items, big-eared bats would not be at risk from treatment of irrigation canals with herbicides.

Long-Legged Myotis Bat (*Myotis volans*)
Primarily in montane coniferous forests, in the south most often at 2000-3000 m; also riparian and desert (Baja California) habitats. May change habitats seasonally. Uses caves and mines as hibernacula, but winter habits are poorly known. Roosts in abandoned buildings, rock crevices, under bark, etc. In summer, apparently does not use caves as daytime roost site. In some areas hollow trees are the most common nursery sites, but buildings and rock crevices are also used (NatureServe 2004). Feeds primarily on moths. Also consumes a wide variety of invertebrates: fleas, termites, lacewings, wasps, small beetles, etc. (Warner and Czaplewski 1984 in NatureServe 2004). Follows prey for relatively long distances around, through, over forest canopy, forest clearings, and over water. In New Mexico, forages primarily in open areas, feeds mainly on small moths (Black 1974 in NatureServe 2004). The diet of long-legged myotis consists of mostly terrestrial insects, so the exposure to herbicides introduced to irrigation canals for control of aquatic weeds would be greatly limited.

Yuma Myotis Bat (*Myotis yumanensis*)
Yuma myotis bats inhabit deserts, coniferous and mixed forests, grassland/herbaceous areas, shrubland/chaparral, suburban/orchard, urban, and coniferous and mixed woodlands. They are more closely associated with water than most other North American bats, but are also found in a wide variety of upland and lowland habitats, including riparian, desert scrub, moist woodlands and forests Nursery colonies usually are in buildings, caves and mines, and under bridges. Yuma myotis bats are insectivorous, with small moths believed to be the primary food source in some areas; dipterans and ground beetles are other common prey items. They often feed over ponds and streams, flying just above the water surface (NatureServe 2004). The relatively small proportion of the landscape that would provide emergent insects would greatly limit the exposure of Yuma myotis to herbicides applied to irrigation canals.

Reptiles

Northwestern Pond Turtle (*Clemmys marmorata marmorata*)
The northwestern pond turtle is primarily riparian, most often living in sloughs, streams (both permanent and intermittent), and large rivers, although some may inhabit impoundments, irrigation ditches, and other artificial water bodies. In streams, pools are preferred over shallow reaches (Bury 1972 in Ernst *et al.* 1994). Habitats may be either rocky or mud bottomed, but usually contain some aquatic vegetation and basking sites (Ernst *et al.* 1994). Western pond turtles are opportunistic feeders and eat a variety of food items including carrion, aquatic invertebrates, insects and worms (Larsen 1997). Their habitat requirements and feeding habits indicate northwestern pond turtles may be exposed to pulses of herbicide-treated water.

Western Pond Turtle (*Clemmys marmorata*)
See Northwestern pond turtle.

Giant Garter Snake (*Thamnophis gigas*)
Eric Hansen (pers. comm.) and the U.S. Fish and Wildlife Service (USFWS 1999) stress the importance of rice agriculture as providing continuous water, and thus prey habitat for giant garter snakes. Maintenance of rice cultivation in the Sacramento Valley is considered important to the continued existence of the giant garter snake (USFWS 1999). While working in rice agriculture, Hansen did not observe adverse impacts to the giant garter snake from chemical treatments of irrigation canals or rice fields (pers. comm.). Hansen and Brode (1993 in USFWS 1999) note that the ongoing maintenance of irrigation canals prevents the establishment of vegetation, making those irrigation canals less suitable for giant garter snakes. In June and July, they found giant garter snakes use irrigation canals less once they move into the rice fields as the rice matures.
Giant garter snakes occur in streams and sloughs, usually with mud bottoms (Stebbins 1985 in NatureServe 2004). One of the most aquatic of garter snakes; usually in areas of freshwater marsh and low-gradient streams with emergent vegetation, also drainage canals and irrigation ditches (California Department of Fish and Game 1990 in NatureServe 2004) and ponds and small lakes (USFWS 1993 in NatureServe 2004). Usually in areas of permanent water, sometimes in areas of temporary water such as irrigation/drainage canals and (less often) rice fields (Biosystems Analysis, Inc. 1989 in NatureServe 2004, USFWS 1993 in NatureServe 2004). Adult and immature snakes eat small mammals, invertebrates, and fish (NatureServe 2004). Their habitat requirements and feeding habits indicate giant garter snakes may be exposed to pulses of herbicide-treated water.

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 not likely to feed directly from the treated canals, it is not probable that they will be exposed to hazardous concentrations of herbicides introduced to irrigation canals for the control of aquatic weeds.

Great Egret (*Ardea alba*)
Great egrets use similar habitat to that of the great blue heron. They forage in open areas, such as along the edges of lakes, large marshes, and shallow coastal lagoons and estuaries. They also forage along rivers in wooded areas (Kaufman 1996). Great egrets forage in freshwater, marine, and estuarine wetlands, shallow water of ponds, and regularly use uplands habitats (Palmer 1962 in NatureServe 2004; McCrimmon *et al.* 2001). They forage in water up to about 28 cm (Powell 1987 in McCrimmon *et al.* 2001). Great egrets use similar habitat to that of the great blue heron. They forage in open areas, such as along the edges of lakes, large marshes, and shallow coastal lagoons and estuaries. They also forage along rivers in wooded areas (Kaufman 1996). Great egrets forage in freshwater, marine, and estuarine wetlands, shallow water of ponds, and regularly use uplands habitats (Palmer 1962 in NatureServe 2004; McCrimmon *et al.* 2001). They forage in water up to about 28 cm (Powell 1987 in McCrimmon *et al.* 2001). In the Sacramento Valley, they commonly forage in rice fields. Great egrets eat mostly fish. Aside from fish, they also eat crustaceans, frogs, salamanders, snakes, and aquatic insects. In open fields, they might eat grasshoppers, and rodents (Kaufman 1996). Great egrets feed their nestlings many small fish during each feeding bout (Mock 1985). The potential exists for great egrets to feed on prey exposed to herbicides in irrigation canals. The TRV for acrolein (see Appendix B) for birds is 0.91 mg/kg/day. A water concentration of acrolein of 10 ppm would indicate a dietary exposure of 1.55 mg/kg/day for great egrets, which exceeds the TRV. However, after only 12 hours post-application, water concentrations would decrease to 3.54 ppm leading to a dietary exposure of 0.54 mg/kg/day—less than the TRV. Considering the short duration of exposures exceeding the TRV and the potential for foraging in other habitats (*e.g.* irrigated crop fields), the risk posed by treating irrigation canals with acrolein for the control of aquatic weeds is insignificant. For the great egret, an average water copper concentration of 1 ppm was used to represent the exposure possible during the first day following application after applying a half-life of approximately 20 hours. This concentration would lead to an exposure via the diet of 40.95 mg/kg/day that would not exceed the TRV of 46.97 mg/kg/day (see Appendix B). The risk of applying copper to irrigation ditches for the control of aquatic weeds is insignificant

Great Blue Heron (*Ardea herodias*)
Great blue herons can travel long distances from a nesting colony to a feeding area, up to 34.1 km from the nesting colony (Pfeifer 1979). Because they can range so widely, the nesting colony with its large nest trees does not need to be adjacent to sufficient foraging habitat for all nesting adults and great blue herons can forage in water bodies that do not have adjacent nest trees. They forage in any kind of calm, shallow freshwater (Kaufman 1996) as well as in grasslands, marshes, and along riverbanks. Great blue herons consume a variety of prey, including fish, insects, mammals, amphibians, and crustaceans. Fish are the predominant prey (Butler 1992). The potential exists for great blue herons to feed on prey exposed to copper in canals. The TRV for acrolein (see Appendix B) for birds is 0.91 mg/kg/day. A water concentration of acrolein of 10 ppm would indicate a dietary exposure of 1.1 mg/kg/day for great blue herons, which exceeds the TRV. However, after only 12 hours post-application, water concentrations

would decrease to 3.54 ppm leading to a dietary exposure of 0.39 mg/kg/day—less than the TRV. Considering the short duration of exposures exceeding the TRV and the potential for foraging in other habitats (*e.g.* irrigated crop fields), the risk posed by treating irrigation canals with acrolein for the control of aquatic weeds is insignificant. For the great blue heron, an average water copper concentration of 1 ppm was used to represent the exposure possible during the first day following application after applying a half-life of approximately 20 hours. This concentration could lead to a dietary concentration of 15.2 mg/kg/day that would not exceed the TRV of 46.97 mg/kg/day (see Appendix B). The risk of applying copper to irrigation ditches for the control of aquatic weeds is insignificant.

Burrowing Owl (*Athene cunicularia*)
Burrowing owls inhabit dry, open, shortgrass, treeless plains, and are often associated with burrowing mammals. They can also be found at golf courses, cemeteries, road allowances within cities, airports, vacant lots in residential areas and university campuses, and fairgrounds. The presence of a nest burrow seems to be a critical requirement for western burrowing owls (Thomsen 1971 in Haug *et al.* 1993, Martin 1973 in Haug *et al.* 1993, Zarn 1974 in Haug *et al.* 1993, Wedgwood 1978 in Haug *et al.* 1993, Haug 1985 in Haug *et al.* 1993). They typically forage in shortgrass, mowed, or overgrazed pastures; golf courses and airports (Thomsen 1971 in Haug *et al.* 1993). They are opportunistic feeders, eating primarily arthropods, small mammals, and birds. Amphibians and reptiles constitute a minor component to the diet and possibly only in Florida (Wesemann and Rowe 1987 in Haug *et al.* 1993). The terrestrial nature of their foraging habitats and prey base indicate that exposure to herbicides applied to irrigations canals will be minimal.

