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Attachment E – Notice of Intent

WATER QUALITY ORDER NO. 2013-0002-DWQ
GENERAL PERMIT NO. CAG990005

DIVISION OF WATER QUALITY

**STATEWIDE GENERAL NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
 (NPDES) PERMIT FOR RESIDUAL AQUATIC PESTICIDE DISCHARGES TO WATERS OF
 THE UNITED STATES FROM ALGAE AND AQUATIC WEED CONTROL APPLICATIONS**

I. NOTICE OF INTENT STATUS (see Instructions)

Mark only one item	A. New Applicator	B. Change of Information: WDID# <u>9 000001079</u>
	C. <input type="checkbox"/> Change of ownership or responsibility: WDID# _____	

II. DISCHARGER INFORMATION

A. Name Sweetwater Authority			
B. Mailing Address 100 Lakeview Avenue			
C. City Spring Valley	D. County San Diego	E. State CA	F. Zip 91977
G. Contact Person Scott McClelland	H. E-mail address smcclelland@sweetwater.org	I. Title Director of Water Quality	J. Phone 619-409-6802

III. BILLING ADDRESS (Enter information only if different from Section II above)

A. Name Rich Stevenson			
B. Mailing Address P.O. Box 2328			
C. City Chula Vista	D. County San Diego	E. State CA	F. Zip 91910
G. E-mail address rstevenson@sweetwater.org	H. Title Director of Finance	I. Phone (619)409-6711	

IV. RECEIVING WATER INFORMATION

A. Algaecide and aquatic herbicides are used to treat (check all that apply):

1. Canals, ditches, or other constructed conveyance facilities owned and controlled by Discharger.
Name of the conveyance system: _____

2. Canals, ditches, or other constructed conveyance facilities owned and controlled by an entity other than the Discharger.
Owner's name: _____
Name of the conveyance system: _____

3. Directly to river, lake, creek, stream, bay, ocean, etc.
Name of water body: Sweetwater Reservoir

B. Regional Water Quality Control Board(s) where treatment areas are located
(REGION 1, 2, 3, 4, 5, 6, 7, 8, or 9): Region 9
(List all regions where algaecide and aquatic herbicide application is proposed.)

V. ALGAECIDE AND AQUATIC HERBICIDE APPLICATION INFORMATION

A. Target Organisms: (below)
Taste and odor causing cyanobacteria (blue green algae) species

B. Algaecide and Aquatic Herbicide Used: List Name and Active ingredients
Copper Sulfate; Copper is the active ingredient

C. Period of Application: Start Date Approx. April 1 End Date Approx. October 31

D. Types of Adjuvants Used:
Citric Acid

VI. AQUATIC PESTICIDE APPLICATION PLAN

Has an Aquatic Pesticide Application Plan been prepared and is the applicator familiar with its contents?
 Yes No

If not, when will it be prepared? _____

VII. NOTIFICATION

Have potentially affected public and governmental agencies been notified? Yes No

VIII. FEE

Have you included payment of the filing fee (for first-time enrollees only) with this submittal?
 YES NO NA

IX. CERTIFICATION

"I certify under penalty of law that this document and all attachments were prepared under my direction and supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine or imprisonment. Additionally, I certify that the provisions of the General Permit, including developing and implementing a monitoring program, will be complied with."

A. Printed Name: Scott McClelland
 B. Signature:  Date: 11/11/13
 C. Title: Director of Water Quality

XI. FOR STATE WATER BOARD STAFF USE ONLY

WDID:	Date NOI Received:	Date NOI Processed:
Case Handler's Initial:	Fee Amount Received: \$	Check #:
<input type="checkbox"/> Lyris List Notification of Posting of APAP	Date _____	Confirmation Sent _____

**SWEETWATER AUTHORITY
ROBERT A. PERDUE WATER TREATMENT PLANT**



STATE WATER RESOURCES CONTROL BOARD

AQUATIC PESTICIDE APPLICATION PLAN

(WATER QUALITY ORDER NO. 2013-0002-DWQ)

Prepared By

**Mark D. Hatcher
Sweetwater Authority
Water Quality Laboratory Supervisor**

October 28, 2013

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1.0 Introduction

On March 5, 2013 the State Water Resources Control Board (SWRCB) formally adopted Water Quality Order No. 2013-0002-DWQ; General Permit No. CAG990005. This Permit Order becomes effective on December 1, 2013 and will expire on November 30, 2018. Public agencies currently covered under Permit Order No. 2004-0009-DWQ must apply for coverage under the new aquatic weed permit by submitting a Notice of Intent (NOI) and an Aquatic Pesticide Application Plan (APAP) in compliance with Section II.C (General Permit Application) of Order No. 2013-0002-DWQ. The Sweetwater Authority's APAP was written in accordance with the guidelines provided in Section VIII.C (Aquatic Pesticides Application Plan). The purpose of the APAP is to describe the parameters, methods, and protocols to be used for algaecide applications in Sweetwater Reservoir, as follows:

- The water system and treatment area to which the algaecide will be applied
- The types of aquatic weeds to be controlled and why
- Factors influencing the selection and decision to apply an algaecide
- Best Management Practices (BMPs) to be implemented
- Examination of possible alternatives to reduce the need for algaecide use
- Monitoring Program and procedures to prevent contamination

The Authority's APAP will ensure the application of copper sulfate in Sweetwater Reservoir to control nuisance algae will comply with the requirements of Order No. 2013-0002-DWQ.

2.0 Description of Sweetwater Authority

The Sweetwater Authority is located in San Diego County and is a publicly owned, joint-powers water agency with policies and procedures established by a seven-member Board of Directors. The Authority provides water service to approximately 187,000 people in National City, Bonita, and the western and central portions of Chula Vista. The 32 square mile service area receives water from four sources: the Sweetwater Reservoir, deep freshwater wells in National City, semi-brackish groundwater from wells in Chula Vista and National City, and imported water which is drawn from the Colorado River or the State Water Project in Northern California.

The Authority's watershed encompasses approximately 230 square miles. The Sweetwater River is the primary water course through the watershed, flowing from the Cuyamaca Mountains in eastern San Diego County down to San Diego Bay. There are two impoundment facilities located along the Sweetwater River: Loveland Reservoir (25,400 acre-ft capacity), which is located in the eastern San Diego County community of Alpine; and Sweetwater Reservoir (28,100 acre-ft capacity), which borders Spring Valley. Sweetwater Reservoir has a maximum surface area of 1,027 acres.

The 30 million gallon per day (MGD) Robert A. Perdue Water Treatment Plant, which is located adjacent to Sweetwater reservoir, was originally constructed in 1959 as a direct

filtration plant. Today, it is a conventional filtration plant consisting of chemical treatment, chemical mixing using pumped diffusion, flocculation, dissolved air flotation, and dual-media filters. As mentioned above, the Perdue Plant is capable of either treating (pumping) raw water from Sweetwater Reservoir or from the raw water aqueduct pipeline.

The primary beneficial use of Sweetwater Reservoir is as a drinking water impoundment and it is the main source of supply for the Perdue Water Treatment Plant. Sweetwater Reservoir is a warm water (i.e. remains above 4 ° C throughout the year), eutrophic water body with a typical secchi disk clarity of less than 10 ft. Stratification typically occurs in the late spring through fall, forming an anoxic hypolimnetic layer in the lower reaches of the reservoir. Under stratifying conditions, nutrients such as phosphorous are released into the hypolimnion and become available for cyanobacteria (blue-green algae), which tend to bloom when the lake is stratified.

Not all blue-green algae blooms cause taste and odor problems. However, certain species of cyanobacteria, such as *Anabaena circinalis*, *Anabaena flos-aquae*, *Anabaena spiroides*, *Aphanizomenon flos-aquae*, and *Pseudanabaena limnetica* are known to produce taste and odor compounds such as MIB and/or Geosmin that drinking water consumers find objectionable. Although the Authority's primary algae control strategy is to avoid adding algaecides to Sweetwater Reservoir, there are situations (i.e. nuisance algal blooms) where the Authority may have to directly apply an aquatic pesticide that would be permitted under Order No. 2013-0002-DWQ; General Permit No. CAG990005.

3.0 Characterization of Aquatic Pesticide Application Project

3.1 Copper Sulfate Application Protocol

The only aquatic pesticide ever used on the Sweetwater Reservoir is copper sulfate. Copper sulfate is generally applied to control taste and odor producing algae primarily abundant in the warmer summer months (May – August). Application is performed by adding rock copper sulfate (with granular citric acid as a chelating agent, at a ratio of 2:1) to side hoppers attached to a powerboat. The boat is transversed throughout the surface of the reservoir. A target application of 1 part per million (1 milligram per liter) copper is calculated for the volume of the surface strata as a determination of the total amount of copper sulfate to be applied. The surface strata is the volume of water above the thermocline, this volume varies as the ambient air temperatures and the depth of the reservoir changes. Approximately 2 lbs of copper sulfate and 1 lb of citric acid per surface acre are typically added to treat a nuisance blue-green algae bloom in Sweetwater Reservoir. MSDS documents are provided in Appendix A (copper sulfate) and B (citric acid).

3.2 Gates and Control Structures

The Sweetwater Dam functions as a drinking water impoundment, effectively isolating the reservoir water from other waters of the U.S. Therefore, it is not necessary for the Authority to employ any other gates or control structures to control the extent of

receiving waters potentially affected by the application of copper sulfate. However, the Authority does exercise and inspect the four emergency release valves at the bottom of the dam on an annual basis to ensure the valves function properly and do not leak.

3.3 Copper Transport, Fate, and Effects

In Sweetwater Reservoir, after application of copper sulfate, transport of copper will occur primarily through mixing and dispersion. Copper treatments result in short term increases in dissolved copper, however the long term environmental risk from copper is expected to be less than significant because the applied copper becomes bound to the bottom sediments and is no longer biologically available.

3.4 Triggers for Copper Sulfate Treatment

The factors which influence the decision to apply copper sulfate to control nuisance algae in Sweetwater Reservoir include the following:

- Concentrations of methylisoborneol (MIB) and geosmin
- Cyanobacteria population levels
- Raw and finished water threshold odor number and odor characterization
- Degradation of filter performance
- Consumer taste and odor water quality complaints

In order to track the concentration of taste and odor compounds in Sweetwater Reservoir throughout the year, the Authority typically monitors for MIB and geosmin on a weekly basis. Plankton determinations for Sweetwater reservoir are performed weekly using a Sedgewick-Rafter counting chamber. Plankton speciation and density (counts in ten fields of vision) are recorded. The Perdue Pant operators perform a daily determination of the threshold odor number for Sweetwater Reservoir raw water and Perdue Plant finished water, including a description of the odor (i.e. fishy, musty, grassy, etc.). The Perdue Plant Water Quality Laboratory records consumer complaints received regarding the taste and odor of the finished drinking water in the distribution system.

During an algae bloom, plankton and MIB/geosmin monitoring frequency may be increased so that day to day fluctuations of cyanobacteria counts and odor causing compounds in the reservoir can be tracked. Specifically, the goal is to determine if the cyanobacteria counts and MIB/geosmin levels are increasing, decreasing, or remaining constant. Consumers can generally detect MIB and geosmin above 5 ng/L and if the number of complaints received increases rapidly over a short period of time, it could be an indication that corrective action may be warranted.

Typically, when the decision to apply copper sulfate to Sweetwater Reservoir is made, it is because the indicators described above have increased significantly over a short period of time and because other mitigation strategies, such as adding powdered activated carbon (PAC), increasing free chlorine contact time at the Perdue Plant, or waiting for the bloom to die off have not been successful. In addition, certain species of blue-green

algae, green algae, and diatoms are known to impair filter performance, which could impact compliance with the filtration requirements of the California Surface Water Treatment Rule. As mentioned above, the Authority's primary strategy is to avoid adding copper sulfate. However, in order to comply with state mandated primary (i.e. filter turbidity) and secondary (i.e. taste and odor) water quality standards, there are times when the addition of copper sulfate may be necessary.

3.5 Public Notification

The Authority is the sole owner and operator of Sweetwater Reservoir, which is primarily used as a drinking water impoundment. No other agency has rights to the water stored in Sweetwater Reservoir. The only public access allowed is for the three-day per week fishing program, which is located on a limited section of shoreline on the southern end of the reservoir.

Every calendar year, at least 15 days prior to the first algaecide application (if any), the Authority will post a notification on its website and/or provide on-site signage (as appropriate) at the fishing program area. The notification will conform to the procedures described in Section VIII.B of Order No. 2013-0002-DWQ.

4.0 Best Management Practices

4.1 Avoidance of Aquatic Pesticide Usage

The Sweetwater Authority Water Quality Department practices avoidance of aquatic pesticides as its primary management tool. However, as described above, there are conditions where pesticide application is unavoidable. Only when there is a major bloom of nuisance algae, or an algal caused taste and odor episode, will copper sulfate treatment be initiated, and even then it will be used only after other alternative strategies have been unsuccessful.

4.2 Copper Sulfate

With the implementation of the following copper sulfate application and hazard mitigation BMPs, the potential to create a significant hazard to the public or to the environment will be reduced to less than significant.

4.2.1 Application

Whenever the application of an algaecide has been necessary to control a nuisance algae bloom in Sweetwater Reservoir, a mixture of copper sulfate and citric acid (2:1 ratio) has been shown to be the most effective treatment approach. Using citric acid as a copper-chelating agent has decreased the amount of copper sulfate needed to effectively treat the reservoir by a factor of six or seven. Increasing the effectiveness of each copper sulfate application lessens the possibility that repeat copper sulfate treatment would be required.

However, if additional treatment is necessary, a minimum of two weeks shall elapse between applications. In order to minimize the potential for environmental impacts in Sweetwater Reservoir, no more than one half the surface of the lake will be treated per application (refer to Figure 1).

The Authority shall apply copper sulfate in accordance with the product label and shall comply with the recommendations provided on the MSDS applicable to the specific copper sulfate product to be used (refer to Attachment A). Copper sulfate will be applied in an even, consistent manner over the surface area to be treated, thus minimizing the potential for higher than intended localized concentrations.

4.2.2 Spill Prevention and Containment

Training in copper sulfate safety shall be required for all Authority employees participating in the application and handling of copper sulfate. Additional refresher training may occur, as deemed necessary, prior to each treatment event. Response and containment procedures provided in the Authority's Chemical Hygiene Plan, Hazardous Response Plan, and the product MSDS will be followed in the event of a spill. These include isolation and containment of the spill while wearing the appropriate personal protective equipment.

4.2.3 Personal Protective Equipment

In order to avoid any adverse health effects during the application of copper sulfate, the Authority shall require its employees participating in the application or handling of copper sulfate to wear appropriate personal protective equipment recommended on the MSDS, including protective safety glasses with side shields (or goggles) as per OSHA 29 CFR 1910.133. Chemically-impervious gloves made of any waterproof material, boots, and protective clothing will be worn to avoid skin contact (refer to OSHA 29 CFR 1910.138), as well as a respirator that meets OSHA 29 CFR 1910.134 requirements.

4.3 Watershed Management

As part of its multi-barrier approach to watershed management, the Authority maintains native vegetation buffer strips around the perimeter of Sweetwater Reservoir. These buffer strips help to reduce soil erosion during rain events, which helps to limit the inflow of nutrients into the reservoir.

In addition, the Authority does not allow livestock grazing or farming on lands (owned by the Authority) surrounding Sweetwater Reservoir. This minimizes the potential for nutrient loading into the reservoir from agricultural wastes and fertilizers.

The Sweetwater Authority has also installed a state of the art Urban Runoff Diversion System (URDS) to collect first flush and low flow urban waters from developed areas around Sweetwater Lake and diverts them around the reservoir. This process virtually eliminates the inflow of urban nutrients (phosphorus and nitrates) into the reservoir which, in turn helps to reduce the potential for severe blue-green algae blooms.

4.4 Raw Water Intake, Treatment and Blending Options

The Authority has the option of obtaining water from different levels at its intake structure (40, 50, 60, and 75 feet from the bottom of the reservoir). If water quality conditions permit, water will be drawn from a level where the by-products of the taste and odor producing algae (i.e. MIB and geosmin) are at the lowest concentration.

The Authority also has the ability to blend the reservoir water to a level where the taste and odor compounds are at an acceptable level. Options include blending untreated reservoir water with imported raw waters, or blending Sweetwater treated waters with imported treated waters.

Powdered Activated Carbon (PAC) may be added to the treatment process at the Perdue WTP to mitigate for taste and odor from cyanobacteria algae blooms. The PAC disperses in the water and adsorbs taste and odor compounds such as MIB and geosmin. The purpose of this strategy is to delay or eliminate the need for copper sulfate treatment over the bloom period by allowing enough time for the bloom to die off. The success of this strategy depends on the severity of the bloom and the detected levels of MIB and geosmin.

During a severe bloom, the Authority may increase the dose of chlorine dioxide, which is a strong oxidizer that is added at the intake tower to precondition the raw water prior to entering the Perdue WTP. In addition, free chlorine may be added at the settled water to increase the oxidation of organic compounds which cause taste and odors in the water. This strategy is most effective when “grassy”, “swampy”, or “fishy” tastes and odors are detected.

4.5 Visual Assessment of Adverse Impacts on Beneficial Uses Caused by the Application of Aquatic Pesticides

Sweetwater Reservoir supports a warm freshwater habitat for many non-native, recreational fish species such as threadfin shad (*Dorosoma petenense*), common carp (*Cyprinus carpio*), channel catfish (*Ictalurus punctatus*), white catfish (*Ictalurus catus*), brown bullhead catfish (*Ictalurus nebulus*), large-mouth bass (*Micropterus salmoides*), white crappie (*Pomoxis nigromaculatus*), and bluegill (*Lepomis macrochirus*).