Western Burrowing Owl (*Athene cunicularia hypogaea*)
See Burrowing Owl

Swainson's Hawk (*Buteo swainsoni*)
Swainson's hawks forage in open stands of grass-dominated vegetation, sparse shrublands, and small, open woodlands. They have adapted well to foraging in agricultural areas (e.g., wheat and alfalfa), but cannot forage in most perennial crops or in annual crops that grow much higher than native grasses (Bechard 1982 in England *et al.* 1997, Estep 1989 in England *et al.* 1997, Woodbridge 1991 in England *et al.* 1997). In Central Valley, CA, they forage in row, grain, and hay crop agriculture, particularly during and after harvest, when prey are both numerous and conspicuous. The also are attracted to flood irrigation, primarily in alfalfa fields, when prey take refuge on field margins, and to field burning, which forces prey to evacuate (J.A. Estep per. comm. in England *et al.* 1997). During breeding season, Swainson's hawks mainly feed on vertebrates, including mammals, birds, and reptiles (Schmutz *et al.* 1980 in England *et al.* 1997, Bednarz 1988 in England *et al.* 1997). Invertebrates (especially grasshoppers and dragonflies) are commonly eaten at other times (McAtee 1935 in England *et al.* 1997, Sherrod 1978 in England *et al.* 1997, Jaramillo 1993 in England *et al.* 1997). Swainson's hawks do not prey on species likely to be exposed to herbicides in irrigation canals, so they not likely to be exposed.

Yellow Warbler (*Dendroica petechia*)
Yellow warblers breed most commonly in wet, deciduous thickets, especially those dominated by willows, and in disturbed early successional habitats (Dunn and Garrett 1997 in Lowther *et al.* 1999). They also frequent thickets and hedgerows in human-altered habitats such as power transmission lines, cultivated farmland, orchards, roadsides, and suburban parks (Campbell *et al.* 1999 in Lowther *et al.* 1999). In the northern Rocky Mountain dryland habitats, yellow warblers were more commonly associated (listed in order) with streamside riparian stands, cottonwood bottomland stands, aspen stands, and mid-successional clearcuts than in early successional burned forests (Hutto 1995). In summer near Jackson Hole, Wyoming,

yellow warblers were most common in taller alder, aspen or cottonwood situations (Hutto 1981). Yellow warblers prefer to forage on small limbs to large limbs, tips and dead limbs in either coniferous or deciduous trees (Morse 1973 in Lowther *et al.* 1999). The main diet of yellow warblers consists of insects and other arthropods, but may eat wild fruit occasionally (Stevenson and Anderson 1994 in Lowther *et al.* 1999). Since the feeding habits do not focus on emergent insects or other aquatic prey items, the risk from treating irrigation water in a canal with herbicides would be insignificant.

Snowy Egret (*Egretta thula*)
In the West, the snowy egret prefers willows along large rivers (Alcorn 1988 in Parsons and Masters 2000); reservoirs, grassy marshes, and wet meadows (Andrews and Righter 1992 in Parsons and Masters 2000, Oakleaf *et al.* 1992 in Parsons and Masters 2000); inland lakes and canals in the Harney Basin in Oregon (Gilligan *et al.* 1994 in Parsons and Masters 2000); and irrigation channels, estuarine habitats, marshes, and river courses (Garrett and Dunn 1981 in Parsons and Masters 2000). They generally breed along inland lakes and rivers. Nesting substrate varies from emergent vegetation such as common reed to shrubs and small trees (Parsons and Masters 2000). Snowy egrets favor shallow water (< 15 cm) including near emergent vegetation for foraging (Parsons and Masters 2000). Snowy egrets sometimes forage in dry fields (Kaufman 1996). Snowy egrets consume a wide variety of prey items, including earthworms, annelid worms, aquatic and terrestrial insects, crabs, shrimp, prawns, crayfish, other crustaceans, snails, freshwater and marine fish, frogs/toads, and snakes/lizards (Kushlan 1978a, 1978b in Parsons and Masters 2000). The potential exists for snowy egrets to feed on prey exposed to herbicides in irrigation canals. The TRV for acrolein (see Appendix B) for birds is 0.91 mg/kg/day. A water concentration of acrolein of 10 ppm would indicate a dietary exposure of 2.26 mg/kg/day for great egrets, which exceeds the TRV. However, after only 12 hours post-application, water concentrations would decrease to 3.54 ppm leading to a dietary exposure of 0.80 mg/kg/day—less than the TRV. Considering the short duration of exposures exceeding the TRV and the potential for foraging in other habitats (e.g. irrigated crop fields), the risk posed by treating irrigation canals with acrolein for the control of aquatic weeds is insignificant. For the snowy egret, an average water copper concentration of 1 ppm was used to represent the exposure possible during the first day following application after applying a half-life of approximately 20 hours. This concentration would lead to an exposure via the diet of 221 mg/kg/day that would exceed the TRV of 46.97 mg/kg/day (see Appendix B). However, after 3 days post-application, water concentrations would decrease to 0.13 ppm leading to a dietary exposure of 47.8 mg/kg/day—approximately equal to the TRV. Since snowy egrets feed primarily in shallow water (< 15 cm) the only portions of the canals suitable for foraging by snowy egrets would be the shallow terminal portions where concentrations of herbicides would be minimal.

White-Tailed Kite (*Elanus leucurus*)
White-tailed kites inhabit low elevation grassland, agricultural, wetland, oak-woodland, or savannah habitats. Riparian areas adjacent to open areas are also used. Lightly grazed or ungrazed fields generally support larger prey populations, and are therefore preferred. Intensively cultivated areas are also used (Dunk 1995). Nests in trees (Stendell 1972 in Dunk 1995). They prefer to forage in ungrazed grasslands (Bammann 1975 in Dunk 1995). Wetlands dominated by grasses, and fence rows and irrigation ditches with residual vegetation adjacent to grazed lands (Bammann 1975 in Dunk 1995). They primarily eat small mammals (Dunk 1995). Because they prey mostly on small mammals, white-tailed kites are not likely to be exposed to herbicides applied to irrigation ditches for control of aquatic weeds.

American Peregrine Falcon (*Falco peregrinus anatum*)
The habitat of peregrine falcons generally includes cliffs, for nesting, with open areas of air and generally open landscapes for foraging. In addition to natural habitats peregrine falcons also use urban, human-built

environments such as towers, buildings, etc.). Most prey is captured in the air while in flight, but they also capture prey from the surface of water or the ground. The most common prey include birds, from song birds to small geese, occasionally mammals, and rarely amphibians, fish, and insects (White *et al.* 2002). The feeding habits of peregrine falcons will greatly limit their exposure to copper applied to drainage canals for the control of aquatic weeds.

Loggerhead Shrike (*Lanius ludovicianus*)
Loggerhead shrikes breed in open country with short vegetation, including pastures with fence rows, old orchards, mowed roadsides, cemeteries, golf courses, agricultural fields, riparian areas, and open woodlands (Yosef 1994 in Yosef 1996). They feed in open habitats characterized by well-spaced, often spiny, shrubs and low trees, usually interspersed with short grasses, forbs, and bare ground, including scrub lands, steppes, deserts, savannas, prairies, agricultural lands (particularly pastures and meadows with hedges or shrubs), and some suburban areas (Yosef 1996). They focus on arthropods, amphibians, small to medium-sized reptiles, small mammals and birds (Yosef 1996). Insects generally make the majority of the diet (up to 68%, Bent 1950 in Yosef 1996). Vertebrates are favored in the winter (Graber *et al.* 1973 in Yosef 1996, Kridelbaugh 1982 in Yosef 1996). Since insects such as beetles and grasshoppers are the major insect prey (Kridelbaugh 1982 in Yosef 1996), exposure of loggerhead shrikes to herbicides applied to irrigation canals is low.

Lewis' woodpecker (*Melanerpes lewis*)
Important aspects of Lewis' woodpeckers include an open canopy, a brush understory offering ground cover, dead or downed woody material, available perches, and abundant insects (Bock 1970 in Tobalske 1997). One of the major habitats is open riparian woodland dominated by cottonwood and logged or burned pine forest. Breeding birds are also found in oak woodland, nut and fruit orchards, piñon pine-juniper woodland, a variety of pine and fir forests, and agricultural areas including farm- and ranchland (Bock 1970 in Tobalske 1997, Raphael and White 1984 in Tobalske 1997, Siddle and Davidson 1991 in Tobalske 1997, Linder 1994 in Tobalske 1997, Tashiro-Vierling 1994 in Tobalske 1997, Viering 1997 in Tobalske 1997, Saab and Dudley 1996 in Tobalske 1997). They feed in the air, on tree trunks and branches, in bushes, and on the ground. They eat free-living (not wood-boring) insects, acorns or other nuts, and fruit (Tobalske 1997). Their terrestrial diets indicate their exposure to herbicides applied to irrigation canals would be very low.