Although copper sulfate may have short-term toxic effects on aquatic invertebrates (snails, worms, and clams) and larval fish, vertebrate animals such as adult game fish species and birds are typically unaffected by the low doses generally applied to control nuisance algae. This is supported by the observation that no fish or bird die-offs have ever been observed by Authority staff after copper sulfate additions. A visual inspection by a qualified senior biologist (who is knowledgeable regarding the flora, fauna, ecology, and beneficial uses of Sweetwater Reservoir) will be conducted of the treated areas of Sweetwater reservoir after each copper sulfate application to ensure that no fish kills are observed.

Long-term impacts to the beneficial uses of Sweetwater Reservoir (i.e. drinking water supply, recreation, or wildlife habitat) are not likely to occur for the reasons described in Order No. 2013-0002-DWQ, Fact Sheet Section VII: 1) water quality criteria, which are used directly as receiving water limitations in this General Permit have built-in factors of safety, 2) as shown in the 2004 toxicity study (performed by the San Francisco Estuary Institute (SFEI) on behalf of the SWRCB), the actual peak concentrations after application of copper did not exceed toxicity values, and 3) the applications of copper sulfate are short-term in duration.

In addition, the detected levels of copper are typically near or below the State of California Safe Drinking Water Act detection limit for reporting purposes (DLR) of 50 ug/L. Thus, any impacts to the primary beneficial use of Sweetwater Reservoir as a drinking water source of supply would be less than significant.

5.0 State Implementation Policy (SIP) Section 5.3 Exception

The Authority has not been granted an SIP Section 5.3 Exception for copper when applying copper sulfate to control taste and odor causing cyanobacteria in Sweetwater Reservoir. However, the Authority does intend to formally apply for an SIP Section 5.3 Exception in the future and is currently working with the San Diego County Water Authority and other agencies to submit a region-wide CEQA document, with the understanding that each agency would be individually responsible (i.e. liable) for complying with the terms and conditions specified in Section 5.3 of the SIP and in Order No. 2013-0002-DWQ. In the meantime, if copper sulfate is applied to Sweetwater Reservoir, it is understood that the dissolved freshwater copper receiving water limitation (based upon hardness) listed in Section VI of Order No. 2013-0002-DWQ shall not be exceeded.

6.0 Examination of Possible Alternative Treatment Methods

The Sweetwater Authority will consider other methods of algae control on an on-going basis, but is not currently performing any such on-site evaluations.

The Authority has performed an extensive examination of alternative (nuisance algae bloom) treatment strategies described in the SFEI Aquatic Pesticide Monitoring Program Report entitled “Review of Alternative Aquatic Pest Control Methods for California Waters”. Other potential treatment methods such as ultrasonic waves and peroxide were also reviewed. A summary of alternative treatment options is provided below. At the present time, copper sulfate (with citric acid as a chelating agent) appears to be the most effective, and least intrusive, algaecide available to control nuisance algae in Sweetwater Reservoir.

In developing the APAP, the Authority applied a decision matrix concept, balancing the need to comply with the California Safe Drinking Water Act regulatory requirements (with respect to taste and odor and finished water turbidity) with the need to control nuisance algae blooms in an environmentally sensitive manner, ensuring the beneficial

uses of the reservoir are not impacted. As mentioned in Section 4.0 above, copper sulfate will only be applied in instances when alternative strategies such as avoidance and/or treatment plant process changes have been ineffective. In situations when copper sulfate treatment is unavoidable, the lowest effective dose will be applied to no more than half the surface area of the Sweetwater Reservoir, thus minimizing any potential environmental impacts.

6.1 Biological Methods

Biological control would include using bio-manipulation, bacteria, enzymes, barley straw, or organic matter amendments to reduce the survival, growth, or reproduction of nuisance algae species.

Bio-manipulation involves the introduction of larger fish higher in the food chain to prey upon the smaller planktivorous fish that feed on the zooplankton, which in turn graze upon nuisance algae species. By reducing the population of the smaller fish, the zooplankton population increases, thus reducing the overall abundance of algae in a water body. The downside of fish bio-manipulation is that it is difficult to manage and implement effectively. Further, this control strategy has not yet been attempted in California waters.

There are commercially available microbial products containing a mixture of bacteria and enzymes, which can be applied to increase the bacterial populations in a water body. The theory is that increased bacterial concentrations will limit the availability of nutrients available for algal growth and reproduction. Bio-control agents are relatively inexpensive however peer-reviewed studies indicate that microbial methods are not very effective for control of nuisance algae blooms and may not be practical in large reservoirs.

Barley straw has been used for algae control with varying success in private ponds or lakes as a “home remedy”. As barley straw is decomposed by fungi, lignins and tannins are released into the water, preventing the growth of algae. The downside is that algae already present in the water are not affected. Adding barley to the surface of Sweetwater Reservoir would create an aesthetic nuisance. Also, barley straw is not registered as an aquatic pesticide in California.

6.2 Physical Control Methods

Physical control methods include mechanical harvesting and removal of aquatic plants, sediment removal, shading, aeration, oxygenation, circulation, nutrient removal, and ultrasonic wave technology.

Mechanical harvesting is a strategy that can be used to reduce dissolved phosphorous and nitrogen inputs from aquatic plants in a lake. Although harvesting can decrease within-lake nutrient levels, algae production may continue to remain high due to nutrient release from sediments under anoxic conditions. Due to the uneven terrain surrounding

Sweetwater Reservoir and logistical concerns, mechanical harvesting of aquatic plants is not a viable option for the Authority.

Sediment dredging has been used to remove nutrient rich sediments from irrigation canals and physical shading can be used to reduce algal growth by limiting the amount of light available for photosynthesis. However, neither of these strategies would be logistically practical for a large body of water such as Sweetwater Reservoir.

Aeration, oxygenation, and water circulation are used to maintain oxygen levels in the hypolimnion, which ultimately reduces algae growth by reducing the rate of nutrient recycling into the water column and also by disturbing the habitat of taste and odor causing cyanobacteria. While this approach may be effective in smaller water bodies, it would not be logistically possible to aerate the entire volume of Sweetwater Reservoir. In addition, Sweetwater Reservoir is infested with quagga mussels, and one of the Authority's primary quagga control strategies is to naturally maintain hypolimnetic anoxia under stratifying conditions.

Commercially available ultrasonic wave generating devices control blue/green algae by damaging their cellular structure, causing them to sink to the bottom of a water body. The main limitation of this technology is that it operates by "line of sight". Because Sweetwater Reservoir has many different inlets and "line of sight" obstructions, multiple ultrasonic generating devices would have to be purchased, which could potentially make this strategy cost prohibitive in Sweetwater Reservoir.

6.3 Non-Conventional Chemical Controls

Many non-conventional chemical algae control methods include calcium based products such as lime ($\text{Ca}(\text{OH})_2$), limestone (CaCO_4), gypsum (CaSO_4) or iron gypsum (Fe-CaSO_4), and aluminum based alum ($\text{Al}_2(\text{SO}_4)_3$) which can be added to eutrophic lakes to bind and precipitate phosphorous out of the water column and into the sediment where it remains sequestered as long as oxygenated conditions prevail.

Aside from the enormous amounts of these chemicals that would have to be added to effectively bind and remove the phosphorous in the lake, this strategy would not be effective in Sweetwater Reservoir because the lake typically stratifies in the spring and summer, creating anoxic conditions in the hypolimnion. So, any phosphorus which had been sequestered in the bottom sediment would be re-solubilized and become a bioavailable nutrient for further cyanobacteria (algae) blooms. It is also not clear whether or not the SWRCB would approve the use of these sequestering chemicals for NPDES permits.

Aquashade is an EPA registered chemical that controls algae growth by filtering out photosynthetically available radiation in the range of blue-violet and red-orange (i.e. 550 nm – 650 nm). This product has been used in private recreational lakes and ponds in California to control algae. However, certain municipalities have declined to use it because they believe it creates an unnatural appearance in the water body. Aside from potential aesthetic concerns, it is unknown whether this treatment strategy would be

appropriate for a large scale application in Sweetwater Reservoir. According to the SFEI Report, more research is necessary to fully determine the efficacy of this product.

Oxidizer algaecides use hydrogen peroxide to rupture the cell walls of the blue-green algae. Sodium Carbonate Peroxyhydrate has been registered in California as an algaecide and oxidizer since early 2006. The advantage of this chemical alternative to copper sulfate is that it breaks down quickly into sodium carbonate, water, and oxygen and is non-persistent in the environment. It is formulated as a flaky granule or liquid which is applied by broadcasting it over the surface of the water within the target area (Clean Lakes Inc. 2011 Winter/Spring Newsletter). This product has been used in California waters to control blue-green algae blooms, however the amount of chemical necessary to treat a lake the size Sweetwater Reservoir could be as high as 25,000 lbs - 50,000 lbs. The downside of using oxidizer algaecides is they have not been as widely used or studied as extensively as copper-based algaecides in California and their long-term efficacy remains to be determined.

7.0 Aquatic Pesticide Monitoring Program

The Authority's Aquatic Pesticide Monitoring Program is designed to comply with the provisions outlined in the Monitoring and Reporting Plan (MRP) in Attachment C of Permit Order No. 2013-0002-DWQ.

7.1 Monitoring Locations

Figure 1 provides a topographical map of Sweetwater Reservoir and includes the monitoring locations to be sampled under the APAP. The Authority uses monitoring locations which are representative of the water quality before, during, and after copper sulfate has been applied. To ensure the monitoring station (buoy) locations are consistent over time, GPS coordinates have been assigned to each location.

7.2 Sample Types

There are three distinct sample types associated with the application of copper sulfate to Sweetwater Reservoir to treat a nuisance algae bloom:

- 1) Background Monitoring (Buoy #1, Buoy #2): Background monitoring samples shall be collected in the application area just prior to (up to 24 hrs in advance of) the application event.
- 2) Event Monitoring (Buoy #7): Event monitoring samples shall be collected immediately outside of the treatment area, immediately after the application event, but after sufficient time has elapsed such that the treated water would have exited the treatment area.
- 3) Post-Event Monitoring (Buoy #1, Buoy #2): Post-event monitoring samples shall be collected within the treatment area within one week after application.

7.3 General Monitoring Provisions

Figure 2 provides the Authority's Aquatic Pesticide Monitoring Worksheet, which includes the chemical and physical analyses (and methods) required in the MRP. All laboratory analyses resulting from a copper sulfate treatment event shall be conducted only at laboratories certified by the California Department of Public Health (CDPH). All analyses shall be conducted in accordance with methods and guidelines established in 40 CFR 136.

Records of monitoring information shall include the date, place, and time of sampling and field measurements, the individuals who performed the sampling or field measurements, the dates and individuals who performed the analyses, the analytical methods used, and a summary of monitoring results.

The Authority shall maintain a log for each copper sulfate application event (refer to Figure 3). The application log shall record the date of application, location of application, names of the applicators, amount of copper sulfate used, lake level, start and stop time of the application event, application rate, and concentration. A visual monitoring assessment is also conducted for each event and includes field observations such as weather conditions, secchi disk clarity, and color.

7.4 Water Quality Analyses

7.4.1 Routine Baseline Monitoring

The Sweetwater Authority Water Quality Laboratory performs baseline testing of the Sweetwater Reservoir at regular intervals. Temperature, pH, color, turbidity, Total Coliform bacteria, and taste and odor analysis are performed daily. Alkalinity, nitrite-N, and ammonia-N are determined weekly, and conductivity, chloride, total hardness, iron, and manganese are measured on a monthly basis. State certified contract laboratories perform most Title 22 inorganic chemical, heavy metal, volatile organic chemical (VOC), and synthetic organic chemical (SOC) analysis at least annually on the reservoir water.

Plankton speciation and enumeration are performed weekly. At the same time the plankton sample is collected, a depth profile for temperature and dissolved oxygen is performed using a Yellow Springs Instrument (YSI), ProDO optical dissolved oxygen instrument.

7.4.2 Copper Sulfate Event Monitoring

All samples are collected and transported to the Water Quality Laboratory by trained Sweetwater Authority Laboratory personnel following proper chain of custody procedures. Proper collection methods and procedures will be followed to ensure samples are representative and free from contamination. Samples are collected in appropriately prepared and labeled containers and transported back to the laboratory in an

ice chest with frozen blue ice. All sample bottles are labeled with the sample location, date, time, preservation (if any), sampler, analysis, and sample identification number.

Whenever copper sulfate applications are required to control taste and odor producing algae, the water quality monitoring for this plan will commence. As required in Table C-1 of the MRP, samples will be collected at a depth of three ft below the surface at each monitoring location (refer to Figure 1) using a depth sampler. Background samples will be taken no earlier than 24 hrs before application. Event monitoring will be performed no later than 24 hrs after algaecide application. Post-event monitoring will be conducted within one week after copper sulfate treatment.

Measurements for dissolved oxygen, temperature, and secchi disk clarity will be performed in the field by Authority staff at each monitoring location. Plankton speciation and enumeration, turbidity, pH, total hardness, and conductivity will be determined in the Authority's Water Quality Laboratory. All laboratory instrumentation will be calibrated according to method and/or manufacturer's specifications.

USEPA Method 200.8 (inductively coupled plasma mass spectrometry (ICPMS)) will be used to determine soluble (i.e. dissolved) copper concentration following filtration with a 0.45 um membrane filter. Samples for copper will be properly preserved and shipped (with chain of custody documentation) to a state certified contract laboratory for testing.

The analytical results will be reviewed first by the analyst. The Laboratory Supervisor will perform a final review of all data for accuracy, consistency, and completeness. The final review will include verification that calibration standards and quality control samples are within method specifications and that the analytical results are properly reported.

7.5 Laboratory Quality Assurance Program

The Authority's Laboratory Quality Assurance (QA) Program will serve as the Quality Assurance Plan for all Aquatic Pesticide Monitoring Program activities associated with Permit Order 2013-0002-DWQ. The Laboratory QA Program is designed to offer controls over both the quality of laboratory equipment and materials, and the reliability of the analytical methods, procedures, and techniques used for analysis. The Laboratory QA Program is a written description of QA activities associated with the sampling, analysis, and data reporting and review procedures followed in the Authority's Water Quality Laboratory. The Standard Operating Procedures (SOPs) utilized in the laboratory will reference either *Standard Methods for the Examination of Water and Wastewater* or analytical methods promulgated by the Environmental Protection Agency (EPA) in accordance with 40 CFR part 136.

7.6 Monitoring Reports

As required in MRP Section IV.C, an annual report shall be submitted to the Deputy Director of the SWRCB and the appropriate Region 9 Water Quality Control Board

Executive Officer, consisting of a summary of the past year's treatment and monitoring activities and will certify compliance with all requirements of Permit Order No. 2013-0002-DWQ. If no copper sulfate treatment was necessary during the calendar year, the discharger shall provide a certification that no algaecide discharges occurred in Sweetwater Reservoir over that time frame. The annual report shall be submitted by March 1 of the year following the calendar year being reported and will contain the following information:

- 1) An executive summary discussing compliance or violation of Order No. 2013-002-DWQ and the effectiveness of the APAP; and
- 2) A summary of monitoring data, including the identification of water quality improvements or degradation as a result of copper sulfate application.

If additional reporting become necessary (i.e. a 24-hr oral report, 5-day written report, or electronic report), the reporting protocols provided in Section IV of Order No. 2013-0002-DWQ will be followed.