Black-crowned Night Herons (*Nycticorax nycticorax*)
Black-crowned night herons inhabit swamps, streams, rivers, the margins of pools, ponds, lakes, lagoons, tidal mudflats, salt marshes, ditches, canals, reservoirs, and wet agricultural fields. Inland, most black-crowned night heron colonies are associated with large wetlands (Davis 1993). Black-crowned night herons nest colonially. Most colony sites are on islands, in swamps, or over water. Black-crowned night herons feed in shallow, weedy pond margins, creeks, and marshes. They feed mainly from evening to early morning, but will feed during the day at times of high food demand (Davis 1993). Black-crowned night herons are opportunistic feeders on leeches, earthworms, aquatic and terrestrial insects including moths, prawns and crayfish, mussels, squid, freshwater and marine fish, amphibians, lizards, snakes, rodents, birds, eggs, carrion, plant materials, and garbage (Bent 1926 in Davis 1993, Kushlan 1978a in Davis 1993). Over 50% of the prey captured at night was fish and approximately 35% were aquatic larvae. Approximately 50% of the prey captured during the day were aquatic larvae with most being 3 – 6 cm (Watmough 1978). Black-crowned night herons are unlikely to feed directly in the canals with flowing water, but they may feed in the weed-choked sloughs where some canals terminate. The level of weed growth in the sloughs indicates little if any herbicide ever reaches the end of the canal. Therefore, the risk from treating irrigation water in a canal with herbicides would be insignificant.

Osprey (*Pandion haliaetus*)
Osprey feed along rivers, marshes, reservoirs, and natural ponds and lakes, where individuals feed in both shallow littoral zones as well as deeper water (Poole *et al.* 2002). They do not favor foraging in water with thick emergent and submerged vegetation (Postupalsky and Stackpole 1974 in Poole *et al.* 2002, Prevost 1977 in Poole *et al.* 2002). Live fish constitute 99% of prey (Poole *et al.* 2002), and it is possible for osprey to forage over irrigation canals treated with herbicides and consume fish from those canals. The TRV for acrolein (see Appendix B) for birds is 0.91 mg/kg/day. A water concentration of acrolein of 10 ppm would indicate the osprey could be exposed to 1.31 mg/kg/day if it fed entirely from treated irrigation canals, and this exposure exceeds the TRV. However, after only 12 hours post-application, water concentrations would decrease to 3.54 ppm leading to a dietary exposure of 0.46 mg/kg/day—less than the TRV. Considering the short duration of exposures exceeding the TRV and the potential for foraging in other habitats (untreated canals and other open water), the risk posed by treating irrigation canals with acrolein for the control of aquatic weeds is insignificant. For the osprey, an average water copper concentration of 1 ppm was used to represent the exposure possible during the first day following application after applying a half-life of approximately 20 hours. This concentration could lead to a dietary concentration of 36.02 mg/kg/day that would not exceed the TRV of 46.97 mg/kg/day (see Appendix B). The risk of applying copper to irrigation ditches for the control of aquatic weeds is insignificant.

Nuttalls' Woodpecker (*Picoides nuttallii*)
Nuttalls' woodpecker occur primarily in oak woodlands, and are also found in riparian woodlands, but rarely in coniferous forests (Lowther 2000). In riparian areas, they are commonly found in areas with willows and sycamores (Jenkins 1979 in Lowther 2000). In Yuba County, CA, they are found at 300 to 600 m elevation and associated most often with blue oak and interior live oak, also with California black oak, gray pine, California buckeye, and valley oak (Lowther 2000). They feed on trees such as oaks, and cottonwoods and willows of riparian habitats (Short 1971 in Lowther 2000). They feed on insects and other arthropods (Lowther 2000). Since they feed on terrestrial insects in trees, their exposure to herbicides used to control aquatic weeds in irrigation canals would be very limited.

White-Faced Ibis (*Plegadis chihi*)
White-faced ibis nests in the midst of an extensive, tall (2.2 m), dense common cattail stand at the edge of a sizable opening and in approximately 45 cm of water (Goossen *et al.* 1995). In Kings County, California, white-faced ibises were observed nesting in Baltic rush, summer tamarisk, cattail, and hardstem bulrush (Ivey and Severson 1984). White-faced ibises commonly forage in shallowly flooded wetlands of short, emergent plants. Dominant plants in feeding areas are sedges and spikerushes as well as salt-tolerant glassworts, desert saltgrass, and greasewood. Nearby irrigated crops, particularly alfalfa, barley, and native hay meadows can be important feeding sites (Bray and Klebenow 1988). During the early summer, ibises were observed in alfalfa fields 86% of the time and 100% of the time in the late summer. White-faced ibises feed mostly on aquatic and moist-soil insects, crustaceans, and earthworms (Ryder and Manry 1994), including insects (11 orders), earthworms, leeches, snails, spiders (Petersen 1953 in Ryder and Manry 1994), as well as small fish, frogs, crayfish, snails, small bivalves (Belknap 1957 in Ryder and Manry 1994, Taylor *et al.* 1989, Bray and Klebenow 1988). The foraging habitat for white-faced ibis indicates that they will not feed directly from irrigation canals, so their exposure would be limited only to herbicides that enter crop fields.

Purple Martin (*Progne subis*)
In the western U.S., purple martins do not commonly use bird houses, but rather are restricted to areas with dead snags containing woodpecker holes (Brown 1997). They will also use drains in urban overpasses

(JPS pers. obs.). Purple martins feed aerially higher than other swallows from 50 to 150 m (Johnston and Hardy 1962 in Brown 1997). No information is available on the distance they forage away from nesting sites. They are a diurnal forager, pursuing and catching insects in flight. Rarely, they glean insects off foliage or alight on the ground to take caterpillars (Gullion 1980 in Brown 1997), or skim insects off water surfaces (Riggs 1947 in Brown 1997). The insects consumed probably reflect local abundance and vary across the breeding season (Johnston 1967 in Brown 1997). Purple martins do not forage solely for emergent insects, and the relatively small proportion of the landscape that would provide emergent insects from treated canals would greatly limit their exposure of purple to herbicides applied to irrigation canals. Therefore, the risk to this species from aquatic herbicides applied to irrigation canals will be insignificant.

Bank Swallow (*Riparia riparia*)
Bank swallows breed along ocean coasts, rivers, streams, lakes, reservoirs, and wetlands (Cramp *et al.* 1988 in Garrison 1999, Turner and Rose 1989 in Garrison 1999, American Ornithologists' Union 1998 in Garrison 1999). They require vertical banks, cliffs, and bluffs in alluvial, friable soils for nesting. Bank swallows forage while flying and consume flying or jumping insects and occasionally eat terrestrial and aquatic insects or larvae (Garrison 1999). They feed over lakes, ponds, rivers and streams, meadows, fields, pastures, and bogs. They occasionally feed over forests and woodlands (Stoner 1936 in Garrison 1999, Gross 1942 in Garrison 1999, Turner and Rose 1989 in Garrison 1999). During the breeding season, they generally forage within 200 m of their nests for feeding the nestlings (Mead 1979 in Garrison 1999, Turner 1980 in Garrison 1999). The only area near the District where bank swallows might nest is along the Bear or Feather Rivers. They generally forage within 200 m of nesting areas while they have young in June and July (Garrison 1999). Bank swallows could feed on emergent insects from canals near the Bear or Feather rivers, but the comparative quality and quantity of foraging habitat immediately along the rivers is much greater than that along the treated lateral canals. It is unlikely for bank swallows to gather the majority of their prey from treated irrigation ditches, so the risk to this species from treating irrigation ditches with copper or acrolein-containing herbicides would be insignificant.

Fish

The fish species described below may occur in the Cross Canal and Auburn Ravine at various times of the year. For the duration of the project, check structures are in place along the Cross Canal to prevent District water from entering the cross canal which also prevents fish from entering the District. Likewise, where water is diverted from Auburn Ravine, aquatic pesticides treatments occur only once the water has flowed over a drop structure. This drop structure prevents District water from entering Auburn Ravine.

Sacramento Splittail (*Pogonichthys macrolepidotus*)
Splittail are primarily freshwater fish, but are tolerant of moderate salinities and can live in water with salinities of 10-18 ppt (Moyle 1976, unpubl. obs. in Moyle *et al.* 1995). Splittail apparently require flooded vegetation for spawning and as foraging areas for young, hence are found in habitat subject to periodic flooding during the breeding season (Caywood 1974 in Moyle *et al.* 1995). Most spawning takes place from February through April, following an upstream migration by the adults. Splittail probably spawn on submerged vegetation in flooded areas, and spawning occurs in the lower reaches of rivers (Caywood 1974 in Moyle *et al.* 1995), dead-end sloughs (Moyle 1976 in Moyle *et al.* 1995) and in the larger sloughs such as Montezuma Slough (Wang 1986 in Moyle *et al.* 1995). Larvae remain in the shallow, weedy areas inshore in close proximity to the spawning sites and move into the deeper offshore habitat as they mature (Wang 1986 in Moyle *et al.* 1995). Splittail are benthic foragers that feed extensively on opossum shrimp (Neomysis mercedis). However, detrital material typically makes up a high percentage of their stomach contents. They will feed opportunistically on earthworms, clams, insect

larvae, and other invertebrates (Moyle *et al.* 1995). Although Sacramento splittail have been observed in the Cross Canal, it seems unlikely they will move up irrigation canals to a large degree. Therefore, the risk of treating irrigation canals with herbicides for the control of aquatic weeds is insignificant.