Figure 1 Monitoring Locations

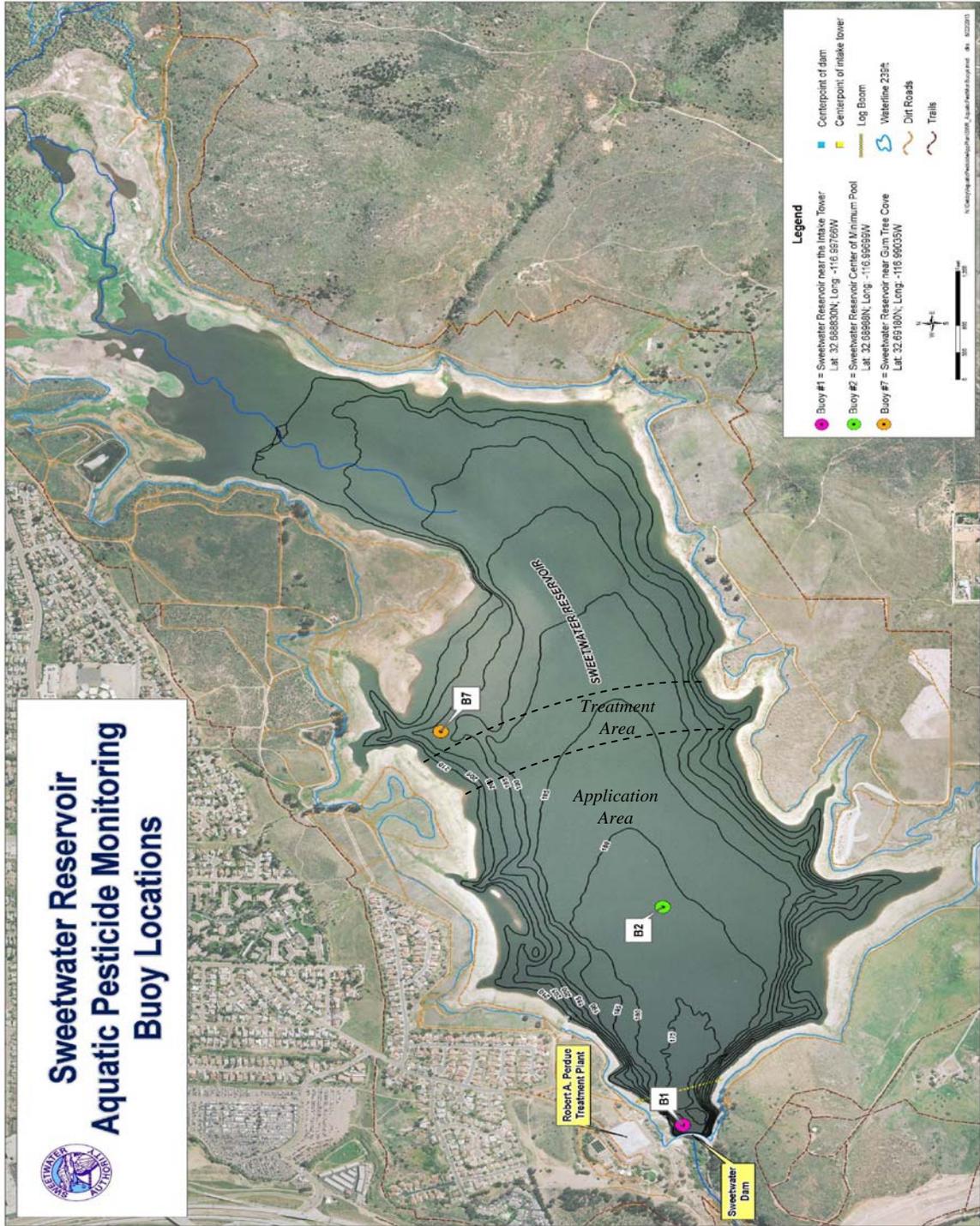


Figure 2 Monitoring Worksheet

Sweetwater Authority Aquatic Pesticide Monitoring Worksheet

Sample Location	Sample Date	Sample Time	Sample Depth (ft)	Sampler Initials	Analysis Date	Analyst Initials	D.O. mg/L (ASTM D888-C)	Temp.(°C) (SM 2550B)	pH Units (SM 4500-H+B)	Turbidity NTU (SM 2130B)	Total Hardness mg/L as CaCO3 (SM 2340C)	Conductivity umhos/cm (2510B)	Dissolved Copper ug/L (EPA 200.8)
Buoy #1													
Buoy #2													
Buoy #7													
Buoy #1													
Buoy #2													
Buoy #7													
Buoy #1													
Buoy #2													
Buoy #7													

Monitoring Buoy Location	GPS Coordinates	
Buoy #1 (Sweetwater Reservoir near the Intake Tower)	Longitude: -116.99766	Latitude: 32.688830
Buoy #2 (Sweetwater Reservoir Center of Minimum Pool)	Longitude: -116.99699	Latitude: 32.68988
Buoy #7 (Sweetwater Reservoir near Gum Tree Cove)	Longitude: -116.99035	Latitude: 32.69180

Figure 3 Application Log

Sweetwater Authority Aquatic Pesticide Application Log

Application Date: _____		Application Start: _____		Application End: _____		Copper Sulfate Application Protocol: Sweetwater Authority APAP	
Pesticide Application Crew: _____						Lake Level (ft): _____	
Lbs of CuSO4 used: _____		Lbs of Citric Acid used: _____		Reservoir Surface Area (Acre): _____		Reservoir Volume (Acre-ft): _____	

Sweetwater Reservoir - Visual Monitoring Assessment									
Date	Time	Sampler	Weather Conditions (foggy, rainy, cloudy, windy, or sunny)	Floating debris or suspended matter present?	Color	Aquatic Life Observations	Visible films, sheens, or coatings?	Surface algae growth (light, moderate, or heavy)	Secchi Disk Clarity (ft)

ATTACHMENT A -- Copper Sulfate MSDS

Product #: 909794 Name: COPPER SULFATE LG CRYST Desc:
From: BRENNTAG MID-SOUTH INC. To: Wednesday, September 14, 2011

Material Safety Data Sheet

Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

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

Chemical Name: Copper Sulfate Pentahydrate

Product Use: For Commercial Use

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

Supplier Information

Chem One Ltd.
8017 Pinemont Drive, Suite 100
Houston, Texas 77040-6519

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

General Comments

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

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

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

Component Related Regulatory Information

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

Component Information/Information on Non-Hazardous Components

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

*** Section 3 - Hazards Identification ***

Emergency Overview

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

Hazard Statements

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

Potential Health Effects: Eyes

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

Potential Health Effects: Skin

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

Potential Health Effects: Ingestion

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

Potential Health Effects: Inhalation

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

HMIS Ratings: Health Hazard: 2* Fire Hazard: 0 Physical Hazard: 1

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

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

First Aid: Eyes

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

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ID: C1-121A

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

First Aid: Skin

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

First Aid: Ingestion

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

First Aid: Inhalation

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

First Aid: Notes to Physician

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

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

Flash Point: Not flammable

Method Used: Not applicable

Upper Flammable Limit (UEL): Not applicable

Lower Flammable Limit (LEL): Not applicable

Auto Ignition: Not applicable

Flammability Classification: Not applicable

Rate of Burning: Not applicable

General Fire Hazards

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

Hazardous Combustion Products

Sulfur oxides and copper fumes.

Extinguishing Media

Use methods for surrounding fire.

Fire Fighting Equipment/Instructions

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

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

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

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

Containment Procedures

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

Clean-Up Procedures

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

Evacuation Procedures

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

Special Procedures

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

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ID: C1-121A

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

Handling Procedures

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

Storage Procedures

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

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

Exposure Guidelines

A: General Product Information

Follow the applicable exposure limits.

B: Component Exposure Limits

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

ACGIH: 1 mg/m³ TWA (dusts & mists)

0.2 mg/m³ TWA (fume)

OSHA: 1 mg/m³ TWA (dusts & mists)

0.1 mg/m³ TWA (fume)

NIOSH: 1 mg/m³ TWA (dusts & mists)

0.1 mg/m³ TWA (fume)

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

0.1 mg/m³ TWA Peak, 2•MAK 15 minutes, average value, 1-hr interval (fume)

Engineering Controls

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

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

PERSONAL PROTECTIVE EQUIPMENT

Personal Protective Equipment: Eyes/Face

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

Personal Protective Equipment: Skin

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

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From: BRENNTAG MID-SOUTH INC. To: Wednesday, September 14, 2011

Material Safety Data Sheet

Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

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

Personal Protective Equipment: Respiratory

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

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

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

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

Up to 50 mg/m³: Air purifying, full-facepiece respirator with high-efficiency particulate filter(s), any powered air-purifying respirator with tight-fitting facepiece and high-efficiency particulate filter(s) or full-facepiece SCBA, or full-facepiece SAR.

Up to 100 mg/m³: Positive pressure, full-facepiece SAR.

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

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

NOTE: The IDLH concentration for Copper dusts and mists (as Cu) is 100 mg/m³.

Personal Protective Equipment: General

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

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

Physical Properties: Additional Information

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

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

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

Chemical Stability

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

Chemical Stability: Conditions to Avoid

Avoid high temperatures, exposure to air and incompatible materials.

Incompatibility

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

Hazardous Decomposition

Sulfur oxides and Copper oxides.

Hazardous Polymerization

Will not occur.

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ID: C1-121A

*** Section 11 - Toxicological Information ***

Acute and Chronic Toxicity

A: General Product Information

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

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

B: Component Analysis - LD₅₀/LC₅₀

Copper Sulfate Pentahydrate (7758-99-8)

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

B: Component Analysis - TDL₀/LDL₀

Copper Sulfate Pentahydrate (7758-99-8)

Oral-man LDLo: 857 mg/kg; Oral-Human LDLo: 50 mg/kg; Behavioral: somnolence (general depressed activity); Kidney, Urethra, Bladder: changes in tubules (including acute renal failure, acute tubular necrosis); Blood: hemorrhage; Oral-Human TDL₀: 11 mg/kg; Gastrointestinal: gastritis; Gastrointestinal: hypermotility, diarrhea, nausea or vomiting; Oral-Human TDL₀: 272 mg/kg; liver, kidney, Blood effects: Oral-Human LDLo: 1088 mg/kg; Oral-child : 150 mg/kg; Kidney, Urethra, Bladder: changes in tubules (including acute renal failure, acute tubular ; necrosis); Blood: other hemolysis with or without anemia; unknown-Man LDLo: 221 mg/kg; Oral-Woman TDL₀: 2400 mg/kg/day; Gastrointestinal tract effects: DNA Inhibition-Human: lymphocyte 76 mmol/L; Oral-woman LDLo: 100 mg/kg; Vascular: Blood pressure lowering not characterized in autonomic section; Liver: hepatitis (hepatocellular necrosis), diffuse; Kidney, Urethra, Bladder: changes in tubules (including acute renal failure, acute tubular necrosis); Oral-Human LDLo: 143 mg/kg; Pulmonary system effects, Gastrointestinal tract effects ;Oral-rat TDL₀: 915 mg/kg/1 year-intermittent; Cardiac: changes in coronary arteries; Blood: changes in serum composition (e.g. TP, bilirubin, cholesterol); Oral-rat TDL₀: 157 mg/kg/6 weeks-intermittent; Endocrine: changes in adrenal weight; Nutritional and Gross Metabolic: weight loss or decreased weight gain; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: dehydrogenases; Oral-rat TDL₀: 7530 mg/kg/30 days-intermittent; Blood: changes in serum composition (e.g. TP, bilirubin, cholesterol); Blood: changes in erythrocyte (RBC) count; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels:- multiple enzyme effect; Oral-rat TDL₀: 2 gm/kg/20 days-intermittent; Liver: other changes; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: phosphatases, Enzyme inhibition, induction, or change in blood or tissue levels; Intraperitoneal-rat TDL₀: 791 mg/kg/18 weeks-intermittent; Nutritional and Gross Metabolic: weight loss or decreased weight gain; Intraperitoneal-rat TDL₀: 7500 µg/kg; female 3 day(s) after conception; Reproductive: Fertility; other measures of fertility; Subcutaneous-rat TDL₀: 12768 µg/kg; male 1 day(s) pre-mating; Reproductive: Paternal Effects: testes, epididymis, sperm duct; Intratesticular rat TDL₀: 3192 µg/kg; male 1 day(s) pre-mating; Reproductive: Paternal Effects: spermatogenesis (incl. genetic material, sperm morphology, motility, and count), testes, epididymis, sperm duct; Oral-mouse TDL₀: 3 gm/kg/8 weeks-continuous; Blood: changes in spleen; Immunological Including Allergic: decrease in cellular immune response, decrease in humoral immune response; Oral-mouse TDL₀: 2 gm/kg/3 weeks-continuous; Blood: changes in spleen; Immunological Including Allergic: decrease in cellular immune response, decrease in humoral immune response; Subcutaneous-mouse LDLo: 500 µg/kg; Subcutaneous-mouse TDL₀: 12768 µg/kg; male 30 day(s) pre-mating; Reproductive: Paternal Effects: testes, epididymis, sperm duct; Intravenous-mouse TDL₀: 3200 µg/kg; female 8 day(s) after conception; Reproductive: Effects on Embryo or Fetus: fetotoxicity (except death, e.g., stunted fetus), Specific Developmental Abnormalities: Central Nervous System, cardiovascular (circulatory) system; Intravenous-mouse TDL₀: 3200 µg/kg; female 7 day(s) after conception; Reproductive: Fertility: post-implantation mortality (e.g. dead and/or resorbed implants per total number of implants); Oral-Dog, adult LDLo: 60 mg/kg; Intravenous-guinea pig TDL₀: 2 mg/kg; Subcutaneous-Guinea Pig, adult LDLo: 62 mg/kg; Oral-Pigeon LDLo: 1000 mg/kg; Oral-Domestic animals (Goat, Sheep) LDLo: 5 mg/kg; Oral-Bird-wild species LDLo: 300 mg/kg; Intravenous-frog LDLo: 25 mg/kg; Parenteral-chicken TDL₀: 10 mg/kg; Tumorigenic: equivocal tumorigenic agent by RTECS criteria; Endocrine: tumors; Oral-pig TDL₀: 140 mg/kg; female 1-15 week(s) after conception, lactating female 4 week(s) post-birth; Reproductive: Effects on Newborn: biochemical and metabolic; Intravenous-hamster TDL₀: 2130 µg/kg; female 8 day(s) after conception; Reproductive: Fertility: post-implantation mortality (e.g. dead and/or resorbed implants per total number of implants), Specific Developmental Abnormalities: Central Nervous System, body wall

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From: BRENNTAG MID-SOUTH INC. To: Wednesday, September 14, 2011

Material Safety Data Sheet

Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

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

Carcinogenicity

A: General Product Information

Copper Sulfate Pentahydrate (7758-99-8)

Cytogenetic Analysis-Rat/ast 300 mg/kg

B: Component Carcinogenicity

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

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

Epidemiology

No information available.

Neurotoxicity

Has not been identified.

Mutagenicity

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

Teratogenicity

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

Other Toxicological Information

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

*** Section 12 - Ecological Information ***

Ecotoxicity

A: General Product Information

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

B: Ecotoxicity

Copper Sulfate Pentahydrate (7758-99-8)

LC₅₀ (*Lepomis machochirus* bluegill) wt 1.5 g = 884 mg/L at 18°C, static bioassay (95% confidence limit 707-1,100 mg/L) (technical material, 100% (about 25% elemental copper)); LC₅₀ (*Leopmis cyanellus*, Green Sunfish) = 1.1 g, 3,510 µg/L at 9°C; LC₅₀ (*Pimephales promelas*, Fat-head minnow) = 1.2 g, 838 µg/L at 18°C; LC₅₀ (*Crassius auratus*, Goldfish) = 0.9 g, 1,380 µg/L at 18°C; LC₅₀ (*Crassius auratus*, Goldfish) = 0.1-2.5 mg/L; LC₅₀ (*EEL*) = 0.1-2.5 mg/L; LC₅₀ (*Salmo gairdneri*, Rainbow trout) = 1.6 g, 135 µg/L at 18°C; LC₅₀ (*Salmo gairdneri*, Rainbow trout) 48 hours = 0.14 ppm; LC₅₀ (*Daphnia magna*) no time specified = 0.182 mg/L; LC₅₀ (*Salmo gairdneri*, Rainbow trout) no time specified = 0.17 mg/L; LC₅₀ (*Lepomis machochirus*, Blue gill) no time specified = 1.5 g, 884 µg/L at 18°C; LC₅₀ (Stripped Bass) 96 hours = 1 ppm or lower; LC₅₀ (Prawn) 48 hours = 0.14; LC₅₀ (Shrimp) 96 hours = 17.0 ppm copper; LC₅₀ (Blue Crab) 96 hours = 28 ppm copper; LC₅₀ (Oyster) 96 hours = 5.8 ppm copper; LC₅₀ (*Viviparus bengalensis* snail) 96 hours = 0.060 ppm copper (at 32.5°C; 0.066 ppm copper static bioassay); LC₅₀ (*Viviparus bengalensis* snail) 96 hours = 0.09 ppm copper (at 27.3°C; 0.066 ppm copper static bioassay); LC₅₀ (*Viviparus bengalensis* snail) 96 hours = 0.39 ppm copper (at 20.3°C; 0.066 ppm copper static bioassay)

Environmental Fate

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

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ATTACHMENT A

Copper Sulfate MSDS

Product #: 909794 Name: COPPER SULFATE LG CRYST Desc:
From: BRENNTAG MID-SOUTH INC. To: Wednesday, September 14, 2011

Material Safety Data Sheet

Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

*** Section 13 - Disposal Considerations ***

US EPA Waste Number & Descriptions

A: General Product Information

This product is a registered pesticide.

B: Component Waste Numbers

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

Disposal Instructions

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

Pesticide Disposal

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

*** Section 14 - Transportation Information ***

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

US DOT Information

UN/NA#: UN3077

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

Hazard Class: 9 (Miscellaneous Hazardous Material)

Packing Group: III

Required Label(s): Class 9 (Miscellaneous Hazardous Materials)

RQ Quantity: 10 lbs (4.54 kg) [Cupric Sulfate]

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

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

Domestic Transportation Exception:

49 CFR 172.504(f)(9) Domestic transportation, a Class 9 placard is not required. A bulk packaging containing a Class 9 material must be marked with the appropriate identification number displayed on a Class 9 placard, an orange panel or a white-square-on-point display configuration as required by subpart D of this part. 49 CFR 172.322 (d)(3) allows the use of the Class 9 placard to replace the marine pollutant marking for domestic shipments.

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ATTACHMENT A

Copper Sulfate MSDS

Product #: 909794 Name: COPPER SULFATE LG CRYST Desc:
From: BRENTAG MID-SOUTH INC. To: Wednesday, September 14, 2011

Material Safety Data Sheet

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

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

International Air Transport Association (IATA)

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

UN: UN 3077

Proper Shipping Name: Environmentally hazardous substance, solid, n.o.s. (cupric sulphate)

Hazard Class: 9

Packing Group: III

Passenger & Cargo Aircraft Packing Instruction: 911

Passenger & Cargo Aircraft Maximum Net Quantity: No Limit

Limited Quantity Packing Instruction (Passenger & Cargo Aircraft): Y911

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

Special Provisions: A97

ERG Code: 91.