Steelhead (*Oncorhynchus mykiss*)-Central Ca Coast and Central Valley ESUs
Steelheads have two basic life history patterns, winter and summer. Winter steelhead enter streams from the ocean when winter rains provide large amounts of cold water for migration and spawning. Summer steelhead typically enter rivers as immature fish during receding flows of spring and migrate to headwaters reaches where they spend the summer. Regardless of the life history strategy, for the first year or two, trout are found in cool, clear, fast-flowing permanent streams and rivers where riffles predominate, where there is ample cover from riparian vegetation or undercut banks, and where invertebrate life is diverse and abundant (Moyle 2002). The potential risk to steelhead from application of herbicides to irrigation canals derives from the possibility they will enter irrigation canals from the unscreened diversions from Auburn Ravine (Placer County Planning Department 2002).

Chinook Salmon (*Oncorhynchus tshawytscha*) - Central Valley fall/late fall-run & Winter and Spring Runs
For spring chinook adults, numbers holding in an area seem to depend on the volume and depth of pools, amount of cover (especially "bubble curtains" created by inflowing water), and proximity to patches of gravel suitable for spawning (G. M. Sato, unpubl. data in Moyle *et al.* 1995). Habitat preference curves determined by the USFWS for adult chinook in the Trinity River indicate that pool use declines when depths become less than 2.4 m and that optimal water velocity ranges between 15-37 cm sec-1 (Marcotte 1984 in Moyle *et al.* 1995). Spawning occurs in gravel beds with gravel of a size that fish can excavate. The specific habitat requirements of late-fall chinook have not been determined, but they are presumably similar to other chinook salmon runs and fall within the range of physical and chemical characteristics of the Sacramento River above Red Bluff (Moyle *et al.* 1995). The potential risk to steelhead from application of herbicides to irrigation canals derives from the possibility they will enter irrigation canals from the unscreened diversions from Auburn Ravine (Placer County Planning Department 2002).

Invertebrates

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

Plants

Rose-Mallow (*Hibiscus lasiocarpus*)
Rose-mallow is a rhizomatous dicot in the Malvaceae family (CalFlora 2004). Native to California, this species of plant is typically found in freshwater marsh habitat, low peat islands in sloughs, or on undeveloped, densely vegetated, and gradually sloped riverbanks (CNDDB 2004). The District's canals and ditches often have steep banks with dry, compacted soil that would not provide adequate habitat conditions for this plant. Exposure to canal water containing aquatic pesticides is indirect, if any, and would only occur through root uptake of soil water. Aquatic pesticide concentration in root zone water is not expected to be sufficient to cause risk.

Sanford's Arrowhead (*Sagittaria sanfordii*)
Sanford's arrowhead is an emergent, rhizomatous perennial in the family Alismataceae (CalFlora 2004). Endemic to California, this species occurs in freshwater wetlands in areas of shallow, standing or slow-moving water including marshes, swamps, ponds, vernal pools, lakes, reservoirs, sloughs, ditches, canals, streams, and rivers (Nakamura, G., J.K. Nelson 2001). Flowering period occurs from May through August (CNDDB 2004). There are currently no reported occurrences of this plant species within Sutter or Placer counties, and therefore this species has been eliminated from further consideration (CalFlora 2004).

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Appendix D

Toxic Reference Values
The U.S. EPA (1989) suggests applying a 20X safety factor to median toxicity values for aquatic threatened or endangered species and a 10X safety factor for terrestrial threatened or endangered species. In this analysis, we applied these safety factors to all species regardless of their designation. Therefore, species listed as California species of special concern received similar consideration in the analyses as federally threatened or endangered species.

U.S. EPA databases of toxicity values for registered pesticides as well as published toxicity values were used to determine appropriate Toxic Reference Values (TRVs) for acrolein. The species of each taxonomic order (i.e., freshwater fish, birds, mammals, freshwater crustacea, etc.) that was most sensitive to each herbicide was selected and its median toxicity value used to calculate each TRV. Since no published TRVs for available for reptiles for copper or acrolein, the approach used here was to select the most sensitive available TRV from either birds or mammals, and apply a safety factor of 10X. The published TRV for mammals of 12.0 mg copper/kg diet is lower than that for birds of 46.97 mg copper/kg diet (EPA 1999), and applying the safety factor provides a reptilian TRV of 1.20 mg copper/kg diet. Using a similar process for acrolein, the TRV would be 0.091 mg/kg/day.

Exposure Assessment
For terrestrial wildlife species, we used the procedures suggested in the U.S. EPA's Wildlife Exposure Factors Handbook (1993). These procedures entailed determining the dietary habits of each species from published literature, determining food intake levels using body weights and metabolic rates, and herbicide uptake values for each dietary component. We used uptake rates or equations to calculate uptake rates published by the U.S. EPA (1999). For fish, exposure to contaminated water was the primary route considered and dietary exposure. For terrestrial plants, exposure only to drift from above-water applications was considered.

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

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

ACROLEIN

Persistence:

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

Physical Properties

Water Solubility:

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

Volatility:

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

Octanol/Water Partitioning Coefficient (K_{ow})

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

Bioaccumulation

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

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

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

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

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

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

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

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

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

COPPER

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

Physical Properties

Water Solubility:	Copper Sulfate: 230.5 g/kg (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, $t_{1/2\text{-}1} = 0.36$ d and $t_{1/2\text{-}2} = 37$ d.

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

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

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

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

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

Fish Dietary Toxicity
Berntssen *et al.* 1999
Laboratory tests were conducted to determine the effects of dietary copper on Atlantic salmon (*Salmo salar*). Dietary concentrations were 0, 35, and 700 mg Cu/kg diet for an experiment lasting 28 days. Addition of the copper supplemented diet did not cause an increase in the water concentrations of copper. Dietary exposure significantly increased intestinal cell proliferation and apoptosis (degeneration of cells into membrane-bound particles that are then phagocytosed by other cells). The copper exposed groups did not grow during the trial.

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

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

Handy 1993
Rainbow trout (*Oncorhynchus mykiss*) were fed commercial trout chow with and without 10 mg Cu/kg dry weight for 28 days. The water concentrations of Cu remained below 1 ppb. Fish were hand-fed to satiation daily. No outward signs of toxicity were noted and a single mortality occurred in the Cu-treated

fish on day 6 of treatment. Despite some regurgitation of diet pellets, no body weight loss was noted. Dietary copper increased tissue concentrations at day 28 to 2.52, 72.66, and 0.636 µg Cu/g weight in the gills, liver and muscle. Concentration in the kidneys were not elevated.

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

Mount *et al.* 1994
Rainbow trout (*Oncorhynchus mykiss*) were fed brine shrimp (*Artemia* sp.) enriched with Cu, Cd, Pb, and Zn alone or as a mixture along with As for 60 days. The water contained 12 µg/L Cu, 1.1 µg/L Cd, 3.2 µg/L Pb, and 50 µg/L Zn. Cu concentrations in the shrimp were 20, 40, and 80 µg/g fresh weight when trout were exposed to Cu alone. Survival of trout was decreased in the medium and high Cu treatments with 69 and 72% survival, respectively. Weight and length of trout were not impacted by feeding on brine shrimp containing Cu. Cu concentrations in whole fish were elevated as compared to controls either in clean water or metal-containing water, but the Cu concentrations did not differ among dietary treatment levels. No detrimental impacts were observed in the exposures to multiple metals via the diet. In that exposure scenario, concentrations in the diet were 0.5, 1, 1.5 and 2X the low concentrations from the first scenario.

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

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

exposed to higher metal concentrations in diet or water. However, the rainbow trout exposed to diets with higher metals concentrations had similar growth patterns regardless of whether they were also exposed to metals-containing water. Also, the growth of the rainbow trout exposed to treated water and the diet with low metal concentrations recovered by day 88 and were no longer significantly different from fish in untreated water.