Limited Quantity Shipments: Such shipments must be marked with the proper shipping name, UN number, and must be additionally marked with the words LIMITED QUANTITIES or LTD. QTY. The total weight of each outer packaging cannot exceed 30 kg (66 lb.). For a shipment by air the class 9 label will be required

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

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

UN #: UN3077

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

Hazard Class: class 9

Packing Group: III

Special Provisions: 274, 909, 944

Limited Quantities: 500g.

Packing Instructions: P002, LP02

Packing Provisions: PP12

EmS: Fire F-A Spill S-F

Stowage and Segregation: Category A

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

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

***** Section 15 - Regulatory Information *****

US Federal Regulations

A: General Product Information

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

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ATTACHMENT A

Copper Sulfate MSDS

Product #: 909794 Name: COPPER SULFATE LG CRYST Desc:
 From: BRENNTAG MID-SOUTH INC. To: Wednesday, September 14, 2011

Material Safety Data Sheet

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

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

US Federal Regulations (continued)

B: Component Analysis

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

Copper Compounds (7440-50-8)

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

Cupric Sulfate (7758-98-7)

CERCLA: final RQ = 10 pounds (4.54 kg)

C: Sara 311/312 Tier II Hazard Ratings:

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

State Regulations

A: General Product Information

California Proposition 65

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

B: Component Analysis - State

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

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

Other Regulations

A: General Product Information

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

B: Component Analysis - Inventory

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

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

C: Component Analysis - WHMIS IDL

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

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

ANSI Labeling (Z129.1):

WARNING! MAY BE HARMFUL OR FATAL IF SWALLOWED. CAUSES SKIN AND EYE IRRITATION. HARMFUL IF INHALED. Keep from contact with clothing. Do not taste or swallow. Do not get on skin or in eyes. Avoid breathing dusts or particulates. Keep container closed. Use only with adequate ventilation. Wash thoroughly after handling. Wear gloves, goggles, faceshields, suitable body protection, and NIOSH-approved respiratory protection, as appropriate. **FIRST-AID:** In Case of Contamination of Skin or Clothing: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. In Case of Contamination of Eyes: Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue to rinse eye. If Inhaled: Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably by mouth to mouth, if possible. If Ingested: Call poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by the poison control center or doctor. Do not give anything by mouth to an unconscious person. Call a poison control center or doctor for treatment advice. Have the product container or label with you when calling a poison control center or doctor, or going for treatment. In the event of a medical emergency, you may also contact

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ATTACHMENT A

Copper Sulfate MSDS

Product #: 909794 Name: COPPER SULFATE LG CRYST Desc:
From: BRENNTAG MID-SOUTH INC. To: Wednesday, September 14, 2011

Material Safety Data Sheet

Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

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

The National Pesticide Information Center at 1-800-858-7378. **IN CASE OF FIRE:** Use water fog, dry chemical, CO₂, or "alcohol" foam. **IN CASE OF SPILL:** Absorb spill with inert material. Place residue in suitable container. Consult Material Safety Data Sheet for additional information.

Labeling Information for Pesticide Use of Product:

DANGER! HAZARD TO HUMANS AND DOMESTIC ANIMALS.

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

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

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

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

STORAGE AND DISPOSAL: PROHIBITIONS: Do not contaminate water, food or feed by storage or disposal. Open burning and dumping is prohibited. Do not re-use empty containers. Keep pesticide in original container. Do not put concentrate or dilutions of concentrate in food or drink containers. Pesticide wastes are acutely hazardous. Improper disposal of excess pesticide, spray mixture or rinsate is a violation of Federal law. If these wastes cannot be disposed of by use, according to label instructions, contact your State Pesticide or Environmental Control Agency, or the Hazardous Waste Representative at the nearest EPA Regional Office for guidance. Completely empty bag of product into application equipment. Dispose of empty bag in a sanitary landfill or by incineration, or if allowed by State and local authorities, by burning. If burned, avoid smoke.

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

AGRICULTURAL USE REQUIREMENTS: Use this product only in accordance with its labeling and with the Worker Protection Standard, CFR Part 170. This standard contains requirements for the protection of agricultural workers on farms, forests, nurseries and greenhouses, and handlers of agricultural pesticides. The Standard contains requirements for the training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE), and restricted-entry interval. These requirements only apply to uses of this product that are covered under the Worker Protection Standard. Do not apply this product in a way that will contaminate workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. Do not allow worker entry into treated areas during the restricted 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.

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ATTACHMENT A

Copper Sulfate MSDS

Product #: 909794 Name: COPPER SULFATE LG CRYST Desc:
From: BRENNTAG MID-SOUTH INC. To: Wednesday, September 14, 2011

Material Safety Data Sheet

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

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

Labeling Information for Pesticide Use of Product (continued):

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

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

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

***** Section 16 - Other Information *****

Other Information

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

Key/Legend

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

Contact: Sue Palmer-Koleman, PhD

Contact Phone: (713) 896-9966

Revision log 07/24/00 4:24 PM SEP Changed company name, Sect 1 and 16, from Corporation to Ltd.
07/27/00 2:49 PM SEP Added "Fine 200, FCC IV, Very High Purity" to synonymus, Section 1
08/23/00 3:15 PM SEP Added "Copper Sulfate Crystals" to synonymus, Section 1
05/31/01 9:31 AM HDF Checked exposure limits; made changes to Sect 9; overall review, add SARA 311/312 Haz Ratings.
06/01/01 7:28 AM HDF Added text to label information from EPA Approved Label
07/24/01 4:31 AM CLJ Add Shipments by Air information to Section 14, Changed contact to Sue, non-800 Chemtree Num.
09/18/01 11:34 AM SEP Added Domestic Transportation Exception, Sect 14
10/05/01 3:30 PM SEP Deleted Alternate Shipping Name, Sect 14
02/15/02 11:01 AM: HDF Revision of SARA Chronic Hazard Rating to "Yes".
2/21/02 4:21 PM HDF Added more information on Marine Pollutant Markings and Limited Quantity Shipments
9/16/03: 3:45 PM HDF Addition of chronic health hazard information. Addition of inhalation hazard information, Section 3. Section 4. expansion of information on Information for Physicians. Up-graded Section 10 Reactivity Information. Up-dated DFG MAK exposure limits. Up-Dated entire Section 14 Transportation Information to include IATA, IMO and current Canadian transport information.
06/22/05 2:24PM SEP Update IATA Section 14
01/06/2006 10:12 am SEP Corrected Section 14 DOT domestic transport exception to read 49 CFR 172.322 (d) (3).
09/08/06 2:52PM SEP Updated DOT and IMO Section 14 SEP
09/25/06 08:43 HDF Review of new toxicological data and addition of data to Section 11.
10/17/06 12:15 pm SEP Updated Section 11.
This is the end of MSDS # C1-121A

Issue Date: 09/09/98 13:25:58 CLW
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Revision Date: 10/17/06 12:15PM SEP

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ATTACHMENT B -- Citric Acid MSDS



Univar USA Inc Material Safety Data Sheet

MSDS No:

Version No:

Order No:

Univar USA Inc., 17425 NE Union Hill Rd., Redmond WA 98052
(425) 889 3400

Emergency Assistance

For emergency assistance involving chemicals call
Chemtrec - (800) 424-9300

ATTACHMENT B

Citric Acid MSDS

UNIVAR USA INC.
ISSUE DATE:2008-05-20
Annotation:

MSDS NO:P21822VS
VERSION:016 2008-10-27

The Version Date and Number for this MSDS is : 10/27/2008 - #016

PRODUCT NAME: CITRIC ACID ANHYDROUS
MSDS NUMBER: P21822VS
DATE ISSUED: 05/20/2008
SUPERSEDES: 07/01/2005
ISSUED BY: 006886

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

COMMERCIAL PRODUCT NAME: CITRIC ACID ANHYDROUS

Distributed by:
Univar USA Inc.
17425 NE Union Hill Rd.
Redmond, WA 98052
425-889-3400

24 Hour Emergency Phone Number: CHEMTREC 1-800-424-9300

PRODUCT USE: Widely used acidulant for flavoring, beverages, food, and as a basic chemical.

2. COMPOSITION, INFORMATION ON INGREDIENTS

Chemical Name Of The Material: 2-hydroxy-1,2,3-propane tricarboxylic acid
Chemical Formula C₆H₈O₇
Chemical Family Organic Acid
SYNONYMS: Citric Acid, Beta-hydroxytricarboxylic acid.

COMPOSITION:	CAS Reg. No.	%
Citric Acid Anhydrous	77-92-9	100

EC-No. 201-069-1
European Food Additive E330
HAZARDOUS IMPURITIES None

3. HAZARDS IDENTIFICATION

ATTACHMENT B

Citric Acid MSDS

UNIVAR USA INC.
ISSUE DATE:2008-05-20

MSDS NO:P21822VS
VERSION:016 2008-10-27

Annotation:

Emergency Overview: Odorless, colorless translucent crystals with strong acidic taste. Citric acid is a skin and mucous membrane irritant and an eye irritant. It may cause allergic reactions in some individuals.