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

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

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

ACROLEIN

Test	Scientific Name	Common Name	Category	Test Result	Value (C.I.)	Toxicity Class	Slope	NOEL	Information Source
24-hr Aquatic Plant Toxicity—Photosynthesis inhibition (N.R.)	*Enteromorpha intestinalis*	Algae	Freshwater Algae	EC_{50}	1.8 ppm (N.R.)	N.A.	N.R.	N.R.	WHO 1991
24-hr Aquatic Plant Toxicity—Photosynthesis inhibition (N.R.)	*Cladophora glomerata*	Algae	Freshwater Algae	EC_{50}	1.0 ppm (N.R.)	N.A.	N.R.	N.R.	WHO 1991
24-hr Aquatic Plant Toxicity—Photosynthesis inhibition (N.R.)	*Anabaena*	Algae	Freshwater Algae	EC_{50}	0.69 ppm (N.R.)	N.A.	N.R.	N.R.	WHO 1991
5-day Aquatic Plant Toxicity (95.03%)	*Selenastrum capricornutum*	Green Algae	Freshwater Algae	EC_{50}	0.05 ppm (0.045-0.055)	N.A.	N.R.	0.03 ppm	U.S. EPA 2004
5-day Aquatic Plant Toxicity (95.03%)	*Anabaena flos-aquae*	Bluegreen Algae	Freshwater Algae	EC_{50}	0.036 ppm (0.036-0.040)	N.A.	3.6	0.012 ppm	U.S. EPA 2004
5-day Aquatic Plant Toxicity (95.03%)	*Navicula pelliculosa*	Diatom	Freshwater Algae	EC_{50}	0.047 ppm (0.043-0.052)	N.A.	N.R.	0.025 ppm	U.S. EPA 2004
14-day Aquatic Plant Toxicity (95.03%)	*Lemna gibba*	Duckweed	Aquatic Plant	EC_{50}	0.075 ppm (0.067-0.083)	N.A.	3.5	N.R.	U.S. EPA 2004
96-hr Acute Aquatic Toxicity (N.R.)	*Xenopus laevis*	African Clawed Frog, tadpoles	Amphibian	LC_{50}	0.007 ppm (0.006-0.008)	N.A.	N.R.	N.R.	Eisler 1994
Acute Oral Toxicity (N.R.)	*Mus* sp.	Mouse	Mammal	LD_{50}	28 mg/kg (N.R.)	Very Highly Toxic	N.A.	N.R.	Eisler 1994
Acute Oral Toxicity (N.R.)	N.R.	Mouse	Mammal	LD_{50}	18 mg/kg (N.R.)	Very Highly Toxic	N.A.	N.R.	U.S. EPA 2003
Acute Oral Toxicity (N.R.)	Wistar	Laboratory Rat	Mammal	LD_{50}	46 mg/kg (39-56)	Very Highly Toxic	N.A.	N.R.	WHO 1991
Acute Oral Toxicity (N.R.)	Sprague-Dawley	Laboratory Rat	Mammal	LD_{50}	29 mg/kg (N.R.)	Very Highly Toxic	N.A.	N.R.	U.S. EPA 2003

Test	Scientific Name	Common Name	Category	Test Result	Value (C.I.)	Toxicity Class	Slope	NOEL	Information Source
Acute Oral Toxicity (97%)	N.R.	Laboratory Rat	Mammal	LD_{50}	10.3 mg/kg (males) 11.8 mg/kg (females) (N.R.)	Very Highly Toxic	N.A.	N.R.	U.S. EPA 2003
10-minute Acute Inhalation Toxicity (N.R.)	Wistar	Laboratory Rat	Mammal	LD_{50}	750 mg/m^3 (N.R.)	Highly Toxic	N.A.	N.R.	WHO 1991
30-minute Acute Inhalation Toxicity (N.R.)	Sprague-Dawley	Laboratory Rat	Mammal	LD_{50}	95-217 mg/m^3 (N.R.)	Very Highly Toxic	N.A.	N.R.	WHO 1991
1-hour Acute Inhalation Toxicity (N.R.)	Sprague-Dawley	Laboratory Rat	Mammal	LD_{50}	65 mg/m^3 (60-68)	Very Highly Toxic	N.A.	N.R.	WHO 1991
4-hour Acute Inhalation Toxicity (N.R.)	Sprague-Dawley	Laboratory Rat	Mammal	LD_{50}	20.8 mg/m^3 (17.5-24.8)	Very Highly Toxic	N.A.	N.R.	WHO 1991
24-hr Drinking Water Toxicity (N.R.)	*Bos* sp.	Cow	Mammal	LD_{50}	N.R.	N.A.c	N.A.	60 ppm	Eisler 1994
Acute Dermal Toxicity (N.R.)	New Zealand White	Rabbit	Mammal	LD_{50}	231 mg/kg (N.R.)	N.A.c	N.A.	60 ppm	U.S. EPA 2003
Acute Oral Toxicity (92%)	*Colinus virginianus*	Northern Bobwhite	Bird	LD_{50}	19 mg/kg (16-22)	Highly Toxic	N.A.	N.R.	U.S. EPA 2004
Acute Oral Toxicity (92%)	*Anas platyrhynchos*	Mallard	Bird	LD_{50}	9.1 mg/kg (6.3-13.1)	Very Highly Toxic	N.A.	N.R.	Eisler 1994; U.S. EPA 2004
Acute Oral Toxicity (95.09%)	*Anas platyrhynchos*	Mallard	Bird	LD_{50}	28 mg/kg (18-38)	Highly Toxic	N.A.	< 14.7 mg/kg	U.S. EPA 2004
Acute Inhalation Toxicity (N.R.)	*Gallus* sp.	Domestic Chicken	Bird	LOEC	50 mg/L (N.A.)	N.A.	N.A.	< 50 mg/L	Eisler 1994
Acute Oral Toxicity (N.R.)	*Phasianus colchicus*	Ring-necked Pheasant	Bird	LD_{50}	> 100 mg/kg (N.R.)	Moderately Toxic	N.A.	N.R.	WHO 1991

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

Test	Scientific Name	Common Name	Category	Test Result	Value (C.I.)	Toxicity Class	Slope	NOEL	Information Source
24-hr Freshwater Acute Toxicity (N.R.)	*Biomphalaria glabrata*	Snail adults	Freshwater Mollusk	35% mortality	2.5 ppm (N.R.)	N.A.	N.R.	N.R.	WHO 1991
96-hr Freshwater Acute Toxicity (N.R.)	*Aplexa hypnorum*	Snail	Freshwater Mollusk	< 50% mortality	0.151 ppm (N.R.)	N.A.	N.R.	N.R.	Eisler 1994
24-hr Freshwater Acute Toxicity (N.R.)	*Australorbis glabratus*	Snail adults	Freshwater Mollusk	0% mortality	1.250 ppm (N.R.)	N.A.	N.R.	N.R.	Eisler 1994
24-hr Freshwater Acute Toxicity (N.R.)	*Australorbis glabratus*	Snail embryos	Freshwater Mollusk	10% mortality	1.250 ppm (N.R.)	N.A.	N.R.	N.R.	Eisler 1994
24-hr Freshwater Acute Toxicity (N.R.)	*Australorbis glabratus*	Snail adults	Freshwater Mollusk	35% mortality	2.500 ppm (N.R.)	N.A.	N.R.	N.R.	Eisler 1994
24-hr Freshwater Acute Toxicity (N.R.)	*Australorbis glabratus*	Snail embryos	Freshwater Mollusk	40% mortality	2.500 ppm (N.R.)	N.A.	N.R.	N.R.	Eisler 1994
24-hr Freshwater Acute Toxicity (N.R.)	*Australorbis glabratus*	Snail adults	Freshwater Mollusk	90% mortality	10.000 ppm (N.R.)	N.A.	N.R.	N.R.	Eisler 1994
24-hr Freshwater Acute Toxicity (N.R.)	*Australorbis glabratus*	Snail embryos	Freshwater Mollusk	100% mortality	10.000 ppm (N.R.)	N.A.	N.R.	N.R.	Eisler 1994
Freshwater Acute Toxicity (96.4%)	*Lepomis macrochirus*	Bluegill Sunfish	Freshwater Fish	LC_{50}	0.022 ppm (N.R.)	Very Highly Toxic	N.R.	N.R.	Turner and Erickson 2003
96-hr Freshwater Acute Toxicity (N.R.)	*Lepomis macrochirus*	Bluegill Sunfish	Freshwater Fish	LC_{50}	0.09 ppm (N.R.)	Very Highly Toxic	N.R.	N.R.	WHO 1991
96-hr Freshwater Acute Toxicity (N.R.)	*Lepomis macrochirus*	Bluegill Sunfish	Freshwater Fish	LC_5	0.033 ppm (0.027-0.040)	Very Highly Toxic	N.R.	N.R.	Eisler 1994