Most important Hazard: Irritating to eyes.

Potential Health Effects:

Inhalation: May cause mucous membrane irritation with sore throat, coughing and shortness of breath.

Eye contact: May cause irritation with redness, pain, possible eye burns, conjunctivitis, ulceration and permanent cloudiness.

Skin contact: May cause irritation with swelling, redness and pain.

Ingestion: May cause acute gastrointestinal irritation with abdominal pain.

Chronic: Repeated or prolonged skin contact may result in dermatitis. Prolonged or repeated eye contact may result in conjunctivitis. Long term oral overexposure may cause damage to tooth enamel.

Carcinogen status: None

4. FIRST AID MEASURES

General advice	Consult a physician.
Major effects of exposure:	Irritating to eyes and skin.
Inhalation	Move to fresh air.
Skin contact	Wash off immediately with soap and plenty of water. If skin irritation persists, call a physician.
Eye contact	Rinse immediately with plenty of water and seek medical advice.
Ingestion	Drink plenty of water. Do not induce vomiting.
Protection of first-aiders	Consult a physician if necessary Use personal protective equipment.

5. FIRE FIGHTING MEASURES

FLASH POINT	Not Applicable
FLAMMABLE LIMITS	Lower 8 gm/FT3 Upper 65 gm/FT3
Autoignition temperature:	1010 deg C / 1850 deg F
Suitable extinguishing media	water, water spray, dry powder, foam , carbon dioxide (CO2), remove containers if possible. Cool container exposed to fire with water spray.

Extinguishing media which must not

ATTACHMENT B

Citric Acid MSDS

UNIVAR USA INC.
ISSUE DATE:2008-05-20

MSDS NO:P21822VS
VERSION:016 2008-10-27

Annotation:

Odor	none
pH (5 % solution)	1.8
Vapor pressure	3.70E-009mm Hg@25 deg C
Vapor density	not applicable
Boiling point	175 deg C
Evaporation rate	essentially 0
Coefficient of water/oil	-1.72 (measured)
distrib Log P (oct)	
Log P (oct)	-1.25 to -1.80 (calculated)
Melting point/range	153 deg C
Decomposition temperature	> 170 deg C
Relative density	1,665 g/cm3
Bulk density	650 - 950 kg/m3
Solubility, Water solubility (25 deg C)	576 g/kg
Solubility in other solvents, Alcohol (25 deg C)	383 g/l
Molecular weight	192.12

10. STABILITY AND REACTIVITY

Stability	Stable at normal conditions
Conditions to avoid	Avoid dust formation and moisture. Take precautionary measures against static discharges.
Materials to avoid	Incompatible with strong bases and oxidizing agents.
Hazardous polymerization	Does not occur.
Corrosion	May corrode metals. 316 Stainless Steel recommended for handling.

11. TOXICOLOGICAL INFORMATION

Acute toxicity	LD50/p.o./rat	11,700 mg/kg
	LD50/i.p./rat	885 mg/kg
	LD50/p.o./mouse	5,040 mg/kg
	LD50/I.p./mouse	961 mg/kg
Local effects	Irritating to eyes and skin	
Chronic toxicity	None	
Human experience	Health injuries are not known or expected under normal use.	

12. ECOLOGICAL INFORMATION

Mobility	Completely soluble
Persistence and degradability	
Chemical oxygen demand	(COD) = 728 mg O ₂ /g

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Citric Acid MSDS

UNIVAR USA INC.
ISSUE DATE:2008-05-20

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VERSION:016 2008-10-27

Annotation:

Biological oxygen demand/5 days	(BOD) = 528 mg O ₂ /g
Readily biodegradable	98% after 2 days
Bioaccumulation	None
Ecotoxicity effects	Toxicity to fish (LC50/96h/goldfish) = 440-706 mg/L Toxicity to bacteria(ECO) = >10,000 mg/L

13. DISPOSAL CONSIDERATIONS

Waste from residues/unused products

Any disposal practice must be in compliance with local, state and federal laws and regulations (contact local or state environmental agency for specific rules).

14. TRANSPORT INFORMATION

Not Regulated

Not classified as dangerous according to TDG (Transportation of Dangerous Goods) and US DOT (Department of Transportation)

15. REGULATORY INFORMATION

Citric acid is generally regarded as safe (GRAS) by USA FDA. 21 CFR 184.1033
Meets the criteria for hazardous material as defined by OSHA Hazard Communication Standard 21 CFR 1910.1200.

The material is listed on the TSCA Inventory List.

CERCLA (Comprehensive Response Compensation, and Liability Act): Not hazardous

SARA Title III (Superfund Amendments and Reauthorization Bill): Not Considered Hazardous

Foreign Inventory Status

Canadian DSL (Domestic Substance List) WHMIS Class E

IDL Citric Acid (CAS-No. 77-92-9) is listed on the Ingredient Disclosure List

DSL Citric Acid (CAS-No. 77-92-9) is listed on the Domestic Substance List

To the best of our knowledge, this Citric Acid Anhydrous does not contain any contaminants or biproducts known to the State of California to cause cancer or reproductive toxicity as listed under Proposition 65 State Drinking Water and Toxic Enforcement Act.

16. OTHER INFORMATION

HMIS* Rating Health = 1, Fire = 0, Reactivity = 0

0=minimal, 1=slight, 2=moderate, 3=serious, 4=severe

*Hazardous Materials Identification System of the National Paint and Coating Association.

ATTACHMENT B

Citric Acid MSDS

Univar USA Inc Material Safety Data Sheet

For Additional Information contact MSDS Coordinator during business hours, Pacific time: (425) 889-3400

Notice

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This information relates only to the product designated herein, and does not relate to its use in combination with any other material or in any other process

ATTACHMENT B

Citric Acid Spec Sheet

PRODUCT SPECIFICATION



Citric Acid, Anhydrous

USP/FCC Grade, Kosher

Univar's premium grade citric acid, anhydrous, is produced to meet the specifications of the Food Chemical Codex (FCC) and the United States Pharmacopoeia (USP). Test methods are listed in the current FCC and USP. This material is supplied in a multi-wall paper bag designed to Univar requirements.

Property	Specification	Typical Results
Description	White or colorless crystals	White or colorless crystals
Assay, calculated on the anhydrous basis	99.5% ~ 100.5%	99.6%
Identification	Pass test	Pass
Clarity of Solution	Pass test	Pass
Color of Solution	Pass test	Pass
Moisture	< 0.3%	0.15 %
Heavy Metal (as Pb)	< 5 ppm	3 ppm
Oxalate	< 350 ppm	< 100 ppm
Readily Carbonizable Substances	Pass test	Pass test
Residue on Ignition (Sulfated ash)	< 0.05%	0.01%
Sulfate	Pass test (< 150 ppm)	10 ppm
Lead, Pb	< 0.5 ppm	< 0.5 ppm
Iron, Fe (not in current FCC/ USP)	< 5 ppm	< 5 ppm

CAS: 77-92-9

Formula: C₆H₈O₇

M.W.: 192.13

Mesh Sizes Available:

Granular:	16 - 30 mesh in 50 lb. Univar bags, or 1 MT super sack Particle size: Retained on 14 mesh: 5% max Through 50 mesh: 10% max
Fine Granular:	30 - 80 mesh in 50 lb. Univar bags Particle size: Retained on 30 mesh: 5 % max Through 100 mesh: 10% max
Powder:	70 - 120 mesh (available in 25 kg fiber drums or cartons only)

RE-EVALUATION DATE: Granular and Fine Granular: 2 years for Yixing/ RZBC; 3 years for BBBCA

SOLUBILITY: Water, 25°C: 62.2%; Ethanol, 20°C: 66%

USES:

- **Flavoring extracts, soft drinks, candy**
- **Effervescent salts**
- **Acidifier**
- **Acidulant and antioxidant in foods**
- **Sequestering agent, water conditioning agent, and detergent builder**
- **Cleaning compounds**

P/C (50 lb. gran): 765118 - Yixing; 765119 - BBBCA; 765120 - RZBC
(1000 kg. SS gran): 713074 - Yixing
(1000 lbs SS gran): 786641 - Yixing; 787544 - RZBC
(50 lb. fine gran): 765121 - Yixing; 765122 - BBBCA; 765123 - RZBC
(1000 lbs SS fine gran): 787545 - RZBC

10-20-2010

Country of Origin: China

Consult the MSDS for additional information.

All information is based on data obtained from the manufacturer or other recognized technical sources. The information is believed to be accurate. Univar makes no representation or warranty, express, or implied, concerning the accuracy or sufficiency of the information. Univar is not liable for any damages resulting from the use or non-use of the information.

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