Test	Scientific Name	Common Name	Category	Test Result	Value (C.I.)	Toxicity Class	Slope	NOEL	Information Source
24-hr Freshwater Acute Toxicity (N.R.)	*Lepomis macrochirus*	Bluegill Sunfish	Freshwater Fish	LC_{50}	0.079 ppm (N.R.)	Very Highly Toxic	N.R.	N.R.	Eisler 1994
96-hr Freshwater Acute Toxicity (N.R.)	*Lepomis macrochirus*	Bluegill Sunfish	Freshwater Fish	LC_{50}	0.090-0.100 ppm (N.R.)	Very Highly Toxic	N.R.	N.R.	Eisler 1994
24-hr Freshwater Acute Toxicity (N.R.)	*Micropterus salmoides*	Largemouth Bass	Freshwater Fish	LC_{50}	0.183 ppm (N.R.)	Highly Toxic	N.R.	N.R.	Eisler 1994
96-hr Freshwater Acute Toxicity (N.R.)	*Micropterus salmoides*	Largemouth Bass	Freshwater Fish	LC_{50}	0.160 ppm (N.R.)	Highly Toxic	N.R.	N.R.	Eisler 1994
96-hr Freshwater Acute Toxicity (Formulation)	*Micropterus salmoides*	Largemouth Bass	Freshwater Fish	LC_{50}	< 0.160 ppm (N.R.)	Highly Toxic	N.R.	N.R.	U.S. EPA 2004
24-hr Freshwater Acute Toxicity (N.R.)	*Pimephales promelas*	Fathead Minnow	Freshwater Fish	LC_{50}	0.150 ppm (N.R.)	Highly Toxic	N.R.	N.R.	Eisler 1994
48-hr Freshwater Acute Toxicity (N.R.)	*Pimephales promelas*	Fathead Minnow	Freshwater Fish	LC_{50}	0.115 ppm (N.R.)	Highly Toxic	N.R.	N.R.	Eisler 1994
48-hr Freshwater Acute Toxicity (Formulation)	*Pimephales promelas*	Fathead Minnow	Freshwater Fish	LC_{50}	< 0.115 ppm (N.R.)	Highly Toxic	N.R.	N.R.	U.S. EPA 2004
96-hr Freshwater Acute Toxicity (N.R.)	*Pimephales promelas*	Fathead Minnow	Freshwater Fish	LC_{50}	0.014 ppm (0.008-0.025)	Very Highly Toxic	N.R.	N.R.	Eisler 1994
Freshwater Acute Toxicity (N.R.)	*Pimephales promelas*	Fathead Minnow	Freshwater Fish	MATC	0.011-0.042 ppm (N.R.)	N.A.	N.R.	N.R.	Eisler 1994
144-hr Freshwater Acute Toxicity (N.R.)	*Pimephales promelas*	Fathead Minnow	Freshwater Fish	LC_{50}	0.084 ppm (N.R.)	Very Highly Toxic	N.R.	N.R.	WHO 1991

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

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

COPPER

Test	Scientific Name	Common Name	Category	Test Result	Value (C.I.)	Toxicity Class	Slope	NOEL	Information Source
Aquatic Plant Toxicity – Frond Count ($CuSO_4$)	*Lemna minor*	Duckweed	Aquatic Plant	EC_{50}	0.8 ppm (0.7 – 0.9)	N.A.	N.R.	N.R.	Bishop and Perry 1981
Aquatic Plant Toxicity – Dry Weight ($CuSO_4$)	*Lemna minor*	Duckweed	Aquatic Plant	EC_{50}	0.8 ppm (0.4 – 1.2)	N.A.	N.R.	N.R.	Bishop and Perry 1981
Aquatic Plant Toxicity – Root Length ($CuSO_4$)	*Lemna minor*	Duckweed	Aquatic Plant	EC_{50}	0.6 ppm (0.3 – 0.8)	N.A.	N.R.	N.R.	Bishop and Perry 1981
Aquatic Plant Toxicity – Growth Rate ($CuSO_4$)	*Lemna minor*	Duckweed	Aquatic Plant	EC_{50}	1.2 ppm (1.1 – 1.3)	N.A.	N.R.	N.R.	Bishop and Perry 1981
2-day Contact toxicity (Copper Sulfate)	*Eisenia fetida*	Earthworm	Oligochaeta	LC_{50}	0.00198 mg/L (N.R.)	N.A.	N.R.	N.R.	Callahan *et al.* 1994
2-day Contact toxicity (Copper Chloride	*Eisenia fetida*	Earthworm	Oligochaeta	LC_{50}	0.000596 mg/L (N.R.)	N.A.	N.R.	N.R.	Callahan *et al.* 1994
2-day Contact toxicity (Copper Nitrate)	*Eisenia fetida*	Earthworm	Oligochaeta	LC_{50}	0.000429 mg/L (N.R.)	N.A.	N.R.	N.R.	Callahan *et al.* 1994
2-day Contact toxicity (Copper Sulfate)	*Eisenia fetida*	Earthworm	Oligochaeta	LC_{50}	638 mg/L (N.R.)	N.A.	N.R.	N.R.	Callahan *et al.* 1994
14-day Soil toxicity (Copper Nitrate)	*Eisenia fetida*	Earthworm	Oligochaeta	LC_{50}	0.000353 mg/kg (N.R.)	N.A.	N.R.	N.R.	Callahan *et al.* 1994
14-day Soil toxicity (Copper Sulfate)	*Eisenia fetida*	Earthworm	Oligochaeta	LC_{50}	0.000522 mg/kg (N.R.)	N.A.	N.R.	N.R.	Callahan *et al.* 1994
Freshwater Acute Toxicity ($Cu(NO_3)2 \cdot 3H_2O$)	*Ceriodaphnia dubia*	Ceriodaphnia	Freshwater Crustacea	LC_{50}	*c.* 1.1 ppm (N.R.)	Moderately Toxic	N.R.	*c.* 0.1 ppm	Cowgill and Milazzo 1991

Test	Scientific Name	Common Name	Category	Test Result	Value (C.I.)	Toxicity Class	Slope	NOEL	Information Source
3-Brood Toxicity Test ($Cu(NO_3)2 \cdot 3H_2O$)	*Ceriodaphnia dubia*	Ceriodaphnia	Freshwater Crustacea	LC_{50}	*c.* 0.2 ppm (N.R.)	Highly Toxic	N.R.	N.R.	Cowgill and Milazzo 1991
Sediment Acute Toxicity ($CuSO_4$)	*Chironomus tentans*	Midge (2nd Instar)	Aquatic Insect	LC_{50}	1.170 ppm (N.A.)	N.A.	N.A.	N.R.	Dobbs *et al.* 1994 in EPA 2003
Filter Paper Acute Toxicity (Copper Sulfate)	*Eisenia fetida*	Earthworm	Oligochaeta	LC_{50}	26.0 $\mu g/cm^2$ (17.1 – 34.9)	N.A.	N.R.	N.R.	Edwards and Bater 1992
Artificial Soil Acute Toxicity (Copper Sulfate)	*Eisenia fetida*	Earthworm	Oligochaeta	LC_{50}	1104.9 ppm (727.6 – 1482.2)	N.A.	N.R.	N.R.	Edwards and Bater 1992
Freshwater Acute Toxicity (Copper Sulfate)	*Anguilla rostrata*	American Eel	Freshwater Fish	LC_{50}	3.20 ppm (2.17 – 13.35)	Moderately Toxic	N.R.	N.R.	Hinton and Eversole 1979
Freshwater Acute Toxicity (Copper form N.R.) (24 hr static)	*Brachionus calyciflorus*	Rotifer	Freshwater Crustacea	LC_{50}	0.026 ± 0.0026 ppm (N.R.)	Very Highly Toxic	N.R.	N.R.	Janssen *et al.* 1994
Chronic Life Cycle (Copper form N.R.)	*Brachionus calyciflorus*	Rotifer	Freshwater Crustacea	LOEC	0.005 ppm[1] (N.A.)	N.A.	N.A.	0.0025 ppm	Janssen *et al.* 1994
48-hr Freshwater Acute Toxicity ($Cu(NO_3)_2 \cdot 3H_2O$)	*Gambusia affinis*	Mosquitofish	Freshwater Fish	LC_{50}	0.140 ppm (0.11 – 0.16)	Highly Toxic	1.47	N.R.	Joshi and Rege 1980
96-hr Freshwater Acute Toxicity ($Cu(NO_3)_2 \cdot 3H_2O$)	*Gambusia affinis*	Mosquitofish	Freshwater Fish	LC_{50}	0.093 ppm (0.08 – 0.15)	Very Highly Toxic	1.56	N.R.	Joshi and Rege 1980
48-hr Freshwater Acute Toxicity ($CuSO_4 \cdot 5H_2O$)	*Gambusia affinis*	Mosquitofish	Freshwater Fish	LC_{50}	0.460 ppm (0.25 – 0.83)	Highly Toxic	1.82	N.R.	Joshi and Rege 1980
96-hr Freshwater Acute Toxicity ($CuSO_4 \cdot 5H_2O$)	*Gambusia affinis*	Mosquitofish	Freshwater Fish	LC_{50}	0.20 ppm (0.11 – 0.33)	Highly Toxic	1.70	N.R.	Joshi and Rege 1980

Test	Scientific Name	Common Name	Category	Test Result	Value (C.I.)	Toxicity Class	Slope	NOEL	Information Source
96-hr Freshwater Acute Toxicity (Cutrine Formulation)	*Salmo trutta*	Brown Trout	Freshwater Fish Fingerlings	LC_{50}	0.198 ppm (0.11 – 0.33)	Highly Toxic	1.70	N.R.	Simonin and Skea 1977
Sediment Acute Toxicity ($CuSO_4$)	*Tubifex tubifex*	Tubifex	Freshwater Worm	LC_{50} (Dry wt.)	> 1000 ppm (N.A.)	N.A.	N.A.	500 ppm	Meller *et al.* 1998
Sediment Acute Toxicity ($CuSO_4$)	*Limnodrilus hoffmeisteri*	Limnodrilus	Freshwater Worm	LC_{50} (Dry wt.)	516 ppm (458 – 581)	N.A.	N.R.	250 ppm	Meller *et al.* 1998
Earthworm Reproduction ($CuCl_2 \cdot H_2O$)	*Enchytraeus crypticus*	Earthworm	Terrestrial Worm	EC_{50}	477 ppm (345 – 658)	N.A.	N.R.	N.R.	Posthuma *et al.* 1997
Freshwater Acute Toxicity ($CuCl_2$)	*Balanus amphitrite*	Acorn Barnacle (nauplii)	Freshwater Crustacea	LC_{50}	0.480 ppm (0.310 – 0.740)	Highly Toxic	N.R.	N.R.	Sasikumar *et al.* 1995
Freshwater Acute Toxicity ($CuCl_2$)	*Artemia* sp.	Brine Shrimp	Freshwater Crustacea	LC_{50}	1.280 ppm (1.01 – 1.560)	Highly Toxic	N.R.	N.R.	Sasikumar *et al.* 1995
14-day Acute Toxicity [$Cu(NO_3)_2$ $3H_2O$]	*Eisenia fetida*	Earthworm	Oligochaeta	LC_{50}	683 µg/g (570 – 812)	N.A.	N.R.	N.R.	Spurgeon *et al.* 1994
56-day Toxicity [$Cu(NO_3)_2$ $3H_2O$]	*Eisenia fetida*	Earthworm	Oligochaeta	LC_{50}	555 µg/g (460 – 678)	N.A.	N.R.	210 µg/g	Spurgeon *et al.* 1994
56-day Cocoon Production [$Cu(NO_3)_2$ $3H_2O$]	*Eisenia fetida*	Earthworm	Oligochaeta	EC_{50}	53.3 µg/g (32.5 – 186)	N.A.	N.R.	32 µg/g	Spurgeon *et al.* 1994

[1] No criteria for LOEC provided.

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Documentation

State Implementation Plan (SIP) Section 5.3 Exception Information Sheet

The Control of Aquatic Weeds in Irrigation Canals Using Copper and Acrolein

South Sutter Water District

July 28, 2004

1. **Notification.** South Sutter Water District (District) will notify potentially effected public and governmental agencies of the project. The project is described in the District's Initial Study/Mitigated Negative Declaration (IS/MND) dated July 27, 2004.
2. **Description of the Proposed Action.** The proposed action is the application of acrolein and copper aquatic pesticides to water in irrigation ditches and canals for the purposes of controlling weeds and algae. For a more detailed description, see the District's aforementioned IS/MND.
3. **Method of Completing the Action.** The action (the application of copper and acrolein aquatic pesticides) will be completed according to the copper and acrolein product's label directions. Refer to the aforementioned IS/MND.
4. **Schedule.** The schedule for the action will be according to Integrated Pest Management (IPM) principles. For example, the application of aquatic pesticides will be done at times and frequencies when the concentration of weeds equals or exceeds thresholds established by the District.
5. **Discharge and Receiving Water Quality Monitoring Plan.** The District has prepared and will use an Aquatic Pesticide Application Plan (APAP) as required in the Statewide General NPDES Permit for the Discharge of Aquatic Pesticides for Aquatic Weed Control In Waters of the United States (No. CAG 99005). 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.
6. **Contingency Plans.** In the event that the District cannot use the SIP exception regarding the use of copper or acrolein to control aquatic weeds, manual control of these weeds may be an option in some areas.
7. **Identification of Alternate Water Supply.** The District has the Bear River as its water source. As an alternative supply, groundwater resources are insufficient to meet demand and are therefore not a viable alternative. The use of groundwater would not resolve the problem of aquatic weed presence in District's canals and ditches.
8. **Residual Waste Disposal Plans.** The District's use of copper or acrolein to control aquatic weeds in canals and ditches does not create residual waste. Note that the manual removal of weeks creates substantial residual waste.
9. **Certification by a Qualified Biologist.** At the completion of the project, the District will provide certification by a qualified biologist that the receiving water beneficial uses have been maintained. Post-project certification will take into account natural variations in project site conditions and the influence these conditions have on beneficial uses.

Notice of Determination

To: Sutter County Clerk
1160 Civic Center Blvd
Suite A
Yuba City, CA 95933

State Clearinghouse
PO Box 3044
Sacramento CA 95814-3044

Placer County Clerk
2954 Richardson Dr.
Auburn, CA 95603

From: South Sutter Water District
2464 Pacific Avenue
Trowbridge, CA 95659

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

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

Contact Person: Brad Arnold, ph: 530-656-2242

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

- Project Location: within Sutter and Placer Counties, CA
- Project Description: The use of acrolein and/or copper to treat algae and aquatic weeds in water conveyances, including irrigation canals and ditches. The South Sutter Water District has prepared the Initial Study/Mitigated Negative Declaration to meet requirements of 1) The State Implementation Plan (SIP) Section 5.3 and 2) NPDES Permit #CAG990005

Determination: This notice is to advise that South Sutter Water District approved the above-described project on July 20, 2004, 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:
      ☒ $1,250 for review of a Negative Declaration
      ☐ $850 for review of an Environmental Impact Report
      ☐ $25 for County Fish and Game program processing fees

Brad Arnold
Brad Arnold, General Manager

7/27/04
Date

NOTICE OF INTENT

To Adopt a Mitigated Negative Declaration for the
South Sutter Water District

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

South Sutter Water District (SSWD) is proposing to continue to use acrolein and copper-based aquatic pesticides to control aquatic weeds in its ditches and canals in Sutter and Placer Counties, California.

The proposed project would include the following elements:

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

To comply with the requirements of the California Environmental Quality Act (CEQA), SSWD 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, SSWD has determined that the proposed project can be carried out without significant impacts on the environment. Therefore, SSWD 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, SSWD will consider public comments on the Initial Study and proposed Mitigated Negative Declaration. All interested parties are invited to submit written comments to:

Brad Arnold
General Manager
South Sutter Water District
2464 Pacific Avenue
Trowbridge, CA 95659

The Initial Study and proposed Mitigated Negative Declaration are available for public review at the above address during normal working hours, 8:00 a.m. to 5:00 p.m. The public review period begins on June 21, 2004, and ends on July 23, 2004. All written comments must be received by 5:00 p.m. on July 23, 2004.

A public hearing on the proposed Negative Declaration will be held during a SSWD Board Meeting on July 27, 2004 at 9:00 a.m. at the District's Office located at 2464 Pacific Avenue in Trowbridge, California. After consideration of all comments, the SSWD Board of Directors will either certify or reject the proposed Mitigated Negative Declaration.

Form A

Notice of Completion & Environmental Document Transmittal

SCH #_____

Mail to: State Clearinghouse, PO Box 3044, Sacramento CA 95814-3044 916/445-0613

Project Title: *Use of Copper and Acrolein Aquatic Pesticides to Control Aquatic Weeds in Water Conveyances*
Lead Agency: *South Sutter Water District*
Contact Person: *Brad Arnold*
Mailing Address: *2464 Pacific Avenue*
Phone: *(530) 656-2242*
City: *Trowbridge, CA* Zip: *95659*
County: *Sutter, Placer, and Yuba Counties*

Project Location:
County: *Sutter, Placer, and Yuba Counties*
City/Nearest Community: *Trowbridge, CA*
Cross Streets:
Zip Code: *95659* Total Acres: *45,000*
Assessor's Parcel No.
Section: *various* Twp: *13N* Range: *04E* Base: *Mt. Diablo*
Within 2 Miles: State Hwy#: *Hwy 90, Hwy 70*
Waterways: *Sacramento River, Auburn Ravine, Coon Creek*
Airports: Railways: *Western Pacific RR*
Schools: *East Nicolaus High School*

Document Type:
CEQA: ☐ NOP ☐ Supplement/Subsequent EIR (Prior SCH No.) ☐ Early Cons ☐ Other X Neg Dec ☐ Draft EIR
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.) X Other: *NPDES Permit and SIP Section 5.3 Exception*

Development Type:

☐ Residential:	*Units*	*Acres*		☐ Water Facilities:	*Type*	*MGD*
☐ Office:	*Sq.ft*	*Acres*	*Employees*	☐ Transportation:	*Type*	
☐ Commercial:	*Sq.ft.*	*Acres*	*Employees*	☐ Mining:	*Mineral*	
☐ Industrial:	*Sq.ft.*	*Acres*	*Employees*	☐ Power:	*Type*	*Watts*
☐ Educational				☐ Waste Treatment:	*Type*	
☐ Recreational				☐ Hazardous Waste:	*Type*	

X Other: *NPDES Permit and State Implementation Plan (SIP) Sec 5.3 Exception*

Funding (approx.): Federal: *None* State: *None* Total: *None*

Project Issues Discussed in Document:

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

Present Land Use/Zoning/General Plan Designation: *Residential, Commercial, Agricultural, Open Space*

Project Description: The use of acrolein and/or copper to treat algae and aquatic weeds in water conveyances, including irrigation canals and ditches. The Princeton-Codora-Glenn Irrigation District is preparing this Initial Study/Mitigated Negative Declaration to meet requirements of 1) The State Implementation Plan (SIP) Section 5.3 and 2) NPDES Permit #CAG990005. See CEQA Initial Study and Mitigated Negative Declaration for details.

Reviewing Agencies Checklist

Form A, contin

KEY
S = Document sent by lead agency
X = Document sent by SCH
Δ = Suggested distribution

___ **Resources Agency**
___ Boating & Waterways
___ Coastal Commission
___ Coastal Conservancy
___ Colorado River Board
___ Conservation
__S__ Fish & Game (Attn: Jana Herren)
___ Forestry & Fire Protection
___ Office of Historic Preservation
___ Parks & Recreation
__Δ__ Reclamation Board
___ S.F. Bay Conservation & Development Commission
__Δ__ Water Resources (DWR)

Business, Transportation & Housing
___ Aeronautics
___ California Highway Patrol
___ CALTRANS District #
___ Department of Transportation Planning (headquarters)
___ Housing & Community Development
__Δ__ **Food & Agriculture**

Health & Welfare
___ Health Services_____

State & Consumer Services
___ General Services
___ OLA (Schools)

Environmental Protection Agency
___ Air Resources Board
___ California Waste Management Board
___ SWRCB: Clean Water Grants
___ SWRCB: Delta Unit
__S__ SWRCB: Water Quality (Attn: Jim Maughn, Phil Isorena)
___ SWRCB: Water Rights
__S__ Regional WQCB# 5b (Attn: Emily Alejandrino)

Youth & Adult Corrections
___ Corrections

Independent Commissions & Offices
___ Energy Commission
___ Native American Heritage Commission
___ Public Utilities Commission
___ Santa Monica Mountains Conservancy
___ State Lands Commission
___ Tahoe Regional Planning Agency

___ Other_____

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

Starting Date: June 21, 2004 Ending Date: July 23, 2004

Signature Brad Arnold Date 6/18/04

Lead Agency (Complete if applicable):

Consulting Firm: *Blankinship & Associates, Inc.*
Address: *2940 Spafford Street, Suite 110*
City/State/Zip: *Davis, CA 95616*
Contact: *Michael Blankinship*
Phone: *(530) 757-0941*

Applicant: *South Sutter Water District*
Address: *2464 Pacific Avenue*
City/State/Zip: *Trowbridge, CA 95659*
Phone: *(530) 656-2242*

For SCH Use Only:

Date Received at SCH_____
Date Review Starts_____
Date to Agencies_____
Date to SCH_____
Clearance Date_____
Notes:

Board Resolution No. 2004-07 of the South Sutter Water District

Adopting a CEQA Mitigated Negative Declaration for Use of Copper and Acrolein To Control Aquatic Weeds In Water Conveyances

The Board of Directors of South Sutter Water District finds and states as follows:

1.) WHEREAS, The South Sutter Water District (herein referred to as the District) proposes to apply copper and or acrolein to canals and ditches under the District's jurisdiction in order to control a variety of aquatic weeds for purposes of maintaining adequate water conveyance capacity (the "Project");
2.) WHEREAS, pursuant to the California Environmental Quality Act (CEQA) guidelines, the District has prepared a CEQA Initial Study and Mitigated Negative Declaration for the Project dated 5/17/04;
3.) WHEREAS, the District's Initial Study concluded that with the implementation of mitigation measures described in the Initial Study, the project will not have a significant effect on the environment;
4.) WHEREAS, the District therefore has proposed to adopt a CEQA Mitigated Negative Declaration for the Project;
5.) WHEREAS, pursuant to CEQA guidelines, the District has circulated for public review and comment a Notice of Intent to Adopt the Mitigated Negative Declaration and the Initial Study;
6.) WHEREAS, the District has [ ] has not [✓] received and responded to public comments concerning the Mitigated Negative Declaration and the Initial Study;
7.) WHEREAS, the District General Manager has recommended that the District Board of Directors adopt the Mitigated Negative Declaration and authorize the filing of a CEQA Notice of Determination;

NOW, THEREFORE BE IT RESOLVED by the Board of Directors of the South Sutter Water District as follows:

1.) **Mitigated Negative Declaration.** The District hereby adopts this Mitigated Negative Declaration for the Project pursuant to CEQA.
2.) **Findings.** The Board has reviewed the proposed Project, Initial Study, Mitigated Negative Declaration, public comments received, and other information provided by District staff. On the basis of this information and the whole record before the District, the Board hereby finds and determines as follows:
    a. The Initial Study and Mitigated Negative Declaration reflect the District's independent judgment and analysis;
    b. Although the project could have a significant effect on the environment without mitigation, there will not be a significant effect because the District has put appropriate mitigation measures in place; and
    c. There is no substantial evidence, in light of the whole record in front of the District, that the Project may have a significant effect on the environment.
3.) **Location and Custodian of Documents.** The Mitigated Negative Declaration, the Initial Study, Notice of Intent to Adopt the Initial Study are on file and available for public review at the District office located at 2464 Pacific Ave., Trowbridge. The District Manager at this address is the custodian of these documents that constitute the record of proceedings upon which the decision in this matter is based.

4.) **Project Approval.** The District Board hereby approves the Project and authorizes the District Manager to proceed with Project implementation in accordance with District policies and requirements.

5.) **Notice of Determination.** The District Board hereby authorizes and directs the District Manager to prepare, sign and file a CEQA Notice of Determination with the Sutter County Clerk and the State Clearinghouse within 5 days from the date of this Mitigated Negative Declaration, and to pay the California Department of Fish and Game fee for review of the Mitigated Negative Declaration in accordance with Fish and Game Code section 711.4.

PASSED AND ADOPTED by the Board of Directors of the South Sutter Water District, at a meeting held on July 27, 2004 by the following roll call vote:

AYES: DIRECTORS, VAN DYKE, TREUETHAN, NELSON, RAI, CUQUET, VERTREES, CONANT
NYES: NONE
ABSENT: NONE

Signed by me after its passage this 27th day of July, 2004

President, Board of Directors

ATTEST:

Secretary

SOUTH SUTTER WATER DISTRICT
SUTTER AND PLACER COUNTIES
CALIFORNIA

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

2940 Spafford St., Suite 110, Davis, CA 95616
Tel. (530) 757-0941 Fax (530) 757-0940
www.envfox.com

Emily Alejandrino
Central Valley RWQCB
11020 Sun Center Drive #200
Rancho Cordova, CA 95670

July 21, 2004

RE: South Sutter Water District (SSWD) CEQA Documentation for the use of Acrolein and Copper to Control Aquatic Weeds (WDID# 5A51NP00009).

Dear Emily:

We are in receipt of your letter dated July 12, 2004. Thank you for your comments on the draft California Environmental Quality Act (CEQA) Initial Study/Mitigated Negative Declaration submitted to your office on June 18, 2004.

According to the product label directions, "Water treated with Magnacide H herbicide must be used for irrigation of fields, either crop bearing, fallow, or pasture, where the treated water remains on the field OR held for 6 days before being released into fish bearing waters or where it will drain into them."

When irrigation water treated with acrolein is released to a field, SSWD takes several steps to prevent acrolein-treated water from entering a water course before 6 days has elapsed. Four general categories can be considered:

1.) Rice Fields: Once flooded, water is held and replenished daily for periods well in excess of 6 days (often as long as 4-6 weeks). Growers regularly monitor their fields to inspect levees and berms for leakage. If leaks are detected, they are fixed immediately. Only a small percentage (<5 %) of the volume of water in a flooded rice field at any one time is from an acrolein-treated irrigation conveyance. Accordingly, the dilution of acrolein is significant. Further, as a result of shallow water in the rice field, water temperatures are higher and ultraviolet light penetration into the water is greater than in an irrigation conveyance resulting in a higher than normal rate of acrolein degradation. Specifically, the half-life of acrolein in irrigation canals is between 10 and 26 hours and would likely be 10 or fewer hours in a flooded rice field. Accordingly, as a result of significant dilution and rapid degradation, we believe that acrolein would be non-detectable in water leaving a rice field.

2.) Row Crops and Alfalfa: Acrolein-treated water is passed over dry land >200 yards prior to reaching the end of a field or a tailwater drain. In order to prevent erosion and to save irrigation water cost, most growers use irrigation efficiently enough so that only the amount needed is applied to meet crop needs. As a result, the volume of water, if any, reaching the end of the field is little to none. When irrigation water is applied to a field, it is applied slowly in order to minimize erosion and maximize infiltration. As a result, acrolein has ample time to degrade and /or volatilize.

Assuming typical irrigation practices over a minimum of 200 yards, we believe that if acrolein-treated water reached the end of a field, acrolein would be non-detectable.

3.) Tailwater. In the event that either rice field water is released or excess irrigation water does reach a tailwater drain, this water in most cases is picked up and used again by an adjacent or nearby grower. These growers apply this tailwater as irrigation water to their fields at similarly slow rates as described in 2.) above. Although unlikely, if acrolein is present in this "reused" irrigation water, it will continue to degrade and volatilize.

4.) Grower Notification. In cases where grower's fields may drain to a watercourse that is not a tailwater drain delivering water for reuse, the SSWD notifies these growers of acrolein applications so that they do not use acrolein-treated water until it has past their gate or diversion structure.

Please call me at (530) 757-0941 if you have any questions.

Sincerely,

BLANKINSHIP & ASSOCIATES, INC.

Michael S. Blankinship, P.E.
Project Manager

CC: Brad Arnold, SSWD